APPLICATION OF BEACON COMMUNITIES DEVELOPMENT LLC, FOR ZONING REGULATION AMENDMENT, RESUBDIVISION, REZONING, AND SITE PLAN APPROVAL FOR MULTI-FAMILY RESIDENTIAL REDEVELOPMENT OF 20 SECURITY DRIVE AS "THE HOMES AT AVON PARK"

Avon Planning and Zoning Commission

September 17, 2021

Applicant:
Beacon Communities Development LLC
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(617) 574-1100

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Attorney for Beacon Communities Development LLC

Development Team

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TABLE OF CONTENTS
September 17, 2021

Tab:

14. Site Plan Amenities

15. Sustainability Narrative

16. Traffic Report, prepared by SLR Consulting, September 2021

17. Drainage Report, prepared by SLR Consulting, September 2021

18. Letter from Hinckley Allen to Wetlands Agent John McCahill re no regulated activities, September 14, 2021

19. Draft Affordability Plan, September 2021

20. Affordable Housing Need, September 2021

21. Letter to Water Pollution Control Authority, SLR Consulting, September 15, 2021

22. Public Water Supply Watershed/Aquifer Area Project Notification Form (to be sent by SLR Consulting)

23. Consultant Resumes

Submitted Separately:

1. 15 full-size and 15 reduced size copies of "The Homes at Avon Park, Redevelopment of 20 Security Drive, Avon, Connecticut" dated September 17, 2021, 32 sheets total, prepared by SLR Consulting, BSC Group, The Architectural Team, Apex Lighting, and Alford Associates

2. Check payable to the Town of Avon for total application fees of $36,240.00*

   - $200.00 Application for change in zoning regulations;
   - $350.00 Application for zone change;
   - $250.00 Application for resubdivision approval (single lot);
   - $35,200.00 Application for site plan approval ($200 per residential unit X 176)
   - $240.00 DEEP Fee ($60 per application)

   Electronic version in PDF format also submitted.

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* Fee adjustment requested, see letter at Tab 1.

TAB 1

HINCKLEY
ALLEN

20 Church Street
Hartford, CT 06103-1221

p: 860-725-6200 f: 860-278-3802
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September 17, 2021

VIA HAND DELIVERY AND E-FILE

Thomas Armstrong, Chair, and Members
Avon Planning & Zoning Commission
60 West Main Street (Route 44)
Avon, CT 06001

Hiram Peck, III
Director, Planning and Community Development
60 West Main Street (Route 44)
Avon, CT 06001

Re: Application of Beacon Communities Development, LLC for Zoning Regulation Amendment, Resubdivision, Rezoning, and Site Plan Approval, Residential Redevelopment of 20 Security Drive, Avon

Dear Chair Armstrong, Planning and Zoning Commission Members, and Mr. Peck:

We represent Beacon Communities Development LLC ("Beacon"). On its behalf, we are filing this four-part application to (1) amend the Avon Zoning Regulations to create a new multi-family residential zone called the "Housing Opportunity Zone" ("HOZ"), on a portion of the site at 20 Security Drive to be redeveloped; (2) rezone 11.21 acres to this new HOZ; (3) obtain resubdivision approval; and (4) obtain site plan approval.

Procedural Matters

One Application. While this application has four parts (text amendment, resubdivision, rezoning, and the site plan), the parts are integrally related and should be considered, noticed, and heard as a unified application at a combined public hearing. The applicant will grant extensions of time if necessary to enable and ensure consideration of all parts on the same time track.

Section 8-30g "Assisted Housing." This application is for "assisted housing" as defined in General Statutes § 8-30g, because the applicant intends to apply for governmental financial assistance for this development, most likely under the federal Low Income Housing Tax Credit (LIHTC) program. This program requires long-term preservation of a percentage of the proposed residential units for moderate and low-income households.

Notices. All parts of this application are, therefore, submitted pursuant to and in compliance with General Statutes § 8-30g. **All published notices regarding this application should reference § 8-30g.**

Receipt. This application is being filed on September 21, 2021 with an expected receipt date of October 12, 2021, and a request to commence the public hearing at the Commission's and staff's earliest possible opportunity.

Aquifer Zone. The northern-most portion of the parcel at 20 Security Drive lies within an aquifer zone. Therefore, pursuant to General Statutes § 8-3i and § 22a-42f, an Aquifer Area Protection Notification Form has been sent, concurrent with the filing of this application, to the Connecticut Water Company, and a copy has been included at Tab 18.

Peer Review Fees. With regard to any peer review fee to be proposed for Beacon's application, and fees for that review, the applicant makes the following requests:

1) Compliance with Public Act 21-29, § 2(b) and (c), effective October 1, 2021, which contains new rules for third-party peer review fees, including limits on amounts, and accounting requirements.

2) Your office will identify to us in advance any consultant that the Commission proposes to retain, so that we can verify that the person or firm has the necessary qualifications to conduct the peer review, and has no conflicts of interest or bias with regard to the applicant, its team, or the proposed redevelopment. A list of the applicant's development team is included in the Table of Contents of this application.

3) We ask to be apprised of each consultant's proposed scope of work and fee agreement before the commencement of work.

4) We request that each consultant be provided a copy of this letter, be apprised of the public hearing schedule, and confirm availability to produce a complete report in a timely manner, as explained below.

5) We request that each consultant be instructed to reach out to the applicant's consultants directly, by phone, e-mail, or face-to-face meeting; and to ask questions and clarify facts, plans, or information, rather than assuming, guessing, or writing memos asking questions or requesting additional information that could be provided more quickly by direct request.

6) Because each consultant is being retained as an independent third-party, we request that each report or communication with Town staff or the Commission be copied to the applicant team at the email addresses provided on the cover sheet above.

7) We request that each consultant report or submission (initial, reply, or supplement) be produced electronically to the applicant simultaneously with

being sent to the Commission or staff, and transmitted at least three business days prior to the public hearing at which the report will be presented.

8) We request that each consultant not make a presentation to a meeting of any other town agency without the applicant being notified of that meeting.

The applicant intends to work with the Commission and its staff and consultants to ensure a thorough and fair peer review process. These requests are intended to clarify procedures.

Fee Reduction. Beacon has paid with this application a site plan approval fee of $35,200.00. It does so under protest. Respectfully, the applicant believes that this fee is excessive. General Statutes § 8-1c provides that application fees must be reasonable, which is generally understood to mean sufficient to cover the town's administrative costs to process the application. Anything more is an illegal tax. Beacon understands that the Town and the Commission, as noted above, have authority to charge applicants a peer review fee. This is, therefore, a request for a reduction of the site plan application fee, which can be coordinated with agreement on any peer review fees, to ensure that the charges and payments are reasonable, and the Town's administrative costs are covered, but the fee is not excessive.

A detailed overview of this project is provided in the letter at Tab 2. We look forward to present this application to the Commission.

We look forward to presenting this application to the Commission.

Very truly yours,

Tim Hollister

Timothy S. Hollister

cc: Beacon Communities Development LLC

TAB 2

HINCKLEY
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September 17, 2021

VIA HAND DELIVERY AND E-FILE

Thomas Armstrong, Chair, and Members
Avon Planning & Zoning Commission
60 West Main Street (Route 44)
Avon, CT 06001

Hiram Peck, III
Director, Planning and Community Development
60 West Main Street (Route 44)
Avon, CT 06001

Re: Application of Beacon Communities Development, LLC for Zoning Regulation Amendment, Resubdivision, Rezoning, and Site Plan Approval, Residential Redevelopment of 20 Security Drive, Avon

Dear Chair Armstrong, Zoning Commission Members, and Mr. Peck:

On behalf of our client Beacon Communities Development, LLC ("Beacon"), we are submitting the attached application to the Town of Avon Planning and Zoning Commission for approval of a multi-family residential redevelopment of 20 Security Drive, to be called "The Homes at Avon Park." The purpose of this letter is to explain the application in detail and to answer in writing, in advance of a public hearing, likely questions.

1. History of Subject Site

In the early 1970's, FIP Corporation developed Avon Park North and Avon Park South, for office and light industrial uses, on 550 acres acquired from the Ensign-Bickford Company. These office parks were, at the time, ground-breaking development models, with features such as underground utilities, extensive tree preservation, and recorded restrictions to govern development and use.

An office building was first built at 20 Security Drive in 1972-73, with the Security-Connecticut Life Insurance being the primary occupant from the building's opening through the 1980s. Later tenants included Parke-Davis & Co.; a medical equipment distributor; and Eastern Color Printing, Inc. The existing parking garage on the west side of the site was built in the late 1980s. The Ana Grace Academy of the Arts, affiliated with CREC, occupied part of the office space and the exterior playground beginning in 2013, before relocating to Bloomfield in 2021.

2. Beacon Communities

Beacon Communities, based in Boston, is a developer and manager of housing, with an extensive portfolio of properties and multi-family residential units preserved for moderate and low income households. On July 20, 2021, in a preapplication meeting with this Commission, Beacon explained its mission, experience, expertise, and successes, including several developments in Connecticut, the most recent being Montgomery Mill in Windsor Locks. Materials about Beacon from the July 2020 presentation are at Tab 5 of this package.

3. Property Proposed for Redevelopment

Twenty Security Drive, LLC, has owned 20 Security Drive, a 17 acre parcel, since 2009. See Tab 3. The overall 17 acre parcel is currently zoned Industrial Park ("IP"). To proceed with this application, Beacon has executed an agreement with Twenty Security Drive, LLC to ground lease, for 99 years, 11.2 acres of the 17 acre parcel. This 11.2 acres, containing the existing office building but not the parking garage, is referred to in this application package as the "redevelopment area." The redevelopment area also contains two large surface parking lots, a fenced-in playground area, and paved walkways.

Because a long-term lease is considered the equivalent of ownership, Beacon has applied, as part of this application, in compliance with the Avon Subdivision Regulations § 2.01. and General Statutes § 8-18(c) for a resubdivision of the 17 acre parcel into the 11.2 acre parcel it intends to redevelop, with the remaining acreage to remain with the current owner. As part of its ground lease, Beacon will be granted easements for access and utilities over the owner-retained acreage.

As shown in the plan set, the redevelopment area has its public street frontage along Darling Drive, at the northwest portion of the 11.2 acres. Otherwise, the redevelopment area is directly south of West Main Street/Route 44. Northeast of the 11.2 acres is a small area of office and retail uses. To the immediate west of the 11.2 acres is a commercial building owned by Southern New England Telephone Company.

4. Appropriate Location for Residential Redevelopment

Several characteristics of the surrounding area make it appropriate for multi-family residential redevelopment. The office building is well screened from Route 44 and Darling Drive by a berm and trees. The existing building is currently vacant. The Avon Village Center development, including the new Whole Foods store, are accessible through the pedestrian tunnel from Darling Drive that proceeds under Route 44. South of the redevelopment area, along Darling Drive, is a senior living community, Peachtree Village, consisting of 104 units. River Ridge at Avon, another senior living community, and Avon Colonial Manor, an apartment complex, are also nearby.

The redevelopment area is proximate to the Farmington Canal Heritage Trail. An existing crosswalk to the northeast of the site along Darling Drive allows direct access from the site to the Trail. Beacon's site plan envisions a second crosswalk, south of the property, along Security Drive, providing another access to the Trail.

5. Four-Part Application

This application is filed in compliance with General Statutes § 8-30g. Following established best practices for General Statutes § 8-30g applications, this application consists of (1) a proposed site-specific text amendment for a new zone, to be called the Housing Opportunity Zone (HOZ); (2) a resubdivision application, to divide the existing 17 acre parcel into the 11.2 acre redevelopment and the fee owner's remaining parcel; (3) rezoning of the resubdivided 11.2 acre lot to Housing Opportunity Zone; and (4) site plan approval for the redevelopment to multi-family residential. The lot that will be retained by Twenty Security Drive, LLC will remain in the IP zone.

6. Explanatory Statement for Regulation Amendment and Rezoning

The Zoning Regulations require a statement of reasons for a proposed regulation amendment and rezoning.

The appropriateness of the subject site for residential redevelopment is addressed above in § 4.

A site-specific zoning regulation amendment is proposed for several reasons. First, residential redevelopment of an existing office use as proposed here, that will include units preserved for moderate and low income households, requires a combination of specific land use and affordability administration provisions that is not found in any existing Avon regulation.

Second, a site specific regulation allows the Commission to consider the application without having to review how and where the regulation might be applicable elsewhere in town. (The Commission, of course, now or later, may consider expanding the regulation's geographic applicability.)

Third, Court decisions have made it clear that a site-specific regulation to enable development under § 8-30g is not spot zoning.

Fourth, this site-specific model has been used successfully in more than 50 Connecticut towns during the past 31 years that § 8-30g has been state law.

Fifth, wherever possible, the proposed HOZ regulation contains substantive and procedural provisions that track, to the extent possible, Avon's existing land use regulations.

The applicant has considered carefully the option of proceeding under the Town's Attainable Housing Overlay Zone regulation. While that regulation is commendable in many respects, its substantive standards do not fit well with the redevelopment proposed here. Also, that regulation retains to the Commission discretion to modify regulations and standards during the process, thereby creating some uncertainty and the possibility of a protracted review.

The HOZ regulation proposed is intended to provide detailed standards, so that the Commission will know what is being proposed, and how the property will be used and administered if the application is approved. In a § 8-30g application, a zoning commission has not only the authority but also the obligation to identify "reasonable changes" to the application that will address concerns, and to impose approval conditions on the site plan to ensure proper governance and enforceability.

7. Residential Redevelopment Plan

Beacon proposes a 176-unit, multi-family rental development, consisting of 86 one-bedroom units and 90 two-bedroom units. The plan is comprised of the existing office building, which will be converted to 76 units (Building A), and a new building to be constructed on the site of an existing parking lot with 100 units, (Building B). Building A will retain its "barbell" shape, with the western portion being three stories and the eastern portion being four stories. Building B will be in a "U" shape and will be four stories. The plans also involves the construction of parking areas around the buildings, largely utilizing the existing parking lots, as well as improvements to the existing pathways and walkways, and the construction of residential amenities, including a basketball court and two dog runs. A detailed explanation of amenities is at Tab 14. The Affordability Plan, at Tab 19, contains (Schedule B) a list of interior unit amenities and materials to ensure quality.

Unit sizes will range from 682 to 1138 sq. feet for one bedroom units and 997 to 1416 square feet for two bedroom units. (The larger units are located mainly in the renovated office building, where conversion to apartments must work with existing interior spaces.) The overall plan provides 266 parking spaces, based on 1.0 parking space for each one-bedroom unit and 2.0 parking spaces for each two-bedroom unit.

The redevelopment is served by existing water and sewer lines, as well as existing electricity and natural gas.

In September 2021, Beacon obtained from the Avon Water Pollution Control Authority approval to provide sewer service to the redevelopment, with conditions listed at Tab 21.

The proposed HOZ regulation provides for the removal of earth materials as part of site plan approval in compliance with the substantive requirements of § III.H. of the Avon Zoning Regulations, but without a separate special exception from the Commission. In general, special permits and special exceptions, being discretionary, are inconsistent with the review standards of

General Statutes § 8-30g. Therefore, this application does not include a special exception application.

8. Collateral Approvals and Funding Sources

There are no wetlands on upland review areas on the subject 11.2 acre redevelopment parcel.

The redevelopment will require approval by the Office of State Traffic Administration (OSTA) (whose predecessor issued a similar approval for the office building in 1969). It should be noted that General Statutes § 8-30g may be used in Avon's Industrial Park (IP) zone because that zone allows several residential uses.

The federal Low Income Housing Tax Credit program, the nation's most widely used and successful mixed income housing development program, operates through the State Department of Housing and the Connecticut Housing Finance Agency receiving from the federal government an allocation of tax credits, which are awarded to development proposals through a highly competitive, point system-based application process. The tax credits are sold, mainly to corporations and investors, in an open market. The credit purchasers use the credits to offset tax liability, and the money received from the tax credits becomes the core of funds used to lower development costs and permit applicants and developers to commit to long-term preservation of below-market rents.

Finally, the application package includes, as part of Tab 20, excerpts from Avon's Plan of Conservation and Development. This application is consistent with the goals of the Housing chapters of the POCD. This said, the POCD is advisory as to this application, as it is to all zoning applications.

9. Pedestrian Connectivity

An ADA-compliant pedestrian route from the site to Route 44 and its retail, office, and commercial uses is provided by sidewalks south along the driveway from the residential apartments, then east along Security Drive, then north along Darling Drive. In addition, the plan calls for a pedestrian trail in the northwest corner, connecting to Darling Drive. At that point, both routes lead to the pedestrian tunnel under Route 44, to the new Whole Foods and the Avon Village Center.

10. Sustainability, Amenities, Construction Specifications

The applicant respectfully directs the Commission's attention to three aspects of this application that substantiates a commitment to quality and environmental sustainability: (1) the Sustainability Narrative, Tab 15; (2) the Site Plan Amenities description, Tab 14; and (3) Schedule B of the Affordability Plan, Tab 20, which specifies construction features and materials.

11. Affordability Plan

An Affordability Plan compliant with § 8-30g requirements for "assisted housing" is in this package at Tab 20. Notably, the exact qualifying maximum incomes, affordability levels, and time frame will be specified in a binding, recorded declaration of covenants and restrictions that will be executed when the public financing transaction is completed. In this sense, "assisted housing" differs from privately-financed "30 percent set aside" housing, which is the other § 8-30g program.

As to affordability levels, if the LIHTC program becomes the funding source, Beacon expects that: (1) 20 percent of the units will be rented at market rates, expected to be in the range of $1,880 to $2,100 per month; and the remaining units will be preserved for households earning between 30 percent and 80 percent of the area median income for the region in which Avon is located (greater Hartford), where the area median for a four-person household is currently $104,300. Rents for these units would range from $500 per month to $1,670 per month.

12. Public Act 21-29

The applicant respectfully notes several new rules and obligations regarding affordable housing development contained in Public Act 21-29, which takes effect October 1. The Act requires zoning commissions, in addition to § 8-30g obligations, to use zoning regulation to "affirmatively further" the purpose of the federal Fair Housing Act. In general, this refers to towns taking proactive, specific steps to ensure that racial, ethnic, and economic groups that have historically been excluded from obtaining affordable housing are given opportunities to do so. How this new, first-in-the-nation requirement will shape consideration of this application can be addressed at the public hearing, but the applicant notes it at this time.

Looking Forward

The applicant team has tried in this letter and in its application materials to explain the plan in detail; cover all bases; answer anticipated questions; shorten the list of items to be discussed at the public hearing; facilitate review by peer consultants, Town staff, and the public; demonstrate that the site plan can be constructed without any substantial health or safety impacts; and show that the development will benefit the Town of Avon.

Thank you for your attention.

Very truly yours,

Tim Hollister

Timothy S. Hollister

cc: Beacon Communities Development LLC

TAB 3

| BEACON |
communities

Beacon Communities Development LLC

Two Center Plaza, Suite 700
Boston, MA 02108
P: 617.574.1100 TTY 711
BeaconCommunitiesLLC.com

September 20, 2021

Thomas Armstrong, Chair, and Members
Avon Planning & Zoning Commission
60 West Main Street (Route 44)
Avon, CT 06001

Hiram Peck, III
Director, Planning | Community Development
60 West Main Street (Route 44)
Avon, CT 06001

Re: Application of Beacon Communities Development LLC for Resubdivision, Zoning Regulation Amendment, Site Re-Zoning, and Site Plan Approval

Dear Chair Armstrong, Zoning Commission Members, and Director Peck:

I am the President of Beacon Communities Corp., the Manager of Beacon Communities Development LLC, the ground lessee of the property at 20 Security Drive and the applicant in the above application.

I hereby authorize attorneys with Hinckley Allen to pursue the above application dated September 17, 2021 to resubdivide the property, amend the zoning regulations and re-zone the property, and for approval of a site plan, in the town of Avon.

Very truly yours,

Beacon Communities Development LLC
By: Beacon Communities Corp., its Manager

By: __________________
Dara Kovel, President

Doc ID: 000638200006 Type: LAN
BK 591 PG 853-858

LIMITED WARRANTY DEED

TO ALL PEOPLE TO WHOM THESE PRESENTS SHALL COME, GREETING:

KNOW YE, that, **AVON ASSOCIATES LIMITED PARTNERSHIP**, a limited partnership existing under the laws of the State of Connecticut and having its principal place of business c/o UBS Financial Services, Inc., 51 West 52nd Street, 23rd Floor, New York, New York 10019, hereinafter referred to as the "Grantor", for the consideration of One Dollar ($1.00) and other valuable consideration received to its full satisfaction of **20 SECURITY DRIVE, LLC**, a limited liability company existing under the laws of the State of Connecticut and having its principal place of business in the Town of Litchfield, County of Litchfield and State of Connecticut, hereinafter referred to as the "Grantee", does hereby give, grant, bargain sell and confirm unto the said Grantee and unto its successors and assigns forever, all that certain piece or parcel of land with all the improvements thereon, situated in the Town of Avon, County of Hartford and State of Connecticut, known as 20 Security Drive said piece or parcel of land being bounded and described in **Schedule A** attached hereto and made a part hereof.

TO HAVE AND TO HOLD the above granted and bargained premises, with all the appurtenances thereof, unto the said Grantee, and unto its successors and assigns forever, to its and their own proper use and benefit.

AND ALSO, the said Grantor does for itself and for its successors and assigns, covenant with the said Grantee, and with its successors and assigns, that Grantor has not done or suffered anything whereby the said premises has been incumbered in any way, except as mentioned in **Schedule B**.

AND FURTHERMORE, the said Grantor does by these presents bind itself and its successors and assigns forever to WARRANT AND DEFEND the above granted and bargained premises to the said Grantee, and to its successors and assigns, against all claims and demands of any person or persons claiming by or under the said Grantor, except as mentioned in **Schedule B**.

[Remainder of Page Intentionally Left Blank]

$ 43,272.07 State
$10818.02 Conveyance Tax Received

Ann L. Deanstep
Town Clerk of Avon

IN WITNESS WHEREOF, the said Grantor has caused this Limited Warranty Deed to be executed this 18 day of June, 2009.

Signed and Delivered in the presence of:

Witnesses:

Name: Joseph I. Sipario II

Deirdre Nichols
Name: Deirdre Nichols

AVON ASSOCIATES LIMITED PARTNERSHIP,
a Connecticut limited partnership

By: Midtown Associates Limited Partnership/1984,
a Massachusetts limited partnership,
its general partner

By: Midtown, Inc.,
a Delaware corporation,
its general partner

By: Clifford Wattley
Name: Clifford Wattley
Title: President

STATE OF NEW YORK
ss:
COUNTY OF NEW YORK

On the 8th day of June, in the year 2009 before me, the undersigned, a Notary Public in and for said state, personally appeared Clifford Wattley, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity as President of Midtown, Inc., a Delaware corporation, in its capacity as the general partner of Midtown Associates Limited Partnership/1984, a Massachusetts limited partnership, in its capacity as the general partner of Avon Associates Limited Partnership, a Connecticut limited partnership and that by his signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Lauren B. Silfen
Notary Public
My Commission Expires: Oct. 16, 2011

LAUREN B. SILFEN
Notary Public, State of New York
No. 01SI4842910
Qualified in New York County
Commission Expires ~~May 31, 20~~
Oct. 16, 2011

SCHEDULE A

LEGAL DESCRIPTION

(20 Security Drive, Avon, Connecticut)

Two certain pieces or parcels of land, together with the buildings and improvements thereon, located in the Town of Avon, County of Hartford and State of Connecticut, and being more particularly bounded and described as follows:

PARCEL A

A certain piece or parcel of land shown and designated as "Parcel A" on a map entitled, "Map of land owned by Security Connecticut Life Insurance Company Security Drive & Darling Drive Avon, Connecticut Scale 1" = 60' February 1984 certified substantially correct in accordance with Class A-2 of the code of recommended practice for accuracy of surveys & maps. Edward F. Reuber, Surveyor Hodge Surveying Associates, P.C."; being more particularly bounded and described as follows, to wit:

Beginning at a point on the southerly highway line of Albany Turnpike said point marking the northeasterly corner of land herein described and the northwesterly corner of land of Anthony J. Francoline said point also being located ninety-six and fifty-nine hundredths (96.59) feet westerly of a CHD monument as measured along said highway line of Albany Turnpike, thence S 27° 32' 59" W for a distance of one hundred five and sixty one hundredths (105.61) feet to an iron pipe, thence S 63° 41' 25" E for a distance of eighty-nine and eighty-seven hundredths (89.87) feet to a concrete monument, thence S 27° 42' 29" W for a distance or fifty-five and forty-three hundredths (55.43) feet to an iron pin, thence S 68° 18' 40" E for a distance of seventy-one and ninety-seven hundredths (71.97) feet to an iron pipe, thence S 23° 03' 16" W for a distance of one hundred eighty-one and fifty-two hundredths (181.52) feet to an iron pipe, thence S 68° 50' 56" E for a distance of two hundred fifteen and eighty-seven hundredths (215.87) feet to an iron pipe, the last six courses being along land of Anthony J. Francoline, thence S 58° 37' 02" E for a distance of one hundred eighty-nine and sixty-nine hundredths (189.69) feet to an iron pipe, the last course being along land now or formerly of Darrell Reisner, thence S 42° 6' 31" W for a distance of ninety-three and no hundredths (93.00) feet to an iron pipe, thence S 40° 42' 01" W for a distance of three hundred forty-one and nine tenths (341.90) feet to a monument, thence S 36°16' 31" W for a distance of sixty-five and one tenth (65.10) feet to a monument, the last three courses being along land now or formerly of Kathleen C. O'Neill, thence N 60° 26' 42" W along land now or formerly of Avon Park Properties thirty and no hundredths (30.00) feet to an iron pin, thence N 60° 26' 42" W for a distance of three hundred forty-three and five hundredths (343.05) feet to a point thence continuing the same course thirty-eight and ninety-nine hundredths (38.99) feet to a point, thence S 43° 23' 21" W for a distance of three hundred fifteen and no hundredths (315.00) feet to a point, thence S 01° 24' 14" E for a distance of twenty-eight and thirty-nine hundredths (28.39) feet to a point on the northerly highway line of Security Drive, the last four courses being along Parcel 15 as shown on the above referred to map, thence in a general westerly direction it being a curve to the left having a radius of one thousand three hundred eighty-six and eighty-two hundredths (1386.82) feet for a distance of twenty (20) feet to a highway monument thence N 46° 36' 39" W for a distance of three hundred thirteen and fifty-nine hundredths (313.59) feet to a highway monument, thence in a general westerly direction it being a curve to the left having a radius of four hundred twenty-two and twenty-seven hundredths (422.27) feet for a distance of one hundred thirty-one and sixty-six hundredths (131.66) feet to a highway monument, thence in a general northwesterly direction it being a curve to, the right having a radius of twenty-four and twenty-eight hundredths (24.28) feet for a distance of forty and one hundredth (40.01) feet to a highway monument, the last four courses being along the northerly highway line of Security Drive, thence N 29° 56' 58" E for a distance of seventy-two and seventy-one hundredths (72.71) feet to a highway monument, thence in a general northerly direction it being a curve to the left having a radius of seven hundred twenty-five and three hundredths (725.03) feet for a distance of two hundred thirty-one and sixty-six hundredths (231.66) feet to an iron pin, the last two courses being along the easterly highway line of Darling Drive, thence S 80° 26' 30" E for a distance of two hundred twenty-two and nine hundredths. (222.09) feet to a point, thence N 09° 33' 30" E for a distance of one hundred ninety-nine and seventy-nine hundredths (199.79) feet to a point, thence N 80° 26' 30" W for a distance of two hundred sixteen and sixty-one hundredths (216.61) feet to a monument on the easterly highway line of Darling Drive, the last three courses being along land now or formerly of the Southern New England Telephone Company, thence N 09° 33' 30" E for a distance of one hundred sixty and no hundredths (160.00) feet to a monument, thence in a general northeasterly direction it being a curve to the right having a radius of twenty-four and sixty-three hundredths (24.63) feet for a distance of thirty-nine and nine hundredths (39.09) feet to a monument, the last two courses being along the easterly highway line of Darling Drive, thence S 79° 29' 41" E for a distance of two hundred seven and seven hundredths (207.07) feet to a CHD monument, thence N 82° 47' 08" E for a distance of three hundred eighty-seven and eight hundredths (387.08) feet to a CHD monument, thence S 81° 47' 47" E for a distance of ninety-five and forty-four hundredths (95.44) feet to point of beginning, the last three courses being along the southerly highway line of Albany Turnpike.

The above described land is bounded northerly by Albany Turnpike, land of Anthony J. Francoline, land of Darrell Reisner and land of the Southern New England Telephone Company, in part by each, easterly by land of Anthony J. Francoline, land of Kathleen C. O'Neill and Parcel 15 as shown on the above referred to map, in part by each, southerly by said Parcel 15, Security Drive and land of the Southern New England Telephone Company, in part by each, and westerly by Darling Drive and land of the Southern New England Telephone Company, in part by each.

Together with rights and easements set forth in a Sanitary Sewer Easement dated March 26, 1983 from Anthony J. Francoline to Security-Connecticut Life Insurance Company recorded in the Avon Land Records in Volume 137 at Page 129.

PARCEL 15

A certain piece or parcel of land shown and designated as "Parcel 15" on a map entitled, "Map of land owned by Security Connecticut Life Insurance Company Security Drive & Darling Drive Avon, Connecticut Scale 1" = 60' February 1984 certified substantially correct in accordance with Class A-2 of the code of recommended practice for accuracy of surveys & maps. Edward F. Reuber, Surveyor Hodge Surveying Associates, P.C."; being more particularly bounded and described as follows, to wit:

Beginning at a monument on the northerly highway line of Security Drive said monument marking the southeasterly corner of land herein described and the southwesterly corner of land now or formerly of Avon Park Properties known as Parcel 16, thence running in a general westerly direction along said northerly highway line of Security Drive it being a curve to the left having a radius of one thousand three hundred eighty-six and eighty-two hundredths (1386.82) feat for a distance or three hundred twenty-five and seventy-two hundredths (325.72) feet to a point, thence running N 01° 24' 14" W for a distance of twenty-eight and thirty-nine hundredths (28.39) feet to a point, thence N 43° 23' 21" E for a distance of three hundred fifteen and no hundredths (315.00) feet to a point, thence S 60° 26' 42" E for a distance of thirty-eight and ninety-nine hundredths (38.99) feet to a point, thence continuing the same course three hundred forty-three and five hundredths (343.05) feet to an iron pin, the last four courses being along Parcel A as shown on the above referred to map, thence running S 46° 54' 40" W along land now or formerly of Avon Park Properties known as Parcel 16 for a distance of four hundred seventy and one tenth (470.10) feet to point of beginning.

The above described land is bounded northerly and westerly by Parcel A as shown on the above referred to map, easterly by land now or formerly of Avon Park Properties known as Parcel 16 and southerly by Security Drive.

SCHEDULE B

PERMITTED EXCEPTIONS

1. Drainage Easement to Town of Avon in deed dated 3/9/1971 and recorded 3/15/1971 in Volume 70, Page 420 of the Avon Land Records.

2. Easement to the Hartford Electric Light Company dated 10/9/1972 and recorded 10/17/1972 in Volume 79, Page 39 of the Avon Land Records.

3. Drainage Easements to Town of Avon in deed dated 11/9/1973 and recorded 11/14/1973 in Volume 84, Page 210 of the Avon Land Records.

4. Reservations and Restrictions in a deed dated 11/16/1973 and recorded 11/16/1973 in Volume 84, Page 259 of the Avon Land Records.

5. Declaration of Restrictive Covenants dated 12/17/1975 and recorded 12/23/1975 in Volume 91, Page 254 of the Avon Land Records and amended by amendment dated 10/13/1977 and recorded 10/14/1977 in Volume 100, Page 32 of the Avon Land Records.

6. Easement to Richard D'Amico Jr. and Alba P. D'Amico dated 2/28/1979 and recorded 3/16/1979 in Volume 110, Page 421 of the Avon Land Records.

7. Town of Avon Sewer Permit Agreement dated 3/14/1979 and recorded 3/23/1979 in Volume 110, Page 526 of the Avon Land Records.

8. Reservations and restrictions in deed dated 6/21/1979 and recorded 6/22/1979 in Volume 112, Page 572 of the Avon Land Records.

9. Terms and conditions of a Sanitary Sewer Easement dated 3/26/1983 and recorded 6/15/1983 in Volume 137, Page 129 of the Avon Land Records.

10. Easement to the Southern New England Telephone Company dated 8/20/1996 and recorded 9/4/1996 in Volume 323, Page 409 of the Avon Land Records.

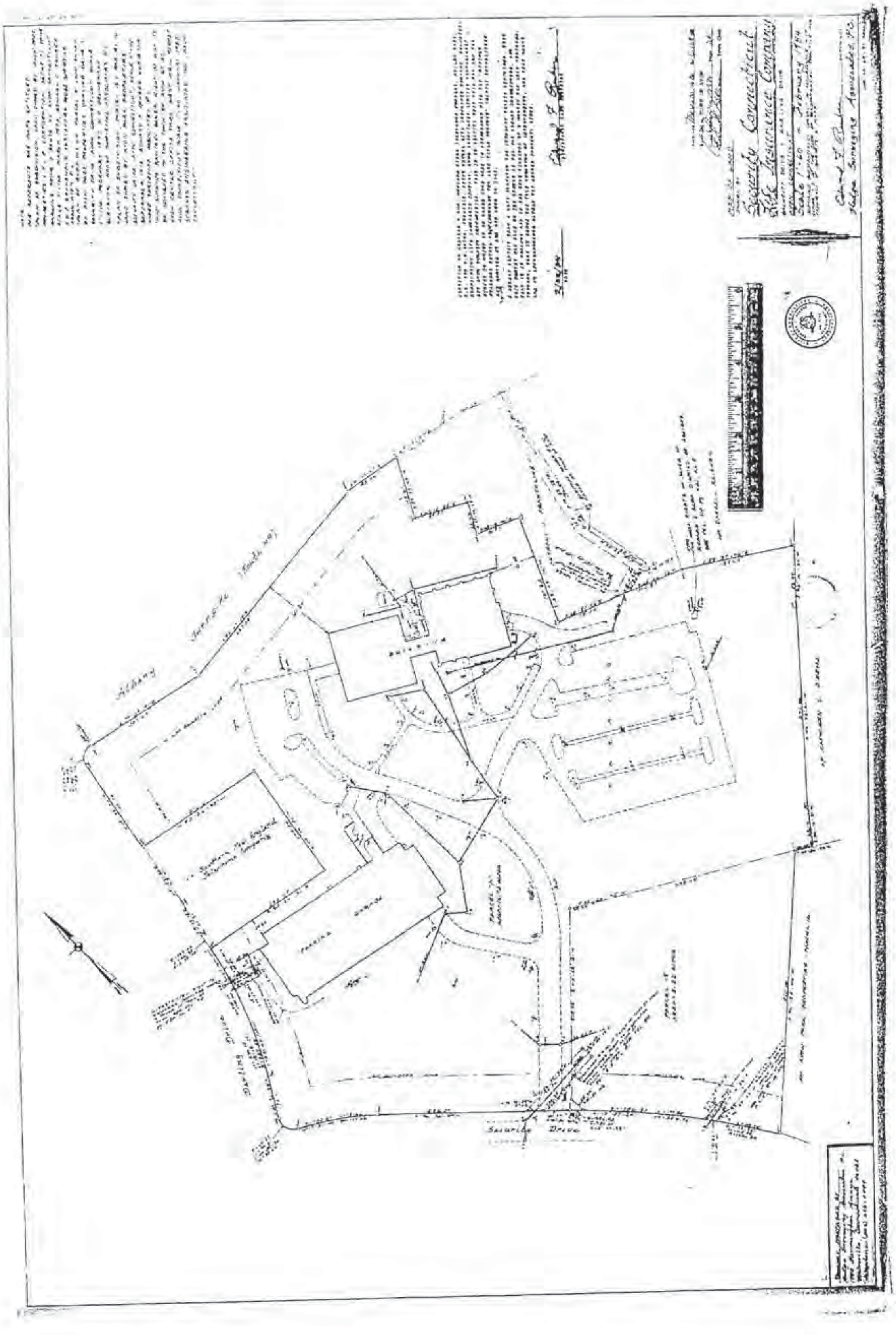
11. Subordinated Mortgage Agreement from Avon Associates Limited Partnership to Blyth Eastman Paine Webber dated 3/1/1984 and recorded 10/12/1984 in Volume 151, Page 257 of the Avon Land Records.

12. Intercreditor Agreement between Avon Associates Limited Partnership and Jackson National Life Insurance Company and Teachers Insurance and Annuity Association of America dated 4/1/1999 and recorded 4/1/1999 in Volume 367, Page 327 of the Avon Land Records.

13. Building lines as shown on Map 84-24 of the Avon Land Records.

Received for Record at Avon, CT
On 06/18/2009 At 1:40:43 pm

84 24


Albany Turnpike (Route 44)
Security Drive
Darling Drive
Security Connecticut
Life Insurance Company

TAB 4


Avon Village Center
Avon Town Offices
Existing Office Building
Existing Garage
Route 44
Existing Office Building
Surface Parking

Site Aerial

The Homes at Avon Park

Site Aerial

BEACON communities | SLR | BSC GROUP | tat

The Homes at Avon Park

Existing Office Building

BEACON communities | SLR | BSC GROUP | tat

Existing Office Building

BEACON communities | SLR | BSC GROUP | tat

TAB 5

CONNECTICUT
PORTFOLIO

BEACON
communities

ABOUT BEACON

18,000+
Apartment Homes

150+
Locations

12
States + District of Columbia

700+
Team Members

40+
Years Experience

A mission-driven for-profit, we are committed to our communities, our residents, and our staff.

We show that commitment by consistently delivering quality — and by doing what's right.

CONNECTICUT PORTFOLIO

IN DEVELOPMENT
657 Apartment homes

Edith Johnson — New Haven
Parkside Village — Branford
State and Chapel - New Haven

OWN + MANAGE
654 Apartment homes

Montgomery Mill — Windsor Locks
Ninth Square — New Haven
Monterey Place — New Haven
Southwood Square — Stamford, CT

3rd PARTY MANAGEMENT
885 Apartment homes

Coppermine Village — Bristol
Exchange Place — Waterbury
Countryside — Wolcott
Flanders West — Southington
Laurelwood Place — Bridgeport
Sycamore Place — Bridgeport
Bridgeport Elderly — Bridgeport

PARKSIDE VILLAGE
BRANFORD, CT

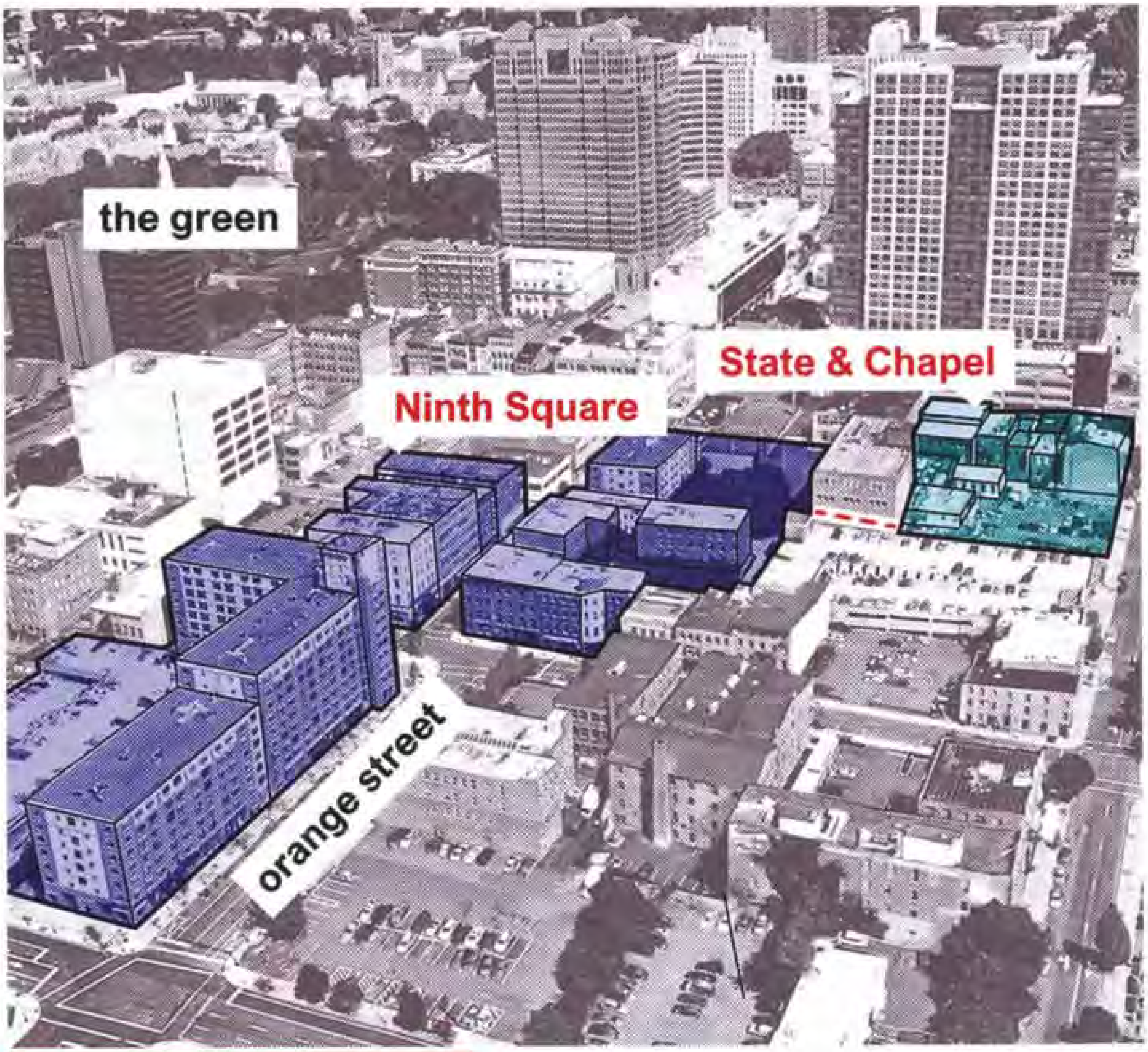
TYPE: New construction

Affordable for families, seniors & disabled

STATUS: In development

NUMBER OF UNITS: 67

ROLE: Developer/owner/manager



STATE AND CHAPEL
NEW HAVEN, CT

TYPE: Mixed Use

Mixed income

STATUS: Predevelopment

NUMBER OF UNITS: 64

ROLE: Developer/owner

MONTGOMERY MILL
WINDSOR LOCKS, CT

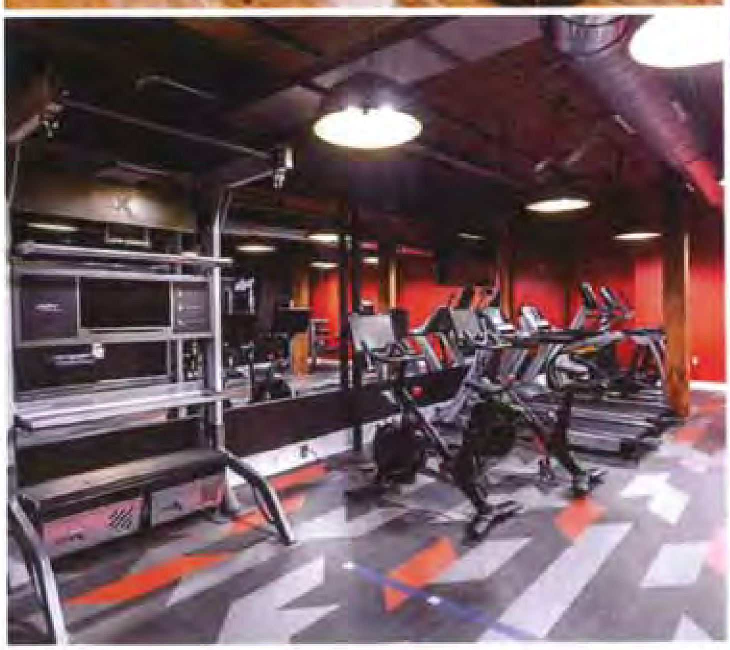
TYPE: Adaptive re-use

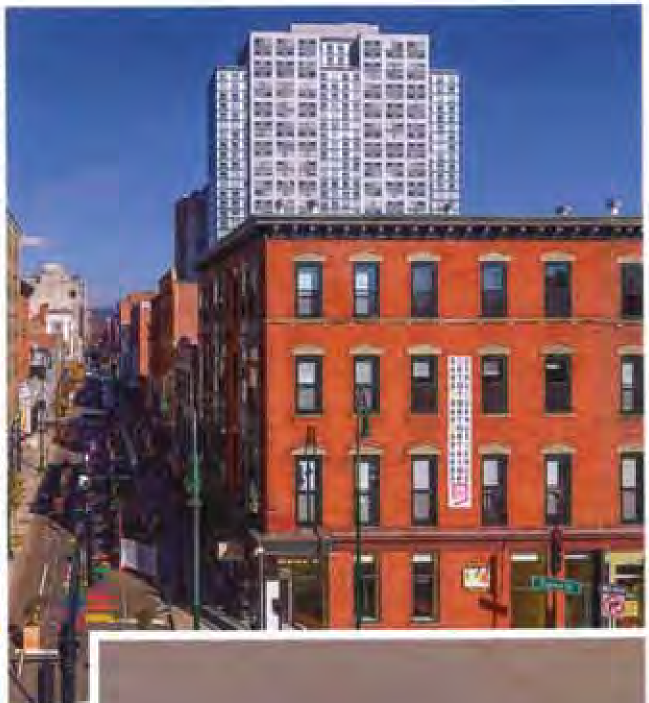
Mixed income for families & individuals

STATUS: Completed 2020

NUMBER OF UNITS: 160

ROLE: Developer/owner/manager





NINTH SQUARE

NEW HAVEN, CT

TYPE: Mid/high-rise

Mixed income for families & individuals

STATUS: Completed 2021

NUMBER OF UNITS: 335

ROLE: Owner/manager

OTHER: 50,000 sq ft of commercial space,

20 businesses

SOUTHWOOD SQUARE
STAMFORD, CT

TYPE: Low/mid-rise

Mixed income for families

STATUS: Completed 2005

NUMBER OF UNITS: 315

ROLE: Developer/owner/manager

MONTEREY PLACE
NEW HAVEN, CT

TYPE: Low/mid-rise

Affordable for families

STATUS: Completed 2002

NUMBER OF UNITS: 339

ROLE: Developer/owner/manager

TAB 6

TOWN OF AVON
PLANNING AND ZONING COMMISSION

APPLICATION # ________

APPLICATION FOR REGULATION CHANGE

1. **APPLICANT**

Name Beacon Communities Development, LLC Phone ________

Business Address 2 Center Plaza, Suite 700, Boston, MA 02108 Phone 617-574-1100

HomeAddress ________ Phone ________

Fax ________ Email thollister@hinckleyallen.com

2. **REGULATION CHANGE INFORMATION**

X Zoning Regulations
Subdivision Regulations
Plan of Development

X New Text
Amendment to Existing Text

Section Number or Location IX-H

Proposed Amendment Title Housing Opportunity Zone

3. **REGULATION TEXT**

See Tab 6.

4. **APPLICANT'S SIGNATURE**

The undersigned warrants the truth of all statements made in conjunction with this application.

Timothy S. Hollister
(Applicant's Signature)

Timothy S. Hollister, Agent/Counsel
(Print or Type Name and Title)

TAB 7

PROPOSED AMENDMENT TO AVON ZONING REGULATIONS (APPENDIX D)

NEW SECTION IX.H "HOUSING OPPORTUNITY ZONE" ("HOZ")

Submission Draft 9-17-21

H. Housing Opportunity Zone (HOZ).

1. *Purpose.* The Housing Opportunity Zone (HOZ) is intended to allow the development of multi-family rental apartment units as "assisted housing" as defined in General Statutes § 8-30g(a) and to promote housing choice and economic diversity within the Town of Avon.

2. *Eligible Location.* Land with the following characteristics may be rezoned to HOZ:

   a. Lot size between 9 and 12 acres; and

   b. Lot must have frontage on Darling Drive.

3. *Permitted Uses.* The following uses are permitted in the HOZ zone, subject to granting of site plan approval by the Planning and Zoning Commission:

   a. Residential development that qualifies as "assisted housing" as defined in General Statutes § 8-30g(a); and

   b. Accessory uses as listed below in subsection (4) of this Section.

4. *Accessory Uses.* All accessory uses and structures that are customary in a multi-family residential zone and incidental to the above permitted use, as well as uses set forth in §§ IV.A.2a. and b., are permitted in the HOZ.

   In addition, the following accessory uses are permitted in connection with multi-family residential use: playground, garden, basketball court, dog run, and pedestrian trail.

5. *Dimensional Standards.* The dimensional standards including height and setback standards of the HOD zone are:

Minimum Lot Area	9 acres
Maximum Lot Area	12 acres
Minimum Lot Width	150 ft.
Minimum Street Frontage	25 ft.
Front Yard	60 ft.
Side Yard	25 ft.
Rear Yard	25 ft.
Maximum Building Height	60 ft.
Maximum Impervious Coverage	50%

Maximum Building Coverage	20%
Maximum Stories	4 stories
Maximum Residential Density Per Net Developable Acre	17 units

6. *Buffers.* All landscaped buffers shall be planted or preserved in a natural state in a mixture of evergreen and deciduous trees and shrubs and shall be maintained in proper order. A landscaped buffer shall not be required along driveways or roadways providing access to or from a HOZ development or in any area requiring drainage runoff improvements, such as drainage swales or detention basins.

7. *Landscaping*

    a. Landscaping shall be provided and permanently maintained on the lot with an intent to reduce excessive heat, glare and dust, to provide privacy from noise and visual intrusion, to control erosion of soil and stormwater runoff, to enable recharge of groundwater and to avoid degradation of groundwater, wetlands and watercourses.

    b. The use of native plant species, where feasible, is strongly encouraged.

    c. The introduction of invasive plant species is prohibited and eradication of existing invasive species may be a required element of the landscaping plan.

    d. All parking, service and storage areas adjacent to perimeter buffers shall be enhanced if necessary to provide screening from abutting properties.

8. *Design Standards*:

    a. Architectural and site designs shall comply with the area and dimensional standards in this section.

    b. All developments shall comply with handicap accessibility requirements mandated by local, state and federal laws.

    c. All site plans shall make adequate provision for facilities and access for fire, police, and other emergency protection.

9. *Housing Affordability Requirement.* The applicant shall prepare and submit an "Affordability Plan" in accordance with the requirements of CGS § 8-30g and shall, at a minimum, include the following:

    a. An identification of the housing units to be initially preserved as affordable within the development.

    b. A requirement that such affordable unit shall only be occupied by a household earning 80 percent or less of the area median income for the region in which Avon is located, as determined and reported by the United States Department of Housing and Urban Development (HUD).

c. A detailed statement of the method for determining the qualifying household income and rental rate of an affordable housing unit at any point in time.

d. A statement of the term of the preservation period for each affordable unit from the date of first occupancy of that affordable unit.

10. *Recreational Areas*. As stated in General Statute § 8-30g, open space shall not be required for an HOZ development, but is encouraged. Land designated for recreation shall not be used for the storage of equipment or the deposit of debris. Any physical improvements to open space/recreation areas approved as part of the HOZ development shall be completed prior to issuance of a certificate of zoning compliance.

11. *Parking Requirements*. Off-street parking shall be 1.0 spaces for each one-bedroom residential unit and 1.5 spaces for each two-bedroom residential unit, and parking spaces shall otherewise comply with § VII.B.

12. *Signs*. Signage shall comply with § VII.C.

13. *Lighting*. Lighting shall comply with § IX.G.9.

14. *Retaining Walls.* Retaining walls may be constructed as necessary to provided grading and stability for residential use, provided that no retaining wall shall exceed 12 feet in height; each wall shall be built with a guardrail or equivalent safety feature as required by code; and specifications of the wall material, appearance shall be stated on the site plan and approval by the Town Engineer as safely designed prior to issuance of a building permit.

15. *Stormwater Management*. All applications for an HOZ development shall include a Stormwater Management Plan.

16. *Soil Erosion & Sediment Control.* Soil erosion and sediment control standards shall comply with § III.I.2.b.

17. *Earth Excavation, Removal and Deposit*:

a. Earth excavation, removal, including off-site removal, and/or fill, shall be permitted for any HOZ development without the need for additional special exception or special approval, provided that such excavation, removal and/or fill is conducted in connection with the construction or alteration of a building or other structure for which the Zoning Commission has issued a site plan approval.

b. All earth excavation, removal, and/or fill for an HOZ development shall comply with the substantive standards in § III.H.3.a. and c.

18. *Building Design and Construction Guidelines.* Since design of buildings and sites is an important part of integrating housing at permissible densities into the community, all development in the HOZ shall be designed to a high level of architectural character so

that the quality of the overall design of any development will be an important positive addition to the area.

a. *Overall Character.*

1. Overall design theme (including building placement, building massing, exterior treatments, signage and other design considerations) shall be established where harmony in textures, lines, and masses is provided and monotony is avoided.

2. A desirable streetscape and attractive landscape transitions to adjoining properties shall be provided.

3. Landscape treatment shall be provided to enhance architectural features, shield unsightly areas, provide shade, and relate to the natural environment and topography.

b. *Building Placement and Siting.*

1. Buildings shall be organized in a coordinated and functional manner that is compatible with site features and the desirable characteristics of adjoining areas.

2. Buildings shall be designed and located on the site so as to retain the existing topography and desirable natural features of the land to the extent feasible.

c. *Building Mass.*

1. The height and scale of each building shall be compatible with its site and the existing or planned character of the area.

2. Architectural features shall be evaluated based on the scale of the building(s), the quality of the design, and the relationship to surroundings.

d. *Exterior Materials and Colors.*

1. Building materials shall have durable quality and shall be selected for harmony or compatibility of the building with adjoining desirable materials.

19. *Application Procedure*:

a. All applications for a HOZ development shall be subject to site development plan review, in accordance with Section X.A.1.a of these regulations.

b. No special exception or special permit shall be required.

20. *Conflict.* In the event any conflict between the provisions of this section and any other section of the regulations, the provisions of this section shall control. If the specific matter is not addressed by this section, then the other section(s) of the Regulations shall control.

TAB 8

TOWN OF AVON
PLANNING AND ZONING COMMISSION

APPLICATION # _____

APPLICATION FOR ZONE CHANGE

1. **APPLICANT**

Name Beacon Communities Development, LLC
Business Address 2 Center Plaza, Suite 700, Boston, MA 02108 Phone 617-574-1100
Home Address _____ Phone _____
Fax _____ Email thollister@hinckleyallen.com

2. **OWNER(S) OF RECORD**

Name 20 Security Drive, LLC
Business Address 184 Fern Avenue, Litchfield, CT 06759 Phone _____
Home Address _____ Phone _____
Fax _____ Email mark@markgreenbergrealestate.com

Name _____
Business Address _____ Phone _____
Home Address _____ Phone _____
Fax _____ Email _____

3. **DESCRIPTION OF PARCEL**

Location 20 Security Drive, Avon, CT 06001
Area (acres) 11.21 (Square feet, if less than 2 acres) _____
Parcel I.D. No. Map 008, Lot 3900020 Zone IP (rezoning to HOZ)

4. **ZONE CHANGE INFORMATION**

Present Zone IP Proposed Zone HOZ
Reason for Proposed Change
See letter at Tab 2.

5. **APPLICANT'S SIGNATURE**

The undersigned warrants the truth of all statements made in conjunction with this application and consents to inspections of the site.

Timothy S. Hollister — Timothy S. Hollister, Agent/Counsel
(Applicant's Signature) (Print or Type Name and Title)

6. **OWNER'S SIGNATURE**

The undersigned owner(s) of record consent(s) to the submission of this application and to inspections of the site.

See authorization letter, Tab 4.

_____ _____
(Owner's Signature) (Print or Type Name and Title)

_____ _____
(Owner's Signature) (Print or Type Name and Title)

CHECK LIST

ZONE CHANGE

___X___ Completed Application Form

___X___ Application Fee

___X___ Map (4 copies) showing the following information:

- ___X___ 1. Name of owner
- ___X___ 2. North point, scale, and date of map
- ___X___ 3. Key map
- ___X___ 4. Names of abutting owners
- ___X___ 5. Boundary lines of entire tract under ownership of applicant
- ___X___ 6. Existing zone or zones
- ___X___ 7. Proposed zone or zones with accurate dimensions and/or bearings.
- ___X___ 8. A-2 certification

___X___ Overall plan (4 copies) at no less than 200-scale for entire parcel showing the following:

- ___X___ 1. Location of buildings, streets, driveways, and other facilities on subject land and adjoining properties within 500 feet.
- ___X___ 2. Zoning districts within 500 feet.

___X___ Reductions of map(s) (11 copies of 11 x 17 reduction)

___X___ Aquifer Area Protection Notification Form (see attached)

TAB 9

SCHEDULE A
PROPERTY DESCRIPTION
11.2+/- ACRES AT 20 SECURITY DRIVE, TO BE RESUBDIVIDED, REZONED, REDEVELOPED FROM OFFICE TO MULTI-FAMILY RESIDENTIAL

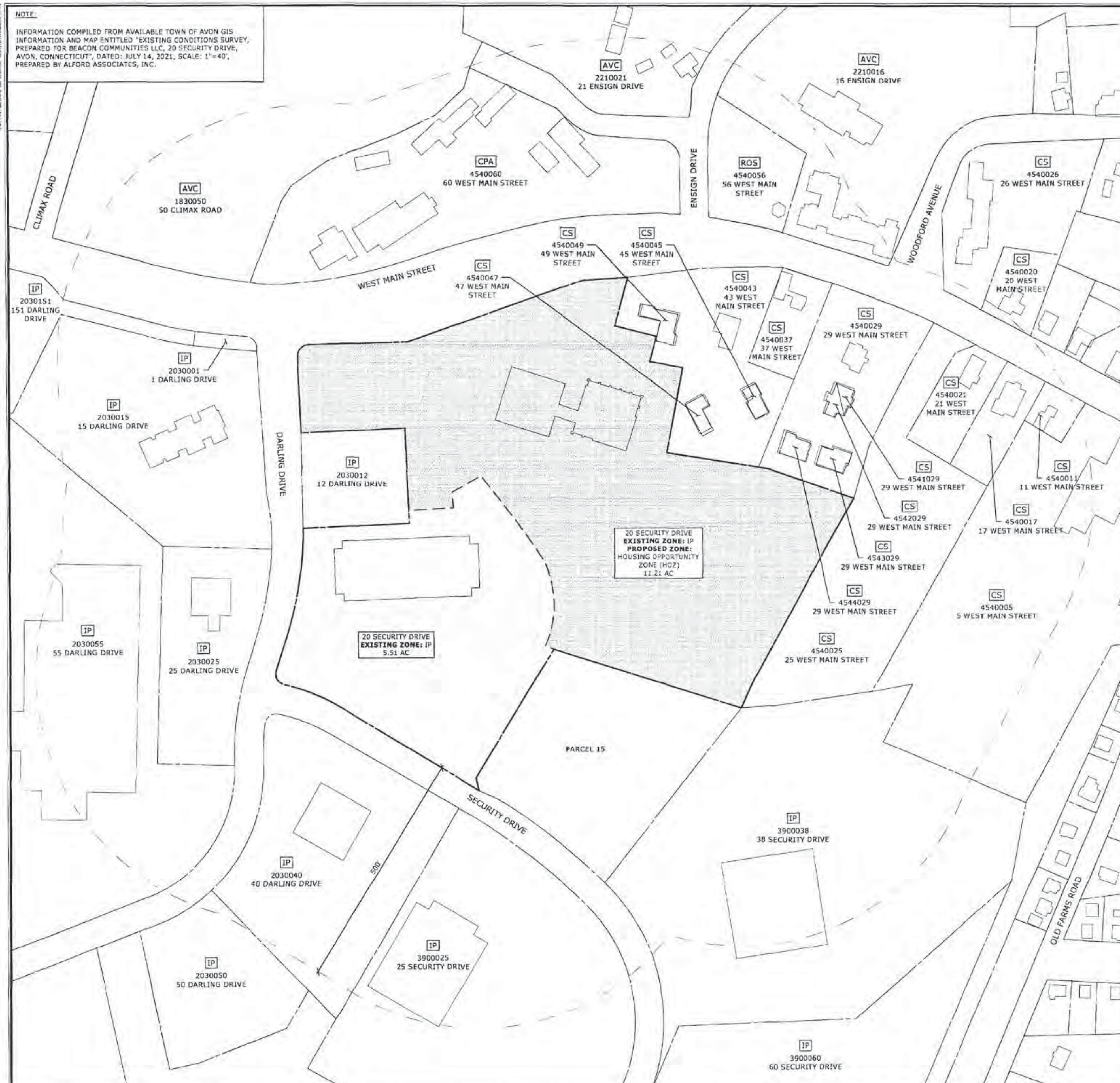
All that certain piece or parcel of land situated in the Town of Avon, County of Hartford and State of Connecticut and shown as "LEASE AREA 488,549 SQ. FT. 11.210 ACRES" on a map or plan entitled "PLAN TO SHOW PROPOSED LEASE AREA PREPARED FOR BEACON COMMUNITIES, LLC 20 SECURITY DRIVE AVON, CONNECTICUT PREPARED BY ALFORD ASSOCIATES, INC., CIVIL ENGINEERS WINDSOR CT, DATE: AUGUST 19, 2021, REVISED AUGUST 25, 2021, SCALE: 1 IN. = 60 FT.", said map or plan is on file or to be filed in the Avon Land Records, and being more particularly bounded and described as follows:

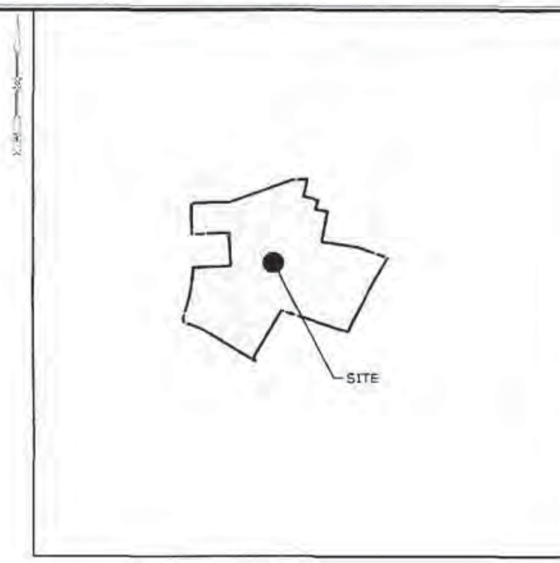
Beginning at the northeast corner of said property along property now or formerly of Crusheen, LLC #25 West Main Street, Map 008 Lot: 4540025; thence running S 42°16'31" W a distance of 93.00 feet to a point; thence turning and running S 40°42'01" W a distance of 341.90 feet to a point; thence turning and running S 36°16'31" W a distance of 65.10 feet to a point; thence turning and running N 60°26'42" W a distance of 431.22 feet to a point; thence turning and running along the arc of a curve to the left with a length of 78.07 feet a Delta of 19°26'53" and a radius of 230.00 to a point; thence turning and running along the arc of a curve to the left a distance of 132.62 feet with a Delta of 37°59'39" and a radius of 200.00 to a point; thence turning and running along the arc of a curve to the left a distance of 81.51 feet with a Delta of 3°53'31" and a radius of 1200.00 to a point; thence turning a running N 25°37'32" W a distance of 115.72 feet to a point; thence turning and running S 71°50'00" W a distance of 69.49 feet to a point; thence turning and running S 09°33' 30" W a distance of 33.00 feet to a point; thence turning and running N 80°26'30" W a distance of 93 feet to a point; thence turning and running N 09°33'30" E a distance of 171.79 feet to a point; thence turning and running N 80°26'30" W a distance of 216.61 feet to a point; thence turning and running N 09°33'30" E a distance of 160.00 feet to a point; thence turning and running along the arc of a curve to the right a length of 39.06 feet, a radius of 24.36 and a Delta of 90°51'16" to a point; thence turning and running S 79°29'41"E a distance of 207.07 feet to a point; thence turning and running N 82°47'08" E a distance of 387.08 feet to a point; thence turning and running S 81°47'47"E a distance of 95.44 feet to a point; thence turning and running S 27°32'59" W a distance of 105.61 feet to a point; thence turning and running S 63°41'25" E a distance of 89.87 feet to a point; thence turning and running S 27°42'29" W a distance of 55.43 feet to a point; thence turning and running S 68°18'40" E a distance of 71.97 feet to a point; thence turning and running S 23°03'16" W a distance of 181.52 feet to a point; thence turning and running S 68°50'56" E a distance of 215.87 feet to a point; thence turning and running S 58°37'02" E a distance of 189.69 feet to the point and place of beginning.

TAB 10

NOTE:

INFORMATION COMPILED FROM AVAILABLE TOWN OF AVON GIS INFORMATION AND MAP ENTITLED "EXISTING CONDITIONS SURVEY, PREPARED FOR BEACON COMMUNITIES LLC, 20 SECURITY DRIVE, AVON, CONNECTICUT", DATED: JULY 14, 2021, SCALE: 1"=40', PREPARED BY ALFORD ASSOCIATES, INC.





LOCATION MAP:

ZONING DISTRICTS

- IP INDUSTRIAL PARK
- CS COMMERCIAL - SPECIALIZED
- CPA COMMERCIAL PARK
- AVC AVON VILLAGE CENTER
- ROS RECREATION/OPEN SPACE

PROPERTY OWNERS WITHIN 500 FT.

GIS PROPERTY PIN	ADDRESS	OWNERS NAME AND ADDRESS
1830050	50 CLIMAX ROAD	FARMINGTON VALLEY GATEWAY LLC 1414 ATWOOD AVENUE JOHNSTON, RI 02919
2030001	1 DARLING DRIVE	TOWN OF AVON 60 WEST MAIN STREET AVON, CT 06001
2030012	12 DARLING DRIVE	SOUTHERN NEW ENGLAND TELEPHONE COMPANY 401 MERRITT 7 NORWALK, CT 06851
2030015	15 DARLING DRIVE	AVON PK SO OFFICE CENTER 15 DARLING STREET STE 9 AVON, CT 06001
2030025	25 DARLING DRIVE	TOWN OF AVON 60 WEST MAIN STREET AVON, CT 06001
2030040	40 DARLING DRIVE	CHAPDELAINE ENTERPRISES LLC 40 DARLING DRIVE AVON, CT 06001
2030050	50 DARLING DRIVE	METRO REALTY GROUP LTD 6 EXECUTIVE DRIVE FARMINGTON, CT 06032
2030055	55 DARLING DRIVE	O F S FITEL LLC 55 DARLING DRIVE AVON, CT 06001
2030151	151 DARLING DRIVE	NORTHINGTON MEADOW INC P.O. BOX 330487 WEST HARTFORD, CT 06133
2210016	16 ENSIGN DRIVE	AVON TOWN CENTER LLC 1414 ATWOOD AVENUE JOHNSTON, RI 02919
2210021	21 ENSIGN DRIVE	AVON TOWN CENTER LLC 1414 ATWOOD AVENUE JOHNSTON, RI 02919
3900025	25 SECURITY DRIVE	AVON PARK REALTY LLC 4 WESTBOROUGH DRIVE SIMSBURY, CT 06089
3900038	38 SECURITY DRIVE	DH THIRTY EIGHT SECURITY DR LLC 38 SECURITY DRIVE AVON, CT 06001
3900060	60 SECURITY DRIVE	STAG AVON LLC ONE FEDERAL STREET 23RD FLOOR BOSTON, MA 02110
4540005	5 WEST MAIN STREET	CRUSHEEN LLC 2032 WEST MELROSE STREET CHICAGO, IL 60618
4540011	11 WEST MAIN STREET	CRUSHEEN LLC 2032 WEST MELROSE STREET CHICAGO, IL 60618
4540017	17 WEST MAIN STREET	SEVENTEEN WEST MAIN ST ASSOC LLC 17 WEST MAIN STREET AVON, CT 06001
4540020	20 WEST MAIN STREET	MAG LLC 71 CHELTENHAM WAY AVON, CT 06001
4540021	21 WEST MAIN STREET	TWENTY ONE WEST MAIN STREET 21 WEST MAIN STREET AVON, CT 06001
4540025	25 WEST MAIN STREET	CRUSHEEN LLC 2032 WEST MELROSE STREET CHICAGO, IL 60618
4540026	26 WEST MAIN STREET	MAN CO LLC 71 CHELTENHAM WAY AVON, CT 06001
4540029	29 WEST MAIN STREET	ENTERPRISE 29 LLC 170 HIGHWOOD DRIVE SOUTH GLASTONBURY, CT 06073
4541029	29 WEST MAIN STREET	JOSEPH M & IRENE P GENTILE 29 WEST MAIN STREET AVON, CT 06001
4542029	29 WEST MAIN STREET	ENTERPRISE 29 LLC 170 HIGHWOOD DRIVE SOUTH GLASTONBURY, CT 06073
4543029	29 WEST MAIN STREET	ENTERPRISE 29 LLC 170 HIGHWOOD DRIVE SOUTH GLASTONBURY, CT 06073
4544029	29 WEST MAIN STREET	ENTERPRISE 29 LLC 170 HIGHWOOD DRIVE SOUTH GLASTONBURY, CT 06073
4540037	37 WEST MAIN STREET	LORENZO DICLEMENTE 170 HIGHWOOD DRIVE SOUTH GLASTONBURY, CT 06073
4540043	43 WEST MAIN STREET	AVON CENTRAL LLC 43 WEST MAIN STREET AVON, CT 06001
4540045	45 WEST MAIN STREET	AVON ALLIES LLC 6 JOYCE LANE SIMSBURY, CT 06070
4540047	47 WEST MAIN STREET	SONCY ENTERPRISES LLC 47 WEST MAIN STREET AVON, CT 06001
4540049	49 WEST MAIN STREET	AVON CENTRAL LLC 43 WEST MAIN STREET AVON, CT 06001
4540056	56 WEST MAIN STREET	TOWN OF AVON 60 WEST MAIN STREET AVON, CT 06001
4540060	60 WEST MAIN STREET	TOWN OF AVON 60 WEST MAIN STREET AVON, CT 06001

DESCRIPTION | DATE | BY

SLR

ZONE CHANGE MAP

THE HOMES AT AVON PARK

20 SECURITY DRIVE
AVON, CONNECTICUT

DESIGNED	DRAWN	CHECKED
AWG	AWG	TD

SCALE: 1"=100'

DATE: SEPTEMBER 17, 2021

PROJECT NO. 20237.00001

SHEET NO. 02 OF 12

ZC

TAB 11

TOWN OF AVON
PLANNING AND ZONING COMMISSION

APPLICATION #______

RESUBDIVISION APPLICATION

1. APPLICANT

Name Beacon Communities Development, LLC
Business Address 2 Center Plaza, Suite 700, Boston, MA 02108 Phone 617-574-1100
Home Address ______ Phone ______
Fax ______ Email thollister@hinckleyallen.com

2. OWNER(S) OF RECORD

Name 20 Security Drive, LLC
Business Address 184 Fern Avenue, Litchfield, CT 06759 Phone ______
Home Address ______ Phone ______
Fax ______ Email mark@markgreenbergrealestate.com

Name ______
Business Address ______ Phone ______
Home Address ______ Phone ______
Fax ______ Email ______

Name ______
Business Address ______ Phone ______
Home Address ______ Phone ______
Fax ______ Email ______

3. DESCRIPTION OF PARCEL

Location 20 Security Drive, Avon, CT 06001
Area (acres) 11.21 (Square Feet, if less than 2 acres) ______
Parcel I.D.No. Map 008, Parcel 3900020 Zone IP (rezoning to HOZ)

4. SUBDIVISION INFORMATION

Subdivision Title ______
Number of Lots 2
[ ] Public Road [X] Private Road [ ] No Road

5. WETLANDS REFERRAL

PLEASE REFER TO SECTION 8-26 OF THE CONNECTICUT GENERAL STATUTES.

6. OPEN SPACE – please check one N/A

Dedication of open space land ______ Fee in Lieu of dedication of open space land ______

7. APPLICANT'S SIGNATURE

The undersigned warrants the truth of all statements made in conjunction with this application and consents to inspection of the site.

Timothy S. Hollister (Applicant's Signature) Timothy S. Hollister (Print or Type Name and Title)

8. OWNER(S) SIGNATURE(S)

The undersigned owner(s) of record consent(s) to the submission of this application and to inspections of the site. See authorization letter

(Owner's Signature) (Print or Type Name)

(Owner's Signature) (Print or Type Name)

(Owner's Signature) (Print or Type Name)

CHECK LIST
SUBDIVISION APPLICATIONS

X Application Form
X Application Fee

SITE DEVELOPMENT PLAN (Sec. 4.02)
Nine (9) copies (24"x36") and eleven (11) copies (11"x17") showing:

X 1. Names of subdivision, owner, applicant
X 2. Date, scale, north point
X 3. Key map at 1"=1000' showing the surrounding area and the proposed subdivision land
X 4. Boundary lines of the subdivision, names of abutting owners, layout of proposed lots (A-2 standards)
X 5. Existing contours at 2' intervals or less
X 6. Existing natural features, easements, and buildings
X 7. Proposed street and utility layout

CONSTRUCTION PLANS (Sec. 4.03)
Seven (7) sets of plan and profiles (24"x36") showing:

X 1. Title of subdivision, date, scale
X 2. Layout of existing and proposed street system
X 3. Existing and proposed grades of streets
X 4. Depth, invert, slope, and size of all utility and drainage facilities
X 5. Description of erosion control methods

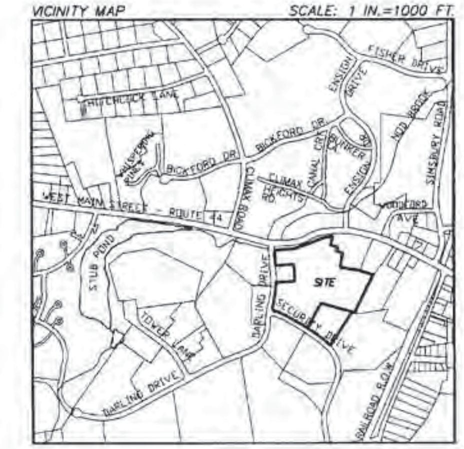
GRADING PLAN (Sec. 4.04)
Seven (7) copies (24"x36") showing:

X 1. Title of subdivision, date, scale, north point
X 2. Layout of existing and proposed lot and street lines
X 3. Existing buildings, well and septic locations, and all test hole locations
X 4. Existing and proposed contours, drainage, and watercourses
X 5. Description of erosion control methods

SUBDIVISION MAP (Sec. 4.05)
Nine (9) copies (24"x36") and eleven (11) copies (11"x17") showing:

X 1. Names of subdivision, owner, applicant
X 2. Date, scale, north point
X 3. Key map at 1"=1000'
X 4. **Multidigit parcel numbers (obtain from Assessor PRIOR to submitting app.)**
X 5. Existing and proposed property and street lines and names of adjacent property owners
X 6. Area of all lots and total acreage of land
X 7. Dimensions and orientations of property lines
X 8. Existing and proposed monuments
X 9. A-2 certification
X 10. **Developable land and density calculations based on 10/21/57 configuration**
___ 11. **Open Space**
X 12. Approval box
X 13. Aquifer Area Protection Notification Form (see attached)

TAB 12



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N/F ACOP LLC
#43 WEST MAIN STREET
Map: 008 Lot: 4540025

DATE	REVISION
9-17-2021	MISCELLANEOUS REVISIONS

STATE OF CONNECTICUT · WILSON H. ALFORD, JR. · No. 9344 · LICENSED PROFESSIONAL ENGINEER

STATE OF CONNECTICUT · WILSON H. ALFORD, JR. · No. 9344 · LICENSED LAND SURVEYOR

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Alford ASSOCIATES, INC.

CIVIL ENGINEERS
WINDSOR, CONNECTICUT
WILSON H. ALFORD JR. P.E. & L.S.

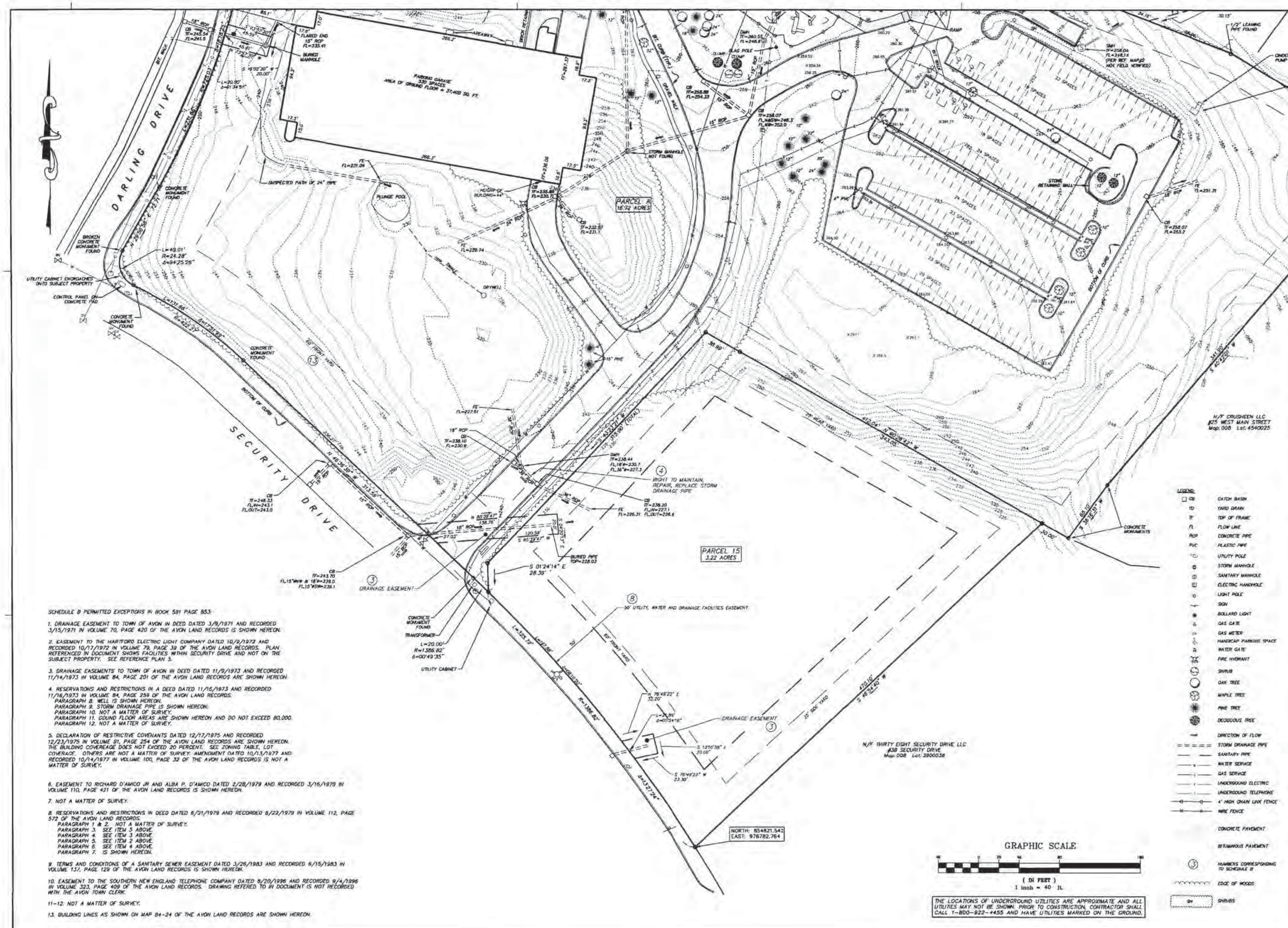
DATE: JULY 14, 2021

SCALE: 1 IN. = 40 FT.

EXISTING CONDITIONS SURVEY
PREPARED FOR
BEACON COMMUNITIES LLC
20 SECURITY DRIVE
AVON, CONNECTICUT

Sheet
ECP 1

P: J09007 D: J09007SU 2 FOLDER: Jacobs- Avon- Security Dr \Beacon



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9-17-2021	MISCELLANEOUS REVISIONS

STATE OF CONNECTICUT · WILSON H. ALFORD, JR. · No. 9344 · LICENSED PROFESSIONAL ENGINEER

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Alford ASSOCIATES, INC.

CIVIL ENGINEERS
WINDSOR, CONNECTICUT
WILSON H. ALFORD JR., P.E. & L.S.

DATE: JULY 14, 2021

SCALE: 1 IN. = 40 FT.

EXISTING CONDITIONS SURVEY
PREPARED FOR
BEACON COMMUNITIES LLC

20 SECURITY DRIVE
AVON, CONNECTICUT

Sheet
ECP 2

P: J09007 D: J09007SU 2 FOLDER: Jacobs- Avon- Security Dr \Beacon

GRAPHIC SCALE

(IN FEET)
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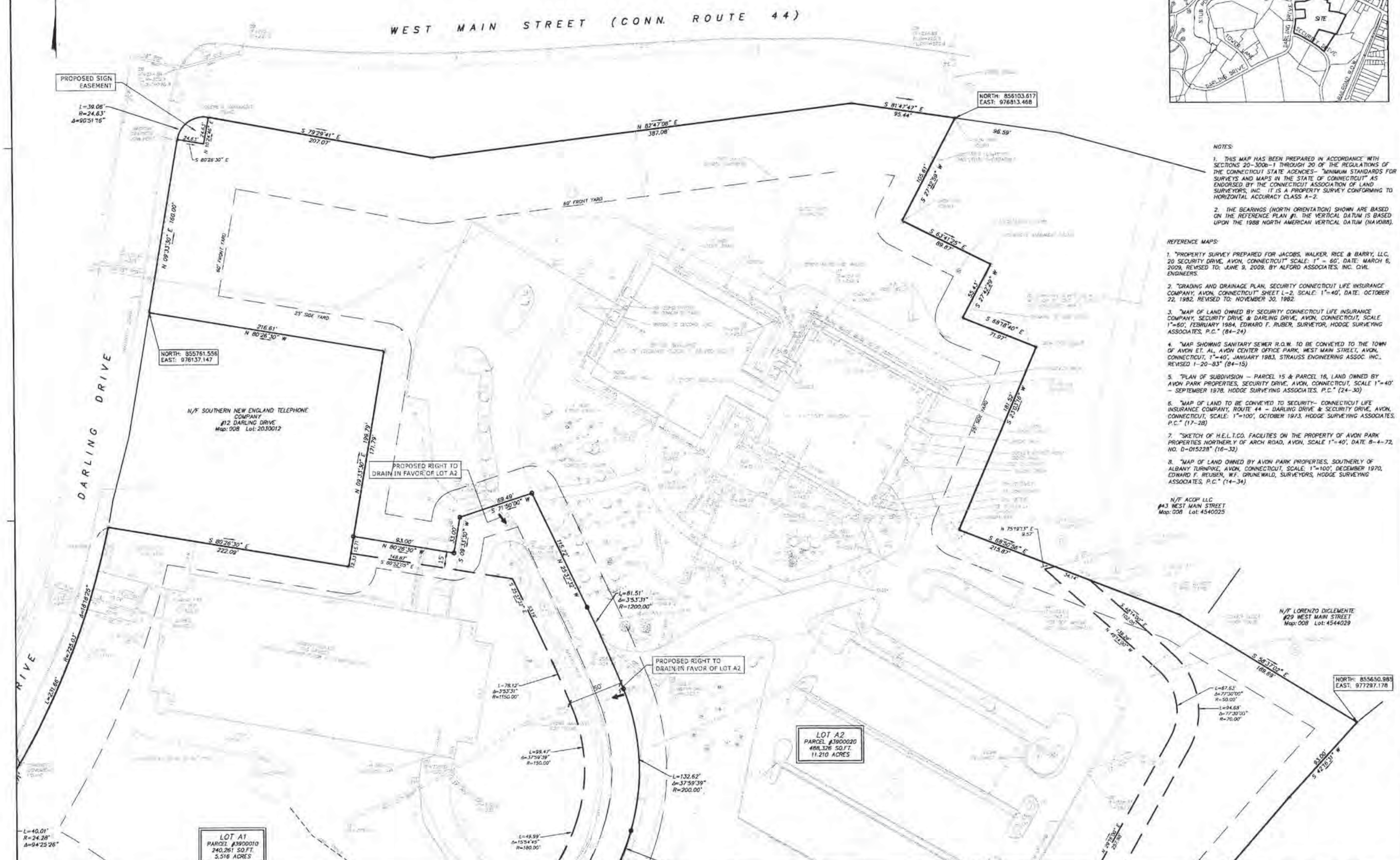
Subdivision Approval:
APPROVED BY THE PLANNING AND ZONING COMMISSION OF THE TOWN OF AVON AT ITS MEETING ON ____________ AND SIGNED BY CHAIRMAN

____

ACCORDING TO CGS SEC 8-26c, ALL WORK IN CONNECTION WITH THE ABOVE SUBDIVISION SHALL BE COMPLETED WITHIN FIVE (5) YEARS______________

VICINITY MAP SCALE: 1 IN.=1000 FT.



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CIVIL ENGINEERS
WINDSOR, CONNECTICUT
WILSON H. ALFORD JR. P.E.& L.S.

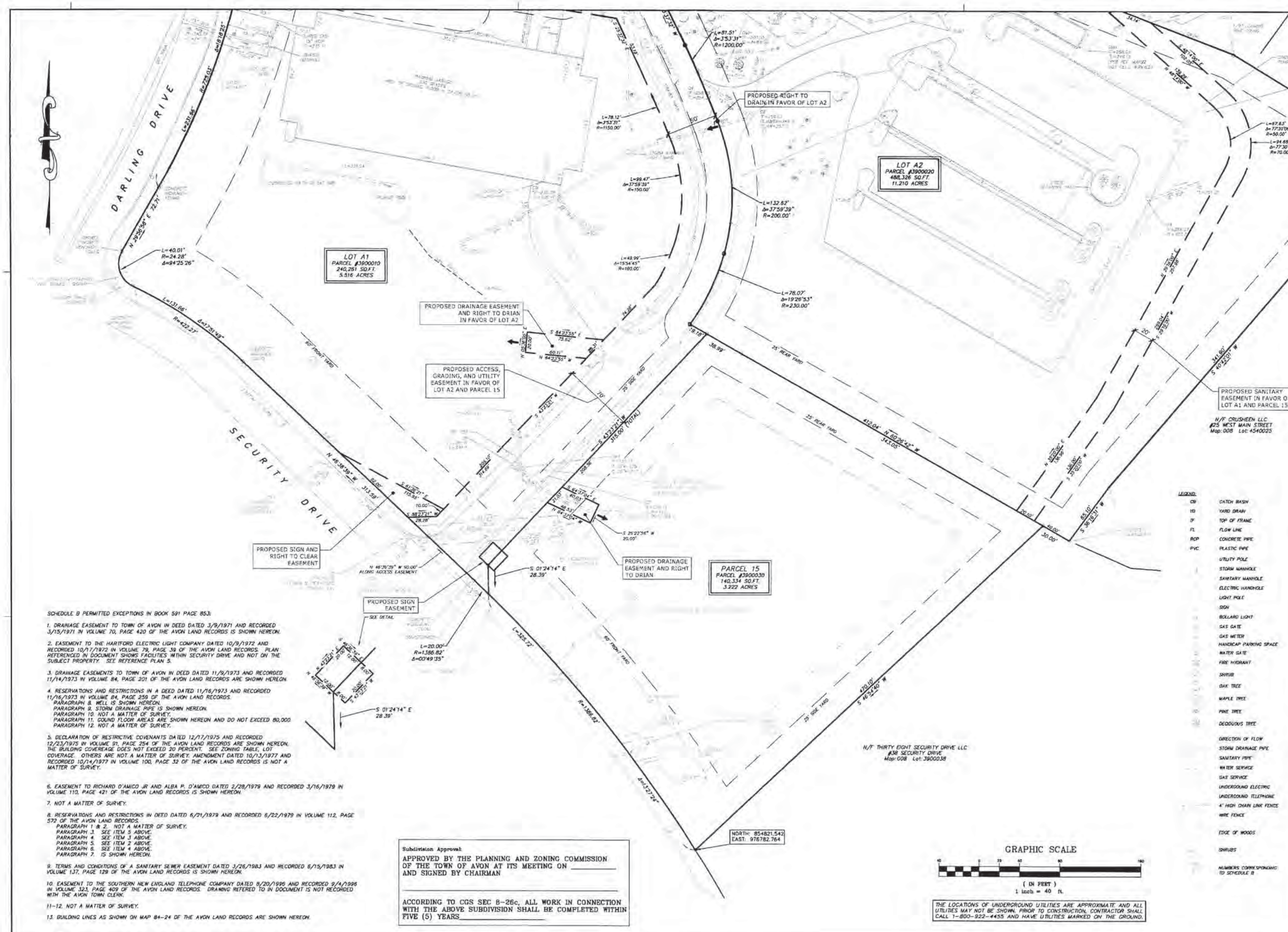
DATE: SEPTEMBER 17, 2021

SCALE: 1 IN. = 40 FT.

RESUBDIVISION PLAN
PREPARED FOR
BEACON COMMUNITIES LLC
20 SECURITY DRIVE
AVON, CONNECTICUT

Sheet
SUB 1

P: J09007 D: J09007SU 2 FOLDER: Jacobs- Avon- Security Dr \Beacon



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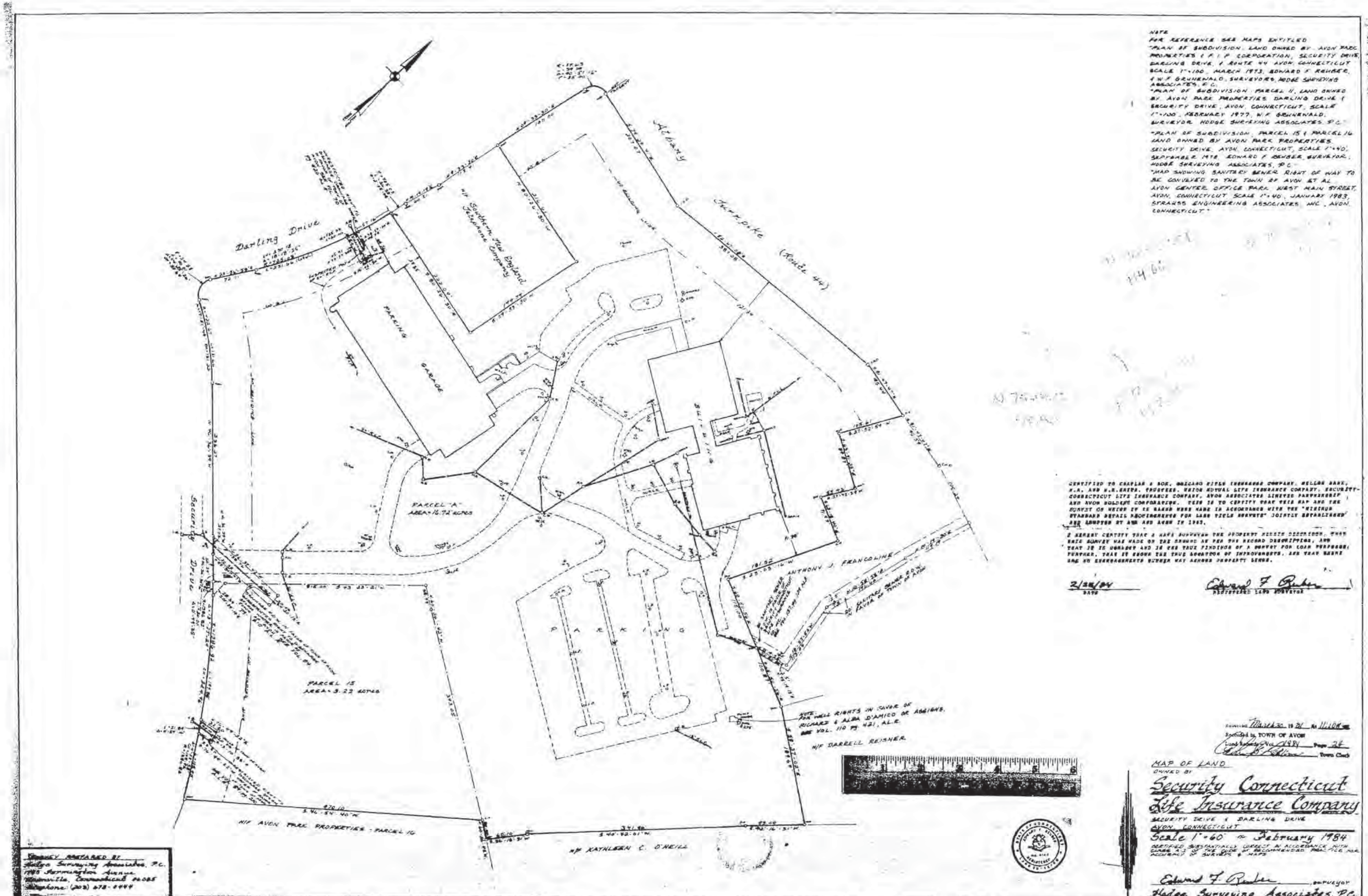
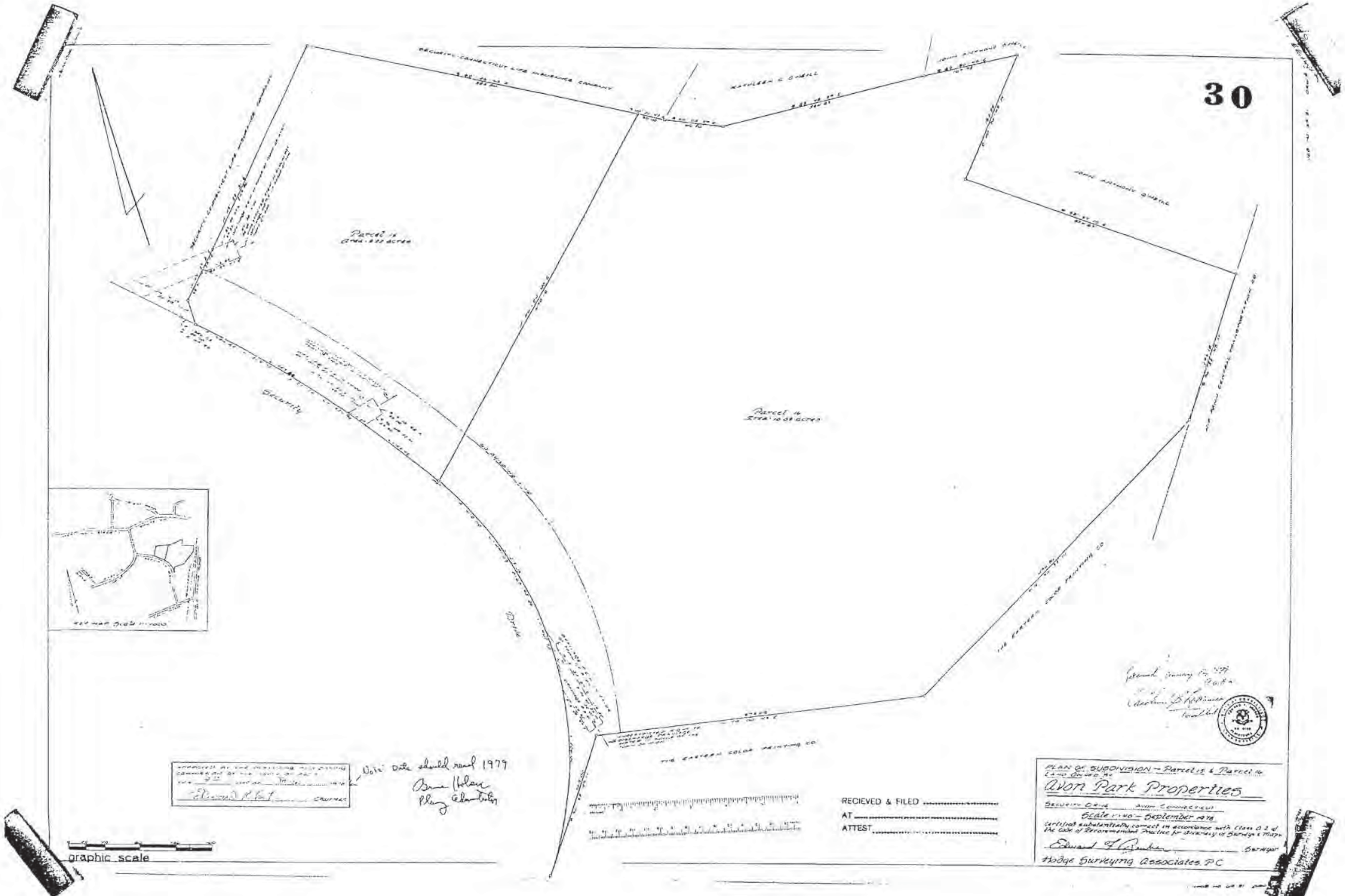
RESUBDIVISION PLAN
PREPARED FOR
BEACON COMMUNITIES LLC
20 SECURITY DRIVE
AVON, CONNECTICUT

Sheet
SUB 2

P: J09007 D: J09007SU 2 FOLDER: Jacobs- Avon- Security Dr \Beacon

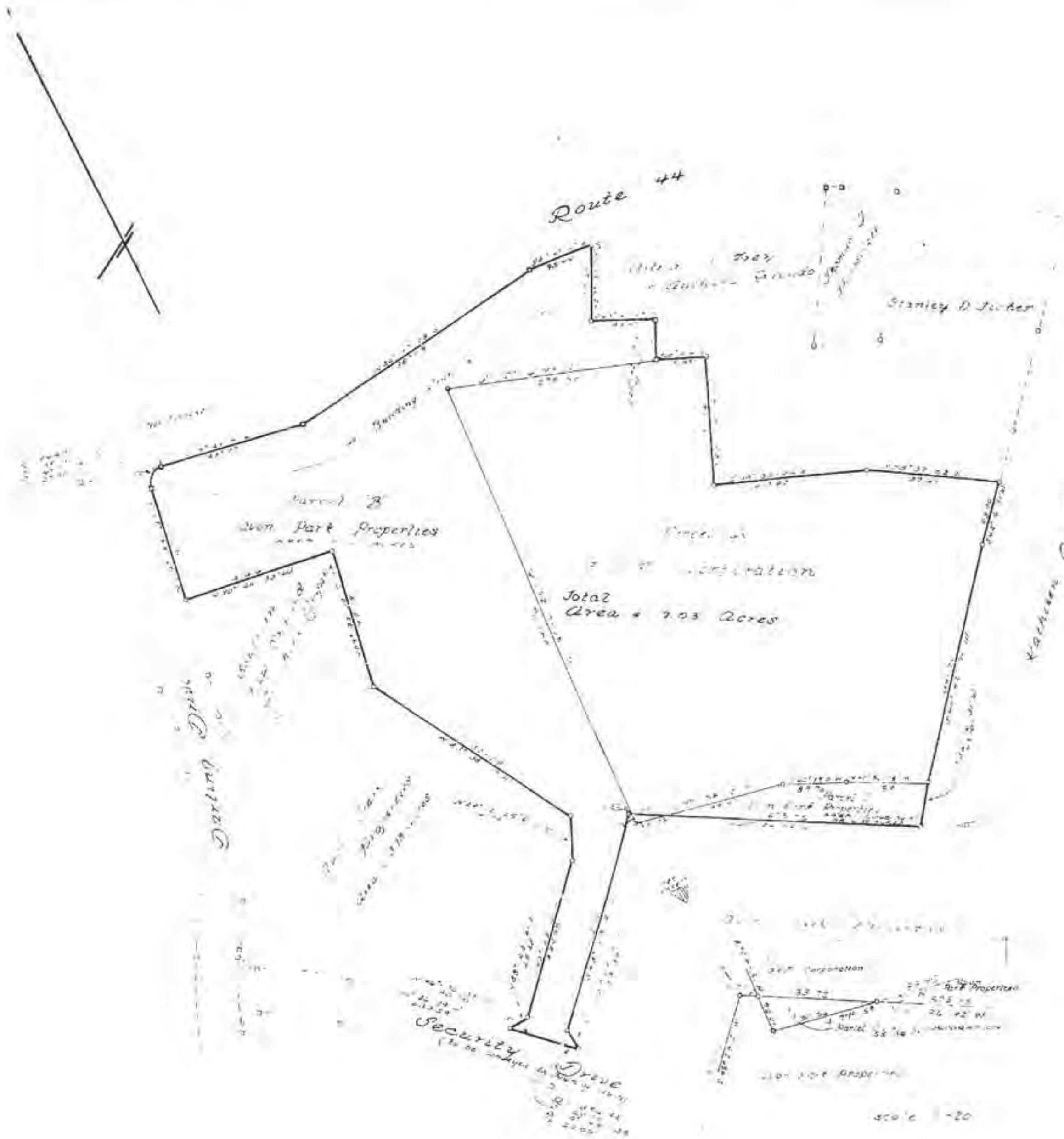
84 24

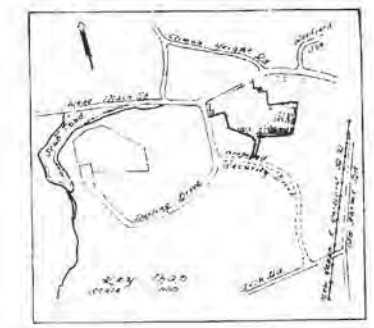

NOTE
FOR REFERENCE SEE MAPS ENTITLED
"PLAN OF SUBDIVISION, LAND OWNED BY AVON PARK PROPERTIES & F.I.P. CORPORATION, SECURITY DRIVE, DARLING DRIVE, & ROUTE 44 AVON, CONNECTICUT SCALE 1"=100, MARCH 1973, EDWARD F. REUBER, & W.F. GRUNEWALD, SURVEYORS, HODGE SURVEYING ASSOCIATES, P.C.
"PLAN OF SUBDIVISION PARCEL 11, LAND OWNED BY AVON PARK PROPERTIES DARLING DRIVE & SECURITY DRIVE, AVON, CONNECTICUT, SCALE 1"=100, FEBRUARY 1977, W.F. GRUNEWALD, SURVEYOR HODGE SURVEYING ASSOCIATES, P.C."
"PLAN OF SUBDIVISION, PARCEL 15 & PARCEL 16 LAND OWNED BY AVON PARK PROPERTIES SECURITY DRIVE, AVON, CONNECTICUT, SCALE 1"=40', SEPTEMBER 1978, EDWARD F. REUBER, SURVEYOR, HODGE SURVEYING ASSOCIATES, P.C."
"MAP SHOWING SANITARY SEWER RIGHT OF WAY TO BE CONVEYED TO THE TOWN OF AVON ET AL AVON CENTER OFFICE PARK WEST MAIN STREET, AVON, CONNECTICUT SCALE 1"=40', JANUARY 1983, STRAUSS ENGINEERING ASSOCIATES, INC., AVON, CONNECTICUT."
Darling Drive
Albany Turnpike (Route 44)
Security Drive
PARKING GARAGE
N/F Southern New England Telephone Company
PARCEL "A" AREA=16.72 ACRES
BUILDING
PARKING
PARCEL 15 AREA=3.22 ACRES
N/F ANTHONY J. FRANCOLINE
N/F DARRELL REISNER
N/F AVON PARK PROPERTIES - PARCEL 16
N/F KATHLEEN C. O'NEILL
NOTE FOR WELL RIGHTS IN FAVOR OF RICHARD & ALBA D'AMICO OR ASSIGNS SEE VOL. 110 PG. 421, A.L.R.
CERTIFIED TO CHAPLAN & BOK, CHICAGO TITLE INSURANCE COMPANY, WELLS BANK, N.A. AND W.R. SMITH, TRUSTEES, UNION MUTUAL LIFE INSURANCE COMPANY, SECURITY-CONNECTICUT LIFE INSURANCE COMPANY, AVON ASSOCIATES LIMITED PARTNERSHIP, AND AVON HOLDING CORPORATION. THIS IS TO CERTIFY THAT THIS MAP AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR LAND TITLE SURVEYS" JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND ACSM IN 1962.
I HEREBY CERTIFY THAT I HAVE SURVEYED THE PROPERTY HEREIN DESCRIBED, THAT SAID SURVEY WAS MADE ON THE GROUND AS PER THE RECORD DESCRIPTION, AND THAT IT IS CORRECT AND IS THE TRUE FINDINGS OF A SURVEY FOR LOAN PURPOSES; FURTHER, THAT IT SHOWS THE TRUE LOCATION OF IMPROVEMENTS, AND THAT THERE ARE NO ENCROACHMENTS EITHER WAY ACROSS PROPERTY LINES.
2/28/84
DATE
Edward F. Reuber
REGISTERED LAND SURVEYOR
Received March 30 1984 At 11:10 AM
Recorded in TOWN OF AVON
Land Records Vol. 1984 Page 24
Town Clerk
MAP OF LAND
OWNED BY
Security Connecticut Life Insurance Company
SECURITY DRIVE & DARLING DRIVE
AVON, CONNECTICUT
Scale 1"=60' ~ February 1984
CERTIFIED SUBSTANTIALLY CORRECT IN ACCORDANCE WITH CLASS A-2 OF THE CODE OF RECOMMENDED PRACTICE FOR ACCURACY OF SURVEYS & MAPS
Edward F. Reuber, surveyor
Hodge Surveying Associates, P.C.
JOB NO. 69-31
SURVEY PREPARED BY
Hodge Surveying Associates, P.C.
1993 Farmington Avenue
Unionville, Connecticut 06085
Telephone (203) 673-4444



30
Parcel 15
Parcel 16
Security
Drive
Note: Date should read 1979
RECIEVED & FILED
AT
ATTEST
graphic scale
PLAN OF SUBDIVISION – Parcel 15 & Parcel 16
Avon Park Properties
Scale 1"=40' – September 1978
Hodge Surveying Associates, PC

16 11





Note: Parcels A & B & C are to be combined into one lot and are not to be considered as individual parcels

Parcel D ... be added to adjoining land of Avon Park Properties to the south and not to be considered an individual parcel

Approved by the Planning and Zoning Commission of the Town of Avon this 27TH day of MARCH 1973

Chairman

Note:
Map conforms to Class A-2 of the Connecticut Technical Council, Inc.
Property is located in Industrial Park Zone

Received March 28, 1973
5:30 P.M.
Town Clerk

Plan of Sub-Division
land owned by
Avon Park Properties &
J.I.P. Corporation
Security Drive, Darling Drive & Route 44
Avon, Connecticut

Scale 1" = 100' certified substantially correct March 1973

Edward L. Reuber, W. F. Grunewald, Surveyors
Hodge Surveying Associates, P.C.

Job # 69-314-B

16-11

TAB 13

TOWN OF AVON
PLANNING AND ZONING COMMISSION

APPLICATION #____

SITE PLAN APPLICATION

1. **APPLICANT**

Name Beacon Communities Development, LLC
Business Address 2 Center Plaza, Suite 700, Boston, MA 02108 Phone 617-574-1100
Home Address ____ Phone ____
Fax ____ Email thollister@hinckleyallen.com

2. **OWNER(S) OF RECORD**

Name 20 Security Drive, LLC
Business Address 184 Fern Avenue, Litchfield, CT 06759 Phone ____
Home Address ____ Phone ____
Fax ____ Email mark@markgreenbergrealestate.com

Name ____
Business Address ____ Phone ____
Home Address ____ Phone ____
Fax ____ Email ____

3. **DESCRIPTION OF PARCEL**

Location 20 Security Drive, Avon, CT 06001
Area (acres) 11.21 (Square Feet, if less than 2 acres) ____
Parcel I.D. No. Map 008, Parcel 3900020 Zone IP (rezoning to HOZ)

4. **PRESENT USE** (Please indicate use and describe; i.e.: restaurant with seating capacity for 75 persons.)

Office building, most recently used as a school

5. **PROPOSED USE** (Please indicate use and list activities for which approval is requested; i.e.: restaurant - requesting building addition, parking lot expansion or renovation, consolidated parcel agreement.)

Multi-family residential development with a portion of the units set aside for moderate to low income households.

6. **APPLICANT'S SIGNATURE**

The undersigned warrants the truth of all statements made in conjunction with this application and consents to inspection of the site.

Timothy S. Hollister — Timothy S. Hollister, Agent / Counsel
(Applicant's Signature) (Print or Type Name and Title)

7. **OWNERS' SIGNATURES**

The undersigned owner(s) of record consent(s) to the submission of this application and to inspections of the site. See authorization letter.

____ ____
(Owner's Signature) (Print or Type Name)

____ ____
(Owner's Signature) (Print or Type Name)

CHECK LIST - SITE PLAN APPROVAL APPLICATIONS

a. Site Development Plan - Site Development Plan applications shall be submitted on forms supplied by the Commission for development of any Commercial or Industrial land use, any Special Exception Application (except signs), and any development in the Educational Land Zone or Recreation/Open Space Zone.

Effective October 2006, any applications for projects that fall within a public water supply aquifer or watershed area, as required by Public Act No.06-53, must notify The Commissioner of Public Health. Please see the attached form, Public Water Supply Watershed or Aquifer Area Project Notification Form or visit the website for the State of CT, Department of Public Health, Drinking Water Section, at http://www.dph.state.ct.us/BRS/Water/Source_Protection/web_form.htm for further information. The Public Drinking Water Source Protection Areas map is located in the Planning Department at the Town Hall.

Applications for Site Plan Approval shall be accompanied by 8 copies (9 copies if 500 feet from an adjoining municipality) of detailed site development plans at no less than forty (40) feet to the inch showing each phase of development for review by the Commission. These plans shall show the following data unless specifically waived by the Town Planner:

i. Title Block, developer, property owner, north point, scale, location map, and seals of the engineer, architect, landscape architect, or surveyor preparing the plan. Each plan shall be prepared by the appropriate design professional as authorized by State licensing authorities.

ii. Boundaries of property certified to a State of Connecticut A-2 Map Survey Standard.

iii. Grading Plans showing existing and proposed contours at not more than two (2)-foot vertical intervals. Certification by a Registered Land Surveyor that the above information is in accordance with National Map Accuracy Standards. Wetlands and all wetland regulated areas, Floodplains, and soil type should be delineated.

iv. Existing and proposed roads, pedestrian walkways, driveways, loading and parking areas.

v. Location and dimension of all existing and proposed buildings, structures, walls, and area fences. Approximate age of existing structures and sites of historical significance should be noted. Building setback lines shall be shown.

vi. A Zoning Data Schedule clearly showing the following minimum require-ments in that zoning district and as proposed on that site development plan: zone designation, lot size, yard areas, building footprint, building gross floor area, percent of building coverage, building height, number of stories, parking spaces, percent of impervious area, percent of landscaped area, percent of landscaped area within parking lots.

vii. Location, nature, and extent of watercourses and water bodies.

viii. Utility plans showing location, size and design of existing and proposed storm drainage, sewage disposal, refuse containment, water supply facilities, and electric and telephone lines. Design calculations, soil types, deep test hole data and percolation test data shall be shown for on-site subsurface sewage disposal system.

ix. Landscape plans showing location, size (at time of planting and maturity), species and type of proposed landscaping including all existing trees of twelve (12) or more inches in diameter, measured at a trunk height of three (3) feet above the ground. Heavily wooded areas shall be shown by foliage lines.

x. Location, dimensions, areas, type, color, materials, and illumination of all proposed exterior signs.

xi. Location, design, and intensity of all proposed exterior lighting.

xii. An Erosion and Sedimentation Control Plan as specified in Section III.I.

xiii. Building elevations, building floor plans, statistical data, and other information considered necessary by the Commission for adequate study of the proposal.

xiv. A plan showing the location of buildings, streets, driveways, and other facilities on the subject land and adjoining properties within 500 feet.

Before the Commission approves a Site Development Plan, the Commission shall determine that the data shown on the Plan meets all of the requirements of these Regulations.

The Commission may require that a bond be posted by the applicant, in an amount and form acceptable to the Commission, to ensure that the improvements shown on the plan are implemented.

A Site Development Plan shall be valid for one year from date of approval unless construction of buildings is in progress or unless an extension of time has been granted by the Commission. Requests for extensions shall be made well in advance of the date of expiration.

A mylar copy of the approved Site Development Plan shall be signed by the Chairman of the Commission and filed in the Office of the Building Official before any building permits are issued for the activities shown on the approved plan.

Building permits and certificates of occupancy shall be issued only in conformance with the approved plans on file in the Office of the Building Official.

TAB 14

The Homes at Avon Park - Site Amenities

Trail Connection to Darling Drive:

At the northwest corner of the site, a 350 foot length trail provides a shortcut to Darling Drive and the West Main Street /Avon Village Center area. This natural walking trail down a wooded hillside covers over 30 feet of grade change and is an excellent opportunity for a quick hike through tall timbers.

Multi-Use Lawn:

At the center of the site, a multi-use lawn serves as an anchoring amenity between the existing building and proposed new residential building. The 4,300 sf lawn is flanked by four outdoor grills and picnic tables on either side and is suitable for informal gatherings, lawn games and programmed events. The lawn is shaded on the sides by a new allée of deciduous shade trees. A mature oak tree to the south (that will be protected in place) serves as a major focal element in this landscape.

Existing Playground:

The site plan seeks to preserve and maintain the existing playground including:

- Preservation of existing shade trees adjacent the existing playground
- Provision of new seating areas (with backrests and armrests) at the existing playground
- Provision of new shade and ornamental trees to increase tree canopy coverage at the new seating areas

Pollinator Garden:

A small pollinator and sensory garden is located south of the playground and west of the multi-use lawn. This garden will feature native grasses and flowering perennials, complementing the existing trees nearby, and serving as a landscape buffer to the adjacent dropoff zone and parking area.

Victory Garden:

The victory garden is also located south of the playground and west of the multi-use lawn. This small sunny area helps to promote outdoor activity, healthy lifestyles as well as hands on education for school age children.

Basketball Court:

A half-court basketball court at the northwest area of the site provides active play opportunities for youth and adults. Seating is provided (bench and chairs with backs and armrests) to accommodate spectators.

Dog Runs:

There are two fenced pea gravel dog runs on site – a smaller 1,300 sf area south of the existing building and a larger 3,500 sf area south of the new building. Both areas will have water connections and provide off-leash opportunities for pet owners.

Amenities at Existing Building:

A paver terrace to the north of the existing building will be repaired to meet ADA requirements. This terrace overlooks the wooded hillside and is a perfect opportunity for a small outdoor dining area with grills and dining tables. To the east of the paver terrace, additional leisurely seating and hammocks are provided at an outdoor "back porch" deck area – also overlooking the scenic hilltop trees.

Amenities at the New Residential building:

A significant amenity area is the outdoor courtyard at the new residential building. The building architecture serves as the walls for this courtyard while columnar and ornamental trees provide additional definition and shade a variety of conversational seating areas, dining areas and grilling stations. At the heart of this courtyard, a large specimen tree further celebrates the beauty of the outdoor environment and serves as focal point and unify element.

Landscape Planting Design:

The planting design features native and adaptive plants that complement the existing natural beauty of the site. Over 100 new deciduous, evergreen and small ornamental flowering trees provide canopy coverage (reducing heat island effect), screening and visual interest over this 11-acre site.

TAB 15

tat

September 17, 2021

The Homes at Avon Park
Security Drive
Avon, CT

Sustainability Narrative

Development Overview

The Homes at Avon Park redevelopment will maximize features designed to energy conservation and sustainability to the greatest degree feasible. Beacon Communities is constantly building on a long-time commitment to sustainable design and high conservation standards. Since 2008, almost all of Beacon's new developments have been LEED-certifiable. Our goal is to go beyond LEED certification, striving instead for a holistic approach to the site, the massing of buildings, the energy that the buildings will consume, and the materials that the buildings will be built from. We will focus on how design choices shape the residents' everyday lives, working to encourage healthy living, minimize environmental impacts, and increase environmental awareness. The buildings will utilize materials and systems that foster resident health. During construction, we will work with our general contractor to focus on waste reduction and recycling. And as managers and operators of the development, we monitor energy use, limit the amount of chemicals we use in landscaping, and maintain our developments to maximize useful life. In all these ways, we work to minimize our environmental footprint and make the built environment better and more environmentally sensitive than when we found it. Below is a summary of design and construction features that will assist the redevelopment in achieving these goals.

Site Location and Selection

The proposed site is an opportunity for housing creation while also supporting sustainable design principles through the site selection.

The site is well suited to housing with its central location in a walkable area with designated bicycle trail network (located across from the entrance to the site), providing access to nearby town offices, public transit, and Avon Village Center retail and restaurants. Sites that are walkable and bikeable reduce occupant dependency on fossil-fuel burning vehicles. The development will further support this by providing both short-term and long-term bicycle parking and storage for building occupants and visitors.

Another sustainable design aspect is the act of redeveloping an underutilized existing office development. This results in lower-impact development over selecting a previously undeveloped site. Redevelopment has many benefits over new development such as reducing the amount of resources required to manufacture materials and site elements that are already in place, as well as reducing new land disturbance and tree clearing.

The adaptive reuse of an existing structure is fundamentally sustainable in that its practice utilizes less new resources and embodied energy to achieve the final product. Reutilization of a building in lieu of demolition reduces waste product.

Water Efficiency

The reduced water consumption goals will be achieved by installing low-flow indoor water fixtures, including showerheads, toilets, and faucets that are WaterSense-labeled. Introducing only native and/or adapted plant species and including minimal turf grass in the design reduces the need for irrigation.

Energy Efficiency at Atmosphere

The development will incorporate various building elements to reduce energy consumption and increase building performance:

- XPS continuous slab insulation, minimum R-10 at the new construction building
- Exterior wall fiberglass insulation with continuous rigid insulation at the new construction building.
- Upgrading the existing insulation values at the existing building.
- Roof insulation having a minimum R-38 rating.
- Replacement of existing low-efficiency storefront windows at existing building to improve thermal performance and reduce air leakage
- Residential windows, minimum performance value U-0.32
- LED lighting within units and common areas
- ENERGY STAR appliances for resident units, including refrigerators, clothes washers and dryers, range hood fans, and kitchen and bath exhausts.

The development will utilize a third-party commissioning agent to execute a commissioning scope for the heating, cooling, hot water, and ventilation systems to ensure equipment and systems are installed properly and running with efficiencies as designed.

No CFC-based refrigerants will be used in any new equipment installation.

Materials and Resources

The development will provide areas accessible to both waste haulers and building occupants for collection and storage of recyclable materials. Collection, storage, and disposal of batteries and mercury-containing lamps will be managed by site staff and the site's contracted waste hauler.

The building will have a separate recycling chute and compactor for single stream recycling, separate from trash.

For Construction Waste Recycling, the development specifications require that the contractor prepare and execute a construction waste management plan and recycle at least 50 percent by weight or volume of total nonhazardous solid waste generated by the Work.

Indoor Environmental Air Quality

The development will be designed with a whole-unit ventilation system for each individual dwelling unit using exhaust fan systems and energy recovery ventilators.

All composite wood materials will meet low- or no-added formaldehyde requirements

The development will be entirely non-smoking to be instituted through lease language. Smoking will be prohibited with 25 feet of all building entries, air intakes, and operable windows.

The development will install low emissions products for three product categories: paints and coatings, adhesive and sealants, and flooring.

TAB 16

September 17, 2021

Ms. Gina Martinez
Beacon Communities LLC
2 Center Plaza, Suite 700
Boston, MA 02108

RE: Traffic Impact Study
Multifamily Residential Redevelopment
20 Security Drive
Avon, Connecticut
SLR #141.20237.00001

Dear Ms. Martinez:

At your request, we have undertaken this study to evaluate the traffic-related implications associated with the proposed multifamily residential redevelopment to be located at 20 Security Drive in Avon, Connecticut. **Figure 1** displays the site location map. The site presently has a 4-story office building and a surface parking lot with approximately 180 parking spaces. The site did receive a certificate (Certificate Number 6) from the State of Connecticut State Traffic Commission (now known as the Office of the State Traffic Administration (OSTA)) in December 1969 for the development of the Avon Industrial Park. It was recently home to the CREC Ana Grace Academy of the Arts Elementary Magnet School, which relocated for the start of this school year. The proposed redevelopment plans are to rehabilitate the existing office building to construct 76 residential units, and construct a new residential building on the existing parking lot with 100 residential units. The existing driveway off Security Drive will be maintained and provide access to the site. **Figure 2** displays the proposed site plan.

The work comprising the study consisted of several tasks including field reconnaissance, data collection, review of roadway and traffic conditions, estimation of site-generated traffic volumes, and assessment of future traffic operations. For this study, the following intersections were evaluated:

1. West Main Street (US Route 44/US Route 202) at Climax Road/Bickford Drive
2. West Main Street (US Route 44/US Route 202) at Darling Drive
3. West Main Street (US Route 44/US Route 202) at Ensign Drive
4. Security Drive at Darling Drive
5. Security Drive at Site Driveway

Figure 3 displays the study area.

EXISTING CONDITIONS

The existing information including traffic volumes, transit service, and crash history was collected to determine the existing conditions of the area around the proposed redevelopment.

Site Environs

West Main Street (US Route 44) is a principal arterial that runs east/west from New York (State Route 55) to Massachusetts (Route 3A). Regionally, US Route 44 provides access to the towns of Canton and New Hartford to the west and the greater Hartford area to the east. Within the site vicinity, the principal arterial generally has two lanes in each direction but widens to provide additional turn lanes at signalized intersections. On-street parking is not permitted and sidewalks are present on both sides of the roadway. The posted speed limit within the site vicinity is 35 miles per hour (mph).

Darling Drive is a local roadway that connects US Route 44 to Security Drive. On-street parking is not permitted and a mixed-use path (the Farmington Canal Heritage Trail) is present on the west side of the roadway. The posted speed limit is 35 mph.

Security Drive is a local roadway that connects Darling Drive and Arch Road. On-street parking is not permitted and a mixed-use path is present on the south side of the roadway. The posted speed limit is 30 mph. As stated previously, the existing driveway off Security Drive will continue to provide access to the site.

Crash Data Summary

Information on traffic crash statistics for the study intersections was obtained from the Connecticut Crash Data Repository for the roughly 3-year period of January 1, 2018, to August 12, 2021. The crash data collected for this period is shown in **Table 1**, summarized by location.

A total of 57 crashes were reported at the study intersections for the 3-year period. No crashes were reported at the intersections of Security Drive at Darling Drive or the site driveway. More than 70% of the total crashes resulted in property damage only. The most common collision type was rear-end collisions, comprising 75% of reported crashes, followed by angle collisions at 14%, and sideswipe (same direction) collisions at 7%.

A total of 13 non-intersection crashes were reported along West Main Street between Climax Road/ Bickford Drive and Ensign Drive for the 3-year period (not including the crashes reported at the study intersections). No crashes were reported on Darling Drive or Security Drive. Over 90% of the total crashes resulted in property damage only. No fatalities were reported. The most common collision type was sideswipe (same direction) collisions, comprising 46% of reported crashes, followed by angle and hit-fixed-object collisions at 15% each. One collision was reported at the existing parking lot on the redevelopment site. It resulted in property damage only.

Existing Transit Routes

CTtransit is Connecticut Department of Transportation's (CTDOT) bus service. CTtransit bus route 901 has stops at the intersection of West Main Street/East Main Street at Old Farms Road/Simsbury Road. Route 901 is an express route that operates between Canton and Hartford. The route operates from approximately 5:30 a.m. to 7:10 p.m. on weekdays. There is no service Saturday or Sunday.

SLR

TABLE 1
Crash Data Summary

LOCATION	CRASH SEVERITY						TYPE OF COLLISION							
	FATAL INJURY	SUSPECTED SERIOUS INJURY	SUSPECTED MINOR INJURY	POSSIBLE INJURY	PROPERTY DAMAGE ONLY	TOTAL	REAR-END	ANGLE	SIDESWIPE (SAME DIRECTION)	HIT-FIXED-OBJECT	HIT CURB	HEAD-ON	WORK ZONE	TOTAL
INTERSECTIONS														
W Main St @ Climax Rd	0	1	1	3	8	**13**	9	4	0	0	0	0	0	**13**
W Main St @ Darling Dr	0	0	0	8	16	**24**	21	0	2	1	0	0	0	**24**
W Main St @ Ensign Dr	0	0	0	3	17	**20**	13	4	2	0	1	0	0	**20**
Intersection Totals	***0***	***1***	***1***	***14***	***41***	***57***	***43***	***8***	***4***	***1***	***1***	***0***	***0***	***57***
W Main St														
Climax Rd – Darling Dr	0	0	0	0	2	**2**	0	1	1	0	0	0	0	**2**
Darling Dr – Ensign Dr	0	0	1	0	10	**11**	0	1	5	2	1	1	1	**11**
Road Segment Totals	***0***	***0***	***1***	***0***	***12***	***13***	***0***	***2***	***6***	***2***	***1***	***1***	***1***	***13***

Source: Connecticut Crash Data Repository from January 1, 2018, to August 12, 2021.

Existing Traffic Volumes

Traffic monitoring data for West Main Street was also obtained from CTDOT from March 2015 (the latest available of such state data). The annualized average daily traffic (AADT) on West Main Street northwest of US Route 202/Route 10 was 21,100 vehicles. The AADT on West Main Street northwest of Climax Road was 24,100 vehicles.

Based on correspondence with CTDOT, the Combined 2020 Volumes from the Avon Village Center OSTA Major Traffic Generator Step One Pre-Certification Application (April 30, 2018) were used as the baseline volumes for the intersections of West Main Street at Climax Road/Bickford Drive and West Main Street at Ensign Drive. The volumes are included in the Appendix.

To supplement the Avon Village Center Combined 2020 Volumes, traffic counts were conducted at the intersections of West Main Street at Darling Drive and Darling Drive at Security Drive. The counts were conducted on Thursday, August 19, 2021, from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. to capture peak roadway activity. The traffic counts are included in the Appendix.

Due to the COVID-19 pandemic and its overall effect on reducing current travel and traffic patterns, the recently conducted traffic counts are likely not indicative of normal (pre-COVID) traffic operations. The traffic counts were balanced (increased) based on the Avon Village Center Combined 2020 Volumes to reflect normal (non-COVID) traffic operations. The COVID adjustments are included in the Appendix. **Figure 4** displays the resulting 2020 Baseline peak-hour traffic volumes.

Avon Village Center

The Avon Village Center is a very large development project that is currently being constructed along the north side of US Route 44 (West Main Street) between Climax Road (proposed to be renamed as Bickford Drive as part of the project) and US Route 202/Route 10 (Simsbury Road). When it is completed, it will include approximately 1.25 million square feet of mixed-use space.

In late 2015, the Avon Town Council approved the Avon Village Center Master Plan. In May of 2018, a Traffic Impact Study for the Avon Village Center Master Plan was completed by Fuss & O'Neill (known herein as the *Avon Village Center Master Plan Traffic Impact Study*). The study concluded that the large mixed-use development is expected to generate 505 new trips in the weekday morning peak hour, 1,577 new trips in the weekday afternoon peak hour, and 1,795 new trips during the Saturday midday peak hour. The intersections of US Route 44 (West Main Street) at Ensign Drive, US Route 44 (West Main Street) at Climax Road/Bickford Drive, and Route 10/202 (Simsbury Road) at Bickford Drive and Mountain View Avenue will experience significant level of service (LOS) degradation with peak-hour delays during the weekday afternoon peak hour with the construction of the proposed Avon Village Center development. Substantial roadway improvements and signal timings were recommended at these intersections to mitigate the traffic generated by the proposed development. As stated previously, the 2020 Combined volumes from this study are used as the baseline volumes for this analysis.

It is important to note that the *Avon Village Center Master Plan Traffic Impact Study* did not include the intersection of US Route 44 (West Main Street) at Darling Drive in their study area. Additionally in the study, the intersection of US Route 44 (West Main Street) and Ensign Drive had northbound and southbound concurrent and permissive left turn phasing with dual left turns. Permissive phasing is not typically supported for dual left turns.

In July 2018, the Avon Planning and Zoning Commission approved Phase 1A of the Avon Village Center development. The first phase included a 44,000-square-foot Whole Foods and more than 54,000 square feet of other retail and commercial space. It also included roadway improvements to the intersection of US Route 44 (West Main Street) and Climax Road/Bickford Drive. The first phase opened on September 1, 2021. The updated signal plans for the intersection of US Route 44 (West Main Street) and Climax Road/Bickford Drive were received from CTDOT and used for this analysis. The rest of the development has gone through the OSTA Major Traffic Generator process, but at the time of this report, CTDOT has not received the Permit Application documentation yet. As such, the signal phasing for the intersection of US Route 44 (West Main Street) and Ensign Drive was estimated for this analysis.

PROPOSED REDEVELOPMENT

As stated previously, the proposed redevelopment plans to rehabilitate the existing office building to construct 76 residential units and construct a new residential building on the existing parking lot with 100 residential units, for a total of 176 residential units. The existing driveway off Security Drive will be maintained and provide access to the site.

As mentioned earlier, the existing office building on the site recently housed the CREC Ana Grace Academy of the Arts Elementary Magnet School, however, the building has historically been used as an office building and could now be used again for office use(s) as-of-right.

Redevelopment Site Trip Generation

As-of-right existing and currently proposed site-generated peak-hour trips were estimated using statistical data published by the Institute of Transportation Engineers (ITE).[1] **Table 2** summarizes the site-generated traffic estimates for the potential re-occupancy of the existing office building and the currently proposed residential redevelopment during the study peak hours. The comparison between the possible re-use of the building again as office versus the proposed residential site-generated peak-hour trips is shown to demonstrate the true impact of the change in the site to residential land use.

TABLE 2
Site-Generated Traffic Estimates

LAND USE	UNITS	A.M. PEAK HOUR				P.M. PEAK HOUR			
		TRIP RATE	IN	OUT	TOTAL	TRIP RATE	IN	OUT	TOTAL
As-of-Right Existing Site									
710 – General Office Building	102 KSF	1.16/KSF	102	17	119	1.15/KSF	19	99	118
Proposed Redevelopment									
221 – Multifamily Housing (Mid-Rise)	176 DU	0.36/DU	16	47	63	0.44/DU	47	30	77
Proposed Redevelopment – Existing Site			***-86***	***30***	***-56***		***28***	***-69***	***-41***

Notes:
1. *Trip Generation, 10th Edition*, Institute of Transportation Engineers
2. KSF = Thousand Square Feet
3. DU = Dwelling Units

The proposed residential redevelopment is anticipated to have opposite travel patterns as compared to the as-of-right existing office building. The proposed residential redevelopment is estimated to generate significantly less trips than the as-of-right existing office building in the inbound direction during the morning peak hour and in the outbound direction during the afternoon peak hour. Overall, the proposed

[1] *Trip Generation, 10th Edition*, Institute of Transportation Engineers, 2017

residential redevelopment would result in a net reduction in total site trips (56 during the morning peak hour and 41 during the afternoon peak hour). As shown in Table 2, the proposed residential redevelopment is estimated to generate 63 total vehicle trips (16 vehicles entering and 47 vehicles exiting) during the morning peak hour and 77 total vehicle trips (47 vehicles entering and 30 vehicles exiting) during the afternoon peak hour.

Proposed Residential Redevelopment Site Trip Distribution

The geographic distribution of the proposed residential redevelopment site-generated traffic was estimated based on review of the roadway traffic patterns in the vicinity of the site. **Figure 5** illustrates the distribution for the proposed residential redevelopment site-generated traffic through the study area. It is important to note that the estimated trip distribution is consistent with the residential distribution assumed in the *Avon Village Center Master Plan Traffic Impact Study* (Fuss & O'Neill, May 2018). Based on the proposed residential redevelopment trip generation and trip distribution, the proposed redevelopment site-generated trips were assigned to the study area intersections. **Figure 6** displays the resulting proposed redevelopment site-generated trip assignment.

Potential Existing Site Trip Distribution

The geographic distribution of site traffic generated by the as-of-right potential re-occupancy of the existing office building was estimated based on review of the roadway traffic patterns in the vicinity of the site and journey-to-work census data. **Figure 7** illustrates the distribution for the as-of-right existing office building site-generated traffic through the study area. Based on the as-of-right existing office building trip generation and trip distribution, the as-of-right existing office building site-generated trips were assigned to the study area intersections. **Figure 8** displays the resulting as-of-right existing office building site-generated trip assignment.

FUTURE (2023) CONDITIONS

The proposed residential redevelopment is anticipated to be completed by 2023. Future (2023) Conditions were evaluated with the existing office building re-occupied and with the proposed residential redevelopment completed to determine possible traffic impacts. Under Future (2023) Conditions, it is assumed that all the components of the Avon Village Center Master Plan are completed and occupied. This includes all the recommended geometric improvements for the study intersections included in the *Avon Village Center Master Plan Traffic Impact Study* (Fuss & O'Neill, May 2018). Recommended geometric improvements include:

- West Main Street at Climax Road/Bickford Drive
    - Widen West Main Street and construct a 100-foot westbound right turn storage lane
    - Widen Climax Road/Bickford Drive to construct two left turn lanes and a dedicated right turn lane on the southbound approach
- West Main Street at Ensign Drive
    - Construct a 100-foot eastbound left turn storage lane

- Construct a 50-foot westbound left turn storage lane
- Widen Ensign Drive to construct a dedicated left turn lane, a combined left/through lane, and a dedicated right turn lane on the southbound approach

Background with Office Traffic Volumes

The Background with Office traffic scenario is reflective of Future (2023) Conditions if the proposed residential redevelopment was not built but instead if the existing office building was re-occupied. Background with Office Conditions also includes traffic associated with other nearby expected upcoming developments as well as general traffic growth.

Based on correspondence with CTDOT, other than the upcoming developments included in the Avon Village Center Combined 2020 Volumes, there are no other proposed developments nearby that would impact the study intersections. Based on correspondence with CTDOT, the baseline traffic volumes were projected to Future (2023) Conditions using a growth rate of 1.1 percent per year. Background with Office Conditions peak-hour traffic volumes were estimated by applying the growth rate to the 2020 baseline peak-hour traffic volumes (shown in Figure 4) and adding the as-of-right existing office building site-generated trip assignment (shown in Figure 8). The resultant Background with Office Conditions peak-hour traffic volumes are shown in **Figure 9**.

Combined with Residential Traffic Volumes

The Combined with Residential traffic scenario is reflective of Future (2023) Conditions once the proposed residential redevelopment is completed. Combined with Residential Conditions peak-hour traffic volumes were estimated by adding the estimated proposed residential redevelopment site-generated trip assignment (shown in Figure 6) to the Background with Office Traffic Volumes (shown in Figure 9) sans the as-of-right existing office scenario site traffic (shown in Figure 8). The resultant peak-hour traffic volumes are shown in **Figure 10**.

INTERSECTION CAPACITY ANALYSIS

Intersection capacity analysis was performed at the study intersections under Background with Office and Combined with Residential Conditions to evaluate each intersection's ability to process traffic volumes. These evaluations were used to determine possible traffic impacts from the proposed residential redevelopment based on the comparison of background versus combined traffic operations. Intersection operation results are expressed as a LOS. LOS is used to provide a qualitative evaluation of the efficiency of operations of an intersection in terms of delay and inconvenience based on certain quantitative calculations. A description of the various LOS designations, A through F, is given in the Appendix. LOS A describes operations with very low average control delay per vehicle while LOS F describes operations with long average delays. The study intersections were evaluated using *Synchro 11* (*Trafficware*) traffic analysis software package. **Table 3** summarizes the capacity analysis findings under Background and Combined (2023) Conditions. The *Synchro* analysis worksheets are included in the Appendix.

It is important to note that LOS A to LOS D are generally considered acceptable conditions. However, in some areas, LOS E during peak hours is often deemed acceptable and can indicate an efficient tradeoff between traffic flow and the amount of land devoted to the movement of motor vehicles.

As shown in Table 3, none of the study intersections are expected to experience reductions in the overall LOS or individual movement LOS caused by the proposed residential redevelopment. Furthermore, the proposed residential redevelopment is anticipated to have opposite travel patterns compared to the as-of-right existing office building, and generate a net reduction in total site trips by comparison. As such, based on the intersection capacity analysis results, no reductions in LOS are expected as a result of the proposed residential redevelopment.

At the intersection of West Main Street and Climax Road/Bickford Drive, the intersection as a whole and all the individual movements are expected to operate at acceptable LOS (LOS E or better) under Background with Office and Combined with Residential Conditions during both peak periods.

At the intersection of West Main Street and Darling Drive, the westbound left/through movement is expected to operate at LOS F during the afternoon peak period under Background with Office and Combined with Residential Conditions. However, the intersection as a whole is expected to operate at LOS E or better. It should be noted that during the afternoon peak period, westbound traffic along the US Route 44 corridor is currently and will continue to be sluggish. However, the proposed residential redevelopment is expected add only approximately 25 trips to the background traffic of over 2,000 vehicles, which is an increase of only around 1%.

At the intersection of West Main Street and Ensign Drive, the westbound through/right movements are, again, expected to operate at LOS F during the afternoon peak period under Background with Office and Combined with Residential Conditions. The intersection as a whole is expected to operate at LOS E or better and remain unchanged between background and combined conditions. Again, it is important to note that the capacity analysis results at this intersection differ from those reported in the *Avon Village Center Master Plan Traffic Impact Study* (Fuss & O'Neill, May 2018), as the signal phasing used in that study included dual left turn permissive phasing, which is not typically allowed and which we modified in the analysis to reflect signal phase operations that are more likely to be implemented. Ultimately, CTDOT will determine the timing and phasing parameters at this improved intersection and the traffic from the proposed residential redevelopment will not change the outcomes of their evaluation.

The two unsignalized intersections are expected to operate well (LOS B or better).

TABLE 3
Capacity Analysis Summary - Future (2023) Conditions

INTERSECTION/LANE GROUP	LEVEL OF SERVICE			
	A.M. PEAK HOUR		P.M. PEAK HOUR	
	BACKGROUND	COMBINED	BACKGROUND	COMBINED
Signalized				
1. West Main Street at Climax Road/Bickford Drive				
Eastbound Left	A	A	D	D
Eastbound Through	A	A	A	A
Westbound Through	B	A	E	E
Westbound Right	A	A	A	A
Southbound Left	D	D	D	D
Southbound Right	A	A	D	D
Overall	***A***	***A***	***D***	***D***
2. West Main Street at Darling Drive				
Eastbound Through/Right	B	B	A	A
Westbound Left/Through	A	A	F	F
Northbound Left	D	D	E	D
Northbound Right	B	B	C	C
Overall	***B***	***B***	***E***	***E***
3. West Main Street at Ensign Drive				
Eastbound Left	A	A	E	E
Eastbound Through/Right	B	B	B	B
Westbound Left	E	E	B	B
Westbound Through/Right	B	B	F	F
Northbound Left/Through/Right	A	A	D	D
Southbound Left/Through	D	D	E	E
Southbound Right	A	A	B	B
Overall	***B***	***B***	***E***	***E***
Unsignalized				
4. Security Drive at Darling Drive				
Westbound Left/Right	B	B	B	B
Southbound Left	A	A	A	A
5. Security Drive at Site Driveway				
Eastbound Left		A		A
Southbound Left/Right		A		A

Notes: LOS calculations were performed using *Synchro 11.*

QUEUE ANALYSIS

Queue lengths at all of the turn lanes at the study intersections were reviewed under Background with Office and Combined with Residential Conditions. 95th percentile queues represent the maximum queue length that can be expected and are only expected to occur 5% of the time. As such, queue lengths will most often be less than the 95th percentile.

Overall, moderate queues are expected at the study intersections at the minor street approaches and the West Main Street turn lanes under Background with Office and Combined with Residential Conditions. This is consistent with the queue results reported in the *Avon Village Center Master Plan Traffic Impact Study* (Fuss & O'Neill, May 2018). On West Main Street, there are several locations where the 95th percentile queue is projected to exceed the available turn lane storage. However, in no case will the proposed residential redevelopment exacerbate this condition. In fact, in some instances, the 95th percentile queues are expected to improve marginally compared to Background with Office Conditions. At turn lanes where the proposed residential redevelopment traffic would moderately increase the 95th percentile queues, there is queue storage to accommodate the small increase (generally less than one car length).

INTERSECTION SIGHT DISTANCE ANALYSIS

As stated previously, the existing driveway off Security Drive will be maintained and continue to provide access to the site. Intersection sight distances were measured at the existing driveway. Intersection sight distance is determined through the creation of clear sight triangles. Each quadrant of the intersection should contain a triangular area free of obstructions. For vehicles approaching an intersection, the length of the legs of the triangle should be long enough such that the driver can see any potentially conflicting vehicles in sufficient time to slow or stop before colliding. For vehicles departing from an intersection, the length of the legs of the triangle should be sufficient for a stopped driver to depart from the intersection and turn onto the main road safely.

Intersection sight distances were measured in accordance with criteria set forth in the CTDOT *Highway Design Manual*. For a speed limit of 30 mph, 335 feet of sight distance is required for a passenger car turning left or right onto a two-lane facility without a median. There is adequate sight distance based on CTDOT minimum requirements at the existing driveway. It is important to note that vegetation within the clear sight triangles must be kept trimmed, especially during the spring and summer, to ensure that sufficient intersection sight distance is provided throughout the year.

SUMMARY

This study was conducted to assess the traffic impacts of the proposed multifamily residential redevelopment to be located at 20 Security Drive in Avon, Connecticut. The proposed residential redevelopment plans to rehabilitate the existing office building on the site to construct 76 residential units and construct a new residential building on the existing parking lot with 100 residential units, for a total of 176 residential units. The existing driveway off Security Drive will be maintained and provide access to the site. The proposed residential redevelopment is anticipated to have opposite travel patterns compared to the as-of-right existing office building and is expected to generate a net reduction in total site trips.

The intersection capacity analysis results revealed that all study intersections are not expected to experience reductions in the overall LOS or individual movement LOS because of the proposed residential redevelopment. In fact, if the existing office building were to be re-occupied with office use(s), it is anticipated that traffic operations in the area could be marginally worse at some locations.

Review of the queues at the turn lanes revealed that the proposed residential redevelopment will not result in any significant changes in queues at the study intersections. Queues that are expected to overflow the provided storage lengths will not be exacerbated and where queues are expected to marginally lengthen, there is available storage to accommodate them.

A review of crash data obtained from the Connecticut Crash Data Repository for the roughly 3-year period of January 1, 2018, to August 12, 2021, indicates that there were no abnormal crash frequencies and crash patterns at the study intersection. Numerous roadway improvements have been implemented by CTDOT on US Route 44 in this area in recent years.

Lastly, vegetation should be kept trim at the corners of the site driveway and Security Drive (and other nearby locations as necessary) to ensure that sufficient visibility and sight distances are provided throughout the year.

In conclusion, we feel the redevelopment of the 20 Security Drive site from office to residential will not substantially change traffic conditions along the already congested West Main Street (US Route 44). Most importantly, no health or safety concerns will be created or exacerbated by the traffic generated by this proposed residential redevelopment.

We hope this report is useful to you and the town of Avon. If you have any questions or need anything further, please do not hesitate to contact either of the undersigned.

Sincerely,

SLR International Corporation

David G. Sullivan, PE
US Manager of Traffic & Transportation Planning

Emily A. Foster, PE
Associate Transportation Engineer

141.20237.00001.s1021.ltr

Figures

- Figure 1 – Site Location Map
- Figure 2 – Proposed Site Plan
- Figure 3 – Study Area
- Figure 4 – Baseline (2020) Peak Hour Traffic Volumes
- Figure 5 – Proposed Residential Redevelopment Site-Generated Trip Distribution
- Figure 6 – Proposed Residential Redevelopment Peak Hour Site-Generated Trip Assignment
- Figure 7 – As-of-Right Existing Office Building Site-Generated Trip Distribution
- Figure 8 – As-of-Right Existing Office Building Site-Generated Peak Hour Trip Assignment
- Figure 9 – Background (2023) with Office Conditions Peak Hour Traffic Volumes
- Figure 10 – Combined (2023) with Residential Conditions Peak Hour Traffic Volumes

Appendix

- Combined 2020 Volumes from the Avon Village Center OSTA Major Traffic Generator Step One Pre-Certification Application (April 30, 2018)
- Traffic Counts
- COVID Adjustments
- LOS Designation Descriptions
- *Synchro* Analysis Worksheets

SLR

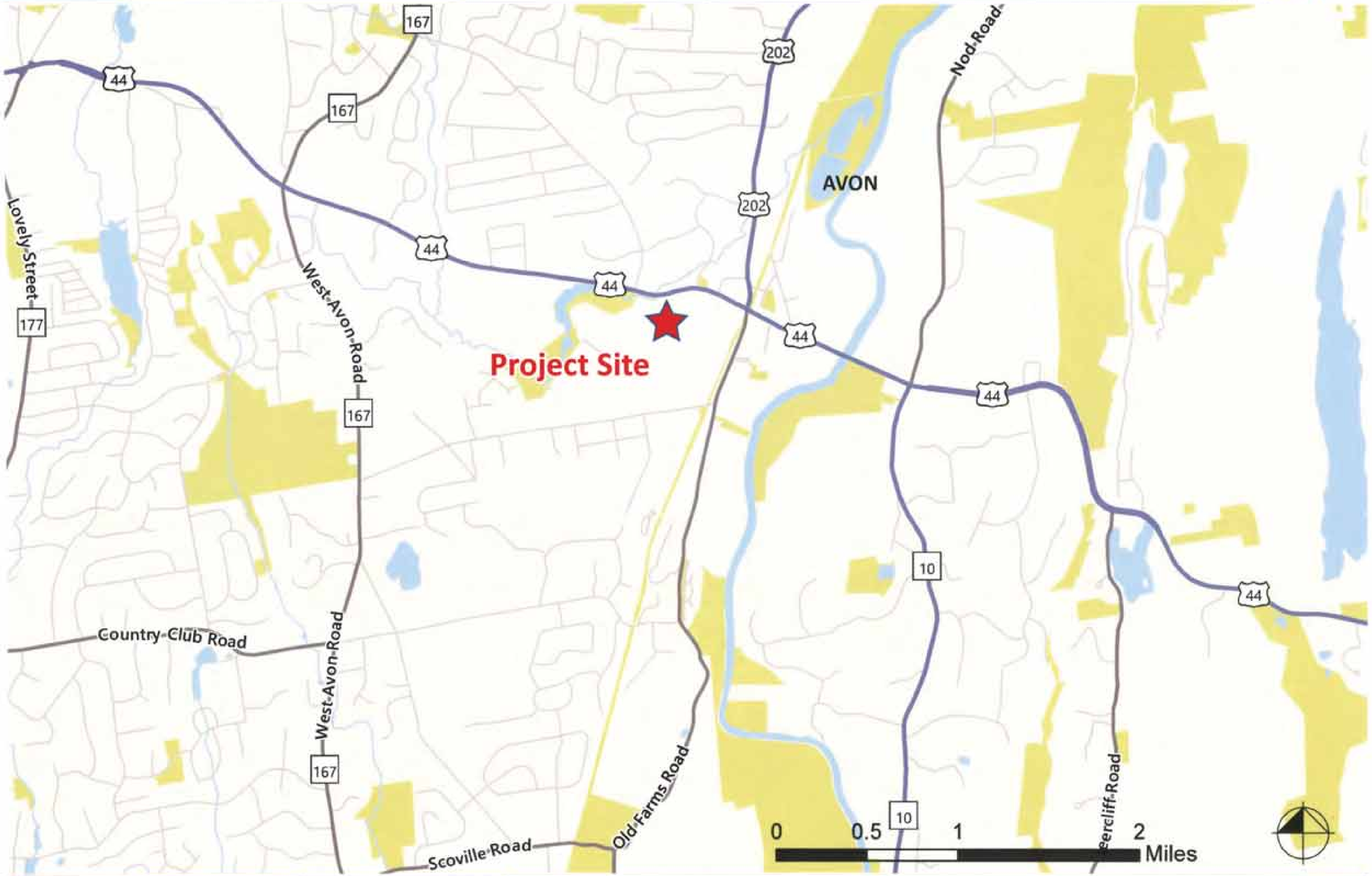


Figure 1
Site Location Map

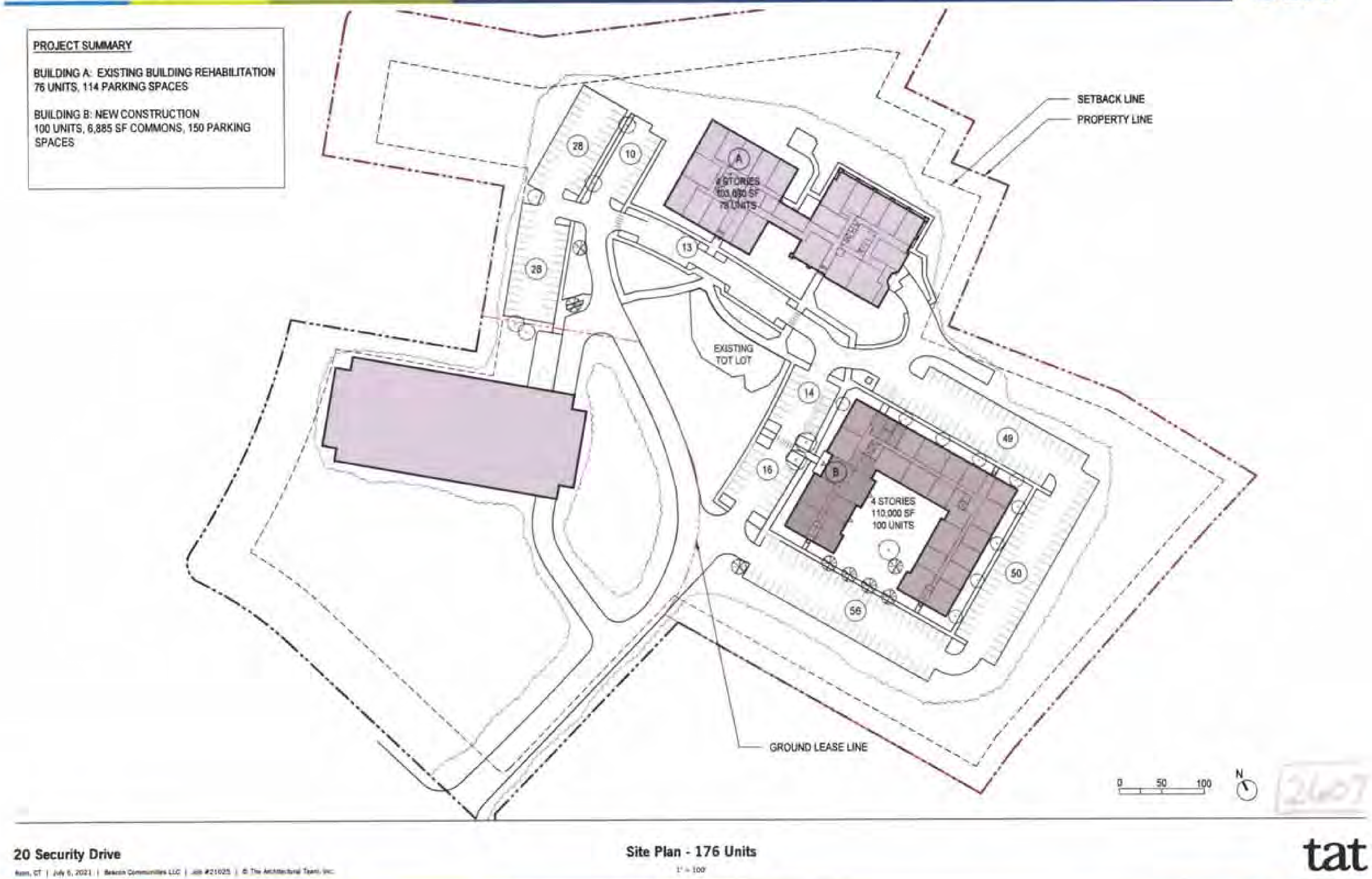


Figure 2
Proposed Site Plan

SLR

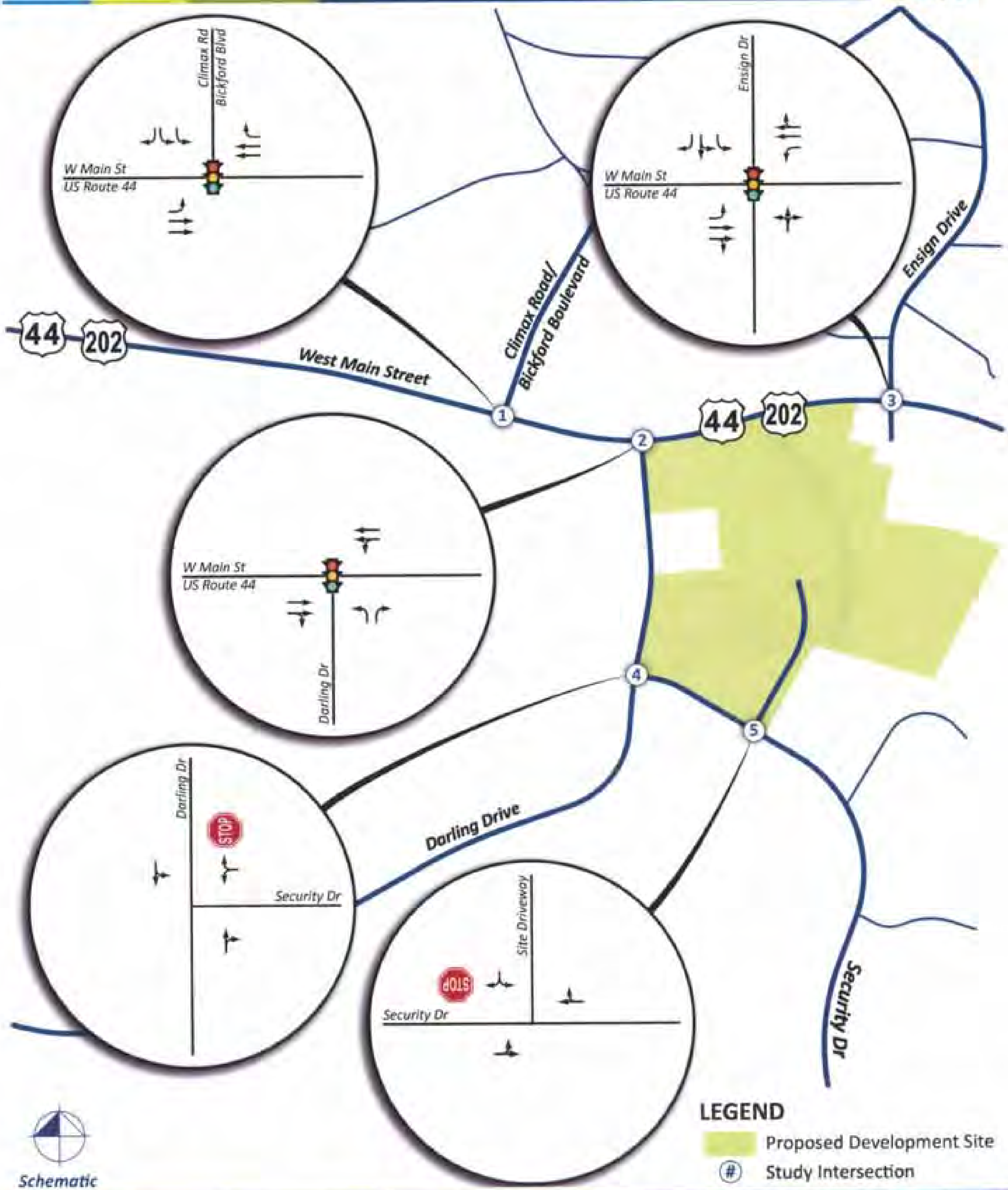


Figure 3
Study Area

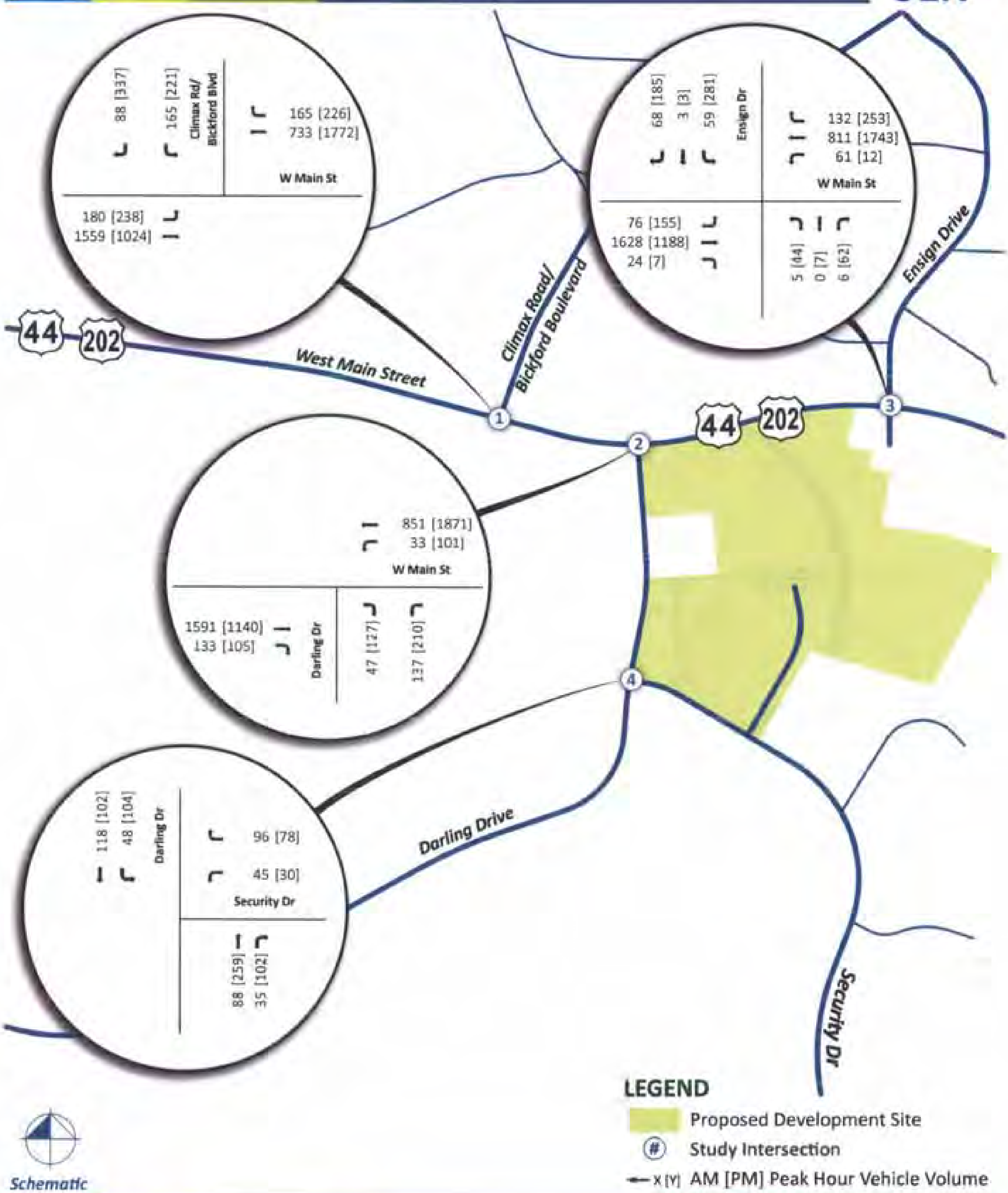


Figure 4
Baseline (2020) Peak Hour Traffic Volumes

Figure 5
Proposed Residential Redevelopment Site-Generated Trip Distribution

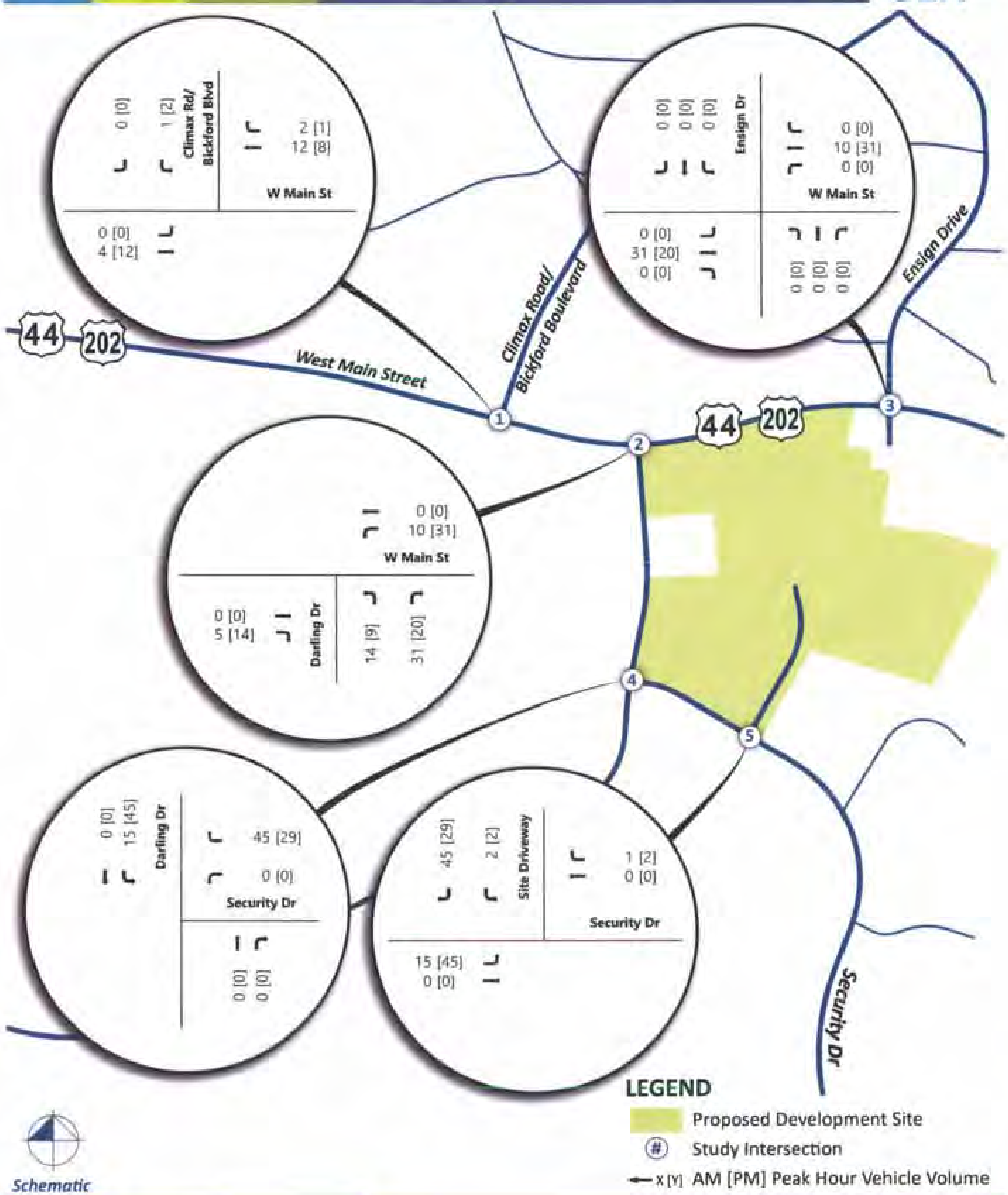


Figure 6
Proposed Residential Redevelopment Peak Hour Site-Generated Trip Assignment

Figure 7
As-of-Right Existing Office Building Site-Generated Trip Distribution

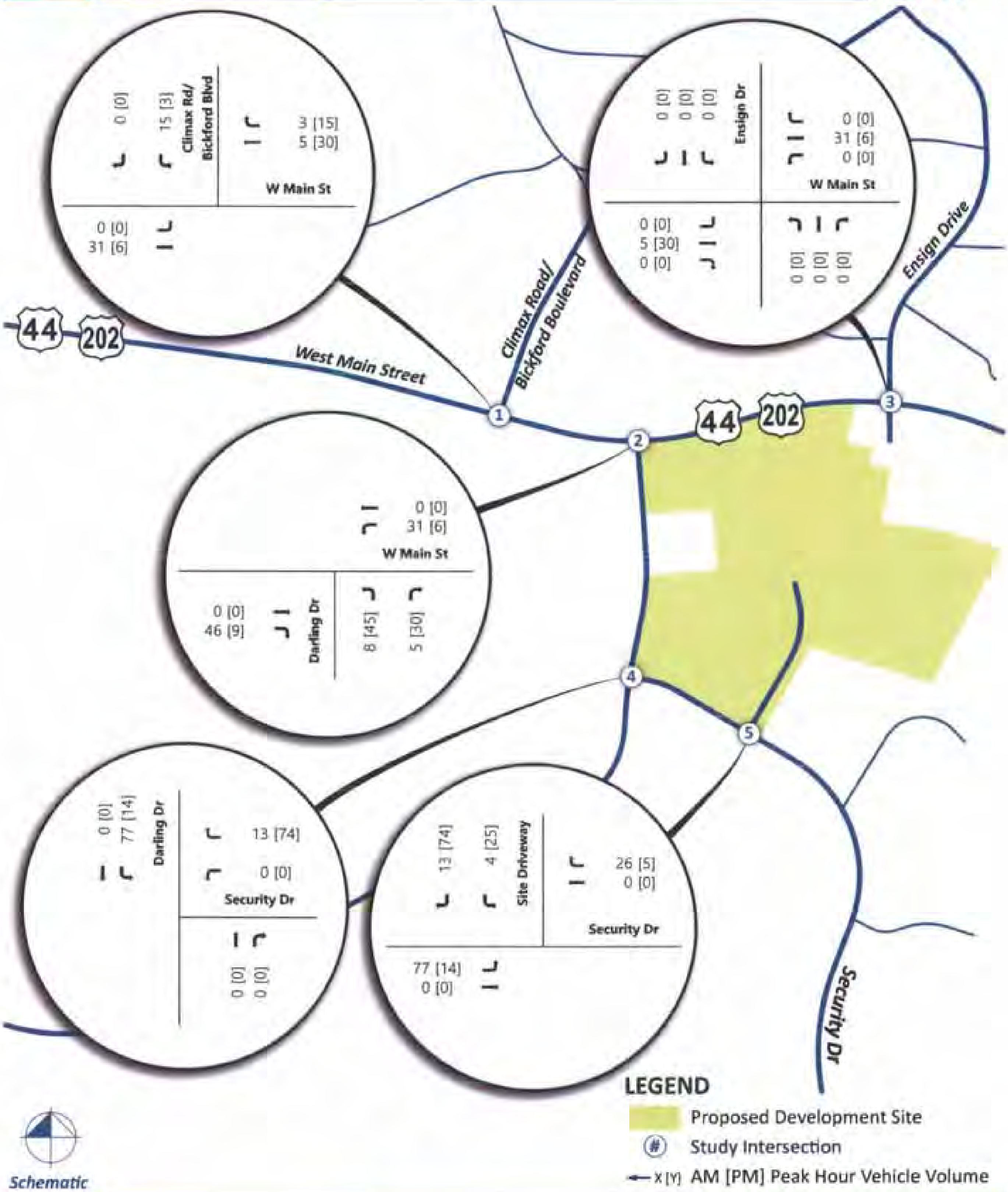


Figure 8
As-of-Right Existing Office Building Site-Generated Peak Hour Trip Assignment

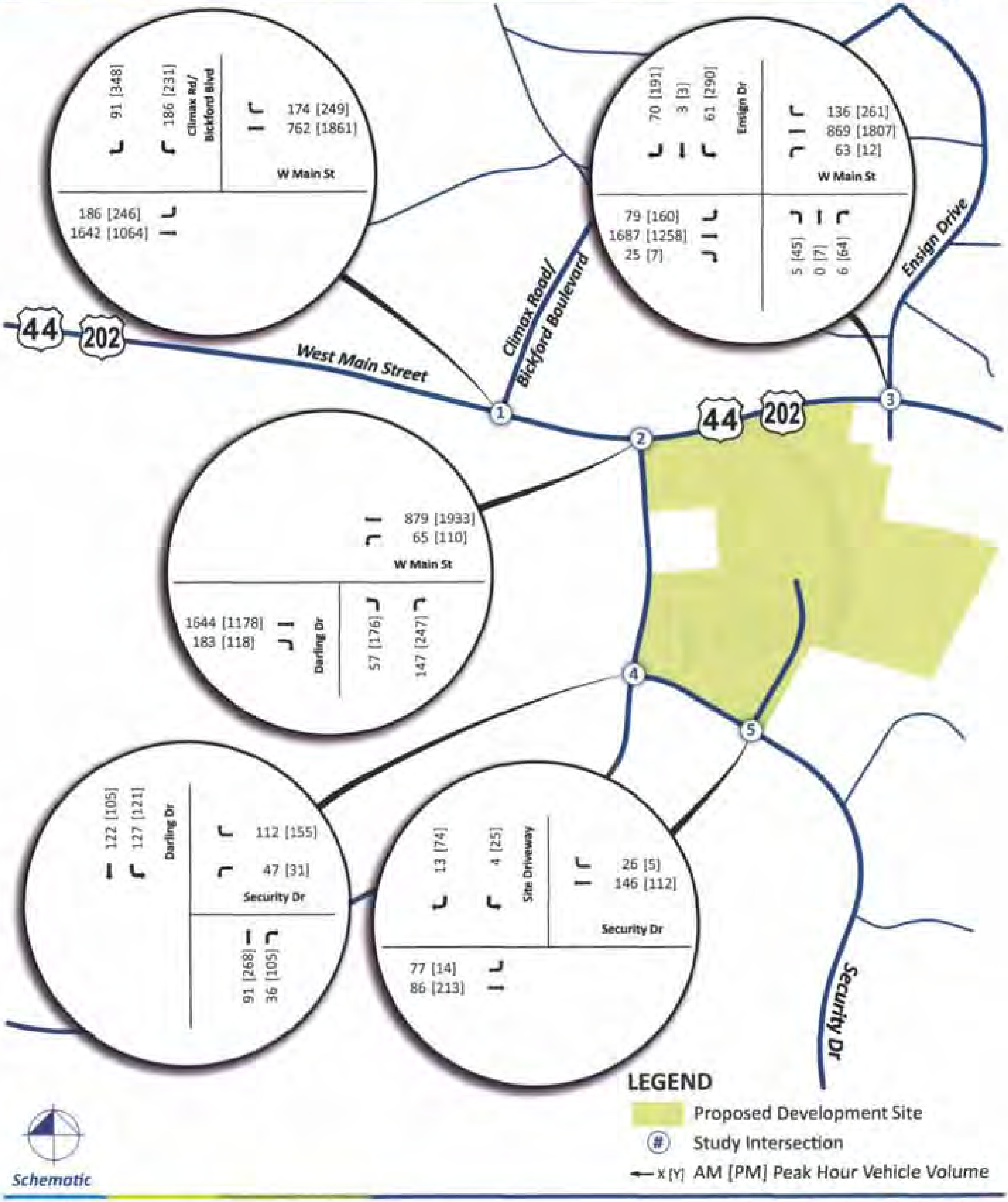


Figure 9
Background (2023) with Office Conditions Peak Hour Traffic Volumes

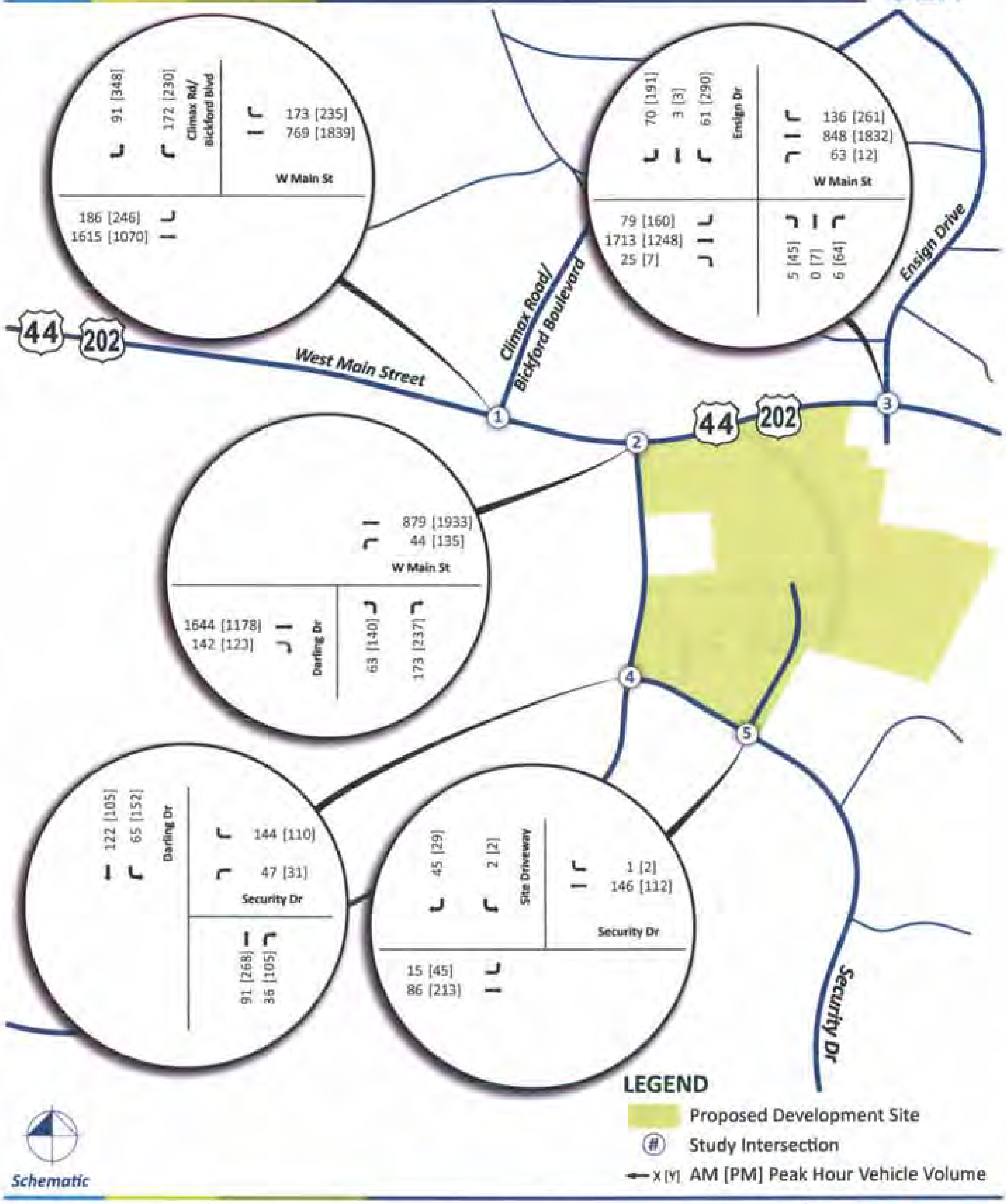
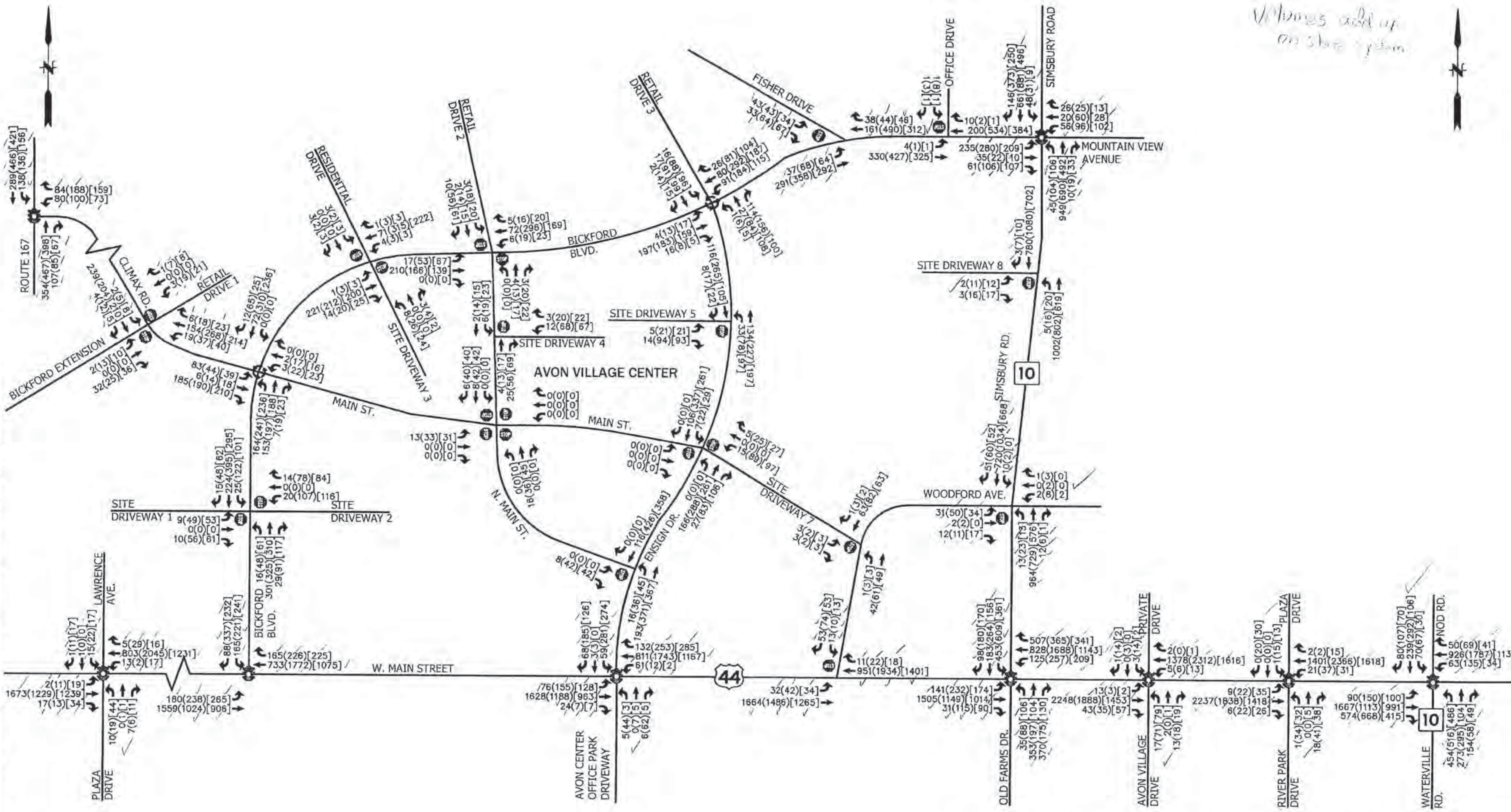


Figure 10
Combined (2023) with Residential Conditions Peak Hour Traffic Volumes

APPENDIX

Volumes add up on state system



XX(XX)[XX] = WEEKDAY AM PEAK HOUR (WEEKDAY PM PEAK HOUR)[SATURDAY PEAK HOUR]

FUSS & O'NEILL
146 HARTFORD ROAD
MANCHESTER, CONNECTICUT 06040
860.646.2469
www.fando.com

FIGURE 15: COMBINED 2020 VOLUMES

PROJ. NO: 20140986.S10

AVON VILLAGE CENTER

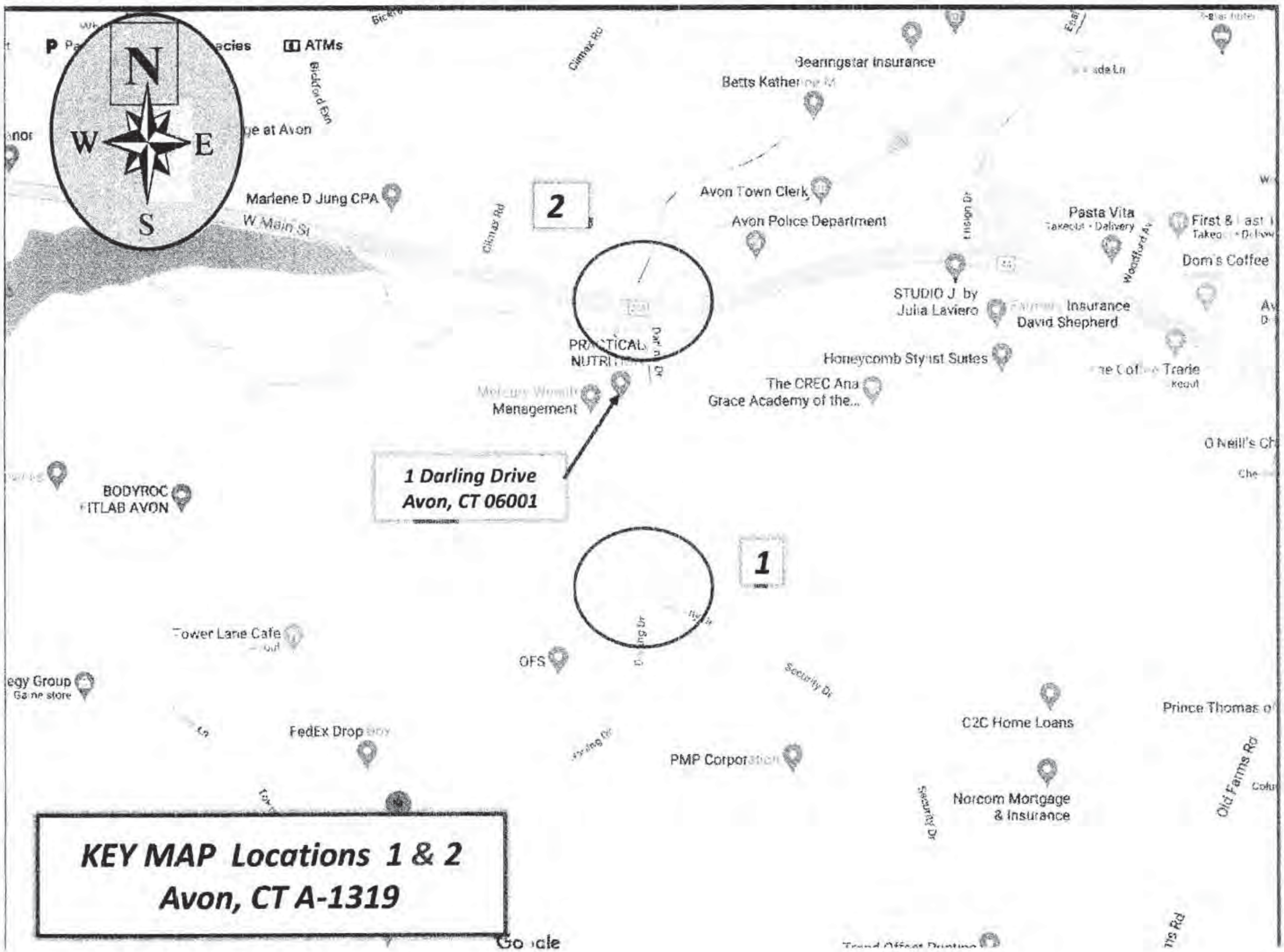
APRIL 2018

Reliable Traffic Counts, LLC
Vehicle/Data Collection Service
11 Branhaven Dr. East Haven, CT 06512 Tel. 203-530-2042 Fax: 203-469-0215 rtcounts@sbcglobal.net

Emily: As per your request, attached please find the following:

1. *Site Location Maps Avon, CT*
2. *Intersection Schematics Locations 1 and 2*
3. *Traffic Counts conducted on Thursday August 19th, 2021*
4. *Traffic Counts on Petra Windows software (email) sent on August 20th, 2021*

Thank you for considering RTC the opportunity of working on this project,
If you have any questions relative to the enclosed information please
Do not hesitate to call...(203) 530-2042


KEY MAP Locations 1 & 2
Avon, CT A-1319
1 Darling Drive
Avon, CT 06001
1
2
N
S
E
W
ATMs
Marlene D Jung CPA
W Main St
Bickford Ext
Climax Rd
Bearingstar Insurance
Avon Town Clerk
Avon Police Department
Ensign Dr
Pasta Vita
Woodford Av
Dom's Coffee
STUDIO J by
Julia Laviero
Insurance
David Shepherd
Honeycomb Stylist Suites
The CREC Ana
Grace Academy of the...
Management
BODYROC
FITLAB AVON
Tower Lane Cafe
OFS
Security Dr
C2C Home Loans
Prince Thomas o
PMP Corporation
Norcom Mortgage
& Insurance
Old Farms Rd
O Neill's Ch
Game store

A.M.TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Locations 1 and 2
Thursday August 19th, 2021
Avon, CT

Reliable Traffic Counts, LLC
Vehicle/Data Collection Service
11 Branhaven Dr. East Haven, CT 06512 Tel. 203-530-2042 Fax: 203-469-0215 rtcvdc@aol.com

Darling Dr. at Security Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 1

Groups Printed- CARS - TRUCKS - BUSES

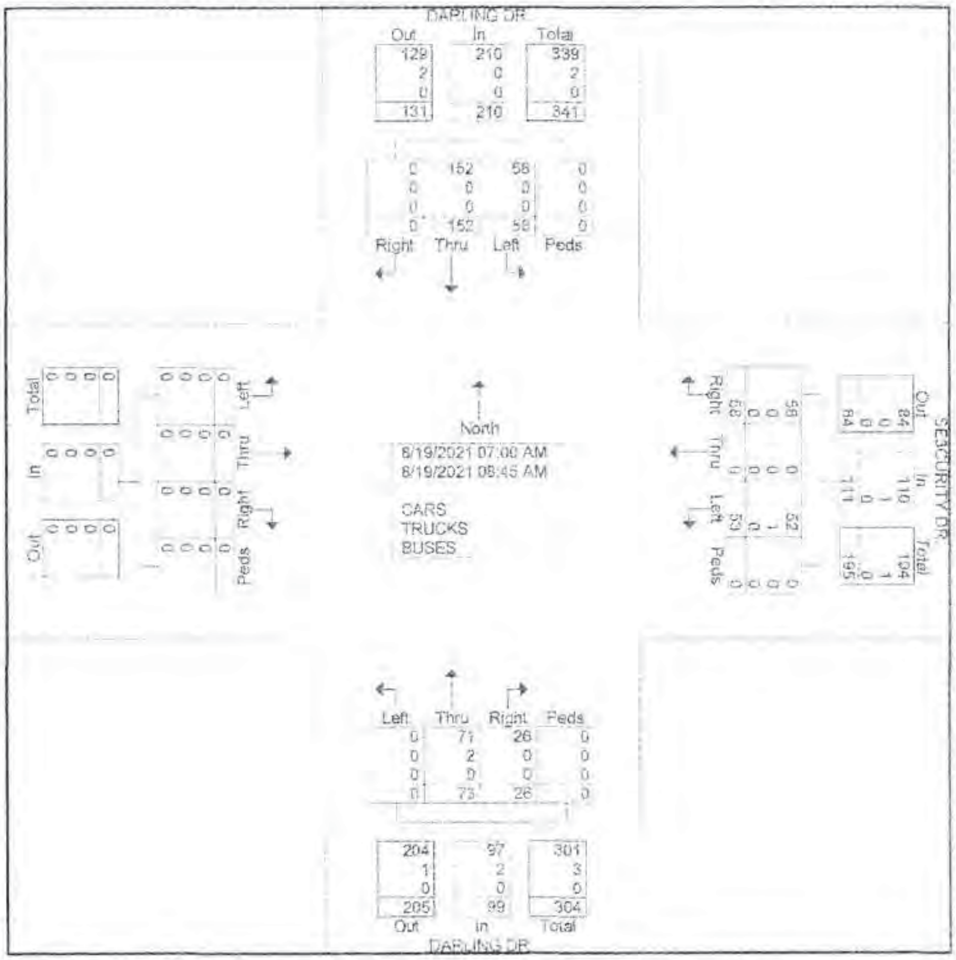
	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	1	15	0	0	16	6	0	1	0	7	0	6	1	0	7	0	0	0	0	0	30
07:15 AM	2	11	0	0	13	3	0	2	0	5	0	4	1	0	5	0	0	0	0	0	23
07:30 AM	6	14	0	0	20	4	0	5	0	9	0	13	2	0	15	0	0	0	0	0	44
07:45 AM	12	20	0	0	32	5	0	6	0	11	0	10	6	0	16	0	0	0	0	0	59
Total	21	60	0	0	81	18	0	14	0	32	0	33	10	0	43	0	0	0	0	0	156
08:00 AM	8	21	0	0	29	10	0	12	0	22	0	16	3	0	19	0	0	0	0	0	70
08:15 AM	10	18	0	0	28	11	0	10	0	21	0	10	6	0	16	0	0	0	0	0	65
08:30 AM	7	24	0	0	31	9	0	10	0	19	0	5	4	0	9	0	0	0	0	0	59
08:45 AM	12	29	0	0	41	5	0	12	0	17	0	9	3	0	12	0	0	0	0	0	70
Total	37	92	0	0	129	35	0	44	0	79	0	40	16	0	56	0	0	0	0	0	264
Grand Total	58	152	0	0	210	53	0	58	0	111	0	73	26	0	99	0	0	0	0	0	420
Apprch %	27.6	72.4	0	0		47.7	0	52.3	0		0	73.7	26.3	0		0	0	0	0		
Total %	13.8	36.2	0	0	50	12.6	0	13.8	0	26.4	0	17.4	6.2	0	23.6	0	0	0	0	0	
CARS	58	152	0	0	210	52	0	58	0	110	0	71	26	0	97	0	0	0	0	0	417
% CARS	100	100	0	0	100	98.1	0	100	0	99.1	0	97.3	100	0	98	0	0	0	0	0	99.3
TRUCKS	0	0	0	0	0	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	3
% TRUCKS	0	0	0	0	0	1.9	0	0	0	0.9	0	2.7	0	0	2	0	0	0	0	0	0.7
BUSES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% BUSES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Darling Dr. at Security Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 2



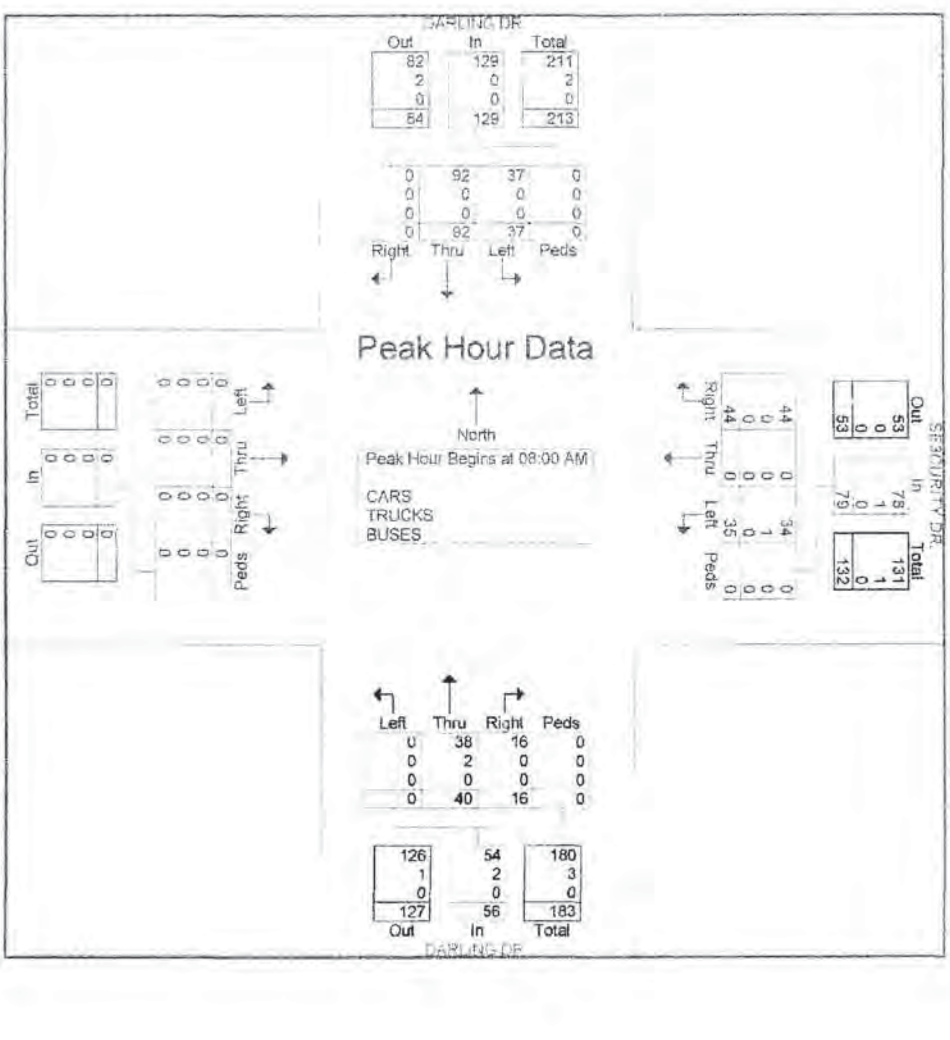
Darling Dr. at Security Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name 1319-1TH
Site Code : 00000001
Start Date 8/19/2021
Page No : 3

	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	8	21	0	0	29	10	0	12	0	22	0	16	3	0	19	0	0	0	0	0	70
08:15 AM	10	18	0	0	28	11	0	10	0	21	0	10	6	0	16	0	0	0	0	0	65
08:30 AM	7	24	0	0	31	9	0	10	0	19	0	5	4	0	9	0	0	0	0	0	59
08:45 AM	12	29	0	0	41	5	0	12	0	17	0	9	3	0	12	0	0	0	0	0	70
Total Volume	37	92	0	0	129	35	0	44	0	79	0	40	16	0	56	0	0	0	0	0	264
% App. Total	28.7	71.3	0	0		44.3	0	55.7	0		0	71.4	28.6	0		0	0	0	0		
PHF	.771	.793	.000	.000	.787	.795	.000	.917	.000	.898	.000	.625	.667	.000	.737	.000	.000	.000	.000	.000	.943
CARS	37	92	0	0	129	34	0	44	0	78	0	38	16	0	54	0	0	0	0	0	261
% CARS	100	100	0	0	100	97.1	0	100	0	98.7	0	95.0	100	0	96.4	0	0	0	0	0	98.9
TRUCKS	0	0	0	0	0	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	3
% TRUCKS	0	0	0	0	0	2.9	0	0	0	1.3	0	5.0	0	0	3.6	0	0	0	0	0	1.1
BUSES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% BUSES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Darling Dr. at Security Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021

Groups Printed- CARS

	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	1	15	0	0	16	6	0	1	0	7	0	6	1	0	7	0	0	0	0	0	30
07:15 AM	2	11	0	0	13	3	0	2	0	5	0	4	1	0	5	0	0	0	0	0	23
07:30 AM	6	14	0	0	20	4	0	5	0	9	0	13	2	0	15	0	0	0	0	0	44
07:45 AM	12	20	0	0	32	5	0	6	0	11	0	10	6	0	16	0	0	0	0	0	59
Total	21	60	0	0	81	18	0	14	0	32	0	33	10	0	43	0	0	0	0	0	156
08:00 AM	8	21	0	0	29	10	0	12	0	22	0	16	3	0	19	0	0	0	0	0	70
08:15 AM	10	18	0	0	28	11	0	10	0	21	0	9	6	0	15	0	0	0	0	0	64
08:30 AM	7	24	0	0	31	9	0	10	0	19	0	5	4	0	9	0	0	0	0	0	59
08:45 AM	12	29	0	0	41	4	0	12	0	16	0	8	3	0	11	0	0	0	0	0	68
Total	37	92	0	0	129	34	0	44	0	78	0	38	16	0	54	0	0	0	0	0	261
Grand Total	58	152	0	0	210	52	0	58	0	110	0	71	26	0	97	0	0	0	0	0	417
Apprch %	27.6	72.4	0	0		47.3	0	52.7	0		0	73.2	26.8	0		0	0	0	0		
Total %	13.9	36.5	0	0	50.4	12.5	0	13.9	0	26.4	0	17	6.2	0	23.3	0	0	0	0	0	

Darling Dr. at Security Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 5

Groups Printed- TRUCKS

	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	2
Total	0	0	0	0	0	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	3
Grand Total	0	0	0	0	0	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	3
Apprch %	0	0	0	0		100	0	0	0		0	100	0	0		0	0	0	0		
Total %	0	0	0	0	0	33.3	0	0	0	33.3	0	66.7	0	0	66.7	0	0	0	0	0	

Darling Dr. at Security Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 6

Groups Printed- BUSES

	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					

Rte. 202 and 44 W. Main St. at Darling Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 1

Groups Printed- CARS - TRUCKS - BUSES

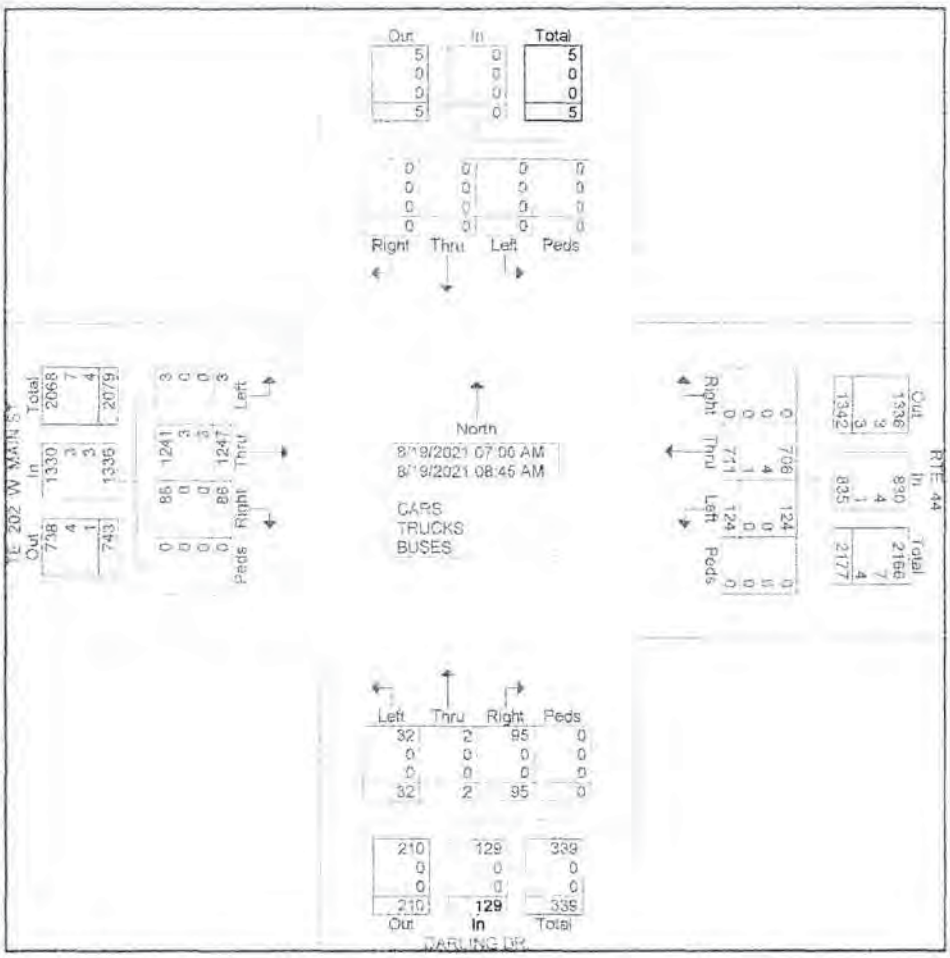
	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	13	67	0	0	80	3	2	5	0	10	0	115	3	0	118	208
07:15 AM	0	0	0	0	0	8	52	0	0	60	3	0	4	0	7	0	144	5	0	149	216
07:30 AM	0	0	0	0	0	7	61	0	0	68	0	0	17	0	17	0	172	14	0	186	271
07:45 AM	0	0	0	0	0	23	96	0	0	119	2	0	11	0	13	0	168	10	0	178	310
Total	0	0	0	0	0	51	276	0	0	327	8	2	37	0	47	0	599	32	0	631	1005
08:00 AM	0	0	0	0	0	14	85	0	0	99	9	0	17	0	26	0	170	10	0	180	305
08:15 AM	0	0	0	0	0	15	120	0	0	135	4	0	15	0	19	0	161	13	0	174	328
08:30 AM	0	0	0	0	0	17	94	0	0	111	4	0	12	0	16	0	155	16	0	171	298
08:45 AM	0	0	0	0	0	27	136	0	0	163	7	0	14	0	21	3	162	15	0	180	364
Total	0	0	0	0	0	73	435	0	0	508	24	0	58	0	82	3	648	54	0	705	1295
Grand Total	0	0	0	0	0	124	711	0	0	835	32	2	95	0	129	3	1247	86	0	1336	2300
Apprch %	0	0	0	0		14.9	85.1	0	0		24.8	1.6	73.6	0		0.2	93.3	6.4	0		
Total %	0	0	0	0	0	5.4	30.9	0	0	36.3	1.4	0.1	4.1	0	5.6	0.1	54.2	3.7	0	58.1	
CARS	0	0	0	0	0	124	706	0	0	830	32	2	95	0	129	3	1241	86	0	1330	2289
% CARS	0	0	0	0	0	100	99.3	0	0	99.4	100	100	100	0	100	100	99.5	100	0	99.6	99.5
TRUCKS	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	7
% TRUCKS	0	0	0	0	0	0	0.6	0	0	0.5	0	0	0	0	0	0	0.2	0	0	0.2	0.3
BUSES	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
% BUSES	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0.2	0	0	0.2	0.2

Rte. 202 and 44 W. Main St. at Darling Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 2



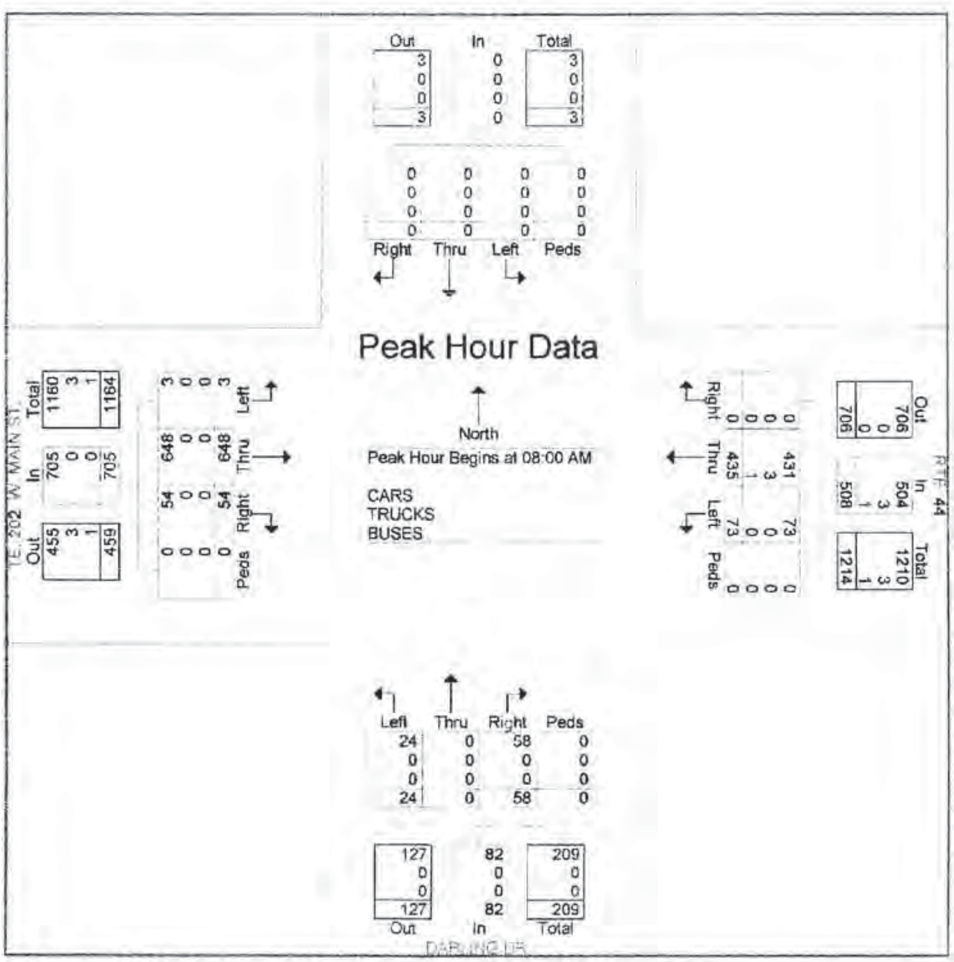
Rte. 202 and 44 W. Main St. at Darling Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 3

	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	14	85	0	0	99	9	0	17	0	26	0	170	10	0	180	305
08:15 AM	0	0	0	0	0	15	120	0	0	135	4	0	15	0	19	0	161	13	0	174	328
08:30 AM	0	0	0	0	0	17	94	0	0	111	4	0	12	0	16	0	155	16	0	171	298
08:45 AM	0	0	0	0	0	27	136	0	0	163	7	0	14	0	21	3	162	15	0	180	364
Total Volume	0	0	0	0	0	73	435	0	0	508	24	0	58	0	82	3	648	54	0	705	1295
% App. Total	0	0	0	0		14.4	85.6	0	0		29.3	0	70.7	0		0.4	91.9	7.7	0		
PHF	.000	.000	.000	.000	.000	.676	.800	.000	.000	.779	.667	.000	.853	.000	.788	.250	.953	.844	.000	.979	.889
CARS	0	0	0	0	0	73	431	0	0	504	24	0	58	0	82	3	648	54	0	705	1291
% CARS	0	0	0	0	0	100	99.1	0	0	99.2	100	0	100	0	100	100	100	100	0	100	99.7
TRUCKS	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
% TRUCKS	0	0	0	0	0	0	0.7	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0.2
BUSES	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% BUSES	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.1



Rte. 202 and 44 W. Main St. at Darling Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 4

Groups Printed- CARS

	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	13	66	0	0	79	3	2	5	0	10	0	114	3	0	117	206
07:15 AM	0	0	0	0	0	8	52	0	0	60	3	0	4	0	7	0	143	5	0	148	215
07:30 AM	0	0	0	0	0	7	61	0	0	68	0	0	17	0	17	0	171	14	0	185	270
07:45 AM	0	0	0	0	0	23	96	0	0	119	2	0	11	0	13	0	165	10	0	175	307
Total	0	0	0	0	0	51	275	0	0	326	8	2	37	0	47	0	593	32	0	625	998
08:00 AM	0	0	0	0	0	14	85	0	0	99	9	0	17	0	26	0	170	10	0	180	305
08:15 AM	0	0	0	0	0	15	119	0	0	134	4	0	15	0	19	0	161	13	0	174	327
08:30 AM	0	0	0	0	0	17	93	0	0	110	4	0	12	0	16	0	155	16	0	171	297
08:45 AM	0	0	0	0	0	27	134	0	0	161	7	0	14	0	21	3	162	15	0	180	362
Total	0	0	0	0	0	73	431	0	0	504	24	0	58	0	82	3	648	54	0	705	1291
Grand Total	0	0	0	0	0	124	706	0	0	830	32	2	95	0	129	3	1241	86	0	1330	2289
Apprch %	0	0	0	0		14.9	85.1	0	0		24.8	1.6	73.6	0		0.2	93.3	6.5	0		
Total %	0	0	0	0	0	5.4	30.8	0	0	36.3	1.4	0.1	4.2	0	5.6	0.1	54.2	3.8	0	58.1	

Rte. 202 and 44 W. Main St. at Darling Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 5

Groups Printed- TRUCKS

	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
Total	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
Grand Total	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	7
Apprch %	0	0	0	0		0	100	0	0		0	0	0	0		0	100	0	0		
Total %	0	0	0	0	0	0	57.1	0	0	57.1	0	0	0	0	0	0	42.9	0	0	42.9	

Rte. 202 and 44 W. Main St. at Darling Dr.

A.M. TRAFFIC COUNTS (7:00 to 9:00 a.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
8:00 TO 9:00 A.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 6

Groups Printed- BUSES

	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Grand Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
Apprch %	0	0	0	0		0	100	0	0		0	0	0	0		0	100	0	0		
Total %	0	0	0	0	0	0	25	0	0	25	0	0	0	0	0	0	75	0	0	75	

P.M.TRAFFIC COUNTS 4:00 to 6:00 p.m.)
Locations 1 and 2
Thursday August 19th, 2021
Avon, CT

Reliable Traffic Counts, LLC
Vehicle/Data Collection Service
11 Branhaven Dr. East Haven, CT 06512 Tel. 203-530-2042 Fax: 203-469-0215 rtcvdc@aol.com

Darling Dr. at Security Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:30 TO 5:30 P.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 1

Groups Printed- CARS - TRUCKS - BUSES

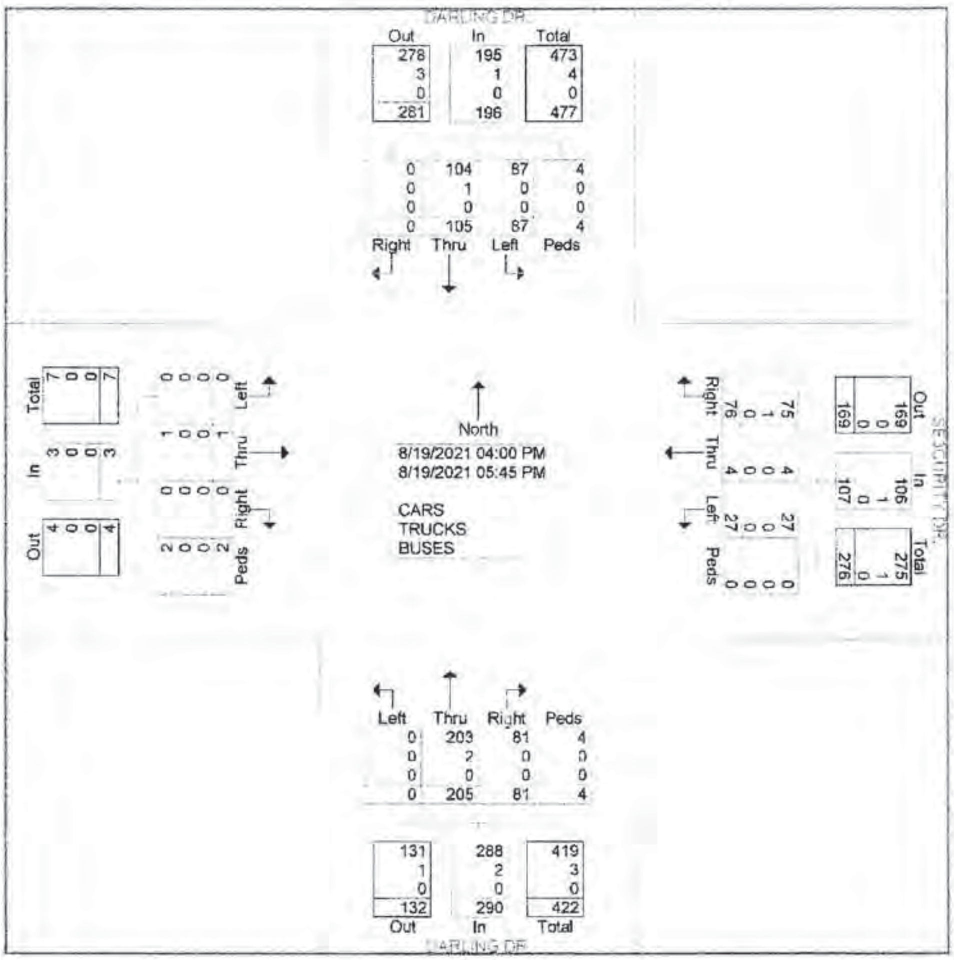
	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	6	6	0	0	12	3	0	7	0	10	0	17	6	1	24	0	0	0	0	0	46
04:15 PM	7	13	0	0	20	2	0	10	0	12	0	29	13	0	42	0	0	0	0	0	74
04:30 PM	12	15	0	0	27	5	2	11	0	18	0	32	8	1	41	0	0	0	0	0	86
04:45 PM	15	22	0	0	37	3	0	11	0	14	0	35	10	0	45	0	0	0	0	0	96
Total	40	56	0	0	96	13	2	39	0	54	0	113	37	2	152	0	0	0	0	0	302
05:00 PM	18	14	0	1	33	6	2	6	0	14	0	28	14	0	42	0	1	0	2	3	92
05:15 PM	17	10	0	1	28	4	0	8	0	12	0	24	15	1	40	0	0	0	0	0	80
05:30 PM	6	13	0	0	19	2	0	14	0	16	0	17	8	1	26	0	0	0	0	0	61
05:45 PM	6	12	0	2	20	2	0	9	0	11	0	23	7	0	30	0	0	0	0	0	61
Total	47	49	0	4	100	14	2	37	0	53	0	92	44	2	138	0	1	0	2	3	294
Grand Total	87	105	0	4	196	27	4	76	0	107	0	205	81	4	290	0	1	0	2	3	596
Apprch %	44.4	53.6	0	2		25.2	3.7	71	0		0	70.7	27.9	1.4		0	33.3	0	66.7		
Total %	14.6	17.6	0	0.7	32.9	4.5	0.7	12.8	0	18	0	34.4	13.6	0.7	48.7	0	0.2	0	0.3	0.5	
CARS	87	104	0	4	195	27	4	75	0	106	0	203	81	4	288	0	1	0	2	3	592
% CARS	100	99	0	100	99.5	100	100	98.7	0	99.1	0	99	100	100	99.3	0	100	0	100	100	99.3
TRUCKS	0	1	0	0	1	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	4
% TRUCKS	0	1	0	0	0.5	0	0	1.3	0	0.9	0	1	0	0	0.7	0	0	0	0	0	0.7
BUSES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% BUSES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Darling Dr. at Security Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:30 TO 5:30 P.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 2



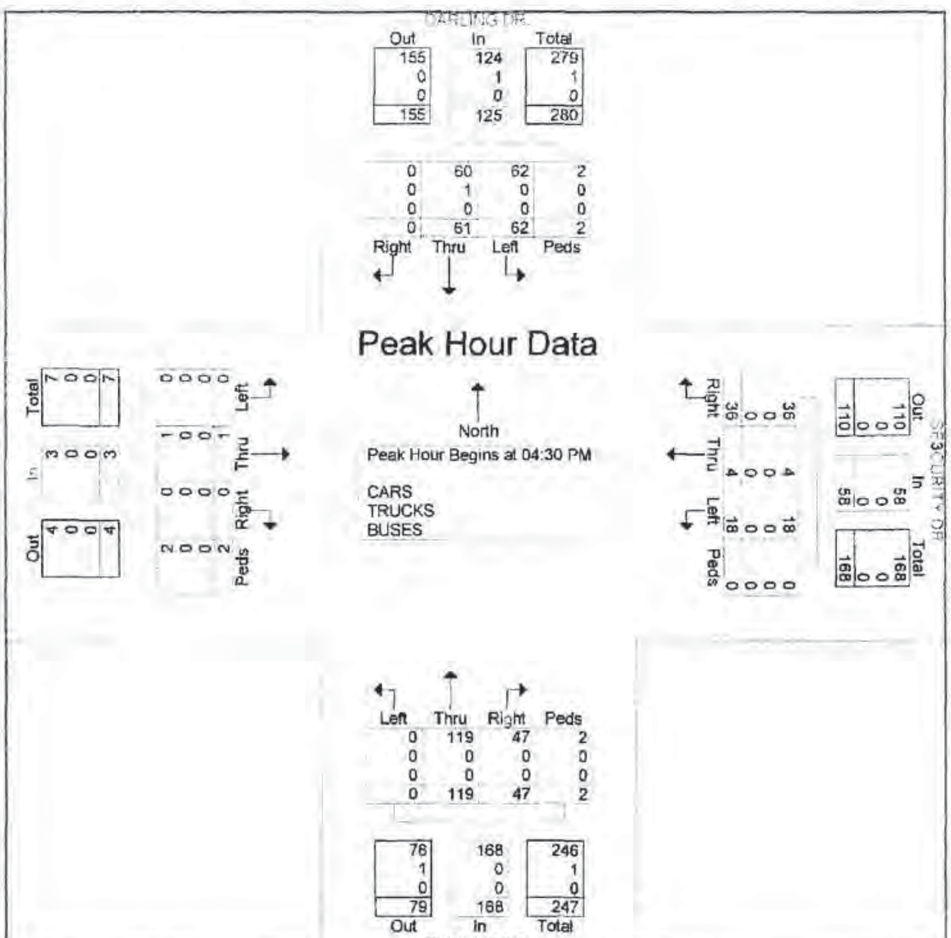
Darling Dr. at Security Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:30 TO 5:30 P.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 3

	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	12	15	0	0	27	5	2	11	0	18	0	32	8	1	41	0	0	0	0	0	86
04:45 PM	15	22	0	0	37	3	0	11	0	14	0	35	10	0	45	0	0	0	0	0	96
05:00 PM	18	14	0	1	33	6	2	6	0	14	0	28	14	0	42	0	1	0	2	3	92
05:15 PM	17	10	0	1	28	4	0	8	0	12	0	24	15	1	40	0	0	0	0	0	80
Total Volume	62	61	0	2	125	18	4	36	0	58	0	119	47	2	168	0	1	0	2	3	354
% App. Total	49.6	48.8	0	1.6		31	6.9	62.1	0		0	70.8	28	1.2		0	33.3	0	66.7		
PHF	.861	.693	.000	.500	.845	.750	.500	.818	.000	.806	.000	.850	.783	.500	.933	.000	.250	.000	.250	.250	.922
CARS	62	60	0	2	124	18	4	36	0	58	0	119	47	2	168	0	1	0	2	3	353
% CARS	100	98.4	0	100	99.2	100	100	100	0	100	0	100	100	100	100	0	100	0	100	100	99.7
TRUCKS	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% TRUCKS	0	1.6	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
BUSES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% BUSES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Darling Dr. at Security Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:30 TO 5:30 P.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 4

Groups Printed- CARS

	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	6	6	0	0	12	3	0	7	0	10	0	17	6	1	24	0	0	0	0	0	46
04:15 PM	7	13	0	0	20	2	0	9	0	11	0	29	13	0	42	0	0	0	0	0	73
04:30 PM	12	14	0	0	26	5	2	11	0	18	0	32	8	1	41	0	0	0	0	0	85
04:45 PM	15	22	0	0	37	3	0	11	0	14	0	35	10	0	45	0	0	0	0	0	96
Total	40	55	0	0	95	13	2	38	0	53	0	113	37	2	152	0	0	0	0	0	300
05:00 PM	18	14	0	1	33	6	2	6	0	14	0	28	14	0	42	0	1	0	2	3	92
05:15 PM	17	10	0	1	28	4	0	8	0	12	0	24	15	1	40	0	0	0	0	0	80
05:30 PM	6	13	0	0	19	2	0	14	0	16	0	15	8	1	24	0	0	0	0	0	59
05:45 PM	6	12	0	2	20	2	0	9	0	11	0	23	7	0	30	0	0	0	0	0	61
Total	47	49	0	4	100	14	2	37	0	53	0	90	44	2	136	0	1	0	2	3	292
Grand Total	87	104	0	4	195	27	4	75	0	106	0	203	81	4	288	0	1	0	2	3	592
Apprch %	44.6	53.3	0	2.1		25.5	3.8	70.8	0		0	70.5	28.1	1.4		0	33.3	0	66.7		
Total %	14.7	17.6	0	0.7	32.9	4.6	0.7	12.7	0	17.9	0	34.3	13.7	0.7	48.6	0	0.2	0	0.3	0.5	

Darling Dr. at Security Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:30 TO 5:30 P.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 5

Groups Printed- TRUCKS

	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
Grand Total	0	1	0	0	1	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	4
Apprch %	0	100	0	0		0	0	100	0		0	100	0	0		0	0	0	0		
Total %	0	25	0	0	25	0	0	25	0	25	0	50	0	0	50	0	0	0	0	0	

Darling Dr. at Security Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:30 TO 5:30 P.M.

File Name : 1319-1TH
Site Code : 00000001
Start Date : 8/19/2021
Page No : 6

Groups Printed- BUSES

	DARLING DR. SOUTHBOUND					SE3CURITY DR. WESTBOUND					DARLING DR. NORTHBOUND					EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					

Rte. 202 and 44 W. Main St. at Darling Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:15 TO 5:15 P.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 1

Groups Printed- CARS - TRUCKS - BUSES

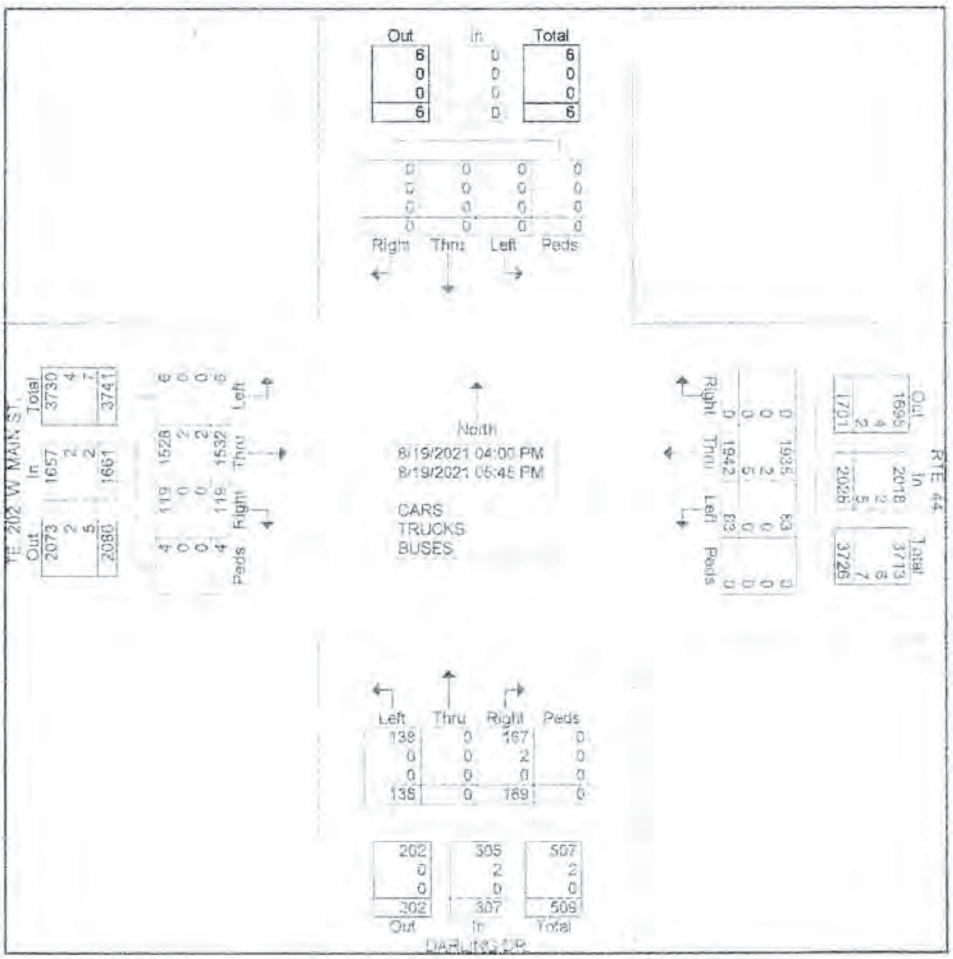
	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	9	254	0	0	263	14	0	16	0	30	0	195	12	0	207	500
04:15 PM	0	0	0	0	0	7	242	0	0	249	13	0	25	0	38	0	203	14	0	217	504
04:30 PM	0	0	0	0	0	9	283	0	0	292	19	0	28	0	47	5	197	15	0	217	556
04:45 PM	0	0	0	0	0	12	215	0	0	227	18	0	27	0	45	0	169	25	0	194	466
Total	0	0	0	0	0	37	994	0	0	1031	64	0	96	0	160	5	764	66	0	835	2026
05:00 PM	0	0	0	0	0	16	248	0	0	264	17	0	23	0	40	0	214	18	2	234	538
05:15 PM	0	0	0	0	0	13	243	0	0	256	18	0	15	0	33	0	184	13	0	197	486
05:30 PM	0	0	0	0	0	7	241	0	0	248	22	0	17	0	39	0	197	15	0	212	499
05:45 PM	0	0	0	0	0	10	216	0	0	226	17	0	18	0	35	1	173	7	2	183	444
Total	0	0	0	0	0	46	948	0	0	994	74	0	73	0	147	1	768	53	4	826	1967
Grand Total	0	0	0	0	0	83	1942	0	0	2025	138	0	169	0	307	6	1532	119	4	1661	3993
Apprch %	0	0	0	0		4.1	95.9	0	0		45	0	55	0		0.4	92.2	7.2	0.2		
Total %	0	0	0	0	0	2.1	48.6	0	0	50.7	3.5	0	4.2	0	7.7	0.2	38.4	3	0.1	41.6	
CARS	0	0	0	0	0	83	1935	0	0	2018	138	0	167	0	305	6	1528	119	4	1657	3980
% CARS	0	0	0	0	0	100	99.6	0	0	99.7	100	0	98.8	0	99.3	100	99.7	100	100	99.8	99.7
TRUCKS	0	0	0	0	0	0	2	0	0	2	0	0	2	0	2	0	2	0	0	2	6
% TRUCKS	0	0	0	0	0	0	0.1	0	0	0.1	0	0	1.2	0	0.7	0	0.1	0	0	0.1	0.2
BUSES	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	2	0	0	2	7
% BUSES	0	0	0	0	0	0	0.3	0	0	0.2	0	0	0	0	0	0	0.1	0	0	0.1	0.2

Rte. 202 and 44 W. Main St. at Darling Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:15 TO 5:15 P.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 2



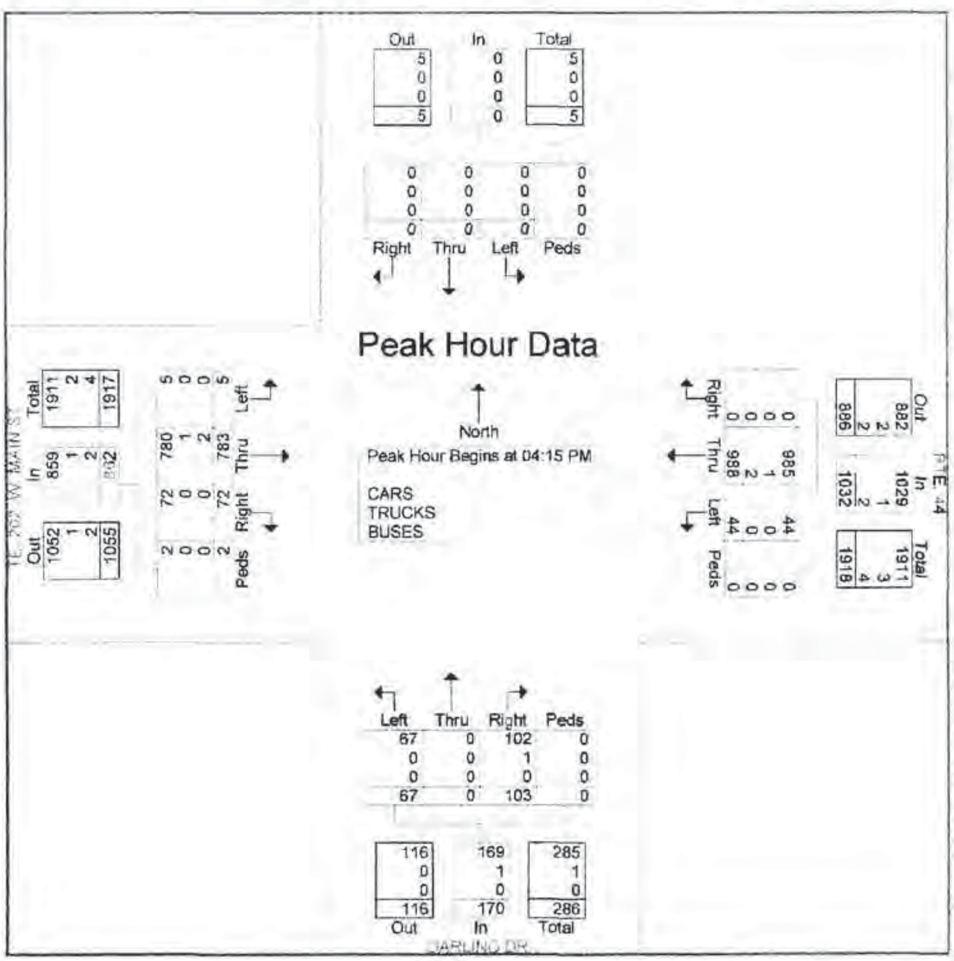
Rte. 202 and 44 W. Main St. at Darling Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:15 TO 5:15 P.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 3

	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	7	242	0	0	249	13	0	25	0	38	0	203	14	0	217	504
04:30 PM	0	0	0	0	0	9	**283**	0	0	**292**	**19**	0	**28**	0	**47**	**5**	197	15	0	217	**556**
04:45 PM	0	0	0	0	0	12	215	0	0	227	18	0	27	0	45	0	169	**25**	0	194	466
05:00 PM	0	0	0	0	0	**16**	248	0	0	264	17	0	23	0	40	0	**214**	18	**2**	**234**	538
Total Volume	0	0	0	0	0	44	988	0	0	1032	67	0	103	0	170	5	783	72	2	862	2064
% App. Total	0	0	0	0		4.3	95.7	0	0		39.4	0	60.6	0		0.6	90.8	8.4	0.2		
PHF	.000	.000	.000	.000	.000	.688	.873	.000	.000	.884	.882	.000	.920	.000	.904	.250	.915	.720	.250	.921	.928
CARS	0	0	0	0	0	44	985	0	0	1029	67	0	102	0	169	5	780	72	2	859	2057
% CARS	0	0	0	0	0	100	99.7	0	0	99.7	100	0	99.0	0	99.4	100	99.6	100	100	99.7	99.7
TRUCKS	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	3
% TRUCKS	0	0	0	0	0	0	0.1	0	0	0.1	0	0	1.0	0	0.6	0	0.1	0	0	0.1	0.1
BUSES	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
% BUSES	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	0	0.3	0	0	0.2	0.2



Rte. 202 and 44 W. Main St. at Darling Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:15 TO 5:15 P.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 4

Groups Printed- CARS

	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	9	254	0	0	263	14	0	16	0	30	0	194	12	0	206	499
04:15 PM	0	0	0	0	0	7	241	0	0	248	13	0	25	0	38	0	202	14	0	216	502
04:30 PM	0	0	0	0	0	9	282	0	0	291	19	0	27	0	46	5	196	15	0	216	553
04:45 PM	0	0	0	0	0	12	214	0	0	226	18	0	27	0	45	0	169	25	0	194	465
Total	0	0	0	0	0	37	991	0	0	1028	64	0	95	0	159	5	761	66	0	832	2019
05:00 PM	0	0	0	0	0	16	248	0	0	264	17	0	23	0	40	0	213	18	2	233	537
05:15 PM	0	0	0	0	0	13	241	0	0	254	18	0	15	0	33	0	184	13	0	197	484
05:30 PM	0	0	0	0	0	7	240	0	0	247	22	0	16	0	38	0	197	15	0	212	497
05:45 PM	0	0	0	0	0	10	215	0	0	225	17	0	18	0	35	1	173	7	2	183	443
Total	0	0	0	0	0	46	944	0	0	990	74	0	72	0	146	1	767	53	4	825	1961
Grand Total	0	0	0	0	0	83	1935	0	0	2018	138	0	167	0	305	5	1528	119	4	1657	3980
Apprch %	0	0	0	0		4.1	95.9	0	0		45.2	0	54.8	0		0.4	92.2	7.2	0.2		
Total %	0	0	0	0	0	2.1	48.6	0	0	50.7	3.5	0	4.2	0	7.7	0.2	38.4	3	0.1	41.6	

Rte. 202 and 44 W. Main St. at Darling Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:15 TO 5:15 P.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 5

Groups Printed- TRUCKS

	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
04:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	2	0	0	2	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	2
Grand Total	0	0	0	0	0	0	2	0	0	2	0	0	2	0	2	0	2	0	0	2	6
Apprch %	0	0	0	0		0	100	0	0		0	0	100	0		0	100	0	0		
Total %	0	0	0	0	0	0	33.3	0	0	33.3	0	0	33.3	0	33.3	0	33.3	0	0	33.3	

Rte. 202 and 44 W. Main St. at Darling Dr.

P.M.TRAFFIC COUNTS (4:00 to 6:00 p.m.)
Avon, CT
prepared by Reliable Traffic Counts, LLC
Weather Clear

TRAFFIC COUNTS
PEAK HOUR
4:15 TO 5:15 P.M.

File Name : 1319-2TH
Site Code : 00000002
Start Date : 8/19/2021
Page No : 6

Groups Printed- BUSES

	SOUTHBOUND					RTE. 44 WESTBOUND					DARLING DR. NORTHBOUND					TE. 202 W. MAIN ST. EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
04:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	3
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
05:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	4
Grand Total	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	2	0	0	2	7
Apprch %	0	0	0	0		0	100	0	0		0	0	0	0		0	100	0	0		
Total %	0	0	0	0	0	0	71.4	0	0	71.4	0	0	0	0	0	0	28.6	0	0	28.6	

Project:	20 Security Drive	**Date:**	8/11/2021
Location:	Avon, CT		
Project No. :	141.20237.00001		

COVID Adjustment: Vehicles

Weekday AM Peak Hour

Intersection	INTID	SBR	SBT	SBL	WBR	WBT	WBL	NBR	NBT	NBL	EBR	EBT	EBL
Route 202 @ Climax Rd	1	1	1	1	1	1	1	1	1	1	1	1	1
Route 202 @ Darling Dr	2	0.00	0.00	0.00	0.00	1.96	0.45	2.36	0.00	1.96	2.46	2.46	0.00
Route 202 @ Ensign Dr	3	1	1	1	1	1	1	1	1	1	1	1	1
Darling Dr @ Security Dr	4	0.00	1.29	1.29	2.19	0.00	1.29	2.19	2.19	0.00	0.00	0.00	0.00

Weekday PM Peak Hour

Intersection	INTID	SBR	SBT	SBL	WBR	WBT	WBL	NBR	NBT	NBL	EBR	EBT	EBL
Route 202 @ Climax Rd	1	1	1	1	1	1	1	1	1	1	1	1	1
Route 202 @ Darling Dr	2	0.00	0.00	0.00	0.00	1.89	2.30	2.04	0.00	1.89	1.46	1.46	0.00
Route 202 @ Ensign Dr	3	1	1	1	1	1	1	1	1	1	1	1	1
Darling Dr @ Security Dr	4	0.00	1.67	1.67	2.17	0.00	1.67	2.17	2.17	0.00	0.00	0.00	0.00

LEVEL OF SERVICE
FOR
SIGNALIZED INTERSECTIONS
(MOTORIZED VEHICLE MODE)

Level of service for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions: in the absence of traffic control, geometric delay, any incidents, and any other vehicles. Specifically, LOS criteria for traffic signals are stated in terms of the average control delay per vehicle, typically for a 15-min analysis period. Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group. The criteria are given below.

LEVEL-OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS
MOTORIZED VEHICLE MODE

LOS By Volume-to-Capacity Ratio[1]		CONTROL DELAY (s/veh)
v/c ≤ 1.0	v/c > 1.0	
A	F	≤ 10
B	F	> 10 AND ≤ 20
C	F	> 20 AND ≤ 35
D	F	> 35 AND ≤ 55
E	F	> 55 AND ≤ 80
F	F	> 80

[1] For approach-based and intersection-wide assessments, LOS is defined solely by control delay.

Specific descriptions of each LOS for signalized intersections are provided below:

<u>Level of Service A</u> describes operations with a control delay of 10 s/veh and 20 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If LOS A is the result of favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.

<u>Level of Service B</u> describes operations with control delay between 10 and 20 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.

<u>Level of Service C</u> describes operations with control delay between 20 and 35 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual *cycle failures* (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.

<u>Level of Service D</u> describes operations with control delay between 35 and 55 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

<u>Level of Service E</u> describes operations with control delay between 55 and 80 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

<u>Level of Service F</u> describes operations with control delay exceeding 80 s/veh or a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Reference: <u>Highway Capacity Manual 6,</u> Transportation Research Board, 2016.

LEVEL OF SERVICE
FOR TWO-WAY
STOP SIGN CONTROLLED INTERSECTIONS

The level of service for a TWSC (two-way stop controlled) intersection is determined by the computed or measured control delay and is defined for each minor movement. Level of service is not defined for the intersection as a whole. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS criteria are given in the Table. LOS criteria are given below:

LEVEL-OF SERVICE CRITERIA FOR AWSC INTERSECTIONS	
LOS[1]	**CONTROL DELAY (s/veh)**
A	**≤ 10**
B	**> 10 AND ≤ 15**
C	**> 15 AND ≤ 25**
D	**> 25 AND ≤ 35**
E	**> 35 AND ≤ 50**
F	**> 50**

Note: LOS criteria apply to each lane on a given approach and to each approach on the minor street.
LOS is not calculated for major-street approaches or for the intersection as a whole.
LOS F is assigned to a movement if the volume-to-capacity ratio exceeds 1.0, regardless of the control delay

Reference: Highway Capacity Manual Version 6.0, Transportation Research Board, 2016.

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	186	1642	762	174	186	91
Future Volume (vph)	186	1642	762	174	186	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125			100	215	300
Storage Lanes	1			1	1	1
Taper Length (ft)	75				75	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.316				0.950	
Satd. Flow (perm)	589	3539	3539	1583	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				189		99
Link Speed (mph)		35	35		30	
Link Distance (ft)		489	526		864	
Travel Time (s)		9.5	10.2		19.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	202	1785	828	189	202	99
Shared Lane Traffic (%)						
Lane Group Flow (vph)	202	1785	828	189	202	99
Number of Detectors	3	3	3	3	1	1
Detector Template						
Leading Detector (ft)	330	330	330	330	35	35
Trailing Detector (ft)	-5	-5	-5	-5	-5	-5
Detector 1 Position(ft)	-5	-5	-5	-5	-5	-5
Detector 1 Size(ft)	40	40	40	40	40	40
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	162	162	162	162		
Detector 2 Size(ft)	10	10	10	10		
Detector 2 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0	0.0	0.0	0.0		
Detector 3 Position(ft)	320	320	320	320		
Detector 3 Size(ft)	10	10	10	10		
Detector 3 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 3 Channel						
Detector 3 Extend (s)	0.0	0.0	0.0	0.0		
Turn Type	D.P+P	NA	NA	pm+ov	Prot	pm+ov
Protected Phases	1	1 2	2	4	4	1
Permitted Phases	2			2		4
Detector Phase	1	2	2	2	4	4
Switch Phase						
Minimum Initial (s)	5.0		15.0	7.0	7.0	5.0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	10.0		31.2	11.1	11.1	10.0
Total Split (s)	17.0		57.0	16.0	16.0	17.0
Total Split (%)	18.9%		63.3%	17.8%	17.8%	18.9%
Maximum Green (s)	12.0		51.1	11.9	11.9	12.0
Yellow Time (s)	3.0		4.1	3.0	3.0	3.0
All-Red Time (s)	2.0		1.8	1.1	1.1	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.9	4.1	4.1	5.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	1.5		3.0	2.0	2.0	1.5
Recall Mode	None		C-Min	None	None	None
Walk Time (s)			7.0			
Flash Dont Walk (s)			18.0			
Pedestrian Calls (#/hr)			5			
Act Effct Green (s)	66.3	71.3	58.6	74.1	9.6	20.5
Actuated g/C Ratio	0.74	0.79	0.65	0.82	0.11	0.23
v/c Ratio	0.39	0.64	0.36	0.14	0.55	0.23
Control Delay	4.8	5.4	11.4	0.9	43.8	6.9
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	4.8	5.6	11.4	0.9	43.8	6.9
LOS	A	A	B	A	D	A
Approach Delay		5.5	9.4		31.6	
Approach LOS		A	A		C	
Queue Length 50th (ft)	20	169	116	0	57	0
Queue Length 95th (ft)	40	253	212	24	89	36
Internal Link Dist (ft)		409	446		784	
Turn Bay Length (ft)	125			100	215	300
Base Capacity (vph)	620	2803	2303	1336	453	409
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	319	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.72	0.36	0.14	0.45	0.24

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 48 (53%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 9.1 — Intersection LOS: A
Intersection Capacity Utilization 58.8% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: W Main St (Rt 44/202) & Climax Rd/Bickford Dr

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↰↑	↰	↱
Traffic Volume (vph)	1644	183	65	879	57	147
Future Volume (vph)	1644	183	65	879	57	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		0	50
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt	0.985					0.850
Flt Protected				0.997	0.950	
Satd. Flow (prot)	3486	0	0	3529	1770	1583
Flt Permitted				0.633	0.950	
Satd. Flow (perm)	3486	0	0	2240	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	21					145
Link Speed (mph)	35			35	30	
Link Distance (ft)	526			903	811	
Travel Time (s)	10.2			17.6	18.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	1847	206	73	988	64	165
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2053	0	0	1061	64	165
Number of Detectors	1		1	1	1	1
Detector Template			Left			
Leading Detector (ft)	20		20	20	30	30
Trailing Detector (ft)	0		0	0	-10	-10
Detector 1 Position(ft)	0		0	0	-10	-10
Detector 1 Size(ft)	20		20	20	40	40
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases			2			4
Detector Phase	2		1	2	4	4
Switch Phase						
Minimum Initial (s)	15.0		7.0		10.0	10.0
Minimum Split (s)	21.7		11.0		19.0	19.0
Total Split (s)	56.0		11.0		23.0	23.0
Total Split (%)	62.2%		12.2%		25.6%	25.6%
Maximum Green (s)	49.3		7.0		19.0	19.0
Yellow Time (s)	4.1		3.0		3.0	3.0
All-Red Time (s)	2.6		1.0		1.0	1.0
Lost Time Adjust (s)	0.0				0.0	0.0
Total Lost Time (s)	6.7				4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Vehicle Extension (s)	3.0		3.0		1.5	1.5
Recall Mode	C-Max		None		None	None
Walk Time (s)					14.0	14.0
Flash Dont Walk (s)					1.0	1.0
Pedestrian Calls (#/hr)					5	5
Act Effct Green (s)	68.3			71.0	11.0	11.0
Actuated g/C Ratio	0.76			0.79	0.12	0.12
v/c Ratio	0.77			0.60	0.30	0.52
Control Delay	13.2			5.2	39.2	14.7
Queue Delay	1.6			0.0	0.0	0.0
Total Delay	14.8			5.2	39.2	14.7
LOS	B			A	D	B
Approach Delay	14.8			5.2	21.5	
Approach LOS	B			A	C	
Queue Length 50th (ft)	380			216	34	10
Queue Length 95th (ft)	600			95	68	63
Internal Link Dist (ft)	446			823	731	
Turn Bay Length (ft)						50
Base Capacity (vph)	2650			1767	373	448
Starvation Cap Reductn	394			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.91			0.60	0.17	0.37

Intersection Summary	
Area Type: Other	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 85 (94%), Referenced to phase 2:EBWB, Start of Yellow	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 12.2	Intersection LOS: B
Intersection Capacity Utilization 88.7%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 2: Darling Dr & W Main St (Rt 44/202)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	1687	25	63	869	136	5	0	6	61	3	70
Future Volume (vph)	79	1687	25	63	869	136	5	0	6	61	3	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	50		0	0		0	0		80
Storage Lanes	1		0	1		0	0		0	2		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.998			0.980			0.921			0.856	
Flt Protected	0.950			0.950				0.980		0.950		
Satd. Flow (prot)	1770	3532	0	1770	3468	0	0	1681	0	3433	1595	0
Flt Permitted	0.212			0.077				0.837		0.950		
Satd. Flow (perm)	395	3532	0	143	3468	0	0	1436	0	3433	1595	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			28			143			76	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		903			1213			511			388	
Travel Time (s)		17.6			23.6			11.6			8.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	1834	27	68	945	148	5	0	7	66	3	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	1861	0	68	1093	0	0	12	0	66	79	0
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template							Left					
Leading Detector (ft)	25	25		25	25		20	30		30	30	
Trailing Detector (ft)	20	20		20	20		0	-10		-10	-10	
Detector 1 Position(ft)	20	20		20	20		0	-10		-10	-10	
Detector 1 Size(ft)	5	5		5	5		20	40		40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Prot	NA	
Protected Phases	1	1 2			2			4		3	3 4	
Permitted Phases	2			2			4					
Detector Phase	1	2		2	2		4	4		3	4	
Switch Phase												
Minimum Initial (s)	5.0			15.0	15.0		7.0	7.0		5.0		
Minimum Split (s)	9.0			21.8	21.8		19.2	19.2		9.0		
Total Split (s)	9.0			52.0	52.0		20.0	20.0		9.0		
Total Split (%)	10.0%			57.8%	57.8%		22.2%	22.2%		10.0%		
Maximum Green (s)	5.0			45.2	45.2		14.8	14.8		5.0		
Yellow Time (s)	3.0			4.1	4.1		3.3	3.3		3.0		
All-Red Time (s)	1.0			2.7	2.7		1.9	1.9		1.0		
Lost Time Adjust (s)	0.0			0.0	0.0			0.0		0.0		
Total Lost Time (s)	4.0			6.8	6.8			5.2		4.0		
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0			3.0	3.0		2.0	2.0		3.0		
Recall Mode	None			C-Max	C-Max		None	None		None		
Walk Time (s)							13.0	13.0				
Flash Dont Walk (s)							1.0	1.0				
Pedestrian Calls (#/hr)							5	5				
Act Effct Green (s)	64.4	68.4		58.0	58.0			8.4		5.0	16.8	
Actuated g/C Ratio	0.72	0.76		0.64	0.64			0.09		0.06	0.19	
v/c Ratio	0.23	0.69		0.74	0.49			0.05		0.35	0.22	
Control Delay	7.9	12.6		68.8	12.2			0.4		46.2	8.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	7.9	12.6		68.8	12.2			0.4		46.2	8.9	
LOS	A	B		E	B			A		D	A	
Approach Delay		12.4			15.5			0.4			25.9	
Approach LOS		B			B			A			C	
Queue Length 50th (ft)	19	299		29	182			0		19	1	
Queue Length 95th (ft)	m31	528		#123	285			0		40	34	
Internal Link Dist (ft)		823			1133			431			308	
Turn Bay Length (ft)	100			50								
Base Capacity (vph)	374	2686		92	2246			355		190	467	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.23	0.69		0.74	0.49			0.03		0.35	0.17	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 50 (56%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 14.0 Intersection LOS: B
Intersection Capacity Utilization 79.1% ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Avon Office Park/Ensign Dr & W Main St (Rt 44/202)

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	47	112	91	36	127	122
Future Volume (vph)	47	112	91	36	127	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.905		0.962			
Flt Protected	0.985					0.975
Satd. Flow (prot)	1660	0	1792	0	0	1816
Flt Permitted	0.985					0.975
Satd. Flow (perm)	1660	0	1792	0	0	1816
Link Speed (mph)	30		30			30
Link Distance (ft)	207		335			811
Travel Time (s)	4.7		7.6			18.4
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	50	119	97	38	135	130
Shared Lane Traffic (%)						
Lane Group Flow (vph)	169	0	135	0	0	265
Sign Control	Stop		Free			Free

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 39.9%	ICU Level of Service A
Analysis Period (min) 15	

Intersection						
Int Delay, s/veh	5.2					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	47	112	91	36	127	122
Future Vol, veh/h	47	112	91	36	127	122
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	119	97	38	135	130

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	516	116	0	0	135	0
Stage 1	116	-	-	-	-	-
Stage 2	400	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	519	936	-	-	1449	-
Stage 1	909	-	-	-	-	-
Stage 2	677	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	467	936	-	-	1449	-
Mov Cap-2 Maneuver	467	-	-	-	-	-
Stage 1	909	-	-	-	-	-
Stage 2	609	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.5	0	3.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	722	1449	-
HCM Lane V/C Ratio	-	-	0.234	0.093	-
HCM Control Delay (s)	-	-	11.5	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0.3	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	246	1064	1861	249	231	348
Future Volume (vph)	246	1064	1861	249	231	348
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125			100	215	300
Storage Lanes	1			1	1	1
Taper Length (ft)	75				75	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.073				0.950	
Satd. Flow (perm)	136	3539	3539	1583	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				174		6
Link Speed (mph)		35	35		30	
Link Distance (ft)		489	526		864	
Travel Time (s)		9.5	10.2		19.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	267	1157	2023	271	251	378
Shared Lane Traffic (%)						
Lane Group Flow (vph)	267	1157	2023	271	251	378
Number of Detectors	3	3	3	3	1	1
Detector Template						
Leading Detector (ft)	330	330	330	330	35	35
Trailing Detector (ft)	-5	-5	-5	-5	-5	-5
Detector 1 Position(ft)	-5	-5	-5	-5	-5	-5
Detector 1 Size(ft)	40	40	40	40	40	40
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	162	162	162	162		
Detector 2 Size(ft)	10	10	10	10		
Detector 2 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0	0.0	0.0	0.0		
Detector 3 Position(ft)	320	320	320	320		
Detector 3 Size(ft)	10	10	10	10		
Detector 3 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 3 Channel						
Detector 3 Extend (s)	0.0	0.0	0.0	0.0		
Turn Type	D.P+P	NA	NA	pm+ov	Prot	pm+ov
Protected Phases	1	1 2	2	4	4	1
Permitted Phases	2			2		4
Detector Phase	1	2	2	4	4	4
Switch Phase						
Minimum Initial (s)	5.0		15.0	7.0	7.0	5.0

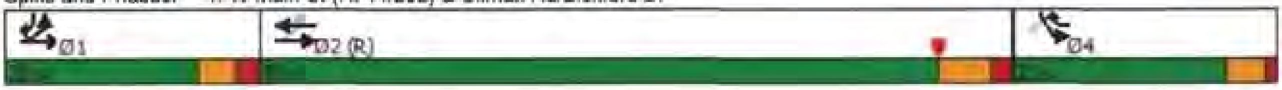
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	10.0		31.2	11.1	11.1	10.0
Total Split (s)	20.0		59.0	21.0	21.0	20.0
Total Split (%)	20.0%		59.0%	21.0%	21.0%	20.0%
Maximum Green (s)	15.0		53.1	16.9	16.9	15.0
Yellow Time (s)	3.0		4.1	3.0	3.0	3.0
All-Red Time (s)	2.0		1.8	1.1	1.1	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.9	4.1	4.1	5.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	1.5		3.0	2.0	2.0	1.5
Recall Mode	None		C-Min	None	None	None
Walk Time (s)			7.0			
Flash Dont Walk (s)			18.0			
Pedestrian Calls (#/hr)			5			
Act Effct Green (s)	69.0	74.0	54.9	77.7	16.9	34.2
Actuated g/C Ratio	0.69	0.74	0.55	0.78	0.17	0.34
v/c Ratio	0.86	0.44	1.04	0.21	0.43	0.69
Control Delay	51.9	5.6	38.4	1.3	39.9	35.2
Queue Delay	0.0	0.0	24.4	0.0	0.0	0.0
Total Delay	51.9	5.6	62.8	1.3	39.9	35.2
LOS	D	A	E	A	D	D
Approach Delay		14.3	55.5		37.1	
Approach LOS		B	E		D	
Queue Length 50th (ft)	113	125	~758	18	74	196
Queue Length 95th (ft)	#238	158	m438	m11	112	302
Internal Link Dist (ft)		409	446		784	
Turn Bay Length (ft)	125			100	215	300
Base Capacity (vph)	340	2618	1943	1268	580	545
Starvation Cap Reductn	0	0	274	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.44	1.21	0.21	0.43	0.69

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 97 (97%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 39.3 Intersection LOS: D
Intersection Capacity Utilization 84.2% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: W Main St (Rt 44/202) & Climax Rd/Bickford Dr



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1178	118	110	1933	176	247
Future Volume (vph)	1178	118	110	1933	176	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		0	50
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt	0.986					0.850
Flt Protected				0.997	0.950	
Satd. Flow (prot)	3490	0	0	3529	1770	1583
Flt Permitted				0.686	0.950	
Satd. Flow (perm)	3490	0	0	2428	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	18					169
Link Speed (mph)	35			35	30	
Link Distance (ft)	526			903	811	
Travel Time (s)	10.2			17.6	18.4	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	1267	127	118	2078	189	266
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1394	0	0	2196	189	266
Number of Detectors	1		1	1	1	1
Detector Template			Left			
Leading Detector (ft)	20		20	20	30	30
Trailing Detector (ft)	0		0	0	-10	-10
Detector 1 Position(ft)	0		0	0	-10	-10
Detector 1 Size(ft)	20		20	20	40	40
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases			2			4
Detector Phase	2		1	2	4	4
Switch Phase						
Minimum Initial (s)	15.0		7.0		10.0	10.0
Minimum Split (s)	21.7		11.0		19.0	19.0
Total Split (s)	64.0		11.0		25.0	25.0
Total Split (%)	64.0%		11.0%		25.0%	25.0%
Maximum Green (s)	57.3		7.0		21.0	21.0
Yellow Time (s)	4.1		3.0		3.0	3.0
All-Red Time (s)	2.6		1.0		1.0	1.0
Lost Time Adjust (s)	0.0				0.0	0.0
Total Lost Time (s)	6.7				4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Vehicle Extension (s)	3.0		3.0		1.5	1.5
Recall Mode	C-Max		None		None	None
Walk Time (s)					14.0	14.0
Flash Dont Walk (s)					1.0	1.0
Pedestrian Calls (#/hr)					5	5
Act Effct Green (s)	74.4			77.1	14.9	14.9
Actuated g/C Ratio	0.74			0.77	0.15	0.15
v/c Ratio	0.54			1.17	0.72	0.70
Control Delay	5.2			93.7	55.2	25.0
Queue Delay	0.1			0.7	0.0	0.0
Total Delay	5.2			94.4	55.2	25.0
LOS	A			F	E	C
Approach Delay	5.2			94.4	37.6	
Approach LOS	A			F	D	
Queue Length 50th (ft)	91			~916	117	57
Queue Length 95th (ft)	104			m#751	179	136
Internal Link Dist (ft)	446			823	731	
Turn Bay Length (ft)						50
Base Capacity (vph)	2599			1870	371	465
Starvation Cap Reductn	154			0	0	0
Spillback Cap Reductn	0			396	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.57			1.49	0.51	0.57

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 86 (86%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.17
Intersection Signal Delay: 57.3 Intersection LOS: E
Intersection Capacity Utilization 114.9% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Darling Dr & W Main St (Rt 44/202)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑		↰	↑↱			✣		↰↰	↱	
Traffic Volume (vph)	160	1258	7	12	1807	261	45	7	64	290	3	191
Future Volume (vph)	160	1258	7	12	1807	261	45	7	64	290	3	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	50		0	0		0	0		80
Storage Lanes	1		0	1		0	0		0	2		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.999			0.981			0.926			0.852	
Flt Protected	0.950			0.950				0.981		0.950		
Satd. Flow (prot)	1770	3536	0	1770	3472	0	0	1692	0	3433	1587	0
Flt Permitted	0.074			0.162				0.783		0.950		
Satd. Flow (perm)	138	3536	0	302	3472	0	0	1351	0	3433	1587	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			25			50			99	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		903			1213			511			388	
Travel Time (s)		17.6			23.6			11.6			8.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	1367	8	13	1964	284	49	8	70	315	3	208
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	1375	0	13	2248	0	0	127	0	315	211	0
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template							Left					
Leading Detector (ft)	25	25		25	25		20	30		30	30	
Trailing Detector (ft)	20	20		20	20		0	-10		-10	-10	
Detector 1 Position(ft)	20	20		20	20		0	-10		-10	-10	
Detector 1 Size(ft)	5	5		5	5		20	40		40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Prot	NA	
Protected Phases	1	1 2			2			4		3	3 4	
Permitted Phases	2			2			4					
Detector Phase	1	2		2	2		4	4		3	4	
Switch Phase												
Minimum Initial (s)	5.0			15.0	15.0		7.0	7.0		5.0		
Minimum Split (s)	9.0			21.8	21.8		19.2	19.2		9.5		
Total Split (s)	9.0			61.0	61.0		16.0	16.0		14.0		
Total Split (%)	9.0%			61.0%	61.0%		16.0%	16.0%		14.0%		
Maximum Green (s)	5.0			54.2	54.2		10.8	10.8		10.0		
Yellow Time (s)	3.0			4.1	4.1		3.3	3.3		3.0		
All-Red Time (s)	1.0			2.7	2.7		1.9	1.9		1.0		
Lost Time Adjust (s)	0.0			0.0	0.0			0.0		0.0		
Total Lost Time (s)	4.0			6.8	6.8			5.2		4.0		
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0			3.0	3.0		2.0	2.0		3.0		
Recall Mode	None			C-Max	C-Max		None	None		None		
Walk Time (s)							13.0	13.0				
Flash Dont Walk (s)							1.0	1.0				
Pedestrian Calls (#/hr)							5	5				
Act Effct Green (s)	63.3	67.3		54.2	54.2			9.5		10.0	24.7	
Actuated g/C Ratio	0.63	0.67		0.54	0.54			0.10		0.10	0.25	
v/c Ratio	0.92	0.58		0.08	1.19			0.73		0.92	0.45	
Control Delay	69.7	12.6		12.6	114.0			51.4		77.4	19.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	69.7	12.6		12.6	114.0			51.4		77.4	19.6	
LOS	E	B		B	F			D		E	B	
Approach Delay		19.0			113.4			51.4			54.2	
Approach LOS		B			F			D			D	
Queue Length 50th (ft)	~76	246		4	~914			47		104	57	
Queue Length 95th (ft)	#204	287		14	#1055			#128		#185	125	
Internal Link Dist (ft)		823			1133			431			308	
Turn Bay Length (ft)	100			50								
Base Capacity (vph)	189	2378		163	1893			190		343	485	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.92	0.58		0.08	1.19			0.67		0.92	0.44	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 53 (53%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.19
Intersection Signal Delay: 71.9 Intersection LOS: E
Intersection Capacity Utilization 102.6% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Avon Office Park/Ensign Dr & W Main St (Rt 44/202)

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	31	155	268	105	121	105
Future Volume (vph)	31	155	268	105	121	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.887		0.962			
Flt Protected	0.992					0.974
Satd. Flow (prot)	1639	0	1792	0	0	1814
Flt Permitted	0.992					0.974
Satd. Flow (perm)	1639	0	1792	0	0	1814
Link Speed (mph)	30		30			30
Link Distance (ft)	207		335			811
Travel Time (s)	4.7		7.6			18.4
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	34	170	295	115	133	115
Shared Lane Traffic (%)						
Lane Group Flow (vph)	204	0	410	0	0	248
Sign Control	Stop		Free			Free

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 54.0%	ICU Level of Service A
Analysis Period (min) 15	

Intersection						
Int Delay, s/veh	4.7					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	31	155	268	105	121	105
Future Vol, veh/h	31	155	268	105	121	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	170	295	115	133	115

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	734	353	0	0	410	0
Stage 1	353	-	-	-	-	-
Stage 2	381	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	387	691	-	-	1149	-
Stage 1	711	-	-	-	-	-
Stage 2	691	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	339	691	-	-	1149	-
Mov Cap-2 Maneuver	339	-	-	-	-	-
Stage 1	711	-	-	-	-	-
Stage 2	605	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.3	0	4.6
HCM LOS	B		

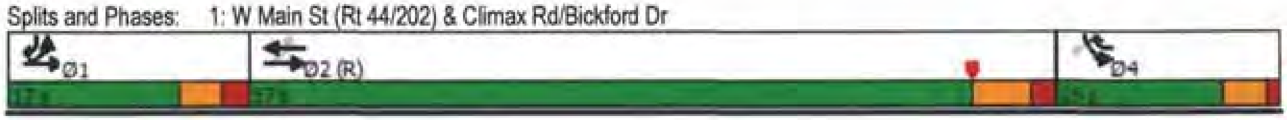
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	589	1149	-
HCM Lane V/C Ratio	-	-	0.347	0.116	-
HCM Control Delay (s)	-	-	14.3	8.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0.4	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	186	1615	769	173	172	91
Future Volume (vph)	186	1615	769	173	172	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125			100	215	300
Storage Lanes	1			1	1	1
Taper Length (ft)	75				75	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.313				0.950	
Satd. Flow (perm)	583	3539	3539	1583	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				188		99
Link Speed (mph)		35	35		30	
Link Distance (ft)		489	526		864	
Travel Time (s)		9.5	10.2		19.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	202	1755	836	188	187	99
Shared Lane Traffic (%)						
Lane Group Flow (vph)	202	1755	836	188	187	99
Number of Detectors	3	3	3	3	1	1
Detector Template						
Leading Detector (ft)	330	330	330	330	35	35
Trailing Detector (ft)	-5	-5	-5	-5	-5	-5
Detector 1 Position(ft)	-5	-5	-5	-5	-5	-5
Detector 1 Size(ft)	40	40	40	40	40	40
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	162	162	162	162		
Detector 2 Size(ft)	10	10	10	10		
Detector 2 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0	0.0	0.0	0.0		
Detector 3 Position(ft)	320	320	320	320		
Detector 3 Size(ft)	10	10	10	10		
Detector 3 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 3 Channel						
Detector 3 Extend (s)	0.0	0.0	0.0	0.0		
Turn Type	D.P+P	NA	NA	pm+ov	Prot	pm+ov
Protected Phases	1	1 2	2	4	4	1
Permitted Phases	2			2		4
Detector Phase	1	2	2	2	4	4
Switch Phase						
Minimum Initial (s)	5.0		15.0	7.0	7.0	5.0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	10.0		30.9	11.1	11.1	10.0
Total Split (s)	17.0		57.0	16.0	16.0	17.0
Total Split (%)	18.9%		63.3%	17.8%	17.8%	18.9%
Maximum Green (s)	12.0		51.1	11.9	11.9	12.0
Yellow Time (s)	3.0		4.1	3.0	3.0	3.0
All-Red Time (s)	2.0		1.8	1.1	1.1	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.9	4.1	4.1	5.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	1.5		3.0	2.0	2.0	1.5
Recall Mode	None		C-Min	None	None	None
Walk Time (s)			7.0			
Flash Dont Walk (s)			18.0			
Pedestrian Calls (#/hr)			5			
Act Effct Green (s)	66.5	71.5	58.8	74.1	9.4	20.3
Actuated g/C Ratio	0.74	0.79	0.65	0.82	0.10	0.23
v/c Ratio	0.39	0.62	0.36	0.14	0.52	0.23
Control Delay	4.8	5.2	9.7	0.6	43.3	7.0
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	4.8	5.3	9.7	0.6	43.3	7.0
LOS	A	A	A	A	D	A
Approach Delay		5.3	8.1		30.7	
Approach LOS		A	A		C	
Queue Length 50th (ft)	20	158	91	0	53	0
Queue Length 95th (ft)	40	244	195	13	83	36
Internal Link Dist (ft)		409	446		784	
Turn Bay Length (ft)	125			100	215	300
Base Capacity (vph)	617	2812	2312	1336	453	408
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	271	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.69	0.36	0.14	0.41	0.24

Intersection Summary	
Area Type: Other	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 48 (53%), Referenced to phase 2:EBWB, Start of Yellow	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 8.4	Intersection LOS: A
Intersection Capacity Utilization 58.1%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: W Main St (Rt 44/202) & Climax Rd/Bickford Dr



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1644	142	44	879	63	173
Future Volume (vph)	1644	142	44	879	63	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		0	50
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt	0.988					0.850
Flt Protected				0.998	0.950	
Satd. Flow (prot)	3497	0	0	3532	1770	1583
Flt Permitted				0.733	0.950	
Satd. Flow (perm)	3497	0	0	2594	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	16					145
Link Speed (mph)	35			35	30	
Link Distance (ft)	526			903	811	
Travel Time (s)	10.2			17.6	18.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	1847	160	49	988	71	194
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2007	0	0	1037	71	194
Number of Detectors	1		1	1	1	1
Detector Template			Left			
Leading Detector (ft)	20		20	20	30	30
Trailing Detector (ft)	0		0	0	-10	-10
Detector 1 Position(ft)	0		0	0	-10	-10
Detector 1 Size(ft)	20		20	20	40	40
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases			2			4
Detector Phase	2		1	2	4	4
Switch Phase						
Minimum Initial (s)	15.0		7.0		10.0	10.0
Minimum Split (s)	21.7		11.0		19.0	19.0
Total Split (s)	56.0		11.0		23.0	23.0
Total Split (%)	62.2%		12.2%		25.6%	25.6%
Maximum Green (s)	49.3		7.0		19.0	19.0
Yellow Time (s)	4.1		3.0		3.0	3.0
All-Red Time (s)	2.6		1.0		1.0	1.0
Lost Time Adjust (s)	0.0				0.0	0.0
Total Lost Time (s)	6.7				4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Vehicle Extension (s)	3.0		3.0		1.5	1.5
Recall Mode	C-Max		None		None	None
Walk Time (s)					14.0	14.0
Flash Dont Walk (s)					1.0	1.0
Pedestrian Calls (#/hr)					5	5
Act Effct Green (s)	68.3			71.0	11.0	11.0
Actuated g/C Ratio	0.76			0.79	0.12	0.12
v/c Ratio	0.76			0.51	0.33	0.61
Control Delay	12.6			2.9	39.9	19.8
Queue Delay	1.3			0.0	0.0	0.0
Total Delay	13.9			2.9	39.9	19.8
LOS	B			A	D	B
Approach Delay	13.9			2.9	25.2	
Approach LOS	B			A	C	
Queue Length 50th (ft)	352			6	38	26
Queue Length 95th (ft)	590			28	74	86
Internal Link Dist (ft)	446			823	731	
Turn Bay Length (ft)						50
Base Capacity (vph)	2657			2046	373	448
Starvation Cap Reductn	405			0	0	0
Spillback Cap Reductn	0			0	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.89			0.51	0.19	0.43

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 85 (94%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 11.3 Intersection LOS: B
Intersection Capacity Utilization 71.9% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Darling Dr & W Main St (Rt 44/202)

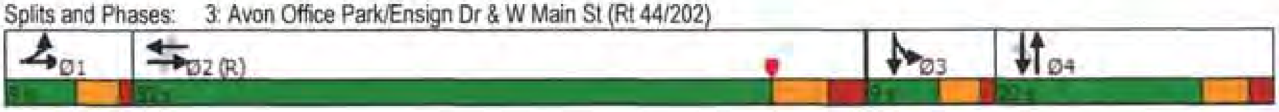
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	1713	25	63	848	136	5	0	6	61	3	70
Future Volume (vph)	79	1713	25	63	848	136	5	0	6	61	3	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	50		0	0		0	0		80
Storage Lanes	1		0	1		0	0		0	2		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.998			0.979			0.921			0.856	
Flt Protected	0.950			0.950				0.980		0.950		
Satd. Flow (prot)	1770	3532	0	1770	3465	0	0	1681	0	3433	1595	0
Flt Permitted	0.220			0.074				0.837		0.950		
Satd. Flow (perm)	410	3532	0	138	3465	0	0	1436	0	3433	1595	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			29			143			76	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		903			1213			511			388	
Travel Time (s)		17.6			23.6			11.6			8.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	1862	27	68	922	148	5	0	7	66	3	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	1889	0	68	1070	0	0	12	0	66	79	0
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template							Left					
Leading Detector (ft)	25	25		25	25		20	30		30	30	
Trailing Detector (ft)	20	20		20	20		0	-10		-10	-10	
Detector 1 Position(ft)	20	20		20	20		0	-10		-10	-10	
Detector 1 Size(ft)	5	5		5	5		20	40		40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Prot	NA	
Protected Phases	1	1 2			2			4		3	3 4	
Permitted Phases	2			2			4					
Detector Phase	1	2		2	2		4	4		3	4	
Switch Phase												
Minimum Initial (s)	5.0			15.0	15.0		7.0	7.0		5.0		
Minimum Split (s)	9.0			21.8	21.8		19.2	19.2		9.0		
Total Split (s)	9.0			52.0	52.0		20.0	20.0		9.0		
Total Split (%)	10.0%			57.8%	57.8%		22.2%	22.2%		10.0%		
Maximum Green (s)	5.0			45.2	45.2		14.8	14.8		5.0		
Yellow Time (s)	3.0			4.1	4.1		3.3	3.3		3.0		
All-Red Time (s)	1.0			2.7	2.7		1.9	1.9		1.0		
Lost Time Adjust (s)	0.0			0.0	0.0			0.0		0.0		
Total Lost Time (s)	4.0			6.8	6.8			5.2		4.0		
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0			3.0	3.0		2.0	2.0		3.0		
Recall Mode	None			C-Max	C-Max		None	None		None		
Walk Time (s)							13.0	13.0				
Flash Dont Walk (s)							1.0	1.0				
Pedestrian Calls (#/hr)							5	5				
Act Effct Green (s)	64.4	68.4		58.0	58.0			8.4		5.0	16.8	
Actuated g/C Ratio	0.72	0.76		0.64	0.64			0.09		0.06	0.19	
v/c Ratio	0.22	0.70		0.76	0.48			0.05		0.35	0.22	
Control Delay	7.8	12.4		74.6	12.0			0.4		46.2	8.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	7.8	12.4		74.6	12.0			0.4		46.2	8.9	
LOS	A	B		E	B			A		D	A	
Approach Delay		12.2			15.7			0.4			25.9	
Approach LOS		B			B			A			C	
Queue Length 50th (ft)	18	287		30	177			0		19	1	
Queue Length 95th (ft)	m33	534		#87	276			0		40	34	
Internal Link Dist (ft)		823			1133			431			308	
Turn Bay Length (ft)	100			50								
Base Capacity (vph)	383	2686		89	2244			355		190	467	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.22	0.70		0.76	0.48			0.03		0.35	0.17	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 50 (56%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 14.0 Intersection LOS: B
Intersection Capacity Utilization 79.2% ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Avon Office Park/Ensign Dr & W Main St (Rt 44/202)



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	47	144	91	36	65	122
Future Volume (vph)	47	144	91	36	65	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.898		0.962			
Flt Protected	0.988					0.983
Satd. Flow (prot)	1653	0	1792	0	0	1831
Flt Permitted	0.988					0.983
Satd. Flow (perm)	1653	0	1792	0	0	1831
Link Speed (mph)	30		30			30
Link Distance (ft)	420		335			811
Travel Time (s)	9.5		7.6			18.4
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	50	153	97	38	69	130
Shared Lane Traffic (%)						
Lane Group Flow (vph)	203	0	135	0	0	199
Sign Control	Stop		Free			Free

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 38.5%	ICU Level of Service A
Analysis Period (min) 15	

Intersection						
Int Delay, s/veh	5.1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	47	144	91	36	65	122
Future Vol, veh/h	47	144	91	36	65	122
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	153	97	38	69	130

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	384	116	0	0	135	0
Stage 1	116	-	-	-	-	-
Stage 2	268	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	619	936	-	-	1449	-
Stage 1	909	-	-	-	-	-
Stage 2	777	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	587	936	-	-	1449	-
Mov Cap-2 Maneuver	587	-	-	-	-	-
Stage 1	909	-	-	-	-	-
Stage 2	737	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	2.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	817	1449	-
HCM Lane V/C Ratio	-	-	0.249	0.048	-
HCM Control Delay (s)	-	-	10.9	7.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1	0.1	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	15	86	146	1	2	45
Future Volume (vph)	15	86	146	1	2	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.999		0.870	
Flt Protected		0.993			0.998	
Satd. Flow (prot)	0	1850	1861	0	1617	0
Flt Permitted		0.993			0.998	
Satd. Flow (perm)	0	1850	1861	0	1617	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		420	381		403	
Travel Time (s)		9.5	8.7		9.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	93	159	1	2	49
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	109	160	0	51	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 26.4% ICU Level of Service A

Analysis Period (min) 15

Intersection						
Int Delay, s/veh	1.9					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	86	146	1	2	45
Future Vol, veh/h	15	86	146	1	2	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	93	159	1	2	49

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	160	0	-	0	285	160
Stage 1	-	-	-	-	160	-
Stage 2	-	-	-	-	125	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1419	-	-	-	705	885
Stage 1	-	-	-	-	869	-
Stage 2	-	-	-	-	901	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1419	-	-	-	697	885
Mov Cap-2 Maneuver	-	-	-	-	697	-
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	901	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1419	-	-	-	875
HCM Lane V/C Ratio	0.011	-	-	-	0.058
HCM Control Delay (s)	7.6	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	246	1070	1839	235	230	348
Future Volume (vph)	246	1070	1839	235	230	348
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125			100	215	300
Storage Lanes	1			1	1	1
Taper Length (ft)	75				75	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.073				0.950	
Satd. Flow (perm)	136	3539	3539	1583	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				174		6
Link Speed (mph)		35	35		30	
Link Distance (ft)		489	526		864	
Travel Time (s)		9.5	10.2		19.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	267	1163	1999	255	250	378
Shared Lane Traffic (%)						
Lane Group Flow (vph)	267	1163	1999	255	250	378
Number of Detectors	3	3	3	3	1	1
Detector Template						
Leading Detector (ft)	330	330	330	330	35	35
Trailing Detector (ft)	-5	-5	-5	-5	-5	-5
Detector 1 Position(ft)	-5	-5	-5	-5	-5	-5
Detector 1 Size(ft)	40	40	40	40	40	40
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	162	162	162	162		
Detector 2 Size(ft)	10	10	10	10		
Detector 2 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0	0.0	0.0	0.0		
Detector 3 Position(ft)	320	320	320	320		
Detector 3 Size(ft)	10	10	10	10		
Detector 3 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 3 Channel						
Detector 3 Extend (s)	0.0	0.0	0.0	0.0		
Turn Type	D.P+P	NA	NA	pm+ov	Prot	pm+ov
Protected Phases	1	1 2	2	4	4	1
Permitted Phases	2			2		4
Detector Phase	1	2	2	2	4	4
Switch Phase						
Minimum Initial (s)	5.0		15.0	7.0	7.0	5.0

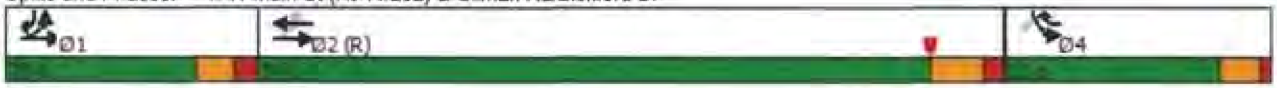
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	10.0		31.2	11.1	11.1	10.0
Total Split (s)	20.0		59.0	21.0	21.0	20.0
Total Split (%)	20.0%		59.0%	21.0%	21.0%	20.0%
Maximum Green (s)	15.0		53.1	16.9	16.9	15.0
Yellow Time (s)	3.0		4.1	3.0	3.0	3.0
All-Red Time (s)	2.0		1.8	1.1	1.1	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.9	4.1	4.1	5.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	1.5		3.0	2.0	2.0	1.5
Recall Mode	None		C-Min	None	None	None
Walk Time (s)			7.0			
Flash Dont Walk (s)			18.0			
Pedestrian Calls (#/hr)			5			
Act Effct Green (s)	69.1	74.1	55.0	77.7	16.8	34.1
Actuated g/C Ratio	0.69	0.74	0.55	0.78	0.17	0.34
v/c Ratio	0.86	0.44	1.03	0.20	0.43	0.70
Control Delay	51.9	5.6	33.0	1.4	40.0	35.3
Queue Delay	0.0	0.0	29.2	0.0	0.0	0.0
Total Delay	51.9	5.6	62.2	1.4	40.0	35.3
LOS	D	A	E	A	D	D
Approach Delay		14.3	55.3		37.2	
Approach LOS		B	E		D	
Queue Length 50th (ft)	113	126	~740	15	74	196
Queue Length 95th (ft)	#238	159	m371	m9	112	302
Internal Link Dist (ft)		409	446		784	
Turn Bay Length (ft)	125			100	215	300
Base Capacity (vph)	340	2621	1945	1268	580	529
Starvation Cap Reductn	0	0	301	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.44	1.22	0.20	0.43	0.71

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 97 (97%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 39.1 Intersection LOS: D
Intersection Capacity Utilization 83.5% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: W Main St (Rt 44/202) & Climax Rd/Bickford Dr



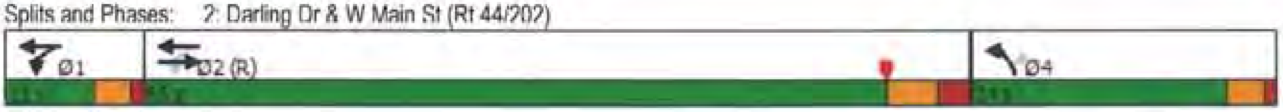
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1178	123	135	1933	140	237
Future Volume (vph)	1178	123	135	1933	140	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		0	50
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt	0.986					0.850
Flt Protected				0.997	0.950	
Satd. Flow (prot)	3490	0	0	3529	1770	1583
Flt Permitted				0.641	0.950	
Satd. Flow (perm)	3490	0	0	2269	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	19					170
Link Speed (mph)	35			35	30	
Link Distance (ft)	526			903	811	
Travel Time (s)	10.2			17.6	18.4	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	1267	132	145	2078	151	255
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1399	0	0	2223	151	255
Number of Detectors	1		1	1	1	1
Detector Template			Left			
Leading Detector (ft)	20		20	20	30	30
Trailing Detector (ft)	0		0	0	-10	-10
Detector 1 Position(ft)	0		0	0	-10	-10
Detector 1 Size(ft)	20		20	20	40	40
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases			2			4
Detector Phase	2		1	2	4	4
Switch Phase						
Minimum Initial (s)	15.0		7.0		10.0	10.0
Minimum Split (s)	21.7		11.0		19.0	19.0
Total Split (s)	65.0		11.0		24.0	24.0
Total Split (%)	65.0%		11.0%		24.0%	24.0%
Maximum Green (s)	58.3		7.0		20.0	20.0
Yellow Time (s)	4.1		3.0		3.0	3.0
All-Red Time (s)	2.6		1.0		1.0	1.0
Lost Time Adjust (s)	0.0				0.0	0.0
Total Lost Time (s)	6.7				4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Vehicle Extension (s)	3.0		3.0		1.5	1.5
Recall Mode	C-Max		None		None	None
Walk Time (s)					14.0	14.0
Flash Dont Walk (s)					1.0	1.0
Pedestrian Calls (#/hr)					5	5
Act Effct Green (s)	76.0			78.7	13.3	13.3
Actuated g/C Ratio	0.76			0.79	0.13	0.13
v/c Ratio	0.53			1.25	0.64	0.71
Control Delay	4.5			127.1	53.3	25.9
Queue Delay	0.0			0.7	0.0	0.0
Total Delay	4.6			127.9	53.3	25.9
LOS	A			F	D	C
Approach Delay	4.6			127.9	36.1	
Approach LOS	A			F	D	
Queue Length 50th (ft)	91			~964	93	51
Queue Length 95th (ft)	104			m#780	149	129
Internal Link Dist (ft)	446			823	731	
Turn Bay Length (ft)						50
Base Capacity (vph)	2656			1785	354	452
Starvation Cap Reductn	155			0	0	0
Spillback Cap Reductn	0			363	0	0
Storage Cap Reductn	0			0	0	0
Reduced v/c Ratio	0.56			1.56	0.43	0.56

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 86 (86%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.25
Intersection Signal Delay: 75.8 Intersection LOS: E
Intersection Capacity Utilization 114.4% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Darling Dr & W Main St (Rt 44/202)

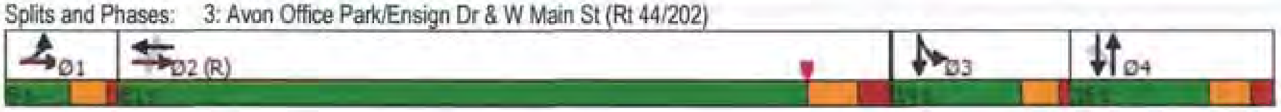


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	1248	7	12	1832	261	45	7	64	290	3	191
Future Volume (vph)	160	1248	7	12	1832	261	45	7	64	290	3	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	50		0	0		0	0		80
Storage Lanes	1		0	1		0	0		0	2		1
Taper Length (ft)	75			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.999			0.981			0.926			0.852	
Flt Protected	0.950			0.950				0.981		0.950		
Satd. Flow (prot)	1770	3536	0	1770	3472	0	0	1692	0	3433	1587	0
Flt Permitted	0.074			0.165				0.783		0.950		
Satd. Flow (perm)	138	3536	0	307	3472	0	0	1351	0	3433	1587	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			24			50			98	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		903			1213			511			388	
Travel Time (s)		17.6			23.6			11.6			8.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	1357	8	13	1991	284	49	8	70	315	3	208
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	1365	0	13	2275	0	0	127	0	315	211	0
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template							Left					
Leading Detector (ft)	25	25		25	25		20	30		30	30	
Trailing Detector (ft)	20	20		20	20		0	-10		-10	-10	
Detector 1 Position(ft)	20	20		20	20		0	-10		-10	-10	
Detector 1 Size(ft)	5	5		5	5		20	40		40	40	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Prot	NA	
Protected Phases	1	1 2			2			4		3	3 4	
Permitted Phases	2			2			4					
Detector Phase	1	2		2	2		4	4		3	4	
Switch Phase												
Minimum Initial (s)	5.0			15.0	15.0		7.0	7.0		5.0		
Minimum Split (s)	9.0			21.8	21.8		19.2	19.2		9.0		
Total Split (s)	9.0			61.0	61.0		16.0	16.0		14.0		
Total Split (%)	9.0%			61.0%	61.0%		16.0%	16.0%		14.0%		
Maximum Green (s)	5.0			54.2	54.2		10.8	10.8		10.0		
Yellow Time (s)	3.0			4.1	4.1		3.3	3.3		3.0		
All-Red Time (s)	1.0			2.7	2.7		1.9	1.9		1.0		
Lost Time Adjust (s)	0.0			0.0	0.0			0.0		0.0		
Total Lost Time (s)	4.0			6.8	6.8			5.2		4.0		
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0			3.0	3.0		2.0	2.0		3.0		
Recall Mode	None			C-Max	C-Max		None	None		None		
Walk Time (s)							13.0	13.0				
Flash Dont Walk (s)							1.0	1.0				
Pedestrian Calls (#/hr)							5	5				
Act Effct Green (s)	63.3	67.3		54.2	54.2			9.5		10.0	24.7	
Actuated g/C Ratio	0.63	0.67		0.54	0.54			0.10		0.10	0.25	
v/c Ratio	0.92	0.57		0.08	1.20			0.73		0.92	0.45	
Control Delay	69.5	12.6		12.6	120.5			51.4		77.4	19.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	69.5	12.6		12.6	120.5			51.4		77.4	19.8	
LOS	E	B		B	F			D		E	B	
Approach Delay		19.1			119.8			51.4			54.3	
Approach LOS		B			F			D			D	
Queue Length 50th (ft)	~74	247		4	~934			47		104	57	
Queue Length 95th (ft)	#204	285		14	#1074			#128		#185	125	
Internal Link Dist (ft)		823			1133			431			308	
Turn Bay Length (ft)	100			50								
Base Capacity (vph)	189	2378		166	1892			190		343	485	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.92	0.57		0.08	1.20			0.67		0.92	0.44	

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 53 (53%), Referenced to phase 2:EBWB, Start of Yellow	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.20	
Intersection Signal Delay: 75.6	Intersection LOS: E
Intersection Capacity Utilization 103.3%	ICU Level of Service G
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 3: Avon Office Park/Ensign Dr & W Main St (Rt 44/202)



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	31	110	268	105	152	105
Future Volume (vph)	31	110	268	105	152	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.895		0.962			
Flt Protected	0.989					0.971
Satd. Flow (prot)	1649	0	1792	0	0	1809
Flt Permitted	0.989					0.971
Satd. Flow (perm)	1649	0	1792	0	0	1809
Link Speed (mph)	30		30			30
Link Distance (ft)	420		335			811
Travel Time (s)	9.5		7.6			18.4
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	34	121	295	115	167	115
Shared Lane Traffic (%)						
Lane Group Flow (vph)	155	0	410	0	0	282
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 52.9% ICU Level of Service A

Analysis Period (min) 15

Intersection						
Int Delay, s/veh	4.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	31	110	268	105	152	105
Future Vol, veh/h	31	110	268	105	152	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	121	295	115	167	115

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	802	353	0	0	410	0
Stage 1	353	-	-	-	-	-
Stage 2	449	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	353	691	-	-	1149	-
Stage 1	711	-	-	-	-	-
Stage 2	643	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	298	691	-	-	1149	-
Mov Cap-2 Maneuver	298	-	-	-	-	-
Stage 1	711	-	-	-	-	-
Stage 2	543	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.4	0	5.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	536	1149	-
HCM Lane V/C Ratio	-	-	0.289	0.145	-
HCM Control Delay (s)	-	-	14.4	8.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.2	0.5	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	45	213	112	2	2	29
Future Volume (vph)	45	213	112	2	2	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.998		0.873	
Flt Protected		0.991			0.997	
Satd. Flow (prot)	0	1846	1859	0	1621	0
Flt Permitted		0.991			0.997	
Satd. Flow (perm)	0	1846	1859	0	1621	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		420	381		403	
Travel Time (s)		9.5	8.7		9.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	232	122	2	2	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	281	124	0	34	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 30.4%	ICU Level of Service A
Analysis Period (min) 15	

Intersection						
Int Delay, s/veh	1.5					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	45	213	112	2	2	29
Future Vol, veh/h	45	213	112	2	2	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	232	122	2	2	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	124	0	-	0	453	123
Stage 1	-	-	-	-	123	-
Stage 2	-	-	-	-	330	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1463	-	-	-	565	928
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	728	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1463	-	-	-	544	928
Mov Cap-2 Maneuver	-	-	-	-	544	-
Stage 1	-	-	-	-	868	-
Stage 2	-	-	-	-	728	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1463	-	-	-	888
HCM Lane V/C Ratio	0.033	-	-	-	0.038
HCM Control Delay (s)	7.5	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

TAB 17

THE HOMES AT AVON PARK PROPOSED RESIDENTIAL APARTMENTS

Stormwater Management Report

Prepared for:

Beacon Communities, LLC

2 Center Plaza, Suite 700

Boston, Massachusetts 02108

SLR #141.20237.00001.0030

September 17, 2021

SLR

Stormwater Management Report

Proposed Residential Apartments
20 Security Drive
Avon, Connecticut
September 17, 2021
SLR #141.20237.00001.0030

This Stormwater Management Report has been prepared in support of the proposed residential apartments to be constructed at 20 Security Drive in the town of Avon, Connecticut. The redevelopment proposes to convert the existing building into residential units, retain the existing parking garage, and construct a new building with multifamily residential units as well as all associated site infrastructure.

Figure 1 – #3900020 Parcel

Table 1 – Stormwater Data

Parcel Size Total	11.31 acres
Existing Impervious Area (Watershed Area)	3.97 acres
Proposed Impervious Area (Watershed Area)	5.21 acres
Soil Types (Hydrologic Soil Group)	"A" and "B"
Existing Land Use	Woods, open space, bituminous driveway, parking lot, sidewalk, and building
Proposed Land Use	Woods, open space, bituminous driveway, parking lot, sidewalk, and building
Design Storm for Stormwater Management (Town of Avon)	No increases in peak rates of runoff for the 2-, 10-, 25-, 50-, and 100-year storms, Connecticut Department of Energy & Environmental Protection (CTDEEP) Water Quality Flow (WQF)
Water Quality Measures	2-foot sump catch basins, hydrodynamic separators, isolator row within underground detention system
Design Storm for Storm Drainage (Town of Avon)	10-year storm
Federal Emergency Management Agency Special Flood Hazard Areas	Area of Minimal Flood Hazard (Zone X)
Connecticut Department of Energy & Environmental Protection Aquifer Protection Areas	Well 2 – Level A

STORMWATER MANAGEMENT APPROACH

The stormwater management system for this site has been designed utilizing Best Management Practices (BMPs) to provide water quality management while attenuating the proposed peak-flow rates from the redevelopment. The design goal is to provide water quality treatment in accordance with the CTDEEP requirements for WQF and prevent increases in the predevelopment runoff rates from the site. Existing drainage patterns will be maintained to the maximum extent practicable, and a new stormwater treatment train proposes catch basins with 2-foot sumps, an isolator row integrated within the underground chamber system, and hydrodynamic separators.

The existing storm drainage on the site collects runoff via yard drains and catch basins to three different discharge points. Runoff from half of the existing eastern parking lot, the northern parking lot, the internal drives, and sidewalks drains to an existing depression located south of the existing parking garage via a 24" reinforced concrete pipe (RCP). Runoff from the other half of the eastern parking lot drains to the eastern property boundary via an 18" RCP. Roof runoff from the existing building is collected and discharged via a system of yard drains that outlet downgradient on the northern portion of the property.

The proposed redevelopment will include an underground detention system that is designed to mitigate the increase in stormwater runoff from the site due to the new impervious surfaces. The underground storage area was created using a StormTech MC-3500 chamber system. The underground detention system will be fitted with an outlet control structure in the form of a standard manhole structure with an internal weir wall. The proposed storm drainage system will discharge to the existing drainage system located in the entrance drive to the site.

The computer program entitled *Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2019* by Autodesk, Inc., Version 2018.3, was used for designing the proposed storm drainage collection system. Storm drainage computations performed include pipe capacity and hydraulic grade line calculations. The contributing watershed to each individual catch basin inlet was delineated to determine the drainage area and land coverage. These values were used to determine the stormwater runoff to each inlet using the Rational Method. The rainfall intensities for the site were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 10, Precipitation Frequency Data Server (PFDS). The proposed storm drainage system is designed to provide adequate capacity to convey the 10-year storm event. The outlet pipe from the underground detention system was adequately sized to convey the 100-year discharge from the detention system.

WATER QUALITY MANAGEMENT

Stormwater runoff from the proposed redevelopment will be collected by a subsurface pipe and catch basin drainage system. The proposed drainage system will include catch basins with 2-foot sumps to trap sediment and debris. The underground chamber systems incorporate an isolator row that consists of a row of chambers where stormwater is further treated prior to entering the storage chamber system, thus enhancing sediment removal and protecting the storage chambers from sediment accumulation.

Hydrodynamic separators, such as *CDS®* devices manufactured by Contech Engineered Solutions, will be installed in the proposed storm drainage system prior to discharging stormwater runoff into the proposed underground detention system as well as the existing storm drainage system. These units will further remove suspended solids before discharging downgradient, which will in turn remove other pollutants that tend to attach to the suspended solids and effectively remove other debris and floatables that may be present in stormwater runoff. The hydrodynamic separators have been designed to meet criteria recommended by the CTDEEP *2004 Stormwater Quality Manual*. The devices were designed based on the determined WQF, which is the peak-flow rate associated with the Water Quality Volume (WQV), and sized based on the manufacturer's specifications.

HYDROLOGIC ANALYSIS

A hydrologic analysis was conducted to analyze the predevelopment and postdevelopment peak-flow rates from the site. Four analysis points consisting of four existing subwatersheds were chosen based on the fact that each area receives stormwater runoff from a portion of the site. Analysis Point A analyzes the portion of the site that drains to the 36" RCP located at the southern end of the entrance drive to the site. Analysis Point B represents the portion of the site that drains to the adjacent parcel south of the site. Analysis Point C represents the portion of the site that drains to the northeastern property boundary where runoff then makes its way to a stone swale and drainage system located at West Main Street (CT Route 44). Analysis Point D represents the portion of the site that drains to the northwest of the property and the drainage system located in Darling Drive. The total watershed area delineated is approximately 13.1 acres under both existing and proposed conditions.

The method of predicting the surface water runoff rates utilized in this analysis was a computer program entitled *Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2019* by Autodesk, Inc., Version 2020. The *Hydrographs* program is a computer model that utilizes the methodologies set forth in the *Technical Release No. 55* (TR-55) manual and *Technical Release No. 20* (TR-20) computer model, originally developed by the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). The *Hydrographs* computer modeling program is primarily used for conducting hydrology studies such as this one.

The *Hydrographs* computer program forecasts the rate of surface water runoff based upon several factors. The input data includes information on land use, hydrologic soil type, vegetation, contributing watershed area, time of concentration, rainfall data, storage volumes, and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains, and stormwater management basins. The input data for rainfalls with statistical recurrence frequencies of 2, 10, 25, 50, and 100 years was obtained from the NOAA Atlas 14, Volume 10 database. The corresponding rainfall totals are listed below.

Storm Frequency	Rainfall (inches)
2-year	3.38
10-year	5.44
25-year	6.73
50-year	7.67
100-year	8.71

Land use for the site under existing and proposed conditions was determined from field survey, town topographic maps, and aerial photogrammetry. Land use types used in the analysis included woods, grassed or open space, building, and impervious (paved) cover. Soil types in the watershed were determined from the CTDEEP Geographic Information System (GIS) database of the USDA-NRCS soil survey for Hartford County, Connecticut. For the analysis, the site was determined to contain hydrologic soil types "A" and "B" as classified by USDA-NRCS. Composite runoff Curve Number (CN) for each subwatershed was calculated based on the different land use and soil types. The time of concentration (Tc) was estimated for each subwatershed using the TR-55 methodology and was computed by summing all travel times through the watershed as sheet flow, shallow concentrated flow, and channel flow.

Onsite soil testing was performed to determine the feasibility of the stormwater infiltration in the area of the proposed underground detention basin. The soil testing consisted of two borings and visual field identifications. The boring locations did not indicate the presence of groundwater or another restrictive layer. Based on the subsurface conditions encountered and guidance from USDA-NRCS, an infiltration rate of 9.9 inches per hour was used in the design of the underground detention systems.

The existing conditions were modeled with the *Hydrographs* program to determine the peak-flow rates for the various storm events at each analysis point. A revised model was developed incorporating the proposed site conditions and the underground detention system. The flows obtained with the revised model were then compared to the results of the existing conditions model. Peak-flow rates from the site were controlled by the storage volume provided within the proposed underground chamber system and the hydraulic capacity of the outlet control structures. The underground chamber system has been designed such that the estimated water surface elevation within the chambers during a 100-year storm event does not exceed the top of the stone layer above the chambers.

The following peak rates of runoff were obtained from the *Hydrographs* hydrology results:

Analysis Point A – 36" RCP in Entrance Drive					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	4.3	10.2	14.2	17.2	20.6
Proposed Conditions	4.3	9.3	13.3	16.4	19.6

Underground Detention System 120*					
	Water Surface Elevation (feet)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Proposed Conditions	248.0	249.3	250.3	251.2	252.1

***Top Elevation of Stone Above Chambers = 252.15 feet**

Analysis Point B – Southern Property Boundary					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	0.0	0.0	0.0	0.2	0.4
Proposed Conditions	0.0	0.0	0.0	0.1	0.3

Analysis Point C – Drainage System in West Main Street					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	2.0	7.8	12.3	15.9	19.9
Proposed Conditions	0.8	4.5	7.5	10.1	13.0

Analysis Point D – Drainage System in Darling Drive					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	0.0	0.0	0.1	0.2	0.5
Proposed Conditions	0.0	0.0	0.0	0.2	0.4

CONCLUSION

The results of the hydrologic analysis demonstrate that there will be no increases in peak-flow rates from the proposed redevelopment. This was achieved for the storm events modeled through a planned stormwater management system with detention provided in the proposed underground chamber system. The proposed redevelopment will also introduce a new stormwater treatment train consisting of several water quality measures such as catch basins with 2-foot sumps, an isolator row within the underground chamber system, and hydrodynamic separators.

The hydrodynamic separators will pretreat stormwater runoff generated from the proposed impervious surfaces prior to it entering the receiving underground detention system and existing drainage system. *CDS*® units, manufactured by Contech Engineered Solutions, were selected and sized based on the contributing WQF, which is the peak-flow rate associated with the WQV.

All supporting documentation and stormwater-related computations are attached to this report along with the *Hydraflow Hydrographs* model results for stormwater management and *Hydraflow Storm Sewers* model results for the proposed storm drainage system. Illustrative watershed maps for both existing and proposed conditions are also attached to this report.

<u>Attachments</u>

Appendix A – United States Geological Survey Location Map
Appendix B – Federal Emergency Management Agency Flood Insurance Rate Map
Appendix C – Natural Resources Conservation Service Hydrologic Soil Group Map
Appendix D – Storm Drainage Computations
Appendix E – Water Quality Computations
Appendix F – Hydrologic Analysis – Input Computations
Appendix G – Hydrologic Analysis – Computer Model Results
Appendix H – Watershed Maps

20237.00001.0030.au3021.rpt.docx

APPENDIX A

UNITED STATES GEOLOGICAL SURVEY LOCATION MAP

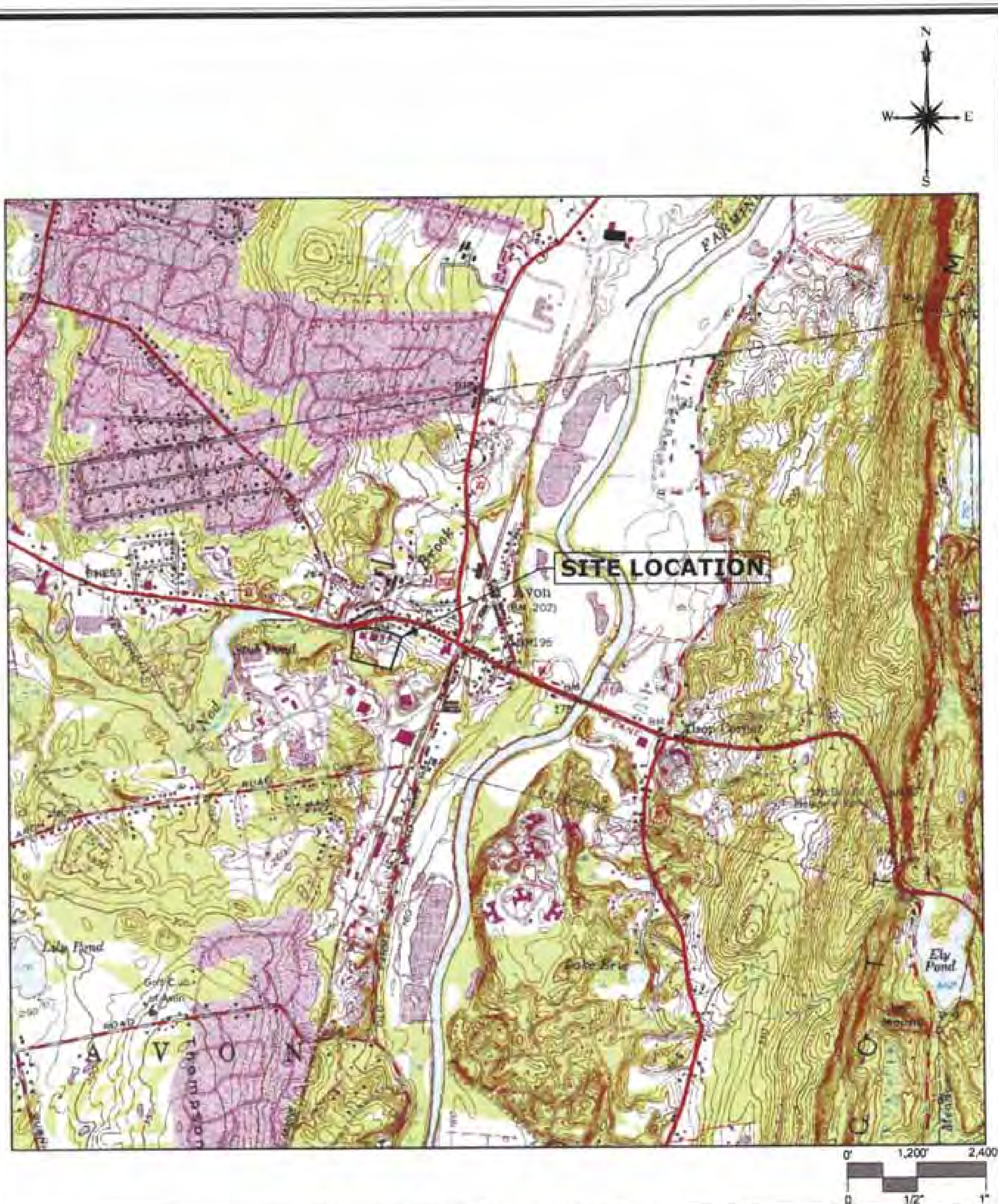
Drainage Report

Beacon Communities, LLC

2 Center Plaza, Suite 700

Boston, Massachusetts 02108

September 17, 2021



DATE	AUGUST 30, 2021
SCALE	1"=2,400'
PROJ. NO.	20237.00001

DESIGNED	DRAWN	CHECKED
---	MCB	---

DRAWING NAME: **LOC**

USGS QUADRANGLE MAP, QUAD NO. 36

PROPOSED RESIDENTIAL APARTMENTS

20 SECURITY DRIVE
AVON, CONNECTICUT

PROJECT PHASE:

REV: ---

SLR

APPENDIX B

FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAP

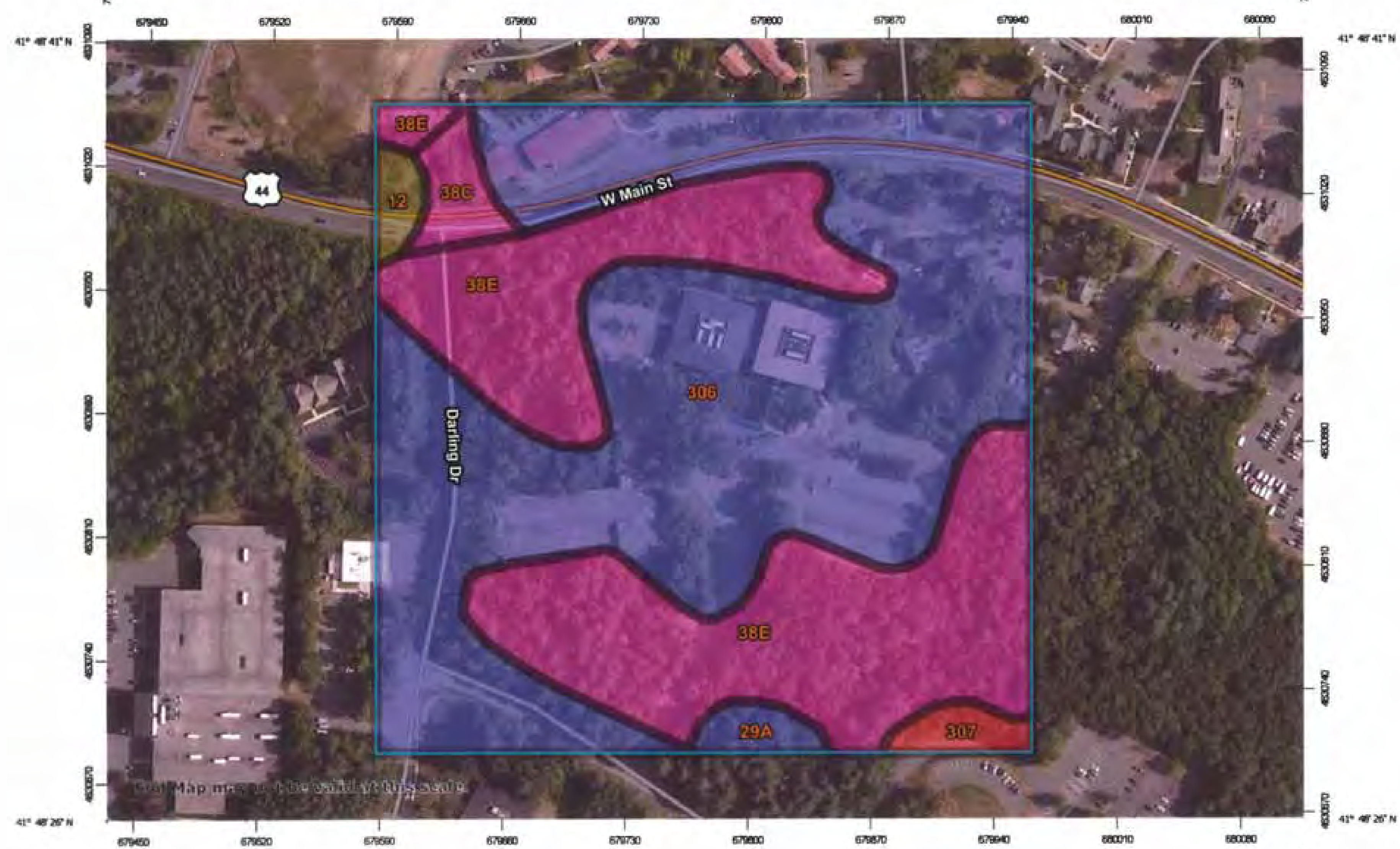
Drainage Report

Beacon Communities, LLC

2 Center Plaza, Suite 700

Boston, Massachusetts 02108

September 17, 2021



Map Scale: 1:3,110 if printed on A landscape (11" x 8.5") sheet.

0 45 90 180 270 Meters

0 150 300 600 900 Feet

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

APPENDIX C

NATURAL RESOURCES CONSERVATION SERVICE HYDROLOGIC SOIL GROUP MAP

Drainage Report

Beacon Communities, LLC

2 Center Plaza, Suite 700

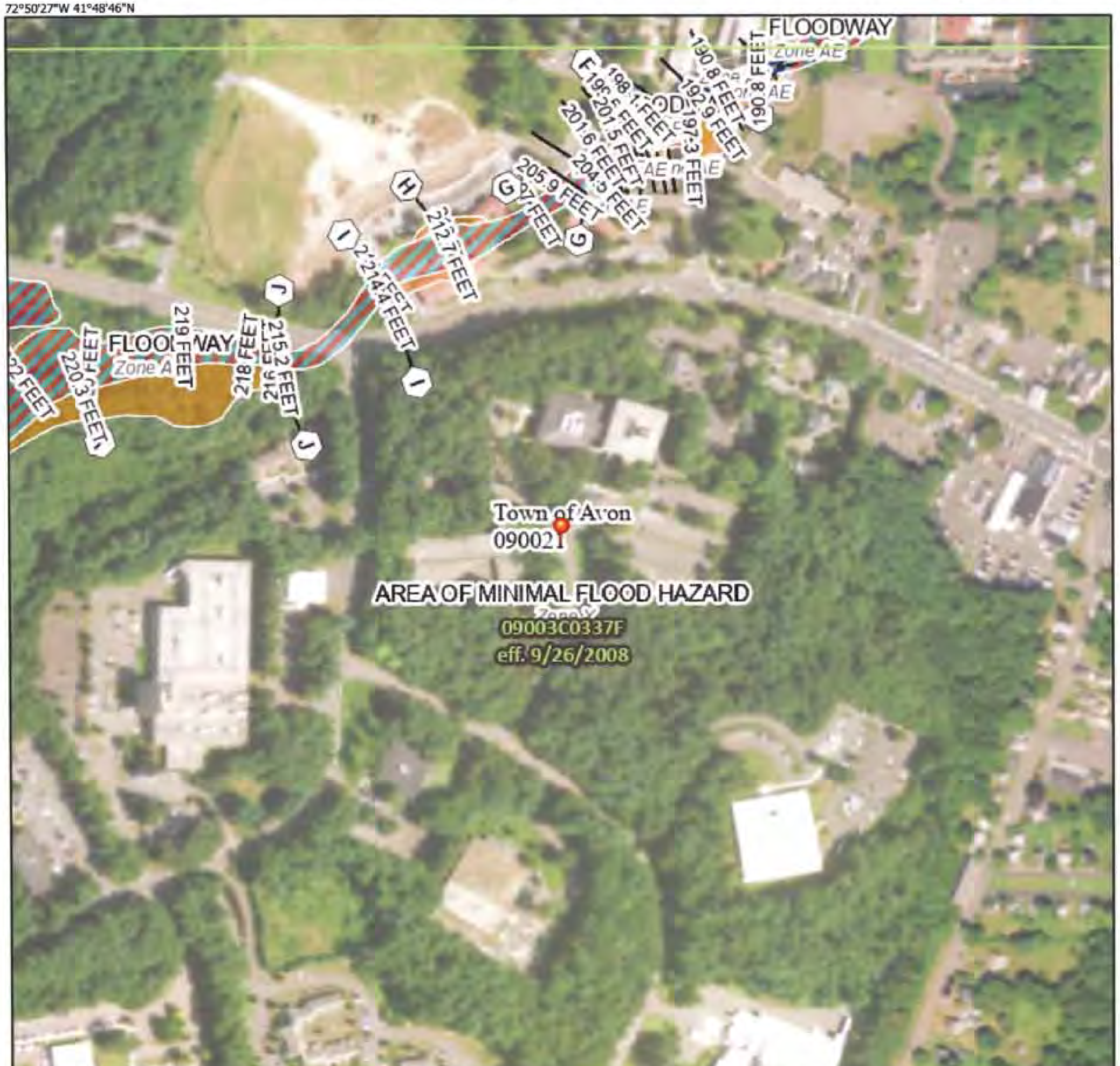
Boston, Massachusetts 02108

September 17, 2021

National Flood Hazard Layer FIRMette

FEMA

72°50'27"W 41°48'46"N



72°49'50"W 41°48'19"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- **Without Base Flood Elevation (BFE)** *Zone A, V, A99*
- **With BFE or Depth** *Zone AE, AO, AH, VE, AR*
- **Regulatory Floodway**

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/6/2021 at 11:38 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 15, 2019—Aug 29, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12	Raypol silt loam	C/D	0.4	1.1%
29A	Agawam fine sandy loam, 0 to 3 percent slopes	B	0.4	1.3%
38C	Hinckley loamy sand, 3 to 15 percent slopes	A	0.7	2.0%
38E	Hinckley loamy sand, 15 to 45 percent slopes	A	12.0	35.3%
306	Udorthents-Urban land complex	B	20.0	58.8%
307	Urban land	D	0.5	1.4%
Totals for Area of Interest			**34.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

SLR

APPENDIX D

STORM DRAINAGE COMPUTATIONS

Drainage Report

Beacon Communities, LLC

2 Center Plaza, Suite 700

Boston, Massachusetts 02108

September 17, 2021

Rational Method Individual Basin Calculations

Project: Proposed Residential Apartments By: AWG Date: 8/25/21
Location: 20 Security Drive, Avon, Connecticut Checked: Date:

Basin Name	Impervious Area C=0.9 (sf)	Grassed Area C=0.3 (sf)	Wooded Area C=0.2 (sf)	Total Area (sf)	Total Area (ac)	Weighted C	Tc (min)
			System 100				
MH 35	10466	3743	0	14209	0.33	0.74	5.0
CCB 36	9421	2347	0	11768	0.27	0.78	5.0
CCB 37	2968	701	0	3669	0.08	0.79	5.0
CCB 38	1126	1072	0	2198	0.05	0.61	5.0
CCB 39	5809	221	0	6030	0.14	0.88	5.0
CCB 40	1906	0	0	1906	0.04	0.90	5.0
			System 120				
CCB 6	2099	0	0	2099	0.05	0.90	5.0
CCB 7	4412	0	0	4412	0.10	0.90	5.0
AD 7A	770	9474	0	10244	0.24	0.35	5.0
CCB 8	5949	272	0	6221	0.14	0.87	5.0
CCB 9	1688	0	0	1688	0.04	0.90	5.0
CCB 10	5295	0	0	5295	0.12	0.90	5.0
CCB 11	5906	429	0	6334	0.15	0.86	5.0
CCB 12	2056	2203	0	4259	0.10	0.59	5.0
AD 13	461	1796	0	2257	0.05	0.42	5.0
AD 15	178	964	0	1142	0.03	0.39	5.0
AD 16	74	1039	0	1113	0.03	0.34	5.0
AD 17	6301	1554	0	7856	0.18	0.78	5.0
AD 18	0	1873	0	1873	0.04	0.30	5.0
CCB 19	8588	3199	0	11787	0.27	0.74	5.0
CCB 20	8400	0	0	8400	0.19	0.90	5.0
CCB 21	2102	411	0	2513	0.06	0.80	5.0
CCB 22	2531	514	0	3045	0.07	0.80	5.0
CCB 23	3439	1100	0	4538	0.10	0.75	5.0
CCB 24	1835	1161	0	2996	0.07	0.67	5.0
CLCB 25	8972	5693	0	14665	0.34	0.67	5.0
CCB 26	3320	3615	0	6935	0.16	0.59	5.0
CCB 27	3802	2975	0	6777	0.16	0.64	5.0
AD 29	1387	3540	0	4928	0.11	0.47	5.0
AD 30	595	3229	0	3824	0.09	0.39	5.0
CCB 31	5108	12801	0	17909	0.41	0.47	5.0
CCB 32	3427	2670	0	6098	0.14	0.64	5.0
CCB 33	2793	710	0	3503	0.08	0.78	5.0
CCB 34	2672	2846	0	5518	0.13	0.59	5.0

Rational Method Roof Drain System Calculations

Project: Proposed Residential Apartments By: AWG Date: 8/26/21

Location: 20 Security Drive, Avon, Connecticut Checked: Date:

Total Roof Runoff to Proposed Storm Drainage System (in Hydraflow Model)

	Full Roof To CCB 10						
C	0.90						
I	7.54						
A	0.63						
Q	4.29						

NOAA Atlas 14, Volume 10, Version 3
Location name: Avon, Connecticut, USA*
Latitude: 41.809°, Longitude: -72.8357°
Elevation: 264.33 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.20 (3.23-5.41)	5.04 (3.88-6.49)	6.41 (4.91-8.28)	7.54 (5.74-9.80)	9.10 (6.72-12.4)	10.3 (7.44-14.3)	11.5 (8.11-16.7)	12.9 (8.63-19.1)	14.8 (9.55-22.9)	16.4 (10.4-25.9)
10-min	2.98 (2.29-3.83)	3.57 (2.74-4.60)	4.54 (3.47-5.87)	5.34 (4.07-6.95)	6.44 (4.76-8.78)	7.28 (5.27-10.1)	8.15 (5.74-11.8)	9.11 (6.11-13.6)	10.5 (6.75-16.2)	11.6 (7.34-18.3)
15-min	2.34 (1.80-3.00)	2.80 (2.15-3.61)	3.56 (2.72-4.60)	4.19 (3.19-5.45)	5.05 (3.73-6.89)	5.70 (4.14-7.96)	6.39 (4.50-9.26)	7.14 (4.79-10.6)	8.22 (5.32-12.7)	9.10 (5.76-14.4)
30-min	1.58 (1.22-2.03)	1.90 (1.46-2.44)	2.42 (1.85-3.12)	2.85 (2.17-3.70)	3.44 (2.54-4.69)	3.88 (2.82-5.42)	4.35 (3.07-6.31)	4.87 (3.27-7.25)	5.60 (3.63-8.66)	6.20 (3.92-9.79)
60-min	0.997 (0.766-1.28)	1.20 (0.920-1.54)	1.53 (1.17-1.98)	1.80 (1.37-2.34)	2.17 (1.61-2.96)	2.46 (1.78-3.43)	2.75 (1.94-3.99)	3.08 (2.07-4.59)	3.55 (2.30-5.48)	3.93 (2.48-6.20)
2-hr	0.644 (0.498-0.824)	0.772 (0.596-0.988)	0.980 (0.755-1.26)	1.15 (0.884-1.49)	1.39 (1.04-1.89)	1.57 (1.15-2.18)	1.76 (1.25-2.56)	1.98 (1.33-2.94)	2.31 (1.50-3.56)	2.60 (1.65-4.09)
3-hr	0.495 (0.385-0.630)	0.594 (0.461-0.757)	0.755 (0.585-0.967)	0.889 (0.684-1.15)	1.07 (0.804-1.45)	1.21 (0.890-1.69)	1.36 (0.975-1.98)	1.54 (1.04-2.27)	1.81 (1.18-2.78)	2.05 (1.30-3.21)
6-hr	0.313 (0.245-0.396)	0.379 (0.296-0.480)	0.486 (0.379-0.619)	0.576 (0.446-0.737)	0.699 (0.527-0.945)	0.789 (0.585-1.10)	0.888 (0.644-1.30)	1.01 (0.685-1.49)	1.21 (0.786-1.85)	1.37 (0.875-2.15)
12-hr	0.191 (0.151-0.240)	0.235 (0.185-0.296)	0.307 (0.241-0.388)	0.367 (0.286-0.467)	0.449 (0.341-0.605)	0.510 (0.380-0.706)	0.576 (0.421-0.838)	0.660 (0.448-0.969)	0.792 (0.518-1.21)	0.907 (0.581-1.41)
24-hr	0.112 (0.089-0.140)	0.141 (0.112-0.176)	0.188 (0.148-0.236)	0.227 (0.178-0.286)	0.280 (0.215-0.377)	0.319 (0.240-0.442)	0.363 (0.268-0.529)	0.419 (0.286-0.614)	0.511 (0.335-0.776)	0.591 (0.380-0.916)
2-day	0.063 (0.050-0.078)	0.080 (0.064-0.100)	0.109 (0.087-0.136)	0.133 (0.105-0.167)	0.166 (0.128-0.223)	0.190 (0.144-0.263)	0.217 (0.162-0.318)	0.253 (0.173-0.369)	0.314 (0.207-0.477)	0.369 (0.238-0.571)
3-day	0.046 (0.037-0.056)	0.058 (0.047-0.072)	0.080 (0.064-0.099)	0.097 (0.077-0.122)	0.121 (0.094-0.163)	0.139 (0.106-0.192)	0.159 (0.119-0.233)	0.186 (0.127-0.270)	0.232 (0.153-0.351)	0.274 (0.176-0.422)
4-day	0.037 (0.030-0.045)	0.047 (0.038-0.058)	0.064 (0.051-0.079)	0.078 (0.062-0.097)	0.097 (0.076-0.130)	0.111 (0.085-0.154)	0.127 (0.096-0.186)	0.149 (0.102-0.216)	0.186 (0.123-0.281)	0.219 (0.142-0.336)
7-day	0.025 (0.020-0.031)	0.032 (0.026-0.039)	0.043 (0.034-0.052)	0.052 (0.041-0.064)	0.064 (0.050-0.085)	0.073 (0.056-0.100)	0.083 (0.063-0.121)	0.097 (0.067-0.140)	0.120 (0.079-0.180)	0.141 (0.091-0.216)
10-day	0.020 (0.017-0.025)	0.025 (0.021-0.031)	0.033 (0.027-0.041)	0.040 (0.032-0.049)	0.049 (0.038-0.065)	0.056 (0.043-0.076)	0.063 (0.048-0.091)	0.073 (0.051-0.106)	0.090 (0.060-0.135)	0.105 (0.068-0.160)
20-day	0.015 (0.012-0.018)	0.017 (0.014-0.021)	0.021 (0.017-0.026)	0.025 (0.020-0.031)	0.030 (0.023-0.039)	0.033 (0.026-0.045)	0.037 (0.028-0.052)	0.042 (0.029-0.060)	0.050 (0.033-0.074)	0.057 (0.037-0.087)
30-day	0.012 (0.010-0.015)	0.014 (0.012-0.017)	0.017 (0.014-0.021)	0.019 (0.016-0.024)	0.022 (0.018-0.029)	0.025 (0.019-0.033)	0.027 (0.020-0.038)	0.031 (0.021-0.044)	0.035 (0.024-0.052)	0.039 (0.026-0.060)
45-day	0.010 (0.009-0.012)	0.012 (0.009-0.014)	0.013 (0.011-0.016)	0.015 (0.012-0.018)	0.017 (0.014-0.022)	0.019 (0.015-0.025)	0.021 (0.015-0.028)	0.023 (0.016-0.032)	0.025 (0.017-0.037)	0.027 (0.018-0.042)
60-day	0.009 (0.007-0.011)	0.010 (0.008-0.012)	0.011 (0.009-0.014)	0.013 (0.010-0.015)	0.014 (0.011-0.018)	0.016 (0.012-0.021)	0.017 (0.013-0.023)	0.018 (0.013-0.026)	0.020 (0.014-0.030)	0.021 (0.014-0.032)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

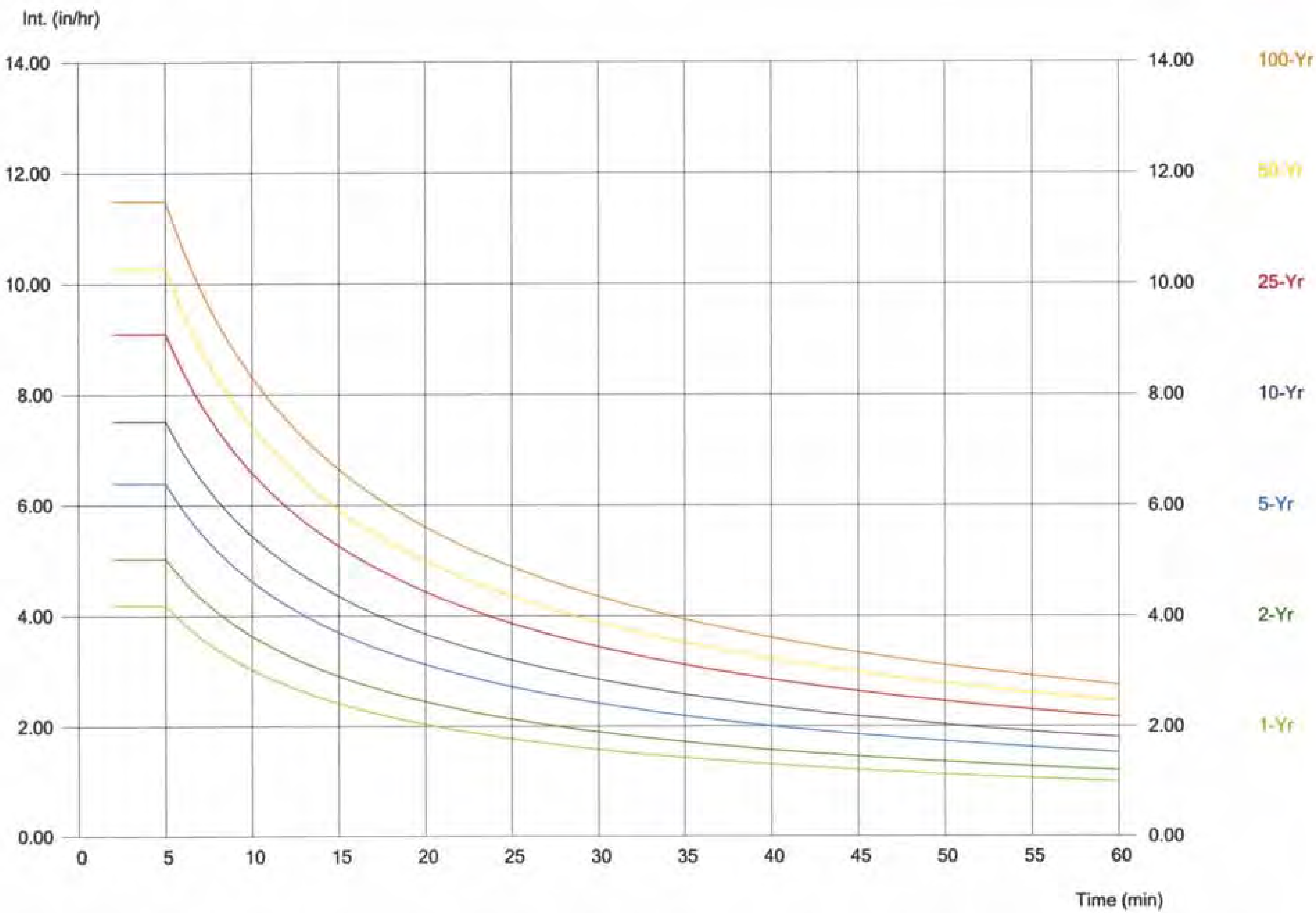
Large scale terrain

Large scale map

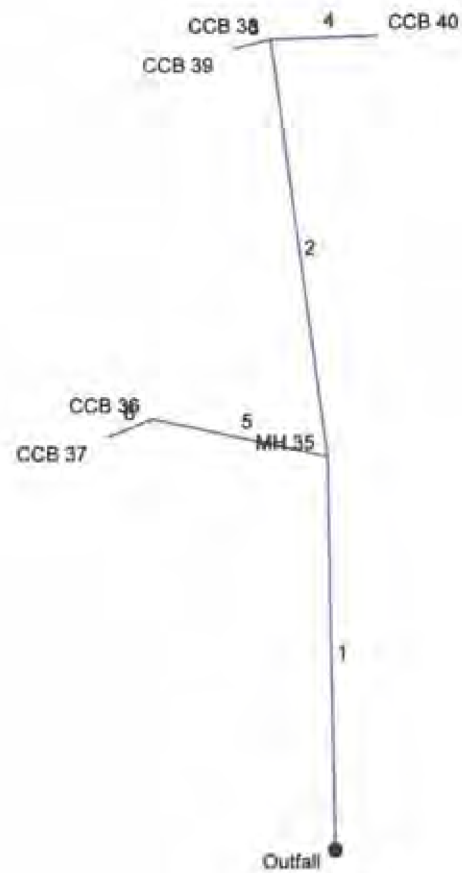
Large scale aerial

Storm Sewer IDF Curves

IDF file: Avon.IDF



Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: System 100.stm	Number of lines: 6	Date: 9/7/2021

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	157.000	-90.882	Comb	0.00	0.33	0.74	5.0	248.70	4.39	255.60	15	Cir	0.013	1.47	261.60	EX PIPE
2	1	168.000	-6.674	Comb	0.00	0.05	0.61	5.0	257.60	2.02	261.00	12	Cir	0.012	2.25	264.70	MH 35-CB 38
3	2	15.000	-96.455	Comb	0.00	0.14	0.88	5.0	262.00	2.00	262.30	12	Cir	0.012	1.00	266.10	CB 38-CB 39
4	2	42.000	95.718	Comb	0.00	0.04	0.90	5.0	261.00	1.19	261.50	12	Cir	0.012	1.00	265.30	CB 38-CB 40
5	1	71.000	-76.760	Comb	0.00	0.27	0.78	5.0	256.00	0.85	256.60	12	Cir	0.012	0.92	261.00	MH 35-CB 36
6	5	19.000	-34.243	Comb	0.00	0.08	0.79	5.0	256.60	1.05	256.80	12	Cir	0.012	1.00	260.60	CB 36-CB 37

Project File: System 100.stm | Number of lines: 6 | Date: 9/7/2021

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	157.000	0.33	0.91	0.74	0.24	0.71	5.0	6.2	6.9	4.86	13.54	3.96	15	4.39	248.70	255.60	256.75	257.64	252.00	261.60	EX PIPE
2	1	168.000	0.05	0.23	0.61	0.03	0.19	5.0	5.5	7.2	1.37	5.49	4.11	12	2.02	257.60	261.00	258.00	261.50	261.60	264.70	MH 35-CB 38
3	2	15.000	0.14	0.14	0.88	0.12	0.12	5.0	5.0	7.5	0.93	5.46	4.15	12	2.00	262.00	262.30	262.28	262.70	264.70	266.10	CB 38-CB 39
4	2	42.000	0.04	0.04	0.90	0.04	0.04	5.0	5.0	7.5	0.27	4.21	1.45	12	1.19	261.00	261.50	261.50	261.71	264.70	265.30	CB 38-CB 40
5	1	71.000	0.27	0.35	0.78	0.21	0.27	5.0	5.5	7.2	1.97	3.55	2.51	12	0.85	256.00	256.60	258.00	258.19	261.60	261.00	MH 35-CB 36
6	5	19.000	0.08	0.08	0.79	0.06	0.06	5.0	5.0	7.5	0.47	3.96	0.60	12	1.05	256.60	256.80	258.28	258.28	261.00	260.60	CB 36-CB 37

Project File: System 100.stm

Number of lines: 6

Run Date: 9/7/2021

NOTES: Intensity = 36.65 / (Inlet time + 3.90) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

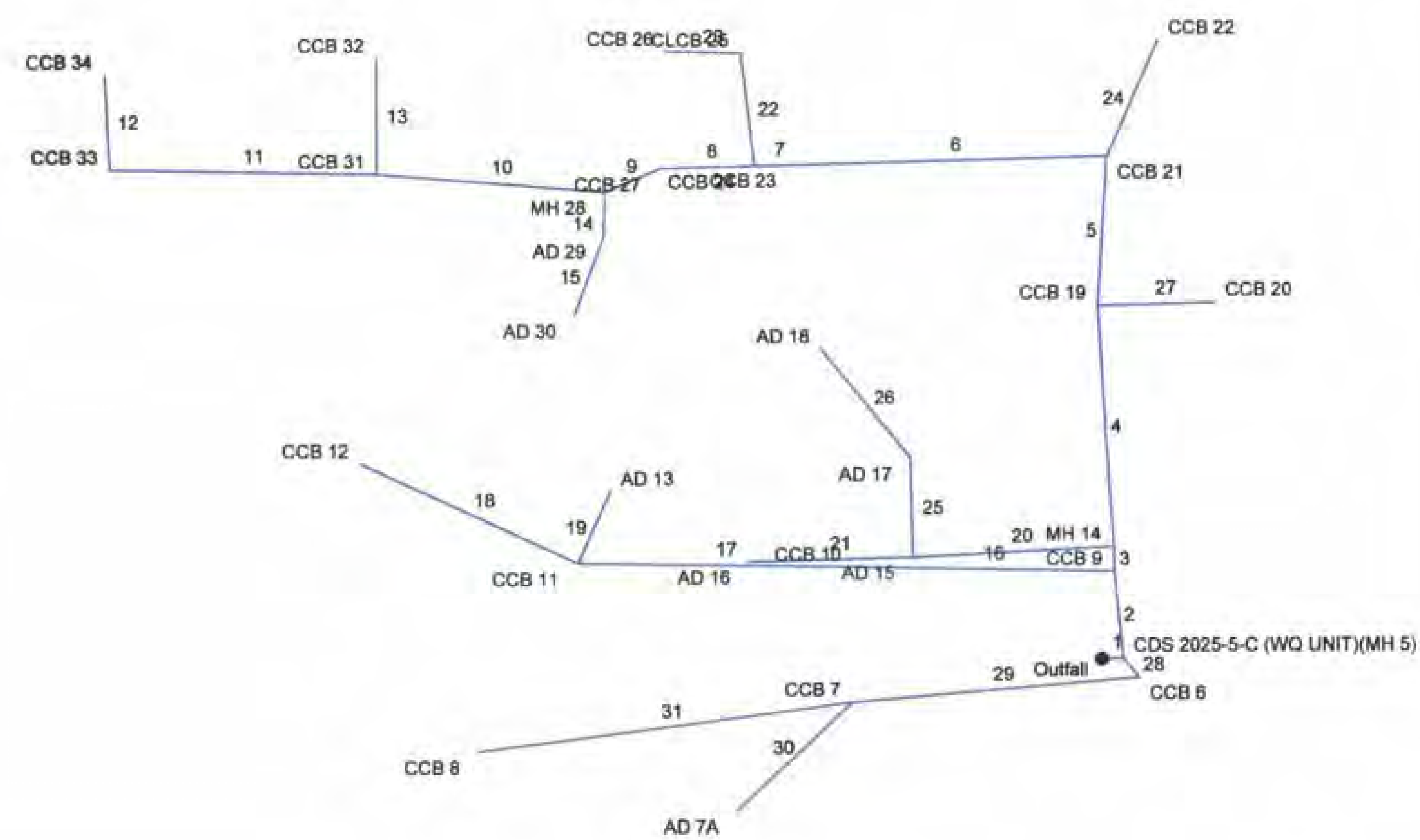
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	15	4.86	248.70	256.75	1.25	1.23	3.96	0.24	256.99	0.567	157.000	255.60	257.64	1.25	1.23	3.96	0.24	257.89	0.567	0.567	0.891	1.47	0.36
2	12	1.37	257.60	258.00	0.40	0.29	4.68	0.19	258.19	0.000	168.000	261.00	261.50	0.50**	0.39	3.54	0.19	261.69	0.000	0.000	n/a	2.25	n/a
3	12	0.93	262.00	262.28	0.28*	0.18	5.17	0.15	262.43	0.000	15.000	262.30	262.70	0.40**	0.30	3.12	0.15	262.85	0.000	0.000	n/a	1.00	n/a
4	12	0.27	261.00	261.50	0.50	0.12	0.70	0.08	261.57	0.000	42.000	261.50	261.71 j	0.21**	0.12	2.20	0.08	261.79	0.000	0.000	n/a	1.00	0.08
5	12	1.97	256.00	258.00	1.00	0.79	2.51	0.10	258.10	0.262	71.000	256.60	258.19	1.00	0.79	2.51	0.10	258.28	0.262	0.262	0.186	0.92	0.09
6	12	0.47	256.60	258.28	1.00	0.79	0.60	0.01	258.28	0.015	19.000	256.80	258.28	1.00	0.79	0.60	0.01	258.28	0.015	0.015	0.003	1.00	0.01

Project File: System 100.stm | Number of lines: 6 | Run Date: 9/7/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: System 120-2.stm	Number of lines: 31	Date: 9/7/2021

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	10.000	-1.824	MH	0.00	0.00	0.00	0.0	247.40	1.00	247.50	24	Cir	0.012	1.00	257.70	MH 4 - MH 5
2	1	42.000	-93.899	Comb	0.00	0.04	0.90	5.0	247.50	0.71	247.80	24	Cir	0.012	1.49	257.70	MH 5 - CCB 9
3	2	12.000	4.248	MH	0.00	0.00	0.00	0.0	247.80	1.67	248.00	18	Cir	0.012	1.00	257.30	CCB 9 - MH 14
4	3	117.000	-2.102	Comb	0.00	0.27	0.74	5.0	248.00	1.03	249.20	18	Cir	0.012	1.50	255.50	MH 14 - CCB 19
5	4	72.000	7.084	Comb	0.00	0.06	0.80	5.0	249.20	0.97	249.90	18	Cir	0.012	2.00	257.00	CCB 19 - CCB 21
6	5	149.000	-94.982	Comb	0.00	0.10	0.75	5.0	249.90	1.01	251.40	15	Cir	0.012	0.50	256.40	CCB 21 - CCB 23
7	6	20.000	0.000	Comb	0.00	0.07	0.67	5.0	251.40	1.50	251.70	15	Cir	0.012	1.49	256.10	CCB 23 - CCB 24
8	7	45.000	0.000	Comb	0.00	0.16	0.64	5.0	252.30	2.00	253.20	12	Cir	0.012	0.63	256.50	CCB 24 - CCB 27
9	8	29.000	-21.275	MH	0.00	0.00	0.00	0.0	252.10	1.03	252.40	12	Cir	0.012	0.93	257.30	CCB 27 - MH 28
10	9	110.000	27.301	Comb	0.00	0.41	0.47	5.0	252.40	1.00	253.50	12	Cir	0.012	1.50	257.90	MH 28 - CCB 31
11	10	128.000	-3.451	Comb	0.00	0.08	0.78	5.0	254.10	1.25	255.70	12	Cir	0.012	1.50	259.70	CCB 31 - CCB 33
12	11	46.000	85.885	Comb	0.00	0.13	0.59	5.0	255.70	1.09	256.20	12	Cir	0.012	1.00	260.00	CCB 33 - CCB 34
13	10	56.000	85.247	Comb	0.00	0.14	0.64	5.0	253.50	1.07	254.10	12	Cir	0.012	1.00	257.90	CCB 31 - CCB 32
14	9	21.000	-66.016	DrGrt	0.00	0.11	0.47	5.0	252.90	1.43	253.20	12	Cir	0.012	0.57	256.80	MH 28 - AD 29
15	14	41.000	19.151	DrGrt	0.00	0.09	0.39	5.0	253.20	0.98	253.60	12	Cir	0.012	1.00	257.10	AD 29 - AD 30
16	2	125.000	-83.129	Comb	4.29	0.12	0.90	5.0	247.80	2.00	250.30	15	Cir	0.012	0.50	257.30	CCB 9 - CCB 10
17	16	132.000	-0.245	Comb	0.00	0.15	0.83	5.0	250.30	1.97	252.90	12	Cir	0.012	1.50	256.90	CCB 10 - CCB 11
18	17	115.000	23.995	Comb	0.00	0.10	0.59	5.0	252.90	1.48	254.60	12	Cir	0.012	1.00	258.40	CCB 11 - CCB 12
19	17	38.000	113.037	DrGrt	0.00	0.05	0.42	5.0	252.90	2.37	253.80	12	Cir	0.012	1.00	257.30	CCB 12 - AD 13
20	3	96.000	-91.431	DrGrt	0.00	0.03	0.39	5.0	250.60	1.04	251.60	12	Cir	0.012	1.50	257.00	MH 14 - AD 15
21	20	79.000	1.540	DrGrt	0.00	0.03	0.34	5.0	252.70	1.01	253.50	12	Cir	0.012	1.00	257.00	AD 15 - AD 16
22	7	55.000	84.551	Grate	0.00	0.34	0.67	5.0	251.70	1.09	252.30	12	Cir	0.012	1.49	256.10	CCB 24 - CCB 25
23	22	36.000	-81.907	Comb	0.00	0.16	0.59	5.0	252.30	1.11	252.70	12	Cir	0.012	1.00	256.50	CCB 25 - CCB 26

Project File: System 120-2.stm | Number of lines: 31 | Date: 9/7/2021

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	5	61.000	19.987	Comb	0.00	0.07	0.80	5.0	252.20	1.15	252.90	12	Cir	0.012	1.00	256.70	CCB 21 - CCB 22
25	20	48.000	91.431	DrGrt	0.00	0.18	0.78	5.0	251.60	1.04	252.10	12	Cir	0.012	0.99	256.50	AD 15 - AD 17
26	25	68.000	-37.491	DrGrt	0.00	0.04	0.30	5.0	252.10	1.03	252.80	12	Cir	0.012	1.00	256.30	AD 17 - AD 18
27	4	56.000	92.102	Comb	0.00	0.19	0.90	5.0	251.00	1.25	251.70	12	Cir	0.012	1.00	255.50	CCB 19 - CCB 20
28	1	12.000	51.800	Comb	0.00	0.05	0.90	5.0	247.50	1.67	247.70	12	Cir	0.012	1.50	257.60	MH 5 - CCB 6
29	28	138.000	125.161	Comb	0.00	0.10	0.90	5.0	247.70	1.01	249.10	12	Cir	0.012	1.00	257.30	CCB 6 - CCB 7
30	29	76.000	-38.186	DrGrt	0.00	0.24	0.35	5.0	250.50	1.05	251.30	12	Cir	0.012	1.00	254.80	CCB 7 - AD 7A
31	29	181.000	-2.491	Comb	0.00	0.14	0.87	5.0	249.10	0.66	250.30	12	Cir	0.012	1.00	253.60	CCB 7 - CCB 8

Project File: System 120-2.stm | Number of lines: 31 | Date: 9/7/2021

Storm Sewer Tabulation

Station Line	Station To Line	Len (ft)	Drng Area Incr (ac)	Drng Area Total (ac)	Rnoff coeff (C)	Area x C Incr	Area x C Total	Tc Inlet (min)	Tc Syst (min)	Rain (I) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe Size (in)	Pipe Slope (%)	Invert Elev Dn (ft)	Invert Elev Up (ft)	HGL Elev Dn (ft)	HGL Elev Up (ft)	Grnd / Rim Elev Dn (ft)	Grnd / Rim Elev Up (ft)	Line ID
1	End	10.000	0.00	3.65	0.00	0.00	2.39	0.0	8.9	5.8	18.14	24.50	6.45	24	1.00	247.40	247.50	249.30	249.03	258.00	257.70	MH 4 - MH 5
2	1	42.000	0.04	3.12	0.90	0.04	2.05	5.0	8.7	5.8	16.24	20.71	6.47	24	0.71	247.50	247.80	249.03	249.25	257.70	257.70	MH 5 - CCB 9
3	2	12.000	0.00	2.66	0.00	0.00	1.70	0.0	8.7	5.8	9.94	14.69	6.08	18	1.67	247.80	248.00	249.25	249.21	257.70	257.30	CCB 9 - MH 14
4	3	117.000	0.27	2.38	0.74	0.20	1.53	5.0	8.4	5.9	9.10	11.52	6.05	18	1.03	248.00	249.20	249.21	250.37	257.30	255.50	MH 14 - CCB 19
5	4	72.000	0.06	1.92	0.80	0.05	1.16	5.0	8.2	6.0	6.99	11.22	5.09	18	0.97	249.20	249.90	250.37	250.92	255.50	257.00	CCB 19 - CCB 21
6	5	149.000	0.10	1.79	0.75	0.08	1.05	5.0	7.7	6.2	6.52	7.02	6.06	15	1.01	249.90	251.40	250.92	252.43	257.00	256.40	CCB 21 - CCB 23
7	6	20.000	0.07	1.69	0.67	0.05	0.98	5.0	7.7	6.2	6.08	8.57	5.72	15	1.50	251.40	251.70	252.43	252.70	256.40	256.10	CCB 23 - CCB 24
8	7	45.000	0.16	1.12	0.64	0.10	0.61	5.0	7.6	6.3	3.82	5.46	6.50	12	2.00	252.30	253.20	252.92	254.03	256.10	256.50	CCB 24 - CCB 27
9	8	29.000	0.00	0.96	0.00	0.00	0.51	0.0	7.5	6.3	3.20	3.92	4.08	12	1.03	252.10	252.40	254.03	254.23	256.50	257.30	CCB 27 - MH 28
10	9	110.000	0.41	0.76	0.47	0.19	0.42	5.0	6.3	6.8	2.87	3.86	3.66	12	1.00	252.40	253.50	254.47	255.08	257.30	257.90	MH 28 - CCB 31
11	10	128.000	0.08	0.21	0.78	0.06	0.14	5.0	5.3	7.3	1.02	4.31	2.26	12	1.25	254.10	255.70	255.39	256.12	257.90	259.70	CCB 31 - CCB 33
12	11	46.000	0.13	0.13	0.59	0.08	0.08	5.0	5.0	7.5	0.58	4.02	2.27	12	1.09	255.70	256.20	256.12	256.52	259.70	260.00	CCB 33 - CCB 34
13	10	56.000	0.14	0.14	0.64	0.09	0.09	5.0	5.0	7.5	0.67	3.99	0.86	12	1.07	253.50	254.10	255.39	255.41	257.90	257.90	CCB 31 - CCB 32
14	9	21.000	0.11	0.20	0.47	0.05	0.09	5.0	7.0	6.5	0.56	4.61	0.72	12	1.43	252.90	253.20	254.47	254.47	257.30	256.80	MH 28 - AD 29
15	14	41.000	0.09	0.09	0.39	0.04	0.04	5.0	5.0	7.5	0.26	3.81	0.35	12	0.98	253.20	253.60	254.48	254.48	256.80	257.10	AD 29 - AD 30
16	2	125.000	0.12	0.42	0.90	0.11	0.31	5.0	6.9	6.5	6.33	9.89	5.55	15	2.00	247.80	250.30	249.25	251.31	257.70	257.30	CCB 9 - CCB 10
17	16	132.000	0.15	0.30	0.83	0.12	0.20	5.0	6.1	6.9	1.42	5.41	2.69	12	1.97	250.30	252.90	251.31	253.40	257.30	256.90	CCB 10 - CCB 11
18	17	115.000	0.10	0.10	0.59	0.06	0.06	5.0	5.0	7.5	0.44	4.69	1.82	12	1.48	252.90	254.60	253.40	254.88	256.90	258.40	CCB 11 - CCB 12
19	17	38.000	0.05	0.05	0.42	0.02	0.02	5.0	5.0	7.5	0.16	5.94	1.15	12	2.37	252.90	253.80	253.40	253.96	256.90	257.30	CCB 12 - AD 13
20	3	96.000	0.03	0.28	0.39	0.01	0.17	5.0	6.4	6.7	1.18	3.94	3.87	12	1.04	250.60	251.60	250.97	252.06	257.30	257.00	MH 14 - AD 15
21	20	79.000	0.03	0.03	0.34	0.01	0.01	5.0	5.0	7.5	0.08	3.88	1.76	12	1.01	252.70	253.50	252.80	253.61	257.00	257.00	AD 15 - AD 16
22	7	55.000	0.34	0.50	0.67	0.23	0.32	5.0	5.3	7.3	2.37	4.03	3.67	12	1.09	251.70	252.30	252.70	252.96	256.10	256.10	CCB 24 - CCB 25

Project File: System 120-2.stm | Number of lines: 31 | Run Date: 9/7/2021

NOTES:Intensity = 36.65 / (Inlet time + 3.90) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
23	22	36.000	0.16	0.16	0.59	0.09	0.09	5.0	5.0	7.5	0.71	4.07	2.09	12	1.11	252.30	252.70	252.96	253.05	256.10	256.50	CCB 25 - CCB 26
24	5	61.000	0.07	0.07	0.80	0.06	0.06	5.0	5.0	7.5	0.42	4.13	2.93	12	1.15	252.20	252.90	252.42	253.17	257.00	256.70	CCB 21 - CCB 22
25	20	48.000	0.18	0.22	0.78	0.14	0.15	5.0	6.2	6.9	1.05	3.94	3.12	12	1.04	251.60	252.10	252.06	252.53	257.00	256.50	AD 15 - AD 17
26	25	68.000	0.04	0.04	0.30	0.01	0.01	5.0	5.0	7.5	0.09	3.91	0.96	12	1.03	252.10	252.80	252.53	252.92	256.50	256.30	AD 17 - AD 18
27	4	56.000	0.19	0.19	0.90	0.17	0.17	5.0	5.0	7.5	1.28	4.31	4.13	12	1.25	251.00	251.70	251.37	252.18	255.50	255.50	CCB 19 - CCB 20
28	1	12.000	0.05	0.53	0.90	0.05	0.34	5.0	7.1	6.5	2.20	4.98	2.80	12	1.67	247.50	247.70	249.03	249.07	257.70	257.60	MH 5 - CCB 6
29	28	138.000	0.10	0.48	0.90	0.09	0.30	5.0	6.4	6.8	2.00	3.89	3.29	12	1.01	247.70	249.10	249.26	249.71	257.60	257.30	CCB 6 - CCB 7
30	29	76.000	0.24	0.24	0.35	0.08	0.08	5.0	5.0	7.5	0.63	3.96	3.24	12	1.05	250.50	251.30	250.77	251.63	257.30	254.80	CCB 7 - AD 7A
31	29	181.000	0.14	0.14	0.87	0.12	0.12	5.0	5.0	7.5	0.92	3.14	2.19	12	0.66	249.10	250.30	249.96	250.70	257.30	253.60	CCB 7 - CCB 8

Project File: System 120-2.stm

Number of lines: 31

Run Date: 9/7/2021

NOTES:Intensity = 36.65 / (Inlet time + 3.90) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	24	18.14	247.40	249.30	1.90	2.58	5.89	0.77	250.07	0.000	10.000	247.50	249.03	1.53**	2.58	7.02	0.77	249.80	0.000	0.000	n/a	1.00	0.77
2	24	16.24	247.50	249.03	1.53	2.44	6.29	0.69	249.72	0.000	42.000	247.80	249.25 j	1.45**	2.44	6.65	0.69	249.94	0.000	0.000	n/a	1.49	n/a
3	18	9.94	247.80	249.25	1.45	1.53	5.68	0.65	249.91	0.000	12.000	248.00	249.21 j	1.21**	1.53	6.49	0.65	249.87	0.000	0.000	n/a	1.00	0.65
4	18	9.10	248.00	249.21	1.21	1.47	5.93	0.59	249.81	0.000	117.000	249.20	250.37 j	1.17**	1.47	6.17	0.59	250.96	0.000	0.000	n/a	1.50	n/a
5	18	6.99	249.20	250.37	1.17	1.28	4.74	0.46	250.83	0.000	72.000	249.90	250.92 j	1.02**	1.28	5.45	0.46	251.38	0.000	0.000	n/a	2.00	0.92
6	15	6.52	249.90	250.92	1.02	1.07	6.07	0.57	251.49	0.000	149.000	251.40	252.43	1.03**	1.08	6.04	0.57	253.00	0.000	0.000	n/a	0.50	n/a
7	15	6.08	251.40	252.43	1.03	1.05	5.63	0.52	252.95	0.000	20.000	251.70	252.70 j	1.00**	1.05	5.80	0.52	253.22	0.000	0.000	n/a	1.49	0.78
8	12	3.82	252.30	252.92	0.62*	0.51	7.52	0.47	253.38	0.000	45.000	253.20	254.03	0.83**	0.70	5.48	0.47	254.50	0.000	0.000	n/a	0.63	0.29
9	12	3.20	252.10	254.03	1.00	0.79	4.08	0.26	254.29	0.689	29.000	252.40	254.23	1.00	0.79	4.08	0.26	254.49	0.688	0.689	0.200	0.93	0.24
10	12	2.87	252.40	254.47	1.00	0.79	3.66	0.21	254.68	0.554	110.000	253.50	255.08	1.00	0.79	3.66	0.21	255.29	0.554	0.554	0.610	1.50	0.31
11	12	1.02	254.10	255.39	1.00	0.32	1.30	0.03	255.42	0.070	128.000	255.70	256.12 j	0.42**	0.32	3.22	0.16	256.28	0.498	0.284	n/a	1.50	n/a
12	12	0.58	255.70	256.12	0.42	0.21	1.82	0.11	256.24	0.000	46.000	256.20	256.52 j	0.32**	0.21	2.71	0.11	256.63	0.000	0.000	n/a	1.00	0.11
13	12	0.67	253.50	255.39	1.00	0.79	0.86	0.01	255.40	0.030	56.000	254.10	255.41	1.00	0.79	0.86	0.01	255.42	0.030	0.030	0.017	1.00	0.01
14	12	0.56	252.90	254.47	1.00	0.79	0.72	0.01	254.48	0.021	21.000	253.20	254.47	1.00	0.79	0.72	0.01	254.48	0.021	0.021	0.004	0.57	0.00
15	12	0.26	253.20	254.48	1.00	0.79	0.34	0.00	254.48	0.005	41.000	253.60	254.48	0.88	0.73	0.36	0.00	254.48	0.004	0.004	0.002	1.00	0.00
16	15	6.33	247.80	249.25	1.25	1.07	5.16	0.41	249.67	0.820	125.000	250.30	251.31 j	1.01**	1.07	5.94	0.55	251.86	0.835	0.828	n/a	0.50	n/a
17	12	1.42	250.30	251.31	1.00	0.40	1.80	0.05	251.37	0.135	132.000	252.90	253.40 j	0.50**	0.40	3.58	0.20	253.60	0.527	0.331	n/a	1.50	n/a
18	12	0.44	252.90	253.40	0.50	0.18	1.12	0.10	253.50	0.000	115.000	254.60	254.88 j	0.28**	0.18	2.52	0.10	254.97	0.000	0.000	n/a	1.00	n/a
19	12	0.16	252.90	253.40	0.50	0.08	0.40	0.06	253.46	0.000	38.000	253.80	253.96 j	0.16**	0.08	1.90	0.06	254.02	0.000	0.000	n/a	1.00	0.06
20	12	1.18	250.60	250.97	0.37*	0.27	4.37	0.18	251.15	0.000	96.000	251.60	252.06	0.46**	0.35	3.36	0.18	252.23	0.000	0.000	n/a	1.50	0.26
21	12	0.08	252.70	252.80	0.10*	0.04	1.95	0.04	252.84	0.000	79.000	253.50	253.61	0.11**	0.05	1.57	0.04	253.65	0.000	0.000	n/a	1.00	0.04
22	12	2.37	251.70	252.70	1.00	0.55	3.01	0.29	252.99	0.381	55.000	252.30	252.96 j	0.66**	0.55	4.32	0.29	253.25	0.638	0.510	n/a	1.49	0.43

Project File: System 120-2.stm | Number of lines: 31 | Run Date: 9/7/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

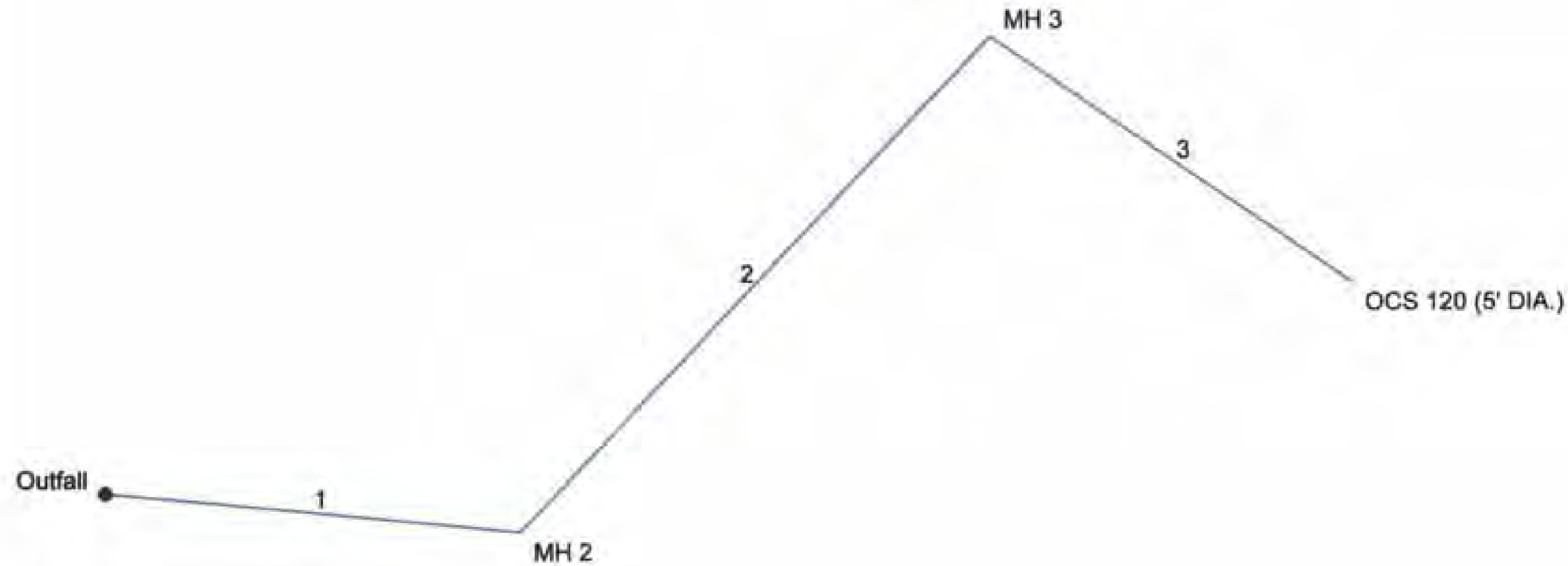
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
23	12	0.71	252.30	252.96	0.66	0.25	1.29	0.13	253.09	0.000	36.000	252.70	253.05 j	0.35**	0.25	2.88	0.13	253.18	0.000	0.000	n/a	1.00	0.13
24	12	0.42	252.20	252.42	0.22*	0.12	3.38	0.10	252.51	0.000	61.000	252.90	253.17	0.27**	0.17	2.48	0.10	253.26	0.000	0.000	n/a	1.00	n/a
25	12	1.05	251.60	252.06	0.46	0.32	2.99	0.16	252.22	0.000	48.000	252.10	252.53 j	0.43**	0.32	3.24	0.16	252.69	0.000	0.000	n/a	0.99	0.16
26	12	0.09	252.10	252.53	0.43	0.05	0.28	0.04	252.57	0.000	68.000	252.80	252.92 j	0.12**	0.05	1.64	0.04	252.96	0.000	0.000	n/a	1.00	n/a
27	12	1.28	251.00	251.37	0.37*	0.27	4.79	0.19	251.56	0.000	56.000	251.70	252.18	0.48**	0.37	3.46	0.19	252.36	0.000	0.000	n/a	1.00	n/a
28	12	2.20	247.50	249.03	1.00	0.79	2.80	0.12	249.16	0.325	12.000	247.70	249.07	1.00	0.79	2.80	0.12	249.19	0.325	0.325	0.039	1.50	0.18
29	12	2.00	247.70	249.26	1.00	0.50	2.55	0.10	249.36	0.270	138.000	249.10	249.71 j	0.61**	0.50	4.02	0.25	249.96	0.580	0.425	0.586	1.00	0.25
30	12	0.63	250.50	250.77	0.27*	0.17	3.69	0.12	250.89	0.000	76.000	251.30	251.63	0.33**	0.23	2.79	0.12	251.75	0.000	0.000	n/a	1.00	n/a
31	12	0.92	249.10	249.96	0.86	0.29	1.28	0.15	250.11	0.000	181.000	250.30	250.70 j	0.40**	0.29	3.11	0.15	250.85	0.000	0.000	n/a	1.00	n/a

Project File: System 120-2.stm | Number of lines: 31 | Run Date: 9/7/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Outlet 120.stm	Number of lines: 3	Date: 9/7/2021

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	95.000	5.601	None	0.00	0.00	0.00	0.0	230.00	7.37	237.00	18	Cir	0.012	0.82	246.40	FES 1-MH 2
2	1	155.000	-51.666	None	0.00	0.00	0.00	0.0	237.00	4.58	244.10	18	Cir	0.012	0.99	255.50	MH 2-MH 3
3	2	99.000	80.311	None	11.25	0.00	0.00	0.0	245.10	1.57	246.65	18	Cir	0.012	1.00	257.40	MH 3-OCS 120

Project File: Outlet 120.stm | Number of lines: 3 | Date: 9/7/2021

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	95.000	0.00	0.00	0.00	0.00	0.00	0.0	0.6	0.0	11.25	30.88	6.68	18	7.37	230.00	237.00	232.00	238.28	235.45	246.40	FES 1-MH 2
2	1	155.000	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	11.25	24.35	7.00	18	4.58	237.00	244.10	238.28	245.38	246.40	255.50	MH 2-MH 3
3	2	99.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	11.25	14.23	7.96	18	1.57	245.10	246.65	246.11	247.93	255.50	257.40	MH 3-OCS 120

Project File: Outlet 120.stm | Number of lines: 3 | Run Date: 9/7/2021

NOTES: Intensity = 55.22 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 100 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	11.25	230.00	232.03	1.50	1.61	6.37	0.63	232.63	0.978	95.000	237.00	238.28 j	1.28**	1.61	7.00	0.76	239.04	0.915	0.946	n/a	0.82	n/a
2	18	11.25	237.00	238.23	1.28*	1.61	7.00	0.76	239.04	0.000	155.000	244.10	245.38	1.28**	1.61	7.00	0.76	246.14	0.000	0.000	n/a	0.99	n/a
3	18	11.25	245.10	246.11	1.01*	1.26	8.93	0.76	246.87	0.000	99.000	246.65	247.93	1.28**	1.61	7.00	0.76	248.69	0.000	0.000	n/a	1.00	n/a

Project File: Outlet 120.stm | Number of lines: 3 | Run Date: 9/7/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Channel Report

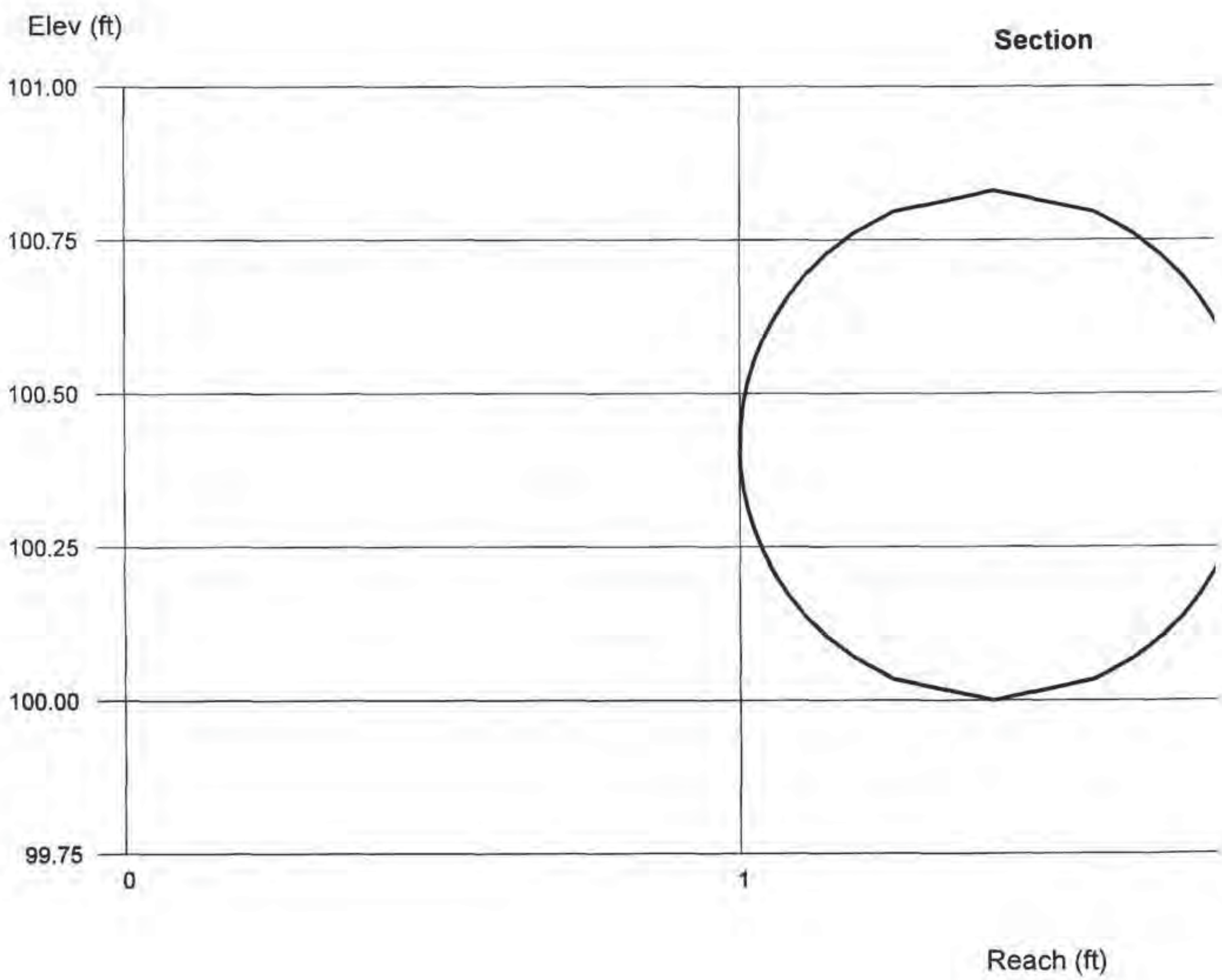
<Name>

Circular
Diameter (ft) = 0.83

Invert Elev (ft) = 100.00
Slope (%) = 1.00
N-Value = 0.012

Calculations
Compute by: Q vs Depth
No. Increments = 10

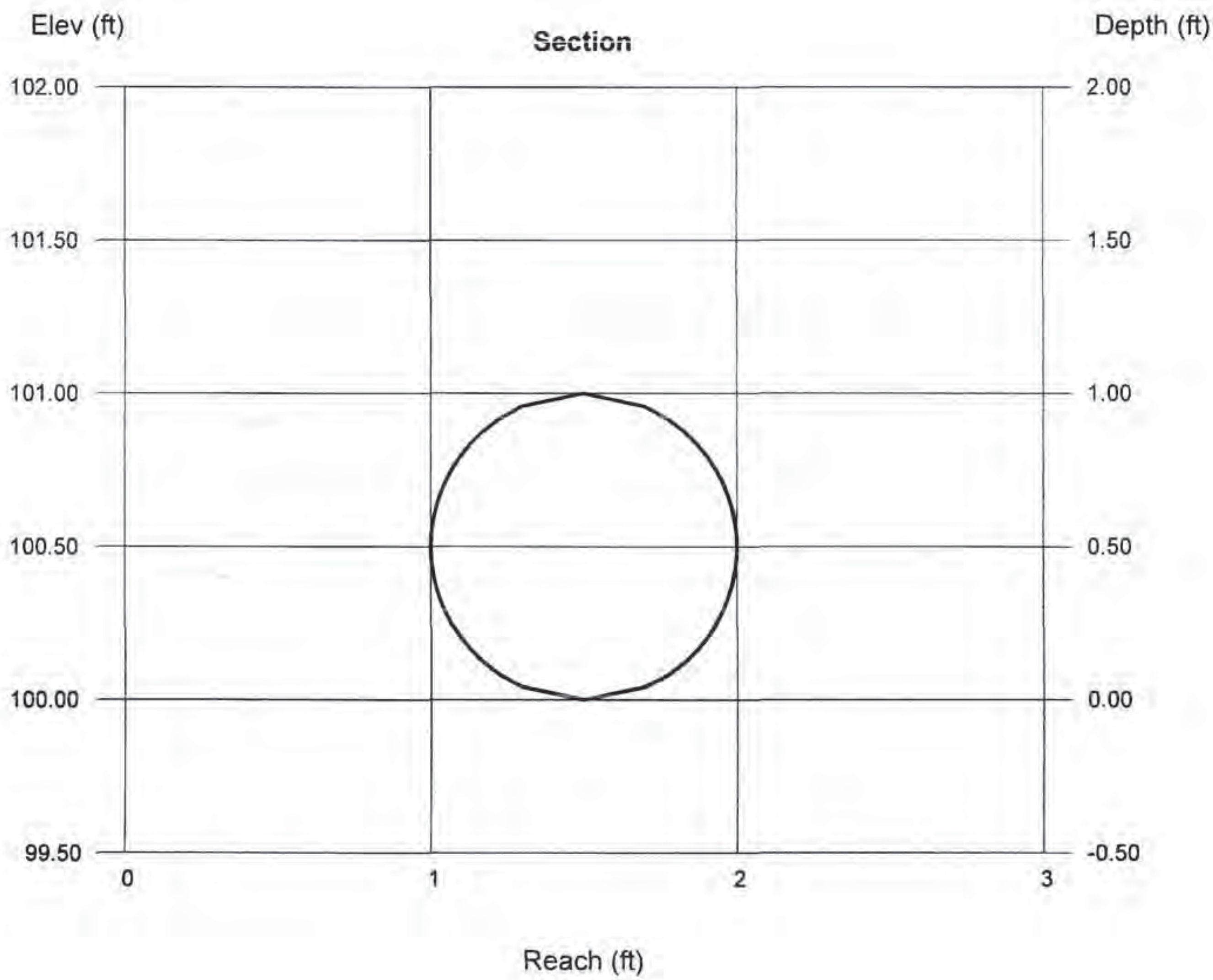
Highlighted
Depth (ft) = 0.83
Q (cfs) = 2.347
Area (sqft) = 0.54
Velocity (ft/s) = 4.34
Wetted Perim (ft) = 2.61
Crit Depth, Yc (ft) = 0.69
Top Width (ft) = 0.00
EGL (ft) = 1.12



Channel Report

<Name>

Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 1.00
		Q (cfs)	= 4.725
		Area (sqft)	= 0.79
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 6.02
Slope (%)	= 1.50	Wetted Perim (ft)	= 3.14
N-Value	= 0.012	Crit Depth, Yc (ft)	= 0.91
		Top Width (ft)	= 0.00
Calculations		EGL (ft)	= 1.56
Compute by:	Q vs Depth		
No. Increments	= 10		



Outlet Protection Calculations

Project: Proposed Residential Apartments By: MCB Date: 9/17/2021
Location: Avon, CT Checked: Date:
Outlet I.D. **FES 1**

*Based on Connecticut DOT Drainage Manual, Section 11.13

Description:
FES 1

Design Criteria (100-yr Storm Event):

Q (cfs) =	11.25	R_p (ft)=	1.5
D (in) =	18	S_p (ft) =	1.5
V (fps) =	6.68	Tw (ft)=	1.5

Q= Flow rate at discharge point in cubic feet per second (cfs)
D= Outlet pipe diameter (in)
V= Flow velocity at discharge point (ft/s)
R_p= Maximum inside pipe rise (ft)
S_p= inside diametere for circular sections of maximum inside pipe span for non-circular sections (ft)
T_w= Tailwater depth (ft)

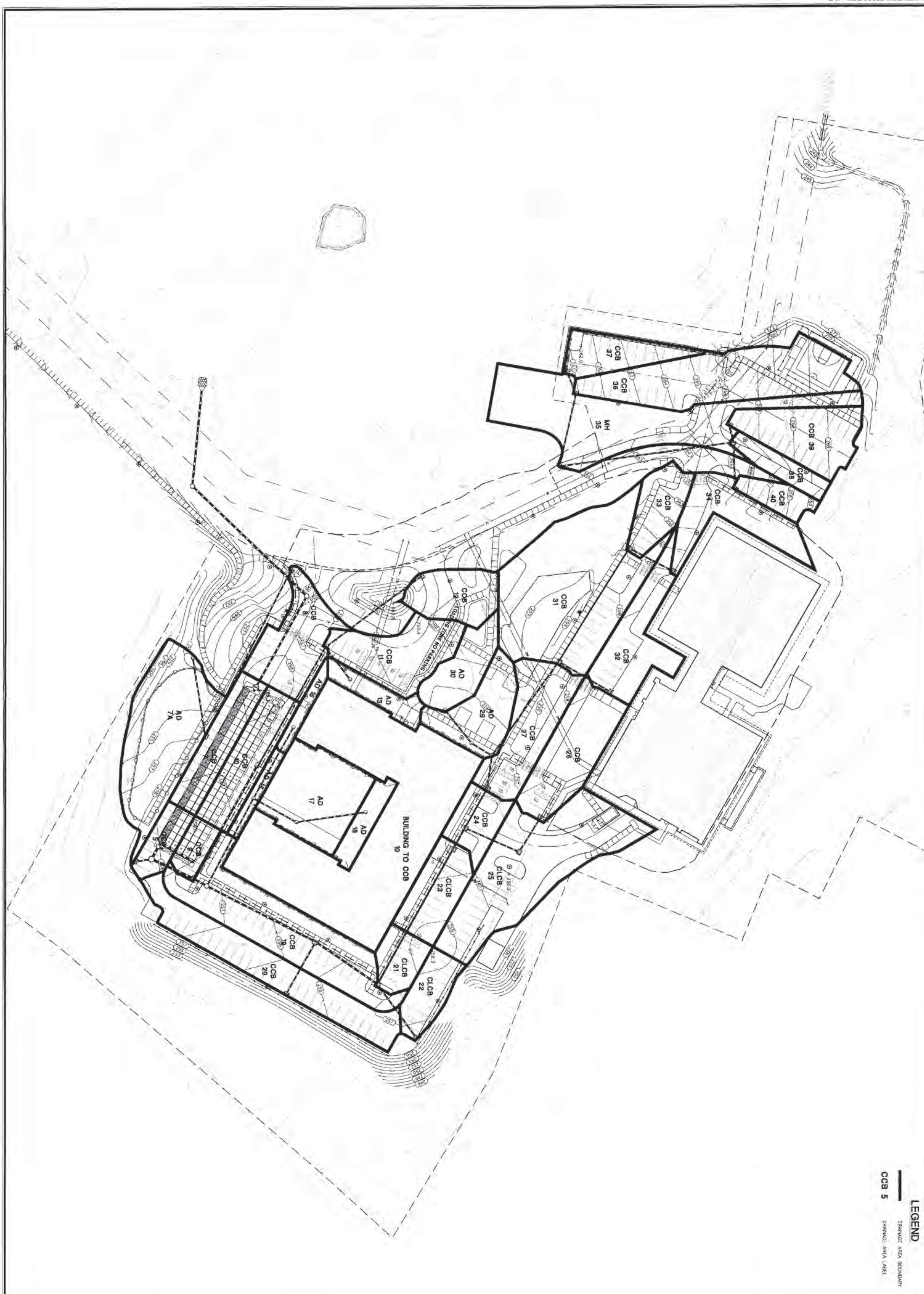
Based on **Table 11.13.1**, A *Preformed Scour Hole* is used *One Half Pipe Rise Depression (Type I)*

Rip Rap Stone Size:

D_{50} Computed (ft)	Rip Rap Specification	D_{50} Stone Size Required
0.122	Modified	5 inches

Prefomed Scour Hole Dimensions:

$F = 0.5(R_p)$	=	0.75 ft
$C = 3.0(S_p)+6.0(F)$	=	9ft
$B = 2.0(S_p)+6.0(F)$	=	8ft
d (Depth of Stone)	=	12 inches



DRAINAGE AREA MAP - STORM DRAINAGE SYSTEM

PROPOSED RESIDENTIAL APARTMENTS

20 SECURITY DRIVE
AVON, CONNECTICUT

DESCRIPTION	DATE	BY

SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

DESIGNED MCB
DRAWN AWG
CHECKED TD
SCALE 1"=60'
DATE SEPTEMBER 17, 2021
PROJECT NO. 20237.00001
SHEET NO. 1 OF 1
SHEET NAME CB

SLR

APPENDIX E

WATER QUALITY COMPUTATIONS

Drainage Report

Beacon Communities, LLC

2 Center Plaza, Suite 700

Boston, Massachusetts 02108

September 17, 2021

	SLR Consulting	Project	**20237.00001**
	COMPUTATION SHEET - WATER QUALITY FLOW (WQF)	Made By:	MCB
Subject:	**Proposed Residential Apartments**	Date:	8/30/2021
		Chkd by:	
		Date:	

CDS Unit - MH 4

Contributing Basins	Imperv. Area (acres)	Total Area (acres)
Total	2.89	4.29

Table 4.1: WQV = $(P)(R_v)(A)/12$ =	0.235	acre-feet	
Where:			
I = % of Impervious Cover =	67%		
R_v = volumetric runoff coeff. 0.05 + 0.009(I) =	0.656		
P = design precipitation (1.0" for water quality storm) =	1	inch	
A = site area (acres) =	4.29	acres =	0.0067 miles^2

Q = runoff depth (in watershed inches) = [WQV(acrefeet)]*[12(inches/foot)]/drainage area (acres)

Q = 0.656

$CN = 1000 / [10+ 5P + 10Q -10(Q^2 + 1.25QP)^{0.5}]$ = 96

Where:

Q = runoff depth (in watershed inches)

t_c = 0.166 hours

Type III Rainfall Distribution:			
From Table 4-1, Ia = (TR-55)	0.062	Ia/P =	0.062
From Exhibit 4-III, q_u = (TR-55)	650 csm/in.		
WQF = (qu)(A)(Q) =	2.86 cfs		**CDS 2025-5-C Flow = 3.2 cfs -> OK**

MH 4

2. Compute the time of concentration (t_c) based on the methods described in Chapter 3 of TR-55. A minimum value of 0.167 hours (10 minutes) should be used. For sheet flow, the flow path should not be longer than 300 feet.

3. Using the computed CN, t_c, and drainage area (A) in acres, compute the peak discharge for the water quality storm (i.e., the water quality flow [WQF]), based on the procedures described in Chapter 4 of TR-55.

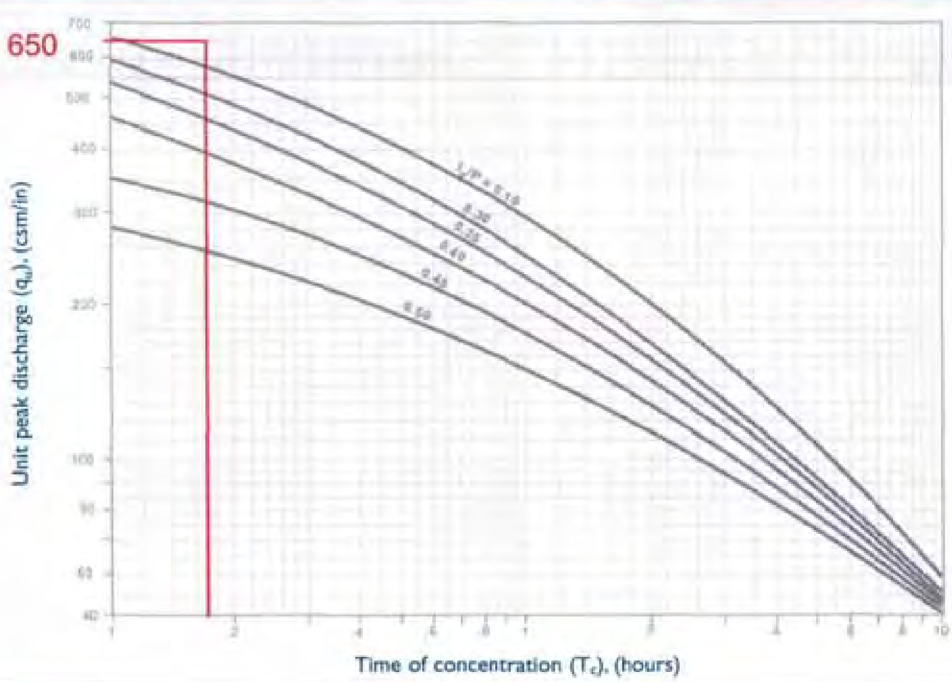
❍ *Read initial abstraction (I_a) from Table 4-1 in Chapter 4 of TR-55 (reproduced below); compute I_a/P*

Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)	Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	55	1.636	70	0.857	85	0.353
41	2.878	56	1.571	71	0.817	86	0.326
42	2.762	57	1.509	72	0.778	87	0.299
43	2.651	58	1.448	73	0.740	88	0.273
44	2.545	59	1.390	74	0.703	89	0.247
45	2.444	60	1.333	75	0.667	90	0.222
46	2.348	61	1.279	76	0.632	91	0.198
47	2.255	62	1.226	77	0.597	92	0.174
48	2.167	63	1.175	78	0.564	93	0.151
49	2.082	64	1.125	79	0.532	94	0.128
50	2.000	65	1.077	80	0.500	95	0.105
51	1.922	66	1.030	81	0.469	96	0.083
52	1.846	67	0.985	82	0.439	97	0.062
53	1.774	68	0.941	83	0.410	98	0.041
54	1.704	69	0.899	84	0.381		

❍ *Read the unit peak discharge (q_u) from Exhibit 4-III in Chapter 4 of TR-55 (reproduced below) for appropriate t_c*

Exhibit 4-III Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution



	SLR Consulting					Project	**20237.00001**
	COMPUTATION SHEET - WATER QUALITY FLOW (WQF)					Made By:	MCB
Subject:	**Proposed Residential Apartments**					Date:	8/30/2021
						Chkd by:	
						Date:	

CDS Unit - MH 42

Contributing Basins		Imperv. Area (acres)	Total Area (acres)				
Total		0.66	0.93				

Table 4.1: WQV = (P)(R_v)(A)/12 =			0.053	acre-feet			
Where:							
I = % of Impervious Cover =			71%				
R_v = volumetric runoff coeff. 0.05 + 0.009(I) =			0.689				
P = design precipitation (1.0" for water quality storm) =				1	inch		
A = site area (acres) =			0.93	acres =	0.0015	miles^2	
Q = runoff depth (in watershed inches) = [WQV(acrefeet)]*[12(inches/foot)]/drainage area (acres)							
		Q =	0.689				
CN = 1000 / [10+ 5P + 10Q -10(Q^2 + 1.25QP)$^{0.5}$] =				97			
Where:							
Q = runoff depth (in watershed inches)							
		t_c =	0.1	hours			
Type III Rainfall Distribution:							
From Table 4-1, Ia =	0.062		Ia/P =	0.062			
(TR-55)							
From Exhibit 4-III, q_u =	700	csm/in.					
(TR-55)							
WQF = (qu)(A)(Q) =	0.70	cfs		**CDS 2015-4-C Flow = 1.4 cfs -> OK**			

MH 42

2. Compute the time of concentration (t_c) based on the methods described in Chapter 3 of TR-55. A minimum value of 0.167 hours (10 minutes) should be used. For sheet flow, the flow path should not be longer than 300 feet.

3. Using the computed CN, t_c, and drainage area (A) in acres, compute the peak discharge for the water quality storm (i.e., the water quality flow [WQF]), based on the procedures described in Chapter 4 of TR-55.

   - *Read initial abstraction (I_a) from Table 4-1 in Chapter 4 of TR-55 (reproduced below); compute I_a/P*

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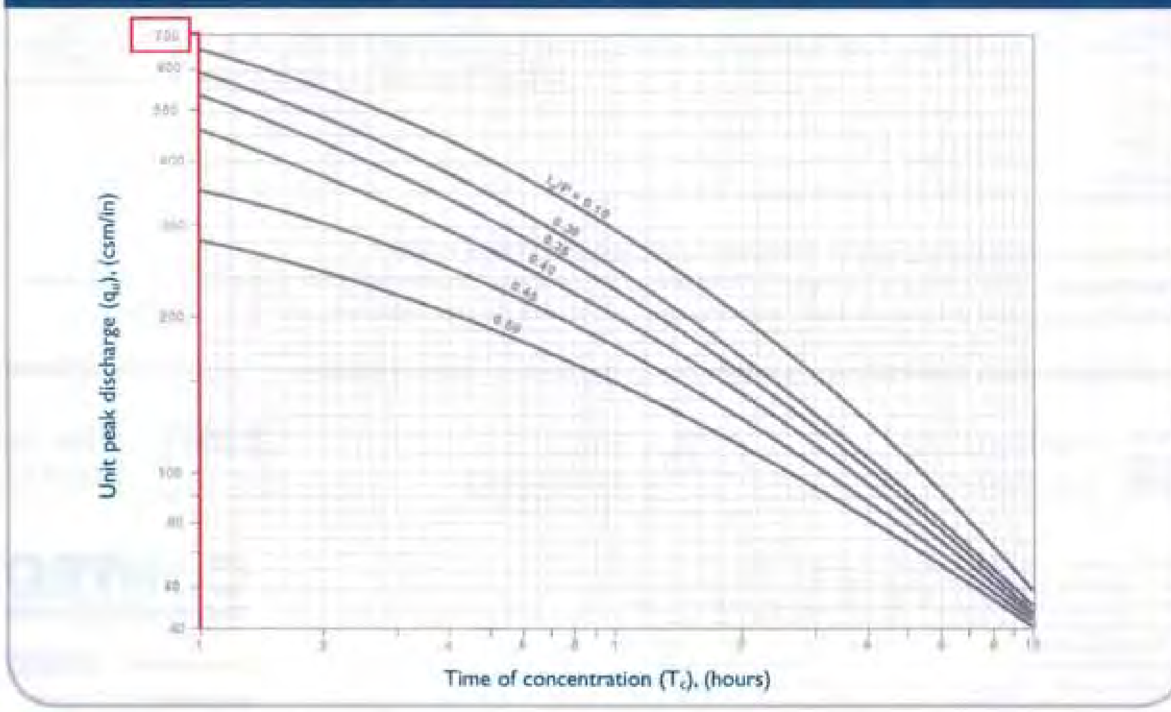
41	2.878	56	1.571	71	0.817	86	0.326
42	2.762	57	1.509	72	0.778	87	0.299
43	2.651	58	1.448	73	0.740	88	0.273
44	2.545	59	1.390	74	0.703	89	0.247
45	2.444	60	1.333	75	0.667	90	0.222
46	2.348	61	1.279	76	0.632	91	0.198
47	2.255	62	1.226	77	0.597	92	0.174
48	2.167	63	1.175	78	0.564	93	0.151
49	2.082	64	1.125	79	0.532	94	0.128
50	2.000	65	1.077	80	0.500	95	0.105
51	1.922	66	1.030	81	0.469	96	0.083
52	1.846	67	0.985	82	0.439	97	0.062
53	1.774	68	0.941	83	0.410	98	0.041
54	1.704	69	0.899	84	0.381		

   - *Read the unit peak discharge (q_u) from Exhibit 4-III in Chapter 4 of TR-55 (reproduced below) for appropriate t_c*

Exhibit 4-III Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution



Product Flow Rates

CASCADE

Model	Treatment Rate (cfs)	Sediment Capacity[1] (CF)
CS-4	2.00	19
CS-5	3.50	29
CS-6	5.60	42
CS-8	12.00	75
CS-10	18.00	118

CDS

Model	Treatment Rate[2] (cfs)	Sediment Capacity[1] (CF)
1515-3	1.00	14
2015-4	1.40	25
2015-5	1.40	39
2015-6	1.40	57
2020-5	2.20	39
2020-6	2.20	57
2025-5	3.20	39
2025-6	3.20	57
3020-6	3.90	57
3025-6	5.00	57
3030-6	5.70	57
3035-6	6.50	57
4030-8	7.50	151
4040-8	9.50	151

VORTECHS

Model	Treatment Rate (cfs)	Sediment Capacity[3] (CF)
1000	1.60	16
2000	2.80	32
3000	4.50	49
4000	6.00	65
5000	8.50	86
7000	11.00	108
9000	14.00	130
11000	17.5	151
16000	25	192

STORMCEPTOR STC

Model	Treatment Rate (cfs)	Sediment Capacity[1] (CF)
STC 450i	0.40	46
STC 900	0.89	89
STC 2400	1.58	205
STC 4800	2.47	543
STC 7200	3.56	839
STC 11000	4.94	1086
STC 16000	7.12	1677

1 *Additional sediment storage capacity available – Check with your local representative for information.*

2 *Treatment Capacity is based on laboratory testing using OK-110 (average D50 particle size of approximately 100 microns) and a 2400 micron screen.*

3 *Maintenance recommended when sediment depth has accumulated to within 12-18 inches of the dry weather water surface elevation.*

STORMWATER SOLUTIONS

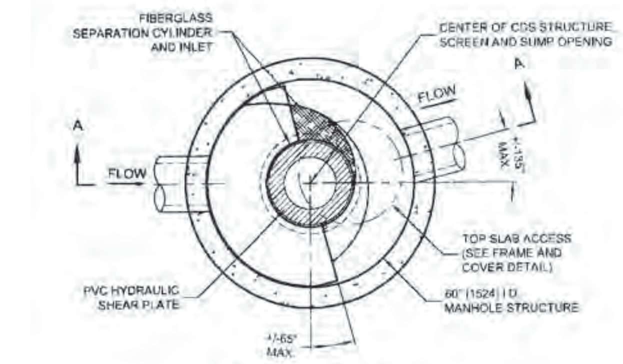
PIPE SOLUTIONS

STRUCTURES SOLUTIONS

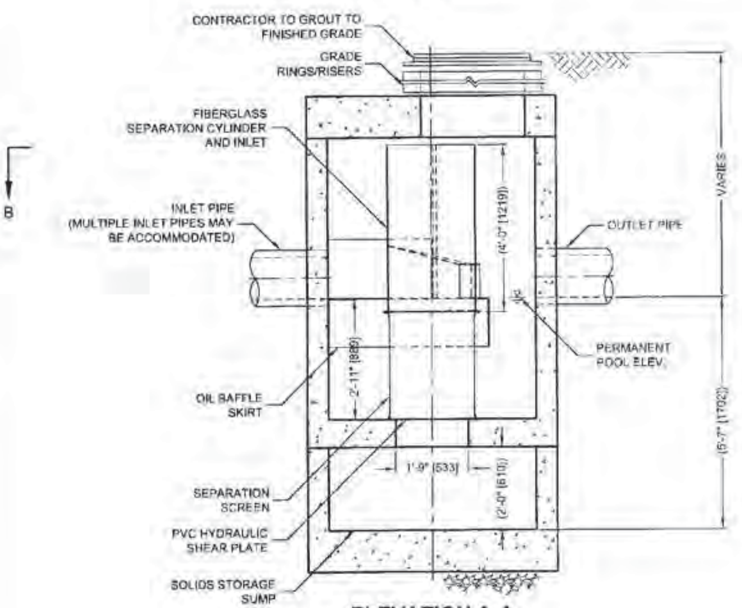
CONTECH ENGINEERED SOLUTIONS

Get social with us:

800-338-1122 | www.ContechES.com



PLAN VIEW B-B
N.T.S.

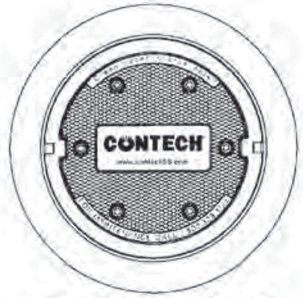


ELEVATION A-A
N.T.S.

CDS2025-5-C DESIGN NOTES

THE STANDARD CDS2025-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES:

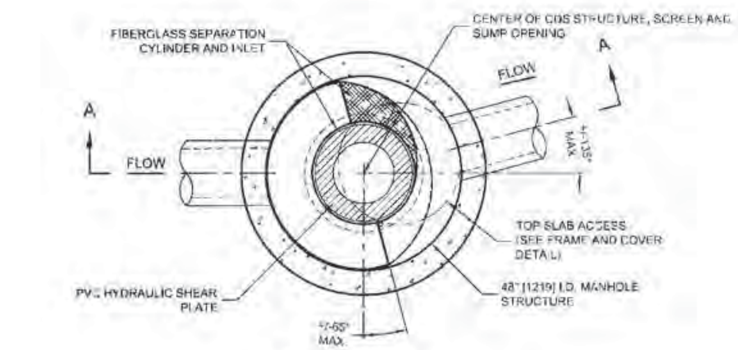
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES

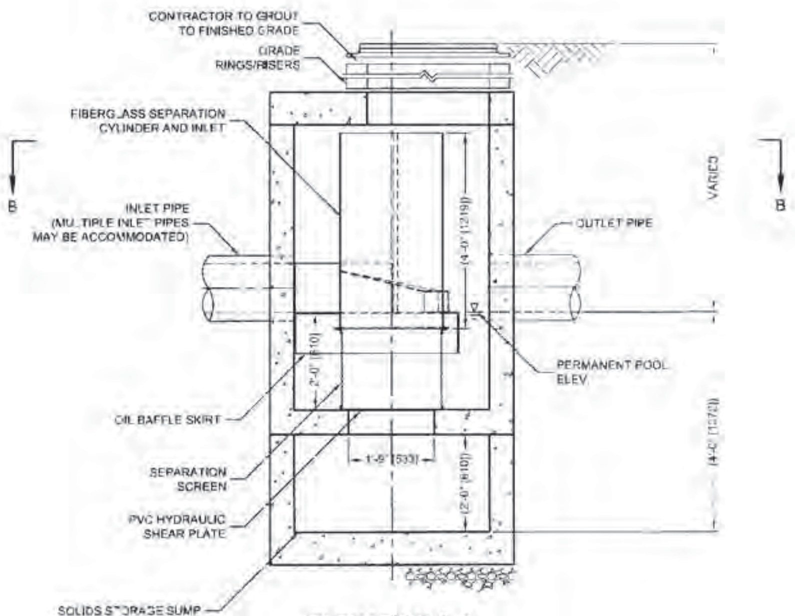
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS2025-5-C
INLINE CDS
STANDARD DETAIL



PLAN VIEW B-B
N.T.S.

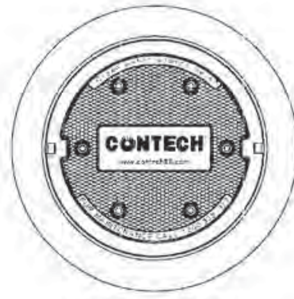


ELEVATION A-A
N.T.S.

CDS2015-4-C DESIGN NOTES

THE STANDARD CDS2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS2015-4-C
INLINE CDS
STANDARD DETAIL

CONTECH
ENGINEERED SOLUTIONS

CDS Guide
Operation, Design, Performance and Maintenance

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

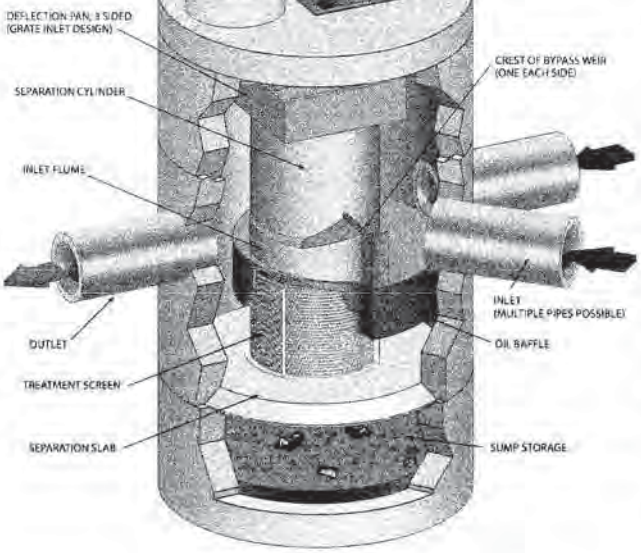
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

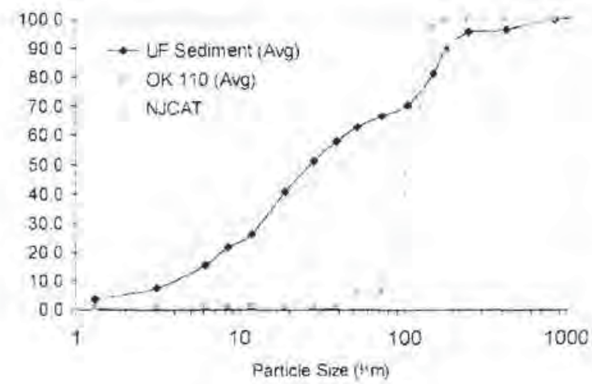


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

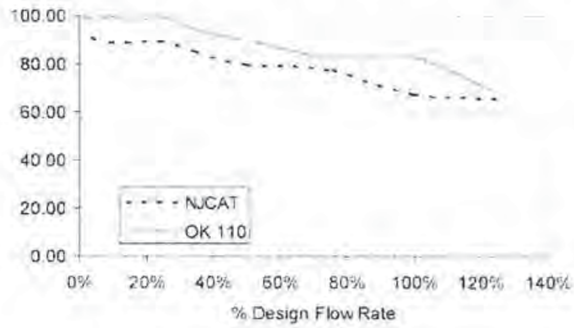


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

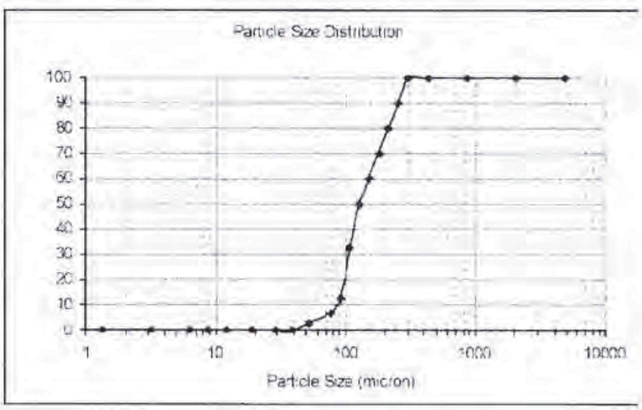


Figure 3. WASDOE PSD

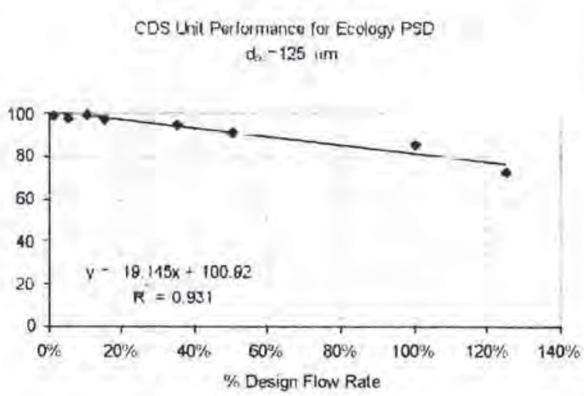


Figure 4. Modeled performance for WASDOE PSD.

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified

during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

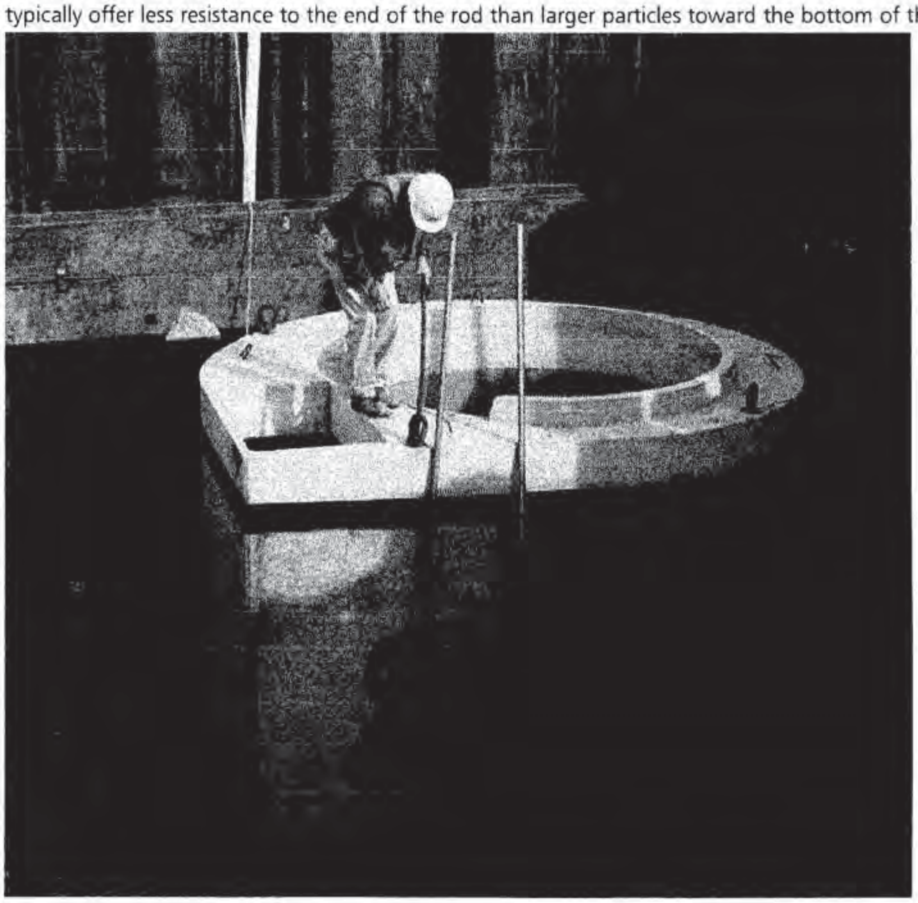
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be cleaned to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y³	m³
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: ____________________ Location: ____________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. *The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the* top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

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cds_manual 3/17 PDF

APPENDIX F

HYDROLOGIC ANALYSIS – INPUT COMPUTATIONS

Drainage Report

Beacon Communities, LLC

2 Center Plaza, Suite 700

Boston, Massachusetts 02108

September 17, 2021

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB   Date: 8/30/21   Checked: ____   Date: ____
Circle one: ***Present***   Developed   Watershed: EX WS10

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	Acres Sq. Ft. %	
A Soil	Woods - Good Condition	30			0.14	4.16
A Soil	Open Space - Good Condition	39			0.09	3.42
B Soil	Woods - Good Condition	55			0.01	0.56
B Soil	Open Space - Good Condition	61			2.22	135.60
N/A	Paved/Impervious	98			2.06	201.96
				Totals =	4.52	345.69
					(0.00706	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{345.69}{4.52}$$

Use CN = $\boxed{76}$

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ____ Date: ____
Circle one: ***Present*** Developed Watershed: EX WS11

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A Soil	Woods - Good Condition	30			0.15	4.59
A Soil	Open Space - Good Condition	39			0.06	2.39
B Soil	Woods - Good Condition	55			0.01	0.52
B Soil	Open Space - Good Condition	61			0.16	9.50
N/A	Paved/Impervious	98			0.16	15.43
				Totals =	0.54	32.42

(0.00084 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{32.42}{0.54}$ Use CN = 60

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ______ Date: ______
Circle one: ***Present*** Developed Watershed: EX WS20

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value 1/			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	Acres Sq. Ft. %	
A Soil	Woods - Good Condition	30			1.42	42.55
A Soil	Open Space - Good Condition	39			0.10	4.04
				Totals =	1.52	46.59
					(0.00238	sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{46.59}{1.52}$ Use CN = $\boxed{31}$

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ______ Date: ______
Circle one: ***Present*** Developed Watershed: EX WS30

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1]			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	Acres / Sq. Ft. / %	
A Soil	Woods - Good Condition	30			1.57	46.96
A Soil	Open Space - Good Condition	39			0.14	5.64
B Soil	Woods - Good Condition	55			1.21	66.38
B Soil	Open Space - Good Condition	61			0.60	36.66
N/A	Building	98			0.89	87.59
N/A	Paved/Impervious	98			0.86	84.73
				Totals =	5.28	327.96
					(0.00824	sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{327.96}{5.28}$ Use CN = $\boxed{62}$

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ______ Date: ______
Circle one: ***Present*** Developed Watershed: EX WS40

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	Acres Sq. Ft. %	
A Soil	Woods - Good Condition	30			1.07	32.24
A Soil	Open Space - Good Condition	39			0.03	1.16
B Soil	Woods - Good Condition	55			0.08	4.59
B Soil	Open Space - Good Condition	61			0.06	3.85
				Totals =	1.25	41.84

(0.00195 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{41.84}{1.25}$ Use CN = $\boxed{33}$

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ________ Date: ________
Circle one: Present ***Developed*** Watershed: PR WS10

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A Soil	Woods - Good Condition	30			0.003	0.08
A Soil	Open Space - Good Condition	39			0.02	0.59
B Soil	Woods - Good Condition	55			0.001	0.06
B Soil	Open Space - Good Condition	61			1.05	64.23
N/A	Paved/Impervious	98			1.11	109.01
				Totals =	2.18	173.95
					(0.00341	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{173.95}{2.18} \quad \text{Use CN} = \boxed{80}$$

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ____________ Date: ____________
Circle one: Present ***Developed*** Watershed: PR WS11

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1]			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	Acres / Sq. Ft. / %	
A Soil	Woods - Good Condition	30			0.02	0.68
A Soil	Open Space - Good Condition	39			0.20	7.72
B Soil	Open Space - Good Condition	61			0.10	6.33
N/A	Paved/Impervious	98			0.25	24.61
				Totals =	0.58	39.34
					(0.00090	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{39.34}{0.58}$$

Use CN = 68

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ________ Date: ________
Circle one: Present **_Developed_** Watershed: PR WS12

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A Soil	Open Space - Good Condition	39			0.19	7.51
A Soil	Gravel	76			0.15	11.08
B Soil	Woods - Good Condition	55			0.00	0.24
B Soil	Open Space - Good Condition	61			1.05	64.28
N/A	Paved/Impervious	98			2.26	221.85
N/A	Proposed Building	98			0.63	61.96
				Totals =	4.29	366.92
					(0.00671	sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{366.92}{4.29}$ Use CN = 85

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ________ Date: ________
Circle one: Present **Developed** Watershed: PR WS20

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1]			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	Acres Sq. Ft. %	
A Soil	Woods - Good Condition	30			0.70	20.99
A Soil	Open Space - Good Condition	39			0.19	7.25
				Totals =	0.89	28.24
					(0.00138	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{28.24}{0.89}$$

Use CN = **32**

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ______ Date: ______
Circle one: Present ***Developed*** Watershed: PR WS30

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	Acres Sq. Ft. %	
A Soil	Woods - Good Condition	30			1.36	40.76
A Soil	Open Space - Good Condition	39			0.22	8.61
B Soil	Woods - Good Condition	55			1.12	61.61
B Soil	Open Space - Good Condition	61			0.44	26.78
N/A	Existing Building	98			0.89	87.59
N/A	Proposed Building	98			0.01	1.01
N/A	Paved/Impervious	98			0.06	5.51
					Totals = 4.10	231.88

(0.00640 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{231.88}{4.10}$$

Use CN = 57

SLR

Curve Number Calculations

Project: Proposed Residential Apartments
Location: 20 Security Drive
Avon, Connecticut
By: MCB Date: 8/30/21 Checked: ______ Date: ______
Circle one: Present ***Developed*** Watershed: PR WS40

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A Soil	Woods - Good Condition	30			0.99	29.73
A Soil	Open Space - Good Condition	39			0.04	1.45
B Soil	Woods - Good Condition	55			0.05	2.61
B Soil	Open Space - Good Condition	61			0.02	1.22
				Totals =	1.10	35.00
					(0.00171	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{35.00}{1.10}$$

Use CN = $\boxed{32}$

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development — By: MCB — Date: 08/30/21
Location: Avon, Connecticut — Checked: — Date:
Circle one: ***Present*** Developed — Watershed: EX WS10
Circle one: ***T_c*** T_t — Subwatershed:

Sheet flow (applicable to T_c only)

		Segment ID		
			A-B	
1. Surface description (Table 3-1)			WOODS	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.400	
3. Flow Length, L (< 300ft)	ft.		66.0	
4. Two-year 24-hr rainfall, P_2	in.		3.38	
5. Land slope, s	ft./ft.		0.011	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.		0.317	= 0.317

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID					
		B-C	C-D				
7. Surface description		GRASS	BIT				
8. Manning's roughness coeff., n		0.080	0.011				
9. Paved or unpaved		UNPVD	PVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40	0.20				
11. Flow Length, L	ft.	44.0	300.0				
12. Watercourse slope, s	ft./ft.	0.011	0.021				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	1.06	6.71				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.012	+ 0.012			=	0.024

Channel flow

		Segment ID					
		D-E	E-F				
15. Channel Bottom width, b	ft.	15" RCP	24" RCP				
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	-	-				
17. Depth of flow, d	ft.	FULL	FULL				
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$	1.23	3.14				
19. Wetted perimeter, P_w	ft.	3.93	6.24				
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.31	0.50				
21. Channel slope, s	ft./ft.	0.082	0.01				
22. Manning's roughness coeff., n		0.013	0.013				
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	15.13	7.25				
24. Flow length, L	ft.	209.0	137.0				
25. $T_t = \frac{L}{3600 * V}$	hr.	0.004	+ 0.005			=	0.009
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)						hr.	0.350

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development By: MCB Date: 08/30/21
Location: Avon, Connecticut Checked: Date:
Circle one: ***Present*** Developed Watershed: EX WS11
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

	Segment ID	A-B	
1. Surface description (Table 3-1)		GRASS	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240	
3. Flow Length, L (< 300ft)	ft.	80.0	
4. Two-year 24-hr rainfall, P_2	in.	3.38	
5. Land slope, s	ft./ft.	0.088	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.107	= 0.107

Shallow concentrated flow (assume hyd. radius = depth of flow)

	Segment ID	B-C				
7. Surface description		BIT				
8. Manning's roughness coeff., n		0.011				
9. Paved or unpaved		PVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.20				
11. Flow Length, L	ft.	395.0				
12. Watercourse slope, s	ft./ft.	0.043				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	9.61				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.011	+			= 0.011

Channel flow

	Segment ID					
15. Channel Bottom width, b	ft.					
16. Horizontal side slope component, z (z horiz:1 vert)	ft.					
17. Depth of flow, d	ft.					
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$					
19. Wetted perimeter, P_w	ft.					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.					
21. Channel slope, s	ft./ft.					
22. Manning's roughness coeff., n						
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.					
24. Flow length, L	ft.					
25. $T_t = \frac{L}{3600 * V}$	hr.					= 0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.					0.118

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development By: MCB Date: 08/30/21
Location: Avon, Connecticut Checked: Date:
Circle one: ***Present*** Developed Watershed: EX WS 20
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		A-B	
1. Surface description (Table 3-1)		WOODS	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.400	
3. Flow Length, L (< 300ft)	ft.	100.0	
4. Two-year 24-hr rainfall, P_2	in.	3.38	
5. Land slope, s	ft./ft.	0.015	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.391	= 0.391

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		B-C				
7. Surface description		WOODS				
8. Manning's roughness coeff., n		0.100				
9. Paved or unpaved		UNVPD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40				
11. Flow Length, L	ft.	218.0				
12. Watercourse slope, s	ft./ft.	0.064				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	2.05				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.030	+			= 0.030

Channel flow

Segment ID						
15. Channel Bottom width, b	ft.					
16. Horizontal side slope component, z (z horiz:1 vert)	ft.					
17. Depth of flow, d	ft.					
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$					
19. Wetted perimeter, P_w	ft.					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.					
21. Channel slope, s	ft./ft.					
22. Manning's roughness coeff., n						
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.					
24. Flow length, L	ft.					
25. $T_t = \frac{L}{3600 * V}$	hr.					= 0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.					0.420

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development By: MCB Date: 08/30/21
Location: Avon, Connecticut Checked: Date:
Circle one: ***Present*** Developed Watershed: EX WS 30
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

		Segment ID	A-B
1.	Surface description (Table 3-1)		WOODS
2.	Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.400
3.	Flow Length, L (< 300ft)	ft.	100.0
4.	Two-year 24-hr rainfall, P_2	in.	3.38
5.	Land slope, s	ft./ft.	0.050
6.	$T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.	0.241 = 0.241

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID	B-C				
7.	Surface description		WOODS				
8.	Manning's roughness coeff., n		0.100				
9.	Paved or unpaved		UNPVD				
10.	Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40				
11.	Flow Length, L	ft.	53.0				
12.	Watercourse slope, s	ft./ft.	0.226				
13.	Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	3.85				
14.	$T_t = \frac{L}{3600 * V}$	hr.	0.004	+			= 0.004

Channel flow

		Segment ID					
15.	Channel Bottom width, b	ft.					
16.	Horizontal side slope component, z (z horiz:1 vert)	ft.					
17.	Depth of flow, d	ft.					
18.	Cross sectional flow area, A (assume trapazoidal)	$ft.^2$					
19.	Wetted perimeter, P_w	ft.					
20.	Hydraulic Radius, $R = \frac{A}{P_w}$	ft.					
21.	Channel slope, s	ft./ft.					
22.	Manning's roughness coeff., n						
23.	$V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.					
24.	Flow length, L	ft.					
25.	$T_t = \frac{L}{3600 * V}$	hr.					= 0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.245

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development — By: MCB — Date: 08/30/21
Location: Avon, Connecticut — Checked: — Date:
Circle one: ***Present*** Developed — Watershed: EX WS 40
Circle one: T_c T_t — Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		A-B	
1. Surface description (Table 3-1)		WOODS	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.400	
3. Flow Length, L (< 300ft)	ft.	100.0	
4. Two-year 24-hr rainfall, P_2	in.	3.38	
5. Land slope, s	ft./ft.	0.070	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.211	= 0.211

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		B-C				
7. Surface description		WOODS				
8. Manning's roughness coeff., n		0.100				
9. Paved or unpaved		UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40				
11. Flow Length, L	ft.	14.0				
12. Watercourse slope, s	ft./ft.	0.143				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	3.06				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.001	+			= 0.001

Channel flow

Segment ID						
15. Channel Bottom width, b	ft.					
16. Horizontal side slope component, z (z horiz:1 vert)	ft.					
17. Depth of flow, d	ft.					
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$					
19. Wetted perimeter, P_w	ft.					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.					
21. Channel slope, s	ft./ft.					
22. Manning's roughness coeff., n						
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.					
24. Flow length, L	ft.					
25. $T_t = \frac{L}{3600 * V}$	hr.					= 0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.212

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development — By: MCB — Date: 08/30/21
Location: Avon, Connecticut — Checked: — Date:
Circle one: Present **_Developed_** — Watershed: PR WS10
Circle one: _T_c_ T_t — Subwatershed:

Sheet flow (applicable to T_c only)

	Units					
Segment ID		A-B				
1. Surface description (Table 3-1)		GRASS				
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240				
3. Flow Length, L (< 300ft)	ft.	72.0				
4. Two-year 24-hr rainfall, P_2	in.	3.38				
5. Land slope, s	ft./ft.	0.069				
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.108	= 0.108			

Shallow concentrated flow (assume hyd. radius = depth of flow)

	Units					
Segment ID		B-C				
7. Surface description		BIT				
8. Manning's roughness coeff., n		0.011				
9. Paved or unpaved		PVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.20				
11. Flow Length, L	ft.	492.0				
12. Watercourse slope, s	ft./ft.	0.049				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	10.25				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.013	+			= 0.013

Channel flow

	Units					
Segment ID		C-D				
15. Channel Bottom width, b	ft.	24" RCP				
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	-				
17. Depth of flow, d	ft.	FULL				
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$	3.14				
19. Wetted perimeter, P_w	ft.	6.24				
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.50				
21. Channel slope, s	ft./ft.	0.0095				
22. Manning's roughness coeff., n		0.013				
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	7.07				
24. Flow length, L	ft.	105.0				
25. $T_t = \frac{L}{3600 * V}$	hr.	0.004				= 0.004

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.126

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project:	Proposed Residential Development	By:	MCB	Date:	08/30/21
Location:	Avon, Connecticut	Checked:		Date:	
Circle one:	Present **_Developed_**	Watershed:	PR WS11		
Circle one:	**_T_c_** T_t	Subwatershed:			

Sheet flow (applicable to T_c only)

	Units	Segment ID: A-B	
1. Surface description (Table 3-1)		GRASS	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240	
3. Flow Length, L (< 300ft)	ft.	61.0	
4. Two-year 24-hr rainfall, P_2	in.	3.38	
5. Land slope, s	ft./ft.	0.210	
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.	0.061	= 0.061

Shallow concentrated flow (assume hyd. radius = depth of flow)

	Units	Segment ID: B-C				
7. Surface description		BIT				
8. Manning's roughness coeff., n		0.015				
9. Paved or unpaved		PVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.20				
11. Flow Length, L	ft.	268.0				
12. Watercourse slope, s	ft./ft.	0.083				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	9.79				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.008	+			= 0.008

Channel flow

	Units	Segment ID				
15. Channel Bottom width, b	ft.					
16. Horizontal side slope component, z (z horiz:1 vert)	ft.					
17. Depth of flow, d	ft.					
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$					
19. Wetted perimeter, P_w	ft.					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.					
21. Channel slope, s	ft./ft.					
22. Manning's roughness coeff., n						
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.					
24. Flow length, L	ft.					
25. $T_t = \frac{L}{3600 * V}$	hr.					= 0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) ~~0.068~~ hr.

Min Tc = 0.1 hr

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development — By: MCB — Date: 08/30/21
Location: Avon, Connecticut — Checked: ______ — Date: ______
Circle one: Present ***Developed*** — Watershed: PR WS12
Circle one: ***T_c*** T_t — Subwatershed: ______

Sheet flow (applicable to T_c only)

Segment ID		A-B	
1. Surface description (Table 3-1)		GRASS	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240	
3. Flow Length, L (< 300ft)	ft.	79.0	
4. Two-year 24-hr rainfall, P_2	in	3.38	
5. Land slope, s	ft./ft.	0.070	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.116	= 0.116

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		B-C	C-D			
7. Surface description		GRASS	BIT			
8. Manning's roughness coeff., n		0.080	0.011			
9. Paved or unpaved		UNPVD	PVD			
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40	0.20			
11. Flow Length, L	ft.	68.0	7.0			
12. Watercourse slope, s	ft./ft.	0.010	0.010			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	1.01	4.63			
14. $T_t = \frac{L}{3600 * V}$	hr.	0.019	+ 0.000			= 0.019

Channel flow

Segment ID		D-E	E-F			
15. Channel Bottom width, b	ft.	15" HDPE	24" HDPE			
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	-	-			
17. Depth of flow, d	ft.	FULL	FULL			
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$	1.23	3.14			
19. Wetted perimeter, P_w	ft.	3.93	6.24			
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.31	0.50			
21. Channel slope, s	ft./ft.	0.010	0.01			
22. Manning's roughness coeff., n		0.012	0.012			
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	5.72	7.86			
24. Flow length, L	ft.	389.0	400.0			
25. $T_t = \frac{L}{3600 * V}$	hr.	0.019	0.014			= 0.033

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.168

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development By: MCB Date: 08/30/21
Location: Avon, Connecticut Checked: ______ Date: ______
Circle one: Present ***Developed*** Watershed: PR WS20
Circle one: ***T_c*** T_t Subwatershed: ______

Sheet flow (applicable to T_c only)

	Units	Segment ID: A-B		
1. Surface description (Table 3-1)		WOODS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.400		
3. Flow Length, L (< 300ft)	ft.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.38		
5. Land slope, s	ft./ft.	0.030		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.296	=	0.296

Shallow concentrated flow (assume hyd. radius = depth of flow)

	Units	Segment ID: B-C				
7. Surface description		WOODS				
8. Manning's roughness coeff., n		0.100				
9. Paved or unpaved		UNVPD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40				
11. Flow Length, L	ft.	189.0				
12. Watercourse slope, s	ft./ft.	0.106				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	2.63				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.020	+			= 0.020

Channel flow

	Units	Segment ID				
15. Channel Bottom width, b	ft.					
16. Horizontal side slope component, z (z horiz:1 vert)	ft.					
17. Depth of flow, d	ft.					
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$					
19. Wetted perimeter, P_w	ft.					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.					
21. Channel slope, s	ft./ft.					
22. Manning's roughness coeff., n						
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.					
24. Flow length, L	ft.					
25. $T_t = \frac{L}{3600 * V}$	hr.					= 0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.316

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project:	Proposed Residential Development	By:	MCB	Date:	08/30/21
Location:	Avon, Connecticut	Checked:		Date:	
Circle one:	Present **Developed**	Watershed:	PR WS30		
Circle one:	T_c T_t	Subwatershed:			

Sheet flow (applicable to T_c only)

		Segment ID	A-B		
1. Surface description (Table 3-1)			WOODS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.400		
3. Flow Length, L (< 300ft)	ft.		100.0		
4. Two-year 24-hr rainfall, P_2	in.		3.38		
5. Land slope, s	ft./ft.		0.050		
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.		0.241	=	0.241

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID	B-C							
7. Surface description			WOODS							
8. Manning's roughness coeff., n			0.100							
9. Paved or unpaved			UNPVD							
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.		0.40							
11. Flow Length, L	ft.		53.0							
12. Watercourse slope, s	ft./ft.		0.226							
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.		3.85							
14. $T_t = \frac{L}{3600 * V}$	hr.		0.004	+					=	0.004

Channel flow

		Segment ID						
15. Channel Bottom width, b	ft.							
16. Horizontal side slope component, z (z horiz:1 vert)	ft.							
17. Depth of flow, d	ft.							
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$							
19. Wetted perimeter, P_w	ft.							
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.							
21. Channel slope, s	ft./ft.							
22. Manning's roughness coeff., n								
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.							
24. Flow length, L	ft.							
25. $T_t = \frac{L}{3600 * V}$	hr.						=	0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)							hr.	0.245

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Proposed Residential Development   By: MCB   Date: 08/30/21
Location: Avon, Connecticut   Checked: ______   Date: ______
Circle one: Present ***Developed***   Watershed: PR WS40
Circle one: ***T_c*** T_t Subwatershed: ______

Sheet flow (applicable to T_c only)

	Units	Segment ID: A-B	
1. Surface description (Table 3-1)		WOODS	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.400	
3. Flow Length, L (< 300ft)	ft.	81.0	
4. Two-year 24-hr rainfall, P_2	in.	3.38	
5. Land slope, s	ft./ft.	0.099	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.155	= 0.155

Shallow concentrated flow (assume hyd. radius = depth of flow)

	Units	Segment ID				
7. Surface description						
8. Manning's roughness coeff., n						
9. Paved or unpaved						
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.					
11. Flow Length, L	ft.					
12. Watercourse slope, s	ft./ft.					
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.					
14. $T_t = \frac{L}{3600 * V}$	hr.		+			= 0.000

Channel flow

	Units	Segment ID				
15. Channel Bottom width, b	ft.					
16. Horizontal side slope component, z (z horiz:1 vert)	ft.					
17. Depth of flow, d	ft.					
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$					
19. Wetted perimeter, P_w	ft.					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.					
21. Channel slope, s	ft./ft.					
22. Manning's roughness coeff., n						
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.					
24. Flow length, L	ft.					
25. $T_t = \frac{L}{3600 * V}$	hr.					= 0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)   hr.   0.155

SLR

NOAA Atlas 14, Volume 10, Version 3
Location name: Avon, Connecticut, USA*
Latitude: 41.809°, Longitude: -72.8357°
Elevation: 264.33 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.350 (0.269-0.451)	0.420 (0.323-0.541)	0.534 (0.409-0.690)	0.628 (0.478-0.817)	0.758 (0.560-1.03)	0.856 (0.620-1.19)	0.958 (0.676-1.39)	1.07 (0.719-1.60)	1.23 (0.798-1.91)	1.36 (0.863-2.16)
10-min	0.496 (0.382-0.639)	0.595 (0.457-0.767)	0.756 (0.579-0.978)	0.890 (0.678-1.16)	1.07 (0.793-1.46)	1.21 (0.879-1.69)	1.36 (0.957-1.97)	1.52 (1.02-2.26)	1.75 (1.13-2.70)	1.93 (1.22-3.05)
15-min	0.584 (0.449-0.751)	0.700 (0.538-0.902)	0.889 (0.681-1.15)	1.05 (0.797-1.36)	1.26 (0.933-1.72)	1.43 (1.03-1.99)	1.60 (1.13-2.32)	1.79 (1.20-2.66)	2.06 (1.33-3.18)	2.27 (1.44-3.59)
30-min	0.790 (0.608-1.02)	0.949 (0.729-1.22)	1.21 (0.925-1.56)	1.42 (1.08-1.85)	1.72 (1.27-2.34)	1.94 (1.41-2.71)	2.17 (1.53-3.15)	2.43 (1.63-3.62)	2.80 (1.81-4.33)	3.10 (1.96-4.90)
60-min	0.997 (0.766-1.28)	1.20 (0.920-1.54)	1.53 (1.17-1.98)	1.80 (1.37-2.34)	2.17 (1.61-2.96)	2.46 (1.78-3.43)	2.75 (1.94-3.98)	3.08 (2.07-4.59)	3.55 (2.30-5.48)	3.93 (2.48-6.20)
2-hr	1.29 (0.997-1.65)	1.54 (1.19-1.98)	1.96 (1.51-2.52)	2.31 (1.77-2.98)	2.78 (2.07-3.78)	3.13 (2.29-4.37)	3.51 (2.51-5.11)	3.96 (2.67-5.87)	4.63 (3.00-7.13)	5.19 (3.30-8.17)
3-hr	1.49 (1.16-1.89)	1.78 (1.38-2.27)	2.27 (1.76-2.90)	2.67 (2.06-3.44)	3.22 (2.41-4.38)	3.63 (2.67-5.06)	4.08 (2.93-5.94)	4.62 (3.11-6.83)	5.44 (3.54-8.38)	6.14 (3.91-9.65)
6-hr	1.87 (1.47-2.37)	2.27 (1.77-2.87)	2.91 (2.27-3.70)	3.45 (2.67-4.41)	4.18 (3.16-5.66)	4.72 (3.50-6.57)	5.32 (3.86-7.75)	6.06 (4.10-8.93)	7.21 (4.70-11.0)	8.22 (5.24-12.9)
12-hr	2.31 (1.82-2.90)	2.84 (2.23-3.57)	3.70 (2.91-4.68)	4.42 (3.45-5.63)	5.42 (4.11-7.30)	6.14 (4.58-8.51)	6.94 (5.07-10.1)	7.95 (5.40-11.7)	9.54 (6.24-14.6)	10.9 (6.99-17.0)
24-hr	2.68 (2.14-3.36)	3.38 (2.68-4.23)	4.51 (3.56-5.66)	5.44 (4.27-6.87)	6.73 (5.15-9.04)	7.67 (5.77-10.6)	8.71 (6.43-12.7)	10.1 (6.86-14.7)	12.3 (8.04-18.6)	14.2 (9.11-22.0)
2-day	3.01 (2.41-3.73)	3.86 (3.08-4.79)	5.24 (4.17-6.53)	6.39 (5.05-8.02)	7.97 (6.15-10.7)	9.11 (6.93-12.6)	10.4 (7.78-15.3)	12.2 (8.32-17.7)	15.1 (9.93-22.9)	17.7 (11.4-27.4)
3-day	3.28 (2.63-4.05)	4.21 (3.37-5.20)	5.73 (4.58-7.12)	7.00 (5.56-8.75)	8.74 (6.78-11.7)	10.00 (7.64-13.8)	11.4 (8.59-16.7)	13.4 (9.18-19.5)	16.7 (11.0-25.2)	19.7 (12.7-30.4)
4-day	3.52 (2.84-4.34)	4.52 (3.63-5.57)	6.14 (4.92-7.61)	7.50 (5.97-9.34)	9.35 (7.27-12.5)	10.7 (8.19-14.8)	12.2 (9.20-17.9)	14.3 (9.83-20.8)	17.8 (11.8-26.9)	21.0 (13.6-32.4)
7-day	4.21 (3.41-5.15)	5.33 (4.31-6.53)	7.16 (5.77-8.81)	8.67 (6.95-10.8)	10.8 (8.40-14.3)	12.3 (9.42-16.8)	14.0 (10.5-20.3)	16.3 (11.2-23.6)	20.2 (13.3-30.3)	23.6 (15.3-36.3)
10-day	4.90 (3.98-5.98)	6.08 (4.93-7.43)	8.01 (6.48-9.82)	9.61 (7.72-11.9)	11.8 (9.24-15.6)	13.4 (10.3-18.2)	15.2 (11.5-21.9)	17.6 (12.2-25.4)	21.6 (14.3-32.3)	25.1 (16.3-38.4)
20-day	7.07 (5.79-8.57)	8.30 (6.79-10.1)	10.3 (8.40-12.6)	12.0 (9.69-14.7)	14.3 (11.2-18.6)	16.0 (12.3-21.4)	17.8 (13.4-25.1)	20.2 (14.0-28.9)	23.9 (15.8-35.7)	27.2 (17.7-41.5)
30-day	8.90 (7.32-10.7)	10.1 (8.33-12.3)	12.2 (9.96-14.8)	13.9 (11.3-17.0)	16.2 (12.7-20.9)	17.9 (13.8-23.8)	19.8 (14.8-27.5)	22.0 (15.4-31.4)	25.4 (17.0-37.8)	28.3 (18.5-43.2)
45-day	11.2 (9.21-13.4)	12.4 (10.3-15.0)	14.5 (11.9-17.6)	16.3 (13.3-19.8)	18.7 (14.7-23.8)	20.5 (15.7-26.9)	22.4 (16.5-30.6)	24.4 (17.1-34.6)	27.3 (18.3-40.5)	29.7 (19.4-45.1)
60-day	13.0 (10.8-15.6)	14.4 (11.6-17.2)	16.5 (13.6-19.9)	18.3 (15.0-22.3)	20.8 (16.4-26.4)	22.8 (17.5-29.6)	24.7 (18.2-33.3)	26.6 (18.7-37.5)	29.0 (19.5-42.8)	30.8 (20.2-46.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

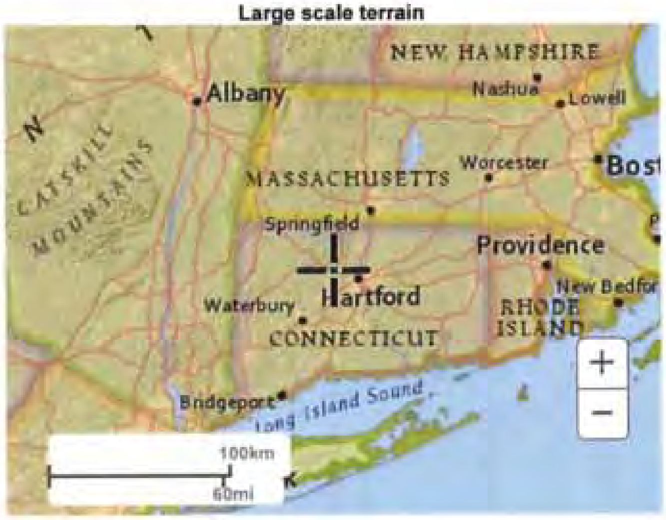
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Large scale terrain



Large scale map

Large scale aerial

KOZENY-CARMAN (1956) ANALYSES TO ESTIMATE SATURATED HYDRAULIC CONDUCIVITY OF CLEAN SANDS
PROJECT NAME: PROPOSED MULTIFAMILY RESIDENTIAL DEVELOPMENT
PROJECT LOCATION: AVON, CONNECTICUT

Boring No.	Sample Depth (ft.)	Lab Test No.	Corrected SPT "N-Value" (Blows/Ft.)	Relative Density (%)	Void Ratio (e)	Shape Factor	Effective Diameter (cm)	Saturated Hydraulic Conductivity (k) (cm/s)
SLR-2	S-5: 15'-17'	660-21	23	61	0.59	7	0.014	0.010
SLR-3	S-5: 15'-17'	661-21	12	44	0.65	7	0.016	0.018

Note: 1. Corrected SPT "N-Value" is equal to the average of Samples S-5 through S-7 for Boring SLR-2 and Samples S-6 and S-7 for Boring SLR-3.
2. Sieve size for "Pan" material based on extrapolation of gradation curve.

SLR-2 S-5: 15'-17'

emin. = 0.45 Temp. = 20°C
emax. = 0.80

Sieve No.	Sieve Size (cm)	Percent Passing	Percent Retained	Fraction of Particles Between Two Consectutive Sieves
3/4"	1.900	100.0	0.0	
1/4"	0.630	98.0	2.0	2.0
#4	0.475	96.5	3.5	1.5
#10	0.200	92.2	7.8	4.3
#40	0.0425	53.4	46.6	38.8
#100	0.015	29.8	70.2	23.6
#200	0.0075	17.2	82.8	12.6
Pan	0.0025	0.0	100.0	17.2

Fraction between:	3/4"	1/4"	2.03
Fraction between:	1/4"	#4	2.82
Fraction between:	#4	#10	15.13
Fraction between:	#10	#40	486.77
Fraction between:	#40	#100	1028.65
Fraction between:	#100	#200	1263.48
Fraction between:	#200	Pan	4387.62

D_{eff} 0.01391

SLR-3 S-5: 15'-17'

emin. = 0.45 Temp. = 20°C
emax. = 0.80

Sieve No.	Sieve Size (cm)	Percent Passing	Percent Retained	Fraction of Particles Between Two Consectutive Sieves
3/4"	1.900	100.0	0.0	
1/4"	0.630	98.5	1.5	1.5
#4	0.475	97.9	2.1	0.6
#10	0.200	91.8	8.2	6.1
#40	0.0425	47.1	52.9	44.7
#100	0.015	24.0	76.0	23.1
#200	0.0075	13.5	86.5	10.5
Pan	0.0025	0.0	100.0	13.5

Fraction between:	3/4"	1/4"	1.52
Fraction between:	1/4"	#4	1.13
Fraction between:	#4	#10	21.47
Fraction between:	#10	#40	560.79
Fraction between:	#40	#100	1006.86
Fraction between:	#100	#200	1052.90
Fraction between:	#200	Pan	3443.77

D_{eff} 0.01642

Kavg = (0.010 cm/s + 0.018 cm/s) / 2 = 0.014 cm/s

0.014 cm/sec * 1 in/2.54 cm * 3600 sec/hour = 19.8 in/hr

Factor of Safety of 2 => 19.8 in/hr * 50% = **9.9 in/hr**

GRAIN SIZE DISTRIBUTION TEST DATA

8/25/2021

Client: : SLR International Corporation Date: 08/19/2021
Project: : Multifamily Residential Development Avon, CT
Location: Onsite Date: 08/19/2021
Depth: 15' to 17' **Sample Number:** 660-21
Material Description: Reddish brown silty sand, trace gravel
Liquid Limit: N/A **Plastic Limit:** N/A
USCS Classification: N/A **AASHTO Classification:** N/A
Testing Remarks: ASTM C 136, C 117 (Sample ID= SLR-2 (S-5, Depth 15' to 17')
Tested by: HQ **Checked by:** IC

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 234.60
Tare Wt. = 0.00
Minus #200 from wash = 16.2%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
280.10	0.00	0.00	3/4"	0.00	100.0	0.0
			1/4"	5.70	98.0	2.0
			#4	9.90	96.5	3.5
			#10	21.90	92.2	7.8
			#40	130.40	53.4	46.6
			#100	196.50	29.8	70.2
			#200	232.00	17.2	82.8

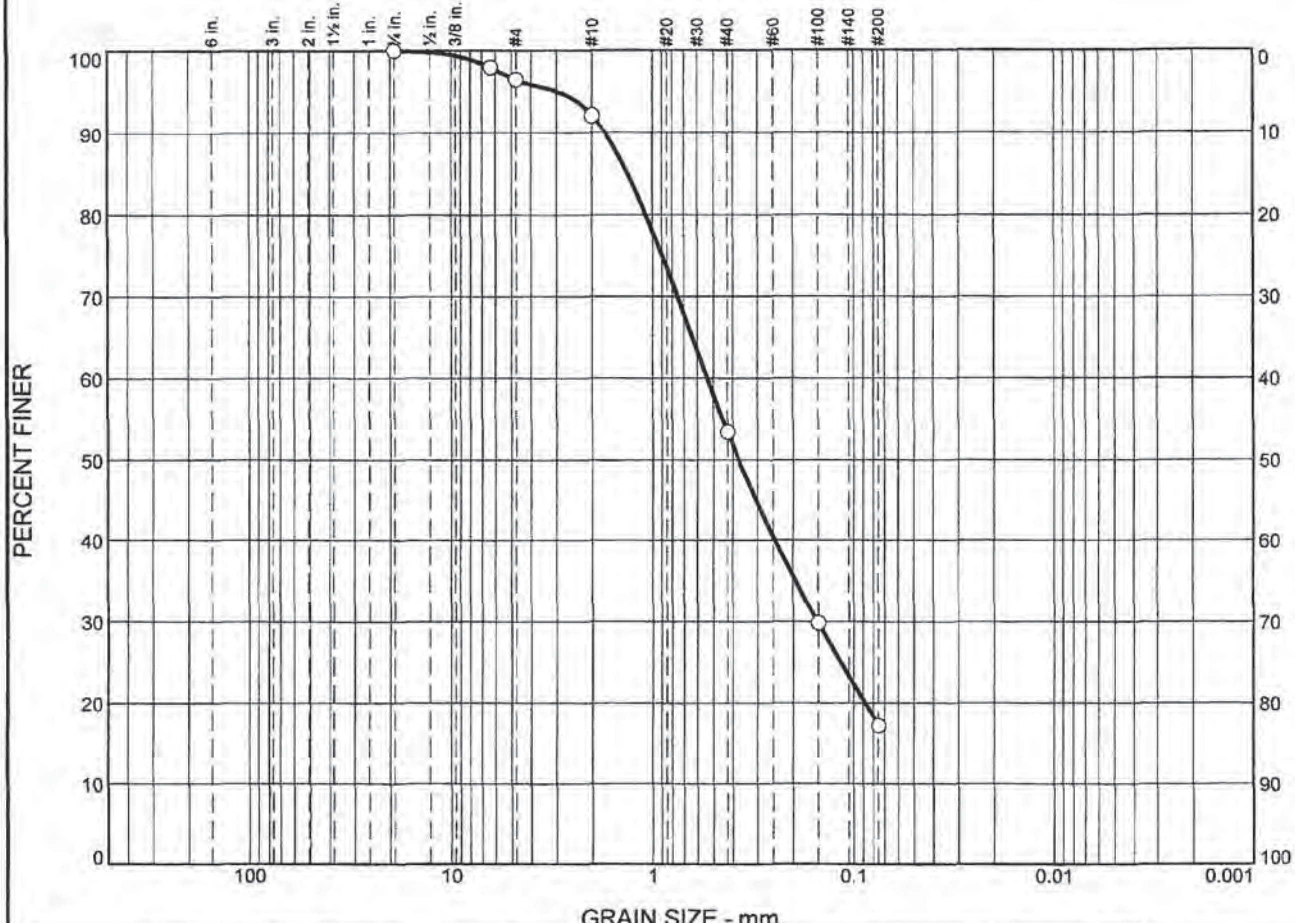
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	3.5	3.5	4.3	38.8	36.2	79.3			17.2

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.0879	0.1512	0.2457	0.3733	0.5358	1.0792	1.3272	1.7154	2.9552

Fineness Modulus
1.90

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.5	4.3	38.8	36.2	17.2	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	N/A	N/A	1.3272	0.5358	0.3733	0.1512				

Material Description	USCS	AASHTO
○ Reddish brown silty sand, trace gravel	N/A	N/A

Project No. **Client:** : SLR International Corporation

Project: : Multifamily Residential Development Avon, CT

○ **Source:** Onsite Date: 08/19/2021

Remarks:
○ ASTM C 136, C 117 (Sample ID= SLR-2 (S-5, Depth 15' to 17')

Tri State Materials Testing Lab

Wallingford, Connecticut

Figure

Tested By: HQ **Checked By:** IC

GRAIN SIZE DISTRIBUTION TEST DATA

8/25/2021

Client: : SLR International Corporation — Date: 08/19/2021

Project: : Multifamily Residential Development Avon, CT

Location: Onsite — Date: 08/19/2021

Depth: 15' to 17' — **Sample Number:** 661-21

Material Description: Reddish brown silty sand , trace gravel

Liquid Limit: N/A — **Plastic Limit:** N/A

USCS Classification: N/A — **AASHTO Classification:** N/A

Testing Remarks: ASTM C 136, C 117 (Sample ID= SLR-3 (S-5, Depth 15' to 17')

Tested by: HQ — **Checked by:** IC

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare** = 243.00
Tare Wt. = 0.00
Minus #200 from wash = 13.0%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
279.40	0.00	0.00	3/4"	0.00	100.0	0.0
			1/4"	4.10	98.5	1.5
			#4	5.80	97.9	2.1
			#10	23.00	91.8	8.2
			#40	147.80	47.1	52.9
			#100	212.30	24.0	76.0
			#200	241.70	13.5	86.5

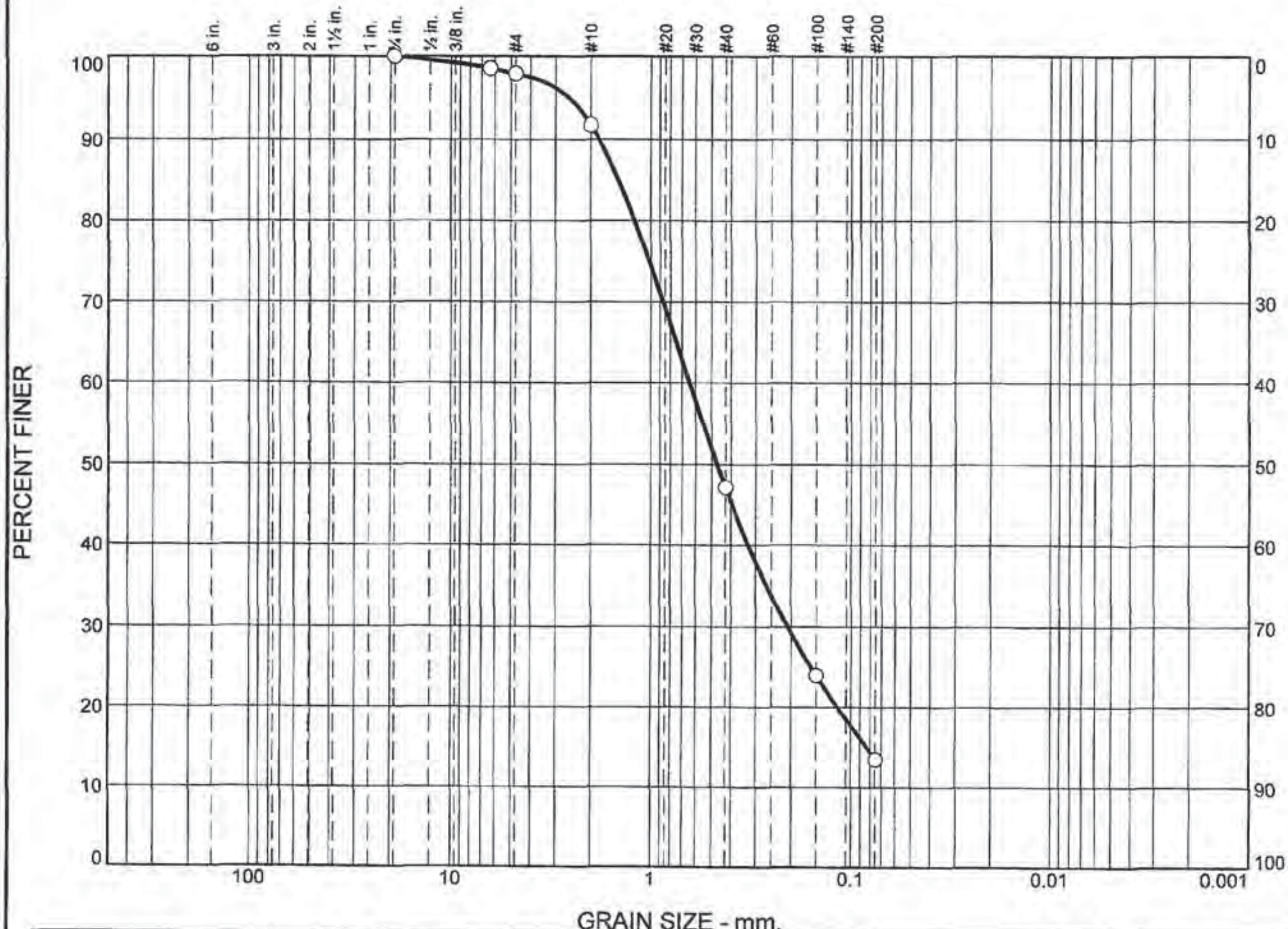
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	2.1	2.1	6.1	44.7	33.6	84.4			13.5

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.0833	0.1168	0.2083	0.3265	0.4687	0.6417	1.2046	1.4500	1.8125	2.5746

Fineness Modulus
2.10

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.1	6.1	44.7	33.6	13.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	N/A	N/A	1.4500	0.6417	0.4687	0.2083	0.0833			

Material Description	USCS	AASHTO
○ Reddish brown silty sand , trace gravel	N/A	N/A

Project No. **Client:** : SLR International Corporation

Project: : Multifamily Residential Development Avon, CT

○ **Source:** Onsite Date: 08/19/2021

Remarks:
○ASTM C 136, C 117 (Sample ID= SLR-3 (S-5, Depth 15' to 17')

Tri State Materials Testing Lab

Wallingford, Connecticut

Figure

Tested By: HQ **Checked By:** IC

APPENDIX G

HYDROLOGIC ANALYSIS – COMPUTER MODEL RESULTS

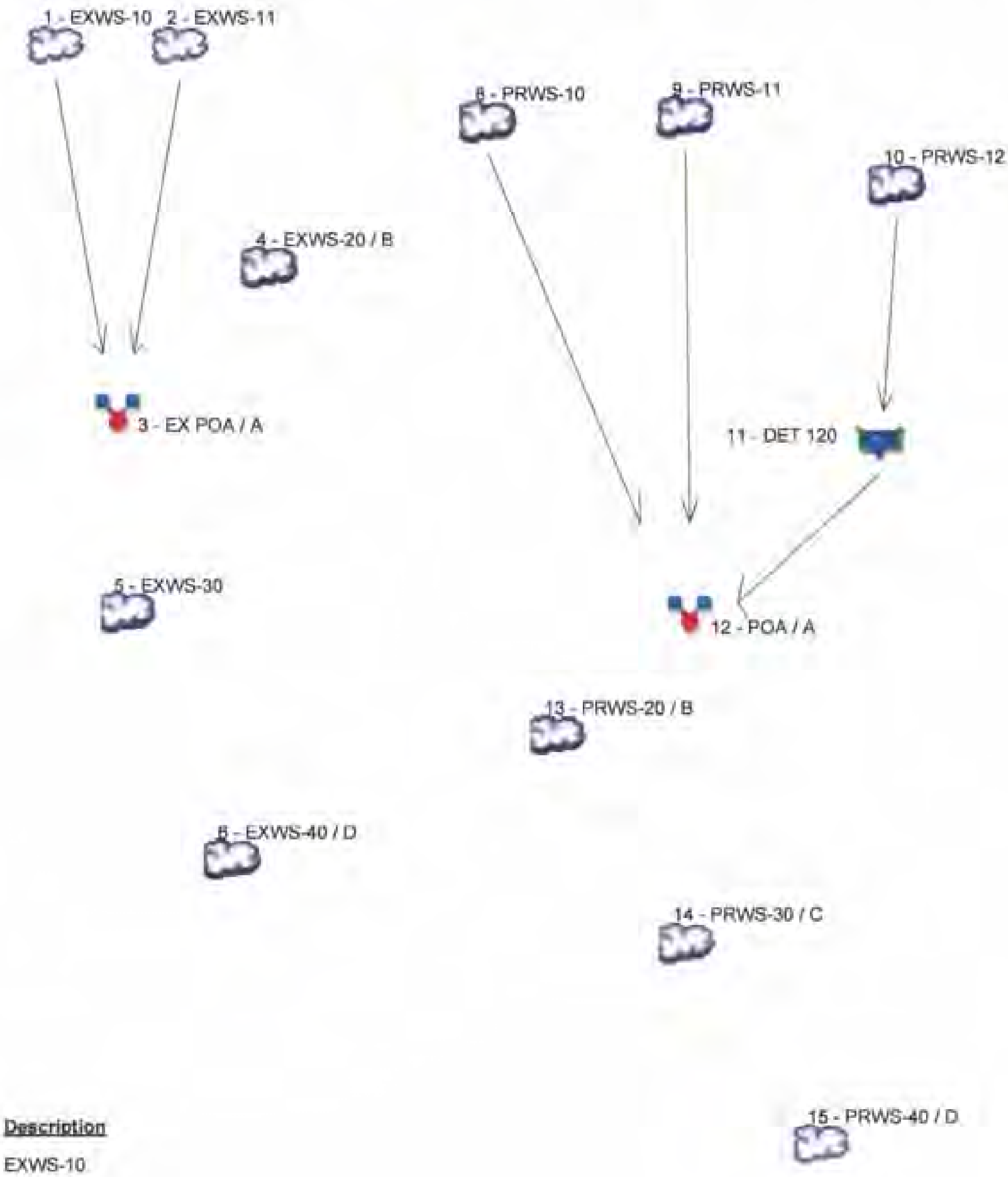
Hydrographs Peak Flowrate Summary (cfs)
Existing vs. Proposed

Storm Event	2yr		10yr		25yr		50yr		100yr	
	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop
Point of Analysis A	4.3	4.3	10.2	9.3	14.2	13.3	17.2	16.4	20.6	19.6
DET 120 W.S. Elev. (ft.) Top of Stone Elev. = 252.15	--	248.0	---	249.3	---	250.3	---	251.2	---	252.1
Point of Analysis B	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.4	0.3
Point of Analysis C	2.0	0.8	7.8	4.5	12.3	7.5	15.9	10.1	19.9	13.0
Point of Analysis D	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.5	0.4

Study Area	**Description**
A	36" RCP in Entrance Drive
B	Southern Property Boundary
C	Drainage System in West Main Street
D	Drainage System in Darling Drive

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Legend

Hyd.	Origin	Description
1	SCS Runoff	EXWS-10
2	SCS Runoff	EXWS-11
3	Combine	EX POA / A
4	SCS Runoff	EXWS-20 / B
5	SCS Runoff	EXWS-30
6	SCS Runoff	EXWS-40 / D
8	SCS Runoff	PRWS-10
9	SCS Runoff	PRWS-11
10	SCS Runoff	PRWS-12
11	Reservoir	DET 120
12	Combine	POA / A
13	SCS Runoff	PRWS-20 / B
14	SCS Runoff	PRWS-30 / C
15	SCS Runoff	PRWS-40 / D

Project: SD-Model02.gpw

Tuesday, 09 / 7 / 2021

Hydraflow Table of Contents

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	4.159	-------	-------	9.714	13.47	16.26	19.38	EXWS-10
2	SCS Runoff	------	-------	0.172	-------	-------	0.800	1.292	1.678	2.126	EXWS-11
3	Combine	1, 2	-------	4.288	-------	-------	10.21	14.23	17.22	20.56	EX POA / A
4	SCS Runoff	------	-------	0.000	-------	-------	0.008	0.045	0.155	0.397	EXWS-20 / B
5	SCS Runoff	------	-------	1.995	-------	-------	7.799	12.32	15.85	19.91	EXWS-30
6	SCS Runoff	------	-------	0.000	-------	-------	0.014	0.084	0.248	0.517	EXWS-40 / D
8	SCS Runoff	------	-------	3.258	-------	-------	7.092	9.598	11.44	13.48	PRWS-10
9	SCS Runoff	------	-------	0.436	-------	-------	1.284	1.889	2.350	2.871	PRWS-11
10	SCS Runoff	------	-------	7.572	-------	-------	14.77	19.31	22.62	26.26	PRWS-12
11	Reservoir	10	-------	0.910	-------	-------	3.048	4.130	5.984	11.06	DET 120
12	Combine	8, 9, 11	-------	4.266	-------	-------	9.329	13.31	16.37	19.56	POA / A
13	SCS Runoff	------	-------	0.000	-------	-------	0.007	0.036	0.128	0.291	PRWS-20 / B
14	SCS Runoff	------	-------	0.783	-------	-------	4.464	7.543	10.06	13.00	PRWS-30 / C
15	SCS Runoff	------	-------	0.000	-------	-------	0.009	0.045	0.165	0.356	PRWS-40 / D

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	4.159	3	738	0.470	------	------	------	EXWS-10
2	SCS Runoff	0.172	3	729	0.020	------	------	------	EXWS-11
3	Combine	4.288	3	738	0.490	1, 2	------	------	EX POA / A
4	SCS Runoff	0.000	3	n/a	0.000	------	------	------	EXWS-20 / B
5	SCS Runoff	1.995	3	732	0.246	------	------	------	EXWS-30
6	SCS Runoff	0.000	3	n/a	0.000	------	------	------	EXWS-40 / D
8	SCS Runoff	3.258	3	726	0.251	------	------	------	PRWS-10
9	SCS Runoff	0.436	3	726	0.038	------	------	------	PRWS-11
10	SCS Runoff	7.572	3	729	0.684	------	------	------	PRWS-12
11	Reservoir	0.910	3	750	0.091	10	248.00	0.136	DET 120
12	Combine	4.266	3	726	0.380	8, 9, 11	------	------	POA / A
13	SCS Runoff	0.000	3	n/a	0.000	------	------	------	PRWS-20 / B
14	SCS Runoff	0.783	3	738	0.127	------	------	------	PRWS-30 / C
15	SCS Runoff	0.000	3	n/a	0.000	------	------	------	PRWS-40 / D

SD-Model02.gpw	Return Period: 2 Year	Tuesday, 09 / 7 / 2021

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	9.714	3	735	1.066	------	------	------	EXWS-10
2	SCS Runoff	0.800	3	726	0.066	------	------	------	EXWS-11
3	Combine	10.21	3	735	1.132	1, 2	------	------	EX POA / A
4	SCS Runoff	0.008	3	1332	0.005	------	------	------	EXWS-20 / B
5	SCS Runoff	7.799	3	729	0.755	------	------	------	EXWS-30
6	SCS Runoff	0.014	3	915	0.009	------	------	------	EXWS-40 / D
8	SCS Runoff	7.092	3	726	0.542	------	------	------	PRWS-10
9	SCS Runoff	1.284	3	726	0.100	------	------	------	PRWS-11
10	SCS Runoff	14.77	3	729	1.350	------	------	------	PRWS-12
11	Reservoir	3.048	3	747	0.318	10	249.32	0.329	DET 120
12	Combine	9.329	3	726	0.960	8, 9, 11	------	------	POA / A
13	SCS Runoff	0.007	3	939	0.005	------	------	------	PRWS-20 / B
14	SCS Runoff	4.464	3	732	0.460	------	------	------	PRWS-30 / C
15	SCS Runoff	0.009	3	1326	0.005	------	------	------	PRWS-40 / D

SD-Model02.gpw | Return Period: 10 Year | Tuesday, 09 / 7 / 2021

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	13.47	3	735	1.476	------	------	------	EXWS-10
2	SCS Runoff	1.292	3	726	0.102	------	------	------	EXWS-11
3	Combine	14.23	3	735	1.577	1, 2	------	------	EX POA / A
4	SCS Runoff	0.045	3	831	0.028	------	------	------	EXWS-20 / B
5	SCS Runoff	12.32	3	729	1.146	------	------	------	EXWS-30
6	SCS Runoff	0.084	3	750	0.032	------	------	------	EXWS-40 / D
8	SCS Runoff	9.598	3	726	0.739	------	------	------	PRWS-10
9	SCS Runoff	1.889	3	726	0.145	------	------	------	PRWS-11
10	SCS Runoff	19.31	3	729	1.786	------	------	------	PRWS-12
11	Reservoir	4.130	3	750	0.499	10	250.32	0.458	DET 120
12	Combine	13.31	3	726	1.383	8, 9, 11	------	------	POA / A
13	SCS Runoff	0.036	3	765	0.020	------	------	------	PRWS-20 / B
14	SCS Runoff	7.543	3	729	0.730	------	------	------	PRWS-30 / C
15	SCS Runoff	0.045	3	750	0.022	------	------	------	PRWS-40 / D

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	16.26	3	735	1.784	------	------	------	EXWS-10
2	SCS Runoff	1.678	3	726	0.130	------	------	------	EXWS-11
3	Combine	17.22	3	735	1.915	1, 2	------	------	EX POA / A
4	SCS Runoff	0.155	3	756	0.053	------	------	------	EXWS-20 / B
5	SCS Runoff	15.85	3	729	1.453	------	------	------	EXWS-30
6	SCS Runoff	0.248	3	744	0.057	------	------	------	EXWS-40 / D
8	SCS Runoff	11.44	3	726	0.886	------	------	------	PRWS-10
9	SCS Runoff	2.350	3	726	0.179	------	------	------	PRWS-11
10	SCS Runoff	22.62	3	729	2.108	------	------	------	PRWS-12
11	Reservoir	5.984	3	747	0.646	10	251.20	0.544	DET 120
12	Combine	16.37	3	726	1.712	8, 9, 11	------	------	POA / A
13	SCS Runoff	0.128	3	753	0.036	------	------	------	PRWS-20 / B
14	SCS Runoff	10.06	3	729	0.946	------	------	------	PRWS-30 / C
15	SCS Runoff	0.165	3	744	0.041	------	------	------	PRWS-40 / D

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	19.38	3	735	2.133	------	------	------	EXWS-10
2	SCS Runoff	2.126	3	726	0.163	------	------	------	EXWS-11
3	Combine	20.56	3	735	2.296	1, 2	------	------	EX POA / A
4	SCS Runoff	0.397	3	750	0.089	------	------	------	EXWS-20 / B
5	SCS Runoff	19.91	3	729	1.810	------	------	------	EXWS-30
6	SCS Runoff	0.517	3	741	0.090	------	------	------	EXWS-40 / D
8	SCS Runoff	13.48	3	726	1.051	------	------	------	PRWS-10
9	SCS Runoff	2.871	3	726	0.219	------	------	------	PRWS-11
10	SCS Runoff	26.26	3	729	2.467	------	------	------	PRWS-12
11	Reservoir	11.06	3	741	0.838	10	252.12	0.602	DET 120
12	Combine	19.56	3	726	2.109	8, 9, 11	------	------	POA / A
13	SCS Runoff	0.291	3	747	0.059	------	------	------	PRWS-20 / B
14	SCS Runoff	13.00	3	729	1.202	------	------	------	PRWS-30 / C
15	SCS Runoff	0.356	3	738	0.066	------	------	------	PRWS-40 / D

Pond Report

Pond No. 2 - DET 120

Pond Data

UG Chambers -Invert elev. = 247.40 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 7.17 ft, No. Barrels = 144, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 246.65 ft, Width = 6.42 ft, Height = 5.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	246.65	n/a	0.000	0.000
0.55	247.20	n/a	0.033	0.033
1.10	247.75	n/a	0.065	0.099
1.65	248.30	n/a	0.083	0.182
2.20	248.85	n/a	0.081	0.263
2.75	249.40	n/a	0.078	0.341
3.30	249.95	n/a	0.073	0.414
3.85	250.50	n/a	0.066	0.481
4.40	251.05	n/a	0.055	0.535
4.95	251.60	n/a	0.035	0.570
5.50	252.15	n/a	0.033	0.604

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	6.00	6.00	0.00
Span (in)	= 18.00	6.00	6.00	0.00
No. Barrels	= 1	1	2	0
Invert El. (ft)	= 246.65	246.65	248.20	0.00
Length (ft)	= 99.00	0.00	0.00	0.00
Slope (%)	= 1.57	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.25	0.75	0.00	0.00
Crest El. (ft)	= 251.90	250.60	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= Yes	Yes	No	No
Exfil.(in/hr)	= 9.900 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	246.65	0.00	0.00	0.00	---	0.00	0.00	---	---	0.000	---	0.000
0.55	0.033	247.20	0.49 ic	0.47 ic	0.00	---	0.00	0.00	---	---	1.779	---	2.252
1.10	0.099	247.75	0.80 ic	0.80 ic	0.00	---	0.00	0.00	---	---	2.040	---	2.837
1.65	0.182	248.30	1.11 ic	1.03 ic	0.06 ic	---	0.00	0.00	---	---	2.300	---	3.393
2.20	0.263	248.85	2.37 ic	1.16 ic	1.20 ic	---	0.00	0.00	---	---	2.560	---	4.912
2.75	0.341	249.40	3.18 ic	1.31 ic	1.84 ic	---	0.00	0.00	---	---	2.820	---	5.972
3.30	0.414	249.95	3.80 ic	1.46 ic	2.32 ic	---	0.00	0.00	---	---	3.081	---	6.853
3.85	0.481	250.50	4.34 ic	1.59 ic	2.71 ic	---	0.00	0.00	---	---	3.341	---	7.643
4.40	0.535	251.05	5.50 ic	1.70 ic	3.05 ic	---	0.00	0.75	---	---	3.601	---	9.102
4.95	0.570	251.60	7.60 ic	1.74 ic	3.36 ic	---	0.00	2.50	---	---	3.861	---	11.46
5.50	0.604	252.15	11.45 ic	1.62 ic	3.24 ic	---	1.77	4.82	---	---	4.122	---	15.57

APPENDIX H

WATERSHED MAPS

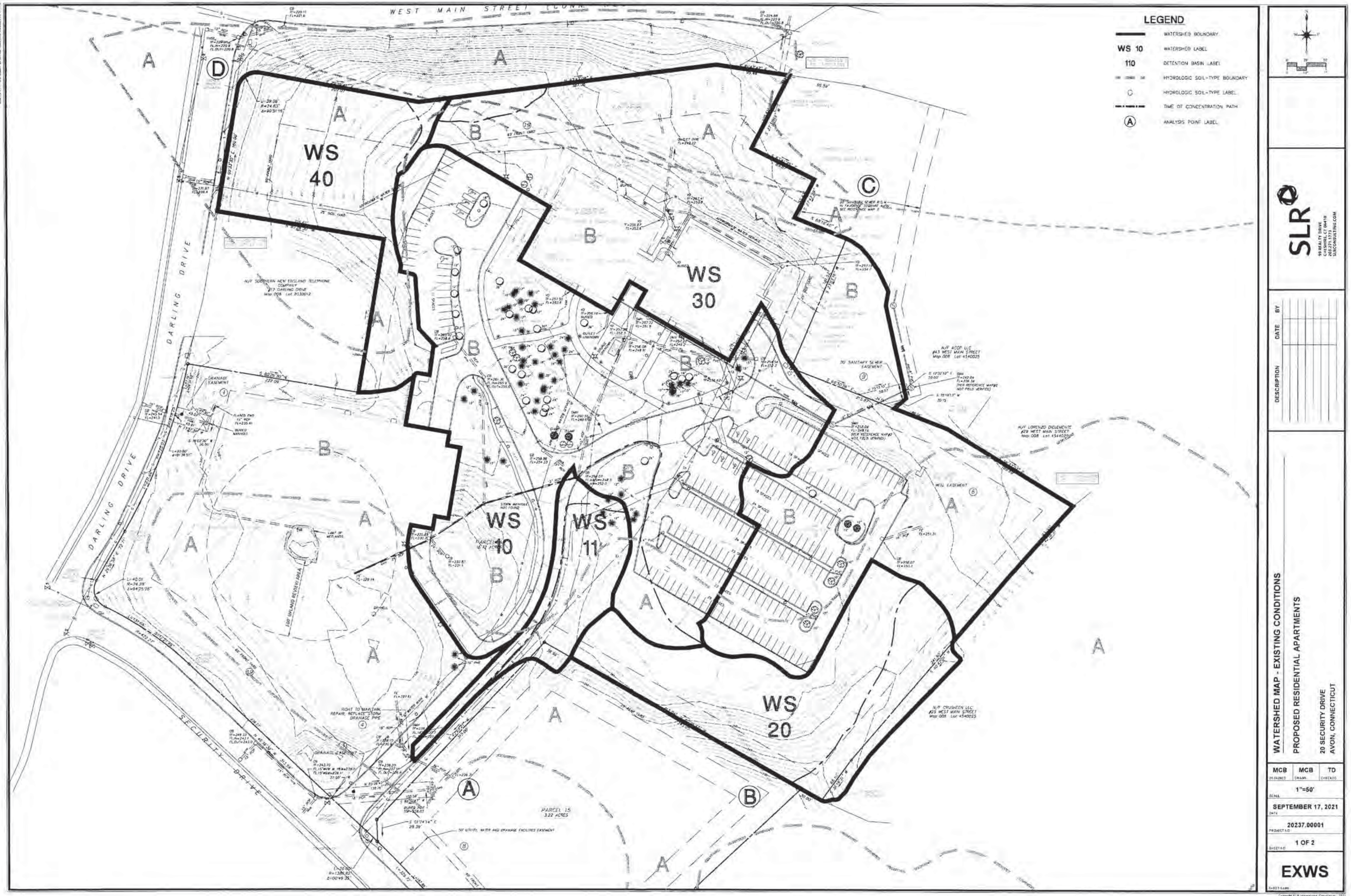
Drainage Report

Beacon Communities, LLC

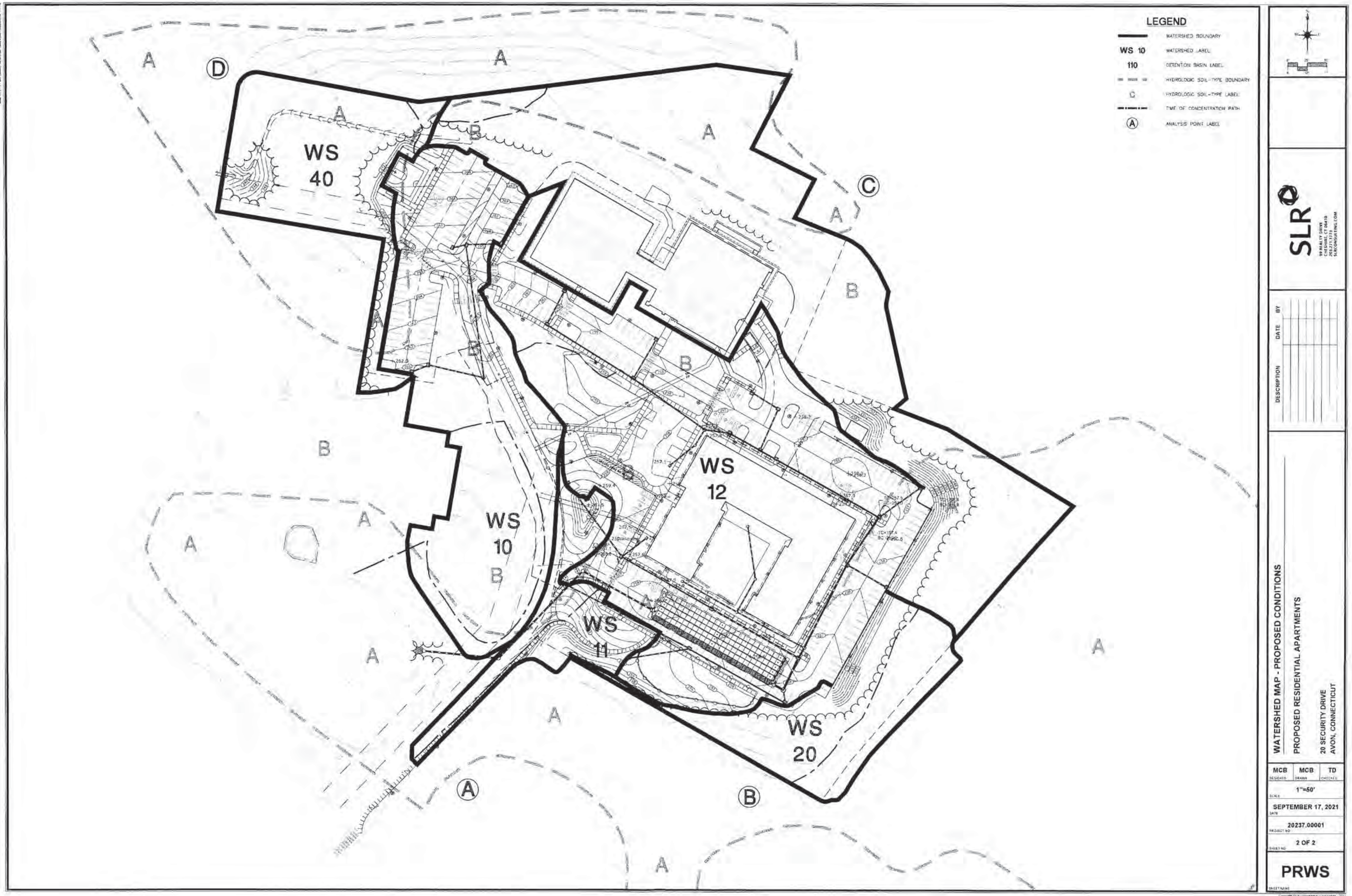
2 Center Plaza, Suite 700

Boston, Massachusetts 02108

September 17, 2021



LEGEND
WATERSHED BOUNDARY
WS 10 WATERSHED LABEL
110 DETENTION BASIN LABEL
HYDROLOGIC SOIL-TYPE BOUNDARY
HYDROLOGIC SOIL-TYPE LABEL
TIME OF CONCENTRATION PATH
ANALYSIS POINT LABEL
WEST MAIN STREET
DARLING DRIVE
SECURITY DRIVE
WS 40
WS 30
WS 10
WS 11
WS 20
A
B
C
D
PARCEL 15
3.22 ACRES
SLR
DESCRIPTION
DATE
BY
WATERSHED MAP - EXISTING CONDITIONS
PROPOSED RESIDENTIAL APARTMENTS
20 SECURITY DRIVE
AVON, CONNECTICUT
MCB
MCB
TD
1"=50'
SEPTEMBER 17, 2021
20237.00001
1 OF 2
EXWS



LEGEND
WATERSHED BOUNDARY
WS 10
WATERSHED LABEL
110
DETENTION BASIN LABEL
HYDROLOGIC SOIL-TYPE BOUNDARY
C
HYDROLOGIC SOIL-TYPE LABEL
TIME OF CONCENTRATION PATH
A
ANALYSIS POINT LABEL
WS 40
WS 10
WS 11
WS 12
WS 20
A
B
C
D
SLR
DESCRIPTION
DATE
BY
WATERSHED MAP - PROPOSED CONDITIONS
PROPOSED RESIDENTIAL APARTMENTS
20 SECURITY DRIVE
AVON, CONNECTICUT
MCB
DESIGNED
MCB
DRAWN
TD
CHECKED
1"=50'
SCALE
SEPTEMBER 17, 2021
DATE
20237.00001
PROJECT NO
2 OF 2
SHEET NO
PRWS
SHEET NAME

TAB 18

HINCKLEY
ALLEN

20 Church Street
Hartford, CT 06103-1221

p: 860-725-6200 f: 860-278-3802
hinckleyallen.com

Timothy S. Hollister
(860) 331-2823 (Direct)
(860) 558-1512 (Cell)
thollister@hinckleyallen.com

September 15, 2021

John McCahill, Wetlands Agent
Town of Avon
Avon Town Hall
60 West Main Street
Avon, CT 06001

Re: Zoning Application of Beacon Communities Development, LLC
For Multi-Family Residential Redevelopment of 11.5 acres at 20 Security Drive

Dear Mr. McCahill:

As we discussed by phone, we represent Beacon Communities Development, LLC ("Beacon"), which is about to file a zoning application with the Avon Planning and Zoning Commission for redevelopment of the vacant office building at 20 Security Drive for multi-family residential use. The purpose of this letter is to inform your office that the redevelopment site of which Beacon will be the ground lessee for 99 years from property owner 20 Security Drive LLC, contains no wetlands or watercourses; no upland review area of a wetland or watercourse; and therefore no regulated activity. A report prepared for Beacon by SLR Consulting is attached. That report references a September 2, 2021 letter (also attached) to your office from soil scientist George Logan. The report and letter support our conclusion that the Beacon zoning application does not require an application to the Avon Inland Wetlands and Watercourse Commission. We will include a copy of this letter in our zoning application. Thank you.

Very truly yours,

Tim Hollister

Timothy S. Hollister

TSH:kcs
Attachments

cc: Gina Martinez, Beacon
Attorney T.J. Donohue, owner's counsel
Peter Shea, SLR Consulting

Attachment 1

SLR

September 7, 2021

Ms. Gina Martinez
Beacon Communities, LLC
2 Center Plaza, Suite 700
Boston, MA 02108

Re: Wetland and Watercourse Delineation
Multifamily Residential Redevelopment
20 Security Drive
Avon, Connecticut
SLR #141.20237.00001.0050

Dear Ms. Martinez:

On July 13, 2021, Peter Shea, Licensed Environmental Professional (LEP) and Soil Scientist with SLR International Corporation, completed a wetland delineation of the parcel located at 20 Security Drive in Avon, Connecticut. The wetland delineation was completed on behalf of Beacon Communities, LLC for a portion of the parcel to be leased as part of a proposed redevelopment project. The parcel has a land area of approximately 20 acres with the proposed leased area approximately 11 acres in the northern portion of the property (Figure 1). The wetland and watercourse delineation was completed to support the local permitting process of the proposed development within this leased area.

In summary, no regulated wetlands or watercourses were identified within the leased area of the parcel or within 100-feet (upland review area) of the leased area boundary.

REMA Ecological Services, LLC, prepared a Soil Investigation letter to the Town of Avon for the non-leased portion of the parcel on behalf of the property owner dated September 2, 2021. Based on this letter, there are no regulated wetlands or watercourses observed or delineated at the site. Drainage improvements were identified in the southwestern portion of the property that included a plunge pool and associated dry well and drainage ditch.

General Site Description

In general, the topography of the 20-acre parcel lies at the top of a mapped kame-terrace deposit (*Geologic Map of Avon Quadrangle*, Schnabel, 1962) from an elevation of 250 feet (ft) above mean sea level (amsl) at the entrance to the Site off Security Drive, to 260 ft amsl at the top of the parcel. Most of the Site improvements, which include a multistory building most recently used as a school, a multistory garage, and an asphalt access driveway and associated parking lot (Figure 1), are located in the central portion of the Site. The leased portion of the property will include the multistory building and parking area in the northern section of the parcel. A copy of the site plan is attached for reference.

A topographic depression is located in the southwestern portion of the property on the west side of the access driveway. The depression is at an elevation of 230 ft amsl and extends from the driveway to the south side of the parking garage structure. Stormwater from most of the Site is conveyed through a series of catch basins and underground piping to this area. Two 24-inch reinforced concrete outfalls discharge stormwater to a plunge pool, and directly to the topographic depression with a drywell structure located at the lowest point. Overflow from the depression would continue under the access driveway through a 24-inch culvert and discharge off site to the east within a drainage swale. This area is not part of the leased portion of the parcel.

Field Method

Inland wetlands and watercourses on the project Site were delineated in accordance with the regulations of the Town of Avon, Connecticut, and the State of Connecticut Inlands Wetlands and Watercourses Act, CGS 22a-36 through 45. Regulated wetland areas consist of any of the soil types designated by the National Cooperative Soil Survey as poorly drained, very poorly drained, alluvial, or floodplain. Regulated watercourses consist of rivers; streams; brooks, waterways; lakes; ponds; marshes; swamps; bogs; and all other bodies of water, natural or artificial, vernal or intermittent, public or private, not regulated pursuant to Sections 22a-28 to 22a-35 inclusive (tidal wetlands).

Weather conditions were sunny with an air temperature of approximately 80^{0}F. Site conditions were suitable for wetland delineation work.

Soils were examined using a Dutch auger to help determine hydric or nonhydric soil characteristics. Geospatial data was accessed via the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) web soil survey mapping. Figure 1 depicts the soil survey mapping overlaid onto a 2019 aerial image provided by the Connecticut Department of Energy & Environmental Protection (CTDEEP). There were no inland wetland soils (alluvial or hydric) mapped within the Site boundary. The following soil units were identified for the Site:

- Hinkley gravelly sandy loam
- Udorthents-Urban land complex

Findings

Based on the field investigation, the soils present within the leased area are consistent with the NRCS mapped soil series. Most of the leased area is improved and mapped as Udorthents-Urban land complex with the forested undisturbed areas mapped as Hinkley gravelly sandy loam. The Hinkley series is defined as excessively drained soils formed in glaciofluvial materials. They are nearly level through very steep soils on outwash terraces, outwash plains, outwash deltas, kames, kame terraces, and eskers. The Udorthent complex series consists of soils that have either been filled and/or cut by more than 2 feet and do not exhibit a natural soil horizon profile. These soils can range from somewhat poorly drained to well drained.

Based on the field investigation there are no regulated wetlands or watercourses within the leased area of the Site or within the upland review area (within 100 feet of the leased boundary).

If you have any questions regarding my delineation and/or the information presented within this report, please do not hesitate to call me at (860) 400-5711 or e-mail me at pshea@slrconsulting.com.

Sincerely,

SLR International Corporation

Peter Shea, LEP
Senior Environmental Scientist

Attachments

141.20237.00001.0050.au2321.ltr.docx

Date Saved: 9/7/2021

Document Path: N:\Glastonbury CT\GIS\GIS Projects\20237_P\Wetland Delineation.mxd

SLR

99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

WETLAND BOUNDARY & NRCS SOILS

WETLAND DELINEATION
BEACON COMMUNITIES, LLC
20 SECURITY DRIVE
AVON, CONNECTICUT

N

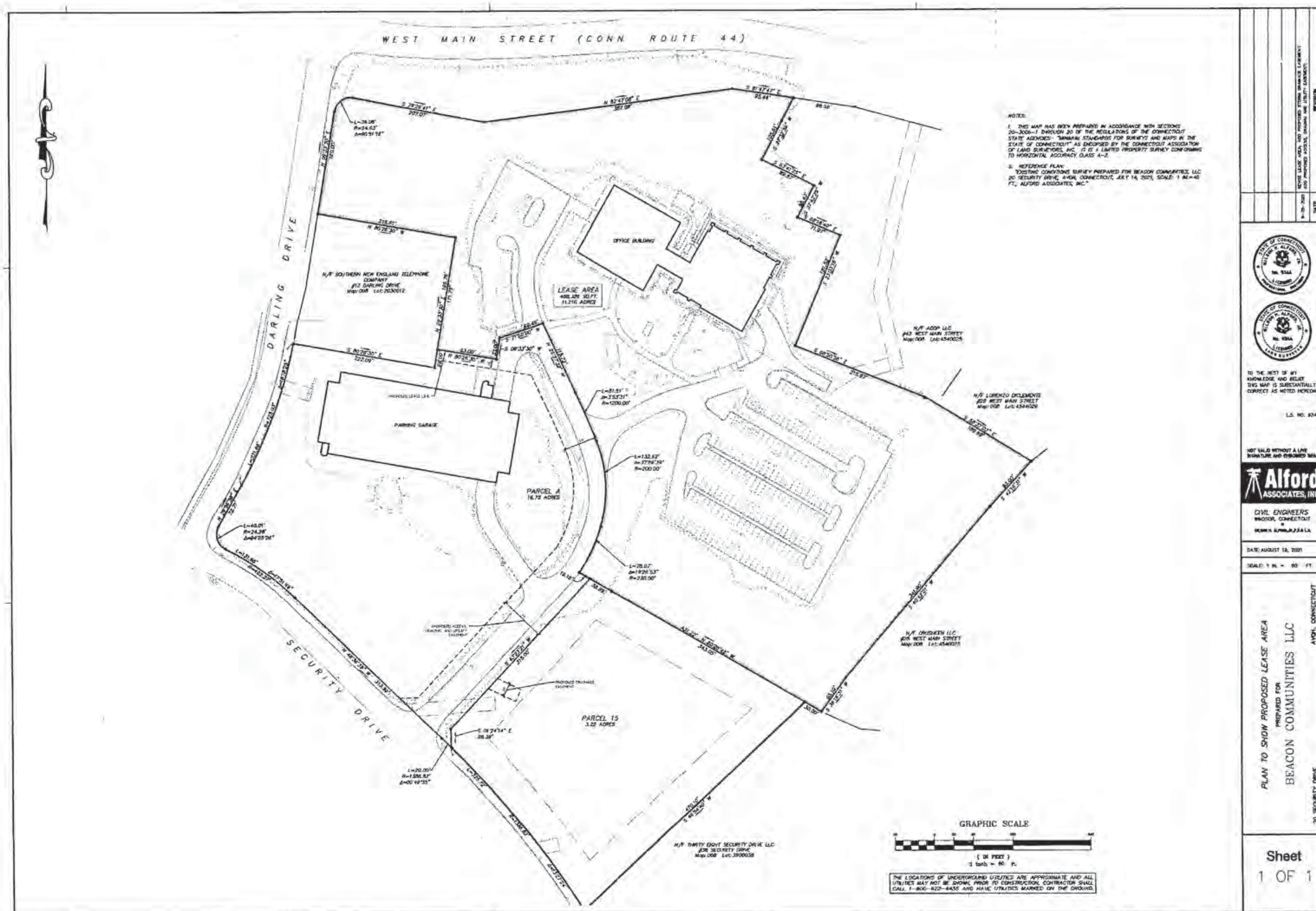
0 100
Feet

SCALE 1 " = 200 '

DATE 9/7/2021

20237.0003
PROJ. NO.

FIG. 1


WEST MAIN STREET (CONN ROUTE 44)
DARLING DRIVE
SECURITY DRIVE
OFFICE BUILDING
LEASE AREA
PARKING GARAGE
PARCEL A
16.72 ACRES
PARCEL 15
3.22 ACRES
N/F SOUTHERN NEW ENGLAND TELEPHONE COMPANY
#12 DARLING DRIVE
N/F ADDP LLC
#43 WEST MAIN STREET
N/F LORENZO DICLEMENTE
N/F CRISHKEN LLC
N/F THIRTY EIGHT SECURITY DRIVE LLC
#38 SECURITY DRIVE
NOTES:
1. THIS MAP HAS BEEN PREPARED IN ACCORDANCE WITH SECTIONS 20-300b-1 THROUGH 20 OF THE REGULATIONS OF THE CONNECTICUT STATE AGENCIES- "MINIMUM STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ENDORSED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. IT IS A LIMITED PROPERTY SURVEY CONFORMING TO HORIZONTAL ACCURACY CLASS A-2.
2. REFERENCE PLAN:
"EXISTING CONDITIONS SURVEY PREPARED FOR BEACON COMMUNITIES, LLC 20 SECURITY DRIVE, AVON, CONNECTICUT, JULY 14, 2021, SCALE: 1 IN.=40 FT., ALFORD ASSOCIATES, INC."
GRAPHIC SCALE
(IN FEET)
1 inch = 60 ft.
THE LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE AND ALL UTILITIES MAY NOT BE SHOWN. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL CALL 1-800-922-4455 AND HAVE UTILITIES MARKED ON THE GROUND.
REVISE LEASE AREA, ADD PROPOSED STORM DRAINAGE EASEMENT
ADD PROPOSED ACCESS, DRAINAGE AND UTILITY EASEMENT
DATE
REVISION
TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.
L.S. NO. 9344
NOT VALID WITHOUT A LIVE SIGNATURE AND EMBOSSED SEAL
Alford
ASSOCIATES, INC.
CIVIL ENGINEERS
WINDSOR, CONNECTICUT
DATE: AUGUST 19, 2021
SCALE: 1 IN. = 60 FT.
PLAN TO SHOW PROPOSED LEASE AREA
PREPARED FOR
BEACON COMMUNITIES LLC
20 SECURITY DRIVE
AVON, CONNECTICUT
Sheet
1 OF 1

Attachment 2

• Soil & Wetland Studies
• Ecology • Application Reviews
• Listed Species Surveys • GPS
• Environmental Planning & Management
• Ecological Restoration & Habitat Mitigation
• Expert Testimony • Permitting

VIA E-MAIL

September 2, 2021

Town of Avon
Planning and Community Development
60 West Main Street
Avon, CT 06001

ATTN: John McCahill, Wetlands Agent

RE: SOIL INVESTIGATIONS
20 Security Drive, Avon, CT
REMA Job # 21-2420-AVO49

Dear Mr. McCahill:

At the request of the property owner for the above-referenced property, Twenty Security Drive, LLC, on August 31st, and again on September 1st, 2021, REMA Ecological Services, LLC (REMA), conducted on-site soil investigations for the purpose of determining the presence or absence of regulated wetlands and watercourses, in accordance with the applicable State Statutes.

The "study area" is an approximately 6.5-acre portion of the overall 20.04-acre property, which characterized predominately by mixed deciduous-evergreen forest (see Figure A, attached). An existing access driveway connects Security Drive, located to the south, with the developed northern portion of the property, divides the study area into western and eastern sections, both of which contain low lying areas surrounded by moderately steep to steep slopes.

Stormwater runoff from impervious surfaces (i.e., on-site and off-site), enter the western section where it infiltrates into the sandy soils. Overflow from the western section outlets via a culvert under the access driveway to the eastern section, which is topographically lower. Upon discharge to the eastern section runoff has, over time, eroded a channel down moderate slopes for roughly 120 linear feet. The eroded sediment has been deposited below and is now densely vegetated with a stand of invasive Japanese knotweed (*Fallopia japonica*). Further to the east, and within the lower area of this eastern portion, temporarily ponded water infiltrates into the ground.

The soils within the study are derived from glaciofluvial materials (e.g., stratified sands and gravel). The dominant soils are the somewhat excessively drained Hinckley (38) loamy sand, and the well-drained Agawam (29) fine sandy loam (see attached Web Soil Survey). A few areas have been disturbed in the past, either through drainage improvements, such as by the construction of a plunge pool, drainage ditch, and the installation of a "dry well" within the eastern section, or through natural or agricultural-related erosion and sedimentation over the past two plus centuries.

At approximately 33 inches within the lowest area of the eastern portion of the study area, a "natural" soil profile (i.e., A- and B-horizons) has developed, which sits on top of a buried wetland soil profile, likely an old glacial kettle-hole that was filled through sediment deposition over many years.

No regulated wetlands or watercourses were observed or delineated within the study area. The aforementioned plunge pool, constructed downgradient of a drainage outfall, floods temporarily, but water either infiltrates to the sandy subsoils or discharges via rip rap ditch to the area with the "dry well."

The plunge pool needs maintenance and renovation, as several feet of sediment have been deposited here since its construction many decades ago. As discussed on-site with you on September 1st, 2021, the property owner will proceed with the required maintenance in the next few days.

Please contact us if you have any questions on the above.

Respectfully submitted,

Rema Ecological Services, LLC

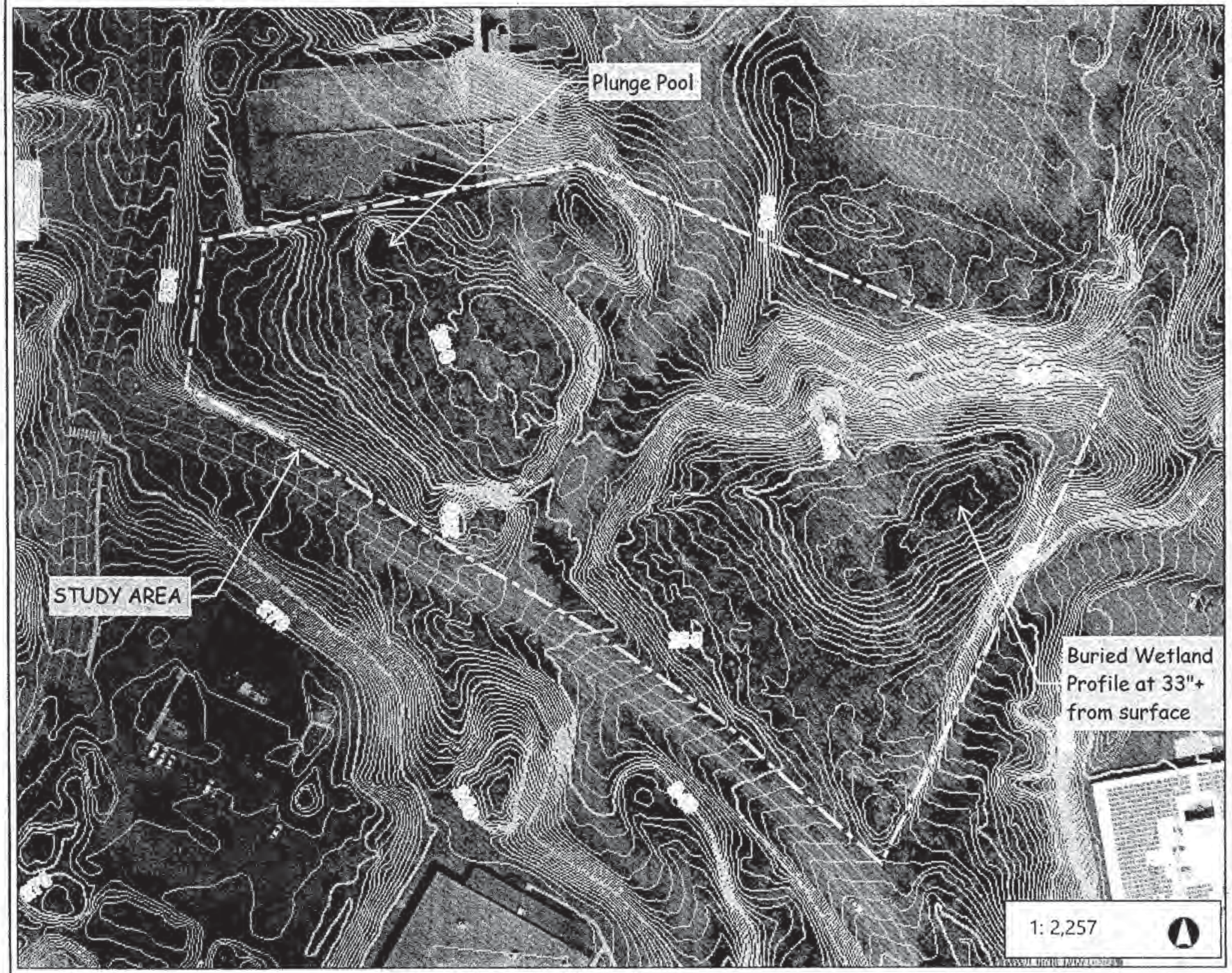
George T. Logan

George T. Logan, MS, PWS, CSE
Certified Professional Wetland Scientist
Registered Soil Scientist, Certified Senior Ecologist

Attachments: Figure A: Study Area
CT Web Soil Survey of Study Area

CT Environmental Conditions Online

FIGURE A: 20 SECURITY DRIVE, AVON, CT
(as seen on a 2016 aerial photograph with 2016 topography



0.1 0 0.04 0.1 Miles

Legend

Light Gray Canvas Base

Notes

THIS MAP IS NOT TO BE USED FOR NAVIGATION

This map is intended for general planning, management, education, and research purposes only. Data shown on this map may not be complete or current. The data shown may have been compiled at different times and at different map scales, which may not match the scale at which the data is shown on this map.

Soil Map—State of Connecticut
(20 Security Drive, Avon, CT)

Map Scale: 1:3,050 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 45, 90, 180, 270

Feet: 0, 100, 200, 400, 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 15, 2019—Aug 29, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam	0.0	0.0%
29A	Agawam fine sandy loam, 0 to 3 percent slopes	2.3	5.2%
34A	Merrimac fine sandy loam, 0 to 3 percent slopes	1.5	3.5%
38E	Hinckley loamy sand, 15 to 45 percent slopes	12.8	29.4%
306	Udorthents-Urban land complex	22.9	52.4%
307	Urban land	4.1	9.4%
Totals for Area of Interest		**43.7**	**100.0%**

TAB 19

Affordability Plan

The Homes at Avon Park
20 Security Drive
Avon, Connecticut

Submission Draft
SEPTEMBER 2021

Submitted by Beacon Communities Development, LLC to the Avon Planning & Zoning Commission

PREPARED BY:
Hinckley, Allen & Snyder LLP
20 Church Street, #18
Hartford, Connecticut 06103
(860) 725-6200

DEFINITIONS:

"**Community**" – means The Homes at Avon Park, a multi-family rental development approved as a Housing Opportunity Zone ("HOZ") by the Avon Planning and Zoning Commission ("Commission") as more fully described in **Schedule A**. The site plan is on file with that Commission. All apartments homes within the Community shall be constructed in compliance with the minimum specifications set forth in **Schedule B**.

"**Developer**" – means Beacon Communities Development LLC ("Beacon") or its successors and assigns.

I. Designation as "Assisted Housing."

The Homes at Avon Park, will qualify as "assisted housing" within the meaning of § 8-30g(a)(3) of the Connecticut General Statutes through receipt of (a) mortgage financing from the Connecticut Housing Finance Authority ("CHFA") or the Department of Housing and/or (b) an allocation of low income housing tax credits from CHFA, in each instance for the purpose of financing development in which a portion is low and moderate income housing.

II. Affordability Period.

The assisted housing units shall be designated as affordable for no less than the period stated in a Declaration and Agreement of Restrictive Covenants, to be determined by the rules of the government financing program. The affordability period shall be calculated separately for each assisted housing unit, and the period shall begin on the date of initial rental of such unit to an eligible tenant household.

III. Entity Responsible for Administration and Compliance.

This Affordability Plan will be administered by Beacon, or its designees, successors and assigns, and in such role is hereafter referred to as "Administrator." In addition to compliance filing required by the assisted housing finance program (sample form, "Exhibit B" attached. The Administrator shall submit a status report to the Town on compliance with this Affordability Plan annually on or about January 31 to show the prior year's activity, as required by General Statutes § 8-30h.

IV. Notices of Availability for Rental of Units.

The Developer shall provide notice of the availability of each unit for rental. Such notices shall be provided in accordance with the Affirmative Fair Housing Marketing Plan as outlined in Section VI. The Administrator shall also provide such notice to the Commission. Such notice shall include a description of the available unit(s), the eligibility criteria for potential tenants, the maximum rental price, and the availability of application forms and additional information. All such notices shall comply with the federal Fair Housing Act, 42 U.S.C. §§ 3601 *et seq.* and the Connecticut Fair Housing Act, §§ 46a-64b, 64c of the Connecticut General Statutes (together, the "Fair Housing Acts").

V. Household Income Limitation.

As further defined in a Declaration and Agreement of Restrictive Covenants, for the duration of the time period set forth in Section II above, all units will qualify as "assisted housing" within the meaning of Connecticut General Statutes § 8-30g(a)(3) and the Developer will comply with all rules and regulations of that program.

VI. Affirmative Fair Housing Marketing Plan.

The rental of units in the Community shall be publicized, using State regulations for affirmative fair housing marketing programs as guidelines. The Developer shall have responsibility for compliance with this section. Notices of initial availability of units shall be provided, at a minimum, by advertising at least two times in a newspaper of general circulation in such identified municipalities. The Administrator shall also provide such notices to the Avon Planning and Zoning Commission and the local housing authority. Such notices shall include a description of the available unit(s), the eligibility criteria for potential tenants, the maximum rental price, and the availability of application forms and additional information.

All notices shall comply with the federal Fair Housing Act, 42 U.S.C. §§ 3601 *et seq.* and the Connecticut Fair Housing Act, §§ 46a-64b, 64c of the Connecticut General Statutes (together, the "Fair Housing Acts").

VII. Application Process.

A family or household seeking to rent one of the units ("Applicant") must complete an application to determine eligibility. The application form and process shall comply with the Fair Housing Act.

A. Application Form.

The application form shall be provided by the Administrator and shall include an income pre-certification eligibility form and an income certification form. In general, income for purposes of determining an Applicant's qualification shall include the Applicant family's total anticipated income from all sources for the twelve (12) month period following the date the application is submitted ("Application Date"). If the Applicant's financial disclosures indicate that the Applicant may experience a significant change in the Applicant's future income during the twelve (12) month period, the Administrator shall not consider this change unless there is a reasonable assurance that the change will in fact occur. The Applicant's income need not be re-verified after the time of initial rental. In determining what is and is not to be included in the definition of family annual income, the Administrator shall use the criteria set forth by HUD and listed on **Schedule C**, attached.

B. Applicant Interview.

The Administrator shall interview an Applicant upon submission of the completed application. Specifically, the Administrator shall, during the interview, undertake the following:

1. Review with the Applicant all the information provided on the application.

2. Explain to the Applicant the requirements for eligibility, verification procedures, and the penalties for supplying false information.

3. Verify that all sources of family income and family assets have been listed in the application. The term "family" shall be as defined by the Zoning Regulations of the Town of Avon.

4. Request the Applicant to sign the necessary release forms to be used in verifying income. Inform the Applicant of what verification and documentation must be provided before the application is deemed complete.

5. Inform the Applicant that a certified decision as to eligibility cannot be made until all items on the application have been verified.

6. Review with the Applicant the process and restrictions regarding re-rental.

C. Verification of Applicant's Income.

Where it is evident from the income certification form provided by the Applicant that the Applicant is not eligible, additional verification procedures shall not be necessary. However, if the Applicant appears to be eligible, the Administrator shall issue a pre-certification letter. The letter shall indicate to the Applicant and the Developer that the Applicant is income eligible, subject to the verification of the information provided in the Application. The letter will notify the Applicant that he/she will have thirty (30) days to submit all required documentation.

If applicable, the Applicant shall provide the documentation listed on **Schedule D** attached hereto, to the Administrator. This list is not exclusive, and the Administrator may require any other verification or documentation, as the Administrator deems necessary.

VIII. Prioritization of Applicants for Initial Rental.

If, after publication of the Notice of Initial Rental as described in Section VI hereof, the number of qualified Applicants exceeds the number of units, then the Administrator shall establish a priority list of applicants based on a "first come, first served" basis, subject to the applicant's income pre-certification eligibility. The units will then be offered according to the applicant's numerical listing with priority given to persons on the Beacon waiting list.

IX. Maximum Rent.

As further defined in a Declaration and Agreement of Restrictive Covenants, for the duration of the time period set forth in Section II above, the maximum rent shall conform to the rules and regulations of the applicable government assistance program.

X. Principal Residence.

Units shall be occupied only as a tenant's principal residence. Subleasing of units shall be prohibited.

XI. Requirement to Maintain Condition.

All tenants are required to maintain their units. The tenant shall not destroy, damage or impair the unit, allow the unit to deteriorate, or commit waste on the unit. When a unit is offered for re-rental, the Administrator may cause the unit to be inspected.

XII. Conflict Between Affordability Plan and Declaration.

In the event of a conflict between this Affordability Plan and **Schedule E**, the Declaration and Agreement of Restrictive Covenants, shall govern.

XIII. Enforcement.

A violation of this Affordability Plan shall not result in a forfeiture of title, but the Avon Planning and Zoning Commission or its designated agent shall otherwise retain all enforcement powers granted by the Connecticut General Statutes, including § 8-12, which powers include, but are not limited to, the authority, at any reasonable time, to inspect the property and to examine the books and records of the Administrator to determine compliance of units with the affordable housing regulations.

XIV. Binding Effect.

This Affordability Plan shall be binding on the successors and assigns of the Developer.

SCHEDULE A
PROPERTY DESCRIPTION
11.2+/- ACRES AT 20 SECURITY DRIVE, TO BE RESUBDIVIDED, REZONED, REDEVELOPED FROM OFFICE TO MULTI-FAMILY RESIDENTIAL

All that certain piece or parcel of land situated in the Town of Avon, County of Hartford and State of Connecticut and shown as "LEASE AREA 488,549 SQ. FT. 11.210 ACRES" on a map or plan entitled "PLAN TO SHOW PROPOSED LEASE AREA PREPARED FOR BEACON COMMUNITIES, LLC 20 SECURITY DRIVE AVON, CONNECTICUT PREPARED BY ALFORD ASSOCIATES, INC., CIVIL ENGINEERS WINDSOR CT, DATE: AUGUST 19, 2021, REVISED AUGUST 25, 2021, SCALE: 1 IN. = 60 FT.", said map or plan is on file or to be filed in the Avon Land Records, and being more particularly bounded and described as follows:

Beginning at the northeast corner of said property along property now or formerly of Crusheen, LLC #25 West Main Street, Map 008 Lot: 4540025; thence running S 42º16'31" W a distance of 93.00 feet to a point; thence turning and running S 40º42'01" W a distance of 341.90 feet to a point; thence turning and running S 36º16'31" W a distance of 65.10 feet to a point; thence turning and running N 60º26'42" W a distance of 431.22 feet to a point; thence turning and running along the arc of a curve to the left with a length of 78.07 feet a Delta of 19º26'53" and a radius of 230.00 to a point; thence turning and running along the arc of a curve to the left a distance of 132.62 feet with a Delta of 37º59'39" and a radius of 200.00 to a point; thence turning and running along the arc of a curve to the left a distance of 81.51 feet with a Delta of 3º53'31" and a radius of 1200.00 to a point; thence turning a running N 25º37'32" W a distance of 115.72 feet to a point; thence turning and running S 71º50'00" W a distance of 69.49 feet to a point; thence turning and running S 09º33' 30" W a distance of 33.00 feet to a point; thence turning and running N 80º26'30" W a distance of 93 feet to a point; thence turning and running N 09º33'30" E a distance of 171.79 feet to a point; thence turning and running N 80º26'30" W a distance of 216.61 feet to a point; thence turning and running N 09º33'30" E a distance of 160.00 feet to a point; thence turning and running along the arc of a curve to the right a length of 39.06 feet, a radius of 24.36 and a Delta of 90º51'16" to a point; thence turning and running S 79º29'41"E a distance of 207.07 feet to a point; thence turning and running N 82º47'08" E a distance of 387.08 feet to a point; thence turning and running S 81º47'47"E a distance of 95.44 feet to a point; thence turning and running S 27º32'59" W a distance of 105.61 feet to a point; thence turning and running S 63º41'25" E a distance of 89.87 feet to a point; thence turning and running S 27º42'29" W a distance of 55.43 feet to a point; thence turning and running S 68º18'40" E a distance of 71.97 feet to a point; thence turning and running S 23º03'16" W a distance of 181.52 feet to a point; thence turning and running S 68º50'56" E a distance of 215.87 feet to a point; thence turning and running S 58º37'02" E a distance of 189.69 feet to the point and place of beginning.

SCHEDULE B.1
MINIMUM SPECIFICATIONS FOR HOUSING OPPORTUNITY UNITS – BUILDING A (Existing Rehabilitation)

Foundation

- Footings – existing poured concrete
- Frost Walls – existing poured concrete
- Floors – existing poured concrete

Exterior

- Framing and Sheathing – existing structural steel framing, non-structural sheathing
- Exterior Wall – metal stud framing 6" (non-bearing)
- Interior Wall – metal stud framing 3-5/8"
- Existing roof, replace in kind, EPDM
- Foundation plantings – as specified
- Existing masonry facade
- No gutters, drip strip provided (existing to be rehabilitated)
- Exterior weather-proof outlets
- Energy efficient vinyl or fiberglass windows
- Asphalt driveways, concrete walkways, brick accent areas
- Insulation per code, R-21 wall, R-38 uninterrupted at ceiling

Interior

- Vinyl plank
- Energy efficient heating system
- High efficiency hot water, central plant
- Low-flow fixtures for showerheads, toilets, and faucets
- Addressable fire alarm system with heat detection
- Addressable direct wire smoke and CO2 detectors
- Wire closet shelving
- Pre-wired telephone and cable
- Central laundry
- GFI circuits in wet areas (kitchens and baths)
- Panel doors- molded hardboard

Kitchens

- Vinyl Plank [flooring material]
- Full overlay cabinets, plywood box
- Electric Range, Microwave/Hood, Refrigerator
- Dishwasher, built-in, insulation blanket

- Laminate countertop
- Stainless Steel sink with single-lever faucet

Bathrooms

- Medicine Cabinet, recess mount
- Porcelain enamel tub with solid surface wall surround
- Cultured Marble counter with integral sink
- Tile floor

SCHEDULE B.2
MINIMUM SPECIFICATIONS FOR HOUSING OPPORTUNITY UNITS – BUILDING B (New Construction)

Foundation

- Footings – poured concrete
- Frost Walls – poured concrete
- Floors – poured concrete

Exterior

- Framing and Sheathing – per building code
- Exterior Wall – 2 x 6 wood stud framing
- Interior Wall – 2 x 4 wood stud (bearing), 3-5/8" metal stud framing (non-bearing)
- Asphalt Shingle Roof (30 year)
- Foundation plantings – as specified
- Masonry façade (first floor), cement fiber clapboard siding, cement fiber panel siding
- No gutters, drip strip provided
- Exterior weather-proof outlets
- Energy efficient vinyl or fiberglass windows
- Asphalt driveways, concrete walkways, brick accent areas
- Insulation per code, R-21 wall, R-38 uninterrupted at ceiling

Interior

- Vinyl plank
- Energy efficient heating system
- High efficiency hot water, central plant
- Low-flow fixtures for showerheads, toilets, and faucets
- Addressable fire alarm system with heat detection
- Addressable direct wire smoke and CO2 detectors
- Wire closet shelving
- Pre-wired telephone and cable
- Central laundry
- GFI circuits in wet areas (kitchens and baths)
- Panel doors- molded hardboard

Kitchens

- Vinyl Plank [flooring material]
- Full overlay cabinets, plywood box
- Electric Range, Microwave/Hood, Refrigerator
- Dishwasher, built-in, insulation blanket

- Laminate countertop
- Stainless Steel sink with single-lever faucet

Bathrooms

- Medicine Cabinet, recess mount
- Porcelain enamel tub with solid surface wall surround
- Cultured Marble counter with integral sink
- Tile floor

SCHEDULE C
DEFINITIONS AND ELEMENTS OF ANNUAL FAMILY INCOME

1. Annual income shall be calculated with reference to 24 C.F.R. § 5.609, and includes, but is not limited to, the following:

a. The full amount, before any payroll deductions, of wages and salaries, overtime pay, commissions, fees, tips, bonuses and other compensation for personal services.

b. The net income from operations of a business or profession, before any capital expenditures but including any allowance for depreciation expense. Any withdrawal of cash or assets from the operation of a business or profession will be included in income, except to the extent the withdrawal is reimbursement of cash or assets invested in the operation by the family.

c. Interest, dividends, and other net income of any kind from real or personal property, before any capital expenditures but including any allowance for depreciation expense. Any withdrawal of cash or assets from an investment will be included in income, except to the extent the withdrawal is reimbursement of cash or assets invested by the family. Where the family has net family assets in excess of $5,000, annual income shall include the greater of the actual income derived from all net family assets or a percentage of the value of such assets based on the current passbook savings rate, as determined by HUD.

d. The full amount of periodic payments received from social security, annuities, insurance policies, retirement funds, pensions, disability or death benefits, or other similar types of periodic payments; including a lump-sum amount or prospective monthly amounts for the delayed start of a periodic amount, except as permitted in 2q, below.

e. Payments in lieu of earnings, such as unemployment and disability compensation, worker's compensation, and severance pay, except as permitted in 2c, below.

f. Welfare assistance payments.

(1) Welfare assistance payments made under the Temporary Assistance for Needy Families ("TANF") program are included in annual income only to the extent such payments:

(a) Qualify as assistance under the TANF program definition at 45 C.F.R. § 260.31; and

(b) Are not otherwise excluded under Section 2, below.

(2) If the welfare assistance payments include an amount specifically designated for shelter and utilities that is subject to adjustment by the welfare assistance agency

in accordance with the actual cost of shelter and utilities, the amount of welfare assistance to be included as income consists of the following:

(a) The amount of the allowance or grant exclusive of the amounts designated for shelter or utilities, plus

(b) The maximum amount that the welfare assistance agency could in fact allow the family for shelter and utilities. If the family's welfare assistance is ratably reduced from the standard of need by applying a percentage, the amount calculated under this paragraph shall be the amount resulting from one application of the percentage.

g. Periodic and determinable allowances, such as alimony and child support payments, and regular contributions or gifts received from organizations or persons not residing with the Applicant (*e.g.*, periodic gifts from family members, churches, or other sponsored group, even if the gifts are designated as rental or other assistance).

h. All regular pay, special pay and allowances of a member of the Armed Forces, except combat pay as in 2g, below.

i. For section 8 programs only and as provided in 24 C.F.R. § 5.612, any financial assistance, in excess of amounts received for tuition and any other required fees and charges, that an individual receives under the Higher Education Act of 1965 (20 U.S.C. §§ 1001 *et seq.*), from private sources, or from an institution of higher education (as defined under the Higher Education Act of 1965 (20 U.S.C. § 1002)), shall be considered income to that individual, except that financial assistance described in this paragraph is not considered annual income for persons over the age of 23 with dependent children. For purposes of this paragraph, "financial assistance" does not include loan proceeds for the purpose of determining income.

2. Excluded from the definition of family annual income are the following:

a. Income from employment of children under the age of 18 (including foster children).

b. Payments received for the care of foster children or foster adults.

c. Lump-sum additions to family assets, such as inheritances, insurance payments (including payments under health and accident insurance and worker's compensation), capital gains and settlement for personal or property losses, except as proved in 1e, above.

d. Amounts received by the family that are specifically for, or in reimbursement of, the cost of medical expenses for any family member.

e. Income of a live-in aide, as defined in 24 C.F.R. § 5.403.

f. Subject to 1i, above, the full amount of student financial assistance paid directly to the student or to the educational institution.

g. The special pay to a family member serving in the Armed Forces who is exposed to hostile fire.

h. Amounts received under training programs funded by HUD.

i. Amounts received by a person with a disability that are disregarded for a limited time for purposes of Supplemental Security Income eligibility and benefits because they are set aside for use under a Plan to Attain Self-Sufficiency ("PASS").

j. Amounts received by a participant in other publicly assisted programs which are specifically for or in reimbursement of out-of-pocket expenses incurred (special equipment, clothing, transportation, child care, etc.) and which are made solely to allow participation in a specific program.

k. Amounts received under a resident service stipend. A resident service stipend is a modest amount (not to exceed $200 per month) received by a resident for performing a service for the PHA or owner, on a part-time basis, that enhances the quality of life in the development. Such services may include, but are not limited to, fire patrol, hall monitoring, lawn maintenance, and resident initiatives coordination. No resident may receive more than one such stipend during the same period of time.

l. Incremental earnings and benefits resulting to any family member from participation in qualifying State or local employment training programs (including training programs not affiliated with a local government) and training of a family member as resident management staff. Amounts excluded by this provision must be received under employment training programs with clearly defined goals and objectives, and are excluded only for the period during which the family member participates in the employment training program.

m. Temporary, nonrecurring or sporadic income (including gifts that are not regular or periodic).

n. Reparation payments paid by a foreign government pursuant to claims filed under the laws of that government by persons who were persecuted during the Nazi era.

o. Earnings in excess of $480 for each full-time student 18 years old or older (excluding the head of household and spouse).

p. Adoption assistance payments in excess of $480 per adopted child.

q. Deferred periodic amounts from supplemental security income and social security benefits that are received in a lump sum amount or in prospective monthly amounts, or any deferred Department of Veterans Affairs disability benefits that are received in a lump sum amount or in prospective monthly amounts.

r. Amounts received by the family in the form of refunds or rebates under State or local law for property taxes paid on the dwelling unit.

s. Amounts paid by a State agency to a family with a member who has a developmental disability and is living at home to offset the cost of services and equipment needed to keep the developmentally disabled family member at home.

t. Amounts specifically excluded by any other Federal statute from consideration as income for purposes of determining eligibility or benefits under a category of assistance programs that includes assistance under any program to which the exclusions set forth in 24 C.F.R. § 5.609(c) apply. *See* Exhibit 5-1 at pp. 4-5 to HUD Handbook 4350.3: Occupancy Requirements of Subsidized Multifamily Housing Programs, revised as of November 2013, for a listing of income sources that apply for the exclusion.

3. Net family assets for purposes of imputing annual income include the following:[1]

a. Cash held in savings and checking accounts, safety deposit boxes, homes, etc.

b. The current market value of a trust for which any household member has an interest.

c. The current market value of any rental property or other capital investments, less (i) any unpaid balance on any loans secured by the property and (ii) reasonable costs that would be incurred in selling the asset (*e.g.*, penalties, broker fees, etc.).

d. The current market value of all stocks, bonds, treasury bills, certificates of deposit, mutual funds, and money market accounts.

e. The current value of any individual retirement, 401K or Keogh account.

f. The cash value of a retirement or pension fund which the family member can withdraw without terminating employment or retiring.

g. Periodic or lump-sum receipts from pension and retirement funds at retirement, termination of employment or withdrawal.

h. The cash value of life insurance policies available to the individual before death.

[1] What is included and excluded from Net Family Assets is derived with reference to Exhibit 5-2 to HUD Handbook 4350.3: Occupancy Requirements of Subsidized Multifamily Housing Programs, revised as of November 2013.

i. Any lump-sum receipts not otherwise included in income (*e.g.*, inheritances, capital gains, one-time lottery winnings, victim's restitution and settlement on insurance claims).

j. The current market value of any personal property held for investment (*e.g.*, gems, jewelry, coin collections).

k. Interest payments on a mortgage or deed of trust held by an Applicant.

4. Net family assets do not include the following:

a. Necessary personal property (*e.g.* clothing, furniture, cars, jewelry not held for personal investment etc.).

b. Interest in Indian Trust Land.

c. Equity in a cooperative unit in which the family lives.

d. Term life insurance policies.

e. Assets which are part of an active business, not including rental properties.

f. Assets that are not effectively owned by the Applicant because, although held in the Applicant's name, the assets and any income accrue to the benefit of someone else who is not a member of the family and the other person is responsible for income taxes incurred.

g. Assets that are not accessible to the Applicant and provide no income to the Applicant.

SCHEDULE D
DOCUMENTATION OF INCOME

The following documents shall be provided, where applicable, to the Administrator to determine income eligibility:

1. Employment Income.

Verification forms must request the employer to specify the frequency of pay, the effective date of the last pay increase, and the probability and effective date of any increase during the next twelve (12) months. Acceptable forms of verification (of which at least one must be included in the Applicant file) include:

a. An employment verification form completed by the employer.

b. Check stubs or earnings statement showing Applicant's gross pay per pay period and frequency of pay.

c. W-2 forms if the Applicant has had the same job for at least two years and pay increases can be accurately projected.

d. Notarized statements, affidavits or income tax returns signed by the Applicant describing self-employment and amount of income, or income from tips and other gratuities.

2. Social Security, Pensions, Supplementary Security Income, Disability Income.

a. Benefit verification form completed by agency providing the benefits.

b. Award or benefit notification letters prepared and signed by the authorizing agency. (Since checks or bank deposit slips show only net amounts remaining after deducting SSI or Medicare, they may be used only when award letter cannot be obtained.)

c. If a local Social Security Administration ("SSA") office refuses to provide written verification, the Administrator should meet with the SSA office supervisor. If the supervisor refuses to complete the verification forms in a timely manner, the Administrator may accept a check or automatic deposit slip as interim verification of Social Security or SSI benefits as long as any Medicare or state health insurance withholdings are included in the annual income.

3. Unemployment Compensation.

a. Verification form completed by the unemployment compensation agency.

b. Records from unemployment office stating payment dates and amounts.

4. Government Assistance.

a. All Government Assistance Programs. Agency's written statements as to type and amount of assistance Applicant is now receiving, and any changes in assistance expected during the next twelve (12) months.

b. Additional Information for "As-paid" Programs: Agency's written schedule or statement that describes how the "as-paid" system works, the maximum amount the Applicant may receive for shelter and utilities and, if applicable, any factors used to ratably reduce the Applicant's grant.

5. Alimony or Child Support Payments.

a. Copy of a separation or settlement agreement or a divorce decree stating amount and type of support and payment schedules.

b. A letter from the person paying the support.

c. Copy of latest check. The date, amount, and number of the check must be documented.

d. Applicant's notarized statement or affidavit of amount received or that support payments are not being received and the likelihood of support payments being received in the future.

6. Net Income from a Business.

The following documents show income for the prior years. The Administrator must consult with Applicant and use this data to estimate income for the next twelve (12) months.

a. IRS Tax Return, Form 1040, including any:

(1) Schedule C (Small Business).

(2) Schedule E (Rental Property Income).

(3) Schedule F (Farm Income).

b. An accountant's calculation of depreciation expense, computed using straight-line depreciation rules. (Required when accelerated depreciation was used on the tax return or financial statement.)

c. Audited or unaudited financial statement(s) of the business.

d. A copy of a recent loan application listing income derived from the business during the previous twelve (12) months.

e. Applicant's notarized statement or affidavit as to net income realized from the business during previous years.

7. Recurring Gifts.

a. Notarized statement or affidavit signed by the person providing the assistance. Must give the purpose, dates and value of gifts.

b. Applicant's notarized statement or affidavit that provides the information above.

8. Scholarships, Grants, and Veterans Administration Benefits for Education.

a. Benefactor's written confirmation of amount of assistance, and educational institution's written confirmation of expected cost of the student's tuition, fees, books and equipment for the next twelve (12) months. To the extent the amount of assistance received is less than or equal to actual educational costs, the assistance payments will be excluded from the Applicant's gross income. Any excess will be included in income.

b. Copies of latest benefit checks, if benefits are paid directly to student. Copies of canceled checks or receipts for tuition, fees, books, and equipment, if such income and expenses are not expected to change for the next twelve (12) months.

c. Lease and receipts or bills for rent and utility costs paid by students living away from home.

9. Family Assets Currently Held.

For non-liquid assets, collect enough information to determine the current cash value (*i.e.*, the net amount the Applicant would receive if the asset were converted to cash).

a. Verification forms, letters, or documents from a financial institution, broker, etc.

b. Passbooks, checking account statements, certificates of deposit, bonds, or financial statements completed by a financial institution or broker.

c. Quotes from a stock broker or realty agent as to net amount Applicant would receive if Applicant liquidated securities or real estate.

d. Real estate tax statements if tax authority uses approximate market value.

e. Copies of closing documents showing the selling price, the distribution of the sales proceeds and the net amount to the borrower.

f. Appraisals of personal property held as an investment.

g. Applicant's notarized statements or signed affidavits describing assets or verifying the amount of cash held at the Applicant's home or in safe deposit boxes.

10. Assets Disposed of for Less Than Fair Market Value ("FMV") During Two Years Preceding Application Date.

a. Applicant's certification as to whether it has disposed of assets for less than FMV during the two (2) years preceding the Application Date.

b. If the Applicant states that it did dispose of assets for less than FMV, then a written statement by the Applicant must include the following:

(1) A list of all assets disposed of for less than FMV;

(2) The date Applicant disposed of the assets;

(3) The amount the Applicant received; and

(4) The market value to the asset(s) at the time of disposition.

11. Savings Account Interest Income and Dividends.

a. Account statements, passbooks, certificates of deposit, etc., if they show enough information and are signed by the financial institution.

b. Broker's quarterly statements showing value of stocks or bonds and the earnings credited the Applicant.

c. If an IRS Form 1099 is accepted from the financial institution for prior year earnings, the Administrator must adjust the information to project earnings expected for the next twelve (12) months.

12. Rental Income from Property Owned by Applicant.

The following, adjusted for changes expected during the next twelve (12) months, may be used:

a. IRS Form 1040 with Schedule E (Rental Income).

b. Copies of latest rent checks, leases, or utility bills.

c. Documentation of Applicant's income and expenses in renting the property (tax statements, insurance premiums, receipts for reasonable maintenance and utilities, bank statements or amortization schedule showing monthly interest expense).

d. Lessee's written statement identifying monthly payments due the Applicant and Applicant's affidavit as to net income realized.

13. Full-Time Student Status.

a. Written verification from the registrar's office or appropriate school official.

b. School records indicating enrollment for sufficient number of credits to be considered a full-time student by the school.

Exhibit B
Owner's Certificate of Continuing Program Compliance

Received Date (*For Office Use Only*):

OWNER'S CERTIFICATE OF CONTINUING LIHTC PROGRAM COMPLIANCE

To: Connecticut Housing Finance Authority
C/O Spectrum Enterprises, Inc.
545 Shore Road
Cape Elizabeth, ME 04107

☐ No buildings have been Placed in Service
☐ At least one building has been placed in Service but owner elects to begin credit period in the following year.

If either of the above applies, please check the appropriate box, and proceed to page 3 to sign and date this form.

Certification Dates:	From: **January 1, 20**	To: **December 31, 20**			
Project Name:		**Project No:**			
Project Address:		**City:**		**Zip:**	
Tax ID # of Ownership Entity:					

The undersigned ______________________________ on behalf of ______________________________ (the "Owner"), hereby certifies to the Connecticut Housing Finance Authority ("the Authority") that:

I. The project met the minimum requirements of: (check one)
☐ 20 - 50 test under Section 42(g)(1)(A) of the Code
☐ 40 - 60 test under Section 42(g)(1)(B) of the Code

And, if applicable to the project: (check)
☐ 15 - 40 test for "deep rent-skewed" projects under Section 42(g)(4) and 142(d)(4)(B) of the Code;

II. There has been **no change in the applicable fraction** (as defined in Section 42(c)(1)(B)) of any building in the project, or that there was a change and description of the change;
☐ **NO CHANGE** ☐ **CHANGE**

If **"Change"** list the applicable fraction to be reported to the IRS for each building in the project for the certification year on page 3.

III. The owner has received an annual income certification from each low-income tenant, and documentation to support that certification; or, in the case of a tenant receiving Section 8 housing assistance payments, the statement from a public housing authority described in paragraph (b)(1)(vii) of Section 1.42-5;
☐ **YES** ☐ **NO**

IV. Each low-income unit in the project has been rent-restricted under Section 42(g)(2);
☐ **YES** ☐ **NO**

V. All units in the project were for use by the general public (as defined in Section 1.42-9), including the requirement that no finding of discrimination under the Fair Housing Act, 42 U.S.C. 3601-3619, occurred for the project. A finding of discrimination includes an adverse final decision by the Secretary of the Department of Housing and Urban Development (HUD), 24 CFR 180.680, an adverse final decision by a substantially equivalent state or local fair housing agency, 42 U.S.C. 3616a(a)(1), or an adverse judgment from a federal court;
☐ **YES** ☐ **NO**

VI. The buildings and low-income units in the project were suitable for occupancy, taking into account local health, safety, and building codes (or other habitability standards), and the State or local government unit responsible for making local health, safety, or building code inspections did not issue a violation report for any building or low-income unit in the project. If a violation report or notice was issued by the governmental unit, the owner must attach a statement summarizing the violation report or notice or a copy of the violation report or notice to the annual certification submitted to the Authority under paragraph (c)(1) of Section 1.42-5. In addition, the owner must state whether the violation has been corrected;
☐ **YES** ☐ **NO**

VII. There was no change in the eligible basis (as defined in Section 42(d)) of any building in the project, or if there was a change, the nature of the change (e.g., a common area has become commercial space, or a fee is now charged for a tenant facility formerly provided without charge):

☐ **NO CHANGE** ☐ **CHANGE**

If "**Change**", state nature of the change on page 3.

VIII. All tenant facilities included in the eligible basis under Section 42(d) of any building in the project, such as swimming pools, other recreational facilities, and parking areas, were provided on a comparable basis without charge to all tenants in the building;

☐ **YES** ☐ **NO**

IX. If a low-income unit in the project has been vacant during the year, reasonable attempts were or are being made to rent that unit or the next available unit of comparable or smaller size to tenants having a qualifying income before any units in the project were or will be rented to tenants not having a qualifying income;

☐ **YES** ☐ **NO**

X. If the income of tenants of a low-income unit in the building increased above the limit allowed in Section 42(g)(2)(D)(ii), the next available unit of comparable or smaller size in the building was or will be rented to tenants having a qualifying income;

☐ **YES** ☐ **NO**

XI. An extended low-income housing commitment as described in Section 42(h)(6) was in effect (for buildings subject to Section 7108(c)(1) of the Omnibus Budget Reconciliation Act of 1989, 103 Stat. 2106, 2308-2311), including the requirement under Section 42(h)(6)(B)(iv) that an owner cannot refuse to lease a unit in the project to an applicant because the applicant holds a voucher or certificate of eligibility under Section 8 of the United States Housing Act of 1937, 42 U.S.C. 1437f (for buildings subject to Section 13142(b)(4) of the Omnibus Budget Reconciliation Act of 1993, 107 Stat. 312, 438-439);

☐ **YES** ☐ **NO** ☐ **N/A**

XII. All low-income units in the project were used on a nontransient basis (except for transitional housing for the homeless provided under Section 42(i)(3)(B)(iiii) or single-room-occupancy units rented on a month-by-month basis under Section 42(i)(3)(B)(iv);

☐ **YES** ☐ **NO** ☐ **HOMELESS**

XIII.a The owner received its credit allocation from the portion of the state ceiling set-aside for a project involving "qualified non-profit organizations" under Section 42 (h)(5) of the code.

☐ **YES** ☐ **NO (If NO, skip to question XIV)**

XIII.b If the answer to XIII.a was yes, is that participation ongoing?

☐ **YES** ☐ **NO**

XIV. There has been no change in the ownership or management of the project;

☐ **NO CHANGE** ☐ **CHANGE**

If "**Change**", complete page 3 detailing the changes in ownership or management of the project.

XV. The Owner complies with Internal Revenue Service ("IRS") Revenue Ruling 2004-82, which at Question and Answer 5, states that Internal Revenue Code ("IRC") Section 42(h)(6)(B)(i) requires that "an extended low-income housing commitment include a prohibition during the extended use period against (1) the eviction or termination of tenancy (other than for good cause) of an existing tenant of any low-income unit (no-cause eviction protection) and (2) any increase in the gross rent with respect to the unit not otherwise permitted under § 42.

☐ **YES** ☐ **NO**

XVI. The person responsible for the tax credit management of the property has attended LIHTC training within the past three years. Provide copy of certificate of continuing education.

☐ **YES** ☐ **NO**

Note: Failure to complete this form in its entirety will result in noncompliance with program requirements. In addition, any individual other than an owner or general partner of the project is not permitted to sign this form, unless permitted by the state agency.

The project is otherwise in compliance with the Code, including any Treasury Regulations, the applicable State Allocation Plan, and all other applicable laws, rules and regulations. This Certification and any attachments are made UNDER PENALTY OF PERJURY.

By: ______________________________ ______________________________
(Signature) (Ownership Entity)

______________________________ ______________________________
(Please Print Name) (Owner Phone Number)

Title: ______________________________

Date: ______________________________

Signed sealed and delivered in the presence of:

Notary: ______________________________

Witness: ______________________________ My commission expires: ______________________________

Date of Execution: ______________________________ (NOTARY PUBLIC SEAL)

PLEASE EXPLAIN ANY ITEMS THAT WERE ANSWERED "NO" OR "CHANGE" ON QUESTIONS 1-14. (EXCEPT XIIIA)

Question #	Explanation

CHANGES IN OWNERSHIP OR MANAGEMENT
(to be completed **ONLY if "CHANGE"** marked for question 14 above)

TRANSFER OF OWNERSHIP

Date of Change:	
Taxpayer ID Number:	
Legal Owner Name:	
General Partnership:	
Status of Partnership (LLC, etc):	

CHANGES IN OWNER CONTACT

Date of Change:	
Owner Contact:	
Owner Contact Phone:	
Owner Contact Fax:	
Owner Contact Email:	

CHANGES IN MANAGEMENT CONTACT

Date of Change:	
Management Co. Name:	
Management Address:	
Management city, state, zip:	
Management Contact:	
Management Contact Phone:	
Management Contact Fax:	
Management Contact Email:	

Exhibit C
Tenant Income Certification

TENANT INCOME CERTIFICATION TC - 100

☐ Initial Certification ☐ Recertification
☐ Other ____________

Effective Date: ____________
Move-in Date: ____________ (YYYY-MM-DD)

PART I - DEVELOPMENT DATA

Property Name:	County:	BIN #:	PISD:		
BIN Address:		City:		Zip:	
Unit Number:		# Bedrooms:		Square Footage:	

PART II. HOUSEHOLD COMPOSITION (DEMOGRAPHIC INFORMATION IS FOR LIHTC ONLY)

HH Mbr#	Last Name	First Name	Middle Initial	Relationship to Head of Household	Date of Birth (MM/DD/YY)	F/T Student?	SS# Last 4 Digits	Race	Ethnic	Disabled?
1				HEAD						
2										
3										
4										
5										
6										
7										

PART III. GROSS ANNUAL INCOME (USE ANNUAL AMOUNTS)

HH Mbr #	(A) Employment or Wages	(B) Soc. Security/Pensions	(C) Public Assistance	(D) Other Income
TOTALS	$	$	$	$

Add totals from (A) through (D), above   TOTAL INCOME (E): $

PART IV. INCOME FROM ASSETS

Hshld Mbr #	(F) Type of Asset	(G) C/I	(H) Cash Value of Asset	(I) Annual Income from Asset
		TOTALS:	$	$

Enter Column (H) Total If over $5,000 $________ X Passbook Rate .06% = (J) Imputed Income $

Enter the greater of the total of column I, or J: imputed income   TOTAL INCOME FROM ASSETS (K) $

(L) Total Annual Household Income from all Sources [Add (E) + (K)] $

HOUSEHOLD CERTIFICATION & SIGNATURES

The information on this form will be used to determine maximum income eligibility. I/we have provided for each person(s) set forth in Part II acceptable verification of current anticipated annual income. I/we agree to notify the landlord immediately upon any member of the household moving out of the unit or any new member moving in. I/we agree to notify the landlord immediately upon any member becoming a full time student.

Under penalties of perjury, I/we certify that the information presented in this Certification is true and accurate to the best of my/our knowledge and belief. The undersigned further understands that providing false representations herein constitutes an act of fraud. False, misleading or incomplete information may result in the termination of the lease agreement.

Signature	(Date)	Signature	(Date)
Signature	(Date)	Signature	(Date)

PART V. DETERMINATION OF INCOME ELIGIBILITY

			RECERTIFICATION ONLY:
TOTAL ANNUAL HOUSEHOLD INCOME FROM ALL SOURCES: From item (L) on page 1	$	Household Meets Income Restriction at:	Current Income Limit x 140% $
Current LIHTC Income Limit per Family Size for the federal 50% or 60% set aside:	$	☐ 60% ☐ 50% ☐ 40% ☐ 30% ☐ ___%	Household Income exceeds 140% at recertification: ☐ Yes ☐ No
Household Income at Move-in:	$		
Household Size at Move-in:			

PART VI. RENT

Tenant Paid Rent	$	Federal Rent Assistance Amount: $______ *Source: ____ (*1-8)
Utility Allowance	$	Non-Federal Rent Assistance Amount: $______
Other non-optional charges:	$	TOTAL RENT ASSISTANCE: $______
GROSS RENT FOR UNIT: (Tenant paid rent plus Utility Allowance & other non-optional charges)	$	* Source of Federal Assistance 1 **HUD Multi-Family Project-Based Rental Assistance (PBRA) 2 Section 8 Moderate Rehabilitation 3 Public Housing Operating Subsidy 4 HOME Rental Assistance 5 HUD Housing Choice Voucher (HCV), tenant-based 6 HUD Project-Based Voucher (PBV) 7 USDA Section 521 Rental Assistance Program 8 Other Federal Rental Assistance
Maximum Rent Limit for this unit:	$	
Unit Meets Rent Restriction at:	☐ 60% ☐ 50% ☐ 40% ☐ 30% ☐ ___%	
		** (PBRA) Includes: Section 8 New Construction/Substantial Rehabilitation; Section 8 Loan Management; Section 8 Property Disposition; Section 202 Project Rental Assistance Contracts (PRAC)

PART VII. STUDENT STATUS

ARE ALL OCCUPANTS FULL TIME STUDENTS? ☐ Yes ☐ No	If yes, Enter student explanation* (also attach documentation) *Enter 1-6: ______	*Student Explanation: 1 TANF assistance 2 Job Training Program 3 Single parent/dependent child 4 Married/joint return 5 Formerly in foster care 6 Extended-Use Period

PART VIII. PROGRAM TYPE

Mark the program(s) listed below (a. through e.) for which this household's unit will be counted toward the property's occupancy requirements. Under each program marked, indicate the household's income status as established by this certification/recertification.

a. Tax Credit ☐	b. HOME ☐	c. Tax Exempt ☐	d. AHDP ☐	e. ☐ ______ *(Name of Program)*
See Part V above.	*Income Status* ☐ ≤ 50% AMGI ☐ ≤ 60% AMGI ☐ ≤ 80% AMGI ☐ OI**	*Income Status* ☐ 50% AMGI ☐ 60% AMGI ☐ 80% AMGI ☐ OI**	*Income Status* ☐ 50% AMGI ☐ 80% AMGI ☐ OI**	*Income Status* ☐ ______ ☐ ______ ☐ OI**

**Upon recertification, household was determined over-income (OI) according to eligibility requirements of the program(s) marked above.

SIGNATURE OF OWNER/REPRESENTATIVE

Based on the representations herein and upon the proofs and documentation required to be submitted, the individual(s) named in Part II of this Tenant Income Certification is/are eligible under the provisions of Section 42 of the Internal Revenue Code, as amended, and the Land Use Restriction Agreement (if applicable), to live in a unit in this Project.

______________________________ ______________
SIGNATURE OF OWNER/REPRESENTATIVE DATE

TAB 20

MEMORANDUM

TO: Avon Planning and Zoning Commission

FROM: Hinckley, Allen & Snyder LLP

DATE: September 17, 2021

RE: Affordable Housing Need in Avon and Surrounding Towns

This memorandum and the accompanying exhibits provide the Commission with data that will help it evaluate the need for affordable housing in Avon and surrounding towns.

I. Current Demand for Affordable Rental Housing

According to "The State of the Nation's Housing," a 2020 study by the Joint Center for Housing Studies at Harvard University, "[e]ven before the pandemic, housing affordability was at crisis levels" and "the current economic meltdown has revealed just how many millions of vulnerable households could be one rent payment away from eviction and homelessness. Short-term federal aid has helped some households weather the storm, but much more housing assistance—and housing supply—is necessary to counter the combined effects of the affordability crisis and the pandemic." See Tab A, p. 34. Moreover, "[e]ven before the pandemic-induced [economic] downturn, the number of US households with cost burdens held near record highs. Indeed, with the economy near full employment in 2019, some 37.1 million households (30.2 percent) spent more than 30 percent of their incomes on housing. Of this group, 17.6 million households had severe burdens, paying more than half their incomes for housing. Although on a downtrend, the number of cost-burdened households was still 5.6 million higher last year than in 2001." Id at p. 34. Furthermore, "[h]ousing affordability problems are more than twice as common among renters than among homeowners. Even with a 1.2 percentage point decline in 2018–2019, 46.3 percent of renter households were cost burdened last year, including 23.9 percent with severe burdens" Id at p. 34. "Many of today's 20 million cost-burdened renters have low to moderate incomes." Id at p. 6. Rental construction resumed a more moderate pace in September, after a sharp spike in the summer, "but sales of multifamily properties fell amid rising vacancy rates and ongoing uncertainty. Meanwhile, with most new units intended for the high end of the market and continued losses of low-cost units, rental affordability continues to erode, and the concentrated location of affordable units reinforces inequities." Id at p. 28.

II. Current Affordable Rental Housing Situation

A. In Avon:

Approximately 14 percent of Avon's 7,400 housing units are rental units. The median home price as of 2021 is approximately $399,000, and the median income is about $131,000.

The Affordable Housing Appeals List is a report of the percentages of deed-restricted and governmentally-assisted affordable housing units for all of Connecticut's municipalities that is issued by the Connecticut Department of Housing ("DOH"). The 2020 list shows that 4.11% of dwelling units in Avon qualified as affordable housing. See Tab B. Avon has zero units listed as deed restricted in compliance with § 8-30g. Section 8-30g has been in effect since 1990. As of 1993, Avon had 74 of 5,794 units counted as affordable, 1.3%. In 2000, the town had 6,468 total units, 1.8% affordable. Thus, since 1993, Avon has added about 1,700 housing units, but only 229 affordable units.

The Town of Avon approved its operative Plan of Conservation and Development ("POCD" or "Plan") in 2016. That Plan provides that, as of 2016, only 3.76% of housing units in Avon met the Connecticut Department of Housing definition of affordability. See Tab C, p. 72. As indicated above, the 2020 Affordable Housing Appeals List indicates that Avon continues to have about four percent affordable housing units in its housing stock. Nevertheless, the Plan recognizes the need for additional affordable housing in Avon. See, p. 73-74, 77, 119. To address this unmet need for affordable, diverse housing, the Plan recommends creating more affordable housing pursuant to Connecticut General Statutes § 8-30g. Id., at p. 73.

Under federal and state law, rent can take up no more than 30 percent of a household's income to be considered affordable. The Partnership for Strong Communities' 2020 Housing Data Profiles for Avon states that in Avon, 16 percent of households spend more than 30 percent of their income on housing and 28 percent of renters in Avon are burdened by the cost of housing. See Tab D, p. 1, 4.

B. In the Region:

The Partnership for Strong Communities' 2020 Housing Data Profiles for Hartford County indicates that 14.4 percent of the region's housing is affordable. See Tab E, p. 6. In addition, "47% of renters in Hartford County are cost burdened, that is, spend 30% or more of their income on rent and associated costs." Id. at p. 8. The median income for renters in the region is $38,000. Id., at p. 11.

In "Out of Reach 2020," a study published by the National Low Income Housing Coalition, an average full-time (40 hour per week) worker in the Hartford-West Hartford-East Hartford, CT HMFA has to earn $23.65 an hour, or $49,200 annually, to be able to afford a basic two-bedroom apartment unit rental. Therefore, a worker in the region who earns minimum wage has to work 2.2 full-time jobs in order to afford a two-bedroom apartment. The estimated hourly mean renter wage in the area is $16.92 an hour. Therefore, a worker who earns the mean renter wage of $16.92 an hour in Avon has to work 1.4 full-time jobs in order to afford a two-bedroom apartment rental. See Tab F, p. CT-51.

C. In Connecticut:

"Out of Reach 2020" ranks Connecticut as the tenth most expensive state in the United States with regard to housing. According to this Study, an average full-time worker in Connecticut has to earn $26.42 an hour, or $54,956 annually, to be able to afford a basic two-bedroom apartment unit rental. Therefore, a worker who earns minimum wage in Connecticut has to work 2.4 full-time jobs in order to afford a two-bedroom apartment rental. The estimated hourly mean renter wage in Connecticut is $17.70 an hour. Therefore, a worker who earns the mean renter wage of $17.70 an hour in Connecticut has to work 1.5 full-time jobs in order to afford a two-bedroom apartment rental. See Tab F, p. 18-19.

A report by the Partnership for Strong Communities entitled "Housing in Connecticut 2020" assesses Connecticut's housing situation. "Nearly 120,000 Connecticut households spend over half of their income on rental housing (including rent and utilities). When households spend half their paycheck on home-related costs, they are forced to spend less on other needs, such as food, healthcare, and childcare. In turn, local businesses are negatively affected by residents' lack of income for other essentials." See Tab G, p. 1. "Household sizes in the U.S. have fallen for decades, leading to an increase in demand for multi-family homes. Despite this trend, multi-family housing starts have plummeted in Connecticut in recent years." Id.

III. The Myth of Fiscal Impacts

Recent studies have documented that mixed-income developments and affordable housing have no impact on home values in the communities where they are built. See Tabs H and I.

In addition, recent findings show that one and two-bedroom rental apartments have negligible impact on municipal and school expenditures. See Tab J.

IV. What Affordable Housing Looks Like

Local officials from Kent, Avon, Darien, West Harford, and Wallingford assess mixed-income housing developments built in their communities. See Tab K. For photographs of affordable housing built across the country, please see Tab L.

TABLE OF CONTENTS

Description **Tab Number**

THE STATE OF THE NATION'S HOUSING 2020

JOINT CENTER FOR HOUSING STUDIES OF HARVARD UNIVERSITY

THE STATE OF THE NATION'S HOUSING 2020

JOINT CENTER FOR HOUSING STUDIES OF HARVARD UNIVERSITY

HARVARD GRADUATE SCHOOL OF DESIGN | HARVARD KENNEDY SCHOOL

TABLE OF CONTENTS

ONLINE TABLES AND EXHIBITS

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Federal Home Loan Banks

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National Association of Home Builders

National Association of Housing and Redevelopment Officials (NAHRO)

National Association of REALTORS®

National Council of State Housing Agencies

National Housing Conference

National Housing Endowment

National League of Cities

National Low Income Housing Coalition

National Multifamily Housing Council

NeighborWorks America

1 | EXECUTIVE SUMMARY

For most of 2020, the country has been beset by the COVID-19 pandemic, social unrest sparked by longstanding racial injustice, and the devastating impacts of climate change. Although low interest rates and continued growth in some sectors have bolstered homebuying and the broader economy, conditions have worsened for many households. Indeed, the nation's failure to live up to its long-stated goal of a decent home in a suitable environment for all has never been clearer—particularly in the lack of affordable rental housing and unequal access to homeownership. Today's crisis conditions call for a comprehensive re-envisioning of national housing policy.

WORSENING AFFORDABILITY FOR RENTERS

With rent increases continuing to compete with income gains, some 20.4 million renter households paid more than 30 percent of their incomes for housing in 2019. Although this represents a modest decline since the peak in 2014, the total number of cost-burdened renters last year was still 5.6 million higher than in 2001.

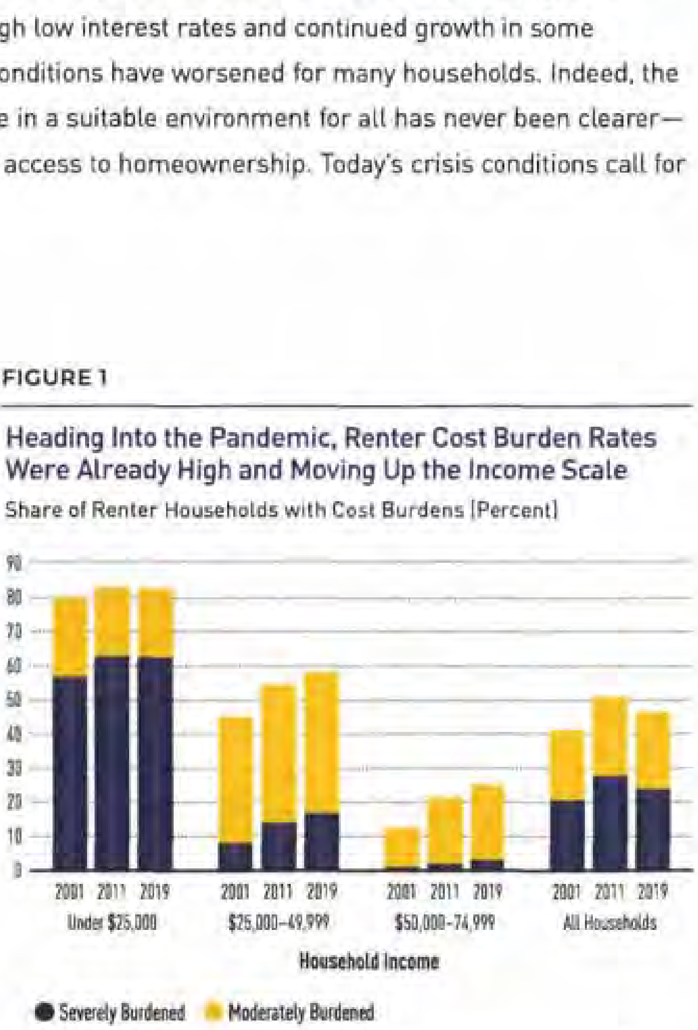
For lowest-income renter households, however, conditions have barely improved since 2011. More than four-fifths of households with incomes under $25,000 were at least moderately cost burdened in 2019, including 62 percent paying more than half their incomes for housing. Tight supply and rising rents have increased the pressures on moderate-income households as well, lifting the share of cost-burdened households earning between $25,000 and $49,999 from 44 percent in 2001 to 58 percent last year **(Figure 1)**.

The economic fallout from the COVID-19 pandemic has amplified the rental affordability crisis. According to the Census Bureau's Household Pulse Survey for late September, renters earning less than $25,000 a year were much more likely to report lost employment income since the March shutdown. Indeed, more than half (52 percent) of lowest-income renters lost wages during this period, compared with 41 percent of all households. Not surprisingly, about one in five renters earning less than $25,000 also said they were behind on rent, compared with 15 percent of all renters and just 7 percent of renters earning more than $75,000. Those earning $25,000 to $49,999 also struggled, with 53 percent losing income and 16 percent behind on rent.

FIGURE 1

Heading Into the Pandemic, Renter Cost Burden Rates Were Already High and Moving Up the Income Scale

Share of Renter Households with Cost Burdens (Percent)



Notes: Incomes are adjusted for inflation using the CPI-U for All Items. Moderately (severely) cost-burdened households pay 30–49% (50% or more) of income for housing. Households with zero or negative income are assumed to have severe burdens, while households paying no cash rent are assumed to be without burdens.
Source: JCHS tabulations of US Census Bureau, American Community Survey 1-Year Estimates.

Renter households of color have also suffered disproportionately from the pandemic's impacts. Even before the COVID-19 outbreak, the cost-burdened shares of Black and Hispanic renters, at 54 percent and 52 percent, were already more than 10 percentage points higher than that of white renters. The disparity between white and Asian renters, however, was just 0.3 percentage point. But with the shutdown of the economy, many of these households experienced income losses. As a result, 23 percent of Black, 20 percent of Hispanic, and 19 percent of Asian renters were behind on their rents by late September, or about twice the 10 percent share of white renters.

Federal support provided through the CARES Act—including enhanced unemployment benefits, stimulus payments, and funding for state and local relief efforts—did manage to keep many renters afloat. The overall economy has also recovered to some degree, with the unemployment rate dropping from 14.7 percent in April to 6.9 percent in October. So far, state and federal moratoriums have slowed evictions, but without additional federal aid, many households that have missed payments may be unable to cover their back rents.

Additional government outlays would not only help keep renters stably housed, but also provide needed support for property owners. With so many tenants in financial distress, landlords are coming under pressure as well. The full impacts of the economic downturn on owners are as yet unknown, although weekly surveys by the National Multifamily Housing Council show that rent delinquencies at professionally managed buildings from May through October averaged just under 10 percent by the 20th of each month.

Still, collections at the types of properties that are not typically professionally managed are much lower. The Household Pulse Survey found that 17 percent of renters in single-family homes and 14 percent of renters in smaller multifamily buildings (with fewer than five units) were behind on rent during the last two weeks of September, compared with 11 percent of tenants in larger apartment buildings (with at least 20 units).

UNCERTAIN DIRECTION OF THE RENTAL MARKET

Even before the pandemic derailed the economy, rental housing demand had slowed as the millennials (born 1985–2004) moved into their prime homebuying years. The number of renter households fell in 2017 and 2018 before rebounding by 301,000 in 2019, leaving their numbers essentially unchanged from 2016. However, the number of renters with higher incomes did continue to rise over this period, buoying the apartment market despite slackening demand overall.

Going forward, rental demand is likely to weaken further as households that have fared well financially this year turn to the homebuying market, while individuals who have lost jobs are forced to double up with others or delay forming their own households. Indeed, with the closing of schools and orders to work from home, a surge of young adults moved back into their parents' homes. According to the Pew Research Center, the share of adults aged 18–29 living with their parents climbed to 52 percent in July 2020, up from 46 percent at the start of the year and the highest level since the Great Depression. While many of these young adults may move to their own homes as the economy reopens further, some share of this group will remain out of the rental market either out of choice or necessity.

Softening demand has been accompanied by a steady flow of new supply. CoStar data for 12.6 million professionally managed apartments put the vacancy rate at 7.0 percent in the third quarter of 2020—the highest level since 2010. The sharpest rise was in the higher-quality segment, up 1.9 percentage points from a year earlier, to 10.5 percent. The increases are widespread, with RealPage reporting higher vacancies in 93 of the 150 markets they survey.

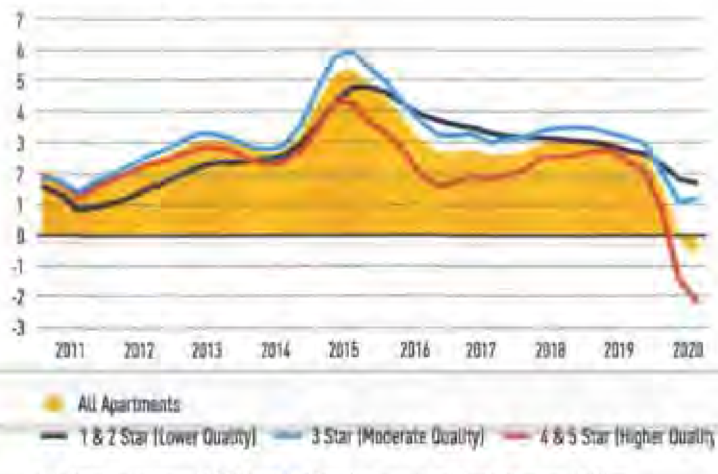
Rents have already started to respond to the falloff in occupancy **(Figure 2)**. CoStar finds that rents were down just 0.6 percent nationwide in the third quarter of 2020, but this decline represents a sharp reversal from the 2.8 percent gains averaged in 2019. With vacancy rates rising, the higher-quality segment has seen the largest drop in rents, off 2.2 percent. RealPage data indicate that third-quarter rents declined in 51 of the metros surveyed—six times the number a year earlier.

But if the rental market is at a turning point, relatively tight supply coming into the pandemic may prevent a steep downturn. In fact, market conditions appear to be relatively strong as apartment property prices

FIGURE 2

Rent Growth Has Slowed Sharply, Particularly at Higher-Quality Properties

Annual Change in Rents (Percent)



Note: Apartment quality is based on the CoStar Building Rating System for professionally managed market-rate apartments in buildings with five or more units.
Source: JCHS tabulations of CoStar data.

continue to rise. According to Real Capital Analytics, prices increased at an 8.8 percent annual rate over the 12 months ending in September 2020, down only slightly from the 9.5 percent rate a year earlier.

And despite concerns about tenants' inability to pay their rents, the delinquency rate for multifamily mortgages has not risen appreciably. The share of multifamily loans that are seriously delinquent (at least 90 days past due) inched up from just 0.12 percent in the first quarter to 0.19 percent in the second. Similarly, a Mortgage Bankers Association survey found that less than 1.7 percent of loans for professionally managed multifamily properties were in any stage of delinquency in September.

Moreover, construction of multifamily housing began 2020 well above the year-earlier pace. Although starts fell sharply during the spring lockdown, they made a quick and strong comeback. This lifted year-to-date starts in September above those in the same period in 2019, which was already the strongest year for multifamily construction in three decades. However, given the lengthy development process, a falloff in multifamily volumes would lag any drop in demand for new rentals. One indication that multifamily construction is in fact headed for a slowdown is that permitting activity was down 10 percent from year-earlier levels through September.

HOMEOWNERS ALSO HARD HIT

Although renters have been more likely to lose income during the pandemic, not all homeowners have been spared. Again, households of color and those with lower incomes have taken a disproportionate hit. While 36 percent of all homeowners reported having lost income between March and the end of September, the shares are as high as 44 percent among owners earning less than $25,000, 41 percent among Black owners, and 49 percent among Hispanic owners.

For many of these homeowners, the income losses come on top of cost burdens, leaving them struggling to pay their mortgages once the shutdown started. Among owners earning less than $25,000 annually, 69 percent were cost burdened going into the pandemic. Homeowners of color at this income level were also 5–10 percentage points more likely to have cost burdens than white homeowners.

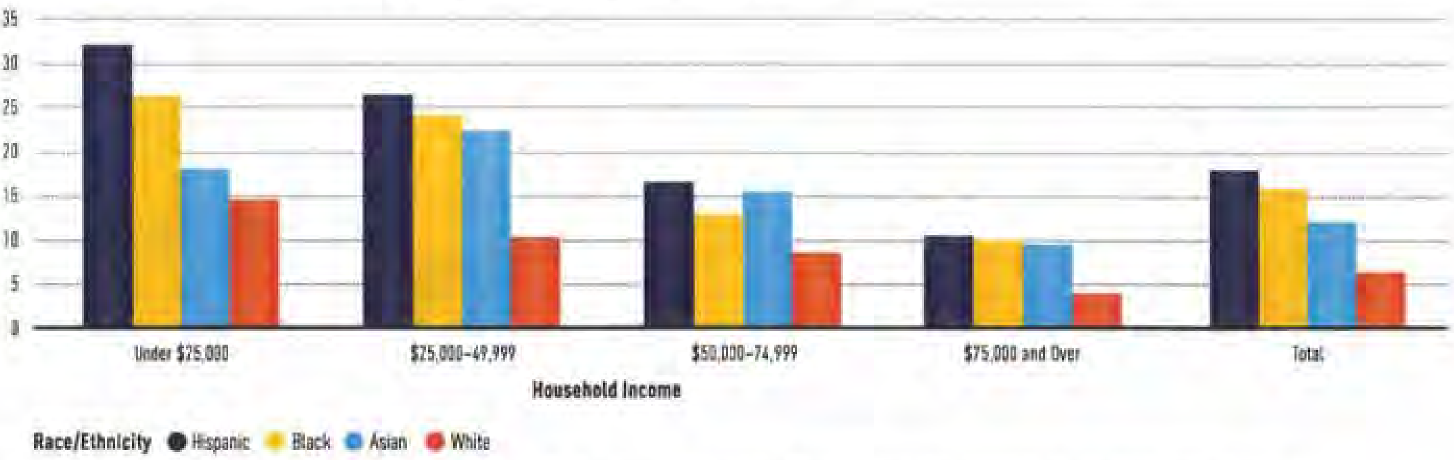
The pandemic has widened these disparities **(Figure 3)**. Just 7 percent of white homeowners were behind on mortgage payments in late September, but the share was nearly two-and-a-half times higher among Hispanic (18 percent) and Black (17 percent) owners, and nearly twice as high among Asian owners (12 percent). The shares of lowest-income households behind on their payments are especially alarming, including nearly a third of Hispanic, a quarter of Black, and a fifth of Asian homeowners.

Since roughly two-thirds of mortgages are federally backed, the government has considerable leeway to extend protections to distressed homeowners. Congress and the Federal Housing Finance Agency (FHFA)—the entity that oversees Fannie Mae and Freddie Mac—acted quickly at the start of the pandemic to provide homeowners forbearance of their monthly payments without penalties, fees, or the threat of foreclosure for up to a year. When the economy

FIGURE 3

Across Income Groups, Homeowners of Color Are More Likely than White Homeowners to Have Fallen Behind on Housing Payments During the Pandemic

Share of Homeowners Behind on Mortgage Payments as of September 2020 (Percent)



Note: Homeowners behind on housing payments reported that they were not caught up at the time of survey. White, Black, and Asian households are non-Hispanic. Hispanic households may be of any race. Totals include owners that identify as other races or as multiracial.
Source: JCHS tabulations of US Census Bureau, Household Pulse Survey, Week 15.

went into freefall in April, it was widely expected that more than one in five homeowners would opt for this relief. As it was, however, the share peaked at just 8.8 percent in June and fell steadily thereafter. Still, Black Knight Mortgage Monitor reports that 6.3 million homeowners had entered forbearance plans by the end of October.

These federal initiatives do not, however, cover 14.6 million homeowners with mortgages, although some lenders are extending similar safeguards to these borrowers. Another notable gap in protections is for the nearly three-quarters of owners of manufactured homes whose units are titled as personal property rather than real estate. Indeed, the Household Pulse Survey for late September shows that owners of manufactured homes are more likely to report lost income since March as well as to be behind on their housing payments.

In addition, homeowners under forbearance plans must work with loan servicers to remedy the accumulated debt. Black Knight reports that 53 percent of homeowners had already exited forbearance by late October, with a large majority of those who exited (68 percent) again current on their loans. Another 14 percent were delinquent but engaged with lenders in loss-mitigation efforts. These results are consistent with the expectation that many borrowers that are unable to make up for back payments will be able to add the outstanding amounts onto the end of their mortgage terms or otherwise restructure their loans. As of October, just 2 percent of these borrowers were at risk of foreclosure, having exited forbearance but still delinquent and not engaged in loss mitigation.

Of course, most homeowners that have exited forbearance plans are less likely to have suffered major income losses compared with those still in forbearance. In contrast, the 3.0 million owners that remain in forbearance may still be at risk of longer-term losses that will make it difficult for them to resume their normal mortgage payments even if the arrearage can be otherwise accommodated. With the steady rise in home prices, though, at least some of these financially stressed owners could avoid foreclosure by selling their homes or refinancing. As of August, some 15 percent of those exiting forbearance had paid off their loans by refinancing or by selling their homes.

But given the disproportionate impact of the pandemic on Black and Hispanic households, forced sales could take a toll on the homeownership rates of these already disadvantaged groups. Maintaining homeownership over a long period of time is critical to wealth creation by enabling households to ride out housing price cycles while gradually paying off mortgage debt. Loss mitigation approaches that help homeowners with longer-term income losses sustain homeownership are therefore important for both their current housing stability and their future financial success.

RESILIENCY IN THE HOMEBUYING MARKET

As 2020 began, the national homeownership rate had climbed back up to 64.6 percent, an increase of 1.2 percentage points from 2016. More importantly, the number of homeowner households grew at a 1.3 million average annual rate over this period, more than making up for nearly a decade of decline. Much of this growth was driven by younger adults, bolstered by the movement of the millennial population into the prime homebuying age group of 25–34. Indeed, the homeownership rate for households under age 35 rose 2.2 percentage points in 2016–2019.

Once the pandemic hit and the economy shut down, however, homebuying came to an abrupt halt. New home sales were down 14 percent year over year in April and existing home sales were off 27 percent in May. But the market for owner occupied homes then made a surprisingly strong rebound, with total sales well above year-earlier levels by summer **(Figure 4)**. At their present pace, sales of both new and existing homes are likely to exceed 2019 levels this year.

Meanwhile, single-family construction started the year at its fastest pace since the Great Recession, running above a 900,000 unit annual rate. Like home sales, though, single-family starts fell sharply in April, dipping below 700,000 units before making a rapid recovery. By September, construction activity was back to a 1.1 million annual rate, up 22 percent from a year earlier.

Still, the supply of homes for sale has not kept up with demand, shrinking already tight inventories. Only 1.47 million existing homes were on the market in September, representing a 2.7 months sup-

FIGURE 4

Home Sales Surged After a Sharp Dive in the Spring

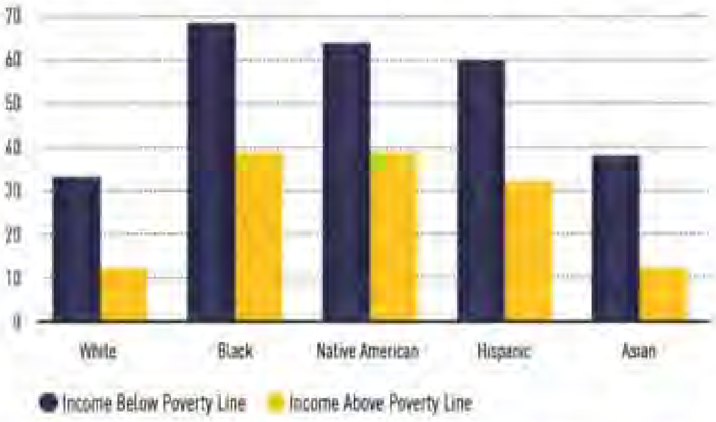
Year-over-Year Change (Percent)

Notes: Year-over-year changes are based on seasonally adjusted data, while the year-to-date changes are not seasonally adjusted. Some monthly data are subject to revision.
Source: JCHS tabulations of US Census Bureau, New Residential Sales; National Association of Realtors (NAR), Existing Home Sales.

FIGURE 5

People of Color Are More Concentrated in High-Poverty Neighborhoods than White People with Similar Incomes

Share of Population Living in Census Tracts with 20% or Higher Poverty (Percent)



Notes: Incomes above or below the poverty line are defined by the official measure of poverty established by the Office of Management and Budget (OMB). Only white individuals are non-Hispanic. Since Hispanic individuals may be of any race, there is some overlap with other racial categories.
Source: JCHS tabulations of US Census Bureau, 2018 American Community Survey 5-Year Estimates.

ply—the lowest level in decades. With strong competition for the limited stock of homes for sale and mortgage rates at record lows, the S&P CoreLogic Case-Shiller home price index rose at a 5.7 percent clip in September, exceeding the previous peak by more than 20 percent. Price increases for modest homes (valued at less than 75 percent of the area median) were especially strong, up 7.5 percent at an annual rate in July. Prices for higher-cost homes (valued at more than 125 percent of the median) rose more slowly but still increased at a 5.0 percent annual rate.

While high unemployment would normally be a significant headwind for the market, the combination of low inventories and low interest rates will likely keep upward pressure on home prices. However, several factors could make it difficult for some potential homebuyers to take advantage of today's low mortgage rates. In particular, house prices continue to outrun incomes, pushing up the national price-to-income ratio to 4.3 in 2019. Although lower than the 4.7 peak reached during the housing boom, the national ratio is well above levels that prevailed in previous decades. Indeed, price-to-income ratios set new highs in 39 of the nation's 100 largest metros. And even if low interest rates help to offset these high prices, the amount of savings needed for downpayment and closing costs still presents a significant hurdle for first-time buyers.

Moreover, lending standards have tightened. With all the uncertainty in the economy, the Mortgage Bankers Association Mortgage Credit Availability Index declined by 34 percent from February to September this year, dipping to its lowest levels since 2014. This decline reflects much more restricted access for borrowers with lower credit scores and higher loan-to-value ratios, as well as a pullback from jumbo loans and non-qualified mortgages.

PERSISTENT RACIAL DISPARITIES

Racial disparities in housing are both a cause and a consequence of other social inequalities. Discriminatory practices have limited the opportunities for people of color to live in neighborhoods that offer good-quality schools and public services, while also increasing their exposure to crime and other environmental hazards. The nation's long history of housing and mortgage market discrimination has also prevented generations of Black and Hispanic households from buying homes and accruing wealth. The impact of this systemic inequality is evident in the lower incomes and wealth of today's households of color, a legacy that perpetuates their struggle to obtain decent, affordable housing in safe neighborhoods.

As a result, people of color have far higher cost-burden rates and far lower homeownership rates than white households, and account for a disproportionately large share of the homeless population. In 2019, some 43 percent of Black, 40 percent of Hispanic, and 32 percent of Asian households spent more than 30 percent of their incomes on housing, compared with 25 percent of white households. Although the higher rate of cost burdens among people of color in part reflects their generally lower incomes, disparities are evident even across households in the same income groups.

Inequality in homeownership rates is even more pronounced. While overall rates began to move up in 2016, the homeownership rate for Black households had increased just 0.6 percentage point by 2019—less than half the 1.4 percentage point gain among white households. And because Black rates fell much more sharply than white rates during the Great Recession, the Black-white homeownership gap is now larger than it has been in decades, at fully 31 percentage points. Although Hispanic and Asian households made more gains than Black households since 2016, their homeownership rates still lag those of white households by 27 and 16 percentage points, respectively.

Another important dimension of unequal housing access is the high degree of residential segregation that exists today **(Figure 5)**. Among the many factors contributing to this pattern are discriminatory housing practices, the lack of affordable rental and homeownership options in many communities, and missed opportunities to affirmatively further racial integration. A consequence of this segregation is that people of color are heavily concentrated in high-poverty neighborhoods and underrepresented in higher-income areas. Nearly two-thirds of the Black, Hispanic, and Native American populations living in poverty reside in communities with poverty rates above 20 percent, about twice the share of the white population living in poverty. Large shares of relatively affluent households of color also live in these neighborhoods, including 39 percent of both Black and Native American households and 30 percent of Hispanic households.

The housing affordability challenges facing people of color are also clear from their disproportionately high rates of homelessness. In 2019, Black people accounted for just under 13 percent of the US population but nearly 40 percent of people experiencing homelessness. A large disparity also exists among Native Americans and Alaskan Natives, who collectively made up 0.9 percent of the population but 3.2 percent of those experiencing homelessness. Hispanics are also overrepresented, comprising 18 percent of the total population but 22 percent of homeless individuals.

THE CASE FOR A NEW NATIONAL HOUSING AGENDA

The economic dislocation caused by the pandemic has underscored the fundamental importance of secure, adequate, and affordable housing for all. It has also revealed just how many millions of cost-burdened households struggle to keep a roof over their heads. Indeed, the experience of the past year has thrown the differences between the country's haves and have-nots into stark relief. Most households with good-quality, appropriate housing have been able to maintain their health and financial security from within their safe harbors. Those without adequate resources and secure housing have faced not just the risk of eviction or foreclosure, but also greater exposure to life-threatening illness from COVID-19.

The National Housing Act of 1949 established the goal of a decent home in a suitable living environment for all. In the more than 70 years since this landmark legislation, the country has not come close to this ideal, at least in part because there is no coherent national housing policy. Instead, US housing policy is an amalgam of measures intended to address past priorities and market conditions, and generally created without regard for any overarching goal.

To be effective, a national housing policy would set out the appropriate roles and responsibilities of federal, state, and local governments in meeting the country's needs. It would establish funding sources and distribution channels for subsidies, create incentives for efficient private production of housing through regulatory and tax structures, and ensure the availability and affordability of mortgage financing as well as the stability of the housing finance system. Other critical elements would be to remedy both the legacy and continuing presence of racial discrimination in housing markets, accommodate the needs of the nation's rapidly aging population, and improve the resilience of the housing stock in the face of climate change.

As it is, however, federal funding has fallen far short of even holding the line on supporting cost-burdened families in need **(Figure 6)**. From 2000 to 2010, the share of federal expenditures for housing assistance fell from 9.0 percent of non-defense discretionary spending to just 7.1 percent, even as the number of cost-burdened renters rose by 6 million. Since then, the housing assistance share has increased marginally to 7.4 percent while the number of cost-burdened renters has barely retreated.

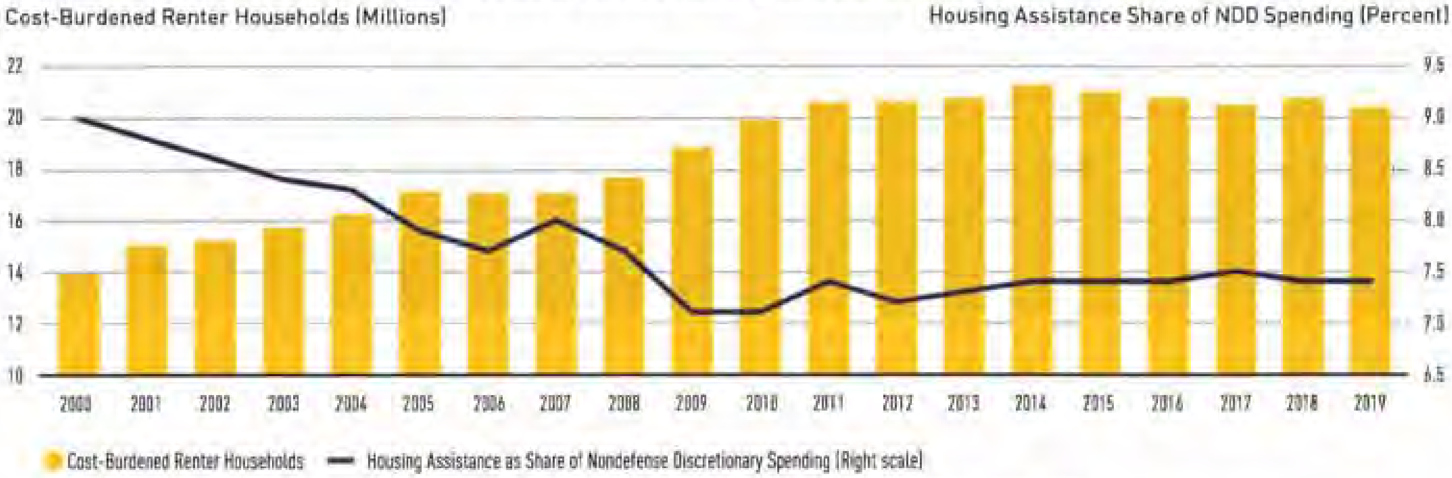
Although households with very low incomes (earning less than 50 percent of area median) are theoretically eligible for federal rent subsidies, housing assistance is not an entitlement program and is vastly underfunded. For the three out of four very low-income households unable to obtain subsidies, few affordable options are available on the open market. The National Low Income Housing Coalition estimates that only 57 rental units are affordable and available for every 100 very low-income renters. Conditions for extremely low-income renters (earning less than 30 percent of area median) are even tighter, with just 36 units affordable and available for every 100 households. A national housing policy should reconsider eligibility rules for housing assistance and then provide the means to fully meet that commitment.

Making housing assistance an entitlement would also help to remedy the country's homelessness crisis. But while stable and affordable housing provides the foundation for at-risk populations, many extremely low-income households need additional services to address the full range of challenges they face. A new national housing policy should therefore consider the best ways to combine rental assistance with other supports to provide the conditions and resources necessary for these households to succeed. And for the rapidly expanding number of older households on fixed incomes, a new national housing policy should ensure affordable, physically appropriate housing as well as the services needed to allow aging in community.

At the same time, many of today's 20 million cost-burdened renters have low to moderate incomes. The challenge for policymakers is to enable private entities to provide housing for these households without public support. However, many regulatory barriers—primarily at the state and local levels—constrain the ability of the private market to supply the types of well-located rental housing that these households can afford. While land use restrictions and building codes are essential to public health and safety, it is critical to balance those goals against the unmet need for smaller, denser housing that is convenient to transportation and employment opportunities. Tax policy at all levels of government has a powerful influence on the location, type, and cost of both new and existing homes, and should be used more strategically to reshape residential development patterns and make housing more affordable.

FIGURE 6

The Number of Cost-Burdened Renters Has Grown as Housing Assistance Has Become a Lower Budget Priority



Notes: Cost-burdened households pay more than 30% of income for housing. Households with zero or negative income are assumed to have burdens, while households paying no cash rent are assumed to be without burdens.
Source: JCHS tabulations of US Census Bureau, American Community Survey 1-Year Estimates; US Office of Management and Budget, Historical Tables, Budget of the United States Government, Fiscal Year 2021, Table 8.7, Outlays for Discretionary Programs: 1962–2025.

Another priority is to help the many households that aspire to own homes but do not understand how to navigate the complex homebuying process or are unable to meet the financial requirements. Support for education and counseling for potential homebuyers, along with broad access to safe and affordable mortgage financing, should therefore be cornerstones of a national policy.

For many would-be homeowners, the large upfront investment for the downpayment and closing costs is perhaps the biggest obstacle. While most states and many localities do offer assistance with these costs, their programs are small relative to potential demand and the qualification criteria vary widely, making it challenging for homebuyers to identify and take advantage of these opportunities. A critical policy question is whether these financial supports should be brought to scale and, if so, how they can ensure that borrowers are positioned to succeed as owners given the financial risks of homeownership.

Beyond making housing affordable for all, a new national housing policy needs to promote reinvestment in long-distressed neighborhoods. In the years following the Great Recession, poverty rates in one out of five census tracts across the country exceeded 40 percent, nearly twice the number of high-poverty tracts in 2000. While the needs of these communities go well beyond housing, good-quality homes are an essential element of a comprehensive neighborhood revitalization strategy. It is true that past efforts to turn distressed neighborhoods around have not been altogether successful, but those experiences nonetheless provide lessons on which future policy can and should build.

Finally, a new national housing policy needs to be more attuned to how the built environment both contributes to and is affected by climate change. Housing is a major source of carbon emissions, not just because of energy use inside the home but also because of travel to and from work, school, and other destinations. Efforts to reduce the nation's carbon footprint must include federal policies aimed at making housing more energy efficient and better connected to low-carbon transportation networks. Investments are also needed to improve the resiliency of the nation's housing stock as natural disasters increase in power and frequency.

Between the health and economic consequences of the COVID-19 pandemic, the social unrest brought on by the nation's reckoning with its painful history of racial discrimination, and the series of storms, floods, and wildfires across the country, 2020 has been a difficult and challenging year for many. All of these sources of distress have important ties to longstanding housing policy issues. The hope is that now that these challenges are so clearly in the spotlight, we as a country can finally re-envision a national housing policy and recommit to the goal of a decent home in a suitable living environment for all.

2 | HOUSING MARKETS

After a year of healthy growth in home sales and new construction, housing markets stalled in mid-March 2020 with the COVID-19 outbreak. Since the summer, however, the rebound in both sales and construction has been surprisingly strong. Home prices have also continued their steady rise, propped up by the historically tight supply of homes for sale and record-low interest rates. These recent trends lend hope that the housing sector can lead the economy into recovery as it has in several past cycles. Whether this momentum will continue depends largely on containment of the virus and the pandemic's longer-term impacts on the labor market.

SHARP DECLINE AND REBOUND IN HOME SALES

Sales of existing homes were steady in the first quarter of 2020, on par with the first quarter of 2019. Once the economy began to shut down in response to the pandemic, however, year-over-year sales plunged 17 percent in April and 27 percent in May. Indeed, May sales sank to a 3.91 million unit annual rate, the lowest reading for that month in records dating back to 1999. Existing home sales began to bounce back in June to a 4.70 million unit annual rate, but were still down 12 percent year over year. The pace of sales then continued to pick up through the summer, climbing 10 percent in August (to a 5.98 million unit annual rate) and 21 percent in September (to a 6.54 million unit annual rate)—the strongest single month since 2006.

After a similar decline in the spring, new home sales recovered even more strongly **(Figure 7)**. Unlike existing home sales, new home sales are not constrained by low inventories and can be recorded when the contract is signed, including before construction even starts. Year-over-year sales of new single-family homes were up 46 percent in July, 41 percent in August, and 32 percent in September. The summer surge put year-to-date new home sales some 17 percent higher in September than a year earlier, while existing home sales were off by just 0.2 percent.

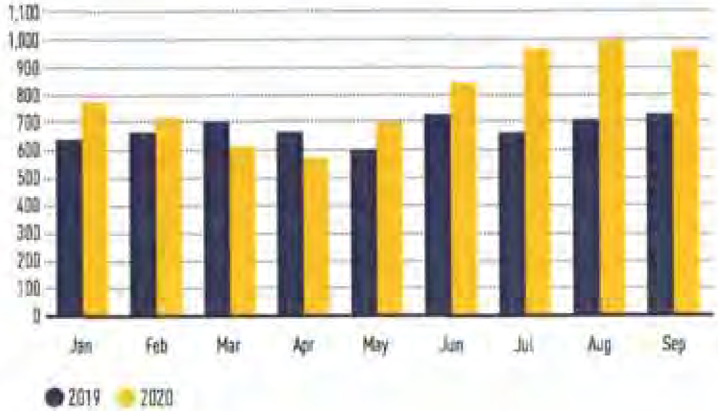
The robust market for new homes in 2020 continues the uptrend started in 2019 when sales jumped 10.7 percent, to 683,000 units—more than double the 2011 low of 306,000 units. In contrast, sales of existing single-family homes rose just 0.5 percent last year, to 4.77 million units, while sales of existing condos and co-ops fell 3.7 percent, to 579,000 units. As a result, existing home sales overall were flat in 2019 at 5.34 million units.

Home sales over the summer were strong for several reasons. First, interest rates dipped to historic lows as the economy entered a

FIGURE 7

After a Steady Decline in Early 2020, New Home Sales Are Now Well Above Year-Earlier Levels

Annualized New Home Sales (Thousands of units, seasonally adjusted)



Note: Recent monthly data are subject to revision.
Source: JCHS tabulations of US Census Bureau, New Residential Sales.

recession in March. According to Freddie Mac's Primary Mortgage Market Survey, the interest rate on a 30-year fixed-rate mortgage declined below 3.0 percent in July for the first time since the survey began in the early 1970s and stood at a record low of 2.8 percent at the end of October.

Second, demographic changes favor homeownership. The Census Bureau's most recent population estimates point to strong growth in the number of 30–44 year olds, the age group most likely to purchase homes. In fact, adults in this age range accounted for half of total population growth between 2018 and 2019. In addition, the economic fallout from the pandemic has had a relatively modest impact on higher-income households, another demographic group likely to purchase homes.

Third, the pandemic disrupted the usual seasonal pattern in home sales, which are typically low in winter months, increase in the spring, and then peak in early summer. This year, the pandemic delayed homebuying in April and May, likely shifting many purchases to the late summer and fall.

Fourth, the pandemic itself may encourage homebuying. With growing numbers of adults working from home and children unable to attend school, some households are looking for larger homes to accommodate their need for added space. Residents of multifamily buildings may also be moving to single-family homes to avoid the threat of virus transmission in shared spaces.

And fifth, innovations in homebuying and selling have streamlined the purchase process in ways that allow social distancing. According to Zillow's 2020 Urban-Suburban Market Report, virtual searches were up significantly over the summer and virtual showings have also become more commonplace. In addition, the Federal Housing Finance Agency (FHFA) made loan closings easier by allowing virtual appraisals and remote notarization of documents.

BOUNCEBACK IN RESIDENTIAL CONSTRUCTION

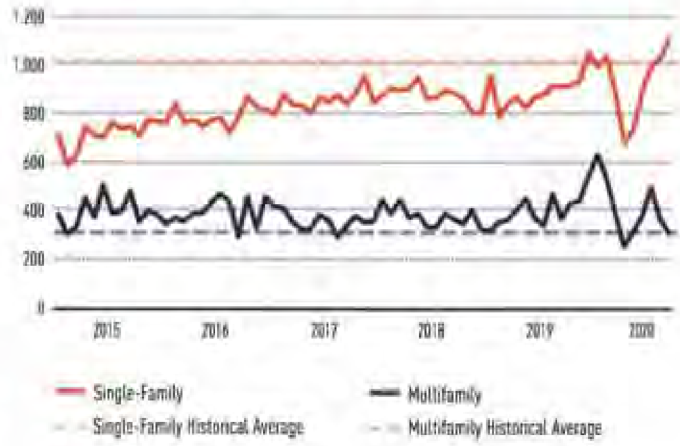
Housing construction also made a quick comeback after a sharp decline in the spring. From December 2019 through February 2020, housing starts were running near a 1.6 million unit annual rate for the first time since 2006. But when all non-essential activity was put on pause, annualized housing starts fell 19 percent between February and March, and another 26 percent from March to April—the largest one-month drop since 1984.

But new construction was back up to a 1.5 million unit annual rate by July, and held at a 1.4 million unit rate in August and September. Single-family starts led the way, increasing to a 1.1 million unit annual rate in September, up 22 percent from the year prior and the strongest month for single-family homebuilding in over 13 years **(Figure 8)**.

FIGURE 8

Housing Construction Is Back on Track After a Near-Record Decline in the Spring

Annualized Housing Starts (Thousands of units, seasonally adjusted)



The recent strength of single-family construction is a sharp departure from 2019 when starts edged up just 1.4 percent, to 887,700 units—the 12th consecutive year below the million mark. In contrast, construction of multifamily units continued to climb, with starts rising 7.5 percent last year to 402,300 units. This was the first year that multifamily starts topped 400,000 units since 1988.

With its current momentum, the housing sector could lead a broader recovery. Historically, housing has helped to bolster economic growth after recessions because starts and sales tend to rebound quickly. Moreover, the persistent deficit in homes for sale makes residential construction ripe for a continued upturn. Indeed, after more than a decade of limited homebuilding, the homeowner vacancy rate was just 1.1 percent in the first quarter of 2020 and the rental vacancy rate was 6.6 percent, both historic lows. Homebuilders are also optimistic about market conditions. According to the NAHB/Wells Fargo Housing Market Index, builder confidence hit 85 in October—the highest reading in the survey's 36-year history.

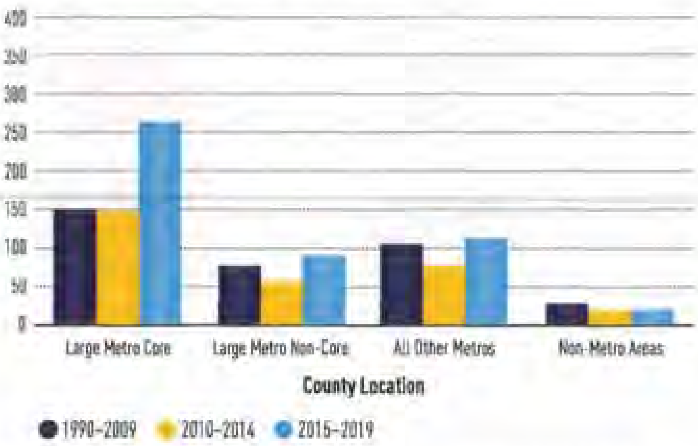
THE LOCATION OF NEW CONSTRUCTION

The pandemic could lead to a change in housing location preferences. For example, if working remotely becomes the norm, demand could strengthen for homes in outlying communities that are

FIGURE 9

Multifamily Construction Has Driven a Building Boom in Core Counties

Average Multifamily Permits (Thousands)

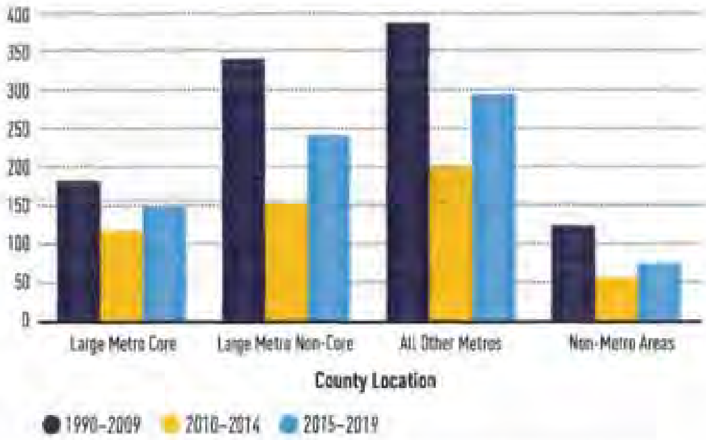


Notes: Large metro areas have at least 1 million residents. Core counties contain either the largest city in the metro area or any city with over 250,000 residents. Non-core counties are all other counties in large metro areas.
Source: JCHS tabulations of US Census Bureau, Building Permits Survey via Moody's Economy.com.

FIGURE 10

Although Reviving Across Locations, Single-Family Construction Still Lags Historical Averages

Average Single-Family Permits (Thousands)



Notes: Large metro areas have at least 1 million residents. Core counties contain either the largest city in the metro area or any city with over 250,000 residents. Non-core counties are all other counties in large metro areas.
Source: JCHS tabulations of US Census Bureau, Building Permits Survey via Moody's Economy.com.

relatively far from employment centers. In this case, construction activity could shift away from central urban areas to suburban communities and perhaps to less expensive markets away from the coasts. In fact, an NAHB analysis of second-quarter permitting data indicates that this may already be happening, at least in the short term. The fastest growth in permits was in the suburban counties of small metro areas, including a nearly 11 percent increase in single-family permits, while the number of units permitted in more central urban areas of large metro areas declined.

If this shift continues, it would represent a significant reversal of recent homebuilding patterns. For the past decade, construction has been concentrated in urban settings. In 2015–2019 alone, more than a third (446,000) of permits issued on average were in the core counties of large metros with at least a million residents, up from 27 percent (395,000) issued on average in 1990–2009.

This urban focus was driven largely by the growth and concentration of multifamily construction **(Figure 9)**. Fully 55 percent of multifamily permits (262,000) were issued in core counties in 2015–2019, compared with just 42 percent in 1990–2009. And although total multifamily permitting increased 36 percent in those five years relative to the prior two decades, its rate of growth in core counties was 78 percent. At the same time, multifamily permitting rose modestly in the suburban counties of large metros (up 17 percent) and in all other metro areas (up 8 percent), but fell in non-metro areas (down 31 percent).

Meanwhile, single-family construction in 2015–2019 was substantially lower across the board relative to the 20-year average **(Figure 10)**. Indeed, single-family permitting was off 26 percent in core counties, 29 percent in the suburbs of large metros, 24 percent in other metros, and 40 percent in non-metro areas. An uptick in single-family homebuilding in response to the pandemic would likely occur in all of these locations, but especially in the suburban counties of large metros and in other metro areas, where two-thirds of single-family construction activity typically takes place.

GROWING SIZE OF NEWER HOMES

Before the pandemic forced many households to work remotely, housing construction had increasingly focused on larger homes over the past several decades. Indeed, the share of newly completed single-family homes with four or more bedrooms grew steadily from 28 percent in 1989 to 47 percent in 2015, before a slight decline to 43 percent in 2019. Accordingly, the median size of new single-family homes jumped 24 percent from 1989 to 2019, to 2,301 square feet. Meanwhile, the average size of households living in newly built homes held at about 2.9.

As a result, many homeowner households have more bedrooms than people. Indeed, 96 percent of owner-occupied households have five or fewer members. Most of these households (61 percent) have at least one extra bedroom, including over a quarter (27 percent) with two or more extra bedrooms. Smaller households living in owner-occupied homes are far more likely to have at least one additional bedroom, including 93 percent of single-person and 79 percent of two-person households, compared with 36 percent of three-person households.

The long-term shift toward larger single-family homes has come at the expense of smaller, more affordable units. However, completions of homes under 1,800 square feet increased 13 percent in 2018–2019. Although well below their 37 percent share in 1999, smaller homes accounted for 24 percent of newly completed houses last year. Meanwhile, completions of homes with at least 3,000 square feet declined 4 percent last year, but still made up 25 percent of new units. The remaining 51 percent of homes completed in 2019 had between 1,800 and 3,000 square feet.

Construction of other smaller housing options also increased last year. Townhome completions were up 12 percent in 2019 (to 120,000 units) and are approaching levels in the early 2000s. Condo completions also rose 15 percent (to 31,000 units), but lagged far below their numbers every year from 1974 to 2009. Manufactured home shipments actually declined slightly in 2019 (to 94,600 units) and had been under 100,000 units every year since 2007. Ultimately, housing construction targeted toward different price points, including smaller homes, will be essential for maintaining affordability over the long term.

INVENTORIES AT NEW LOWS

In the first quarter of 2020, the number of existing single-family homes for sale was already down about 11 percent year over year. Indeed, the supply of for-sale homes was at its lowest level since at least 1982. The pandemic made the shortage even worse, preventing many potential sellers from putting their homes on the market and leaving inventories off about 20 percent from year-earlier levels from April through September. The number of single-family homes for sale stood at just 1.24 million in September 2020, compared with an already low 1.60 million in September 2019 **(Figure 11)**.

Measured in months of supply, for-sale inventories fell from an average of 3.9 months in 2019 to a record low of 2.5 months in September. Inventories were tightest for lower- and moderate-cost homes. According to CoreLogic, the supply was under 2.0 months in July for homes costing 50–150 percent of the metro area median sales price. Inventories of homes priced under 50 percent of the median also ticked down from 3.4 months in 2019 to 3.0 months so far in 2020, while those of homes costing more than 200 percent of the median fell from 5.3 months to 3.9 months.

The pandemic both broadened and accelerated the tightening of supply. In January, for-sale inventories had already fallen year over year in 65 of the 96 large markets tracked by Zillow. By June, inventories were lower in 94 of those markets, with declines accelerating in all but two. The sharpest drop in the number of homes for sale was in the Northeast, where supplies in the Allentown, Philadelphia, and Syracuse metro areas were down by more than 30 percent. Several Western metros also posted declines of more than 25 percent, including Los Angeles, San Jose, and Seattle. Inventories in only two markets—Colorado Springs and San Antonio—increased from the prior year, but by only 2 percent or less.

Inventories of new homes for sale were also below year-earlier levels in early 2020. The number of new single-family homes on the market was about 4 percent lower on average in the first four months of this year, 8 percent lower in May and June, and fully 12 percent lower from July to September. Meanwhile, months of supply of new homes dipped below 4.0 months in July for the first time since 2004.

FIGURE 11

Already Near Historic Lows, the Supply of Homes for Sale Declined Again in 2020

Notes: Data are for single-family homes only. Months of supply measure how long it would take the number of homes on the market to sell at the current rate, where six months is typically considered a balanced market.
Source: JCHS tabulations of NAR, Existing Home Sales.

CONTINUING IMPEDIMENTS TO CONSTRUCTION

Low for-sale inventories in much of the country are evidence of the growing supply-demand mismatch. Among the many reasons for the undersupply of housing—particularly of more affordable homes—are a myriad of regulatory requirements and development fees that both increase construction costs and limit the amount of new housing that can be built by right.

Joint Center analysis of the 2019 National Longitudinal Land Use Survey (NLLUS) found that more than a third of the 1,703 cities, villages, towns, and counties with zoning authority allowed no more than seven housing units per acre. These density restrictions imply a minimum lot size of at least 6,200 square feet in the entire jurisdiction. Indeed, minimum lot sizes up to a full acre are common even in large metro areas. In contrast, only about a quarter of jurisdictions surveyed had zones allowing more than 30 units per acre. A much larger share of these higher-maximum districts was in the West (51 percent) than in the South (27 percent), Midwest (18 percent), and Northeast (16 percent).

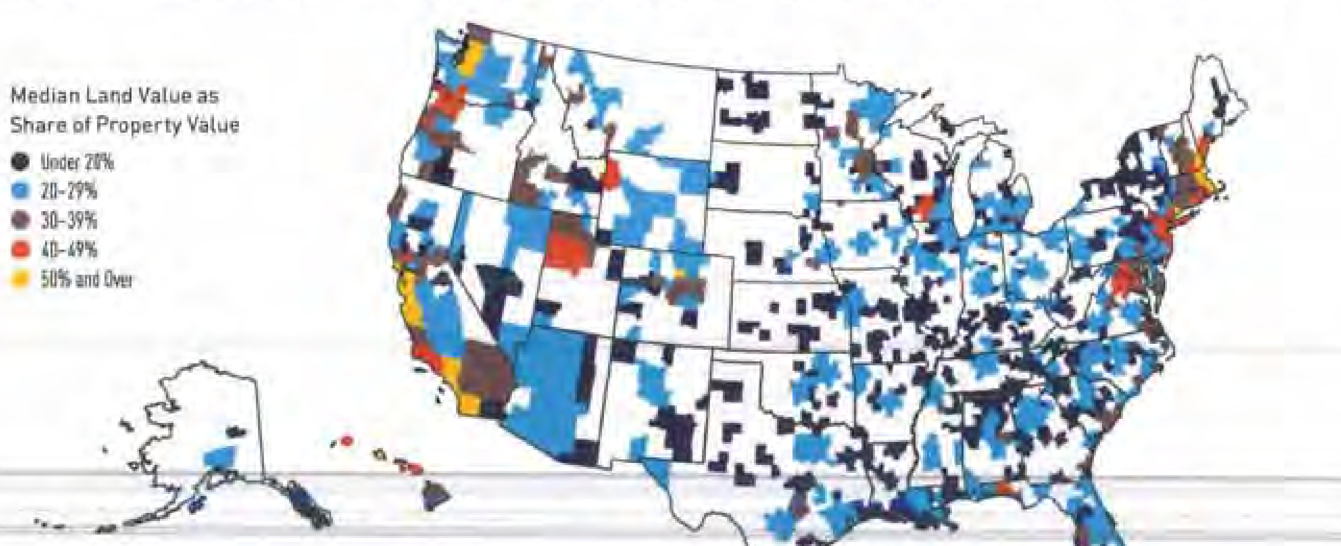
Regulations on housing density effectively limit the supply of new housing and push up land prices, particularly in highly restricted markets with strong demand. According to FHFA data, the median price per quarter acre of land underneath existing single-family housing was $144,100 in 2018, up 56 percent from 2012. At the median, land prices thus represented 39 percent of the total property value. But in highly constrained markets, land costs accounted for more than half of the value of single-family properties, with particularly high shares posted in San Jose (70 percent), Los Angeles (64 percent), and Honolulu (63 percent) **(Figure 12)**.

Local government fees also add directly to the costs of residential development. Many jurisdictions charge impact fees to fund schools, sewerage systems, roads, and other public services associated with new development and growing populations. These fees can be large and raise the price of new homes significantly. Nearly half of the jurisdictions (45 percent) responding to the 2019 NLLUS imposed impact fees, but the share in Western communities was nearly twice as high (86 percent). Parking requirements can also drive up development costs by reducing the amount of land available for housing units and in some cases requiring costly parking structures. Fully 46 percent of jurisdictions required two or more off-site parking spaces per multifamily unit constructed, while just 4 percent required less than one parking space.

Well before the pandemic, the costs of construction materials were on the rise. The Census Bureau's constant quality price indices for single-family home construction jumped 45 percent from 2010 through September 2020, and the current disruption of global supply chains may give another lift to prices, at least temporarily. For example, Bureau of Labor Statistics data indicate that softwood lumber prices jumped 87 percent between April and September—the largest five-month gain since recordkeeping began in the 1940s. NAHB also reports that prices for framing lumber shot up more

FIGURE 12

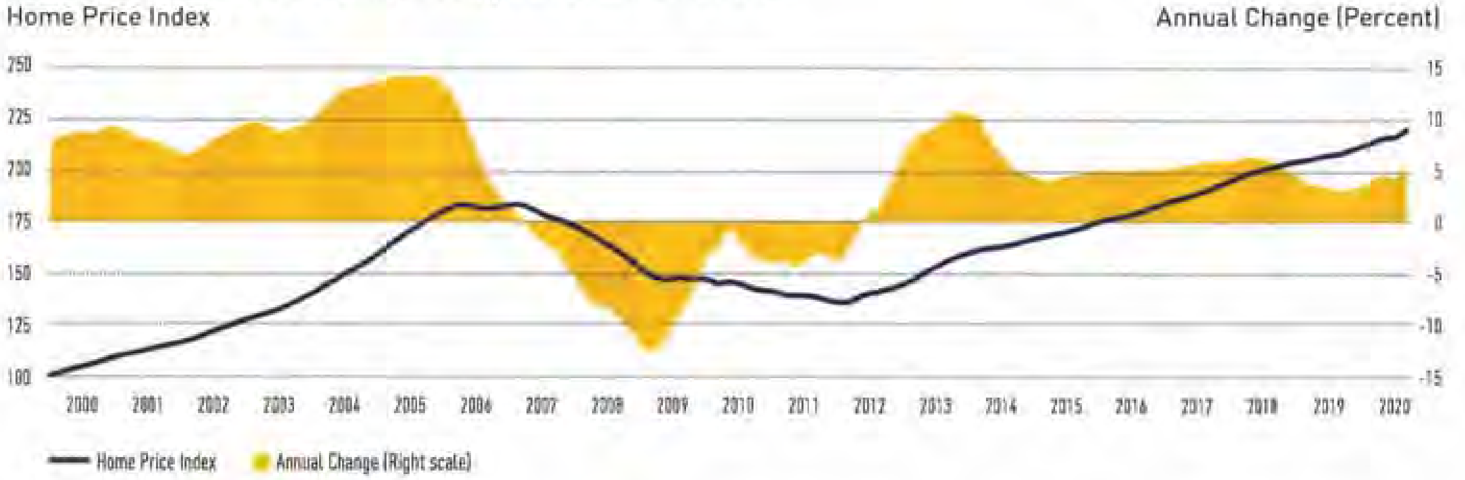
Land Costs Account for More Than Half of Single-Family Property Values in Several Highly Restricted Housing Markets



Note: Prices are for land occupied by existing single-family homes.
Source: JCHS tabulations of Federal Housing Finance Agency (FHFA), The Price of Residential Land for Counties, ZIP Codes, and Census Tracts in the United States.

FIGURE 13

Home Prices Continued to Climb Through the Summer Months



Source: JCHS tabulations of S&P CoreLogic Case-Shiller US National Home Price Index.

than 120 percent over that period, but appeared to decline slightly in October.

The persistent shortage of construction workers is yet another impediment to housing development. The number of construction job openings averaged 321,000 in 2019—the highest level since at least 2001. Openings have remained elevated, averaging 276,000 through August 2020, despite the number of separations (including both layoffs and voluntary quits) reaching new highs in March and April when the shutdowns began.

The pandemic could continue to affect labor availability in at least two ways. On the one hand, if housing construction maintains its momentum, the industry could attract unemployed workers from other sectors such as nonresidential construction. On the other hand, foreign-born workers are a key demographic, accounting for nearly a third of the construction labor force in 2018. Lower immigration could therefore shrink the already tight labor pool.

HOME PRICE GROWTH STILL STRONG

With supply tight and demand strong, home prices rose at an accelerating pace through the middle of 2020. According to the S&P CoreLogic Case-Shiller Home Price Index, nominal home prices were up 5.7 percent year over year in September—much faster than the 3.5 percent average increase in 2019 and even the 4.2 percent average earlier this year **(Figure 13)**. Real home prices also showed strong growth, increasing from 2.4 percent on average in 2019, to 2.6 percent in the first quarter of 2020, to 5.0 percent from April through August.

After rising for more than eight consecutive years, nominal home prices are now 20 percent above their previous peak. Indeed, home prices more than doubled between 2000 and mid-2020, up 121 percent. Even after adjusting for inflation, home prices climbed 51 percent over this period and are back near their previous record highs during the housing boom in the mid-2000s.

Prices for lower-cost homes continue to escalate the most, driven by high demand and limited supply. According to CoreLogic data, prices rose 7.6 percent in July for homes selling for 75 percent or less of the area median price, compared with 5.0 percent for homes selling for 125 percent or more of the area median. In both segments, home price growth accelerated during the spring and summer, although not quite to the pace in 2017 and 2018.

Home price increases in the second quarter of 2020 were widespread, with the FHFA All-Transactions Price Index showing nominal year-over-year gains in 117 of the nation's 120 largest metro areas and divisions. The most rapid increases were in Western markets, including Boise (up 10.0 percent), Tacoma (up 7.6 percent), and Phoenix (up 7.2 percent). At the height of the economic dislocation in the second quarter, price increases did slow in 81 of the 120 largest markets, with notable cooling in Las Vegas, Omaha, San Antonio, and Spokane.

Given such tight inventories and historically low interest rates, home prices will likely continue to rise in the short term. However, demand could drop if unemployment remains high and more temporary job losses become permanent. Freddie Mac forecasts a moderation in home price growth in 2021, while the CoreLogic Home

Price Index Forecast is for a 0.2 percent uptick from August 2020 to August 2021, including actual declines in about half of states. The biggest drops are likely to be in metros with economies that rely heavily on tourism, such as Las Vegas.

ELEVATED PRICE-TO-INCOME RATIOS

Rising home prices relative to household incomes can impede access to homeownership, particularly for low- and moderate-income households. In 2019, the median sales price of existing single-family homes continued to rise faster than the median household income for the eighth straight year, lifting the ratio from 4.2 in 2018 to 4.3. This marked the fourth consecutive year that the median sales price was quadruple median household income.

Moreover, the price-to-income ratio was higher in 2019 than in all but the three years before the housing bust, when it jumped from 3.9 in 2002 to 4.7 in 2005. What is different this time around, however, is that it took five years to reach its current level. And with interest rates so much lower now, buyers can bid up home prices but still keep their monthly payments relatively low, assuming they can afford the larger downpayments.

Even so, price-to-income ratios were higher last year in 39 of the nation's top 100 markets than during the housing boom. The largest increases were in metro areas with significant home price growth, such as Denver (with a ratio of 5.7), Charlotte (4.0), and Dallas (3.8).

And in seven large markets, last year's home prices were at least 6.0 times higher than median household income, including four with ratios above 8.0. With the exception of Miami (6.1), these markets were all in the West and include San Jose (9.8), Los Angeles (9.6), Honolulu (9.3), and San Francisco (8.8). At the same time, though, close to a fifth of the nation's large metro areas had price-to-income ratios below 3.0. Most of these markets were in the Midwest and Northeast, although ratios in three Southern markets—McAllen (2.6), Oklahoma City (2.7), and Little Rock (3.0)—were also relatively low.

THE OUTLOOK

Given the profound impact of the pandemic on how US households live and work, there is plenty of reason to believe that it could bring meaningful changes to housing markets. With millions of people forced to work remotely, employers and employees alike may find this an attractive option even after the pandemic ends. If so, demand would likely increase for homes large enough to provide office space, as well as easy access to outdoor spaces to exercise and socialize. And if long commutes are no longer everyday requirements, many households may move to lower-density areas where housing is less expensive. However, a major shift in residential development patterns is far from certain.

What is certain is that the need for more housing of all types, locations, and price points will persist. In the near term, the outlook for housing markets is bright, fueled by very low interest rates as well as unabated demand from more affluent households. If the pandemic persists, however, it will remain a serious drag on the labor market and wage growth, and ultimately on household formations. Still, the pandemic's negative impact on markets should be relatively muted given historically tight conditions on the supply side.

3 | DEMOGRAPHIC DRIVERS

As 2020 began, low unemployment and rapid income gains were fueling steady household growth, the main driver of housing demand. But the demographic forces that could drag down future demand were already at work, including slowdowns in native population growth, immigration, and residential mobility. And when COVID-19 hit, the crisis not only brought huge losses of life and livelihoods, but also highlighted how growing income inequality has left many millions of households behind.

MILLENNIALS DRIVING HOUSEHOLD GROWTH

Both major surveys of household growth confirm that 2020 started off at a strong pace. According to the Housing Vacancy Survey, annual household growth increased from an already high average of 1.3 million in 2016–2019 to a 1.5 million annual rate in the first quarter of 2020 **(Figure 14)**. The American Community Survey also puts average annual growth at roughly 1.3 million in 2016–2019. While differing somewhat over time, results of both surveys thus suggest that household growth was back to early 2000s levels early this year.

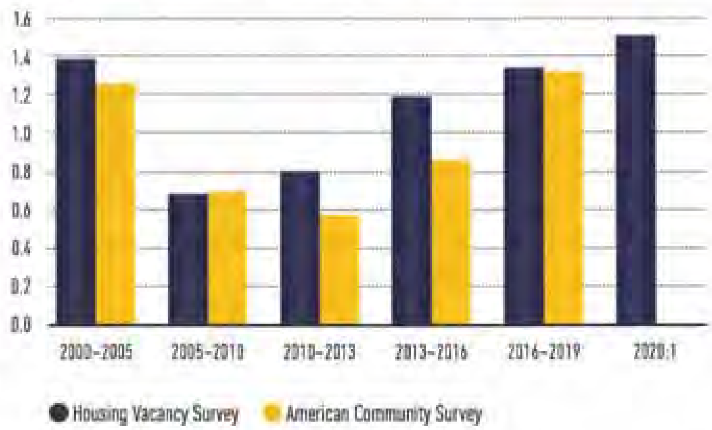
The recent acceleration of household growth reflects a pickup in household formation rates among millennials in their 20s and 30s. After several years of solid income and employment gains, the growth in households aged 25–34 alone jumped from just 34,000 per year in 2010–2013, to 170,000 per year in 2013–2016, to 250,000 per year in 2016–2019. As a result, the share of adults under age 35 heading their own households edged up for the first time in a decade, while the share living with parents declined slightly.

Even this small increase in headship rates among younger adults represents a major turnaround in housing demand for this age group. Between 2007 and 2017, falling headship rates had kept household growth among the under-35 age group to just 240,000 (1 percent), even though the population aged 15–34 increased by fully 5.5 million (7 percent) over that period. As headship rates rose in 2017–2019, however, the number of households under age 35 climbed by 570,000, more than twice the 230,000 growth in population aged 15–34. Still, there were 2 million fewer households headed by adults under age 35 in 2019 than if headship rates had remained at their 2007 level.

FIGURE 14

The Latest Surveys Point to a Continuing Pickup in Household Growth in Early 2020

Average Annual Household Growth (Millions)



Note: Estimate for 2020:1 is based on year-over-year change in the four-quarter trailing average.
Source: JCHS tabulations of US Census Bureau, American Community Survey 1-Year Estimates via IPUMS USA, University of Minnesota, www.ipums.org.

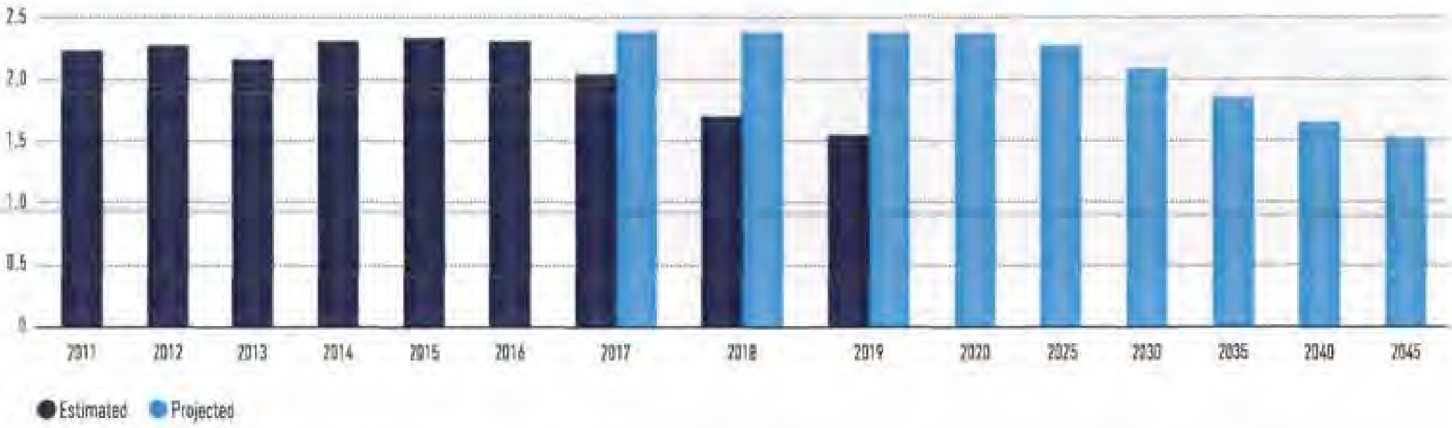
STRUCTURAL DRAGS ON HOUSEHOLD GROWTH

Even as headship rates among the millennial generation were strengthening, two other major drivers of household growth—

FIGURE 15

Census Estimates Indicate that Population Growth Has Slowed Far Earlier than Projected

Annual US Population Growth (Millions)



Source: JCHS tabulations of US Census Bureau, 2019 Vintage Population Estimates and 2017 Middle-Series Population Projections.

resident population growth and immigration—were losing steam. Indeed, Census Bureau estimates indicate that US population growth edged up by just 0.48 percent last year, the lowest annual growth rate since 1918 according to the Brookings Institution. With the slowdown in both the natural growth of the resident population and a drop in net immigration, the US population increased by only 1.55 million last year—far less than the latest Census projections of at least 2.3 million annually until 2030 **(Figure 15)**.

Weaker natural growth of the resident population reflects lower-than-expected births and higher-than-expected deaths even before the pandemic struck. According to the Census Bureau, natural growth was a full 30 percent below its 2017 projections last year, as it dropped below 1 million for the first time in decades. Births were 7 percent below projections, accounting for most of the difference, while deaths were 4 percent above projections, accounting for about a quarter of the difference.

At the same time, the Census Bureau estimates that the net contribution of international immigration to US population growth fell 15 percent in 2019, to just 595,000. This brought the total drop since 2016 to 43 percent. Immigration is sensitive to a variety of economic, political, and other factors, and wide swings over a few years are not uncommon. Still, immigration has been a significant source of household growth for decades, driving well over a third (38 percent) of all household growth from the mid-1990s to 2019. In the 2010s alone, foreign-born households contributed more than 4 million of the roughly 10 million households added over the decade.

Slowing population growth is a long-term concern that has not yet affected current measures of household growth for several reasons. First of all, the overall aging of the population continues to have a large positive impact on household growth because the likelihood of heading a household increases with age. In addition, much of the decline in resident population growth is due to lower birth rates and fewer children under age 18—cohorts that are too young to form households. And finally, because the majority of immigrants do not immediately form their own households upon arrival in the country, the drag on household growth from lower immigration only becomes apparent over time.

SLOWDOWN IN POPULATION AND HOUSEHOLD GROWTH

In the short term, the fallout from the pandemic is sure to result in even slower population growth. International immigration was brought to a halt early in the year, and the spread of COVID-19 led to more than 230,000 additional deaths by November. In addition, the ongoing uncertainty in the economy is likely to lead to lower births, which the Brookings Institution notes typically decline in times of turmoil. Pandemic-related job and income losses in 2020 will also delay household formations among young adults, the age group driving most of household growth.

Beyond 2020, slower population growth is likely to lead to even lower household growth than previously projected. As it is, Joint Center projections from 2018, which were based on the 2017 Census population projections, already anticipated a drop in annual household growth from 1.2 million in 2018–2028 to 960,000 in 2028–2038.

A prolonged slowdown in immigration would lower these projections even further. The 2017 Census projections assumed average net annual immigration of 1.0 million in 2018–2038 (roughly the same as in 2016), well above its 2019 low-series assumptions of just 600,000 per year. Under that revised scenario, projected household growth would drop to 1.0 million per year in 2018–2028 and to 760,000 per year in 2028–2038. Higher mortality rates and lower levels of natural population growth, which are also not factored into the 2017 Census projections, would make future household growth lower still.

DISRUPTIONS TO RESIDENTIAL MOBILITY

Residential mobility rates relate to the turnover of the housing stock, which opens up opportunities for homeowners and renters to form new households, upsize or downsize their housing, accept jobs in new locations, expand their families, or make any number of other lifestyle changes. Mobility also contributes to household growth within and across markets. For example, more than two-thirds of all household growth in Arizona (38,000 of 56,000 additional households) came from interstate moves in 2019. Similarly, half of the 96,000 increase in households in Florida also resulted from interstate moves.

After declining for decades, residential mobility rates for both owners and renters may have edged up slightly heading into the pandemic. Increased homebuying activity since 2016 stabilized the mobility rate of owners and even led to higher rates within certain age groups. Although the rate for renters fell again in 2019, the evidence suggests that apartment turnover was increasing. The National Apartment Association reported a small year-over-year decline in the share of units whose leases renewed last year, while RealPage noted a brief year-over-year decrease in apartment renewal rates in early 2020.

But as the pandemic spread, the uptick in mobility rates came to a halt. For owners, the pause may be temporary, given the sharp rebound in home sales in July. On the rental side, however, the reports are mixed. RealPage notes that renter retention rates climbed to an all-time high for the month of July. At the same time, though, there was a surge in short-term lease-ups, suggesting that renter mobility rates could rise in the coming months.

If the pandemic leads to lasting changes in work arrangements—particularly in working remotely—it could affect mobility between states as well as reverse the recent trend toward urban living. Although most household growth is still in the suburbs, an increasing share has been in urban areas. Annual household growth in cities more than doubled in the latter half of the 2010s, rising from 114,000 per year in 2010–2014 to 270,000 annually in 2014–2018 **(Figure 16)**. As a result, 31 percent of all household growth in 2014–2018 was in the central cities of metro areas, up from 14 percent in the 2000s and 18 percent in the 1990s. Meanwhile, more than two-thirds of household growth occurred in suburban communities and just 2 percent in non-metro areas.

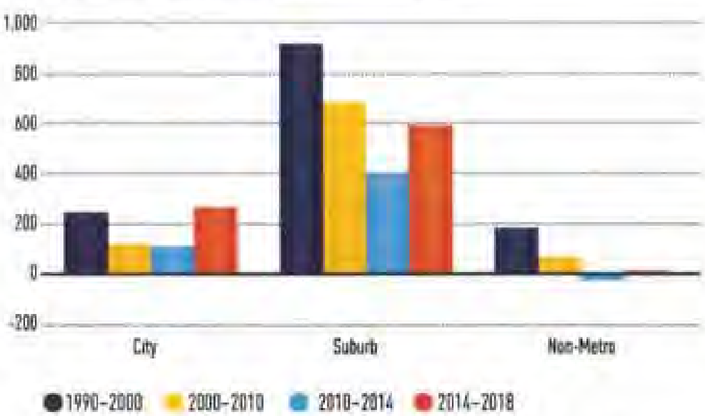
RISING INCOMES, BUT GROWING INCOME INEQUALITY

Prior to 2020, strong income growth and falling unemployment were giving a lift to housing demand. According to the American Community Survey, the median household income was up 4.7 percent in 2018–2019, to $65,000 **(Figure 17)**. Adjusted for inflation, the US median household income grew at a 2.5 percent average annual

FIGURE 16

While Still Concentrated in Suburban Communities, Household Growth Made a Comeback in Cities

Average Annual Household Growth (Thousands)

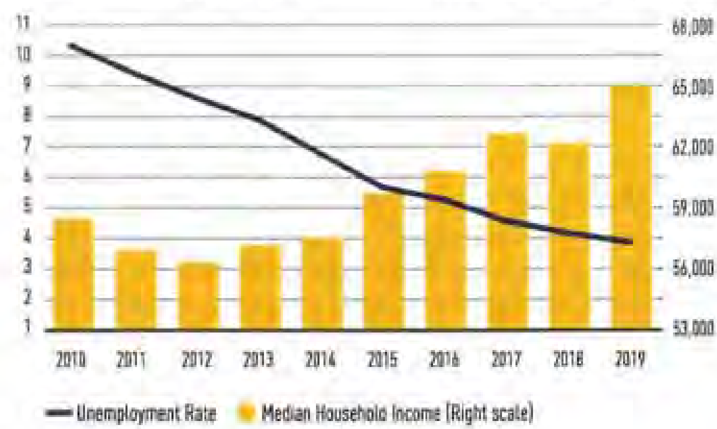


Notes: Cities are defined following Kneebone & [illegible], where city tracts are either in the metro's principal city or in cities with populations over 100,000. All non-city tracts in metro areas are suburban.
Source: JCHS tabulations of US Census Bureau, 1990 and 2000 Decennial Censuses and 2010, 2014, and 2018 American Community Survey 5-Year Estimates.

FIGURE 17

Declining Unemployment and Rising Incomes Set the Stage for a Strong Housing Market in 2020

Unemployment Rate (Percent) Median Income (2019 Dollars)



Note: Incomes are adjusted for inflation using the CPI-U for All Items.
Source: JCHS tabulations of US Census Bureau, American Community Survey 1-Year Estimates via IPUMS USA, and Current Population Surveys via IPUMS CPS, University of Minnesota, www.ipums.org.

rate from 2014 to 2019, and was 11 percent higher last year than in 2010. While all age groups posted gains, the biggest increase was among younger households. Indeed, the real median income for households under age 35 jumped by 21 percent over the decade.

Across-the-board income growth, however, did nothing to reduce the inequality between high- and low-income households. In fact, the gap between lowest- and highest-income households widened. After adjusting for inflation, the average annual income of households in the bottom decile ($7,800) increased just 5 percent from 2010 to 2019, or about $340. In contrast, the average income of households in the top decile ($316,000) soared by 20 percent, or about $52,000. As a result, the average income of top-decile households increased from 35 times the average income of bottom-decile households in 2010 to 41 times in 2019.

Income inequality between Black and white households also worsened. Although the median incomes of both Black and white households grew in the 2010s, Black household incomes rose much more slowly in absolute terms, leaving the income gap wider than it had been in decades **(Figure 18)**. The median income for Black households in 2019 was $43,200—roughly 60 percent of the $70,900 median for white households. The median income for Black households was also far below that for Hispanic households ($55,000), Asian households ($93,000), and households of all other races and ethnicities ($57,300).

In real terms, the median income of Black households in 2019 was only back up to its 2000 level, while the median for white households was 6 percent higher than in 2000. As a result, the Black-white income gap widened by $4,100 (17 percent) over the past two decades, to $27,700, with most of the increase occurring between 2010 and 2019.

COVID'S SEVERE AND DISPARATE ECONOMIC IMPACTS

The pandemic has reduced incomes, especially for those already struggling. The nationwide shutdown of businesses and organizations led to an unprecedented surge in unemployment as well as furloughs and other reductions in work schedules. More than 20 million workers lost jobs between March and April, and initial unemployment claims hit a record 6 million per week twice in those months. In the first five weeks of the shutdown alone, unemployment claims shot up by 20.4 million, the same as in the first year of the Great Recession. After 20 weeks, claims topped 50 million.

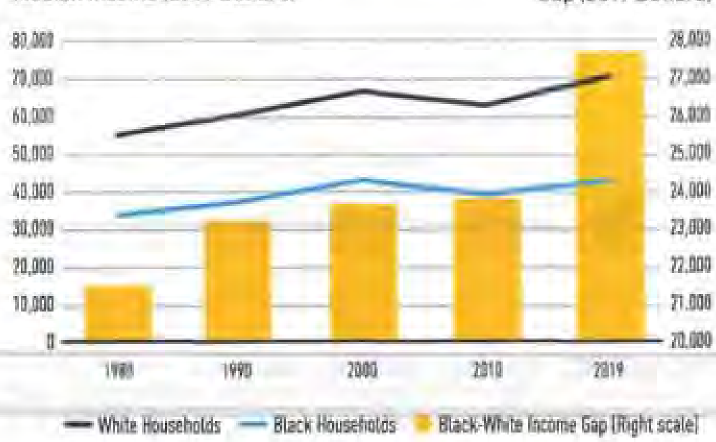
According to the Census Bureau's Household Pulse Survey in late September, 41 percent of all US households reported a pandemic-related loss in earned income since mid-March. Although economic impact payments from the federal government provided temporary support, the drop in employment income hit Hispanic, Black, and Asian households disproportionately hard. Some 54 percent of Hispanic households reported income losses over this period, 12 percentage points above the national average share. At 48 percent, the share of Black households that lost income was also well above average. The share of Asian households with losses was only slightly lower, at 42 percent. By comparison, 37 percent of white households reported income losses between mid-March and late September.

Large shares of lower-income households also had income losses, including 49 percent of households earning less than $25,000 and 45 percent of households earning between $25,000 and $49,999. The shares of households reporting lost income get progressively smaller as income rises, falling from 42 percent of households earning $50,000–74,999, to 35 percent of those earning at least $75,000. As a result, income inequality between the lowest and highest earners likely worsened this year.

Income losses are also more prevalent among households that have less education, rent their housing, and/or include children. Roughly 44 percent of households headed by someone without a college degree reported pandemic-related income losses between March and September, compared with 35 percent of households with a bachelor's degree or higher. The share of households reporting income losses was also significantly higher among renters (50 percent) than owners (37 percent). And with closures of daycare centers and the shutdown of schools, some 50 percent of households with children lost income this year, compared with 37 percent of households without children.

FIGURE 18

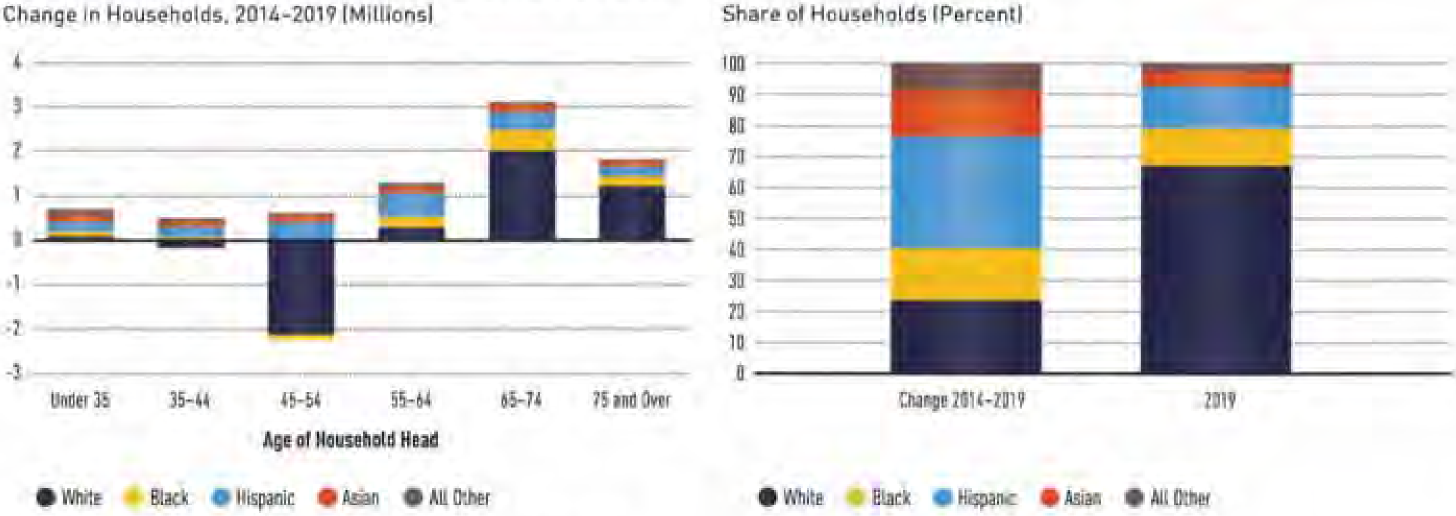
The Black-White Income Gap Widened Further in the 2010s



Note: Incomes are adjusted for inflation using the CPI-U for All Items.
Source: JCHS tabulations of US Census Bureau, 1980, 1990, and 2000 Decennial Censuses, and 2010 and 2019 American Community Survey 1-Year Estimates, via IPUMS USA, University of Minnesota, www.ipums.org.

FIGURE 19

US Households Are Becoming Older and More Diverse



Notes: Householders who are white, Black, Asian, or another race are non-Hispanic. Hispanic householders may be of any race.
Source: JCHS tabulations of US Census Bureau, American Community Survey 1-Year Estimates.

Disparities in income losses in part reflect differences in the types of jobs held by earners. Workers in high-contact jobs, in businesses that depend upon activities most at risk of exposure to COVID, were most likely to have lost income during the pandemic. These jobs, which require being within arm's length of others—such as waiters, taxi drivers, and personal care aides—typically have relatively low incomes to begin with. Indeed, the median income of high-contact workers is $29,200, or about $10,000 less than the median for workers in other types of jobs.

Just under 44 million US households include at least one person who works in a job that requires close contact. In addition, larger shares of households of color—including 40 percent of Black households and 45 percent of Hispanic households—rely on the income from such jobs, compared with just 34 percent of white households.

INCREASING DIVERSITY AND AGE OF HOUSEHOLDS

With such a large share of household growth among people of color, income inequality has major implications for the strength of housing demand going forward. Over the past five years, households of color accounted for more than three out of every four additional households **(Figure 19)**. Hispanic households drove 36 percent of household growth (400,000 per year) in 2014–2019, lifting their share of all households to 14 percent. Black households were responsible for 17 percent of growth (190,000 per year) and made up 12 percent of all households in 2019. Asian households accounted for another 15 percent (165,000 per year) of the increases, raising their share of all households to 5 percent. By comparison, white households drove 23 percent of household growth (260,000 per year) and still made up two-thirds of all households in 2019.

Households of color are a higher share of younger households and accounted for just over 90 percent of additional households under age 35. The numbers of Black, Hispanic, Asian, and other households of color aged 35–64 also increased enough to offset the 2 million decline in white households in this age range over the past five years, with Hispanic households contributing much of this growth. Diversity within the 65-and-over age group is also slowly increasing, with the white share declining from 80 percent to 78 percent in 2014–2019.

Although the resurgence of household formations among the large millennial generation pushed up the number of younger-adult households over the past five years, the age distribution of US households continues to shift upward. As the baby-boom generation (born 1946–1964) makes its way through the 65-and-over age range, they are replacing the much smaller generation that preceded them. As a result, households aged 65-and-over are rising faster than any other age group both in number and as a share of all households. Indeed, as the number of households under age 45 grew by a total of one million between 2014 and 2019, the number of households aged 65 and over increased by nearly a million households each year during that time, lifting the share of older households from 24 percent to 26 percent.

Meanwhile, the younger half of the baby boomers are moving through the 55–64 year-old age group. Given that this is still the largest 10-year cohort of US households, the younger boomers will continue to support growth in the number of households age 65 and over for the near future, but fastest growth over the next decade will be in the population 75 and over, which is projected to increase by 48 percent in 2020–2030.

At the same time, the aging of Generation X—the smaller cohort born after the baby boomers—reduced the number of households aged 45–54 by some 1.6 million in 2014–2019, and by more than 400,000 in 2018–2019 alone. This age group will continue to shrink until the mid-2020s, when members of Gen-X will begin to age out of this age range and the oldest millennials will begin to move in.

CHANGING MIX OF HOUSEHOLD TYPES

With such rapid growth in the older population, single-person households and empty-nest couples have become the fastest-growing household types. Over the past five years, the total number of single-person households increased by 2.2 million, accounting for 40 percent of all household growth. Households age 65 and over drove fully 80 percent of the increase in single-person households. Meanwhile, the number of married couples without young children living at home grew by 1.8 million, or another 32 percent of all household growth. Households age 65 and over accounted for nearly all of the increase in these households.

Younger adult households have also spurred growth in single-person households and married couples without children, but also in the number of unrelated adults living together as roommates. The increase in these households reflects the long-term trend toward delayed marriage and childbearing. In fact, single-person households headed by people under age 35 now outnumber same-age married couples with children. Even so, the aging of the older millennials has lifted the number of married couples with children in the 35–54 year-old age group, and will continue to do so as more members of this large generation move into this age range.

Growth in the number and share of older adults, along with the limited housing options that younger adults can afford, has led to an increase in multigenerational living. The growing diversity of the population has also contributed to this rise, given that Hispanic, Asian, and foreign-born households are especially likely to be multigenerational. The number of two-generation households, consisting of adult children at least 25 years old and their parents, rose by nearly 1.8 million (15 percent) from 2014 to 2019, to 13.8 million—accounting for roughly one out of every three households added during that period. Meanwhile, the number of three-generation households—made up of grandparents and their adult children and grandchildren, who may or may not be adults—also grew over the past five years, increasing by just under 200,000 (4 percent) to 4.7 million.

THE OUTLOOK

The pandemic and its economic aftermath are almost certain to slow the pace of household growth in 2020 and beyond. Immigration is set to drop from its already low 2019 level, and COVID-related deaths will push mortality rates above recent averages. And with the economy at a standstill for much of this year, fewer young adults are likely to have the resources to form their own households.

Still, the sheer size of the millennial and the baby-boomer populations should help to sustain housing demand over the coming decade. The aging of the millennials—the largest and most diverse generation in US history—will drive up the number of households in their prime homebuying years. Millennials will also boost the number of families with children. Similarly, the baby boomers will increase the number and share of age 65-and-over households to unprecedented levels, pushing up the number of single- and two-person households.

But the question remains whether persistent inequalities in income and opportunity will continue to make housing unaffordable to millions of households of color. If the pandemic has demonstrated nothing else, it has clearly shown how many households, young and old, lack the financial resources needed to withstand economic downturns and pay for housing without sacrificing other basic necessities.

4 | HOMEOWNERSHIP

Demand for homeownership firmed through 2019 and, after a dramatic but temporary slowdown when the pandemic took hold, is on track for a strong year in 2020. Low interest rates are attracting homebuyers, while rising home prices are lifting the housing wealth of current owners. Preferences for homeownership also remain steady. At the same time, though, ongoing economic uncertainty has led to tighter credit conditions and left many owners struggling to pay their mortgages. The disparity in Black-white homeownership rates also continues to widen, highlighting the enduring impacts of discriminatory housing policies and structural racism.

HOMEOWNERSHIP RATE EDGING UP

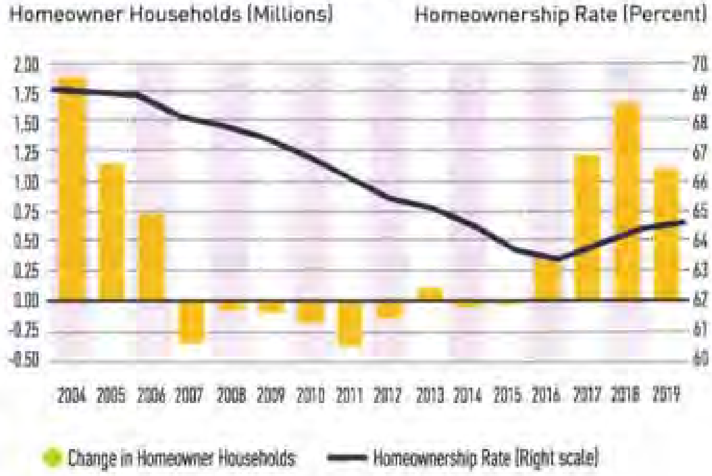
The US homeownership rate began 2020 with some momentum. The Housing Vacancy Survey reported a national rate of 64.6 percent for 2019, up slightly from 64.4 percent in 2018. While still far below the peak of 69.0 percent in 2004, the homeownership rate had recovered by more than a percentage point from the 63.4 percent low in 2016. Meanwhile, the number of net new homeowner households jumped by 1.3 million annually on average from 2016 to 2019 **(Figure 20)**. Strong home sales over the summer suggest that the homeownership rate could increase again in 2020.

Some of the rebound over the last several years reflects rising homeownership rates among younger households. While older households traditionally have the highest rates, the gap between older and younger households widened sharply during the Great Recession as many households under age 45 delayed buying homes or returned to renting after selling or losing their homes to foreclosure. As a result, the homeownership rate for households under age 35 fell from a peak of 43.1 percent in 2004 and 2005 to just 34.6 percent in 2016, before climbing back up to 36.7 percent in 2019. The homeownership rate for households aged 35–44 dropped even more sharply from 69.3 percent in 2005 to a low of 58.5 percent in 2015, but recovered to 60.1 percent last year.

The aging of the US population has also helped lift the number of homeowners. With continued strong growth in the 65-and-over age group, the number of older homeowners increased by more than 2.5 million from 2016 to 2019. Over this same period, the aging of

FIGURE 20

Growth in Homeowner Households Revived After 2016, Lifting the Homeownership Rate



Source: JCHS tabulations of US Census Bureau, Housing Vacancy Surveys.

younger generations, along with the increase in their homeownership rates, pushed up the number of owners under age 35 by 800,000 and those aged 35–44 by nearly 700,000.

All of the recent growth in homeowners has been among households with higher incomes. According to the American Community Survey, the number of owner households increased by 4.9 million between the post-Great Recession low in 2013 and 2019. This total represents 6.8 million more owners with real incomes over $75,000, offset by 698,000 fewer owners with incomes between $30,000 and $75,000 and 1.3 million fewer owners with incomes below $30,000. In fact, most recent gains have been among households with incomes of $150,000 or more, adding 4.3 million to the ranks of homeowners and accounting for more than 88 percent of net growth between 2013 and 2019.

MARKET STABILITY DESPITE ECONOMIC STRAINS

Even with strong income growth through 2019, the financial toll from the pandemic has left many homeowners struggling. Since April 2020, sizable shares of owners have reported that they have been unable to pay their mortgages on time. As of September, the Census Bureau's Household Pulse Survey found that 9 percent of the nation's 48 million homeowners with mortgages were behind on their housing payments.

With so many homeowners under pressure, the Federal Housing Finance Agency (FHFA) instructed Fannie Mae and Freddie Mac to suspend foreclosures for at least 60 days from mid-March, later extending the moratorium through the end of 2020. The Federal Housing Administration, US Department of Veterans Affairs, and US Department of Agriculture also enacted moratoriums through the end of the year. All told, these federal actions offered foreclosure protection to about 70 percent of single-family homeowners with mortgages. FHFA also directed Fannie Mae and Freddie Mac to purchase loans in forbearance (with mortgage payments suspended for up to 12 months), with guidance running through the end of October.

According to the Black Knight Mortgage Monitor (BKMM) report, some 6.3 million homeowners entered a forbearance plan between March and October, with a peak of more than 4.6 million households in active plans in May and June. Once the initial jolt to the housing market passed, however, many homeowners exited their plans and new forbearance starts declined. By the end of October, 3.0 million homeowners remained in forbearance, representing about 5.6 percent of all mortgages.

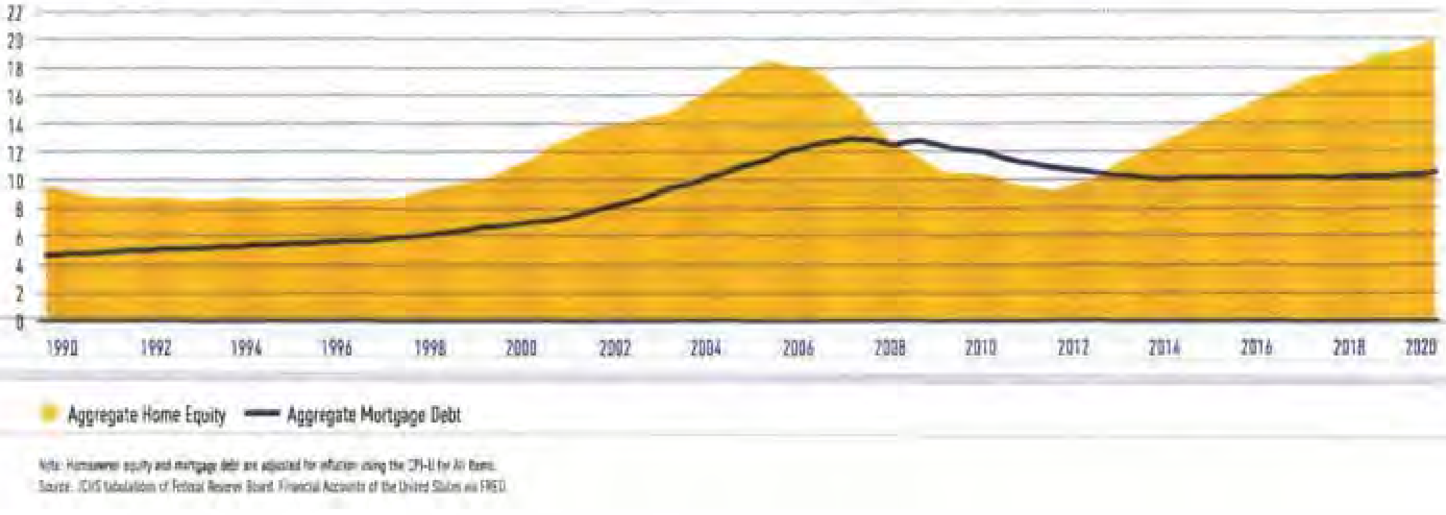
Despite these exits, many homeowners are still financially pressed. The BKMM report shows that the mortgage delinquency rate (including loans in forbearance with missed payments) spiked from a record low of 3.2 percent in early 2020 to 7.8 percent in May before falling back to 6.7 percent in September. This decline reflects a drop in the numbers of owners with payments 30 or 60 days past due, but the number of those that are 90 or more days past due is still growing. Of the 3.7 million owners who had exited forbearance by October, 68 percent were current on their mortgage payments, 15 percent had paid off their loans, 14 percent were delinquent but involved in active loss mitigation, and 2 percent were delinquent.

Fortunately, conditions today are much less threatening than before the foreclosure crisis. First, home price appreciation remains strong. According to the S&P CoreLogic Case-Shiller Home Price Index, seasonally adjusted prices surged 5.7 percent year over year in August 2020, compared to 3.1 percent in August 2019. In contrast, home prices were already falling as the economy headed into the Great Recession, leaving more and more homeowners underwater on their mortgages.

FIGURE 21

Home Equity Has Reached a Record High While Mortgage Debt Remains More Moderate

Trillions of 2020 Dollars

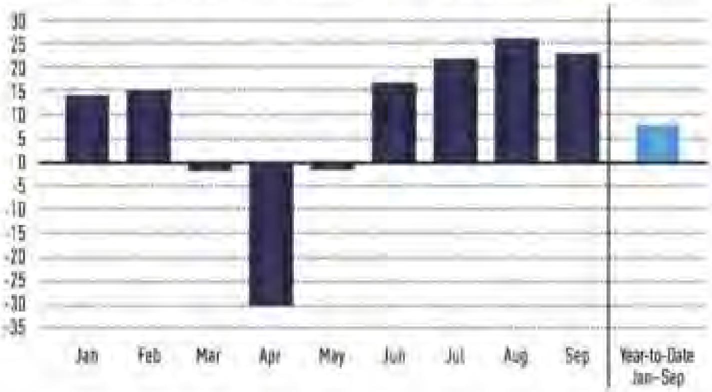


Note: Homeowner equity and mortgage debt are adjusted for inflation using the CPI-U for All Items.
Source: JCHS tabulations of Federal Reserve Board, Financial Accounts of the United States via FRED.

FIGURE 22

After a Sharp But Brief Drop, Home Loan Applications Rebounded Quickly by June

Year-over-Year Change in Home Purchase Mortgage Applications (Percent)



Note: Monthly data are weekly averages.
Source: JCHS tabulations of Mortgage Bankers Association (MBA), Weekly Applications Survey via Moody's Economy.com.

Second, homebuyers are not as highly leveraged as they were entering the last downturn **(Figure 21)**. According to Federal Reserve Flow of Funds data, real home equity rose for 33 straight quarters from early 2012 to a new peak of $20.2 trillion in the second quarter of 2020. At the same time, mortgage debt grew only modestly to $10.6 trillion. The ratio of aggregate home equity to the value of real estate thus held at 65.6 percent, the highest level since mid-1990.

Third, federal interventions—including the foreclosure moratorium, forbearance plans, and stimulus payments—have allowed many homeowners to at least temporarily stay in their homes and suspend mortgage payments as their finances stabilize. With these protections in place, the Mortgage Bankers Association's (MBA's) National Delinquency Survey found that fewer than 265,000 loans were in foreclosure in the second quarter of 2020—the lowest level in more than two decades.

However, millions of homeowners did not benefit from these supports. According to an Urban Institute analysis, the majority of the nation's nearly 5 million owners of manufactured homes were excluded from federal foreclosure protections because their homes were titled as personal property rather than real estate. Many of these owners are in need of support, given that 35 percent work in industries that have had the greatest job losses during the pandemic. In addition, some 14.6 million owners with privately backed mortgages were not covered by federal forbearance plans and foreclosure moratoriums.

CONTINUED STRONG DEMAND FOR HOMEOWNERSHIP

According to the latest Home Mortgage Disclosure Act (HMDA) data, originations of first-lien mortgages for purchase of one- to four-family owner-occupied units rose steadily in 2019, to 3.85 million—the highest level since the homeownership peak in 2006. Originations remained strong at the start of 2020, with MBA reporting 891,000 in the first quarter, up from 830,000 in the first quarter of 2019.

Attitude surveys show continued enthusiasm for homeownership through 2019. According to Freddie Mac's Profile of Today's Renter and Homeowner conducted in April 2019, 61 percent of renter respondents said it was either somewhat or extremely likely they would ever own a home. Millennial renters (aged 23–38) are especially likely to see themselves as future homeowners, with 78 percent stating that they were somewhat or extremely likely to own. Among those expecting to move within the next five years or who were unsure about the timing of their move, 52 percent of millennial renters expected their next move to be to a home they buy.

The Fannie Mae National Housing Survey also reported a consistently positive view of homeownership and of homebuying conditions late last year, with 66 percent of respondents—both owners and renters—saying they would buy a home if they were going to move. Fannie Mae's Home Purchase Sentiment Index (HPSI) echoes these attitudes, rising 8.3 percentage points between January 2019 and January 2020 to 93.0. As the pandemic took hold, however, the HPSI plummeted from 92.5 in February to 63.0 in April before rebounding to 81.0 in September, when most components of the index were again trending positively.

After months of being largely confined to their homes, many households seem to be reexamining their housing options. Zillow reports that views of for-sale listings were up 42 percent year over year in June 2020, although searches largely focused on the same locations and types of homes as a year earlier. About two-thirds of potential homebuyers on the site looked for suburban properties in both years, and the shares searching for single-family detached homes and for homes over 3,500 square feet were relatively unchanged. Zillow did note an 83 percent jump in searches for newly built homes, which also tend to be located in suburban areas, but are only a small share of the for-sale market. Strong demand for homes is borne out by the jump in mortgage applications in the fall. According to the MBA's Purchase Applications Index, loan applications in late summer and into the fall were up more than 20 percent above year-earlier levels **(Figure 22)**.

SHARP CONTRASTS IN AFFORDABILITY

Continuing a decade of growth, US home prices increased again in 2020. The National Association of Realtors® (NAR) reports that the monthly median sales price of existing homes averaged $281,200 through the first six months of the year, a 3.3 percent rise in real terms from 2019. Meanwhile, the Freddie Mac Primary Mortgage Market Survey showed a steady drop in the 30-year fixed mortgage rate from 3.93 percent in 2019 to 3.51 percent in the first quarter of 2020, 3.23 percent in the second quarter, and 2.95 percent in the third quarter—its lowest quarterly level going back to 1989. Weekly rates held under 3.00 percent from late July through the end of October. In addition to increases in household income, these record-low interest rates were enough to offset sustained price increases and reduce real homeownership costs in 2018–2020 for the first time since 2011–2012 **(Figure 23)**.

Black Knight estimates that 15.6 million homeowners are well-positioned to take advantage of these conditions by refinancing, potentially cutting their interest rates by 0.75 percentage point and saving an average of $289 on their monthly payments. Indeed, the MBA reported that 2.8 million borrowers of one- to four-family mortgages refinanced during the first half of 2020 as interest rates fell, more than triple the 810,000 that refinanced during the same period in 2019.

The Joint Center found that the drop in interest rates would benefit new homebuyers as well, despite a more than $9,000 increase in the median sales price of homes from 2019 to mid-2020. Assuming an interest rate of 3.37 percent (the average through the first half of 2020), new buyers could afford to borrow about $19,000 more but still keep their mortgage payments the same as they would have been in 2019. Alternatively, they could purchase the same-priced house as in 2019 and save $82 per month on their housing payments.

These conditions offer moderate-income buyers an opportunity to become homeowners. Based on a 30-percent-of-income affordability standard, a 30-year fixed rate, and an average downpayment for the area, NAR and Realtor.com® estimated that households with incomes under $75,000—close to the national median income for owner households—could afford 46 percent of the homes on the market in September 2020. Because of rising prices, however, this share is somewhat lower than the 49 percent posted in 2019. In addition, affordability varies widely across the country. In a third of the nation's 100 largest metros, households earning under $75,000 could afford less than 40 percent of homes for sale. And in nine of those metros (Boston, Los Angeles, New York, Oxnard, Sacramento, San Diego, San Francisco, San Jose, and Seattle), moderate-income households could afford less than 15 percent of for-sale homes.

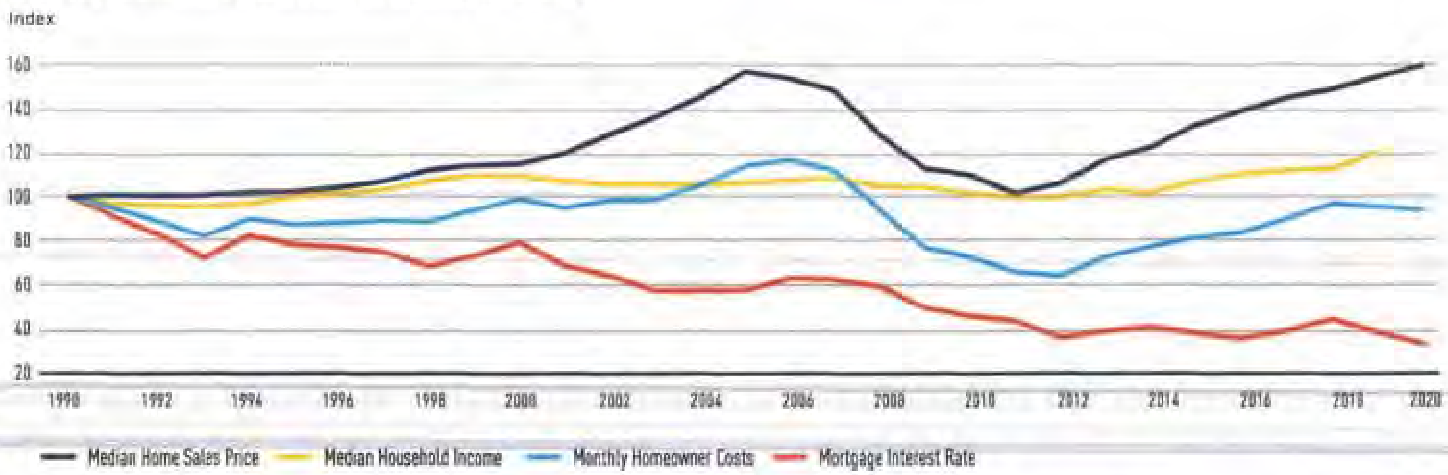
THE HIGH HURDLE TO HOMEOWNERSHIP

Both the upfront and long-term costs of homeownership are major constraints for first-time buyers. With the continuing climb in home prices, however, the lack of sufficient savings for the downpayment and closing costs has become an even greater barrier. The 2019 Profile of Today's Renter and Homeowner survey found that just under half of renters believed that not having enough money for upfront costs would be a "major obstacle" to buying a home. Large shares of respondents also considered being unable to afford monthly mortgage payments a major obstacle (41 percent), along with having mortgage payments higher than their current rents (40 percent).

Affordability is a particularly high hurdle for younger households with competing financial responsibilities. Some 27 percent of all renter respondents to the Freddie Mac survey—including more than a third of millennial renter respondents—adapted their housing

FIGURE 23

Higher Incomes and Lower Interest Rates Have Offset the Rise in House Prices, Bringing Down the Real Cost of Homeownership



Notes: House prices and monthly homeowner costs are adjusted to 2020 dollars using the CPI-U for All Items less shelter. Household incomes are adjusted to 2019 dollars using the CPI-U-RS for All Items. Monthly homeowner costs assume a 3.5% downpayment on a median-priced, existing single-family home (including condos and coops) with property taxes of 1.15%, property insurance of 0.35%, and mortgage insurance of 0.85%. Data for 2020 are the monthly averages from January to June.
Source: JCHS tabulations of NAR, Existing Home Sales; US Census Bureau, Current Population Surveys; Moody's Analytics Forecasts; Freddie Mac, Primary Mortgage Market Surveys.

choices to repay student debt. These renters typically chose to delay buying a home (22 percent), live in cheaper housing (22 percent), or live in smaller units (21 percent). In addition, 23 percent of all renter respondents and about a third of millennial renter respondents altered their housing choices to afford daycare or childcare costs. These renters chose to move to lower-cost areas (22 percent), cheaper housing (21 percent), or to live with family or friends (20 percent).

Another barrier to homeownership is a lack of full information on mortgage qualifications and low downpayment options. In a 2019 Consumer Mortgage Understanding Study, Fannie Mae found that respondents tended to overestimate the minimum credit score and downpayment requirements for buying a home, and to underestimate the maximum debt-to-income ratio that mortgage lenders would allow.

Moreover, only 23 percent of respondents were aware that low-downpayment programs existed. Indeed, the National Survey of Mortgage Originations found that fewer than half of borrowers taking out mortgages in 2017 were told about government programs providing low-downpayment options. While credit and financial constraints are very real barriers to homeownership for many, increased outreach to underserved communities and information about affordable loan options would improve access to ownership for those who want it.

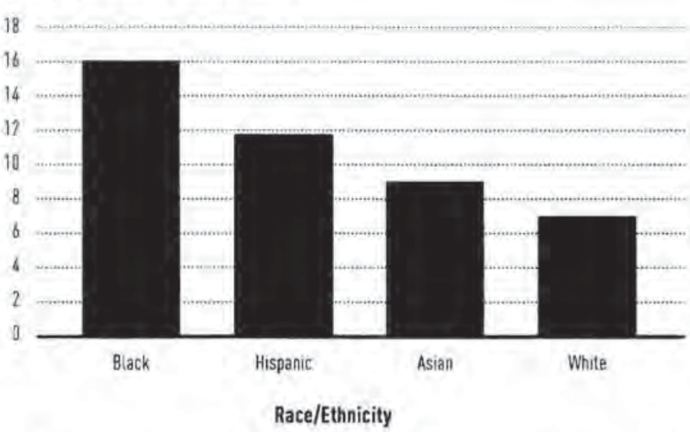
TIGHTENING ACCESS TO MORTGAGE CREDIT

In addition to affordability constraints, tighter credit conditions limit access to homeownership at today's record-low interest rates. The MBA's Mortgage Credit Availability Index (MCAI) measures market tightness based on borrower characteristics (including credit score, loan type, and loan-to-value ratio), as well as lender and investor underwriting criteria. During the recovery from the Great Recession, the MCAI rose 90 points from December 2012 to December 2017 as access to credit eased, and then was essentially flat around 180 through the end of 2019. As the pandemic progressed in 2020, however, the credit availability index fell more than 60 points from January to September, holding near its lowest level in six years.

FIGURE 24

Black Households Experience Especially High Denial Rates for Mortgages

Mortgage Denial Rate (Percent)



Notes: White households are non-Hispanic. Hispanic households are white only. Asian and Black households may be either Hispanic or non-Hispanic.
Source: JCHS tabulations of 2019 Home Mortgage Disclosure Act data.

Mortgage borrowers need to have increasingly strong credit histories to qualify for loans. Indeed, data from the New York Fed Consumer Credit Panel and Equifax show that credit scores for borrowers of newly originated home purchase mortgages have generally been on the rise for two decades. From a low of 698 in the second quarter of 2000, the median credit score jumped to 743 in the first three quarters of 2003 and then held near 720 through the end of 2007. Since then, the median score fluctuated around the 760s before climbing to 770 in the fourth quarter of 2019. By the second quarter of 2020, the median score stood at 784—its highest level in records going back to 1999.

A 2019 Urban Institute analysis using Freddie Mac data highlights how reliance on credit scores poses a particular problem for Black households. The report found that more than half of white households had a FICO score above 700, compared with 21 percent of Black households. Structural racism and other systemic factors related to employment, income, and student loan debt for Black households all affect their credit scores, which do not take into account payment histories for other major items such as rent and utilities. Furthermore, nearly a third of Black households did not have a FICO score at all, compared with 18 percent of white households, effectively shutting these households out of the homeownership market.

Reflecting differences in credit scores, among other factors, racial and ethnic disparities in loan denial rates persist. The 2019 HMDA data show that nearly 16 percent of Black applicants were denied home purchase loans, along with 11.6 percent of Hispanic applicants and 9.1 percent of Asian applicants. The comparable share of white applicants was just 7.0 percent **(Figure 24)**. An inadequate credit history is among the most common reasons for denial, especially for Black applicants.

THE WIDENING BLACK-WHITE HOMEOWNERSHIP GAP

For decades, official and unofficial housing policies at all levels of government, business practices of lenders and other private entities, and discrimination in other facets of society have worked to reduce the incomes, savings, and credit standing of households of color—and in turn, their access to homeownership. Even with today's better legal protections, the legacy of these actions is apparent in the chronic underserving of and underinvestment in communities of color, persistent residential segregation, dramatic disparities in home values, and the enduring—and widening—gap in homeownership rates between white households and households of color.

The largest disparity in homeownership rates continues to be between white and Black households. According to the Housing Vacancy Survey, the homeownership rate for white households ticked up from 73.0 percent in 2018 to 73.3 percent in 2019, while the homeownership rate for Black households was essentially flat at 42.8 percent. This 30.6 percentage point gap is the largest disparity since 1983. And even though the number of Black households increased by some 3.1 million between 2000 and 2019, the number of Black homeowner households rose by just 786,000.

Much of the growing homeownership gap reflects the fact that Black households face greater difficulty buying homes because of their lower average incomes and credit ratings, as well as explicit and implicit biases throughout the lending and buying processes. Homeownership rates for younger and middle-aged Black households thus remain well below their rates two decades earlier, as well as current rates for other racial and ethnic groups **(Figure 25)**. Between 2000 and 2019, homeownership rates for Black households under age 35, aged 35–44, and aged 45–54 were all down 7–10 percentage points. By 2019, Black homeownership rates for these age groups were 28-34 percentage points lower than for same-age white households, 8–12 percentage points lower than for same-age Hispanic households, and 14–24 percentage points lower than for same-age Asian households.

In addition, some of the growing Black-white gap is due to the disproportionate impact of the foreclosure crisis on Black homeowners. Analysis by the Center for Responsible Lending found that Black owners were 76 percent more likely than white owners to lose their homes between 2007 and 2009. Indeed, the homeownership rate for Black households now aged 55–64, one of the age groups most likely to have owned homes when the foreclosure crisis hit, fell from a peak of 66.9 percent in 2005 to just 53.6 percent in 2019. Although the homeownership rate for white households in this age group also declined during the housing downturn, it was just 4 percentage points short of the 85.9 percent peak by 2019. As a result, the Black-white homeownership gap for this age group stood at 28.3 percentage points last year.

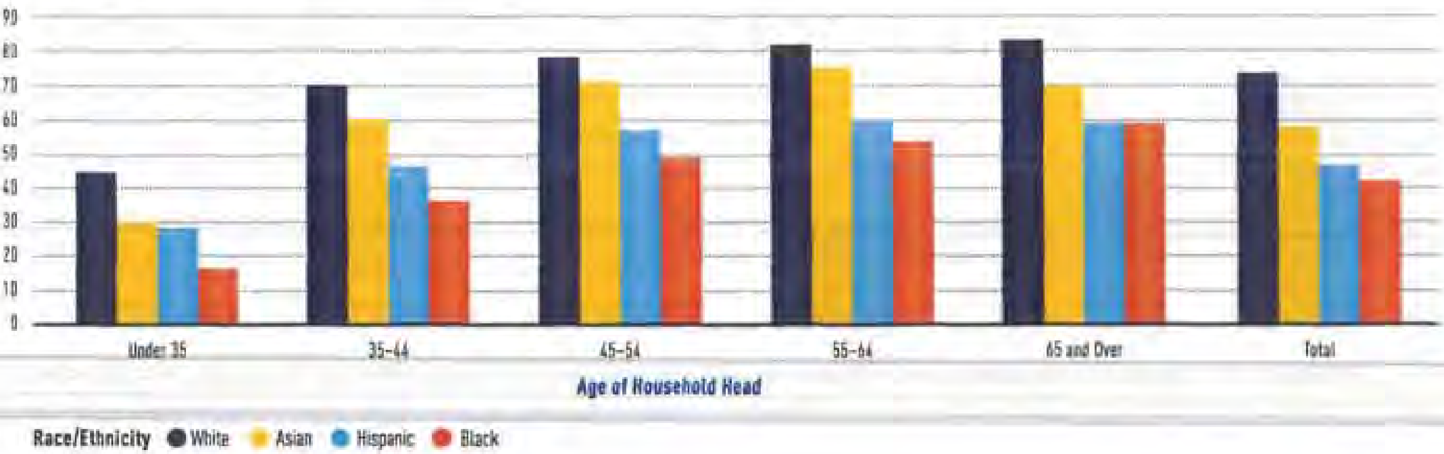
Racial disparities in homeownership also increased within the 65-and-over age group. In 2000, 82.9 percent of older white households were homeowners, compared with 70.2 percent of same-age Black households. The homeownership rate for older white households remained in the 80–85 percent range for the next two decades, while the rate for older Black households peaked at 71.3 percent in 2003 and then dropped to 58.9 percent in 2019—doubling the gap to nearly 25 percentage points.

Although still underrepresented, Hispanic and Asian households have become a larger share of owners as their populations have grown. By the Current Population Survey's count, Hispanic households made up 7.7 percent of homeowners in 2000 and 10.0 percent in 2019. Similarly, the share of Asian homeowners nearly doubled

FIGURE 25

Homeownership Gaps Persist Across All Age Groups, with the Largest Disparities Between Black and White Households

Homeownership Rate (Percent)



Notes: White, Asian, and Black householders are non-Hispanic. Hispanic householders may be of any race.
Source: JCHS tabulations of US Census Bureau, Current Population Surveys via IPUMS CPS, University of Minnesota, www.ipums.org.

from 2.5 percent to 4.8 percent over this period. These households also account for growing shares of recent homebuyers, with Hispanics making up 12.1 percent of households that bought within the previous year and Asians making up 5.5 percent in 2019, up from 9.6 percent and 3.5 percent, respectively, in 2000. In contrast, the share of Black households among recent homebuyers fell from 9.1 percent in 2000 to 6.9 percent in 2019, slightly worsening their under-representation among homeowners.

THE OUTLOOK

Entering 2020, both the national homeownership rate and the number of owner households were on the rise as more young and high-income households bought homes. The aging of the population also helped to lift the number of households into age groups with traditionally high homeownership rates. Attitudes toward and interest in homeownership remained positive, and demand for homeownership was strong. Although many homeowners struggled to make their mortgage payments when the pandemic hit, government interventions, rising home values, and high levels of home equity have so far kept a foreclosure crisis at bay.

Looking ahead, record-low interest rates should keep homebuying on the rise despite tighter credit conditions. However, inequality in the homeownership market may well increase. Current homeowners able to refinance may be able to reap savings on their monthly payments while also enjoying the benefits of rising home equity. But distressed owners now in forbearance plans will have to make up for missed mortgage payments over time, adding to their financial pressures. And for those buying for the first time, homeownership is increasingly out of reach for all but the highest-income households, particularly in many of the nation's largest metro areas.

Moreover, the pandemic has had a disproportionately large impact on lower-income workers, placing those that own homes at higher risk of foreclosure and limiting renter households' ability to save for future downpayments. Other real barriers to homeownership also remain, including tight credit conditions, competing financial demands, and, significantly, the far-reaching impacts of exclusionary housing policies. Efforts to expand access to homeownership as well as educational and economic opportunity must not only address current economic pressures but also confront the lasting legacy of discriminatory housing policy head on.

5 | RENTAL HOUSING

The economic fallout from the pandemic has hit renter households particularly hard. Despite widespread job losses and limited income support, however, most have continued to make their rent payments. After a sharp spike in the summer, rental construction resumed a more moderate pace in September, but sales of multifamily properties fell amid rising vacancy rates and ongoing uncertainty. Meanwhile, with most new units intended for the high end of the market and continued losses of low-cost units, rental affordability continues to erode, and the concentrated location of affordable units reinforces inequities.

HARDSHIPS FOR TENANTS AND LANDLORDS ALIKE

Renter households have been especially vulnerable to the economic disruption caused by COVID-19. According to the Census Bureau's Household Pulse Survey, 49 percent of renter households reported at least some lost employment income between mid-March and mid-September—a much larger share than the 36 percent of homeowners. Income losses have been widespread, affecting some 59 percent of Hispanic renters, 53 percent of Black renters, and 45 percent of white renters.

Nevertheless, most renters continued to make rent payments. As of late September, 15 percent of renter households responding to the Household Pulse Survey said that they were behind on rent. Meanwhile, the National Multifamily Housing Council (NMHC) reports that just 5 percent of the tenants in professionally managed apartments did not make payments by the end of September, a difference of just 0.9 percentage point from a year before. Even in April, when rent payments were down the most (3.1 percentage points), 95 percent of renters still made payments.

FIGURE 26

Many Tenants with Lower Incomes and in Small Rental Buildings Have Had Difficulty Keeping Up with Rent

Share of Households Behind on Rent as of September 2020 (Percent)

Note: Households behind on rent reported that they were not caught up at the time of survey.
Source: JCHS tabulations of US Census Bureau, Household Pulse Survey Week 15.

However, these professionally managed multifamily units make up only about a quarter of the rental stock. Tenants in these buildings typically have higher incomes and are therefore less likely to miss rent payments. Indeed, the Household Pulse Survey found that just 7 percent of renter households making at least $75,000 were behind on rent in late September, closely aligning with the NMHC rent collections rate. At the same time, though, some 21 percent of renters making less than $25,000 reported being behind on rent in September **(Figure 26)**. A larger share of tenants also reported being behind on rent in single-family (17 percent) and small multifamily rentals (14 percent)—the types of units that are not typically professionally managed.

As a result, the landlords of smaller rental properties may already be struggling to cover their costs. ApartmentList reports that tenants of buildings with under 50 units were more likely to make partial payments or to miss a payment in the first week of July than those living in larger multifamily buildings. Avail's survey of smaller landlords, who typically own just one to four units, also found that incomplete rent payments increased 93 percent from March to May 2020, with more than a third of these landlords pulling from savings or emergency funds to cover the shortfall.

Short-term income supports have helped to keep some households afloat so that they could cover their rents. The Household Pulse Survey from late September found that 28 percent of renters used their one-time federal stimulus checks to cover basic needs, including rent, and 17 percent used unemployment insurance benefits. But many households also had to turn to other financial supports. Nearly a quarter of renters borrowed money from friends or family to cover costs, and 27 percent drew on savings. Since nearly half of renter households have savings of less than $1,000 and their rents typically exceed that amount, many have likely depleted their emergency funds.

SHIFTING DEMAND FOR RENTAL HOUSING

After a two-year slowdown, renter household growth resumed in 2019 with the addition of 301,000 households. The number of renter households held steady in the first quarter of 2020, increasing by a modest 18,000 year over year **(Figure 27)**. As a result, the share of US households renting their housing continued to decline, dipping to 35.2 percent in the first quarter—its lowest point in six years.

But even as overall rental demand slowed in recent years, American Community Survey data indicate that the number and share of higher-income renters were on the rise. Some 7.9 million renter households were added between the homeownership peak in 2004 and 2019, bringing the total number to 44.0 million. With higher-income households driving over half of this growth, the number of renter households with incomes of at least $75,000 increased by 4.6 million in 2004–2019 and their share of renter households jumped from 18 percent to 26 percent.

Meanwhile, the number of renter households with incomes under $30,000 grew by just 654,000 over this interval, reducing their share of renters from 42 percent to 36 percent. Indeed, the number of lower-income renter households was on the decline in recent years, including a drop of more than 750,000 in 2019 alone. However, the massive job losses due to the COVID-19 pandemic could reverse this trend, increasing both the number and share of renter households with lower incomes.

The racial and ethnic diversity of renters increased from 2004 to 2019, with households headed by a person of color accounting for about three-quarters of growth and foreign-born households making up more than a quarter of the growth. As a result, the share of renter households headed by a person of color increased 6 percentage points over this period, to 48 percent—well above their 33 percent share of all US households. And regardless of their incomes, households of color, particularly Black and Hispanic households, are more likely to rent their housing than white households.

With the aging of the population, adults age 55 and over drove about two-thirds of renter household growth in 2004–2019, lifting their share of all renters from 22 percent to 30 percent. Indeed, the rentership rate for older adults continued to increase in 2019, with their numbers up 327,600. While households under age 35 still made up just over a third of all renters, the slowdown in their household formation rates kept their share of renter household growth to only 4 percent over this period. Although the number of younger renters picked up by about 110,000 in 2018–2019, the pandemic will likely slow any gains in 2020.

Temporary college closures and rising unemployment among younger workers may also stifle rental demand and encourage more households to double up. Nontraditional households, such as adults living with parents or unrelated individuals, were already a fast-growing household type before the pandemic, accounting for a third of renter household growth in 2004–2019. Indeed, roommate households and adult children living with parents made up a fifth of all renter households last year. Nontraditional households are most common in expensive housing markets, suggesting that these living situations are related to rental affordability.

FIGURE 27

Growth in Rental Demand Was Flat Even Before the Pandemic Hit

Note: Estimates for 2020:1 are based on year-over-year change in the four-quarter trailing average.
Source: JCHS tabulations of US Census Bureau, Housing Vacancy Surveys.

COOLING AT THE HIGH END

Although still positive, rent growth slowed slightly from March to September 2020 as the pandemic progressed. In September, however, the Consumer Price Index for rent of primary residence (a stable measure of overall rent growth that rarely shows nominal declines) rose at a 3.4 percent annual rate—down 0.3 percentage point from March but still more than four times the pace of prices for all other items. CoreLogic's Single-Family Rent Index also showed continued growth of 1.7 percent in July 2020, although a slowdown from 2.9 percent a year earlier.

At the same time, however, nominal rents for professionally managed apartments were falling. According to CoStar, rents for units in higher-quality (4 & 5 Star) properties were down by 1.6 percent year over year in the second quarter of 2020. This was the first actual decline since 2010 and a significant drop from the 2.7 percent increase a year earlier. Rents for top-quality units continued to slide in the third quarter, off 2.2 percent year over year. Rent growth for moderate-quality (3 Star) properties slowed somewhat less, easing from 3.1 percent in the third quarter of 2019 to 1.2 percent in the third quarter of 2020. The slowdown in the lower-quality (1 & 2 Star) segment was even more modest, with rent growth dipping from 2.7 percent to 1.7 percent.

The third-quarter cooldown in rent growth was widespread geographically, with about a third of the 150 markets tracked by RealPage reporting year-over-year declines. By comparison, only eight markets posted rent decreases a year earlier. Rents for professionally managed units dropped by more than 2 percent in 20 markets, 17 of which were in the South or West. Declines of more than 4 percent were posted in 11 markets, including Boston, Los Angeles, New York, and San Francisco.

Softening rents in professionally managed properties reflect rising vacancy rates. CoStar data indicate that the vacancy rate for apartments in buildings with at least five units rose to 6.9 percent in the second quarter and held at 7.0 percent in the third quarter of 2020, nearly a full percentage point higher than a year earlier. Vacancy rates climbed the most in the higher-quality segment, up nearly 2 percentage points year over year in the third quarter, to 10.5 percent. Meanwhile, the vacancy rate at the lower end of the market inched up only 0.2 percentage point to 5.3 percent.

Of the 150 markets tracked by RealPage, third-quarter vacancy rates were up year over year in 93 markets, with increases of more than 1.0 percentage point in 32. Within markets, CoStar reports that the biggest increases were in expensive, high-density urban areas, where rates jumped 3.0 percentage points **(Figure 28)**. The vacancy rate in these prime areas hit 9.1 percent in the third quarter as the rental supply increased by 3.8 percent but demand rose just 0.5 percent. In contrast, rental supply and demand in suburban areas were in close balance, lifting the vacancy rate by just 0.2 percentage point.

RealPage data confirm that expanding supply and faltering demand are behind the jump in rental vacancy rates. Second-quarter completions of new units outpaced the growth in renter households in 92 markets, and net demand fell in 44 markets. Several of the metros with a drop-off in rental demand were high-cost markets, including some that were initially hard hit by COVID-19, such as Boston, New York, and San Francisco. Rental demand regained strength in the third quarter, with especially large increases in Southern and Western markets. Completions of rental units exceeded renter household growth in just 29 markets and net demand was down from the previous quarter in only 11.

While not yet capturing the third-quarter uptick in demand, the Survey of Market Absorption indicates that apartment take-ups at the high end of the market slowed sharply during the spring. Only a third of new units completed in the first quarter of 2020 and renting for more than $2,050 were leased within three months, the lowest absorption rate posted in the last five years. By comparison, two-thirds of newly completed units with rents under $1,050 were leased within three months.

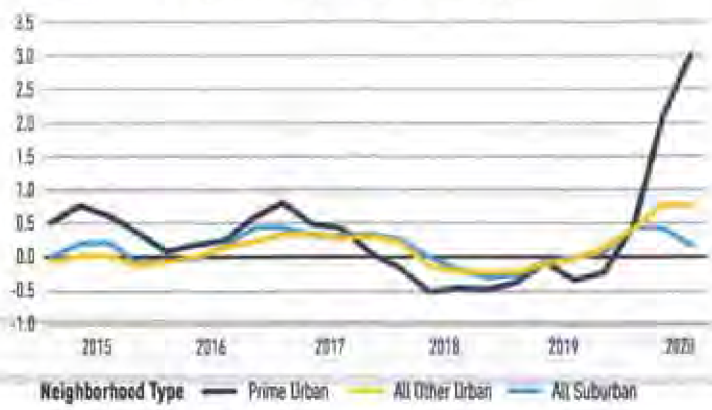
SLOWDOWN IN MULTIFAMILY INVESTMENT

After reaching a 12-year high at the end of 2019, the volume of apartment property transactions plunged 68 percent year over year in the second quarter of 2020 **(Figure 29)**. A slowdown in apartment

FIGURE 28

Vacancies Have Climbed Sharply in Prime Urban Areas

Year-over-Year Change in Vacancy Rate (Percentage points)



Notes: Prime urban areas are the most expensive urban markets. Urban/suburban areas are defined based on density in the 54 largest metros that CoStar tracks.
Source: JCHS tabulations of CoStar data.

FIGURE 29

Sales of Apartment Properties Plunged in Early 2020, But Prices Continued Their Ascent

Note: Apartment property prices are nominal and indexed to 2000.
Source: JCHS tabulations of Real Capital Analytics data.

price growth accompanied the sharp drop in transactions. According to Real Capital Analytics data, year-over-year price growth exceeded 9 percent through April 2020 but then fell steadily to 6.7 percent in September—the lowest year-over-year pace since early 2011.

Although still modest, delinquency rates for multifamily loans ticked up slightly from a near-historic low of 0.12 percent in the first quarter of 2020 to 0.19 percent in the second quarter. Defaults have likely remained low because most tenants continued to make rent payments and owners could use cash reserves to cover temporary shortfalls.

But with fewer transactions and weaker price gains, the total volume of multifamily mortgage originations fell 13 percent from the first to second quarters of 2020, leaving originations down 24 percent from a year earlier. While volumes at commercial banks and life insurance companies and held in commercial mortgage-backed securities declined, Fannie Mae and Freddie Mac continued to support the multifamily market with a 25 percent increase in originations.

With uncertainty in the market, multifamily credit conditions tightened going into the second quarter of the year. Nearly half of the respondents to the Federal Reserve Board's Senior Loan Officer Survey in April said that credit had tightened considerably, and none reported that it was easing. This was a sharp shift from January, when 94 percent responded that credit was either unchanged or easing. For investors that are able to obtain credit, however, mortgage interest rates remain at historic lows.

A sharp drop in net operating income (NOI) may signal problems ahead. According to the National Council of Real Estate Investment Fiduciaries, NOI grew at a strong 5.4 percent annual rate at the end of 2019, but then fell 1.5 percent in the second quarter of 2020—its first decline since 2010. The third quarter was even worse, with NOI down 10.3 percent. With vacancy rates rising, rent collections lagging, and pandemic-related expenses increasing, the net operating incomes of rental property owners will likely continue to fall in the coming months.

MODERATING GROWTH OF MULTIFAMILY CONSTRUCTION

Multifamily construction fluctuated wildly this year before settling back to a more sustainable pace in late summer. After reaching a 30-year high of 389,000 units in 2019, starts of multifamily buildings with at least five apartments jumped to a 426,000 unit annual rate in the first quarter of 2020. But once the pandemic hit and some state and local governments halted non-essential construction activity, seasonally adjusted starts fell 37 percent year over year in April and 31 percent in May. Multifamily starts then bounced back to their 2019 level in June and spiked in July, before gradually easing to a seasonally adjusted annual rate of 295,000 units in September.

Meanwhile, completions of multifamily apartments slowed from a 343,000 to a 335,000 unit seasonally adjusted annual rate in the first quarter of 2020. Much of this decline came in February when the seasonally adjusted number of new units coming on the market was down 43 percent from the year-earlier peak. Activity in the following two months was also weak, with completions falling 20 percent year over year in April and 3 percent in May. Even so, completions were already more than 10 percent higher in June and July than a year earlier, before climbing to a strong 480,000 annual rate in September.

Following the pandemic, changes in remote work policies could alter demand for the type and location of rental housing. In 2019, the majority of multifamily permits issued (53 percent) were in the core areas of major metros. In addition, 49 percent of newly completed units were efficiencies or one-bedroom apartments, and 58 percent were located in large buildings with at least 50 units. However, the number of new single-family homes intended as rentals has been on the rise in recent years, accounting for 51,000 seasonally adjusted completions in the second quarter of 2020. This could mark the start of a trend, with rental demand shifting to larger single-family homes that can accommodate home offices, units in smaller multifamily buildings with fewer shared amenities, and suburban locations that provide more outdoor space.

AFFORDABILITY CHALLENGES FROM STOCK SHIFTS

Well before 2020, changes in the composition of the housing stock had already made renting less affordable. The rental supply grew by 7.5 million units from 2004 to 2019, to a total of 47.4 million. Most of these additions (6.6 million) were either single-family rentals or units in buildings with at least 20 apartments **(Figure 30)**. Meanwhile, the supply of apartments in multifamily buildings with two to four units fell by 38,000.

The impacts of these stock changes are clear. Apartments in larger multifamily buildings and single-family rentals are typically more expensive than those in smaller multifamily structures. Including utilities, the median rent for apartments in buildings with 20 or more units was $1,200 in 2019 (up 29 percent in real terms from 2004) and the median for single-family rentals was also $1,200 (up 19 percent). By contrast, the median rent for apartments in small multifamily buildings increased just 13 percent over this period, to $975.

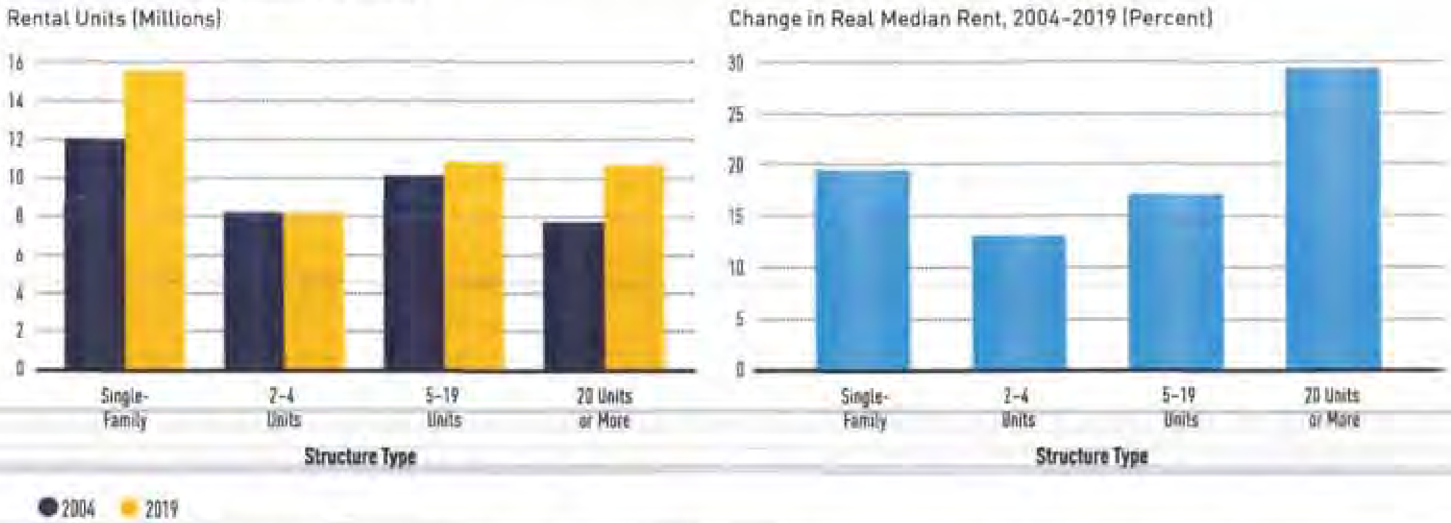
Meanwhile, the real median rent for occupied units increased 20 percent from 2004 to 2019. The number of units with real contract rents of at least $1,000 rose by 10.4 million over this period while the number renting for under $600 fell by 2.5 million. Losses of the low-rent stock were concentrated in small multifamily buildings, where the supply fell by more than 850,000 units. The number of low-rent apartments built before 1970 also declined by 2.1 million over this period, and 44 percent of the low-rent supply was at least 50 years old in 2019. As the rental stock continues to age and landlords of some smaller buildings are unable to collect full rents, more low-cost units will be at risk of deterioration or loss.

ROLE OF RENTAL STOCK LOCATION IN INEQUALITIES

Although rental units make up about a third of the housing in the average census tract, the distribution of the stock is highly uneven. About half of all rental units nationwide are located in just under a quarter of census tracts. Rentals make up more than 80 percent of the stock in just 4 percent of tracts, which are generally located in urban areas. Conversely, the housing in nearly a

FIGURE 30

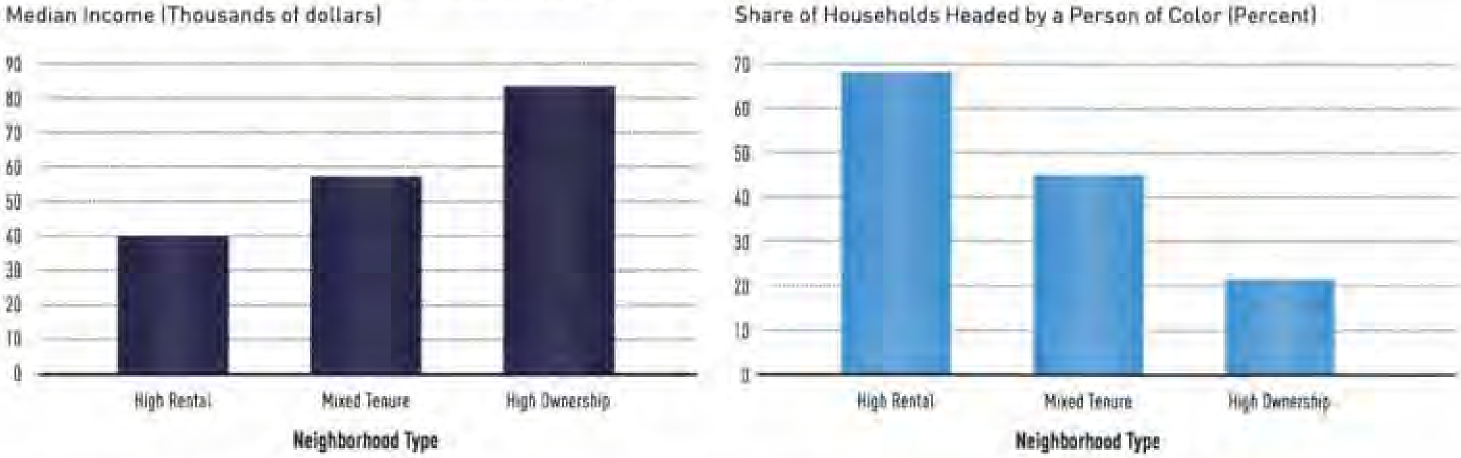
The Rental Stock Has Shifted Toward Single-Family Homes and Large Multifamily Buildings, Where Rents Have Risen the Most



Notes: Rental units may be occupied, vacant for rent, or rented but unoccupied. Median rents are adjusted for inflation using the CPI-U for All Items Less Shelter. Median rents are for occupied units only and exclude units occupied without payment of rent.
Source: JCHS tabulations of US Census Bureau, American Community Survey 1-Year Estimates.

FIGURE 31

The Geographic Concentration of Rental Housing Contributes to Economic and Racial Segregation



third of census tracts is at least 80 percent owner-occupied and typically located in suburban areas. And even though high-ownership neighborhoods far outnumber high-rental neighborhoods, they contain about the same share (10–12 percent) of the entire rental stock.

The spatial concentration of rental housing serves to perpetuate economic and racial segregation **(Figure 31)**. On average, the median household income in high-rental neighborhoods is less than half that in high-ownership neighborhoods. In addition, people of color head just over two-thirds of households in high-rental neighborhoods, or about twice their share of all households. Indeed, some 23 percent of households in high-rental neighborhoods are Black and 32 percent are Hispanic. In high-ownership neighborhoods, however, people of color make up just 20 percent of households, including 6 percent who are Black and 8 percent who are Hispanic.

Low-rent units are even more geographically concentrated than the overall rental stock. Half of the units with rents under $600 are located in just 12 percent of census tracts nationwide. Many of these rentals are in micropolitan areas and in small- to medium-size metros where rents tend to be cheaper. The low-rent stock is also more spatially dispersed in less expensive metros such as Little Rock, McAllen, and Scranton, but highly concentrated in the most expensive markets, including Honolulu, New York, and Washington, DC.

Federally subsidized units are the most spatially concentrated of all rentals. About half of all affordable units subsidized by tax credits are located in just 5 percent of census tracts. The project-based HUD stock, including public housing, is similarly concentrated in just 4 percent of tracts. Although somewhat more dispersed, about half of the private-market units that accept vouchers are located in 10 percent of tracts. On average, neighborhoods with the most subsidized units have higher rentership rates, lower median incomes, and more households of color than those with the least subsidized housing, directly reinforcing long-standing patterns of economic and racial segregation.

THE OUTLOOK

The full effects of COVID-19 on renter households and on the rental housing market remain to be seen. As it is, rental demand is likely to continue to moderate as income and job losses prevent younger adults from forming their own households and historically low mortgage rates encourage more higher-income renters to buy homes. At the same time, however, if foreclosure prevention measures now in place are ended, rental markets could see an influx of former homeowners.

In the near term, demand for higher-quality properties in urban areas and in expensive markets may cool further. The extent of the decline will largely depend on the persistence of the pandemic, the speed of the employment recovery, and the effectiveness of the policy response. Lower-income renters, especially those who have lost wages, are likely to see little relief from rising rents and limited housing choices, although the downward filtering of higher-end apartments could help to expand the affordable stock. But without a significant jobs recovery and a renewal of income or rental supports, more and more households may have difficulty paying their rents, in turn adding to the financial distress of property owners.

6 | HOUSING CHALLENGES

The COVID-19 pandemic has laid bare the connections between racial and income inequality and the nation's longstanding housing policy challenges. Even before the pandemic, housing affordability was at crisis levels, especially among low-income renters of color, and the current economic meltdown has revealed just how many millions of vulnerable households could be one rent payment away from eviction and homelessness. Short-term federal aid has helped some households weather the storm, but much more housing assistance—and housing supply—is necessary to counter the combined effects of the affordability crisis and the pandemic.

THE CONTINUING AFFORDABILITY CRISIS

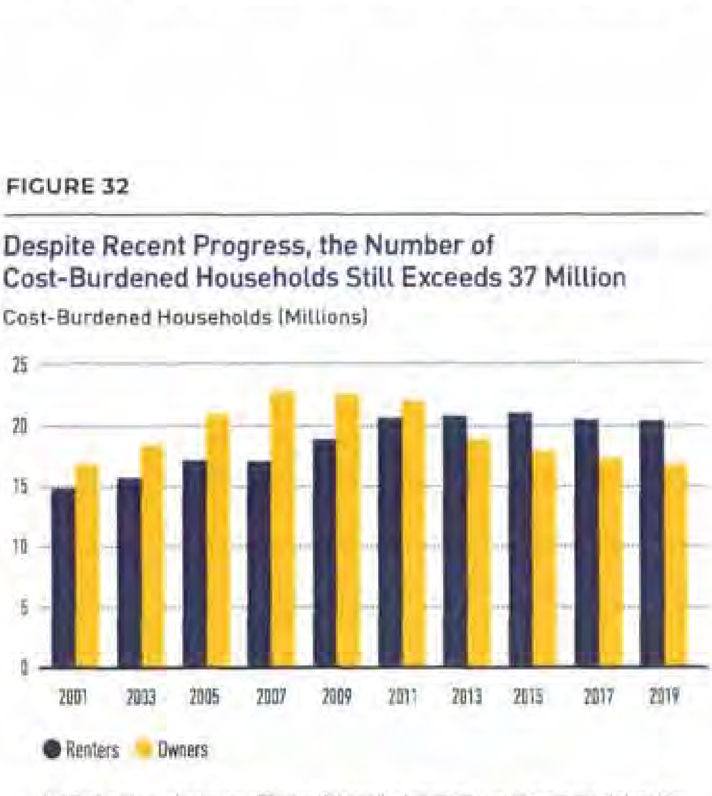
Even before the pandemic-induced downturn, the number of US households with cost burdens held near record highs. Indeed, with the economy near full employment in 2019, some 37.1 million households (30.2 percent) spent more than 30 percent of their incomes on housing **(Figure 32)**. Of this group, 17.6 million households had severe burdens, paying more than half their incomes for housing. Although on a downtrend, the number of cost-burdened households was still 5.6 million higher last year than in 2001.

Housing affordability problems are more than twice as common among renters than among homeowners. Even with a 1.2 percentage point decline in 2018–2019, 46.3 percent of renter households were cost burdened last year, including 23.9 percent with severe burdens. Meanwhile, the share of cost-burdened homeowner households was down 1.4 percentage points, to 21.2 percent, and the share with severe burdens was at 9.0 percent. Still, the total number of cost-burdened homeowners (16.7 million) was not far below the number of cost-burdened renter households (20.4 million).

FIGURE 32

Despite Recent Progress, the Number of Cost-Burdened Households Still Exceeds 37 Million

Cost-Burdened Households (Millions)



Notes: Cost-burdened households pay more than 30% of income for housing. Households with zero or negative income are assumed to have burdens, while households paying no cash rent are assumed to be without burdens.
Source: JCHS tabulations of US Census Bureau, American Community Survey 1-Year Estimates.

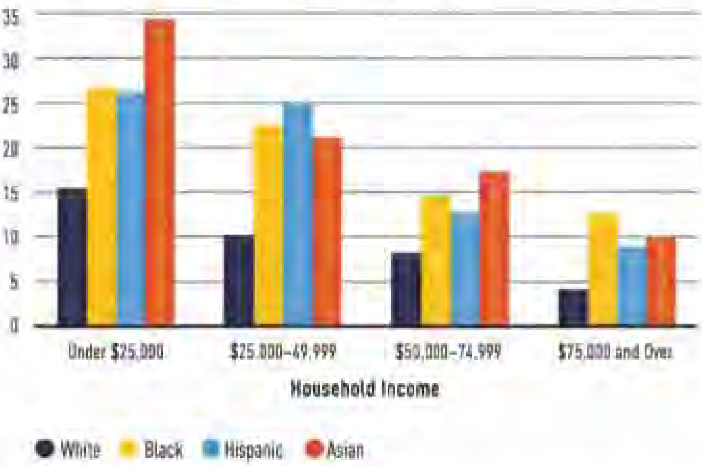
With affordability challenges moving up the income ladder, cost-burden rates among middle-income households edged up again last year. Although still stubbornly high at 83.5 percent, the share of cost-burdened households earning less than $15,000 per year actually dipped by 0.4 percentage point from 2018 to 2019. The rate for households earning $15,000–29,999 also declined by 0.9 percentage point. At the same time, though, the cost-burdened share increased 0.1 percentage point for households with incomes in the $30,000–44,999 range and 0.2 percentage point for those with incomes in the $45,000–74,999 range.

The nation's youngest and oldest households are the most likely to be cost burdened. Households under age 25 have the highest cost-burden rates, including more than half (53.8 percent) of the 4.4 million house-

FIGURE 33

Households of Color Are More Likely to Have Fallen Behind on Housing Payments

Share of Households Behind on Rent/Mortgage in September 2020 (Percent)



Notes: Households behind on rent or mortgage reported that they were not caught up at the time of survey. White, Black, and Asian households are non-Hispanic. Hispanic households may be of any race.
Source: JCHS tabulations of US Census Bureau, Household Pulse Survey, Week 16.

holds in this age group. The shares with burdens decline for each successive age group through ages 45–54, but rise thereafter. Cost-burden rates are especially high among those age 85 and over. Indeed, households in that age group had the second-highest cost-burdened share in 2019, with 1.5 million of the 4.0 million households in this age range (36.8 percent) paying more than a third of their incomes for housing.

For older homeowners more generally, having mortgage debt can make the difference between being cost burdened and not. The share of homeowners with housing debt at age 65 and over more than doubled from 1989 to 2019, while the median loan-to-value ratio on that debt nearly tripled to 36.8 percent. By 2019, 40.2 percent of older homeowners with mortgages (3.8 million) were cost burdened, compared with only 14.7 percent (2.4 million) of same-age owners without mortgages.

Among renters, Black and Hispanic households are particularly likely to have cost burdens. Black renters have the highest share at 53.7 percent, followed closely by Hispanic renters at 51.9 percent. By comparison, 41.9 percent of white renters were cost burdened last year, along with 42.2 percent of Asian renters and 46.6 percent of renter households identifying as multiracial or another race. Across most income groups, households of color are more likely to be cost burdened than white households.

DISPARATE IMPACTS OF THE PANDEMIC

The economic fallout from the pandemic has compounded affordability challenges. The unemployment rate soared from 3.5 percent in February to 14.7 percent in April, with 20.5 million jobs lost in that month alone. As of September, the unemployment rate had declined to 7.9 percent, although the number of unemployed persons remained high at 12.6 million. The households hardest hit by job losses were also the groups most likely to be cost burdened—renters, lower-income households, and households of color.

The pandemic has had a disproportionately large economic impact on people of color. Some 54 percent of Hispanic households reported income losses between March and September, along with 47 percent of Black households and 39 percent of Asian households. The share of white households was 37 percent. Across all income groups, Hispanic households are consistently the most likely to have lost income this year.

Despite federal stimulus payments and extended unemployment benefits early in the pandemic, many households still struggled to cover their housing costs. As of late September, 15 percent of renter households were behind on their rents and 9 percent of homeowners with mortgages were behind on their payments. Lower-income households were significantly more likely to miss payments, including 21 percent of renters and 20 percent of homeowners earning less than $25,000 per year. But even among households with incomes of at least $75,000, 7 percent of renters and 5 percent of homeowners were behind on their housing payments by late September.

The shares of Black and Hispanic households behind on housing payments were more than twice as high as that of white households. Among renters, 23 percent of Black households and 20 percent of Hispanic households were behind, compared with 10 percent of white households. The disparity among homeowners is also substantial, with 17 percent of Black owners and 18 percent of Hispanic owners behind on their mortgages, compared with just 7 percent of white owners.

These racial differences persist across incomes **(Figure 33)**. Among households earning less than $25,000, some 27 percent of Black households and 26 percent of Hispanic households were behind on their rent or mortgage payments in September, in contrast to just 15 percent of white households. And even among households with incomes of $75,000 or more, 13 percent of Black households and 9 percent of Hispanic households reported being behind on payments, far larger shares than the 4 percent of white households.

DIFFICULT TRADEOFFS FOR COST-BURDENED HOUSEHOLDS

Lower-income households with housing cost burdens have little to spend on food, healthcare, and other necessities. According to American Community Survey data, a large majority (71 percent) of households earning less than $15,000 had severe cost burdens in

2019, leaving these households with a meager $225 each month for all non-housing expenses. Households in this income group with moderate burdens had $550 left each month. Among those with incomes between $15,000 and $30,000, severely burdened households had less than $600 for all other expenses while moderately burdened households had $1,150.

When compared with other lower-income households that live in housing they can afford, the differences in spending are stark. Data from the 2018 Consumer Expenditure Survey show that unburdened households in the bottom expenditure quartile (a proxy for lower income) were able to spend 19 percent more each month on non-housing needs than moderately cost-burdened households and 52 percent more than severely cost-burdened households.

Conditions for low-income families with children and those headed by older adults are especially troubling **(Figure 34)**. Among households in the bottom expenditure quartile that included children under age 18, those with moderate cost burdens spent 57 percent less on healthcare (including insurance premiums and out-of-pocket expenses) and 17 percent less on food than unburdened households. Those with severe burdens spent 93 percent less on healthcare and 37 percent less on food.

Differences among households in the bottom expenditure quartile headed by adults age 65 and over are similarly large. Older adults with moderate cost burdens spent 31 percent less on healthcare and 21 percent less on food than same-age households without burdens, while those with severe burdens spent nearly 50 percent less on both healthcare and food.

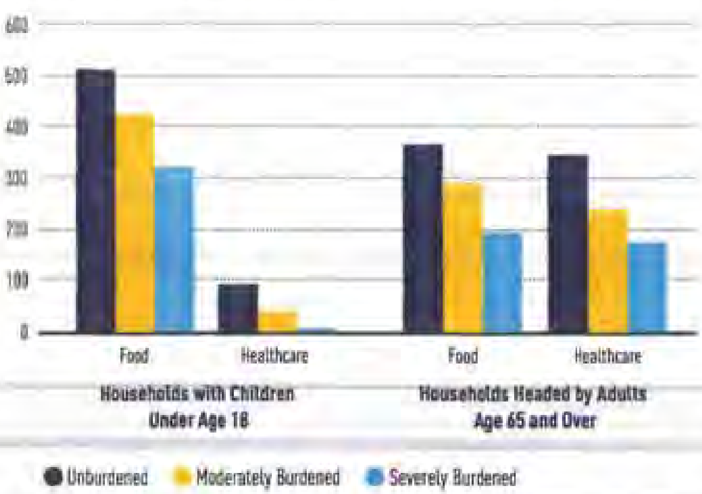
Renter households behind on their housing payments are at significant risk of food insufficiency. In early September, some 46 percent of renter households behind on rent reported they sometimes or often did not have enough to eat in the previous seven days—about double the 24 percent share of owner households behind on their mortgages. Lower-income households are especially vulnerable. Among households earning less than $25,000 in 2019 that were also behind on housing payments, 55 percent of renters and 38 percent of owners reported food insufficiency. Even households that earned more than $75,000 in 2019 and were behind on housing payments said they sometimes or often did not have enough to eat, including 23 percent of renters and 11 percent of owners.

Large shares of renter households of all races and ethnicities experienced food insufficiency in September 2020. Indeed, some 53 percent of white renters behind on rent reported that they sometimes or often did not have enough to eat in the previous seven days—an even larger share than of Black renters (47 percent) and Hispanic renters (45 percent). The shares of homeowners behind on mortgage payments that reported food insufficiency were lower but still sizable at 30 percent for Hispanic homeowners, 27 percent of Black homeowners, and 23 percent of white homeowners.

FIGURE 34

The Burden of High Housing Costs Prevents Vulnerable Households from Meeting Other Basic Needs

Average Monthly Expenditures of Lowest-Income Households (Dollars)



Notes: Data are for households in the bottom quartile of expenditures. Households are moderately (severely) burdened if housing accounts for more than 30% (more than 50%) of their spending. Healthcare expenditures include out-of-pocket costs and insurance premiums.
Source: JCHS tabulations of Bureau of Labor Statistics, 2018 Consumer Expenditure Survey.

HOMELESSNESS AGAIN ON THE RISE

Even before the pandemic, the affordable housing crisis was fueling an increase in homelessness. After edging up in 2017 and 2018, the number of people experiencing homelessness rose more sharply in 2019. HUD's latest point-in-time estimates show a spike of 15,000 more people experiencing homelessness last year, bringing the total to nearly 568,000.

The uptick in homelessness was entirely due to growth in the unsheltered population, whose numbers rose by almost 17,000 (nearly 9 percent), to 211,000. Meanwhile, the number of people in shelters declined by 2,000 (less than 1 percent), reducing the total to 356,000. The number of people in families experiencing either sheltered or unsheltered homelessness also fell by about 9,000 last year, but the number of individuals jumped by nearly 24,000. Homelessness rose in both high- and low-cost states across the country in 2019, with increases of more than 10 percent in six states **(Figure 35)**.

People of color are disproportionately at risk. If homelessness were proportionate to population, 13 percent of people experiencing

FIGURE 35

Homelessness Increased in Both High- and Low-Cost Housing Markets in 2019

Source: JCHS tabulations of US Department of Housing and Urban Development (HUD), Annual Homeless Assessment Report Point-in-Time Estimates.

homelessness would be Black, 18 percent would be Hispanic, 1 percent would be American Indian or Alaska Native, and 72 percent would be white. As it is, however, 40 percent of people experiencing homelessness in 2019 were Black, 22 percent were Hispanic, 3 percent were American Indian or Alaska Native, and just 48 percent were white.

The increase in homelessness last year is especially alarming because people experiencing homelessness are at high risk of COVID-19 exposure. In fact, the Centers for Disease Control and Prevention (CDC) reported that a quarter of residents in 19 homeless shelters in four cities tested positive for the coronavirus between March 27 and April 15. A number of states and localities responded quickly to the public health threat by providing emergency shelter in hotels, convention centers, and trailers. For example, California's Project Roomkey was launched in April with a goal of securing 15,000 rooms in hotels and motels as safe isolation spaces for people experiencing homelessness.

An Urban Institute analysis in August found that about 70 percent of the nation's continuums of care (governing bodies that coordinate homeless services) also used hotels to provide temporary isolation shelters, although they were only able to house about 18 percent of their homeless populations on average. In addition, only a few of these communities had plans to transition their programs to permanent supportive housing, which may be in increased demand if the incidence of homelessness rises over the course of the pandemic.

THE FRAYING HOUSING SAFETY NET

The very high shares of low-income households with cost burdens is a measure of how weak the housing safety net has become. According to HUD's latest Worst Case Housing Needs report, only one in four very low-income renter households (earning less than 50 percent of area median income) received housing assistance in 2017. Nearly two in four very low-income renter households lack assistance and face either severe cost burdens or severely inadequate housing, or both.

Renters with very low incomes who do not receive assistance are left to find housing on the private market, where there is a substantial shortage of units they can afford. According to the National Low Income Housing Coalition's (NLIHC's) latest Gap report, only 10 million rentals on the private market were affordable and available for the nation's nearly 18 million households with very low incomes in 2018.

The lifting of affordability restrictions on thousands of subsidized units over the course of this decade is a potential threat to the low-cost housing stock. According to the 2020 Picture of Preservation report, affordability restrictions are set to expire on over 700,000 subsidized units by 2029. Moreover, a majority of the units with subsidies expiring in the next five years have for-profit owners, who are more likely to convert their properties to market rate. This is especially true for the 21,000 units with for-profit owners that are located in desirable neighborhoods.

Although recent federal budget changes held some promise, funding falls well short of need. Between 2001 and 2010, housing assistance declined from an 8.8 percent share of non-defense discretionary spending to 7.1 percent, even as the number of cost-burdened renter households rose by 6 million. While spending did edge up slightly to 7.4 percent in 2019, the increase was negligible in comparison with the growing incidence of cost burdens over the past two decades.

Of the major HUD programs, only project-based assistance and Housing Choice Vouchers received increased funding from fiscal 2010 to fiscal 2020. Funding for project-based rental assistance was up 25 percent over the decade in real terms, to $12.6 billion, while funding for vouchers rose 12 percent, to $23.9 billion. However, these increases were often dedicated to preserving units rather than expanding the pool of assisted households. The number of households with vouchers only rose from 2.1 million in 2010 to 2.3 million in 2019.

Other programs whose budgets increased from fiscal 2010 to fiscal 2020 include the McKinney-Vento Homeless Assistance grants, up from $2.2 billion to $2.8 billion (in 2019 dollars). The Rental Assistance Demonstration (RAD) program continued to support conversion of public housing units to long-term Section 8 contracts, bringing the total number of converted units to more than 130,000 by February 2020. RAD was expanded in late 2019 to include Section 202 housing for older adults.

At the same time, however, significant cuts were made to other critical programs, including the public housing operating fund (down 19 percent), the HOME Investment Partnership Program (down 37 percent), and Community Development Block Grant program (down 34 percent). While some funding for new homes under the Section 202 Housing for the Elderly program was restored in 2018, its budget in fiscal 2020 was still 18 percent lower than in 2010. Funding for Housing for Persons with Disabilities was also reduced by 43 percent over the decade.

GOVERNMENT RESPONSES TO COVID-19

When the economy nosedived in March, Congress passed the CARES Act, providing $2 trillion in short-term economic relief. The package included direct payments to individuals, funding for coronavirus responses through the Community Development Block Grant and the Emergency Solutions Grants programs, additional unemployment payments, and a moratorium on evictions and foreclosures involving properties with GSE-backed mortgages. The moratorium covered 28 million homeowners and about 28 percent of rental units.

Since March, 43 states and Washington, DC, halted evictions for varying periods, but only 15 had moratoriums still in place at the start of November. The CDC announced a sweeping new eviction moratorium in September, covering renters nationwide until the end of 2020, but the measure carries eligibility requirements and new limitations were added in October. None of these moratoriums forgave back rents.

According to the NLIHC, 43 states and Washington, DC, plus 310 localities, responded to the economic fallout from the pandemic with new or expanded forms of rental assistance. Many of these programs quickly ran out of funds, however, and many others were only able to offer short-term relief. Meanwhile, 35 states and Washington, DC, enacted utility shut-off preventions and payment plans for utility bills. At the start of November, though, these policies were still active in only 19 states and Washington, DC, according to the National Association of Regulatory Utility Commissioners.

The Urban Institute estimates that the cost of helping all renters return to their pre-pandemic income-to-rent ratio without unemployment assistance would be $5.5 billion per month, although even this support would leave many households with cost burdens. A similar Joint Center analysis, focused on workers in jobs at the highest risk of loss, puts the cost of rental assistance at $3.5 billion per month when paired with state unemployment support. Another report, commissioned by the National Council of State Housing Agencies, calculated a cumulative rent shortfall of at least $25 billion by January 2021.

THE NEED TO ADDRESS RESIDENTIAL SEGREGATION

It is a well-documented fact that where children grow up affects their long-term health and well-being. Research has found that children in families who move from high-poverty to low-poverty neighborhoods are more likely to attend college, earn more as an adult, and ultimately live in lower-poverty neighborhoods themselves.

Given the importance of neighborhood quality to future success, national housing policy must do more to reduce the concentration of both poverty and affluence. People of color—particularly low-income households—are far more likely than white people to live in high-poverty areas. Indeed, nearly two-thirds of low-income Black, Hispanic, and Native American individuals live in these communities, compared with only a third of low-income white individuals **(Figure 36)**. It is also striking that 38 percent of Black people with incomes above the poverty line live in high-poverty areas, more than three times the 12 percent share of white people with those incomes.

Today's conditions reflect a long history of housing policies—redlining, siting of public housing, and exclusionary zoning, to name just a few—that prevent people of color and low-income households from living in communities with good-quality public services, easy access to jobs, and healthy environments. Reducing residential segregation requires concerted efforts on multiple fronts, including the elimination of discriminatory treatment in housing and mortgage markets, as well as the amendment of zoning laws that limit housing development in high-opportunity communities.

The federal government has an important role in this, but the recent rollback of HUD's Affirmatively Furthering Fair Housing regulations was a step in the wrong direction. These regulations represented one of the primary tools for ensuring that local governments identify, and take measures to remove, impediments to fair housing. Without state and federal mandates, many local governments are less inclined to expand the housing options for lower-income households.

Still, some jurisdictions have taken the lead in upholding the fight for fair housing. For example, Oregon passed a state mandate last year requiring most communities to allow medium-density housing. Even without a state mandate, the City of Minneapolis eliminated single-family zoning across the city's neighborhoods. These initiatives have gained widespread attention and may help to spur action in other states and localities.

Another federal priority should be to improve the quality of life for people of color living in the nation's distressed communities. Housing production programs would be one facet of these efforts, given the positive impacts of good-quality affordable housing on individual and community well-being. But neighborhood revitalization must also include substantial investments in schools, parks, public safety, transportation networks, and social services. Although past public efforts at urban revitalization have had notoriously poor outcomes, recent initiatives in distressed areas across the country demonstrate that community reinvestment can succeed and their example should inform much needed new policy initiatives.

THE LINKS BETWEEN HOUSING AND PUBLIC HEALTH

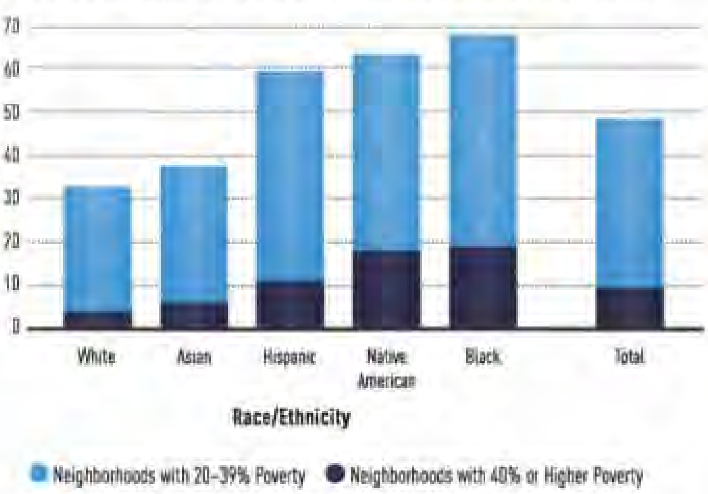
Public health guidance to shelter at home during the pandemic underscored the direct relationships between health and housing. In particular, the evidence suggests that death rates from COVID-19 are disproportionately high in neighborhoods with higher rates of poverty. In addition, research has shown how people living in overcrowded settings are more prone to respiratory illnesses, and the findings of early COVID-19 infection rates bear this out. Crowded conditions are especially common in communities of color, with particularly high rates among Hispanic, Asian, and American Indian or Alaska Native households **(Figure 37)**.

Meanwhile, living in congregate settings has put many older adults and people with underlying health problems at increased risk from COVID-19. Indeed, residents of nursing homes account for just 8 percent of coronavirus cases, but fully 40 percent of deaths. Older adults living in shared households are also more at risk of infection if they are unable to maintain social distancing. As it is, a fifth of adults age 65 and over live in multigenerational households (with at least two adult generations present), with shares reaching as high as 39 percent among older Hispanic adults, 43 percent among older Asian adults, and 28 percent for older Black adults.

FIGURE 36

People of Color with Low Incomes Are Concentrated in High-Poverty Areas

Share of Poor Living in High-Poverty Census Tracts, 2018 (Percent)

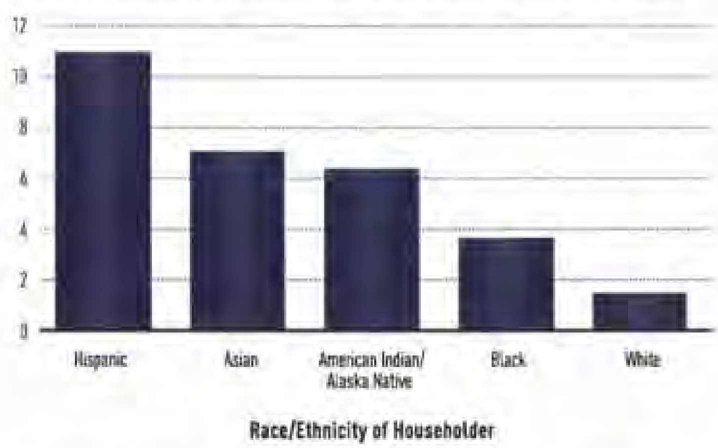


Notes: Incomes above or below the poverty line are defined by the official measure of poverty established by the OMB. Only white individuals are non-Hispanic. Since Hispanic individuals may be of any race, there is some overlap with other racial categories.
Source: JCHS tabulations of US Census Bureau, 2018 American Community Survey 5-Year Estimates.

FIGURE 37

Many Households of Color Live in Overcrowded Conditions

Share of Households with More than One Person per Room (Percent)



Notes: Asian, American Indian/Alaska Native, white, and Black householders are non-Hispanic. Hispanic householders may be of any race.
Source: JCHS tabulations of US Census Bureau, 2019 American Community Survey 1-Year Estimates.

But just as living with others may increase their exposure to the coronavirus, older adults living alone face a serious health risk from loneliness. In 2019, 14 million people age 65 and over lived by themselves, including 4.5 million age 80 and over. Recognizing that loneliness is such a threat to health, operators of age-restricted housing have continued to support communal life during the pandemic with shopping, care coordination, and other services. This support is vital given the competing needs for social distancing and socialization among older adults.

WORSENING IMPACTS OF CLIMATE CHANGE

So far in 2020, the United States has experienced 16 distinct billion-dollar disasters, making this year one of the three worst on record according to the National Oceanic and Atmospheric Administration. The cost of damages from these events neared $50 billion as of September, surpassing the total for all of 2019.

But the massive recovery efforts required by disasters on this scale often overlook the nation's most vulnerable households, particularly renters. For example, an NLIHC analysis of Superstorm Sandy's impact in three New Jersey counties found that there were large losses of low-cost rental units in two of the three counties and that many renters received no disaster assistance at all. A 2010 Government Accountability Office report also showed that only 18 percent of damaged rental units received federal assistance after Hurricanes Katrina and Rita, compared with 62 percent of damaged homeowner units.

Climate change has also added to the number of low-income households facing energy insecurity. When the pandemic forced families to spend more time at home, residential utility use went up—sometimes significantly. This was especially true during the record summer heat, when the need for air conditioning was extreme. For lower-income households, this forced a tradeoff between paying higher utility bills or suffering the health risks of excessive heat.

Even before the pandemic, communities of color were especially at risk of energy insecurity. According to the most recent Residential Energy Consumption Survey, 54 percent of American Indian or Alaska Native, 52 percent of Black, and 45 percent of Hispanic households experienced some form of energy insecurity in 2015—about twice the 25 percent share of non-Hispanic white households. More recent studies have also found that formerly redlined neighborhoods in US cities experienced more extreme heat events than surrounding areas.

THE OUTLOOK

The economic disruption caused by the COVID-19 pandemic has underscored the stark—and growing—differences between financially secure households and those living paycheck to paycheck. While relatively affluent households have been able to retreat to their homes and work remotely during this crisis, millions of low-income households have lost their jobs and fallen behind on their rent or mortgage payments. Many of these households had housing cost burdens even before the crisis hit, and are now facing the potential loss of their homes.

A disproportionate share of those at risk are households of color. The wide racial and income disparities between the nation's haves and have-nots are the legacy of decades of discriminatory practices in the housing market and in the broader economy. This year's traumatic events have delivered a wakeup call that access to affordable housing is an essential right, not only for the disadvantaged but also for the ability of entire communities to prosper. There is no better time for policymakers to seize the moment by framing a new, comprehensive housing strategy that will reduce inequalities and advance the longstanding goal of a decent, affordable home in a suitable living environment for all.

The State of the Nation's Housing 2020 was prepared by the Harvard Joint Center for Housing Studies. The Center advances understanding of housing issues and informs policy. Through its research, education, and public outreach programs, the Center helps leaders in government, business, and the civic sectors make decisions that effectively address the needs of cities and communities. Through graduate and executive courses, as well as fellowships and internship opportunities, the Center also trains and inspires the next generation of housing leaders.

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2020 Affordable Housing Appeals List - Exempt Municipalities

Town	2010 Census	2020 Gov Assisted	2020 Tenant Rental Assistance	2020 Single Family CHFA/USDA Mortgages	2020 Deed Restricted Units	2020 Total Assisted Units	2020 Percent Affordable
Ansonia	8,148	349	764	147	0	1,260	15.46%
Bloomfield	9,019	558	106	341	0	1,005	11.14%
Bridgeport	57,012	6,505	4,353	900	19	11,777	20.66%
Bristol	27,011	1,908	962	1124	0	3,994	14.79%
Danbury	31,154	1,615	1,269	565	289	3,738	12.00%
Derby	5,849	275	301	111	0	687	11.75%
East Hartford	21,328	1,593	815	1035	0	3,443	16.14%
East Windsor	5,045	559	42	116	0	717	14.21%
Enfield	17,558	1,340	227	659	7	2,233	12.72%
Groton	17,978	3,727	107	377	10	4,221	23.48%
Hartford	51,822	10,501	8,635	1523	0	20,659	39.87%
Killingly	7,592	520	147	188	0	855	11.26%
Manchester	25,996	1,851	950	964	32	3,797	14.61%
Meriden	25,892	1,964	1,270	1029	11	4,274	16.51%
Middletown	21,223	3,019	1,123	543	25	4,710	22.19%
New Britain	31,226	2,913	1,583	1167	100	5,763	18.46%
New Haven	54,967	9,511	6,867	982	440	17,800	32.38%
New London	11,840	1,598	510	509	101	2,718	22.96%
North Canaan	1,587	148	0	14	0	162	10.21%
Norwalk	35,415	2,242	1,468	437	635	4,782	13.50%
Norwich	18,659	2,249	794	567	0	3,610	19.35%
Plainfield	6,229	377	190	224	0	791	12.70%
Putnam	4,299	383	64	77	0	524	12.19%
Stamford	50,573	4,225	1,971	450	1270	7,916	15.65%
Torrington	16,761	908	322	547	17	1,794	10.70%
Vernon	13,896	1,509	461	386	12	2,368	17.04%
Waterbury	47,991	5,344	3,123	1,751	21	10,239	21.34%
West Haven	22,446	1,024	1,868	439	0	3,331	14.84%
Winchester	5,613	350	167	92	0	609	10.85%
Windham	9,570	1,763	617	363	0	2,743	28.66%
Windsor Locks	5,429	297	156	243	0	696	12.82%

2020 Affordable Housing Appeals List - Non-Exempt Municipalities

Town	2010 Census	2020 Gov Assisted	2020 Tenant Rental Assistance	2020 Single Family CHFA/USDA Mortgages	2020 Deed Restricted Units	2020 Total Assisted Units	2020 Percent Affordable
Andover	1,317	18	1	32	0	51	3.87%
Ashford	1,903	32	0	36	0	68	3.57%
Avon	7,389	244	16	44	0	304	4.11%
Barkhamsted	1,589	0	6	23	0	29	1.83%
Beacon Falls	2,509	0	4	46	0	50	1.99%
Berlin	8,140	556	50	142	4	752	9.24%
Bethany	2,044	0	2	13	0	15	0.73%
Bethel	7,310	192	26	154	87	459	6.28%

Bethlehem	1,575	24	0	9	0	33	2.10%
Bolton	2,015	0	2	28	0	30	1.49%
Bozrah	1,059	0	3	30	0	33	3.12%
Branford	13,972	233	77	170	9	489	3.50%
Bridgewater	881	0	24	1	0	25	2.84%
Brookfield	6,562	155	27	110	77	369	5.62%
Brooklyn	3,235	189	9	65	0	263	8.13%
Burlington	3,389	27	0	47	0	74	2.18%
Canaan	779	1	4	5	1	11	1.41%
Canterbury	2,043	76	1	68	0	145	7.10%
Canton	4,339	211	15	53	32	311	7.17%
Chaplin	988	0	1	37	0	38	3.85%
Cheshire	10,424	258	22	100	17	397	3.81%
Chester	1,923	23	3	16	0	42	2.18%
Clinton	6,065	105	8	66	0	179	2.95%
Colchester	6,182	364	38	146	4	552	8.93%
Colebrook	722	0	1	7	1	9	1.25%
Columbia	2,308	24	2	62	0	88	3.81%
Cornwall	1,007	28	2	6	0	36	3.57%
Coventry	5,099	103	5	131	20	259	5.08%
Cromwell	6,001	212	11	198	0	421	7.02%
Darien	7,074	136	10	2	104	252	3.56%
Deep River	2,096	26	6	32	0	64	3.05%
Durham	2,694	36	1	28	0	65	2.41%
East Granby	2,152	72	2	48	0	122	5.67%
East Haddam	4,508	73	3	63	0	139	3.08%
East Hampton	5,485	70	6	91	25	192	3.50%
East Haven	12,533	542	168	302	0	1,012	8.07%
East Lyme	8,458	396	20	95	19	530	6.27%
Eastford	793	0	0	15	0	15	1.89%
Easton	2,715	0	0	3	15	18	0.66%
Ellington	6,665	260	5	118	0	383	5.75%
Essex	3,261	58	2	17	16	93	2.85%
Fairfield	21,648	231	131	70	124	556	2.57%
Farmington	11,106	470	107	149	155	881	7.93%
Franklin	771	27	2	20	0	49	6.36%
Glastonbury	13,656	604	44	133	2	783	5.73%
Goshen	1,664	1	1	5	0	7	0.42%
Granby	4,360	85	2	51	5	143	3.28%
Greenwich	25,631	879	443	16	33	1,371	5.35%
Griswold	5,118	137	54	158	0	349	6.82%
Guilford	9,596	186	10	34	0	230	2.40%
Haddam	3,504	22	1	31	0	54	1.54%
Hamden	25,114	937	788	523	4	2,252	8.97%
Hampton	793	0	1	11	0	12	1.51%
Hartland	856	2	0	8	0	10	1.17%
Harwinton	2,282	22	5	36	5	68	2.98%
Hebron	3,567	56	3	51	0	110	3.08%
Kent	1,665	58	4	5	0	67	4.02%
Killingworth	2,598	0	0	18	5	23	0.89%
Lebanon	3,125	26	3	84	0	113	3.62%
Ledyard	5,987	32	8	233	0	273	4.56%
Lisbon	1,730	2	0	59	0	61	3.53%
Litchfield	3,975	140	2	28	19	189	4.75%
Lyme	1,223	0	0	5	8	13	1.06%
Madison	8,049	90	2	11	33	136	1.69%

Mansfield	6,017	175	124	96	2	397	6.60%
Marlborough	2,389	24	0	24	0	48	2.01%
Middlebury	2,892	77	5	25	20	127	4.39%
Middlefield	1,863	30	3	21	1	55	2.95%
Milford	23,074	726	208	192	74	1,200	5.20%
Monroe	6,918	35	3	54	8	100	1.45%
Montville	7,407	81	58	267	0	406	5.48%
Morris	1,314	20	4	8	0	32	2.44%
Naugatuck	13,061	493	315	367	0	1,175	9.00%
New Canaan	7,551	175	21	5	21	222	2.94%
New Fairfield	5,593	0	1	67	17	85	1.52%
New Hartford	2,923	12	4	55	15	86	2.94%
New Milford	11,731	307	44	182	17	550	4.69%
Newington	13,011	531	122	479	36	1,168	8.98%
Newtown	10,061	134	7	95	32	268	2.66%
Norfolk	967	21	2	5	0	28	2.90%
North Branford	5,629	62	13	52	0	127	2.26%
North Haven	9,491	393	53	97	23	566	5.96%
North	2,306	0	1	27	6	34	1.47%
Old Lyme	5,021	60	2	20	3	85	1.69%
Old Saybrook	5,602	50	15	25	73	163	2.91%
Orange	5,345	46	9	12	6	73	1.37%
Oxford	4,746	36	2	31	0	69	1.45%
Plainville	8,063	205	41	306	22	574	7.12%
Plymouth	5,109	178	21	196	0	395	7.73%
Pomfret	1,684	32	5	13	0	50	2.97%
Portland	4,077	185	94	70	0	349	8.56%
Preston	2,019	40	7	40	0	87	4.31%
Prospect	3,474	0	6	56	0	62	1.78%
Redding	3,811	0	1	17	0	18	0.47%
Ridgefield	9,420	175	7	36	69	287	3.05%
Rocky Hill	8,843	235	52	194	0	481	5.44%
Roxbury	1,167	19	0	5	0	24	2.06%
Salem	1,635	0	3	34	0	37	2.26%
Salisbury	2,593	24	2	2	14	42	1.62%
Scotland	680	0	1	31	0	32	4.71%
Seymour	6,968	262	28	113	0	403	5.78%
Sharon	1,775	32	1	3	0	36	2.03%
Shelton	16,146	254	45	137	82	518	3.21%
Sherman	1,831	0	1	7	0	8	0.44%
Simsbury	9,123	289	60	98	0	447	4.90%
Somers	3,479	146	9	35	0	190	5.46%
South Windsor	10,243	443	55	232	9	739	7.21%
Southbury	9,091	90	6	41	0	137	1.51%
Southington	17,447	499	63	354	51	967	5.54%
Sprague	1,248	20	13	27	1	61	4.89%
Stafford	5,124	257	22	127	0	406	7.92%
Sterling	1,511	0	7	24	0	31	2.05%
Stonington	9,467	441	16	97	0	554	5.85%
Stratford	21,091	524	460	373	33	1,390	6.59%
Suffield	5,469	296	5	51	15	367	6.71%
Thomaston	3,276	104	6	98	0	208	6.35%
Thompson	4,171	151	13	48	0	212	5.08%
Tolland	5,451	127	5	103	3	238	4.37%
Trumbull	13,157	315	19	97	303	734	5.58%
Union	388	0	0	5	0	5	1.29%

Voluntown	1,127	20	1	24	0	45	3.99%
Wallingford	18,945	354	129	328	35	846	4.47%
Warren	811	0	0	1	0	1	0.12%
Washington	2,124	14	2	4	23	43	2.02%
Waterford	8,634	123	30	266	0	419	4.85%
Watertown	9,096	205	32	229	0	466	5.12%
West Hartford	26,396	643	854	372	250	2,119	8.03%
Westbrook	3,937	140	5	30	29	204	5.18%
Weston	3,674	0	2	6	0	8	0.22%
Westport	10,399	265	60	4	58	387	3.72%
Wethersfield	11,677	705	114	293	0	1,112	9.52%
Willington	2,637	160	5	37	0	202	7.66%
Wilton	6,475	158	6	17	51	232	3.58%
Windsor	11,767	154	258	453	26	891	7.57%
Wolcott	6,276	313	9	184	0	506	8.06%
Woodbridge	3,478	30	8	6	0	44	1.27%
Woodbury	4,564	60	3	28	0	91	1.99%
Woodstock	3,582	24	0	32	0	56	1.56%
	#######	92,075	47,034	29,858	5,241	174,208	

Avon

PLAN OF CONSERVATION AND DEVELOPMENT
2016 - 2026

Preserving Community Character...

Planning for a Sustainable Future.

Most Chapters of this Plan contain a discussion as to how its various components relate to the principles of sustainability. Where appropriate, specific recommendations are made concerning regulatory changes which warrant further discussion in order to advance these principles.

In general, this Plan addresses Environmental Sustainability by:

- Recommending changes/refinements to existing regulations in the areas of floodplain protection, ridgetop protection, inland wetland regulations, and aquifer protection.
- Recommending the adoption of regulations to manage stormwater in a more environmentally sensitive manner using a concept known as LID (Low Impact Development).
- Setting priorities for the acquisition/preservation of additional open space.
- Setting priorities for the management of existing open space assets and the construction of additional recreational trails.
- Recommending a reduction in the ratio of required parking.
- Creating opportunities for mixed-use developments that will allow residents to gain access to services, shopping, and recreation by walking and biking.

Economic Sustainability by:

- Creating opportunities for commercial and industrial development that reflects the present and projected needs of the residents and businesses of Avon.
- Carefully analyzing remaining vacant land parcels for innovative economic development opportunities.
- Recommending a reduction in the rate of required parking in certain instances which will increase redevelopment opportunities.
- Encouraging investments in high speed internet to facilitate business communications and the ability of employees to work from home.
- Encouraging the establishment of a micro grid for economic benefit and environmental sustainability.

And Social Sustainability by:

- Creating additional opportunities for a broad range of housing that can meet the needs of both younger and older buyers (a significant portion of Avon's population) and reflecting an increased interest in the ability to walk or bike for goods, services, and health.
- Recommending changes to make it easier to establish accessory apartments.
- Recommending ways to make Avon more pedestrian and bike friendly by prioritizing locations for new sidewalk construction, further study to promote the creation of bike lanes, and adding safer crosswalks at several key locations on Route 44.
- Encouraging the preservation of important historic structures which help define community character.

The Capital Region Council of Governments (CRCOG) adopted the "Capital Region Plan of Conservation and Development 2014-2024" with an overall theme of creating a sustainable region. The Plan discusses ways that towns within the region can work together to accomplish these goals. In addition, with funding from the Department of Housing and Urban Development, CRCOG conducted a "Sustainable Land Use Code" project in 2014, which contains model land

People of Avon

The population of every community is somewhat unique. In order to more fully understand the present and future needs of Town residents it is helpful to have an understanding of various community characteristics. These include age composition, income levels, education levels, occupation and place of employment, and household characteristics. It is helpful in some instances to compare this information with the region and State to understand how Avon may be similar or different in certain instances.

Median Age

Over the past 40 years, Avon's population has continued to age with each successive decade. The median age in 1970 was 32.2. In 2010 the median age in Avon according to the 2010 US Census was 45. This is higher than the median age for the State of Connecticut which was 40, and the US as a whole, which was 37.2. **Table 2-3** shows this trend of an aging population in Avon.

1970	1980	1990	2000	2010
32.2	36.2	40.1	42	45

Table 2-3 Median Age of Avon Residents
Source: US Census 2010

The baby boom generation, those residents born between 1946 and 1964, comprise a significant portion of the Town's overall population. As a result, we can expect a greater demand for services and housing choices for seniors. This trend will include a demand for smaller housing units near services and shopping, active adult and senior living facilities, and specialized transportation. **Table 2-4** presents information on the age distribution of Avon's population.

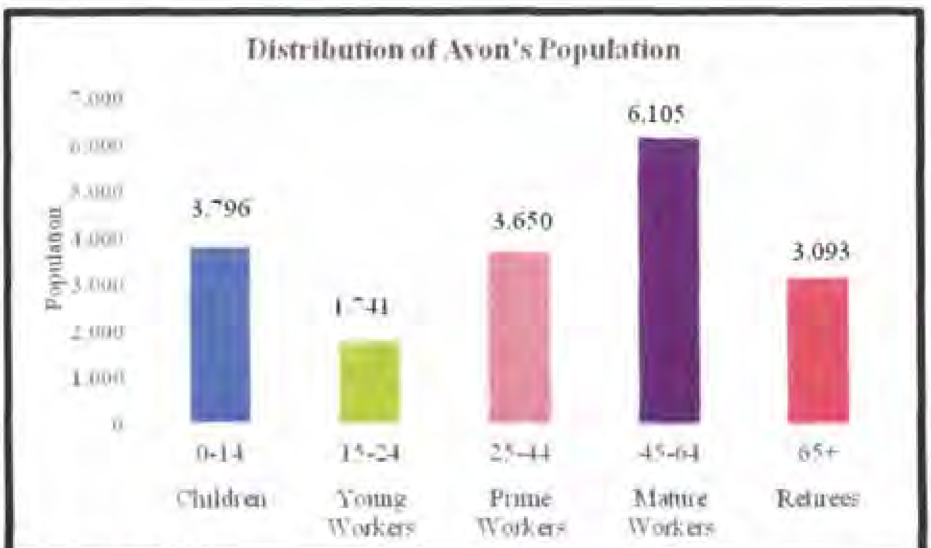


Table 2-4 Age Distribution of Avon's Population
Source: 2010 US Census

The GreatBlue survey conducted in association with this Plan asked residents several questions relating to housing. When participants were asked about their thoughts on the current ratio of single family to multi-family homes, a solid majority, or 67%, believe the current ratio to be about right. Residents were told that the average value of existing houses in Avon is $375,000 and asked to rank the importance of encouraging the development of more moderately priced homes. Respondents were roughly split, with 47% identifying this issue as being either very important or somewhat important and 52% indicating not too important or not important at all.

The Commission recognizes that there are important demographic and societal changes occurring which makes it prudent to encourage the development of smaller, single-family homes and multi-family units in order to meet expected demand. The construction of these units is likely to be matched by the construction of a similar number of single family homes, such that the current ratio of single family to multifamily homes will, in fact, remain similar. Paving the way for a sustainable future means addressing these housing needs.

The 2014-2024 Capitol Region Plan of Conservation and Development discusses two very important demographic trends which are now evident in Avon, the Capitol Region, and the nation as a whole. The baby boomer generation (those born between 1946 and 1964) are retiring and the echo boomer or millennial generation (those born between 1980 and 1995) are entering the workforce. These two groups currently make up more than 1/3 of the Town's total population. A significant number of people from these two age cohorts share a common desire for smaller housing units in a safe, walkable environment, with access to services, shopping, and cultural amenities. The Commission recognized this need, and in January 2016 master plan approval for a mixed-use, "neo-traditional" project in Avon Town Center was granted. This project will include 300-500 multi-family housing units along with approximately 600,000 square feet of retail, restaurants, and office space. The foundation for this Plan was established with the adoption of the Avon Center Plan in 2005; its incorporation into the 2006 Plan of Conservation and Development; and the adoption of Village Center Zoning Regulations in 2011. This new housing will help address this forecasted need; however, the Commission also believes that additional units of this type will be required to meet projected demand. It is also important that the size and price point of these housing units be varied in order to address the needs of Avon's current and future residents. The Commission believes that the discussion which follows will help meet the Commission's goal of providing for a sustainable future in relation to housing opportunities.

Affordable Housing

The State of Connecticut passed a law known as "The Affordable Housing Land Use Appeals Act", in 1989, commonly referred to as 8-30g, in an effort to create more "affordable" housing in Connecticut towns. The term affordable is defined in relationship to mean family income for Hartford County, or the State of Connecticut. In 2014 the mean family income in Hartford County was $65,500. The mean family income for the State was $69,900. Owner-occupied homes or rental apartments must be affordable to people whose family income is between 60% and 80% of the mean (adjusted for family size).

The law exempts certain towns from this law where at least 10% of all existing housing units are considered "affordable". Currently, about 3.76% of all housing units in Avon are deemed affordable under these State criteria; substantially less than the 10% threshold.

A housing unit is considered affordable under this law, if it is financed through a Federal or State program (income dependant), or deed restricted as affordable to low and moderate income families, for a period of at least 40 years. In an effort to overcome what the State believes are hurdles created through restrictive local zoning regulations, the law permits a private real estate developer to develop their own zoning rules relating to use, density, setbacks, etc., where at least 30% of the total number of units will be affordable. A Planning and Zoning Commission has much less discretion in that instance. In the case of a denial, a commission must demonstrate that public interests clearly outweigh the need for affordable housing. A review of decisions relating to Affordable Housing applications, under Section 8-30g, by Connecticut courts clearly indicates that this is a very difficult test to meet.

The Commission supports the construction of additional affordable housing units in Avon. There are a number of possible properties in Avon which might be well suited for either cluster style or multi-family development, which are discussed next. The Commission encourages future applicants who may propose such projects to include a modest number of affordable housing units, as defined under Section 8-30g, as a component of the overall development. The Commission may also wish to adopt inclusionary zoning regulations which would mandate the construction of a modest number of affordable homes as part of a larger project (perhaps a project over 25 units).

It is the Commission's belief that, to date, private developers have proposed a limited number of affordable units, not because of perceived zoning policies or actions of the Commission, but rather due to economics. That is, in many instances private developers believe that more profit may be realized from the development of larger homes. To encourage the inclusion of affordable units, the Commission may wish to consider the adoption of rules granting density bonuses of enough magnitude, so as to make it more likely that a private developer will include an affordable component as part of a multifamily or cluster development. Should such regulations be adopted by the Commission, it is hoped that quality projects may be proposed that will include affordable units without the need to file an application under Section 8-30g. In addition, Regulations which are currently in place, such as the Planned Residential Development Regulations (PRD) which led to the development of Pond Place and modifications to these Regulations adopted in 1996 (which awards a density bonus of up to 3.75 units per acre when providing an affordable housing component) which led to the development of Spring Meadow, can be better utilized to construct additional moderately priced homes.

Finally, the Commission may find one or more properties would be appropriate for designation as an Incentive Housing Zone (IHZ). A State law makes it possible for the State Department of Housing to provide grants to Towns for the purpose of providing technical assistance and pre-development funds in the planning and drafting of incentive housing zones; the adoption of incentive housing zone regulations; and design standards and the review of applicable subdivision regulations. To be eligible, projects must meet certain density requirements (4-10 units per acre). Funding may also be authorized to assist with construction in the amount up to $2,000 per unit for each multifamily unit and up to $5,000 for each single-family detached unit.

Building Additional Multi-Family Units and Cluster Style Housing
There are a number of properties which are worthy of consideration for either cluster single family or multifamily development to meet the Commission's stated goals of:

- Maintaining the current ratio of 70% single family to 30% multifamily housing units to continue to provide housing choices across a wide range of home types and price points for both sale and rental units.
- Provide housing to meet the current and projected needs/interests of baby boomers, millennials, and others seeking alternatives to large lot single family homes.
- Continue to provide the positive fiscal impacts that cluster and multi-family housing provides. (It is well documented that multifamily housing units result in smaller household size and most often contain infrastructure which is privately maintained.)
- Use cluster development techniques to preserve rural streetscape and important open space areas.
- Provide for workforce/affordable/attainable housing so as to provide clean, safe housing for all income levels.

In order to accomplish this goal, the Commission may wish to consider rezoning and/or granting special permit approval to several projects. It is important to note that the list which follows should not be thought of as an automatic endorsement of a parcel of land by the Commission. It is meant to highlight properties which the Commission believes warrant further investigation, should any of these properties be offered for sale or development. Should a development application be advanced to the Commission at a future date, a detailed investigation into neighborhood impacts, traffic impacts, and environmental impacts will still need to be conducted. It must also be demonstrated that the Commission's special exception criteria contained in Section VIII of the Zoning Regulations have been satisfied.

It should also be noted that some of these properties have also been identified in Chapter 5 as having a high priority for preservation as open space. In some instances they are also designated on the official Zoning Map as potential "transfer out" properties under the Town's Transfer of Development Rights (TDR) program as a means to preserve them as open space. In fact, the Commission's highest priority is to acquire title or development rights such that these properties remain open. However, it is likely that the cost to purchase all of these properties would be beyond the reach of the Town. It is also important to note that with creative site planning, it is certainly possible to preserve open space areas along existing roads and in other critical areas in order to protect valuable natural areas, by concentrating development elsewhere on the property. In this manner, vestiges of rural character along roads such as Thompson Road, Scoville Road, West Avon Road, and Old Farms Road may be preserved, and important natural areas preserved, while at the same time accomplishing the Commission's goal of providing these additional housing opportunities.

Table 7-8 presents a list of properties which may be appropriate for either cluster or multifamily development. **Table 7-9** lists properties which have been targeted as high priority for preservation and where this form of development may be appropriate in an instance where the Town cannot purchase these parcels.

Should this be the case, it is the Commission's expectation that as much as 50% of the parcels could be preserved as open space with compact development occurring on the remaining developable land. **Map 7-1** depicts these parcels.

Current Zone	Street Address	Owner	Comments
CP-A	121 Simsbury Road	Herz	Remnant piece from recently constructed assisted living facility, Residence at Brookside. Close to recently approved mix-used master plan for Avon Park North. Across street from Riverdale Farms and easy access to Farmington River Greenway. Must adequately buffer homes on Rosewood Road
CS	5 West Main	Crusheen LLC	Located to rear of O'Neills Chevrolet-Buick. Some steep slopes but good soils. Also adjacent to 38 Security Drive. Easy access to Farmington River Greenway, Avon Center, and Avon Village
CS	12 East Main Street	Zumbroski Trust	Small property, originally small barber shop. Could accommodate small office building with residential units on second floor
R15	17 and 20 Towpath Lane	King, Neriani	Located to the rear of Avon Village; easy walk to new Avon Center project. Adjacent to Farmington River and proposed River trail to Fisher Meadows. Heavily encumbered by floodplain and wetlands. Will need to be evaluated.
R15	15 Columbus Circle	Town of Avon	Small parcel at end of Columbus Circle originally used as community septic system. Modest in size, must be evaluated.
R15	24 Mountain View Avenue	Brighenti	Potential for small project if combined with 2 and 6 Mountain View Avenue
CS	2 and 6 Mountain View Avenue	Candels	Potential for small project if combined with 24 Mountain View Avenue
A	100 Nod Road	Connemara Court (Foley)	This "island" was created with the straightening of Nod Road. Old Nod Road is now called Nod Way. Cluster units with views of the golf course. Located adjacent to Hunter's Run Condominiums
NB and RU2A	9 and 25 Avonwood Road	Jackson Inc. (Brighenti)	Two parcels located to the rear of neighborhood business shops
RU2A	46 and 64 Avonwood Road and Towpath Lane	Avon Place and Towpath Condominiums, Avon Mill Apartments, and Towpath Condominiums	May be opportunities to make modest increases in density without adversely impacting adjoining properties due to the additional sewer and water utilities and surrounding uses
CR	275/279 West Main Street	Rotondo/Wiener	Larger parcel but heavily encumbered by wetlands. Access to shopping and services on Route 44 which will eventually be served with a sidewalk possible rental apartments
CR	268 West Main Street	Sunset of Avon (Rosenfield)	Heavily encumbered by wetlands. Access to shopping and services on Route 44. Possible rental apartments, small boutique, hotel
CR	23 and 24 Bailey Road	Ferrigno/ Cavallari	Consisting of 1 vacant lot and 3 single-family homes. Zoned CR since 1957. Offers walking access to retail shops and services on Route 44. New uses should buffer existing residential from existing commercial
IP	50 Tower Lane	Premier Bank	Former manufacturing, building now vacant. Possible candidate for reuse as residential. Located on periphery of Avon Park South, close to Town Center

Table 7-8 Listing of Properties to Consider for Multifamily and/or Cluster Style Development

STREET ADDRESS	OWNER	COMMENTS
10 Harris Road	Thompson	Sunrise Farm
120 Thompson Road	Parker	Sunrise Farm
133 Thompson Road	Parker	Sunrise Farm
136 Thompson Road	Thompson	Sunrise Farm
170 Thompson Road	Thompson	Sunrise Farm
712 West Avon Road	Thompson	Sunrise Farm, one of the largest assemblages of remaining undeveloped land. Significant opportunities for cluster development away from roads to help preserve rural character
841 West Avon Road	Smith Farm (Witowski)	Opportunities for cluster housing, positioned to preserve streetscape
828 West Avon Road	Severni	Opportunities for cluster housing, positioned to preserve streetscape
355, 500, 555, 575, and 230 Old Farms Road	Avon Old Farms School	The largest remaining privately owned parcel. Should a portion of this property be sold for private development significant benefits may be realized by a cluster development. (Please see detailed discussion in Chapter 11)

Table 7-9 Properties Where Cluster or Multifamily Redevelopment May Be Appropriate If Land Cannot be Acquired as Open Space.

The Commission also finds that it is prudent to consider the following possible regulatory changes.

Cluster Development

Cluster development presents an opportunity to preserve significant areas of unfragmented open space. Current Regulations permit a maximum lot density not to exceed what is permitted with a conventional subdivision. Consider an amendment to the Zoning Regulations to permit an increase in density to encourage cluster development making certain that the financial impact to both the seller and buyer are more favorable as compared to a conventional subdivision. Consider adoption of an overlay zone which would permit cluster development as of right on key parcels. Consider permitting a conventional subdivision on these properties by special permit.

Multifamily Housing and TDR

The Commission adopted rules relating to the Transfer of Development Rights in 2007. These Regulations are aimed at preserving valuable undeveloped parcels by transferring residential density to selected parcels. The Zoning map reflects these areas by designating "transfer out" and "transfer in" areas. The maximum density permitted for a typical multifamily development is 4 units per acre. Under current TDR rules, added density may be transferred to realize a maximum density of 8 units per acre. Density is acquired from the transfer out parcels equivalent to the underlying zone. This process requires that a prospective developer acquire rights to two parcels of land (transfer in and transfer out). Although the economics of such a transfer was considered at the time of adoption, no applications have been received by the Commission to date. There may be a need to amend the Zoning Regulations to make this option more attractive.

The Commission believes that this concept still has merit and may consider regulatory changes that would award a greater credit (or added density) from transfer out parcels.

Consideration may also be given to broaden opportunities by including additional transfer in areas to reflect properties listed in **Table 7-5.** Also, the zoning map should be amended regarding transfer out parcels to reflect priority open space parcels shown in **Table 5-5.**

Accessory Apartments

Current Regulations require that a property owner seek a special permit from the Commission in order to establish an accessory apartment. The commission may wish to consider regulatory changes that would permit the establishment of an accessory apartment as of right. The Commission may also consider a change which would provide an opportunity for an older resident to remain in their home and occupy the smaller accessory unit while renting the larger portion of their home. Although challenging, it is important to clarify the characteristics and lifestyle required to differentiate between a "single housekeeping unit" and separate accessory apartment.

The Commission might also consider broadening opportunities for live/work units in commercial zones to permit the owner of a business to establish his/her residence on the same property.

Residential Dwellings in Commercial Zones

Consider broadening opportunities for residential units in commercial zones. These opportunities are currently limited to the NB zone. Consider adding other commercial zones, particularly the CS, CPA, and CPB zones. Rules could allow, by special exception, both second floor residential units, as well as freestanding units.

Goal and Policies

Goal:

Provide residential environments which are safe, attractive, healthy, and varied to meet current and projected needs.

Policies:

1. It is desirable to maintain the current ratio of single-family housing to multifamily housing by permitting traditional single-family housing as well as cluster and multifamily housing.

2. Promote the development of multifamily projects (both condominiums and rental apartments) across a broad range of price points to meet present and projected needs. Where possible, permit units in a walkable environment to provide easy access to shopping and services.

3. Consider amending Zoning Regulations providing incentives for the inclusion of housing units meeting the State definition of affordable. Promote existing Planned Residential Development Regulations (PRD).

4. Consider amending Zoning Regulations pertaining to Transfer of Development Rights to provide further incentives in the area of assignable density to make it more likely that it will be utilized.

5. Promote the use of cluster development on remaining larger parcels with access to public water and sewer as a means to preserve rural vistas along existing roadways and the preservation of open space. Consider zoning amendments which would increase permitted density to incentivize an applicant to choose this form of development.

6. Consider properties listed in **Tables 7-6 and 7-7** and others, as may be deemed appropriate by the Commission, for the development of compact, single-family detached cluster development or multifamily housing.

7. Consider changes to Zoning Regulations which would permit an accessory apartment as of right.

8. Consider broadening opportunities for residential dwelling units in commercial zoning districts.

In accordance with Connecticut General Statutes, a review of the recommendations contained in this Plan were compared with the Capitol Region Plan of Conservation and Development, 2014-2024, adopted on May 21, 2014.

In addition, a review for consistency with the Connecticut Conservation and Policies Plan 2013-2018, prepared by the State Office of Policy and Management and adopted by the State legislature on April 2013, was also conducted.

The Avon Planning and Zoning Commission has determined that this Plan is consistent with the growth management principles contained in these two Plans.

Comparison with Regional Plan

The Avon Plan of Conservation and Development advances many of the same policies contained in the Capitol Region Plan of Conservation and Development 2014-2024.

The Avon Plan discusses the importance of sustainability throughout and emphasizes the importance of integrating social, economic, and environmental principles.

Avon's Plan establishes priorities for the construction of a variety of new housing types, including rental and for sale units to address the needs of two growing segments of our population; baby boomers and millenials.

The Plan promotes the development of a 1.2M square foot mixed-use development on 93 acres of land within Avon Center designed to be a pedestrian and bicycle friendly project aimed at making the Center more vibrant.

Recommendations are made relating to the redevelopment of commercial properties on Route 44, all served by public transit.

The Avon Plan targets areas for the possible expansion of sewer infrastructure. There are 21 important open space parcels targeted for preservation. However, the Town recognizes that it may be cost prohibitive to purchase all 21 parcels, as they become available for sale. The extension of sewers to some of these areas will create opportunities to cluster residential development while still preserving significant areas of open space.

The municipal focus areas for Avon, described in the Appendix of the CRCOG Plan, continue to accurately reflect many of the goals and policies contained within this 2016 Avon Plan of Conservation and Development.

In accordance with State Law, this Plan was submitted to the Capitol Region Council of Governments. Review comments were received on September 16, 2016. This review found "no apparent conflicts with the Regional Plans and Policies, the growth management principles of the State Plan of Conservation and Development, Plans of Conservation and Development of other municipalities in the region, or the concerns of neighboring Towns."

Comparison with State Plan

The Avon Plan of Conservation and Development is consistent with the Connecticut Conservation and Development Policies Plan 2013-2018. This State Plan establishes 6 growth management principles. **Map 12-1** depicts the Connecticut Conservation and Policies Plan 2013-2018. A more detailed explanation of this Plan and map may be found at www.ct.gov/OPM

The following is a review of how this Plan is consistent with each of these principles.

Growth Management Principle #1:

Redevelop and revitalize regional centers and areas with existing or currently planned physical infrastructure.

The Avon Plan places emphasis on the redevelopment of 93 acres of land within Avon Center. The goal is to create a vibrant, mixed-use pedestrian and bicycle friendly environment. This land has access to public sewer and water. A key aspect of this project will include the use of Low Impact Development techniques (LID) to manage and treat stormwater. A Master Plan for this site was approved by the Commission in November 2015.

Growth Management Principle #2:

Extend housing opportunities and design choices to accommodate a variety of household types and needs.

Avon's Plan related to housing recognizes the growing population of people in both the baby boomer generation and the millennial generation who, in many instances, are seeking alternatives to large lot single-family home living. The Plan establishes goals to construct additional multifamily housing as well as cluster single-family housing across a broad range of house size and price. Chapter 7, Housing, discusses locations that might be appropriate for this housing. In addition, a recently approved master plan approved by the Commission for the construction of a mixed-use project in Avon Village Center includes provisions for 300-500 residential units in a pedestrian-friendly environment, walkable to restaurants, retail uses, and services.

Chapter 7 also discusses ways to introduce additional affordable housing units. It includes a discussion on how to utilize existing regulations to accomplish this goal and ways to incentivize private developers to initiate the inclusion of affordable units as part of a market rate development.

Growth Management Principle #3:

Concentrate development around transportation nodes and along major transportation corridors to support the viability of transportation options.

This Plan discusses the construction of a 1.2M square foot mixed-use development located on 93 acres of land within Avon Village Center. It is located on a bus line with service to Hartford. The areas west of the Center on Route 44 are also served by transit bus. These areas have been zoned for commercial retail development for more than 50 years and are largely developed.

Key Study Findings, continued

- More residents were able to stay in Avon "always" or "most of the time" (77.6%) when in need of retail shopping compared to professional services such as medical and accounting (67.7%). However, when considering the commercial options for the Town Center, residents largely preferred small shops and leisure activities to services.

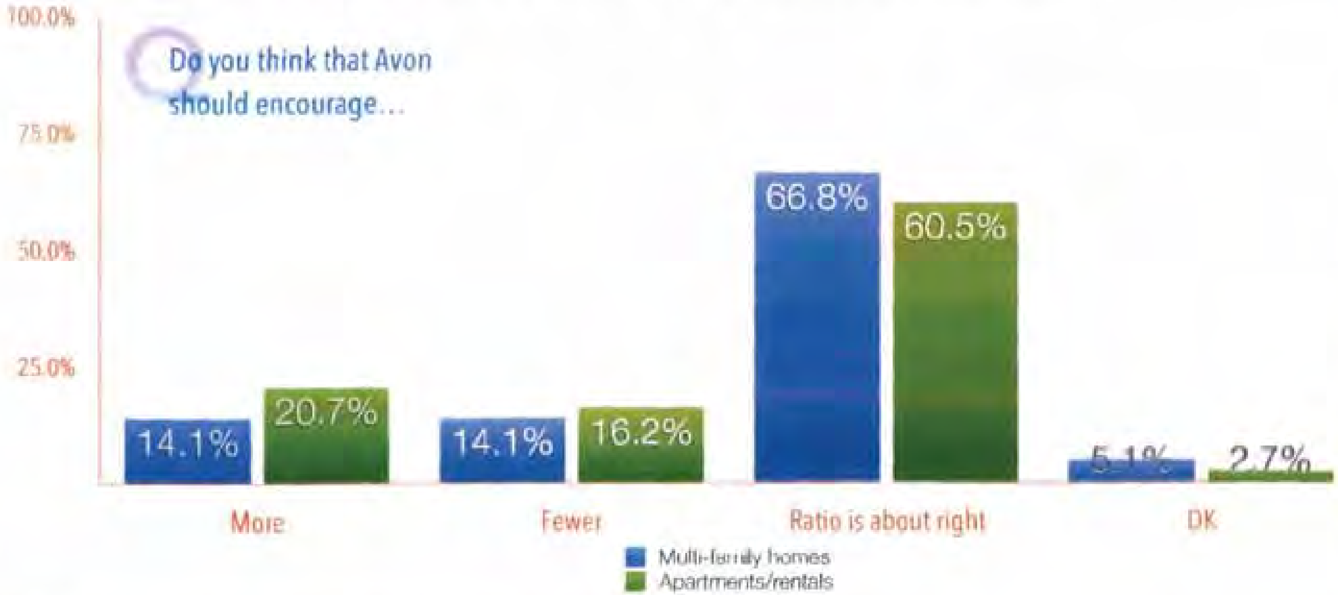
- While the number of multi-family homes and apartment rentals seemed appropriate to most residents (68.8% and 60.5%, respectively), more residents felt there could be a need for additional rentals rather than additional multi-family homes. In addition, residents were less certain that there was enough elderly housing available (48.8%).

- The establishment of crosswalks along Route 44 (72.2%) and the expansion of sidewalks to other areas of Avon (70.7%) were seen as consistently important by residents. These are in alignment with the percentage of residents who believe it is important that Avon make changes to become more pedestrian-friendly (69.2%).

- The majority of residents who use open space for hiking were satisfied with the trail networks (90.9%); however, opportunities exist to enhance the areas used for recreational use in Avon. In particular, 67.4% of residents support the creation of bike lanes throughout Avon.

Sufficient housing opportunities

Residents generally felt the variety of housing units was sufficient and less than half of residents felt it was important for Avon to develop more moderately priced homes. However, there were slightly more residents who believed there should be more apartments and rentals than those who believed there should be more multi-family homes, and only 48.8% felt there was the "right amount" of elderly housing.



2020 Housing Data Profiles

AVON

PARTNERSHIP FOR STRONG COMMUNITIES

KEY FINDINGS

Housing

4% of housing is subsidized

14% of households rent their home

13% of housing units are in multifamily buildings

Affordability

16% of households spend between 30% and 50% of their income on housing

12% of households spend more than half of their income on housing

$23.65 the hourly wage needed to afford a 2-bedroom apartment

Population

44 the median age of residents

20% of residents are people of color (BIPOC)

+29.9% projected population change from 2020 to 2040

HOW TO READ THIS REPORT

Throughout this report, a series of graphs like the one below are used to show how **Avon** compares to other towns in the state on a variety of measures.

ABOUT THE HOUSING DATA PROFILES

The Partnership for Strong Communities' Housing Data Profiles are a free resource to help Connecticut residents, developers, legislators, municipal officials, and others make data-informed decisions. Profiles are available for every town and county in the state. To learn more, please visit **pschousing.org** or **housingprofiles.pschousing.org** to view the interactive version of the profiles.

DATA NOTES

Data comes from the 2014-2018 American Community Survey unless stated otherwise. Percentages may differ slightly or not sum to exactly 100% due to rounding.

SINGLE-FAMILY HOMES AS PERCENT OF ALL HOMES

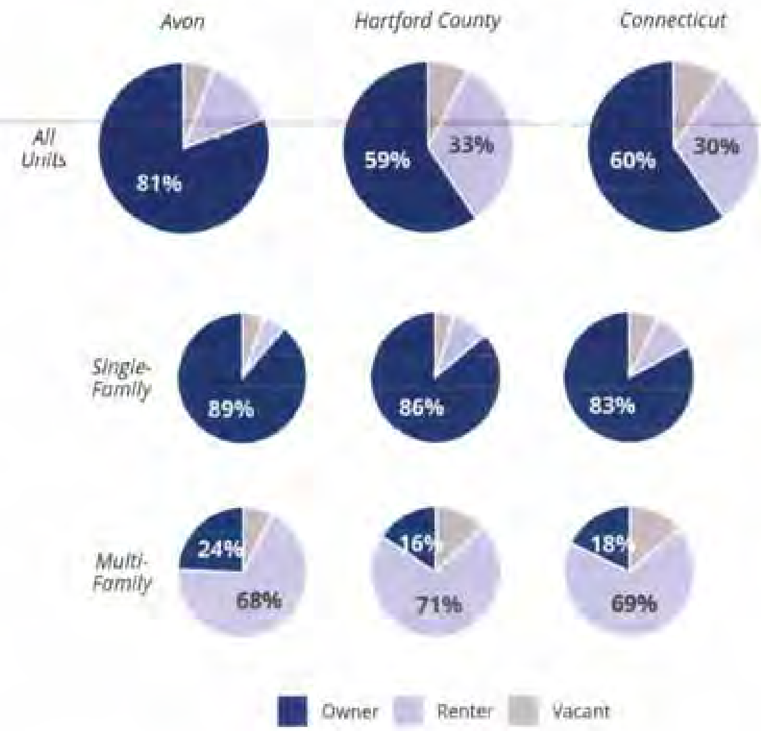
87%

PERCENT OF ALL HOMES OCCUPIED BY OWNERS

81%

Overall, 64% of Connecticut's occupied housing stock is comprised of single-family housing, while 35% is multifamily housing (2+ units in structure). Most single-family homes are occupied by homeowners, while most multifamily units are occupied by renters.

In Avon, 87% of occupied homes are single-family, and 13% are multi-family. Owners live in 89% of Avon's 6,451 single-family homes, and renters live in 68% of its 955 multifamily homes.



CHANGE IN BUILDING PERMITS, 1990-2017

-33%

Growth is slow in the state, which has seen a 42% decrease in building permits between 1990 and 2017.

In Avon, there were 30 building permits issued in 1990, compared to 20 issued in 2017, representing a 33% decrease.

Number of building permits per year, 1990-2017

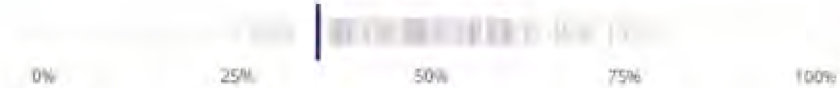
Note: y axis varies between locations

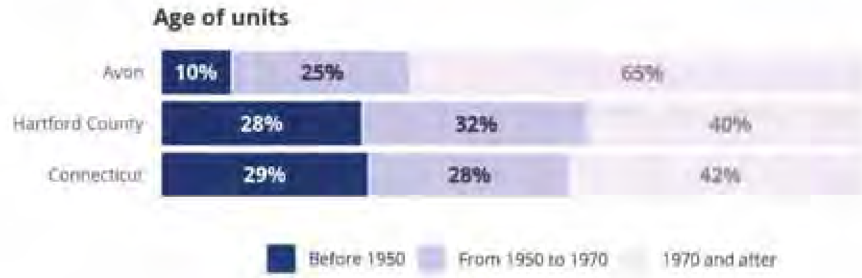
Source: Connecticut Department of Economic and Community Development

UNITS BUILT BEFORE 1970

35%

Older homes are prone to falling into disrepair, and often carry environmental risks such as lead paint. An aging housing stock can be a sign of poor housing quality.

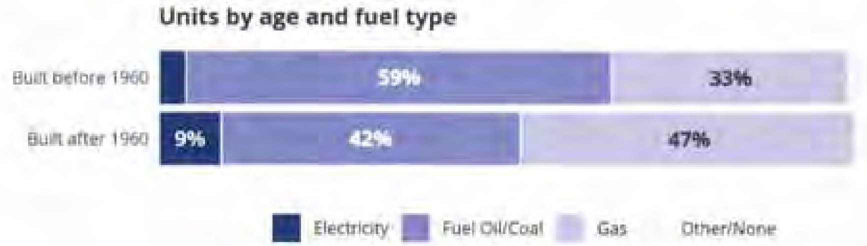




SPENDING ON ENERGY AS PERCENT OF TOTAL INCOME

2.2%

Households that use electricity spend 2.9% of their income on energy (2.5% for fuel oil/coal and 1.8% for gas).



Source: United States Department of Energy

AFFORDABLE HOMES AS A SHARE OF ALL HOUSING UNITS

4%

The CT Department of Housing calculates the percentage of affordable units in a municipality annually for the Affordable Housing Appeals List. Affordable units are units that are subsidized below market-rate through programs like Housing Choice Vouchers or CHFA/USDA mortgages.

Of the 7,389 total units in Avon, 300 are considered to be affordable.

Source: Connecticut Department of Housing

Source: Connecticut Department of Housing

PEOPLE BURDENED BY COST OF HOUSING

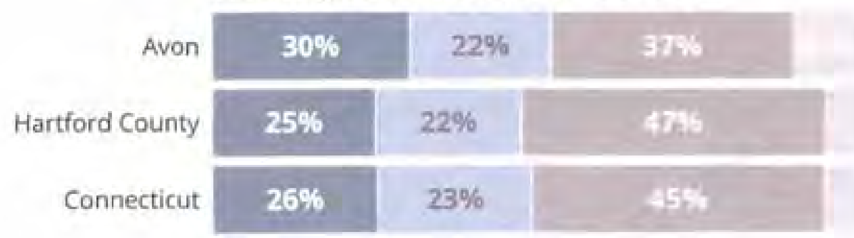
28%

Households that are cost-burdened spend more than 30% of their income on housing. Severely cost-burdened spend more than 50% on housing.

RENTERS BURDENED BY COST OF HOUSING

63%

Housing cost burden for renters



OWNERS BURDENED BY COST OF HOUSING

24%

Housing cost burden for owners

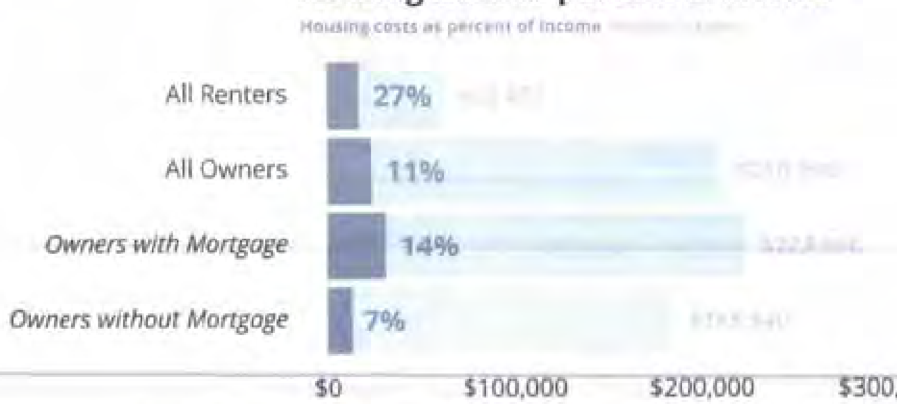
RENTERS' HOUSING COSTS AS PERCENT OF INCOME

27%

OWNERS' HOUSING COSTS AS PERCENT OF INCOME

11%

Housing costs as percent of income



HOUSING WAGE

$23.65

Each year, the National Low Income Housing Coalition calculates the "housing wage," the hourly wage needed to afford a two-bedroom rental home without paying more than 30% of income on housing.

Avon is included in the Hartford-West Hartford-East Hartford HMFA. Avon's housing wage is lower than the state housing wage of $26.42.

Avon is one of 52 towns with a housing wage of $23.65

Source: National Low Income Housing Coalition

HOUSING PRESERVATION UNITS

0%

Avon has 241 federally assisted housing units, of which 0% are at risk of loss within the next 5 years.

Housing preservation by risk

Source: National Housing Preservation Database

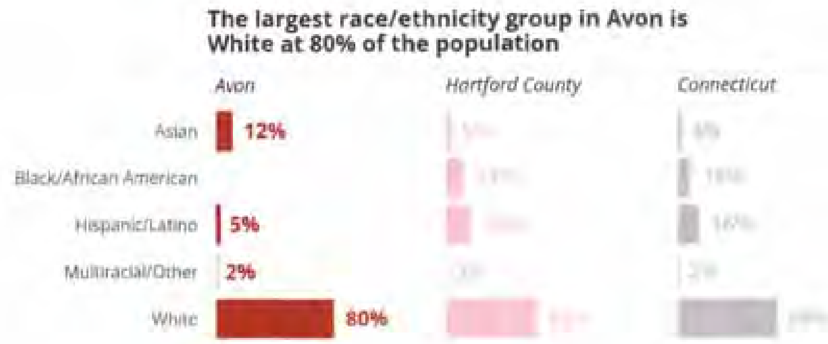
TOTAL POPULATION

18,338

PEOPLE OF COLOR

20%

Connecticut population is becoming increasingly diverse, but the BIPOC population is concentrated in certain municipalities, especially Connecticut's cities. In Avon, 20% of residents are BIPOC, while 80% are white.



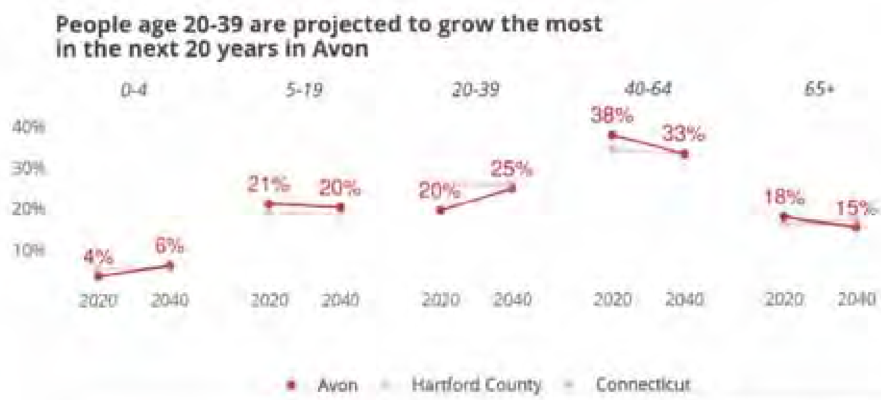
MEDIAN AGE

44

POPULATION CHANGE, 2020 TO 2040

+29.9%

In the next twenty years, Avon's population is projected to grow from 19,795 to 25,706.



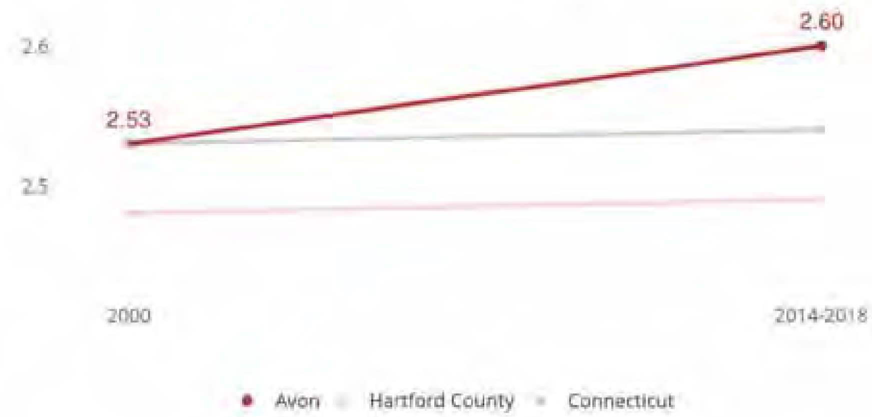
Source: Connecticut Data Center

AVERAGE HOUSEHOLD SIZE

2.60

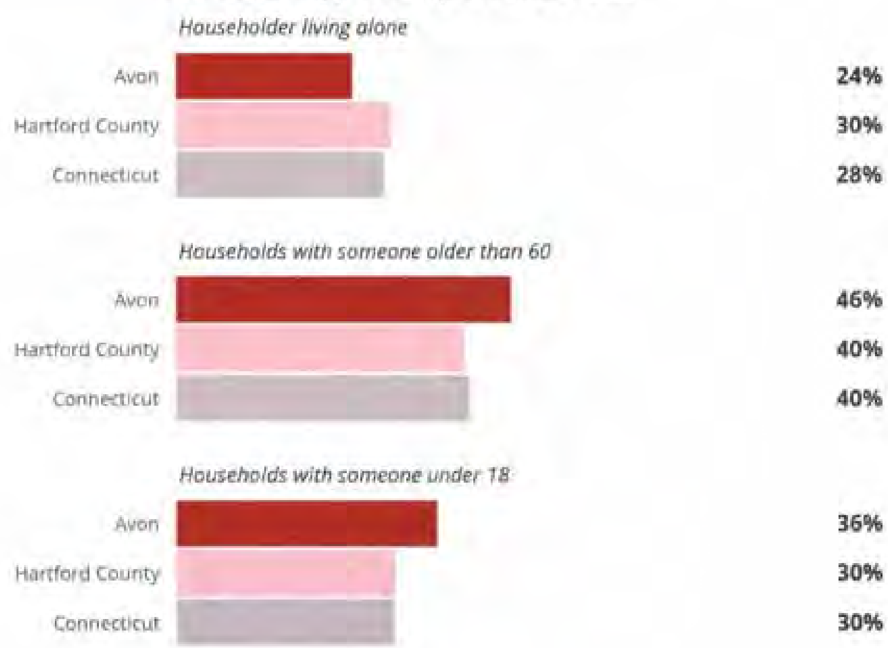
The average household size in Avon has grown between 2000 and 2018.

The average household size in Avon has grown from 2.53 in 2000 to 2.6 in 2018



Understanding who lives in our towns provides insight into the housing and service needs for each community such as accessibility, transportation, child care, and education. Compared to Connecticut, Avon has more households with someone older than 60 and more households with school-age children.

Household types as a percent of total



PARTNERSHIP FOR STRONG COMMUNITIES

Housing Data Profiles

Data on housing and affordability for each of Connecticut's 169 towns and cities

Created by

CT data collaborative

Funded through support from Fairfield County's Community Foundation and Liberty Bank Foundation

Choose towns and counties to compare

Hartford County ×

Jump to Housing, Affordability, or Population

Housing

Units in Structure

The table below shows breakdown of housing units (both occupied and vacant) by the number of housing units in the structure. Urban core areas have a higher share of multi-family housing, such as apartment buildings. Suburbs and rural areas tend to be built up with one-unit detached homes.

	Hartford County	
Total	378,700	100.0%
1, detached	210,989	55.7%
1, attached	22,566	6.0%
2	29,006	7.7%
3 or 4	36,052	9.5%
5 to 9	23,878	6.3%
10 to 19	16,938	4.5%

	Hartford County	
20 to 49	15,737	4.2%
50 or more	21,367	5.6%
Mobile home	2,064	0.5%
Boat, RV, van, etc.	103	0.0%

Source: 2018 American Community Survey, 5-year estimates, Table B25024

Bedrooms

The bar charts below show what percent of housing units by number of bedrooms in Hartford County.

Hover over bars to see units instead of percentages. Percentages may add up to 99 or 101 due to rounding error.

Source: American Community Survey 2018, 5-year estimates, Table B25041
Visualization created by CTData Collaborative

Occupancy Status

The bar charts below show what percent of housing units are owner- and renter-occupied, and vacant in Hartford County.

Hover over bars to see units instead of percentages. Percentages may add up to 99 or 101 due to rounding error.

Source: American Community Survey 2018, 5-year estimates, Table B25004
Visualization created by CTData Collaborative

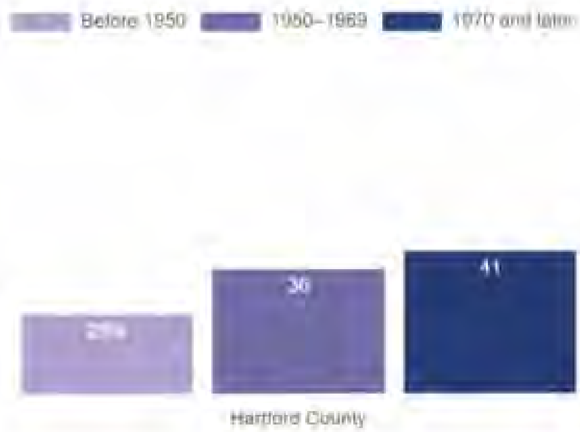
Age of Units

The age of housing is an important indicator for potential environmental hazards and the cost of maintenance and repairs. Homes built prior to 1950 likely have high concentrations of lead paint while those built after 1977 typically do not have lead paint.

The bar charts below show owner- and renter-occupied housing units by year built (prior to 1950, between 1950 and 1969, and 1970 and later).

Hover over bars to see counts. Click categories in the legend to remove them from the chart. Percentages may add up to 99 or 101 due to rounding error.

Owner-Occupied



Renter-Occupied

Source: American Community Survey 2018, 5-year estimates, Table B25036
Visualization created by CTData Collaborative

Units by Gross Rent

The bar chart below shows rental units by gross rent in Hartford County.

Hover over bars to see units instead of percentages. Percentages may add up to 99 or 101 due to rounding error.

Source: American Community Survey 2018, 5-year estimates, Table B25063
Visualization created by CTData Collaborative

Building and Demolition Permits

Building permits are an important indicator of economic activity in the region. Areas of growing population and intense development see a larger number of issued permits.

The table below shows how many building authorizations were issued in 2017 in Hartford County, by number of units.

	Hartford County	
Permits, Total	957	100%
Permits, 1 Unit	455	48%
Permits, 2 Units	14	1%
Permits, 3 or 4 Units	12	1%
Permits, 5 or More Units	476	50%
Demolitions	509	–
Net Gain	448	–

Source: 2017 CT Department of Economic and Community Development (latest available data as of August 2020)

Heating Fuel

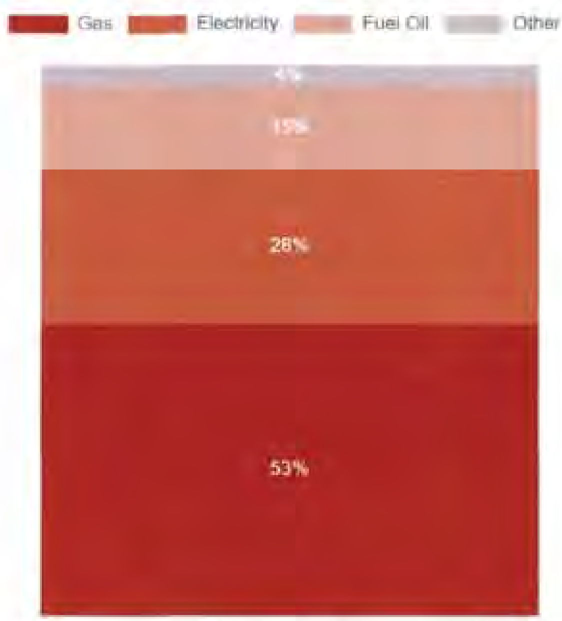
In Connecticut, gas, electricity, and fuel oil (such as kerosene) are the most common types of heating fuels. The bar charts below show owner- and renter-occupied housing units by heating fuel used in Hartford County.

Hover over bars to see counts. Click categories in the legend to remove them from the chart. Percentages may add up to 99 or 101 due to rounding error.

Owner-Occupied

Hartford County

Renter-Occupied



Hartford County

Source: American Community Survey 2018, 5-year estimates, Table B25117. *Other* category includes bottled gas, coal, wood, solar energy, other fuels and no fuel.
Visualization created by CTData Collaborative

Affordability

Assisted Housing Units

Totally assisted units are housing units that receive government financial assistance or the construction or substantial rehabilitation of low and moderate income housing, and any housing occupied by persons receiving rental assistance.

The table below shows the number of affordable units, and its share of all housing units in Hartford County.

	Hartford County
Total Assisted	53,932 (14.4%)
CHFA/USDA Mortgages	10,511
Governmentally Assisted Units	27,547
Tenant Rental Assistance	15,105
Deed Restrictions	769

Source: CT Department of Housing, 2019 Affordable Housing Appeals Listing

Median Rent

Median rent represents gross rent paid by the "middle" renter. In other words, half of renters pay less than the median rent, and half pay more.

Source: 2018 American Community Survey, 5-year estimates, Table B25064
Visualization created by CTData Collaborative

Housing Costs

Guidelines from the federal Department of Housing and Urban Development state that households should pay no more than 30% of their income on housing to be able to pay other expenses. Those paying over 30% are considered cost-burdened, those paying 50% – severely cost-burdened. Those living in rented accommodation tend to spend a greater share of their income on housing compared to homeowners.

Three bar charts below show how much households spend on housing. It is broken down into homeowners with and without mortgage, and renters.

Hover over bars to see counts. Click categories in the legend to remove them from the chart. **Percentages may not add up to 100% due to *not computed* values.**

Homeowners, without mortgage

20% of homeowners (no mortgage) in Hartford County are cost-burdened, that is, spend 30% or more of their income on housing costs.

Homeowners, with mortgage

29% of homeowners (with mortgage) in Hartford County are cost-burdened.

Renters

47% of renters in Hartford County are cost-burdened, that is, spend 30% or more of their income on rent and associated costs.

Source: American Community Survey 2018, 5-year estimates, Tables B25070 and B25091
Visualization created by CTData Collaborative

Home Values

The real estate website Zillow provides data on home values across cities in the United States. The bar charts below show average home values in Hartford County in 2019 for single-family residences, including condos and apartments.

Source: 2019 Zillow Home Value Index (average for 12 months)
Visualization created by CTData Collaborative

Housing Preservation Units

The table below shows the number of active, federally assisted rental housing units in Hartford County. *At-risk* units are those rental homes that face an expiring affordability restriction in the next five years.

	Hartford County
Active Units	24,198
At Risk	3,612 (14.9%)

Source: The National Housing Preservation Database (NHPD), accessed 30 September 2020.

Population

The table below shows estimated current and projected population, number of households (people occupying the same housing unit), average family and household size, and median age in Hartford County.

See US Census Subject Definitions to learn the difference between households and families.

	Hartford County
Population	894,730
Population Projection (2030)	930,629 4.0% ↑
Population Projection (2040)	948,876 6.1% ↑
Households	349,064
Average Household Size	2.5
Average Family Size	3.1
Median Age	38.4

Source: 2018 American Community Survey, 5-year estimates, Tables B01002, B11001, B03002, and S1101. Population projections by CT State Data Center

Population Change In Past 3 Years

The table below shows population change between 2015 and 2018 for Hartford County, ordered by percent change.

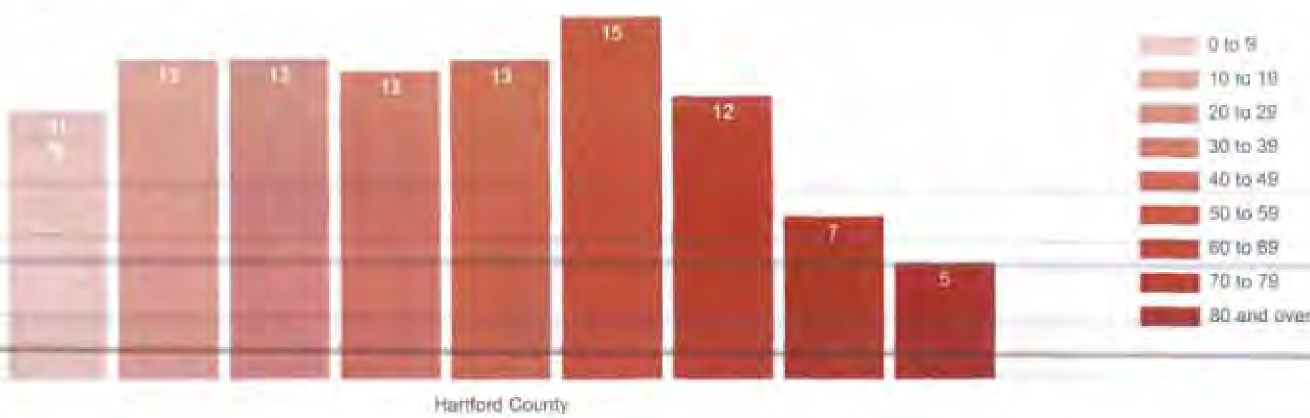
Geography	Population in 2015	Population in 2018	Change	% Change
Hartford County	895,841	892,697	-3,144	-0.4% ↓

Source: CT Department of Public Health, annual population estimates

Population by Age

The chart below shows population breakdown by age. Each column represents a ten-year interval and is labeled by percentage of population in that age group.

Hover over bars to see population counts for the age groups. Click categories in the legend to remove them from the chart. Percentages may add up to 99 or 101 due to rounding error.



Source: American Community Survey 2018, 5-year estimates, Table S0101
Visualization created by CTData Collaborative

Population by Race

The chart below shows population breakdown by race and Hispanic ethnicity. Races include counts and percentages for non-Hispanic population of that race only. Hispanic population of all races is combined under Hispanic category.

Hover over bars to see population counts for racial groups. Click categories in the legend to remove them from the chart. Percentages may add up to 99 or 101 due to rounding error.

Source: American Community Survey 2018, 5-year estimates. Table B03002. *Other* category includes those self-identifying as *American Indian and Alaska Native, Native Hawaiian and Pacific Islander, some other race, and two or more races.*
Visualization created by CTData Collaborative

Median Household Income

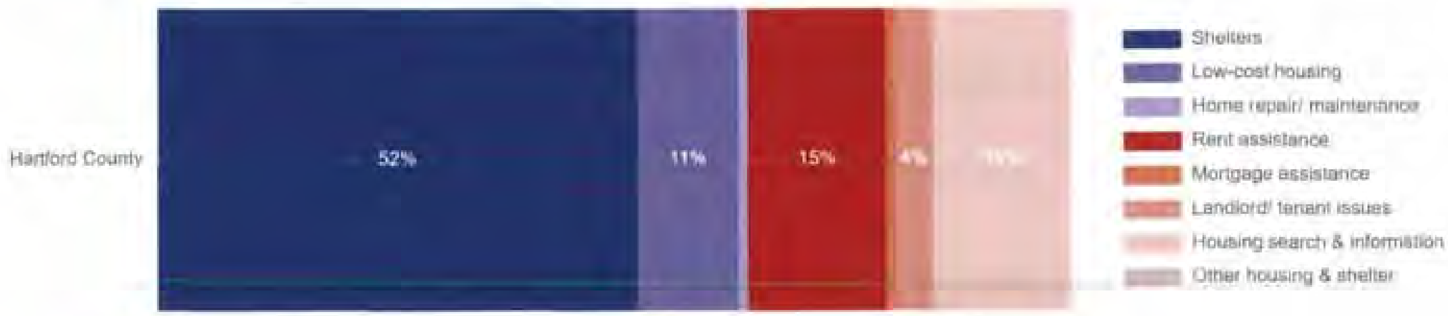
The bar chart shows median household income in Hartford County for renters, homeowners, and everyone. Median represents the "middle" income if all households were to be arranged from lowest to highest. In other words, half of households earn less than the median amount, and half earn more.

Source: 2018 American Community Survey, 5-year estimates. Tables B19013 and B25119
Visualization created by CTData Collaborative

2-1-1 Calls

The bar charts below show 2-1-1 calls related to shelters and housing in Hartford County.

Hover over bars to see numbers instead of percentages. Percentages may add up to 99 or 101 due to rounding error.



Source: 211Counts Connecticut, https://ct.211counts.org/
Visualization created by CTData Collaborative

About

The Partnership for Strong Communities's Housing Data Profiles are a free resource to help Connecticut residents, developers, legislators, municipal officials, and others make data-informed decisions. Profiles are available for every town in the state, as well as each county, and the state as a whole.

Related Links

Partnership for Strong Communities

CERC Town Profiles

OUT of REACH

THE HIGH COST OF HOUSING

2020

NATIONAL LOW INCOME HOUSING COALITION

HOW TO USE THE NUMBERS

A renter household needs to earn at least **$23.96** per hour in order to afford a two-bedroom home at FMR.

The annual median family income (AMI) in the United States is **$80,320** (2020).

For a family earning 100% of AMI, monthly rent of **$2,008** or less is affordable.

There were **43,669,988** renter households in the United States (2014-2018).

Renter households represented **36%** of all households (2014-2018).

The estimated mean (average) renter wage in the United States is **$18.22** per hour (2020).

	FY20 HOUSING WAGE	HOUSING COSTS			AREA MEDIAN INCOME (AMI)				RENTER HOUSEHOLDS				
	Hourly wage needed to afford 2 BR[1] FMR[2]	2 BR FMR	Annual income needed to afford 2 BR FMR	Full-time jobs at minimum wage[3] needed to afford 2 BR FMR	Annual AMI[4]	Monthly rent affordable at AMI[5]	30% of AMI	Monthly rent affordable at 30% of AMI	Renter households	% of total households	Estimated hourly mean renter wage	Rent affordable at mean renter wage	Full-time jobs at mean renter wage needed to afford 2 BR FMR
UNITED STATES	$23.96	$1,246	$49,830	2.4	$80,320	$2,008	$24,096	$602	43,669,988	36%	$18.22	$948	1.3

The FMR for a two-bedroom rental home in the United States is **$1,246** (2020).

A renter household needs an annual income of **$49,830** in order to afford a two-bedroom rental home at FMR.

On average, a renter household needs **2.4 full-time jobs** paying the minimum wage in order to afford a two-bedroom rental home at FMR.

In the United States, a family at 30% of AMI earns **$24,096** annually.

For a family earning 30% of AMI, monthly rent of **$602** or less is affordable.

If a full-time worker earns the mean renter wage, monthly rent of **$948** or less is affordable.

A renter household needs **1.3 full-time jobs** paying the mean renter wage in order to afford a two-bedroom rental home at FMR.

1: BR = Bedroom.

2: FMR = Fiscal Year 2020 Fair Market Rent.

3: This calculation uses the higher of the county, state, or federal minimum wage, where applicable.

4: AMI = Fiscal Year 2020 Area Median Income.

5: Affordable rents represent the generally accepted standard of spending no more than 30% of gross income on rent and utilities.

WHERE THE NUMBERS COME FROM

Divide income needed to afford FMR ($49,830) by 52 (weeks per year) and then by 40 (hours per work week) ($49,830 / 52 = $958; $958 / 40 = **$23.96**).

HUD FY20 estimated median family income based on data from the American Community Survey (ACS). See Appendix B.

Multiply Annual AMI by .3 to get maximum amount that can be spent on housing for it to be affordable ($80,320 x .3 = $24,096). Divide by 12 to obtain monthly amount ($24,096 / 12 = **$2,008**).

ACS (2014-2018).

Divide number of renter households by total number of households (ACS 2014-2018) (43,669,988 / 120,935,203 = .36). Then multiply by 100 (.36 x 100 = **36%**).

Average wage reported by the Bureau of Labor Statistics (BLS) for 2018, adjusted to reflect the income of renter households relative to all households in the United States, and projected to 2020. See Appendix B.

	FY20 HOUSING WAGE	HOUSING COSTS			AREA MEDIAN INCOME (AMI)				RENTER HOUSEHOLDS				
	Hourly wage needed to afford 2 BR[1] FMR[2]	2 BR FMR	Annual income needed to afford 2 BR FMR	Full-time jobs at minimum wage[3] needed to afford 2 BR FMR	Annual AMI[4]	Monthly rent affordable at AMI[5]	30% of AMI	Monthly rent affordable at 30% of AMI	Renter households	% of total households	Estimated hourly mean renter wage	Monthly rent affordable at mean renter wage	Full-time jobs at mean renter wage needed to afford 2 BR FMR
UNITED STATES	**$23.96**	**$1,246**	**$49,830**	**2.4**	**$80,320**	**$2,008**	**$24,096**	**$602**	**43,669,988**	**36%**	**$18.22**	**$948**	**1.3**

Developed by HUD annually (2020). See Appendix B.

Multiply the FMR by 12 to get yearly rental cost ($1,245.75 x 12 = $14,949). Then divide by .3 to determine the total income needed to afford $14,949 per year in rent ($14,949 / .3 = **$49,830**).

National average of jobs needed across all counties, weighted by number of renter households. To find jobs needed in a particular state, metro, or county, divide annual income needed to afford the FMR by 52 (weeks per year). Then divide by the prevailing minimum wage. Then divide by 40 (hours per work week).

Multiply Annual AMI by .3 ($80,320 x .3 = **$24,096**).

Multiply 30% of Annual AMI by .3 to get maximum amount that can be spent on housing for it to be affordable ($24,096 x .3 = $7,228.80). Divide by 12 to obtain monthly amount ($7,228.80 / 12 = **$602.40**).

Calculate annual income by multiplying mean renter wage by 40 (hours per week) and 52 (weeks per year) ($18.22374 x 40 x 52 = $37,905.38). Multiply by .3 to determine maximum amount that can be spent on rent ($37,905.38 x .3 = $11,371.61). Divide by 12 to obtain monthly amount ($11,371.61 / 12 = **$948**).

Divide income needed to afford the FMR by 52 (weeks per year) ($49,830 / 52 = $958). Then divide by $18.22 (the United States' mean renter wage) ($958 / $18.22 = 53 hours). Finally, divide by 40 (hours per work week) (53 / 40 = **1.3 full-time jobs**).

1: BR = Bedroom.

2: FMR = Fiscal Year 2020 Fair Market Rent.

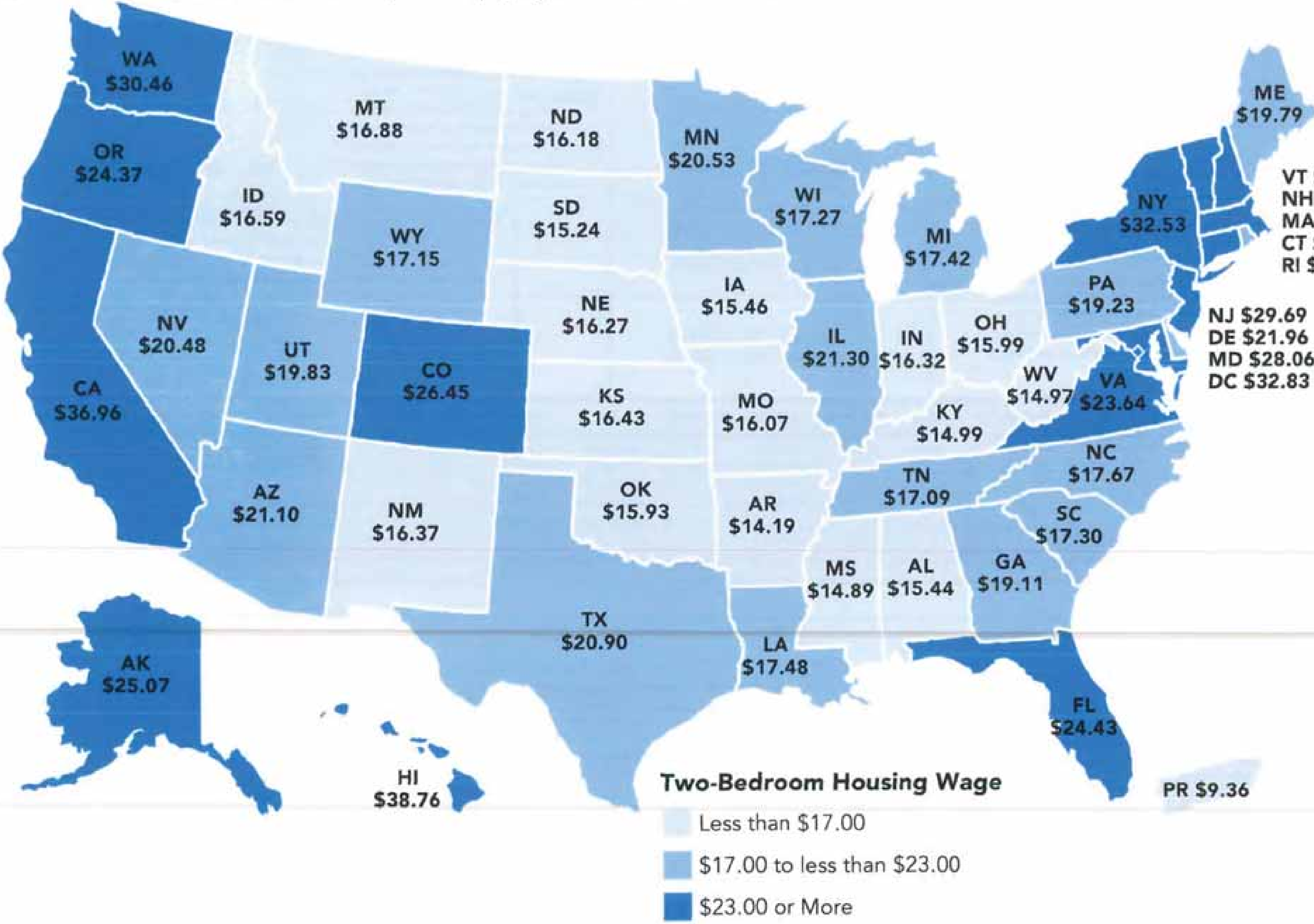
3: This calculation uses the higher of the county, state, or federal minimum wage, where applicable.

4: AMI = Fiscal Year 2020 Area Median Income.

5: Affordable rents represent the generally accepted standard of spending no more than 30% of gross income on rent and utilities.

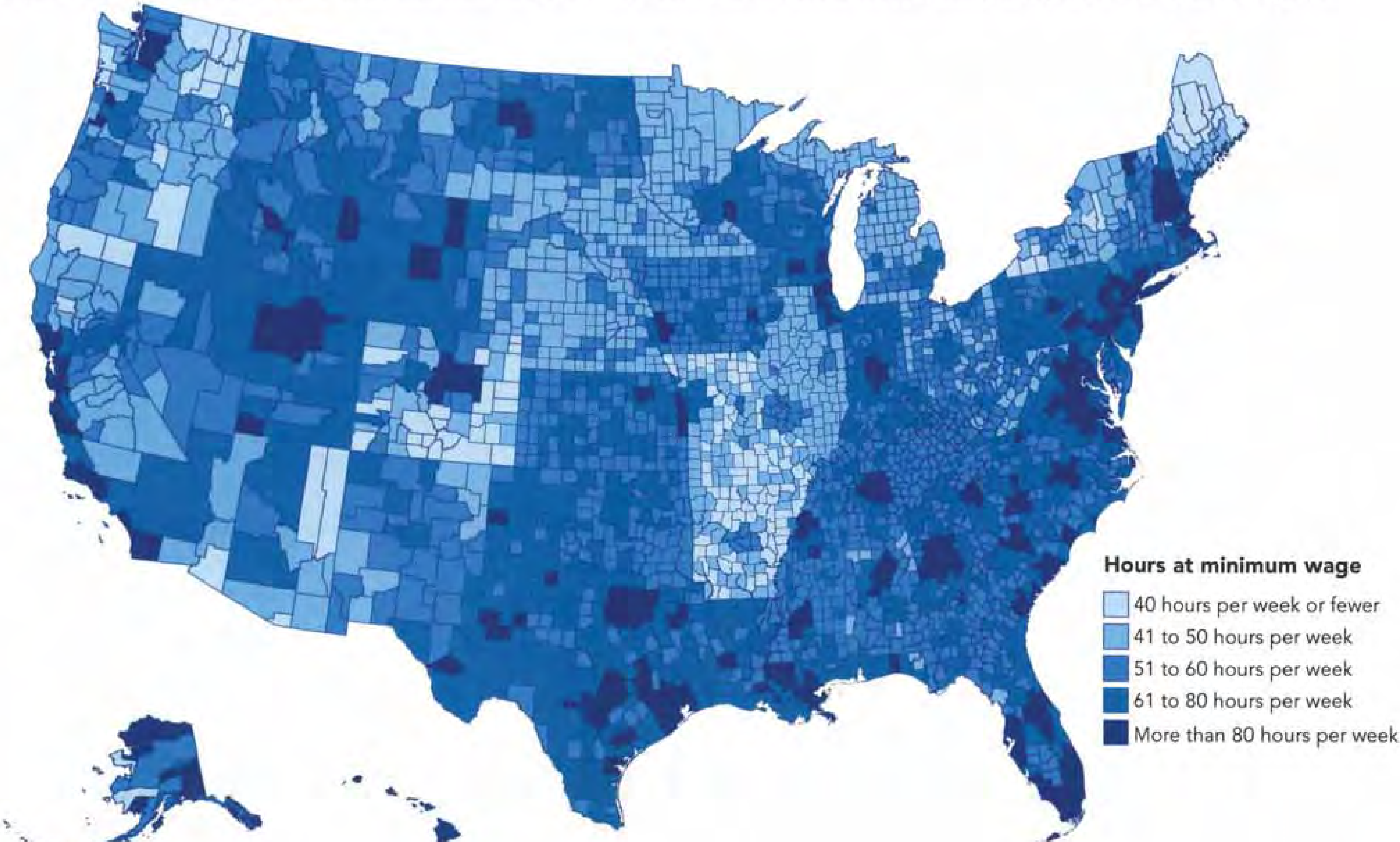
2020 TWO-BEDROOM RENTAL HOUSING WAGES

Represents the hourly wage that a full-time worker must earn (working 40 hours a week, 52 weeks a year) in order to afford the Fair Market Rent for a **TWO-BEDROOM RENTAL HOME**, without paying more than 30% of income.



2020 HOURS AT MINIMUM WAGE NEEDED TO AFFORD A ONE-BEDROOM RENTAL HOME AT FAIR MARKET RENT

*Note: New England states are displayed with HUD Fair Market Rent Areas. All other states are displayed at the county level. This map does not account for the 37 sub-county jurisdictions with minimum wages higher than the prevailing county, state, or federal minimum wage. None of these local minimum wages are sufficient to afford a one-bedroom rental home at the Fair Market Rent with a 40 hour work week. The geographic variation of Oregon and New York's state minimum wages are reflected at the county level.



MOST EXPENSIVE JURISDICTIONS

Metropolitan Areas	Housing Wage for Two-Bedroom FMR[1]
San Francisco, CA HMFA[3]	$64.21
San Jose-Sunnyvale-Santa Clara, CA HMFA	$57.12
Santa Cruz-Watsonville, CA MSA[4]	$48.44
Santa Maria-Santa Barbara, CA MSA	$44.69
Boston-Cambridge-Quincy, MA HMFA	$44.44
Oakland-Fremont, CA HMFA	$43.06
Santa Ana-Anaheim-Irvine, CA HMFA	$42.62
Honolulu, HI MSA	$41.54
Seattle-Bellevue, WA HMFA	$40.37
Stamford-Norwalk, CT HMFA	$39.98

State Nonmetropolitan Areas (Combined)	Housing Wage for Two-Bedroom FMR
Hawaii	$29.81
Alaska	$26.11
Massachusetts	$23.69
Connecticut	$22.69
California	$20.00
New Hampshire	$19.90
Vermont	$19.00
Maryland	$18.91
Washington	$18.34
Colorado	$18.25

Metropolitan Counties[2]	Housing Wage for Two-Bedroom FMR
Marin County, CA	$64.21
San Francisco County, CA	$64.21
San Mateo County, CA	$64.21
Santa Clara County, CA	$57.12
Santa Cruz County, CA	$48.44
Santa Barbara County, CA	$44.69
Alameda County, CA	$43.06
Contra Costa County, CA	$43.06
Orange County, CA	$42.62
Honolulu County, HI	$41.54

Nonmetropolitan Counties (or County-Equivalents)	Housing Wage for Two-Bedroom FMR
Kauai County, HI	$36.17
Aleutians West Census Area, AK	$33.75
Dukes County, MA	$33.23
Monroe County, FL	$33.23
Nantucket County, MA	$33.06
Bethel Census Area, AK	$32.46
Nome Census Area, AK	$32.40
Pitkin County, CO	$30.37
Denali Borough, AK	$29.60
North Slope Borough, AK	$28.50
Juneau City and Borough, AK	$28.50

1 FMR = Fair Market Rent.

2 Excludes metropolitan counties in New England.

3 HMFA = HUD Metro FMR Area. This term indicates that a portion of an Office of Management & Budget (OMB)-defined core-based statistical area (CBSA) is in the area to which the FMRs apply. HUD is required by OMB to alter the names of the metropolitan geographic entities it derives from CBSAs when the geographies are not the same as that established by the OMB.

4 MSA = Metropolitan Statistical Area. Geographic entities defined by OMB for use by the federal statistical agencies in collecting, tabulating, and publishing federal statistics.

STATES RANKED BY TWO-BEDROOM HOUSING WAGE

States are ranked from most expensive to least expensive.

Rank[1]	State	Housing Wage for Two-Bedroom FMR[2]
1	Hawaii	$38.76
2	California	$36.96
3	Massachusetts	$35.52
5	New York	$32.53
6	Washington	$30.46
7	New Jersey	$29.69
8	Maryland	$28.06
9	Colorado	$26.45
10	Connecticut	$26.42
11	Alaska	$25.07
12	Florida	$24.43
13	Oregon	$24.37
14	Virginia	$23.64
15	New Hampshire	$23.43
16	Vermont	$23.36
17	Delaware	$21.96
18	Illinois	$21.30
19	Rhode Island	$21.16
20	Arizona	$21.10
21	Texas	$20.90
22	Minnesota	$20.53
23	Nevada	$20.48
24	Utah	$19.83
25	Maine	$19.79
26	Pennsylvania	$19.23
27	Georgia	$19.11
28	North Carolina	$17.67
29	Louisiana	$17.48
30	Michigan	$17.42
31	South Carolina	$17.30
32	Wisconsin	$17.27
33	Wyoming	$17.15
34	Tennessee	$17.09
35	Montana	$16.88
36	Idaho	$16.59
37	Kansas	$16.43
38	New Mexico	$16.37
39	Indiana	$16.32
40	Nebraska	$16.27
41	North Dakota	$16.18
42	Missouri	$16.07
43	Ohio	$15.99
44	Oklahoma	$15.93
45	Iowa	$15.46
46	Alabama	$15.44
47	South Dakota	$15.24
48	Kentucky	$14.99
49	West Virginia	$14.97
50	Mississippi	$14.89
51	Arkansas	$14.19
	OTHER	
4	District of Columbia	$32.83
52	Puerto Rico	$9.36

1 Includes District of Columbia and Puerto Rico.

2 FMR = Fair Market Rent.

STATE SUMMARY

	FY20 HOUSING WAGE	HOUSING COSTS			AREA MEDIAN INCOME (AMI)				RENTER HOUSEHOLDS				
State	Hourly wage needed to afford 2 BR[1] FMR[2]	2 BR FMR	Annual income needed to Afford 2 BR FMR	Full-time jobs at minimum wage[3] needed to afford 2 BR FMR	Annual AMI[4]	Monthly rent affordable at AMI[5]	30% of AMI	Monthly rent affordable at 30% AMI	Renter households (2014-2018)	% of total households (2014-2018)	Estimated hourly mean renter wage (2020)	Monthly rent affordable at mean renter wage	Full-time jobs at mean renter wage needed to afford 2 BR FMR
Alabama	$15.44	$803	$32,110	2.1	$66,123	$1,653	$19,837	$496	585,046	31%	$13.30	$692	1.2
Alaska	$25.07	$1,304	$52,147	2.5	$92,899	$2,322	$27,870	$697	91,290	36%	$19.55	$1,017	1.3
Arizona	$21.10	$1,097	$43,892	1.8	$72,954	$1,824	$21,886	$547	918,235	36%	$17.46	$908	1.2
Arkansas	$14.19	$738	$29,514	1.4	$61,408	$1,535	$18,422	$461	395,744	34%	$13.92	$724	1.0
California	$36.96	$1,922	$76,879	2.8	$90,909	$2,273	$27,273	$682	5,880,000	45%	$23.96	$1,246	1.5
Colorado	$26.45	$1,375	$55,016	2.2	$91,959	$2,299	$27,588	$690	742,242	35%	$19.49	$1,013	1.4
Connecticut	$26.42	$1,374	$54,956	2.4	$101,816	$2,545	$30,545	$764	460,240	34%	$17.70	$921	1.5
Delaware	$21.96	$1,142	$45,669	2.4	$86,342	$2,159	$25,903	$648	103,457	29%	$17.83	$927	1.2
Florida	$24.43	$1,270	$50,807	2.9	$68,669	$1,717	$20,601	$515	2,667,159	35%	$17.28	$898	1.4
Georgia	$19.11	$994	$39,758	2.6	$72,224	$1,806	$21,667	$542	1,369,507	37%	$17.51	$911	1.1
Hawaii	$38.76	$2,015	$80,613	3.8	$97,168	$2,429	$29,151	$729	190,420	42%	$17.17	$893	2.3
Idaho	$16.59	$863	$34,511	2.3	$68,372	$1,709	$20,511	$513	190,031	31%	$13.26	$689	1.3
Illinois	$21.30	$1,108	$44,310	2.1	$85,252	$2,131	$25,576	$639	1,641,003	34%	$18.00	$936	1.2
Indiana	$16.32	$848	$33,940	2.3	$72,950	$1,824	$21,885	$547	793,086	31%	$14.44	$751	1.1
Iowa	$15.46	$804	$32,151	2.1	$79,229	$1,981	$23,769	$594	362,703	29%	$13.43	$698	1.2
Kansas	$16.43	$855	$34,185	2.3	$74,642	$1,866	$22,393	$560	378,704	34%	$14.21	$739	1.2
Kentucky	$14.99	$780	$31,183	2.1	$66,539	$1,663	$19,962	$499	571,050	33%	$13.79	$717	1.1
Louisiana	$17.48	$909	$36,356	2.4	$64,793	$1,620	$19,438	$486	602,937	35%	$14.64	$761	1.2
Maine	$19.79	$1,029	$41,156	1.6	$76,811	$1,920	$23,043	$576	154,809	28%	$12.34	$642	1.6
Maryland	$28.06	$1,459	$58,366	2.6	$109,357	$2,734	$32,807	$820	728,577	33%	$18.16	$944	1.5
Massachusetts	$35.52	$1,847	$73,890	2.8	$105,892	$2,647	$31,768	$794	968,213	38%	$21.74	$1,131	1.6
Michigan	$17.42	$906	$36,227	1.8	$74,703	$1,868	$22,411	$560	1,132,395	29%	$15.38	$800	1.1
Minnesota	$20.53	$1,068	$42,705	2.1	$92,812	$2,320	$27,844	$696	616,511	28%	$16.06	$835	1.3
Mississippi	$14.89	$774	$30,977	2.1	$57,678	$1,442	$17,303	$433	351,558	32%	$12.10	$629	1.2
Missouri	$16.07	$836	$33,424	1.7	$73,483	$1,837	$22,045	$551	794,426	33%	$15.28	$794	1.1
Montana	$16.88	$878	$35,112	2.0	$73,104	$1,828	$21,931	$548	136,687	32%	$13.15	$684	1.3
Nebraska	$16.27	$846	$33,838	1.8	$78,740	$1,968	$23,622	$591	255,496	34%	$13.70	$712	1.2

1 BR = Bedroom.
2 FMR = Fiscal Year 2020 Fair Market Rent.
3 This calculation uses the higher of the state or federal minimum wage. Local minimum wages are not used. See Appendix B.
4 AMI = Fiscal Year 2020 Area Median Income
5 Affordable rents represent the generally accepted standard of spending no more than 30% of gross income on rent and utilities.

STATE SUMMARY

State	FY20 HOUSING WAGE	HOUSING COSTS			AREA MEDIAN INCOME (AMI)				RENTER HOUSEHOLDS				
	Hourly wage needed to afford 2 BR[1] FMR[2]	2 BR FMR	Annual income needed to Afford 2 BR FMR	Full-time jobs at minimum wage[3] needed to afford 2 BR FMR	Annual AMI[4]	Monthly rent affordable at AMI[5]	30% of AMI	Monthly rent affordable at 30% AMI	Renter households (2014-2018)	% of total households (2014-2018)	Estimated hourly mean renter wage (2020)	Monthly rent affordable at mean renter wage	Full-time jobs at mean renter wage needed to afford 2 BR FMR
Nevada	$20.48	$1,065	$42,592	2.3	$72,497	$1,812	$21,749	$544	475,410	44%	$17.42	$906	1.2
New Hampshire	$23.43	$1,218	$48,726	3.2	$94,756	$2,369	$28,427	$711	153,320	29%	$15.83	$823	1.5
New Jersey	$29.69	$1,544	$61,762	2.7	$102,843	$2,571	$30,853	$771	1,158,949	36%	$19.10	$993	1.6
New Mexico	$16.37	$851	$34,047	1.8	$62,865	$1,572	$18,859	$471	251,409	32%	$13.99	$728	1.2
New York	$32.53	$1,691	$67,653	2.8	$87,886	$2,197	$26,366	$659	3,373,181	46%	$25.68	$1,335	1.3
North Carolina	$17.67	$919	$36,751	2.4	$71,385	$1,785	$21,415	$535	1,369,892	35%	$15.92	$828	1.1
North Dakota	$16.18	$841	$33,647	2.2	$88,698	$2,217	$26,610	$665	117,556	37%	$17.12	$890	0.9
Ohio	$15.99	$832	$33,267	1.8	$74,544	$1,864	$22,363	$559	1,582,848	34%	$14.42	$750	1.1
Oklahoma	$15.93	$828	$33,132	2.2	$66,385	$1,660	$19,916	$498	507,582	34%	$15.12	$786	1.1
Oregon	$24.37	$1,267	$50,687	2.0	$78,661	$1,967	$23,598	$590	606,312	38%	$16.78	$872	1.5
Pennsylvania	$19.23	$1,000	$39,992	2.7	$82,696	$2,067	$24,809	$620	1,557,665	31%	$15.90	$827	1.2
Rhode Island	$21.16	$1,101	$44,023	2.0	$87,969	$2,199	$26,391	$660	163,320	40%	$14.21	$739	1.5
South Carolina	$17.30	$900	$35,984	2.4	$67,964	$1,699	$20,389	$510	589,362	31%	$13.52	$703	1.3
South Dakota	$15.24	$793	$31,701	1.6	$76,055	$1,901	$22,817	$570	108,929	32%	$12.52	$651	1.2
Tennessee	$17.09	$889	$35,550	2.4	$67,463	$1,687	$20,239	$506	865,902	34%	$15.82	$823	1.1
Texas	$20.90	$1,087	$43,478	2.9	$75,592	$1,890	$22,678	$567	3,635,275	38%	$19.56	$1,017	1.1
Utah	$19.83	$1,031	$41,251	2.7	$82,685	$2,067	$24,805	$620	288,634	30%	$14.94	$777	1.3
Vermont	$23.36	$1,215	$48,597	2.1	$78,736	$1,968	$23,621	$591	76,019	29%	$13.81	$718	1.7
Virginia	$23.64	$1,229	$49,167	3.3	$93,280	$2,332	$27,984	$700	1,057,536	34%	$18.67	$971	1.3
Washington	$30.46	$1,584	$63,352	2.3	$93,484	$2,337	$28,045	$701	1,043,871	37%	$21.90	$1,139	1.4
West Virginia	$14.97	$778	$31,135	1.7	$61,519	$1,538	$18,456	$461	198,796	27%	$13.03	$678	1.1
Wisconsin	$17.27	$898	$35,913	2.4	$80,442	$2,011	$24,133	$603	775,089	33%	$14.32	$744	1.2
Wyoming	$17.15	$892	$35,663	2.4	$80,329	$2,008	$24,099	$602	70,509	31%	$15.15	$788	1.1
OTHER													
District of Columbia	$32.83	$1,707	$68,280	2.2	$126,000	$3,150	$37,800	$945	163,751	58%	$29.20	$1,518	1.1
Puerto Rico	$9.36	$487	$19,473	1.3	$25,255	$631	$7,576	$189	384,670	32%	$7.73	$402	1.2

1 BR = Bedroom.
2 FMR = Fiscal Year 2020 Fair Market Rent.
3 This calculation uses the higher of the state or federal minimum wage. Local minimum wages are not used. See Appendix B.
4 AMI = Fiscal Year 2020 Area Median Income
5 Affordable rents represent the generally accepted standard of spending no more than 30% of gross income on rent and utilities.

CONNECTICUT #10*

In **Connecticut**, the Fair Market Rent (FMR) for a two-bedroom apartment is **$1,374**. In order to afford this level of rent and utilities — without paying more than 30% of income on housing — a household must earn **$4,580** monthly or **$54,956** annually. Assuming a 40-hour work week, 52 weeks per year, this level of income translates into an hourly Housing Wage of:

$26.42
PER HOUR
STATE HOUSING WAGE

FACTS ABOUT CONNECTICUT:

STATE FACTS	
Minimum Wage	$11.00
Average Renter Wage	$17.70
2-Bedroom Housing Wage	$26.42
Number of Renter Households	460,240
Percent Renters	34%

96
Work Hours Per Week At **Minimum Wage** To Afford a **2-Bedroom Rental Home** (at FMR)

78
Work Hours Per Week At **Minimum Wage** To Afford a **1-Bedroom Rental Home** (at FMR)

2.4
Number of Full-Time Jobs At **Minimum Wage** To Afford a **2-Bedroom Rental Home** (at FMR)

1.9
Number of Full-Time Jobs At **Minimum Wage** To Afford a **1-Bedroom Rental Home** (at FMR)

MOST EXPENSIVE AREAS	HOUSING WAGE
Stamford-Norwalk HMFA	$39.98
Danbury HMFA	$33.63
Southern Middlesex County HMFA	$27.87
New Haven-Meriden HMFA	$27.06
Milford-Ansonia-Seymour HMFA	$26.46

MSA = Metropolitan Statistical Area; HMFA = HUD Metro FMR Area.
* Ranked from Highest to Lowest 2-Bedroom Housing Wage. Includes District of Columbia and Puerto Rico.

TOWNS WITHIN CONNECTICUT FMR AREAS

BRIDGEPORT, CT HMFA

FAIRFIELD COUNTY

Bridgeport town, Easton town, Fairfield town, Monroe town, Shelton town, Stratford town, Trumbull town

COLCHESTER-LEBANON, CT HMFA

NEW LONDON COUNTY

Colchester town, Lebanon town

DANBURY, CT HMFA

FAIRFIELD COUNTY

Bethel town, Brookfield town, Danbury town, New Fairfield town, Newtown town, Redding town, Ridgefield town, Sherman town

HARTFORD-WEST HARTFORD-EAST HARTFORD, CT HMFA

HARTFORD COUNTY

Avon town, Berlin town, Bloomfield town, Bristol town, Burlington town, Canton town, East Granby town, East Hartford town, East Windsor town, Enfield town, Farmington town, Glastonbury town, Granby town, Hartford town, Hartland town, Manchester town, Marlborough town, New Britain town, Newington town, Plainville town, Rocky Hill town, Simsbury town, South Windsor town, Southington town, Suffield town, West Hartford town, Wethersfield town, Windsor Locks town, Windsor town

MIDDLESEX COUNTY

Chester town, Cromwell town, Durham town, East Haddam town, East Hampton town, Haddam town, Middlefield town, Middletown town, Portland town

TOLLAND COUNTY

Andover town, Bolton town, Columbia town, Coventry town, Ellington town, Hebron town, Mansfield town, Somers town, Stafford town, Tolland town, Union town, Vernon town, Willington town

MILFORD-ANSONIA-SEYMOUR, CT HMFA

NEW HAVEN COUNTY

Ansonia town, Beacon Falls town, Derby town, Milford town, Oxford town, Seymour town

NEW HAVEN-MERIDEN, CT HMFA

NEW HAVEN COUNTY

Bethany town, Branford town, Cheshire town, East Haven town, Guilford town, Hamden town, Madison town, Meriden town, New Haven town, North Branford town, North Haven town, Orange town, Wallingford town, West Haven town, Woodbridge town

NORWICH-NEW LONDON, CT HMFA

NEW LONDON COUNTY

Bozrah town, East Lyme town, Franklin town, Griswold town, Groton town, Ledyard town, Lisbon town, Lyme town, Montville town, New London town, North Stonington town, Norwich town, Old Lyme town, Preston town, Salem town, Sprague town, Stonington town, Voluntown town, Waterford town

SOUTHERN MIDDLESEX COUNTY, CT HMFA

MIDDLESEX COUNTY

Clinton town, Deep River town, Essex town, Killingworth town, Old Saybrook town, Westbrook town

STAMFORD-NORWALK, CT HMFA

FAIRFIELD COUNTY

Darien town, Greenwich town, New Canaan town, Norwalk town, Stamford town, Weston town, Westport town, Wilton town

WATERBURY, CT HMFA

NEW HAVEN COUNTY

Middlebury town, Naugatuck town, Prospect town, Southbury town, Waterbury town, Wolcott town

CONNECTICUT

	FY20 HOUSING WAGE	HOUSING COSTS			AREA MEDIAN INCOME (AMI)				RENTERS				
	Hourly wage necessary to afford 2 BR[1] FMR[2]	2 BR FMR	Annual income needed to afford 2 BMR FMR	Full-time jobs at minimum wage to afford 2BR FMR[3]	Annual AMI[4]	Monthly rent affordable at AMI[5]	30% of AMI	Montly rent affordable at 30% of AMI	Renter households (2014-2018)	% of total households (2014-2018)	Estimated hourly mean renter wage (2020)	Monthly rent affordable at mean renter wage	Full-time jobs at mean renter wage needed to afford 2 BR FMR
Connecticut	$26.42	$1,374	$54,956	2.4	$101,816	$2,545	$30,545	$764	460,240	34%	$17.70	$921	1.5
Combined Nonmetro Areas	$22.69	$1,180	$47,200	2.1	$102,600	$2,565	$30,780	$770	16,908	23%	$11.99	$623	1.9
Metropolitan Areas													
Bridgeport HMFA	$25.88	$1,346	$53,840	2.4	$98,000	$2,450	$29,400	$735	42,489	33%	$22.45	$1,167	1.2
Colchester-Lebanon HMFA	$23.69	$1,232	$49,280	2.2	$115,000	$2,875	$34,500	$863	1,689	19%	$16.83	$875	1.4
Danbury HMFA	$33.63	$1,749	$69,960	3.1	$122,000	$3,050	$36,600	$915	18,878	26%	$22.45	$1,167	1.5
Hartford-West Hartford-East Hartford HMFA	$23.65	$1,230	$49,200	2.2	$97,400	$2,435	$29,220	$731	152,962	34%	$16.92	$880	1.4
Milford-Ansonia-Seymour HMFA	$26.46	$1,376	$55,040	2.4	$108,200	$2,705	$32,460	$812	13,093	27%	$15.50	$806	1.7
New Haven-Meriden HMFA	$27.06	$1,407	$56,280	2.5	$91,200	$2,280	$27,360	$684	82,593	39%	$15.50	$806	1.7
Norwich-New London HMFA	$22.90	$1,191	$47,640	2.1	$91,800	$2,295	$27,540	$689	34,254	35%	$16.83	$875	1.4
Southern Middlesex County HMFA	$27.87	$1,449	$57,960	2.5	$112,000	$2,800	$33,600	$840	4,054	20%	$14.42	$750	1.9
Stamford-Norwalk HMFA	$39.98	$2,079	$83,160	3.6	$143,400	$3,585	$43,020	$1,076	49,955	36%	$22.45	$1,167	1.8
Waterbury HMFA	$21.52	$1,119	$44,760	2.0	$80,300	$2,008	$24,090	$602	29,876	41%	$15.50	$806	1.4
Windham County HMFA	$19.62	$1,020	$40,800	1.8	$86,900	$2,173	$26,070	$652	13,489	30%	$10.71	$557	1.8
Counties													
Litchfield County	$22.69	$1,180	$47,200	2.1	$102,600	$2,565	$30,780	$770	16,908	23%	$11.99	$623	1.9

1: BR = Bedroom
2: FMR = Fiscal Year 2020 Fair Market Rent
3: This calculation uses the higher of the county, state, or federal minimum wage, where applicable.
4: AMI = Fiscal Year 2020 Area Median Income
5: Affordable rents represent the generally accepted standard of spending not more than 30% of gross income on gross housing costs.

APPENDIX B: DATA NOTES, METHODOLOGIES, AND SOURCES

Appendix B describes the data used in *Out of Reach*. Information on how to calculate and interpret the report's numbers are in the pages "How to Use the Numbers" and "Where the Numbers Come From."

FAIR MARKET RENT AREA DEFINITIONS

HUD determines Fair Market Rents (FMRs) for metropolitan and rural housing markets across the country. In metropolitan areas, HUD starts with the Office of Management and Budget's (OMB) metropolitan area boundaries to define FMR areas. Since FMR areas are meant to reflect cohesive housing markets, the OMB boundaries are not always preferable. Also, significant changes to OMB metropolitan boundaries can affect current housing assistance recipients. In keeping with OMB's guidance to federal agencies, HUD modifies OMB boundaries in some instances for program administration.

In FY06, HUD's FMR areas incorporated OMB's 2003 overhaul of metropolitan area boundaries. HUD used OMB's new boundaries but modified them if a county (or town) to be added to an FMR area under OMB's definitions had rents or incomes in 2000 that deviated more than 5% from the newly defined metropolitan area. HUD (and *Out of Reach*) refers to unmodified OMB-defined areas as Metropolitan Statistical Areas (MSAs) and HUD-modified areas as HUD Metro FMR Areas (HMFAs). OMB's subsequent changes to metropolitan boundaries through 2009 were incorporated into HUD's subsequent FMR areas.

OMB released new metropolitan area boundaries in February 2013. For FY16, HUD elected to apply pre-2013 boundaries to FMR areas except where the post-2013 OMB boundaries resulted in a smaller FMR area. Counties that had been removed from metropolitan areas were treated by HUD as nonmetropolitan counties. Counties that had been added to metropolitan areas were treated by HUD as metropolitan subareas (HMFAs) and given their own FMR if local rent data were statistically reliable. New multi-county metropolitan areas were treated by HUD as individual county metropolitan subareas (HMFAs) if the data were statistically reliable. This is consistent with HUD's objective to allow variation in FMRs locally. These changes resulted in more metropolitan areas in *Out of Reach*, beginning in 2016.

In cases in which an FMR area crosses state lines, *Out of Reach* provides an entry for the area under both states. While the Housing Wage, FMR, and Area Median Income (AMI) values apply to the entire FMR area and will be the same in both states, other data such as the number of renter households, the minimum wage, and renter wages apply only to the portion of the FMR area within that state's borders.

FAIR MARKET RENTS

The FY20 FMRs are based on five-year 2013-2017 American Community Survey (ACS) data, supplemented with one-year 2017 ACS data. For each FMR area, a base rent is typically set at the 40th percentile of adjusted standard quality two-bedroom gross rents from the five-year ACS. The estimate is considered reliable by HUD if its margin of error is less than 50% of the estimate and is based on at least 100 observations. If an FMR area does not have a reliable estimate from the five-year 2013-2017 ACS, then HUD checks whether the area had a minimally reliable estimate (margin of error was less than 50% of estimate and based on more than 100 observations) in at least two of the past three years. If so, the FY20 base rent is the average of the inflation-adjusted reliable ACS estimates. If an area has not had at least two minimally reliable estimates in the past three years, the estimate for the next largest geographic area is the base for FY20, which for a nonmetropolitan county would be the state nonmetropolitan area.

A recent mover adjustment factor is applied to the base rent. This factor is calculated as the percentage change between the five-year 2013-2017 40th percentile standard quality two-bedroom gross rent, and the one-year 2017 40th percentile recent mover two-bedroom gross rent. The one-year recent mover two-bedroom gross rent is reliable if its margin of error is less than 50% of the estimate and is based on at least 100 observations. If the one-year recent mover two-bedroom gross rent estimate is not reliable, the one-year recent mover gross rent for all-sized units is used. If that is not reliable, the estimate for the next largest geographic area is used. HUD does not allow recent mover factors to lower the base rent.

Statistically reliable local rent surveys are used to estimate rents when their estimates are statistically different from the ACS-based rents. For FY20, the ACS is not used as the base rent or recent mover factors in 19 FMR areas. HUD currently does not have funds to conduct local rent surveys, so surveys must be paid for by local public housing agencies or other interested parties if they wish for HUD to reevaluate the ACS-based FMRs.

A local or regional CPI update factor is applied to the ACS base rent to adjust for inflation through 2018. A trend factor is then applied to trend the gross rent forward to FY 2020, using local and regional forecasts of the CPI gross rent data.

While the *Out of Reach* report highlights the one-bedroom and two-bedroom FMR, the *Out of Reach* website includes zero- to four-bedroom FMRs. HUD finds that two-bedroom rental units are the most common and the most reliable to survey, so two-bedroom units are utilized as the primary FMR estimate.

HUD applies bedroom-size ratio adjustment factors to the two-bedroom estimates to calculate FMRs for other bedroom-size units. HUD makes additional adjustments for units with three or more bedrooms to increase the likelihood that the largest families, who have the most difficulty in finding units, will be successful in finding rental units eligible for programs whose payment standards are based on FMRs.

Due to changes in FMR methodology over the years, we do not recommend comparing the current edition of *Out of Reach* with previous ones.

FMRs for each area are available at https://www.huduser.gov/portal/datasets/fmr.html

HUD's Federal Register notices for FY20 FMRs are available at https://www.huduser.gov/portal/datasets/fmr.html#2020_documents

NATIONAL, STATE, AND NON-METRO FAIR MARKET RENTS

The FMRs for the nation, states, and state nonmetropolitan areas in *Out of Reach* are calculated by NLIHC and reflect the weighted average FMR for the counties (FMR areas in New England) included in the larger geography. The weight for FMRs is the number of renter households within each county (FMR area in New England) from the five-year 2014-2018 ACS.

AFFORDABILITY

Out of Reach is consistent with federal housing policy in the assumption that no more than 30% of a household's gross income should be consumed by gross housing costs. Spending more than 30% of income on housing is considered "unaffordable."[1]

AREA MEDIAN INCOME (AMI)

This edition of *Out of Reach* uses HUD's FY20 AMIs. HUD calculates the family AMI for metropolitan areas and nonmetropolitan counties. The Census definition of "family" is two or more persons related by blood, marriage or adoption residing together. This family AMI is not intended to apply to a specific family size.

HUD used special tabulations of five-year 2013-2017 ACS data to calculate the FY20 AMIs. In areas with a statistically reliable estimate from one-year 2017 ACS data, HUD incorporated the one-year data. HUD's standard for a reliable estimate is a margin of error of less than 50% of the estimate and at least 100 observations on which the estimate is based.

Where a statistically reliable estimate from five-year data is not available, HUD checks on whether the area has a minimally reliable estimate (margin of error is less than 50% of the estimate) from any of the past three years. If so, the average of these years, is used.

The Congressional Budget Office (CBO) projection of the Consumer Price Index (CPI) was used by HUD to inflate the ACS estimate from 2017 to the mid-point of FY20.

1 The Housing and Urban-Rural Recovery Act of 1983 made the 30% "rule of thumb" applicable to rental housing assistance program.

Applying the assumption that no more than 30% of income should be spent on housing costs, *Out of Reach* calculates the maximum affordable rent for households earning the median income and households earning 30% of the median. This is a straight percentage and does not include HUD's adjustments to income limits for federal housing programs.

The median incomes for states and state combined nonmetropolitan areas reported in *Out of Reach* reflect the weighted average of county AMI data weighted by the total number of households from the 2014-2018 ACS.

FY20 family AMI for metropolitan areas and nonmetropolitan counties, the methodology, and HUD's adjustments to subsequent income limits are available at https://www.huduser.gov/portal/datasets/il.html

PREVAILING MINIMUM WAGE

Out of Reach incorporates the minimum wage in effect as of July 1, 2020. According to the U.S. Department of Labor, the District of Columbia and 29 states have a state minimum wage higher than the federal level of $7.25 per hour. *Out of Reach* incorporates the higher prevailing state minimum wage in these states. Some local municipalities have a minimum wage that is higher than the prevailing federal or state rate, but local rates associated with sub-county jurisdictions are not fully incorporated into *Out of Reach*.

Among the statistics included in *Out of Reach* are the number of hours and subsequent full-time jobs a minimum wage earner must work to afford the FMR. The national average number of hours a full-time worker earning minimum wage must work to afford the FMR is calculated by taking into account the prevailing minimum wage at the county level (or New England FMR area) and finding the weighted average of hours needed in all counties, weighting counties by their number of renter households. Accordingly that average reflects higher state and county minimum wages but not higher minimum wages associated with sub-county jurisdictions.

If the reader would like to calculate the same statistics using a different wage such as a higher local minimum wage, a simple formula can be used for the conversion:

[hours or jobs at the published wage] × [published wage] / [alternative wage]

For example, one would have to work nearly 120 hours per week to afford the two-bedroom FMR in Seattle, WA, if the local minimum wage was equivalent to the State of Washington's rate of $13.50. However, the same FMR would be affordable with 98.5 hours of work per week under the higher local minimum wage of $16.39 (119.6 * $13.50 / $16.39).[2] For further guidance, see "Where the Numbers Come From" or contact NLIHC research staff.

The Department of Labor provides further information on state minimum wages at www.dol.gov/whd/minwage/america.htm.

AVERAGE RENTER WAGE

Recognizing that the minimum wage reflects the earnings of only the lowest income workers, *Out of Reach* also calculates an estimated mean renter hourly wage. This measure reflects the compensation that a typical renter is likely to receive for an hour of work by dividing average weekly earnings by 40 hours, thus assuming a full-time workweek. Earnings include several non-wage forms of compensation like paid leave, bonuses, tips, and stock options.[3]

The estimated mean renter hourly wage is based on the average weekly earnings of private (non-governmental) employees working in each county.[4] Renter wage information is based on 2018 data reported by the BLS in the Quarterly Census of Employment and Wages. For each county, mean hourly earnings are multiplied by the ratio of median renter household income to median household income from the five-year 2014-2018 ACS to arrive at an estimated average renter wage. In nineteen counties nationwide, the median renter household income exceeds the median household income. Nationally, median renter household income was 64% of the median household income.

An inflation factor was applied to the estimated mean renter hourly wage to adjust from 2018 to FY20. The

2 U.C. Berkeley Labor Center (2020). Inventory of U.S. city and county minimum wage ordinances.

3 Please note this measure is different from median renter household income, which reflects an estimate of what renter households are earning today and includes income not earned in relation to employment.

4 Renter wage data for some counties are not provided in *Out of Reach* either because the BLS could not disclose the data for confidentiality reasons or because the number of employees working in the county was insufficient to estimate a reliable wage.

inflation factor (260.306 ÷ 251.104) was based on the CBO January 2020 forecast of the national CPI for FY20.

In approximately 13% of counties or county equivalents (including Puerto Rico), the renter wage is below the federal, state, or local minimum wage. One explanation is that workers in these counties likely average fewer than 40 hours per week, but the mean renter wage calculation assumes weekly compensation is the product of a full-time work week. For example, mistakenly assuming earnings from 20 hours of work were the product of a full-time workweek would underestimate the actual hourly wage by half, but it would still accurately reflect the true earnings.

Wage data from the Quarterly Census of Employment and Wages are available through the Bureau of Labor Statistics at www.bls.gov/cew/home.htm.

MEDIAN RENTER HOUSEHOLD INCOME

Median renter household income is from the 2014-2018 ACS projected forward to FY20 based on the CBO January 2020 forecast of the national CPI for FY20.

WORKING HOURS

Calculations of the Housing Wage and of the number of jobs required at the minimum wage or mean renter wage to afford the FMR assume that an individual works 40 hours per week, 52 weeks each year, for a total of 2,080 hours per year. Seasonal employment, unpaid sick leave, temporary lay-offs, job changes, and other leave prevent many individuals from maximizing their earnings throughout the year. According to the Bureau of Labor Statistics, as of April 2020, the average wage earner in the U.S. worked 34.2 hours per week.[5]

Not all employees have the opportunity to translate an hourly wage into full-time, year-round employment. For these workers, the Housing Wage underestimates the actual hourly compensation needed to afford the FMR. Conversely, some households include multiple wage earners. For these households, a home renting at the FMR would be affordable even if each worker earned less than the area's stated Housing Wage, as long as their combined wages exceed the Housing Wage for at least 40 working hours per week.

SUPPLEMENTAL SECURITY INCOME (SSI)

Out of Reach compares rental housing costs with the rent affordable to individuals receiving Supplemental Security Income (SSI) payments. The national numbers are based on the maximum federal SSI payment for individuals in 2020, which is $783 per month. *Out of Reach* calculations for states include state supplemental payments that benefit all individual SSI recipients in 21 states where the Social Security Administration (SSA) reports the supplemental payment amount.

Supplemental payments provided by other states and the District of Columbia are excluded from *Out of Reach* calculations. For some, these payments are administered by the SSA but are available only to populations with specific disabilities, in specific facilities, or in specific household settings. For the majority, however, the supplements are administered directly by the states, so the data are not readily available if they haven't been reported to the SSA. The only four states that do not supplement federal SSI payments are Arizona, Mississippi, North Dakota, and West Virginia. Residents of Puerto Rico cannot receive federal SSI payments.

Information on SSI payments is available from the Social Security Administration at https://www.ssa.gov/OACT/COLA/SSI.html.

The Technical Assistance Collaborative, Inc., publishes Priced Out, which compares FMRs with the incomes of SSI recipients. The most recent edition can be found at http://www.tacinc.org/knowledge-resources/priced-out-v2/

ADDITIONAL DATA AVAILABLE ONLINE

The print / PDF version of *Out of Reach* contains limited data in an effort to present the most important information in a limited number of pages. Additional data can be found online at http://www.nlihc.org/oor.

The *Out of Reach* methodology was developed by Cushing N. Dolbeare, founder of the National Low Income Housing CoalitionThe Technical Assistance Collaborative, Inc., publishes Priced Out, which compares FMRs with the incomes of SSI recipients. The most recent edition can be found at http://www.tacinc.org/knowledge-resources/priced-out-v2/

5 Bureau of Labor Statistics. (2020). *The employment situation – April 2020.* Washington, D.C.: U.S. Department of Labor.

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DEFINITIONS

Affordability in this report is consistent with the federal standard that no more than 30% of a household's gross income should be spent on rent and utilities. Households paying over 30% of their income are considered cost-burdened. Households paying over 50% of their income are considered severely cost-burdened.

Area Median Income (AMI) is used to determine income eligibility for affordable housing programs. The AMI is set according to family size and varies by region.

Extremely Low Income (ELI) refers to earning less than the poverty level or 30% of AMI.

Housing Wage is the estimated full-time hourly wage workers must earn to afford a decent rental home at HUD's Fair Market Rent while spending no more than 30% of their income on housing costs.

Full-time work is defined as 2,080 hours per year (40 hours each week for 52 weeks). The average employee works roughly 34.5 hours per week, according to the Bureau of Labor Statistics.

Fair Market Rent (FMR) is typically the 40th percentile of gross rents for standard rental units. FMRs are determined by HUD on an annual basis, and reflect the cost of shelter and utilities. FMRs are used to determine payment standards for the Housing Choice Voucher program and Section 8 contracts.

Renter wage is the estimated mean hourly wage among renters, based on 2018 Bureau of Labor Statistics wage data, adjusted by the ratio of renter household income to the overall median household income reported in the ACS and projected to 2020.

Housing in CT 2020

PARTNERSHIP FOR STRONG COMMUNITIES

A Cost We Can't Afford

Housing costs in Connecticut are the 9th highest in the nation. Connecticut's residents are burdened by the lack of modestly-priced rental options – a problem which affects all communities, regardless of income levels.

Nearly 120,000 Connecticut households spend over half of their income on rental housing (including rent and utilities). When households spend half their paycheck on home-related costs, they are forced to spend less on other needs, such as food, healthcare, and childcare. In turn, local businesses are negatively affected by residents' lack of income for other essentials.

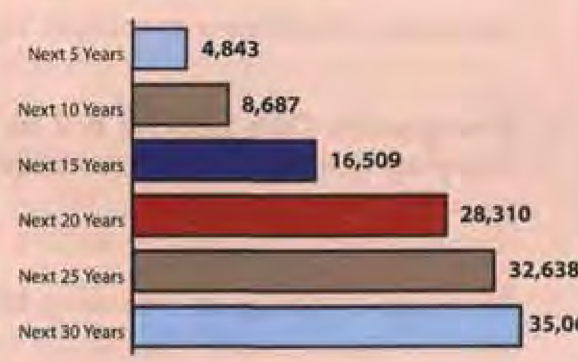
*In the next five years, **4,843 publicly supported rental homes in Connecticut are set to have their affordability restrictions expire.***

60 YEARS OF RISING COSTS

*In 1960, just 11.9% of renters spent over half their income on housing costs. By 2016, that percentage had **more than doubled** to 25.2%.*

PUBLICLY SUPPORTED RENTAL HOMES AT RISK

*More than **one in twenty** publicly supported rental homes face an expiring affordability restriction in the next five years.*



Source: Public and Affordable Housing Research Corporation (PAHR

Growth Starts At Home

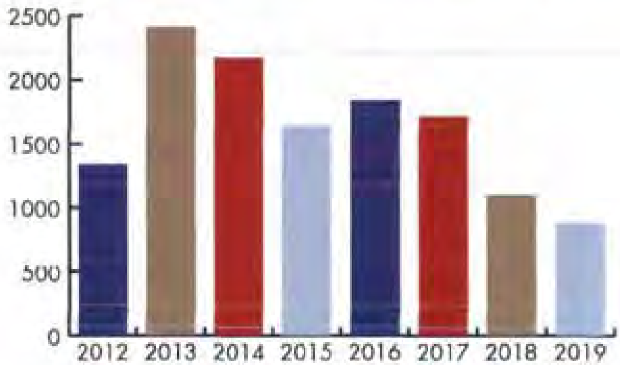
Housing construction in Connecticut has lagged behind that of its neighbors. In 2018, Connecticut ranked second-to-last of U.S. states in permit issuance rate, with a rate of 1.3 permits per 1,000 residents.

Analysis from the National Association of Homebuilders shows that, **for every $1 of state investment in multi-family housing, $4.57 in private investment is leveraged as a result.** Household sizes in the U.S. have fallen for decades, leading to an increase in demand for multi-family homes. Despite this trend, multi-family housing starts have plummeted in Connecticut in recent years.

Preserving Our Homes

Connecticut's housing problems are particularly dire when it comes to rental-assisted homes. In 2018, the State of Connecticut Department of Housing funded the construction of **884 rental-assisted homes**. Rental-assisted home construction fell for the fourth straight year and has declined 63 percent overall since 2013.

YEARLY RENTAL-ASSISTED HOME CONSTRUCTION, 2012-19



The state can help renters and boost economic growth by investing in rent-assisted housing. The state has averaged $112.8 million in new bond authorizations for rent-assisted housing from FY 2011 through FY 2019. However, there were no new bond authorizations adopted during the 2019 legislative session. Without an expanded investment in rental-assisted homes, the proportion of households spending half or more of their income on housing will inevitably grow.

Connecticut's housing stock is the 5th oldest of any state in the country. An estimated 2,230 units of public housing in Connecticut are in need of immediate investment – and thousands more privately-owned homes are similarly in disrepair.

*According to the Cheshire-based PAHRC research group, building rental-assisted housing results in a yearly average increase of **$7,000** in disposable income for families living in these homes.*

What You Can Do

We can reverse this trend of rising rents and priced-out households, while building a more equitable state. First, Connecticut needs to invest in rental options for all levels of income. At the same time, we need to recognize the value of knowledgable, informed Planning & Zoning Commissions in making critical decisions on housing. The Partnership for Strong Communities is proposing these legislative items for the 2020 session:

Continue necessary strategic capital investments in affordable housing by authorizing $100 million each year in the Affordable Housing FLEX Fund, and $50 million each year for the state Housing Trust Fund.

Reorganize CGS Section 8-2 to make it more readable to land use commissions and the public, **develop guidelines for municipal compliance** with the state's existing requirement that each town prepare an affordable housing plan, and require municipal compliance in order to ensure that all families have housing choices in high-opportunity areas.

Develop training on housing issues for local Planning & Zoning commissions to give P&Z commissioners the tools they need to make important land use decisions.

Visit www.pschousing.org to learn more and add your support.

PARTNERSHIP FOR STRONG COMMUNITIES
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Does Low-Income Housing Affect Property Values?

Posted By *ScottMorgan1* On November 16, 2016 @ 11:27 am In Daily Dose,Data,Headlines,News | No Comments

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The deep-set worry that low-income housing has a deleterious effect on the values of other properties appears to have little basis in reality. According to a new study by Trulia [1] of the country's 20 least affordable housing markets, low-income housing built during a 10-year span shows no effect on nearby home values.

Trulia reported Wednesday that resistance to affordable housing development has surfaced in places like San Francisco, New York, and Seattle, where low-inventory and high competition has sparked worries about affordable development. But the firm's analysis of more than 3,000 low-income housing projects built between 1996 to 2006 "found no significant effect on home values located near a low-income housing project, with a few exceptions."

Boston and Cambridge, Massachusetts, were two exceptions. Low-income housing projects there had a negative effect on nearby homes in terms of price per square foot--a drop of $18 to $19 per square foot, "suggesting a region-specific market effect for these two geographically adjacent metros," Trulia reported. But the reason could be too-much-too-fast.

"Concentrating subsidized housing projects in particular areas such as Roxbury and Dorchester in Boston, or Cambridgeport in Cambridge in a short time period, for example, might have the effect of crowding out other development activity," the report stated.

In almost all other markets, low-income housing seems to have had no effect either way. Denver, in fact, was the only metro where low-cost housing actually benefited other homes.

One reason for this could be that parts of downtown Denver around where low-income housing projects were built saw a renaissance in the 1990s, driven by the development of the lower downtown area and the construction of Coors Field.

"Some of these neighborhoods in downtown Denver are now the most sought real estate in the metro area," the report stated. "Indeed, neighborhoods such as the Central Business District and Five Points, where low-income housing projects were concentrated in our study period, outperformed greater Denver in terms of home values per square foot."

The important thing to remember, Trulia reported, is that apart from these two wildly disparate examples, the overall truth is that low-cost housing doesn't affect real estate markets much.

"These are exceptions to the finding that low-income housing projects largely have no effect on home values," the report stated. "The bottom line for NIMBYs who fear that property values will take a hit when a low-income housing project locates nearby is that their anxiety is largely unfounded--at least in cities where housing is either expensive or in short supply."

Click here [1] to view Trulia's complete report.

Article printed from theMReport.com: **https://themreport.com**

URL to article: **https://themreport.com/daily-dose/11-16-2016/low-income-housing-affect-property-values**

URLs in this post:

[1] a new study by Trulia: **https://www.trulia.com/blog/trends/low-income-housing/**

TRULIA RESEARCH AFFORDABILITY

There Doesn't Go the Neighborhood: Low-Income Housing Has No Impact on Nearby Home Values

By **Cheryl Young** | Nov 16, 2016 12:01AM

In the nation's 20 least affordable housing markets, low-income housing built during a 10-year span shows no effect on nearby home values.

Corrected Nov. 29 at 2 pm ET. See below.

Some of the nation's least affordable markets are also ground zero for the fight against building affordable housing – which opponents say, among other things, depreciates nearby home values. Resistance to affordable housing development has surfaced in tight housing markets across the country such as **San Francisco**, **New York**, and **Seattle**.

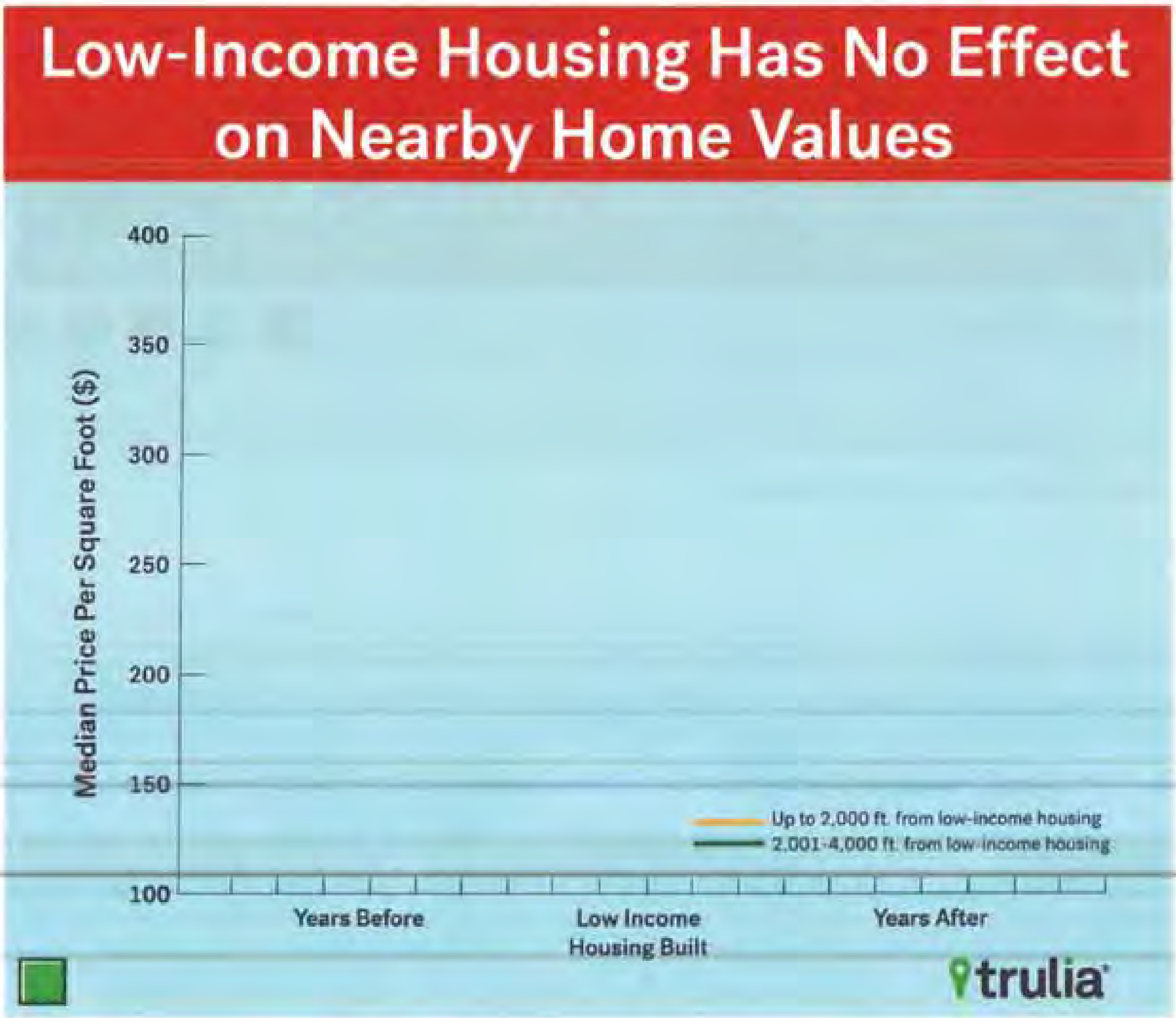
Given **low inventory** and high prices in these tight markets, we set out to uncover how much homeowners really have to fear.

We define low-income housing projects as those funded through the Low-Income Housing Tax Credit (LIHTC) program administered by the U.S. Department of Treasury. Data on these low-income housing projects are collected by the U.S. Department of Housing and Urban Development (HUD). Using Trulia home value data, we examined changes in nearby home values before and after a low-income housing project is completed. Based on the location of low-income housing projects and completion dates,[1] we determined whether or not these projects impact home values. We found:

- In the nation's **20 least affordable markets**, our analysis of 3,083 low-income housing projects from 1996 to 2006 found **no significant effect** on home values located near a low-income housing project, with a few exceptions.
- Among the cities where there was enough data to measure, **San Jose, Calif.**, was the most aggressive in adding low-income housing units (7.81 per 1,000 people) during the decade. Meanwhile, **Oakland,** (0.52 per 1,000 residents) added the fewest units per capita.
- Of the 20 markets examined, **Denver** was the only metro area where homes located near low-income housing projects registered a **positive** effect in terms of price per square foot after a project was completed.
- In **Boston** and **Cambridge, Mass.,** however, low-income housing projects had a **negative** effect on nearby homes in terms of price per square foot, suggesting a region-specific market effect for these two geographically adjacent metros.

We focused on the time period prior to the start of the housing bubble in 2007 in order to ensure that prices reflect consistent comparisons around the time a project is completed and ready for occupancy.

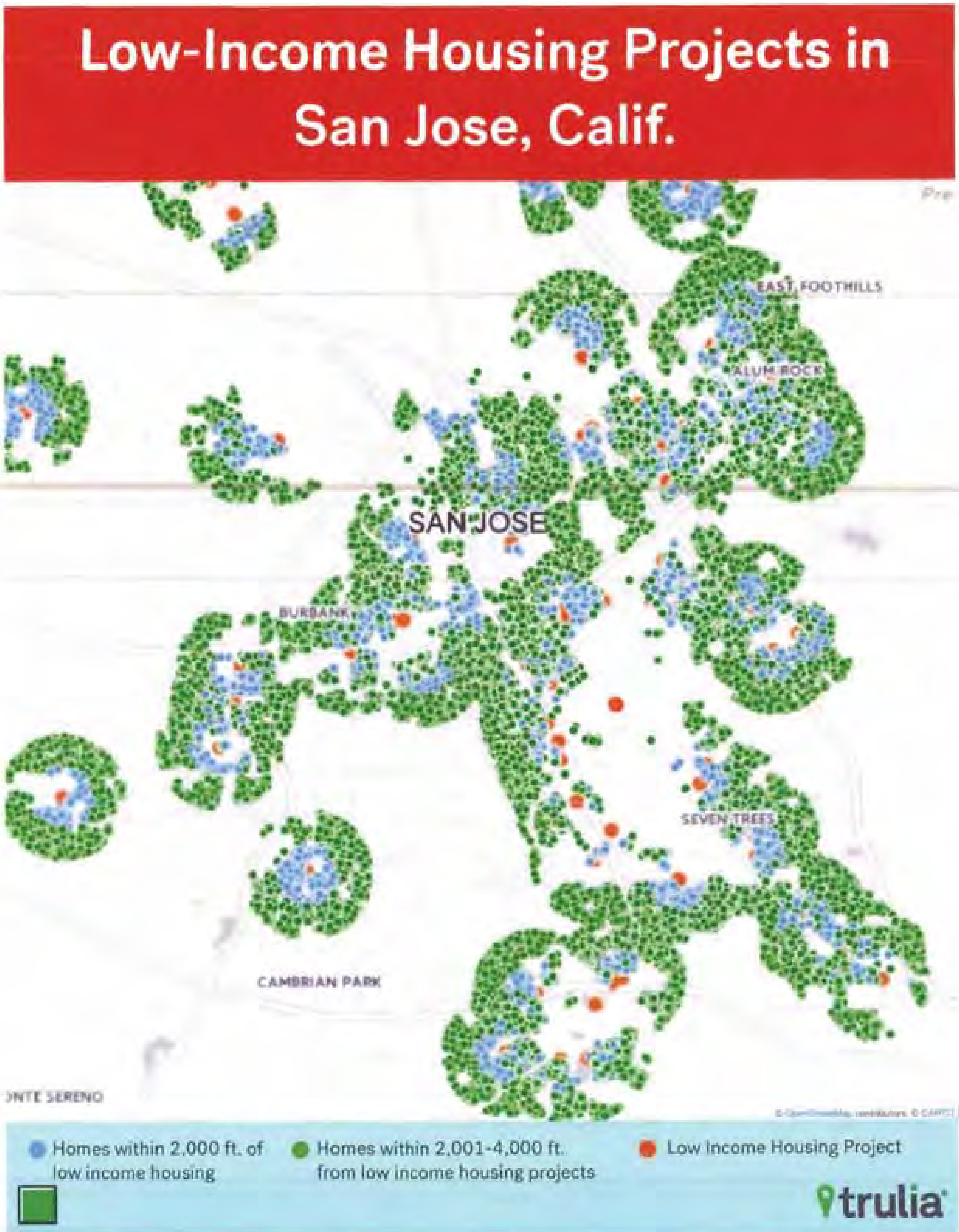
[1] HUD uses the term "placed into service" to denote when an eligible household can move in. For purposes of this report, we consider this the time at which the project is complete and ready for occupancy.



Least Affordable Housing Markets and Low-Income Housing Projects

To test for spillover effects of low-income housing, we tracked home values in terms of price per square foot at two different distances from the low-income housing project from 1996 to 2006. For the **neighborhood**, we identified properties within an inner ring of 2,000 feet of a given low-income housing project as close enough to be impacted by the project. Properties located 2,001 to 4,000 feet from the low-income housing project were used as a **comparison group**.**[1]** The chart below illustrates how properties are placed into inner (light blue) and outer (green) rings around a low-income housing project (orange).

[1] Using distance measures as a way to compare potential effects of housing projects on property values proximate to a project site to those in surrounding neighborhoods is common in the academic literature. See Ellen et al. (2007)'s analysis of the effect of subsidized housing projects in New York City on property values by comparing price changes of properties within a 2,000 foot distance ring to those in similar surrounding neighborhoods. Ellen, Ingrid Gould, Amy Ellen Schwartz, Ioan Voicu and Michael H. Schill. 2007. "Does Federally Subsidized Rental Housing Depress Neighborhood Property Values?" *Journal of Policy Analysis and Management*. Vol. 26, No. 2, pp. 257-280.



If there was an effect from the placement of a low-income housing project into a neighborhood, we would expect to see a drop in prices in the inner ring (red line) compared to the outer ring (blue line) after the project is completed (year 0). In terms of median price per square foot, the inner and outer distance buffers track closely together as shown in the figure below.

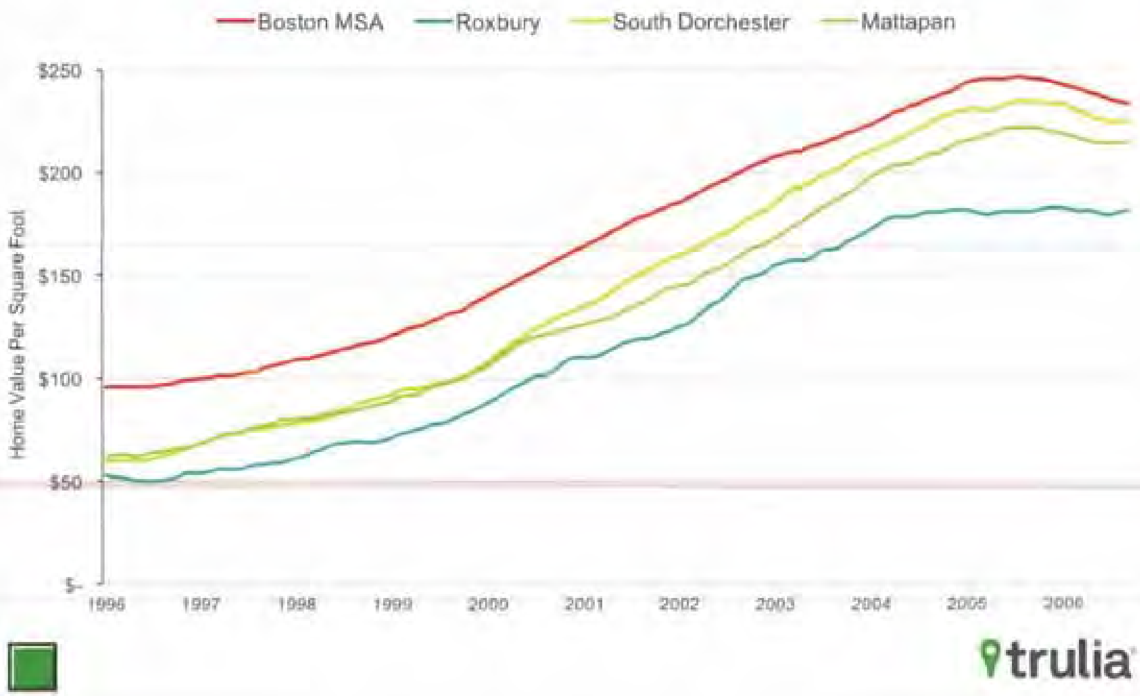
There is no statistically significant difference in price per square foot when comparing properties near a low-income housing project and those farther away when examining projects across all 20 metros. Likewise, at the metro level, the majority of markets yield no significant difference in prices between the inner and outer ring after a project is completed. However, a few housing markets revealed significant differences in price per square foot near low-income housing projects after they were placed into service.

Why did values diverge in some places?

Homes near low-income housing projects in both **Boston** and **Cambridge** saw a **negative** impact on per square foot property prices. Post-project prices near low-income housing projects saw an estimated $18 and $19 drop in prices per square foot relative to the outer ring. Given that these estimated effect in these two markets are geographically adjacent to one another, this effect might be attributed to a region-specific market effects that reflect where low-income housing projects were placed. Concentrating subsidized housing projects in particular areas such as Roxbury and Dorchester in Boston, or Cambridgeport in Cambridge in a short time period, for example, might have the effect of crowding out other development activity.**[1]** The chart below shows that in neighborhoods like Roxbury, prices were indeed depressed compared those of the greater Boston metro area.

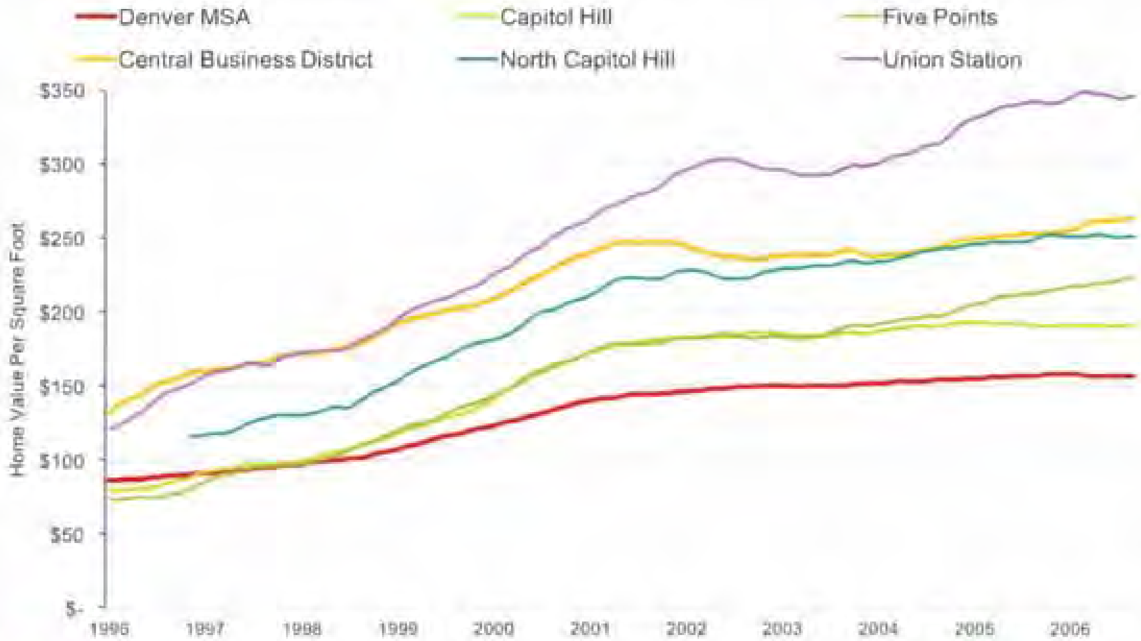
[1] Indeed, the concentration of affordable housing development in certain areas seems to have exacerbated an unequal geography of where low-income residents have settled in the Boston area according to a recent report by the ***Boston Globe***

Low-Income Housing and Boston Neighborhoods



Unlike Boston and Cambridge, the effect of low-income housing projects in the **Denver** metro area were associated with a $7.35 per square foot **increase** in property values for the neighborhood versus the region. One possibility: parts of downtown Denver around where low-income housing projects were built saw a renaissance in the 1990s driven by the development of **LoDo** (Lower Downtown Denver) and the construction of Coors Field. Some of these neighborhoods in downtown Denver are now the most sought real estate in the metro area. Indeed, as the chart below illustrates, neighborhoods such as Central Business District and Five Points, where low-income housing projects were concentrated in our study period outperformed greater Denver in terms of home values per square foot.

Low-Income Housing and Denver Neighborhoods



What does it mean?

Again, these are exceptions to the finding that low-income housing projects largely have no effect on home values. The bottom line for NIMBYs who fear that property values will take a hit when a low-income housing project locates nearby is that their anxiety is largely unfounded – at least in cities where housing is either expensive or in short supply.

This post has been corrected to reflect that it is the U.S. Treasury Department that administers the LIHTC program. An earlier version of this post said HUD administered the program.

Methodology

LIHTC project location, unit count, and year placed into service data are accessed from the United States Department of Housing and Urban Development's LIHTC Database. While LIHTC projects do not cover the entire universe of affordable housing, they constitute the large majority of subsidized rental housing development in the nation. The precise location data of these projects also allows us to estimate their potential spillover effects on nearby property values.

Using the latitude and longitude of these projects, we constructed two distance buffers—one up to 2,000 feet from the project, and another from 2,001 to 4,000 feet. We then identified homes within these buffers and captured Trulia home value data for each of these homes from 1996 to 2006. Trulia home value data is collected as an annual snapshot on June 1st of each year. In order to avoid large shifts in prices from new construction, we only include homes with property records for the entire time period under study. The analysis in this report uses home value per square foot in order to control for changes for housing quality and mix as well as potential changes in value from renovations during the study period.

We use a basic differences-in-differences regression framework to estimate the difference in home values in the inner ring compared to the outer ring after the LIHTC project is placed into service. Differences-in-differences offers a way to identify the effect of a policy by examining relative changes in outcomes in treatment and control groups. In this report, the treatment group consists of those homes located in the inner ring, or nearby the LIHTC projects, and the control group are those in the outer ring. The assumption is that these homes, on average, only differ in terms of their relative proximity to the LIHTC project. Note that after plotting the median home value per square foot of the two distance rings before and after the project, we felt confident home values between distance rings prior to the time projects were placed into service shared common trends. The treatment occurs once the project is put into place, so the differences-in-differences reflects the difference between the treatment group and control group (a proxy for the counterfactual) in the post-treatment period compared to the pre-treatment period.

In order to control for idiosyncratic differences in home values within years and different metro areas, we include year fixed effects (and metro fixed effects for regressions containing projects across all 20 metros). Additionally, we implement cluster-robust standard errors on individual LIHTC projects in order to correct for likely correlation of errors terms within the clusters. Our results yielded differences that were statistically significant in three metro areas. In Boston and Cambridge, the estimated effect of living near LIHTC projects was -$18.05 and -$19.05 per square foot. In Boston the effect was significant at the 99% confidence level and in Cambridge at the 95% confidence level. In Denver the estimated effect was $7.35 and significant at the 95% confidence level.

Affordability is defined as the percent of a median household's income in that market that would be needed to afford a mortgage payment on the median listing price of a home in that market. These median listing prices reflect Trulia listing data from Q3, 2016. Population figures in this report come from the 2000 Census.

Cheryl Young

Cheryl is a Senior Economist at Trulia. Prior to Trulia she was a consultant with the World Bank's Urban Development Unit. She has also served as an associate with Bankable Frontier Associates' housing finance practice, led a housing research program ... **See more**

AFFORDABILITY

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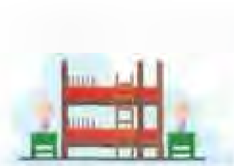

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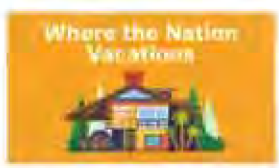

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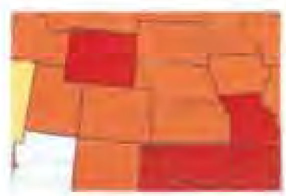

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UPDATED MAY 2014

Affordable Rental Housing Does Not Reduce Property Values: **Evidence from the Twin Cities**

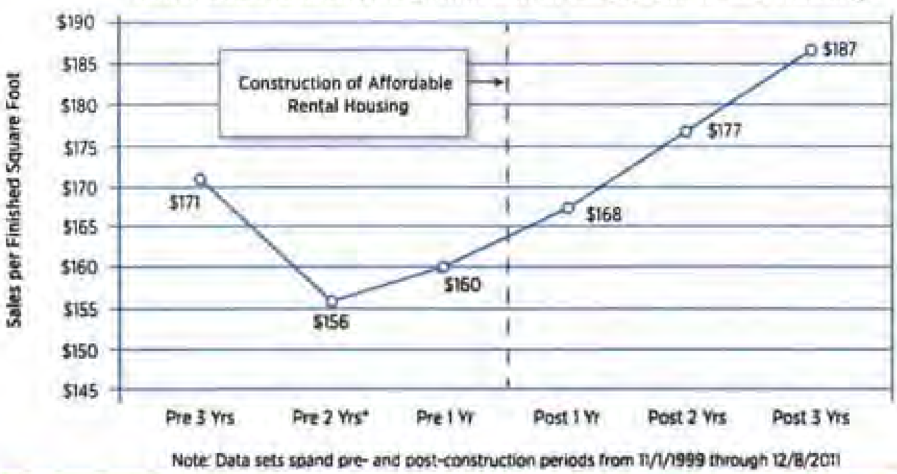
Some neighbors of proposed affordable housing developments express apprehension that the new buildings will lower nearby home values. Concern about property values is understandable; after all, a home is the single largest investment that most families will ever make.

However, the facts about the actual effect of affordable housing on neighboring home values tell a different story. A recent study found little to no evidence to support the claim that affordable housing developments stimulated a decline in their surrounding housing markets; in fact, each of the areas analyzed displayed stronger market performance after affordable housing was built.

The Family Housing Fund commissioned Maxfield Research, a private real estate research firm, to update their original study (published in 2000) of home sales in neighborhoods surrounding affordable rental housing developments with data from developments built between 2002–2008. Research for the updated report was conducted in four counties, within eight suburban communities: Dakota County (Inver Grove Heights, Lakeville, and Rosemount), Hennepin County (Bloomington and Minnetonka), Scott County (Prior Lake), and Washington County (Oakdale and Woodbury).

The affordable rental housing developments studied are typical of those being built throughout the Twin Cities metropolitan area today, all utilizing Low Income Housing Tax Credits to finance construction. The developments provide apartments and townhomes with affordable rents for families earning less than $50,000 per year (less than 60 percent of the area median income).

Average Sales Price Per Finished Square Foot of Homes Sold Three Years Before and After Construction of Affordable Rental Housing



Note: Data sets spand pre- and post-construction periods from 11/1/1999 through 12/8/2011

* The decrease in price per finished square foot in the two years prior to construction was due largely to the housing market crash that was occurring around the same time. Additionally, two of the areas studied had a large number of newer homes; new homes experienced a greater decline in value during the crash than existing stock, further depressing the group average.

Market Performance Remains Strong

In the updated report, Maxfield Research compared home sales prices in the neighborhoods surrounding affordable housing for the three years before and after construction, compared those sales to similar neighborhoods without affordable housing, and compared the data to the broader Twin Cities market. They concluded:

- **Prices Gained by Home Sellers:** Sellers increased the average price they received per square foot of finished space by nearly five percent annually after affordable housing was constructed. Additionally, the average sales price for the entire property increased more than two percent in the post-construction period.
- **Demand for Prices by Buyers:** While the average percentage of the list price that sellers received fluctuated over the six years, it was highest in the third year after construction (99.4 percent). This indicates there was little to no discounting by the buyer as a result of the presence of nearby affordable housing.
- **Speed of Home Sales:** The number of days homes stayed on the market was essentially stable after the affordable rental housing was built, indicating that developments did not make it more difficult for owners to sell their homes.
- **Market Performance:** Market performance of homes located near affordable housing (based on the three previously listed indicators) was as strong or stronger than those located farther from rental housing in 95 percent of the cases.

In short, Maxfield Research found little to no evidence to suggest that the construction of affordable rental housing hurt the performance of home sales. In the areas studied, home sales displayed similar or stronger performance in the period after affordable rental housing was built compared to a control group.

The study examined home sales during an unstable period in the housing market. In the Twin Cities, housing prices began deflating in 2006, and market activity did not renew until 2011. Because of this volatility, Maxfield Research compared the sales prices in the neighborhoods with affordable rental housing to the larger Twin Cities market. The study found that the neighborhoods studied performed similarly or better than the Twin Cities metropolitan area as a whole. Prior to the construction of affordable housing, the neighborhoods analyzed were growing 0.35 percentage points above the overall Twin Cities market. Post-construction, the growth of home sales prices in these neighborhoods was nearly five and a half percentage points higher than the Twin Cities market. In addition to providing evidence that affordable rental housing does not lower property values, this also indicates that the suburban neighborhoods studied were areas of higher price appreciation.

This new study supports the conclusion reached by Ed Goetz, et al. (University of Minnesota, Center for Urban and Regional Affairs, 1996) about the Twin Cities and Ingrid Ellen and Ioan Voicu (New York University, 2006) about New York City that affordable housing managed by nonprofit organizations has a positive impact on property values. Additionally, studies have found that access to affordable housing has a positive impact on education, health, and wealth/earnings outcomes for families.

Whether in the Twin Cities or elsewhere in the country, the evidence is overwhelming: providing quality housing that lower-income families can afford poses no threat to area property values.

Prairie Crossings, Lakeville, Minnesota, was one of the affordable housing developments studied. (Photo courtesy of Dakota County Community Development Agency)

The full study, An Updated Analysis of the Relationship Between Affordable Family Rental Housing and Home Values in the Twin Cities, *can be ordered free of charge from the Family Housing Fund, or viewed and downloaded at www.fhfund.org/reports.*

This publication is part of a Public Education Initiative on affordable housing sponsored by the Family Housing Fund. The Family Housing Fund is a private, nonprofit organization created in 1980 to help bridge the gap between the housing that people need and the housing they can afford. Its mission is to provide safe, affordable, sustainable homes to all families in the Twin Cities metropolitan area through ongoing partnerships with the public and private sector.

For more information about the Family Housing Fund and/or to view other publications available in this series, please visit www.fhfund.org.

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May 2014

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Busted: Seven Myths About Affordable Housing

Posted by Twin Cities Habitat for Humanity on 8:00 AM on February 18, 2020

The need for affordable housing is a fact of life in most communities across the country, yet myths, fear, prejudice, and misunderstanding often overshadow the debate.

To give a little perspective to the debate, here are seven affordable housing myths and realities.

MYTH #1: Affordable housing drives down property values.

REALITY: Repeated research shows affordable housing has no negative impact on home prices or on the speed or frequency of sale of neighboring homes. According to the National Low Income Housing Coalition, 85% of affordable housing meets or exceeds federal quality standards and over 40% of this housing is considered "excellent." That means affordable housing is likely either on-par with its surrounding neighborhood or in even better condition than its neighbors!

MYTH #2: Affordable housing looks "cheap and undesirable."

REALITY: Builders of affordable housing must comply with all the same restrictions on design and construction standards as market-rate projects. Furthermore, because affordable housing projects frequently rely on some public money, they have to comply with additional restrictions and higher standards than market-rate housing.

The reality is that affordable housing is affordable because public and private funds go into making it less costly to live in, not because it's lower quality construction.

Take a look at our current available properties.

MYTH #3: Affordable housing hurts the quality of local schools and lowers standardized test scores.

REALITY: The opposite is actually true. Without affordable housing, many families become trapped in a cycle of rising rents and have to move frequently to find living space they can afford. That means their children are not able to stay in the same school for long, resulting in lower test scores on standardized tests.

When a child has a stable home and can remain in a single school system, their test scores rise. It also means children are able to build long-term relationships with peers, teachers, and mentors that are key to increasing performance in elementary and secondary schools. Finally, it increases the likelihood that children will be able to attend college. When housing disruptions are minimized, everybody wins.

MYTH #4: Affordable housing is a burden on taxpayers and municipalities.

REALITY: Affordable housing actually enhances local tax revenues. By improving or replacing substandard housing, affordable housing becomes a net plus on the tax rolls. Instead of low or no payment of taxes by distressed properties, affordable housing owners actively contribute to the local economy in the taxes they pay, the money they spend in local businesses, and in how they increase property values and revenue in a neighborhood. In fact, in 2019, Twin Cities Habitat for Humanity homeowners contributed nearly $2.7 million in property taxes alone.

MYTH #5: Affordable housing brings increased crime.

REALITY: There are no studies that show affordable housing brings crime to neighborhoods. In fact, families who own their own homes add stability to a neighborhood and lower the crime rate. Homeownership increases neighborhood cohesion and encourages cooperation in ridding communities of criminal activity. Families who live in affordable housing seek the same thing every family does – a safe place to raise children and the opportunity to enhance the value of what they own.

MYTH #6: Affordable housing is just another government hand-out.

REALITY: It isn't the poor who benefit the most from federal housing subsidies, it's the wealthy homeowner. Homeowners receive tax deductions for mortgage interests and a similar write-off for property taxes paid. According to the Department of Housing and Urban Development, in 2003 these subsidies cost the federal government $87.8 billion, while building and subsidizing affordable housing cost only $41.5 billion.

When you factor in improvements in property values, increases in taxes paid by stable employment, and enhanced revenues from a better-educated populace, affordable housing provides a net gain to governments at every level.

MYTH #7: Affordable housing only benefits the very poor, everyone else pays.

REALITY: Some of the people impacted by a lack of affordable housing include employers, seniors, low-income people, immigrants, low-wage or entry-level workers, firefighters, police officers, military personnel, and teachers. The lack of affordable housing means tax revenues are not in place to improve roads, schools, or air quality. It means businesses struggle to retain qualified workers, and lowers the amount of money available to spend in those businesses. Affordable housing isn't about doing something to help the poor, it's about improving business and raising the standards of working- and middle-class families, and the nation at large.

Here at Twin Cities Habitat for Humanity, our mission is to eliminate poverty housing from the Twin Cities and to make decent, affordable shelter for all people a matter of conscience. Despite the affordable housing myths, the truth is that helping people own their own home helps the community as a whole.

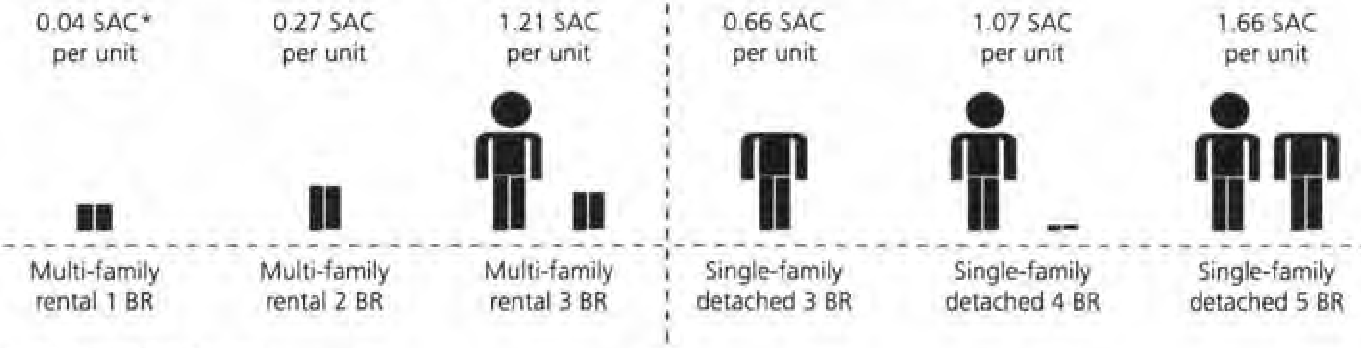
To learn more, read the "Myths and Stereotypes About Affordable Housing" report from Business and Professional People for the Public Interest.

HOMECONNECTICUT
For Our Economy, Our Families, Our Future
a campaign of the Partnership for Strong Communities

The School Cost Myth:
All Housing **Doesn't** Increase School Costs

Only larger homes bring many school-age children

Rutgers University's Center for Urban Policy Research analysis (June 2006) of Connecticut's number of school age children living in various housing types indicate the following averages:



* SAC = School-Age Children

Plus, school enrollments are falling

Report by the CT State Data Center (June 2008) projected significant declines in CT school enrollment:

From their peak in 2004-05, school enrollments are expected to drop by 17% by 2020. Even if new housing brings additional school children, it is likely that classroom vacancies will be able to absorb them without additional costs.

Most school budget increases are not related to enrollment, or to the number of children in housing

Findings of a University of Massachusetts Donohue Institute study (May 2007) on school cost impact of mixed-income housing:

Studying seven Massachusetts communities with mixed-income housing between 1994 and 2004, they found teaching staff levels and overall expenditures increased independently of changes in enrollment.

During that time period, school enrollments statewide were essentially flat, while employment of full time equivalent (FTE) teaching staff increased by eight percent, and total school expenditures grew by 28.6 percent.

Some school districts studied had costs rise significantly even while their enrollment declined. There are clear fiscal pressures on municipalities due to educational costs, but there is no evidence that student enrollment growth is the cause of the budgetary problems.

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THE WANING INFLUENCE OF HOUSING PRODUCTION ON PUBLIC SCHOOL ENROLLMENT IN MASSACHUSETTS

AN MAPC RESEARCH BRIEF
OCTOBER 2017

MAPC
METROPOLITAN AREA PLANNING COUNCIL

THE WANING INFLUENCE OF HOUSING PRODUCTION ON PUBLIC SCHOOL ENROLLMENT IN MASSACHUSETTS

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ABOUT MAPC

The Metropolitan Area Planning Council (MAPC) is a regional planning agency serving the people who live and work in the 101 cities and towns of Metropolitan Boston. Our mission is to promote smart growth and regional collaboration.

Our regional plan, MetroFuture, guides our work as we engage the public in responsible stewardship of our region's future. We work toward sound municipal management, sustainable land use, protection of natural resources, efficient and affordable transportation, a diverse housing stock, public safety, economic development, clean energy, healthy communities, an informed public, and equity and opportunity among people of all backgrounds.

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October 2017

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Ryan Stanton

THE WANING INFLUENCE OF HOUSING PRODUCTION ON PUBLIC SCHOOL ENROLLMENT IN MASSACHUSETTS

One of the most widespread worries about new housing development, especially in suburban communities, is that it will drive up school enrollment. Many local officials and residents assume that new housing, and especially new multifamily housing, will attract families - families with children who will inevitably increase enrollment in the local public schools - creating additional education costs outweighing any new revenue the housing generates.

These apprehensions are rooted in the demographic and development patterns of the late 20th century, when Baby Boomers were in their prime child-rearing years. Their residential choices caused housing stock, enrollment, and school expenditures to grow quickly in many suburbs. Many communities even considered limiting housing development in hopes of curbing school budget increases and the need for more tax revenue.

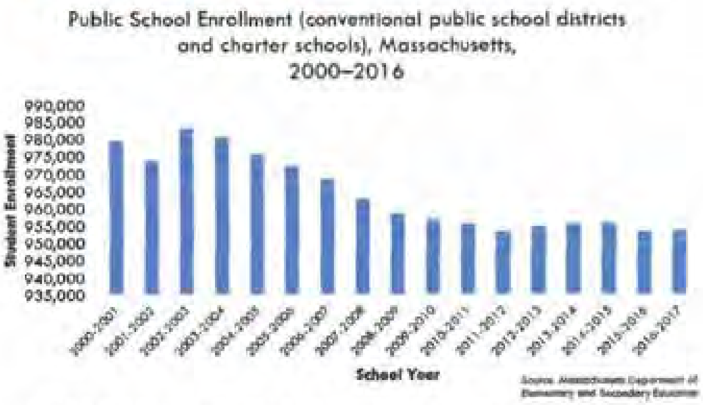
Over the past 15 years, however, multiple studies[1] have examined the enrollment and fiscal impacts of individual housing developments and found that concerns about those impacts are commonly overstated. To complement this work, MAPC examined housing permit and enrollment trends across 234 public school districts over the past 6 years, from 2010 to 2016, inclusive.[2]

We find that the conventional wisdom that links housing production with inevitable enrollment growth no longer holds true. At the district level, we observe no meaningful correlation between housing production rates and enrollment growth over a six-year period. While it is true that schoolchildren occupying new housing units may cause a marginal change in enrollment, they are one small factor among many. In cities and town with the most rapid housing production, enrollment barely budged; and most districts with the largest student increases saw very little housing unit change. The rate of housing unit growth is not a useful predictor of overall enrollment change, nor is rapid housing development a precondition to sudden enrollment increases. It appears that broad demographic trends, parental preferences, and housing availability now play a much larger role in enrollment growth and decline. Our findings raise important issues related to capital planning, education finance, and housing incentive programs.

STATEWIDE ENROLLMENT IS ON A STEADY DECLINE

Over the past 15 years, the patterns of housing growth and enrollment have changed substantially. The state's public school enrollment (including local and regional districts, as well as charter schools) peaked in 2002 and has been declining ever since, now standing at about 3% lower than 14 years ago. The enrollment decline in "conventional" districts (municipal and regional districts) has been somewhat faster, accelerated by a growing enrollment in charters (which now educate 4.5% of the state's pupils, compared to 3.0% in 2011), but at the statewide level, growing charter enrollment explains only about one-third of the decline in local and regional districts. None of the decline in statewide public school enrollment can be attributed to a net shift to private schools, which saw a 20% decline in enrollment over the same period. This decline in the number of school-age children is an expected result of sweeping demographic changes affecting the region. The Baby Boomers are now aging out of their prime child-bearing years, and younger generations are having fewer children, later in life. As a result of these persistent demographic trends, MAPC projects that the number of school-age children (ages 5-19) in Metro Boston will decline by 8% from 2010 to 2040, even as the total population grows by 13%, according to MAPC's population projections. In other words, the "new normal" for statewide school enrollment is likely one of long-term enrollment contraction as a result of slow growth and demographic factors.

FIGURE 1: PUBLIC SCHOOL ENROLLMENT IN MASSACHUSETTS, 2000-1016



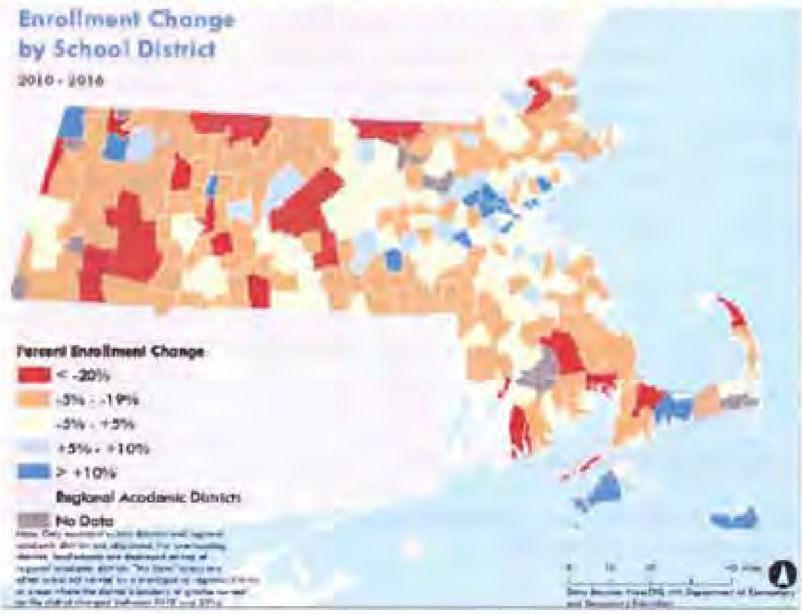
Source: Massachusetts Department of Elementary and Secondary Education

[1] Housing the Commonwealth's School-Age Children: The Implications Of Multi-Family Housing Development for Municipal and School Expenditures, 2003, Community Opportunities Group, Inc. & Connery Associates; Citizens' Planning and Housing Association ([illegible]) and The Costs And Hidden Benefits Of New Housing Development In Massachusetts, Michael Goodman, [illegible], and Jason Wright, PPC Working Paper No. 02 March, 2016 ([illegible])
[2] [illegible]

URBAN DISTRICTS GROWING WHILE SUBURBS ARE CONTRACTING

Figure 2 is a map of enrollment change by school district. From this map it's clear that enrollment declined across vast swaths of the state. In fact, 159 out of 234 local school districts saw enrollment declines over the 6-year period. Also, 43 out of 51 regional academic districts saw declines in enrollment between 2010 and 2016.[3]

FIGURE 2: MAP OF ENROLLMENT CHANGE BY SCHOOL DISTRICT



Nor were these modest declines. In the MAPC region, districts with declining enrollment saw drops averaging 8%, and more than a dozen districts saw drops of 11% or more. Meanwhile, growing districts saw fairly sizeable growth (7% on average in the MAPC region) and a dozen local districts grew by more than 10%, adding an average of 826 students per district. This creates an interesting and significant dichotomy that bears further study, and that policy makers must take into account, since most districts are losing students fairly quickly, while at the same time some districts are growing rapidly. The overall patterns of enrollment change don't fit the narrative of suburban districts bursting at the seams while urban districts are on the decline. In fact, high rates of enrollment growth were more common in urban communities, while most suburbs saw declining enrollment.

Figure 3 shows average enrollment change as organized by MAPC's Community Types, a classification system that groups municipalities on the basis of demographic and land use characteristics. Districts in the highly urbanized Inner Core saw average enrollment growth rates of 8%, while the typical Regional Urban Center district saw little change. Conversely, both suburban Community Types (Maturing Suburbs and Developing Suburbs) averaged negative enrollment change, with the lower-density Developing Suburbs experiencing the sharpest declines in schoolchildren.[4]

In other words, the region's urban school districts are educating an increasing share of the region's schoolchildren, and the number of suburban pupils is rapidly declining.

FIGURE 3: ENROLLMENT CHANGE BY COMMUNITY TYPE, MAPC REGION

Community Type	Average Enrollment Change, 2010–2016	Number of Districts	Example Districts
Inner Core	7%	16	Boston, Cambridge, Revere, Chelsea, Melrose, Arlington, Watertown, Milton
Regional Urban Centers	-1%	11	Lynn, Salem, Framingham, Quincy
Maturing Suburbs	-3%	43	Saugus, Lexington, Acton, Natick, Braintree
Developing Suburbs	-7%	23	Ipswich, Bolton, Holliston, Franklin, Norwell
All Districts	**-2%**	93	

In other words, the region's urban school districts are educating an increasing share of the region's schoolchildren, and the number of suburban pupils is rapidly declining.

[3] We excluded all regional academic districts that changed the area or grades they serve between these two years and excluded any schools that did not exist at both time points.
[4] A fifth Community Type, Rural Towns, is not represented in the MAPC region.

HOUSING PRODUCTION RATES

Of course, we don't expect enrollment to decline equally everywhere. Even as demographic patterns shift regionally, one would assume that rates of housing production would retain some influence on enrollment. We all know the Baby Boomers are getting older, but more housing still means more students, right? Not necessarily. MAPC tracked housing permit issuance and enrollment data for 234 public local school districts in Massachusetts.[5] We found that most school districts lost students over the last six years, and rates of housing production had no significant correlation with the rate of enrollment change.

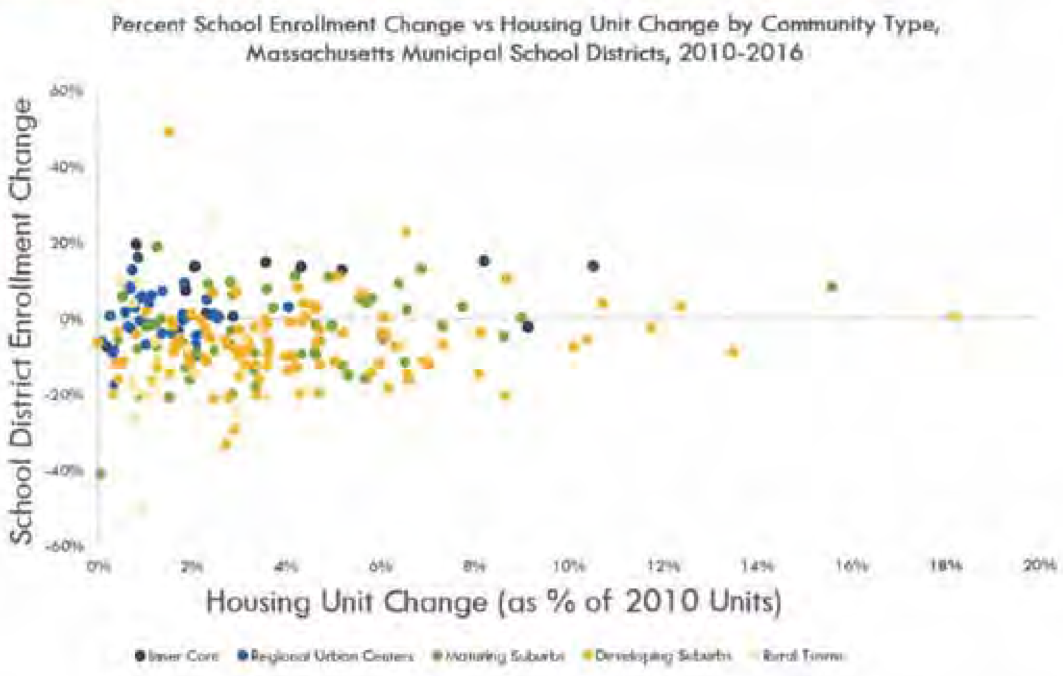
Figure 4 depicts housing unit growth and enrollment change since 2010, and demonstrates a clear lack of correlation between the two. If these two outcomes were correlated, the data points on the chart would trend upward and to the right, so that districts with higher housing unit change would see higher enrollment growth, and vice versa. This association is clearly absent. The district with the most rapid housing unit growth (Hopkinton, at 18%), saw almost no change in enrollment (increase of 0.23%), and the dozen fastest-growing districts (from a housing perspective) saw enrollment growth of only 1%, on average. Meanwhile, those districts with very low rates of housing growth were highly scattered in thei

We examined the 12 fastest-growing MAPC-region districts, which grew by an average of 14% over a six-year period, and found striking results.

In these 12 rapidly growing districts, as with the region overall, housing production rates show no significant correlation with enrollment.[6] Only Natick, Everett, and Chelsea added more than 5% new units, a far lower jump than their enrollment rates. Meanwhile, the fastest growing district, Revere, reported less than 1% housing unit growth, and saw a 20% increase in enrollment. These findings suggest that rapid housing unit growth is neither a predictor, nor a precondition, of net enrollment change. Whether or not much housing is being built, families are moving to these districts and adding their children to the public school rosters.

If not housing units, then what can explain the rapid enrollment growth in some districts, and what does this tell us about capital planning and education finance?

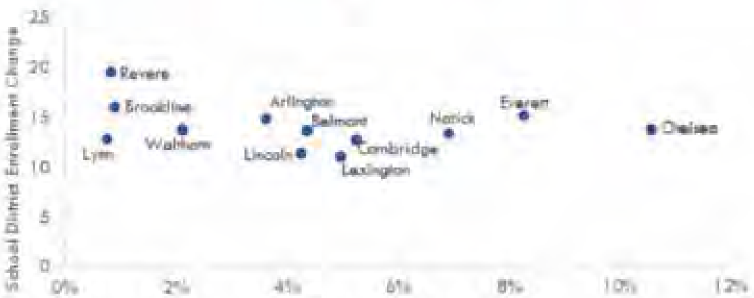
FIGURE 4: HOUSING PRODUCTION RATES AND ENROLLMENT CHANGE, BY DISTRICT



[5] We did not aggregate data for regional districts composed of multiple permit-issuing jurisdictions
[6] It should be noted that Chelsea and Arlington are inconsistent reporters to the Census Bureau building permit survey, providing permit data for fewer than half the months in the study period. However, the Census Bureau's use of imputed data for non-reported months helps to mitigate this lack of response.

FIGURE 5: HOUSING PRODUCTION RATES AND ENROLLMENT CHANGE, BY DISTRICT, 12 FASTEST-GROWING MAPC DISTRICTS

Twelve Fastest-Growing Districts, MAPC Region
Percent School Enrollment Change Vs. Housing Unit Change, 2010–2016



As a first step to explaining rapid enrollment growth in these districts, we found that they fall into two distinct clusters. Seven districts (Arlington, Belmont, Brookline, Cambridge, Lexington, Lincoln, and Natick) could be characterized as highly desirable from an educational perspective, with high standardized test scores relative to the rest of the region. They have an average 75% proficiency rating on the 2013 3rd grade English Language Arts (ELA) MCAS[7], markedly higher than the 67% region-wide average proficiency rate. These districts are also correspondingly expensive, with a 2016 median home sale value of $815,000, almost twice as much as the MAPC regional median sale value of $455,000. With a few exceptions, they are also highly accessible to employment both in Boston and along Route 128, and they feature compact neighborhoods and vibrant, walkable downtowns that are increasingly attractive to some younger families. The other fast-growing districts (Revere, Everett, Chelsea, Lynn, and Waltham) are in diverse, lower-income, and generally more urbanized communities. These districts also exhibit lower test scores, averaging 41% proficient on the same 2013 ELA 3rd grade MCAS, well below the region-wide average proficiency. They are also much more affordable, with 2016 median sale prices of only $360,000, or 20% less than the regional median.

Troublingly, these results are consistent with existing theories about how educational segregation worsens over time. National studies[8] have found that when comparing across school districts, income segregation of families with children worsened by 15% over a 20-year period leading up to 2010, driven in large part by self-selection of wealthy families into high-income districts.[9] We speculate that wealthier families pursuing high-ranking schools may be bidding up housing prices in a limited number of attractive and accessible districts, with cascading results: these municipalities become less accessible to middle- and low-income families; rising prices may induce more Baby Boomers to sell their existing units and leave town, thereby freeing up even more units for young families; and higher socioeconomic status of the school-age population contributes to higher standardized test scores, making the district even more attractive and reinforcing the cycle, without a single new housing unit being built.

Meanwhile, districts with a high number of low-income, immigrant, and English-language learner students are also more likely to have lower standardized test scores, making them less attractive to wealthy families. These cities remain relatively affordable, and may provide the only viable options for low- and moderate-income families priced out of many other places, contributing to a rapidly growing number of students. The combination of rapidly growing enrollment, a high concentration of disadvantaged students, and limited fiscal capacity due to relatively low property values make it particularly challenging for these districts to provide sufficient resources and ensure positive educational outcomes for all students.

SUBURBAN ENROLLMENT DECLINES BRING THEIR OWN CHALLENGES

As described above, the vast majority of suburban communities are seeing sustained declines in enrollment. Even in communities where substantial housing construction has occurred, the corresponding growth in households and children has not generally been sufficient to offset the natural demographic decline in school-age residents associated with the aging of the children of Baby Boomers.

If Baby Boomers choose to age in place, as a result of personal preferences, lack of attractive alternatives, or financial reasons, then those suburban communities will see fewer new households and continued declines in enrollment.

[7] Massachusetts Comprehensive Assessment System
[8] Owens, A., Reardon, S.F., & Jencks, C. (2016). *Income Segregation between Schools and School Districts* (CEPA Working Paper No.16-04). Retrieved from Stanford Center for Education Policy Analysis: http://cepa.stanford.edu/wp16-04
[9] Owens, A. (2016). *Inequality in Children's Contexts: The Economic Segregation of Households with and Without Children. American Sociological Review*, 81(3), 549–574.

While this may sound like music to the ears of local officials who are concerned about municipal finances, the lack of new housing and new households means that municipal tax rolls will become increasingly dependent on aging and retired Baby Boomers. Furthermore, sustained enrollment declines have negative repercussions as well. Many school expenditures are highly inelastic with regard to enrollment, so as enrollment goes down, per-pupil costs are likely to rise.[10] Declining enrollment may also result in less return on investment for capital improvements if recently-constructed facilities become rapidly underutilized. Excess capacity may become a drain on the system, suggesting that districts facing sustained decline need to develop flexible long-term plans for "right-sizing" their facilities and administration, or for combining their systems with those of neighboring communities.

CONCLUSIONS

This analysis provides additional evidence countering misconceptions regarding the patterns of enrollment growth across the region and their relationship to housing production. We observe that, consistent with MAPC's demographic projections, the state has entered a period of long-term decline in school-age population. Some districts are growing quite rapidly and are facing significant funding and capacity challenges, but this growth cannot be attributed only to new housing units. We found no relationship between housing production rates and enrollment growth rates for the 234 districts we studied.

We acknowledge that there are limitations to this analysis: we were not able to analyze charter school enrollment at the district level; building permits are an incomplete picture of housing production; and the lag between production and enrollment may be longer than analyzed here. We intend to continue this analysis with further research into the characteristics of new students, the volume of housing turnover, and the type of housing being produced across districts. Nevertheless, the results described here indicate clear and substantial conclusions relevant to state and local policy:

The permits don't produce the pupils.
These findings demonstrate that the fiscal impact of new residential development cannot be estimated without a full understanding of district demographics and school capacity. While it's true that some students may be housed in new units, the enrollment effect of these students is dwarfed by larger demographic factors driving declines in school age children and parental location preference. As it turns out, the presence of students living in new homes may actually help to mitigate what would otherwise be rapid and disruptive declines in enrollment in many communities, while in other communities, new housing may add students to a much lesser degree than is commonly supposed. Municipalities should take heart in this additional piece of evidence that under most conditions, additional housing, even "family" housing, can be accommodated without driving enrollment through the roof.

School cost reimbursement might not break the bank.
The Commonwealth currently offers a limited school cost reimbursement program tied to certain types of housing developments.[11] There have been calls to expand this "hold harmless" incentive to other types of housing developments. The cost of such a program might be less than assumed. Prior research[12] has shown that the marginal cost of each new student depends in large part on whether the district has available capacity in its physical plant and staff. As shown here, most districts across the state are experiencing declining enrollment and are likely to have excess capacity. Therefore, a program that a) specifically incentivizes multifamily housing and b) focuses on the marginal cost of each new student might require relatively little subsidy to reimburse municipalities for education costs that exceed the property tax generated by new housing.

[10] For example, statewide public school expenditures on benefits and fixed charges (including employee and retiree insurance), which make up 17% of all public school expenditures, increased 9% from 2012 to 2016, but as a result of declining statewide enrollment the per-pupil cost increased at the faster rate of 11%. (Source: MAPC analysis of FY12–FY16 Per-Pupil Expenditures published by MA Department of Elementary and Secondary Education at http://www.doe.mass.edu/finance/statistics/ppx12-16.html)

[11] http://www.mass.gov/hed/community/planning/chapter-40-s.html

[12] The Costs And Hidden Benefits Of New Housing Development In Massachusetts Michael Goodman, Elise Korejwa, and Jason Wright; PPC Working Paper No. 02 March, 2016 http://publicpolicycenter.org/wp/wp-content/uploads/2016/03/GoodmanKorejwaWright_TheCostsBenefitsOfNewHousingDevelopment.pdf. That study found that in districts with excess capacity, the marginal cost of each new student is only 0.65 times the district-wide per pupil expenditures.

Chapter 70 Education Aid should adapt to the new normal.

In a cruel irony, those dense and diverse urban districts seeing rapid enrollment increases are also struggling with recent decreases in state aid that have resulted from a change in the way socioeconomic status is calculated. Recently, the state switched from using a free-lunch eligibility measure based on parent-reported income to using one based on tax and administrative records for public assistance programs.[13] In districts with large numbers of foreign-born residents, both documented and not, who are ineligible for public assistance, this has resulted in substantial declines in apparent economic disadvantage, and corresponding decreases in state aid. Our findings regarding the rapid enrollment growth in these same communities underscore the need to correct this deficiency in the Chapter 70 funding and work toward a system that better accounts for the needs and fiscal capacity of each district, while also recognizing the unique challenges faced by rapidly growing districts of all types.

Is it time to talk regionalization again?

Over the years, Commonwealth support for district consolidation and regionalization has ebbed and flowed; at this time, the incentives for regionalization are relatively weak. However, other factors such as excess capacity and growing fixed costs may prompt some districts to consider this option anew. Given the considerable efficiencies that may be achieved with a well-designed consolidation, the Commonwealth should evaluate how it can provide additional incentives and assistance for districts seeking to deliver more cost effective education to a steadily declining resident school-age population.

[13] http://www.doe.mass.edu/infoservices/data/ed.html

TECHNICAL NOTE:

This analysis examined 234 municipalities that maintained municipal school districts between the 2010–2011 and 2016–2017 school years (referred to as 2010 and 2016, respectively) according to the Department of Elementary and Secondary Education. This analysis does not include regional districts, charter schools, vocational schools, or municipalities/districts where the boundaries or grades served changed over the study period.

Housing-unit production growth in the 234 municipalities we examined was measured using the total number of units reported by the municipality to the Census Building Permit Survey from 2010–2016, as a percentage of 2010 housing stock (2010 Census). It must be acknowledged that building permits are an imperfect measure of actual housing unit growth. The Census Building Permit Survey excludes certain forms of housing unit creation, such as adaptive reuse of existing buildings. Issuance of a building permit is no guarantee of unit production, since construction may be halted due to financial reasons at any time. The worst limitation may be the result of incomplete reporting: numerous municipalities—including some that are known to be experiencing robust housing growth—fail to report building permits to the Census Bureau. In 2016, 47 of 234 municipalities did not provide any building permit reports. Fortunately, the Census Bureau does estimate permits for non-reporters based on prior years, which helps to mitigate the effect of these data gaps. Future research in this area should seek to exclude non-reporters or supplement the available data.

The permit data include the calendar years from 2010 to 2016, inclusive, while the enrollment data is based on school years from 2010 to 2016. Therefore, there is effectively a 9 month lag between permit issuance and enrollment counts. We tested the effect of using a longer lag period (21 months), which also revealed no correlation between housing permits and enrollment.

HOMECONNECTICUT
For Our Economy, Our Families, Our Future
a campaign of the Partnership for Strong Communities

Municipal Officials Assess Mixed-Income Housing

South Commons, Kent

"I was a teacher in town when South Commons was being built. I, and many colleagues, were concerned about the residential element this new complex might bring. Within a year it became clear that **our fears were unjustified**. The new students were bright, made friends quickly and became an integral part of their classes. When Stuart Farms Apartments opened, it too filled quickly with a nice blend of locals and newcomers. **We are lucky to have these additions to Kent**."

Bruce K. Adams
First Selectman, Town of Kent

"**Students coming from South Commons are certainly not a burden on our school system.** Families with children having trouble finding housing they can afford has been a significant factor in our declining school enrollment. **Our schools will thrive if students, teachers and staff can afford to live here.**"

Patricia Chamberlain
Superintendent, Region 1 Public School District

Old Farms Crossing - Avon

"We have brand new housing developments in Avon selling for $400,000 to $600,000, I don't think anywhere near as attractive as this Old Farms Crossing. **There's a need for affordable housing, and this is filling part of that void.** We could use more."

Richard Hines
Former Chair, Avon Town Council

"In comparison to other areas within the town, the calls for service to the Old Farms Crossing complex are at or below average. Essentially, **Old Farms Crossing is similar to anywhere else in town.**"

Lieutenant Christina Barrows
Patrol Division Commander, Avon Police Depart-

Local Officials Assess Mixed-Income Housing

Clock Hill Condominiums - Darien

"Most people don't realize it's affordable housing. Its location is ideal - just a block away from the train station so people can easily get to work without driving, and it's within walking distance of restaurants, shops and other retail.

We all know housing in Fairfield County is expensive and **Clock Hill offers an opportunity for people who work in the area,** but may not have the income to support purchasing a market rate home in Darien, to live closer to their job and to transportation."

Evonne Klein
Former First Selectman, Town of Darien

"The presence of affordable housing in Darien has not impacted calls for police services."

Chief of Police Duane J. Lovello
Darien Police Dept.

Flagg Road, West Hartford

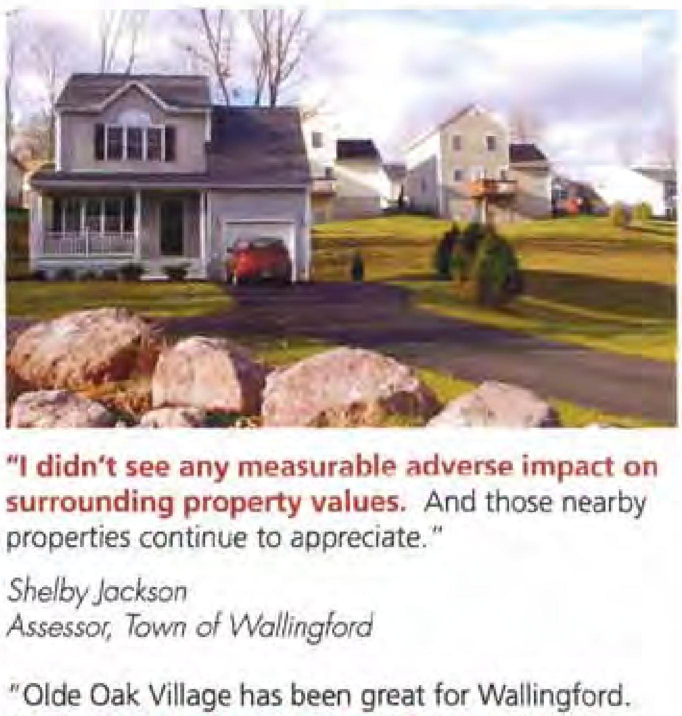
"The beauty of the Flagg Road development is that it blends in with the surrounding neighborhood. Town residents are almost uniformly surprised to learn it's 'affordable housing.' I've never heard of any decline in nearby property values. There's really no problem here, only benefits."

Scott Slifka
Mayor, Town of West Hartford

"We really haven't had a problem here."

James Strillacci
Chief of Police, West Hartford

Olde Oak Village, Wallingford



"I didn't see any measurable adverse impact on surrounding property values. And those nearby properties continue to appreciate."

Shelby Jackson
Assessor, Town of Wallingford

"Olde Oak Village has been great for Wallingford. **It allows us to house many of the middle-class workers that our local economy relies on,** even while housing costs in the region have been rising. These homes are attractive and well-maintained, and the people living there are great neighbors."

William W. Dickinson, Jr.
Mayor, Town of Wallingford

Photos of Affordable Housing From Across the Country

Business and Professional People for the Public Interest

What Affordable Housing Looks Like

Lincoln, Massachusetts

Business and Professional People for the Public Interest

What Affordable Housing Looks Like

Boulder, Colorado

What Affordable Housing Looks Like

Wilmette, Illinois

What Affordable Housing Looks Like

St. Paul, Minnesota

What Affordable Housing Looks Like

Montgomery County, Maryland

What Affordable Housing Looks Like

Longmont, Colorado

What Affordable Housing Looks Like

Andover, Massachusetts

What Affordable Housing Looks Like

Montgomery County, Maryland

Business and Professional People for the Public Interest

What Affordable Housing Looks Like

Chicago, Illinois

What Affordable Housing Looks Like

Fairfax County, Virginia

What Affordable Housing Looks Like

Denver, Colorado

What Affordable Housing Looks Like

Andover, Massachusetts

What Affordable Housing Looks Like

Denver, Colorado

What Affordable Housing Looks Like

Lincoln, Massachusetts

What Affordable Housing Looks Like

Highland Park, Illinois

What Affordable Housing Looks Like

Lincoln, Massachusetts

What Affordable Housing Looks Like

Boulder, Colorado

What Affordable Housing Looks Like

St. Paul, Minnesota

What Affordable Housing Looks Like

Denver, Colorado

What Affordable Housing Looks Like

Aurora, Illinois

What Affordable Housing Looks Like

Boulder, Colorado

What Affordable Housing Looks Like

Highland Park, Illinois

What Affordable Housing Looks Like

Chicago, Illinois

What Affordable Housing Looks Like

Newton, Massachusetts

What Affordable Housing Looks Like

Longmont, Colorado

What Affordable Housing Looks Like

St. Paul, Minnesota

What Affordable Housing Looks Like

Fairfax County, Virginia

What Affordable Housing Looks Like

Montgomery County, Maryland

What Affordable Housing Looks Like

Newton, Massachusetts

What Affordable Housing Looks Like

Montgomery County, Maryland

What Affordable Housing Looks Like

Weston, Massachusetts

Business and Professional People for the Public Interest

What Affordable Housing Looks Like

Longmont, Colorado

What Affordable Housing Looks Like

Newton, Massachusetts

What Affordable Housing Looks Like

Glendale Heights, Illinois

What Affordable Housing Looks Like

Montgomery County, Maryland

What Affordable Housing Looks Like

Chapel Hill, North Carolina

What Affordable Housing Looks Like

Newton, Massachusetts

TAB 21

HINCKLEY ALLEN

20 Church Street
Hartford, CT 06103-1221
p: 860-725-6200 f: 860-278-3802
hinckleyallen.com

Timothy S. Hollister
(860) 331-2823 (Direct)
(860) 558-1512 (Cell)
thollister@hinckleyallen.com

September 15, 2021

VIA EMAIL

Larry Baril, Town Engineer
Town of Avon
Avon Town Hall
60 West Main Street
Avon, CT 06001

Re: Sanitary Sewer Capacity Confirmation, 20 Security Drive

Dear Mr. Baril:

This letter is the response of Beacon Communities Development LLC to the Avon Water Pollution Control Authority's September 9, 2021 conditional approval of sewer capacity for the redevelopment of building 20 Security Drive to multi-family residential apartments. The WPCA requested Beacon's written agreement for your review and acceptance, of the approval conditions stated in the September 9 motion.

Beacon agrees as follows:

1. Beacon will contract with Fuss & O'Neill, at Beacon's expense, for a downstream capacity study, and will provide the results to your office. Fuss & O'Neill's confirmation of available capacity will confirm WPCA approval of the capacity requested for 176 one and two bedroom residential apartments.

2. Beacon agrees to direct its development team to use water saving/low flow fixtures for the redeveloped office building and the new residential structure to the maximum extent possible, and will confirm this in writing to the WPCA.

3. Beacon agrees to work with the WPCA to review and analyze the impact, if any, of Beacon's redevelopment plan on Avon's allocation of sewer capacity by the Town of Simsbury, including any purchase of additional capacity. This agreement is not a commitment to any type or amount of payment, but a pledge to cooperate in consideration of this potential issue.

Beacon will accept the above as approval conditions of the WPCA's September 9, 2021 motion to approve sewer capacity for 176 residential apartments.

Apart from this agreement, Beacon is obligated to express its concern about the use of 210 gallons per day, which is the standard for a single-family home, as the expected sewer discharge from Beacon's proposed one and two bedroom apartments, which can reasonably be expected to be less than 210 gallons per day.

Thank you for your assistance.

Very truly yours,

Timothy S. Hollister

TSH:kcs
Attachments

cc: Gina Martinez, Beacon
Thomas Knowlton, P.E., SLR Consulting
Tom Daly, P.E., SLR Consulting
Andrew Stebbins, ATA

TAB 22

Public Water Supply Watershed or Aquifer Area
Project Notification Form

Requirement:
All applicants before a municipal Zoning Commission, Planning and Zoning Commission, Zoning Board of Appeals, or Inland Wetlands Agency for any project located within a public water supply aquifer or watershed area are required by Section 8-3i and Sec. 22a-42 of the CT General Statutes to notify Connecticut Water Company of the proposed project by certified mail not later than 7 days after the date of the application. The notice should be sent to: Jessica Demar, Environmental & Regulatory Compliance Coordinator, Connecticut Water Company, 93 West Main Street, Clinton, CT 06413 by Certified Mail, Return Receipt.

General Information:

1. Location map of the project site (please show enough information to locate site).
2. Site plans, including soil erosion and sediment control plan, which have been submitted to the town commission for review.
3. Project address 20 Security Drive, Avon, CT
4. Total acreage of project site 16.73 acres
5. Existing land use Office building and parking garage
6. Description of proposed project The project is a proposed multifamily residential development, which consists of converting an existing office building to apartments, and the construction of a new apartment building, creating a total of 176 units. Although the project site falls within the Aquifer Protection Area, none of the proposed development falls within the zone.
7. Acreage of area to be disturbed including structures, additions, paving, and soil disturbance
   7.5 acres
8. Type of sanitary system (circle one): septic system / public sewer / none
9. Number of **existing or proposed** floor drains and their point of discharge e.g. sanitary sewer, holding tank, or ground Unknown
10. Water accessed by (circle one): private well / public water / none
    If other, please specify

11. Distance of site disturbance to nearest watercourse or wetland

+/- 155 feet to on-site wetlands

12. Brief description of **existing and proposed** stormwater management system, including roof drainage, paved areas etc., and discharge points e.g. municipal sewers, drywells, streams, vegetated areas, detention basins etc.

The entire site (including the proposed building and paved areas) will be collected in

the proposed stormwater system, which is collected in an underground detention system,

and eventually discharges to the proposed wetlands on site.

13. Type of heat for facility Natural Gas

14. List of **existing and proposed** underground or above-ground storage tanks including age, capacity and contents

No known existing storage tanks on site. None are proposed.

15. List of potentially harmful chemicals stored or used on property (**existing and proposed**) and typical onsite volumes, including but not limited to petroleum products, lubricants, solvents, detergents and pesticides

No known harmful chemicals are stored or used on site.

16. Describe any wastes generated and their means of disposal

Sewage waste will discharge into the public sewage system.

Solid waste will be collected in on-site dumpsters and picked up in trash trucks.

17. Date application will be heard by Planning and Zoning Commission

18. Date application will be heard by Zoning Board of Appeals

19. Date application will be heard by Inland Wetlands Commission

20. Name, address and telephone number of contact person for the project:

Tom Daly, SLR Consultants
99 Realty Drive, Cheshire, CT 06410
(203) 271-1773

Name of person completing form Signature Date

20 Security Drive, Avon, CT

9/1/2021 9:51:34 AM

Scale: 1"=500'
Scale is approximate

The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.

TAB 23

THOMAS J. DALY, PE

US Manager of Civil & Structural Engineering

YEARS OF EXPERIENCE

- 27 With This Firm
- 4 With Other Firms

EDUCATION

- BS, Civil Engineering
  Villanova University

TECHNICAL REGISTRATIONS

- Professional Engineer - CT

AFFILIATIONS

- Villanova Engineering Alumni Association
- Connecticut Developers Council
- MDC Citizens Advisory Committee for the Clean Water Project (2009-2013)

Mr. Daly is the US Manager of Civil & Structural Engineering and specializes in working with project architects on the planning, design, and construction of projects including educational and private clients. His project experience also involves the development of LEED certified buildings and green design approaches to site development. In addition, he assists architects and developers in guiding projects through the local and state land use approval process.

SELECTED PROJECT EXPERIENCE

- **Campus at Greenhill | Wallingford, CT**
  Project Manager providing site engineering design services for a 300,000-square-foot commercial office building in Wallingford. Specific project tasks included the design of an extensive stormwater management system that involved low impact development design principles. Responsible for the layout, grading, utilities and landscaping design of all the site work, including the parking lots, patios, and gathering areas. The design team guided the project through the local approval process and worked to finalize the State of Connecticut's traffic permit. Assisted in the preparation of the documentation required for the project to receive LEED certification from the U.S. Green Building Council. Responding to the contractors request for information.

- **Whitney Center | Hamden, CT**
  Served as Project Manager for the planning and design of improvements to an existing lifecare center building which is approximately 25 years old. The improvements include 97 new independent living units, 32 new assisted living units, 24 new healthcare beds, 24 units with dementia/memory support beds, and a new Alzheimer's wing. Responsible for site planning and design (including on-site sanitary and storm sewers), stormwater management areas, water distribution lines, and access roadways.

- **80 Elm Street | New Haven, CT**
  Served as Project Manager and provided engineering services for a proposed select service hotel. The proposed project consists of the construction of a six-story building and the demolition of the existing bank structure. Work included the design of utilities and stormwater management system.

- **Downtown Bristol Revitalization | Bristol, CT**
  Project Manager for the development of improvements to the former Bristol Centre Mall site. The goal of the project is to determine development methods for the Centre Square site and identify options that improves the city's ability to facilitate such a development. The project included the design of a new city road with streetscape improvements and public amenities.

SLR

THOMAS A. KNOWLTON, PE

Principal Water & Wastewater Engineer

YEARS OF EXPERIENCE

- 9 With This Firm
- 14 With Other Firms

EDUCATION

- BS, Civil Engineering
- University of New Mexico

TECHNICAL REGISTRATIONS

- Professional Engineer - CT, NM
- OSHA 10-Hour Training
- Certification of Training in Asset Management from Buried Asset Management Institute - International and IUPUI Purdue School of Engineering and Technology
- PSMJ's Project Management Boot Camp
- Confined Space Training and Certification - National Utility Contractor's Association
- Water Distribution Design and Modeling Master Training
- Nuclear Testing Equipment Certification

Thomas Knowlton brings over 20 years of field and office experience in the project management, planning, design, and construction administration for water and wastewater projects. He has experience in design-bid-build projects of all sizes and has an in-depth understanding of water and wastewater pump stations, rehabilitation of pipelines for both water and sewer systems, and water storage tanks. He has experience in private, municipal, and federal projects including multiple military installations that required background checks and security clearance.

SELECTED PROJECT EXPERIENCE

- **Orange Transit Oriented Development (Metro-North Railroad) | Orange, CT**
  Performed sewer flow estimate for WPCA approval of new station and mixed-use development on 20 acres adjacent to existing rail.

- **The Outlets at Cheshire | Cheshire, CT**
  Designed water and sewer for commercial development. Obtained WPCA capacity approval.

- **Hampton Woods | East Hampton, CT**
  Designed all new water and sewer system for 235-home residential development.

- **Yale University | New Haven, CT**
  Project Manager that performed field investigation and provided recommendations for basement flooding.

- **Cafeteria Project | Danbury, CT**
  Design of new 5,000 gallon buried grease interceptor and connection to existing town sewer in accordance with the City of Danbury requirements to facilitate a kitchen upgrade and expansion project. The design consisted of two buried 2,500 gallon fiberglass reinforced plastic tanks manufactured by Proceptor, which included an effluent filter to meet the town's water quality requirements. The design also included a driveway turnout and retaining wall to allow ample access for ease of maintenance and periodic pumping of the tanks.

- **University of Connecticut Storrs Road Pump Station | Storrs, CT**
  Conducted a sewer system condition assessment and provided the design of upgrades including rehabilitation of lift stations, force mains, and gravity sewer lines. A combination of pipeline rehabilitation techniques were utilized including CIPP, pipe bursting, and dig and replace.

SLR

DAVID G. SULLIVAN, PE

US Manager of Traffic & Transportation Planning

YEARS OF EXPERIENCE

- 33 With This Firm
- 5 With Other Firms

EDUCATION

- BS, Civil Engineering
  University of Connecticut

TECHNICAL REGISTRATIONS

- Professional Engineer - CT

AFFILIATIONS

- Institute of Transportation Engineers
- American Society of Civil Engineers

As US Manager of Traffic & Transportation Planning, Mr. Sullivan has supervised numerous traffic engineering and transportation planning studies and improvement plans for new developments, corridors, and campus settings. Integral to these efforts were multimodal evaluations and complete streets solutions. He has also supervised countless traffic impact studies for a variety of uses, including educational facilities, industrial plants, superblocks, shopping centers, residential developments, and office/business parks. Mr. Sullivan has significant experience related to parking studies. This includes evaluation of multiple facilities within town/city centers; individual multiuse projects where shared parking demand by users was evaluated; and operational evaluation of various parking strategies and on-street dynamic parking studies.

SELECTED PROJECT EXPERIENCE

- **Harbor Point and Yale & Towne Development | Stamford, CT**
  Provided traffic engineering and transportation planning services for this Transportation Oriented Development. The project is one of the largest development projects on the U.S. East Coast and includes 6 million square feet of mixed-use development: 85 percent residential (4,000 residential units); 15 percent commercial including office buildings, a grocery store, a waterfront hotel, restaurants, and a full-service marina; more than 11 acres of parks and public space; a community school; and publicly accessible waterfront access. Specific traffic engineering and transportation planning tasks for this $3.5 billion project have included traffic counts, analysis, recommendations, and traffic signal design.

- **Milford Police Station, US Route 1 | Milford, CT**
  Managed the traffic engineering components of the plan to relocate the City of Milford's Police Headquarters to a new location on US Route 1. Worked closely with the project architect evaluating access requirements, considering security needs, public access, maintenance, and emergency response.

- **Tresser Square | Stamford, CT**
  A multifaceted study of the redevelopment of an entire city block in the central business district of Stamford. Significant off-site improvements, revised lane use, increased capacity, and new and revised signalization were some of the recommendations to accommodate the traffic associated with the 850 new residential units and approximately 150,000 square feet of new commercial space.

- **Chapel & Olive Mixed Use Development | New Haven, CT**
  Provided traffic engineering services for 6-story residential/ retail development located in New Haven's historic Wooster Square neighborhood. The project includes covered parking, retail uses, a landscaped courtyard and other amenities, and 232 dwelling units.

SLR

PETER SHEA, LEP

Senior Environmental Scientist

YEARS OF EXPERIENCE

- 12 With This Firm
- 9 With Other Firms

EDUCATION

- BS, Environmental Science Eastern Connecticut State University

TECHNICAL REGISTRATIONS

- Licensed Environmental Professional - CT
- Soil Science Certification
- OSHA 40-hour HAZWOPER
- OSHA 8-hour HAZWOPER Supervisor Certified
- 8-hour HAZWOPER Refresher

AFFILIATIONS

- American Water Works Association
- Environmental Professionals' Organization of Connecticut

Mr. Shea is a Senior Environmental Scientist and Licensed Environmental Professional (LEP) with over 20 years of experience that spans the areas of environmental science and hydrogeology. He is responsible for project management and supervision of technical staff for our client's business needs. Mr. Shea has extensive experience with environmental site assessments (Phase I and CTDOT Task 110); subsurface investigations (Phase II/III and CTDOT Task 210); remedial action planning, estimating, and performance; transportation project soil management plans, specifications (Task 310), and estimating; preparation and approval of Quality Assurance Project Plans (QAPP), community relations plans (CRP), analysis of brownfield cleanup alternatives (ABCA) and federal database management (ACRES) for projects within the federal or state brownfield programs. Additional experience includes completion of water supply project planning and assessments; wetland delineations in support of development projects; and stormwater pollution prevention plans for industrial/ commercial facilities; and development, management, and integration of project data into GIS.

SELECTED PROJECT EXPERIENCE

- **Girl Scout Camps | Tolland, CT**
  Delineated all inland wetlands and watercourses in accordance with the State of Connecticut CGS 22a-36 through 22a-45, and the Natural Resources Conservation Service (NRCS) on a 250-acre parcel in support of master planning services. Surveyed the wetland flags using a handheld GPS unit and post-processed using ArcGIS software to create a wetland boundary feature for inclusion in AutoCAD generated site mapping.

- **Wesleyan Trail Design Services (CTDOT Project No. 82-311) | Middletown, CT**
  Delineated wetlands and watercourses in support of local permitting for a proposed multi-use trail for the City of Middletown. Wetlands and watercourses were delineated in accordance with Rules and Regulations of State of Connecticut CGS 22a-36 through 22a-45.

- **Waterbury Development Corporation – Food Hub**
  Responsible person for the environmental assessment activities with coordination of project status with the CTDECD, WDC and EPA personnel. Preparation and implementation of the Community Relations Plan, Remedial Action Plan, Analysis of Brownfield Cleanup Alternatives. Presented the project goals and objectives to community leaders. Obtained approval for use of an Engineered Control with the CTDEEP with supervision of its installation during project construction. Prepared detailed status reports and required documentation for EPA submittal.

SLR

Andrew N. Stebbins LEED AP | Senior Project Manager

Andrew is an experienced project manager with the ability to unveil the unique aspects of every development he undertakes. He creates enlivened spaces that positively impact the end user and works collaborating with clients to realize their goals. With more than 20 years of project management expertise and a member of the firm's leadership team, Andrew's enthusiastic approach focuses on proactive communication and presenting thoughtful design solutions. His involvement includes all phases of design from the first sketch and schematics through to permitting and occupancy. Andrew is well-versed in both new construction and adaptive reuse and his aptitude spans a wide range of project types, including multifamily, mixed-use, senior living facilities and resilient waterfront design.

JOINED THE ARCHITECTURAL TEAM
1997

EDUCATION
Syracuse University School of Architecture
Bachelor of Architecture

PROFESSIONAL AFFILIATIONS
Boston Society of Architects

SPEAKING ENGAGEMENTS
AIA Conference on Architecture 2019
Waterfront Resiliency: Architecture + Site Strategies
ABX Boston
Rising Sea Levels: Design Strategies for Waterfront Projects

PUBLICATIONS
Commercial Building Products
"Senior Living Comes of Age"
Education & Healthcare Construction Review – Real Estate & Construction Review
"Thought Leadership Contributions"
High Profile Monthly
"For Smaller Massachusetts Cities, Architects Spur Downtown Transformations"
Professional Builder
"The New Wave of Senior Housing"
WIRED
"Designing the Coastal City of the Future"

★ CLIPPERSHIP WHARF, EAST BOSTON, MA
New construction of a resilient waterfront mixed-use community offering 478 multifamily units, retail space, and below-ground parking over a 12-acre site along the Boston Inner Harbor. All four buildings are designed to achieve LEED Gold Certification, and are situated to take advantage of expansive views of Boston skyline while offering an inviting public access to the waterfront.

MODERA NEEDHAM, NEEDHAM, MA
A new 136 unit apartment community situated in a bustling Boston suburb. The units are a mixture of market-rate and fixed-income units incorporated into 52 townhomes within 10 buildings, and 84 flat-style units within a five-story podium building.

WATERTOWN MEWS, WATERTOWN, MA
Phased construction and master planning of a 385 unit multifamily community. Each building offers underground parking, while the master plan successfully introduces a new street network and exterior courtyard spaces, reducing the scale of the 13-acre parcel to a comfortable residential community.

ALTA UNION HOUSE, FRAMINGHAM, MA
New construction of a 196 unit apartment community in an urban setting. This TOD property offers residents an alternative to living in Boston and features a fitness center, swimming pool, resident lounge, community kitchen, pet spa, and structured parking.

THE RESIDENCES AT AMORY PARK, BROOKLINE, MA
A 14 unit luxury condominium community with underground parking, designed in a contemporary Tuscan villa style. The design complements the historic neighborhood, which includes several century-old Italianate-style multifamily apartment buildings and single-family homes.

★ BOURNE MILL APARTMENTS, TIVERTON, RI
The historic preservation and adaptive reuse of eight mill buildings into a new 165 unit mixed-income multifamily community with resident lounge/common areas, billiard room/kitchen, fitness center and laundry room. The project achieved LEED Silver certification.

Michael D. Binette AIA, NCARB | Senior Partner + Managing Principal

Mike is a registered architect with more than 30 years of experience in coordinating and managing teams on complex projects in the multifamily, mixed-use, senior, and commercial markets. As senior partner, he has a value-based approach to design that seeks first to understand the client's goals and then to identify strategic opportunities for greater return. Mike is a hands-on leader, and is involved in all facets of design – from master planning, space programming, and design to construction administration. His multidisciplinary team management and organizational skills, combined with an extensive understanding of the construction process, ensure delivery of projects efficiently and with high levels of client satisfaction. Mike's award-winning work includes The Anne M. Lynch Homes at Old Colony and Harbor Place, having earned recognition from the Boston Society of Architects and the National Housing and Rehabilitation Association.

JOINED THE ARCHITECTURAL TEAM
1982

EDUCATION
Wentworth Institute of Technology
Bachelor of Science in Architectural Engineering

PROFESSIONAL AFFILIATIONS
American Institute of Architects
Boston Society of Architects
National Council of Architectural Registration Boards
National Fire Protection Association
National Housing & Rehabilitation Association
U.S. Green Building Council
Urban Land Institute

PUBLIC AND PROFESSIONAL SERVICE
CURRENT
Chelsea Neighborhood Developers Committee
Committee Member
Federal Home Loan Bank of Boston's Affordable Housing Development Competition
Design Mentor
Boston Society of Architects
Housing Committee Member

FORMER
Masconomet Regional School Building Committee
Committee Member
Boston Society of Architects Housing Committee
Committee Chairman

AWARDS
Mike is honored to have his work recognized by notable professional and trade associations, including the Boston Society of Architects, Massachusetts Historical Commission, Boston Preservation Alliance and Urban Land Institute.

PUBLICATIONS
Tax Credit Advisor
"Multi-Credit Case Study: Evergreen Village"
McKnight's Senior Living
"Minding the 'Gap'"
Eco Structure, by R. Verrier + M. Binette
"Bridging the Gap"
Architects + Artisans
"In Boston, Re-knitting the Fabric"
EDC, by R. Verrier + M. Binette
"Old Mills New Lives"

REGISTRATIONS
Alabama, Arizona, Arkansas, Colorado, Connecticut, District of Columbia, Florida, Georgia, Illinois, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia

MARY ELLEN MCCORMACK, BOSTON, MA
The phased redevelopment of the first public housing complex in New England. Approximately 3,000 new units will replace the 1,061 existing units and offer housing for all levels of income.

★ BRISTOL COMMONS + LENOX GREEN, TAUNTON, MA
The redevelopment of an existing public housing complex involving the demolition of the 150 barracks-style units located on the property's 15-acre site, the new construction of 88 new townhouse-style units, in addition to 72 new mixed-income rental units on a separate 6.4-acre site.

★ THE ANNE M. LYNCH HOMES AT OLD COLONY, SOUTH BOSTON, MA
A new three-phased affordable housing development comprised of apartments and townhomes, offering residents a new LEED Gold Certified learning center and social services. Phase I consists of 116 LEED Platinum Certified units, Phase II of 169 units, and Phase III will include 301 units, 55 of which will be Passive House Certified.

RESIDENCES AT BRIGHTON MARINE, BOSTON, MA
A $46M transit-oriented multifamily development on a 1.4-acre site, offering housing and on-site services to local veterans and their families. It is the first of its kind to offer mixed-income housing in Boston since World War II, providing homes to those with extremely low-, low-, and middle-incomes. The community represents one of the largest private developments ever created for veterans with 102 units and 7,500 square feet of community space.

★ HARBOR PLACE, HAVERHILL, MA
The design of a new mixed-use waterfront development featuring two new midrise buildings: a five-story, 58,000 square foot commercial building; and a six-story mixed-use building with ground floor riverfront restaurant space, commercial uses, and 80 residential units.

★ THE UNION AT 48 BOYLSTON, BOSTON, MA
The preservation and rehabilitation of the former Boston Young Men's Christian Union Building into 46 units of affordable housing with 12,000 square feet designated for St. Francis House's administrative offices and a substance abuse counseling program.

Michael D. Binette AIA NCARB | Senior Partner | Managing Principal

★ VALLEY BROOK VILLAGE, LYONS, NJ

Phase II of Valley Brook Village provides 50 additional units to the development. The new three-story building is oriented around a common village green to complement Phase I.

SOUTHERN HILLS, WASHINGTON, D.C.

The four-phased redevelopment of a former public housing community, totaling 349 units of affordable apartments and townhomes across six three-and four-story midrise buildings and a three-story 25,000 square foot community building.

★ TREADMARK, DORCHESTER, MA

New construction of a 83 unit six-story sustainable TOD structure that maintains a strong visual connection to the former Ashmont Tire shop it replaced. The $45M mixed-income building is enveloped in grey ironspot brickwork interspersed with clean, vertical aluminum panels that give it a modern feel.

★ COBBET HILL APARTMENTS, LYNN, MA

The $18.7M rehabilitation of a 117 unit affordable housing complex. Renovations include the creation of new common areas, a fitness room, modernized mechanical electrical and life safety systems, replacement of the building's roof, and repaired plumbing and masonry. The modernized structure meets Enterprise Green Communities (EGC) criteria.

MIDDLEBURRY ARMS, MIDDLEBOROUGH, MA

The occupied rehabilitation of a 54 unit multifamily community. The rehabilitation included the replacement of unit finishes and extended into common spaces and community rooms. The deteriorated wood framing along the building exterior – sheathing, rim joists – together with the siding, the roof, windows and trellis structures at building entrance and unit balconies were replaced.

★ THE CARRUTH, DORCHESTER, MA

A new six-story mixed-use, TOD that includes 116 apartments and condominiums, street level retail and commercial space, and underground parking adjacent to the Ashmont MBTA Station.

★ A.D. FLATS AT FOREST HILLS, JAMAICA PLAIN, MA

A $35M new mixed-use building featuring 78 mixed-income units, 1,600 square feet of ground-floor retail, 2,500 square feet of community space, and a 42-space underground parking garage. Resident amenities include a fitness center, common lounge, and bicycle storage.

SOUTHEAST TOWERS, ROCHESTER, NY

The $53M moderate rehabilitation of two multifamily residential buildings involving the renovation of the ground floor community space, unit upgrades, and rehabilitation of the exterior facade.

BSC GROUP

Michael
Kluchman, ASLA, LEED AP
Manager of Landscape Architecture

YEARS OF EXPERIENCE
Over 25

EDUCATION
Masters of Landscape Architecture
Rhode Island School of Design

Bachelor of Landscape Architecture
Rhode Island School of Design

Bachelor of Fine Arts
Rhode Island School of Design

REGISTRATIONS
Licensed Landscape Architect

- CT #1555 (2021)
- MA #1513 (2006)

CERTIFICATIONS
- LEED Accredited Professional

AFFILIATIONS
- American Society of Landscape Architects

MEET MICHAEL
Michael has extensive landscape architectural experience on a wide range of project types, including coastal resiliency planning, environmental restoration projects, historic parks and landscapes, complex transportation, public open space projects, and K-12 and higher education campuses. He possesses deep technical abilities and a commitment to the art of design with the proven capacity to creatively synthesize all aspects of complex site projects. He has established facility at public presentation and engagement and thrives on building stakeholder consensus.

PROJECT EXPERIENCE HIGHLIGHTS

Briscoe Village for Living and the Arts, Beverly, MA
Landscape Architect

Landscape Architect, supporting Beacon Communities in the adaptive reuse of a former middle school to 85 units of senior housing, artist live-work studios, and a performance space for the North Shore Music Theatre. BSC is providing a restorative landscape design for the historic "turf bowl" and school building. New residential amenities include a small dog park, seating areas, outdoor dining terraces, and victory gardens.

Lee Fort Terrace, Salem, MA
Landscape Architect

Landscape architect, serving as a subconsultant to Beacon Communities for improvements and possible expansion of a Salem Housing Authority property for elders and persons with disabilities. BSC's design includes accessible pedestrian circulation systems, as well as hardscape and landscape treatments of planting areas for the overall site. The site's location requires incorporating nature based solutions such as stormwater BMPs, floodable and regenerative landscapes, habitat and native plant community restoration, and tree planting to address heat island effect.

Baystate Apartments, Springfield, MA
Landscape Architect

Landscape architect providing landscape design improvements for an existing multi-family residential complex owned by Beacon Communities. New courtyard amenities include conversational seating areas shaded by pergolas, playful swinging chairs, playground equipment, an outdoor fitness circuit, and native pollinator gardens.

Avon High School Athletic Facility Improvements, Avon, CT

Landscape Architect

Responsible for master planning and design services for the Avon High School Athletic Facility. The fully renovated facility includes a new competitive running track, track & field events, a multipurpose synthetic turf field, walkways, fencing, and miscellaneous improvements to the site. Michael was responsible for quality control review and construction administration services. The project was completed in fall 2019.

Bank Street Park, Waterbury, CT

Project Manager

Responsible for planning and design for the redevelopment of a brownfield parcel into a new neighborhood pocket park in the City's Brooklyn neighborhood. The site was the location of the former restaurant which was destroyed by fire. The site has been remediated, and the current project includes community outreach and design of a small scale, but much needed multi-use park for an area of the City with limited access to local public open space.

Boston Planning and Development Agency, National Parks Service, and Private Developer, Residences at The Historic Navy Yard Ropewalk Building, Charlestown, MA

Project Manager

Project Manager for the planning and site design of the reuse and preservation of the Ropewalk Building and site, which was developed to create the best possible new use for this historically significant property while preserving all of the portions and features which convey its historical, cultural, and architectural values.

East Main Street (Route 202) Corridor Study, Torrington, CT

Project Manager

Responsible for planning and design services in support of the Halls Road area improvements, focusing on producing a Master Plan, refining Vison Planning work from the Town's Halls Road Improvement Committee. Michael is leading a team is responsible for the development of updated base mapping, real estate market analysis, and master planning to include new data inputs and refinements. Additionally developing a conceptual streetscape design based on the Master Plan, for core improvements focusing on developing an overall theme, major building blocks, and individual elements of a streetscape complimentary. Design Guidelines are also being developed as part of this process, necessitating collaboration with Committee to revise zoning language to enable mixed-use development within the area.

Jefferson Park Housing, Cambridge, MA for the Cambridge Housing Authority

Project Manager

Project manager/Landscape Architect for planning and site design for the rehabilitation of the Jefferson Park Housing complex in Cambridge, Massachusetts for the Cambridge Housing Authority. The original site plan was designed by the Olmsted Brothers for the City of Cambridge. Jefferson Park was sited in a low-lying area with a highwater table and flooding. During the assessment phase, investigations revealed that the existing buildings have extensive problems with water damage and need to be replaced with a modern, well-functioning facility that better serves the families and seniors who live there for a price that meets available

funding. Several site design alternatives were developed with the design team, illustrating options for circulation and open space in various building configurations and costs.

Halls Road Master Plan, Old Lyme, CT

Project Manager

Responsible for planning and design services in support of the Halls Road area improvements, focusing on producing a Master Plan, refining Vison Planning work from the Town's Halls Road Improvement Committee. Michael is leading a team is responsible for the development of updated base mapping, real estate market analysis, and master planning to include new data inputs and refinements. Additionally developing a conceptual streetscape design based on the Master Plan, for core improvements focusing on developing an overall theme, major building blocks, and individual elements of a streetscape complimentary. Design Guidelines are also being developed as part of this process, necessitating collaboration with Committee to revise zoning language to enable mixed-use development within the area.

BSC GROUP

Monique
Hall, RLA, LEED AP BD+C

Landscape Architect
Associate

YEARS OF EXPERIENCE

17

EDUCATION

MLA, Landscape Architecture
Florida International University

BA, Religious Studies
Virginia Commonwealth University

REGISTRATIONS

Registered Landscape Architect

- MA #4217

CERTIFICATIONS

- LEED AP BD+C (2011)
- CSI - Construction Documents Technologist

AFFILIATIONS

- American Society of Landscape Architects

MEET MONIQUE

Monique is a skilled designer and project manager with project experience encompassing a broad range of project types. Her design expertise encompasses regional and campus master planning, mixed-use developments, luxury resorts, streetscapes, civic parks, and residences. She strives to incorporate principles of sustainability in all her projects, creating beautiful landscapes that are functional for its users, as well as adaptive to environmental conditions and natural resources. Monique also serves as co-chair of BSC's IDEA Council (Inclusion, Diversity, Equity and Awareness). In this role, she helps drive BSC's diversity and inclusion efforts to advance and enhance the firm and profession to a higher level of equity.

PROJECT EXPERIENCE HIGHLIGHTS

North Square at the Mill District, Mixed-Use, North Amherst, MA
Landscape Architect

Responsible for the landscape design and construction administration of a new 5.3 acre mixed-use, sustainably-designed project featuring 22,000 sf of new retail space as well as 130 new apartment homes. New public spaces include a central village green, multi-use plaza, and a recreational playground. Private amenity spaces included a fenced dog park and private courtyards with grilling areas for new residents. Custom site furnishings feature large timbers and galvanized steel to create a unique sense of place that honors and celebrates the pastoral nature of the region.

Briscoe Village for Living and the Arts, Beverly, MA
Landscape Architect

Responsible for supporting Beacon Communities in the adaptive reuse of a former middle school to 85 units of senior housing, artist live-work studios, and a performance space for the North Shore Music Theatre. BSC is providing a restorative landscape design for the historic "turf bowl" and school building. New residential amenities include a small dog park, seating areas, outdoor dining terraces, and victory gardens.

Baystate Apartments, Springfield, MA
Landscape Architect

Provided landscape design improvements for an existing multi-family residential complex owned by Beacon Communities. New courtyard amenities include conversational seating areas shaded by pergolas, playful swinging chairs, playground equipment, an outdoor fitness circuit, and native pollinator gardens.

Lefort Terrace, Salem, MA

Landscape Architect

Working with Beacon Communities on the possible expansion of a Salem Housing Authority property for elders and persons with disabilities. BSC's design includes accessible pedestrian circulation systems, as well as hardscape and landscape treatments of planting areas for the overall site. The site's location requires incorporating nature-based solutions such as stormwater BMPs, floodable and regenerative landscapes, habitat and native plant community restoration, and tree planting to address heat island effect

Quincy Center Downtown Improvements, Quincy, MA

Landscape Architect

Supported the preparation and implementation of the City's Downtown Urban Renewal Plan and other downtown improvements. Monique was involved in the design of improvements to the Hancock lot block, which included streetscape enhancements, a new parking garage and Kilroy Square - a new community plaza . The heart of Kilroy Square is a flexible use hardscape area that can be used for programmed activities and is now home to the Quincy Farmer's Market. Tree allées shade the paving and help to combat urban heat island effect. Permeable paving provides pre-treatment of stormwater runoff, helping to protect the recently daylighted Quincy Town Brook. The use of a variety of species between spaces contributes to the character of the space while meeting each area's unique needs and space requirements. The goal of the project is to attract visitors and businesses to downtown Quincy and associated MBTA transit.

The Tremont at Northwest Park, Burlington, MA

Landscape Designer

Provided landscape design services for two courtyards, totaling 27,100 square-feet of various site amenities. Worked closely with architect Cube 3 Studio and Nordblom in a collaborative process to blend aesthetically pleasing design with practicalities of construction techniques, ease of maintenance, and material longevity. Outdoor amenities include a swimming pool, grilling stations, dining areas, and a custom fire pit with seating areas.

Downtown Hudson Streetscape Improvements, Hudson, MA

Landscape Architect

Responsible for the design of streetscape improvements to downtown Hudson as a means for stimulating economic development. Improvements to the downtown rotary and South Street area have been coordinated with infrastructure improvements to take a holistic approach to downtown revitalization. Streetscape enhancements include widened sidewalks to welcome and accommodate pedestrians as well as new canopy shade trees and seating areas to support outdoor dining opportunities.

Tyler Street Streetscape Improvements, Pittsfield, MA

Landscape Architect

Involved in the design of streetscape improvements to Pittsfield's Tyler Street. This project includes increasing pedestrian safety, complete streets design considerations, increased parking facilities, and enhancing community connectivity.

EMD Serono, Billerica, MA

Landscape Architect

Provided landscape architectural design services for the 22-acre research and development and manufacturing facility located in Middlesex Turnpike. The completed facility will include a 500-space multi-level parking structure, four research and development buildings with a total of 220,000 square feet, and two manufacturing buildings with 98,000 square feet. The site design incorporates large portions of the existing forested terrain and provides extended detention basins and wet ponds for the on-site treatment of storm water run-off. The completed project assimilates with the surrounding environment and adjacent wetland resources. Biophilic design included interior and exterior plantings that helped EMD Serono to earn recognition as the first WELL Gold certified building in the U.S. Additionally, the planting design and maintenance (overseen by BSC) has earned Wildlife Habitat Certification (WHC) from the Wildlife Habit Council which further strengthens EMD's commitment to sustainability.

Coursey & Company

Public Affairs Communications

Chuck Coursey is President of Coursey & Company, a public affairs firm located in West Hartford, CT that specializes in community outreach and engagement for proposed new developments.

For over twenty-five years he has conducted extensive outreach campaigns on behalf of his client's zoning applications. During that time Chuck has worked on many of the region's most high-profile economic development projects, meeting with neighbors and stakeholders, providing project details, answering questions and addressing concerns.

For more information please visit courseyco.com.

HINCKLEY
ALLEN

Timothy S. Hollister

860-331-2823 | thollister@hinckleyallen.com

Tim practices land use, environmental and municipal law, and handles a wide range of real estate and administrative law challenges that arise in the context of land use and environmental matters. He has represented developers, corporations, property owners, municipalities, boards of education, and neighborhood and environmental groups in administrative proceedings before local, state, regional and federal agencies and litigation in the state and federal trial courts. He has argued more than 45 cases in the state and federal appellate courts. When representing applicants seeking land use and environmental permits, Tim's approach is to work closely with the team of experts and consultants to present the application in a professional, procedurally correct, substantively compliant, and cost-conscious manner, and to create an administrative record that will lead the agency to grant approval.

PRACTICE AREAS

Real Estate

Land Use & Development

Environmental

BAR MEMBERSHIPS

Connecticut

U.S. Court of Appeals for the First Circuit

U.S. Court of Appeals for the Second Circuit

U.S. District Court for the District of Connecticut

U.S. Supreme Court

WORK EXPERIENCE

Hinckley Allen

- Co-Chair, Land Use & Development Group
- Partner (2021-Present)

Shipman & Goodwin LLP

- Partner (1992-2021)

EDUCATION

Boston University School of Law (J.D., 1982)

Occidental College (M.A., 1980)

Wesleyan University (B.A., 1978, cum laude)

SPECIAL HONORS

Chambers USA, America's Leading Lawyers: Real Estate (2004-2014); Real Estate: Band One Zoning/Land Use (2015-2021)

Listed in The Best Lawyers in America®: Land Use & Zoning Law, Litigation-Land Use and Zoning (2009-2022)

Named "Lawyer of the Year": Best Lawyers Hartford Region Litigation-Land Use and Zoning; (2011-2014, 2017, 2020): Best Lawyers Hartford Region Land Use & Zoning Law (2016, 2018, 2021)

Local Government Law Fellow, International Municipal Lawyers Association (2002-2007, 2012-2017, renewed in 2017, for 2017-2022)

HINCKLEY ALLEN

Ryan D. Hoyler

860-331-2618 | rhoyler@hinckleyallen.com

Ryan Hoyler is an Associate in the Firm's Real Estate group, specializing in Land Use & Zoning and Environmental matters. Ryan received his Juris Doctorate, with honors, from the University of Connecticut School of Law in 2019. Prior to and during law school, Ryan worked as a paralegal and regulatory manager for a global chemical manufacturer, managing environmental permitting and participating in environmental litigation around the globe.

During law school, Ryan was the senior articles editor for the *Connecticut Journal of International Law*. He was also a member of student government and participated in mock trial and moot court. Ryan earned numerous awards in law school, including a CALI award for excellence in Environmental Law and the Cornelius W. Wickersham, Jr. Award for excellence in Constitutional Law, and was a semi-finalist in the Jeffrey G. Miller National Environmental Law Moot Court Competition.

PRACTICE AREAS

Real Estate
Land Use & Development
Environmental

BAR MEMBERSHIPS

Connecticut
California

WORK EXPERIENCE

Hinckley Allen
- Associate (2021-Present)

Remy Moose Manley, LLP
- Associate (2021)

Morgan, Lewis & Bockius, LLP
- Litigation Clerk (2019-2020)

Connecticut Fund for the Environment
- Legal Intern (2018)

Bracewell, LLP
- Summer Associate (2018)

LANXESS Solution (f/k/a Chemtura Corporation)
- Senior Paralegal, Regulatory and Compliance (2008-2018)

EDUCATION

University of Connecticut School of Law (J.D., 2019)

Connecticut College (B.A., 2005)

WAYPOINTKLA

COMPANY OVERVIEW

Waypoint KLA provides a wide range of consulting and management services for owners, operators, and developers of commercial, residential, industrial, and mixed-use real estate and development projects. We bring unparalleled visibility to every aspect of a construction project – from pre-design to final completion – providing oversight, accountability, and control that ensure projects are completed on time and on budget.

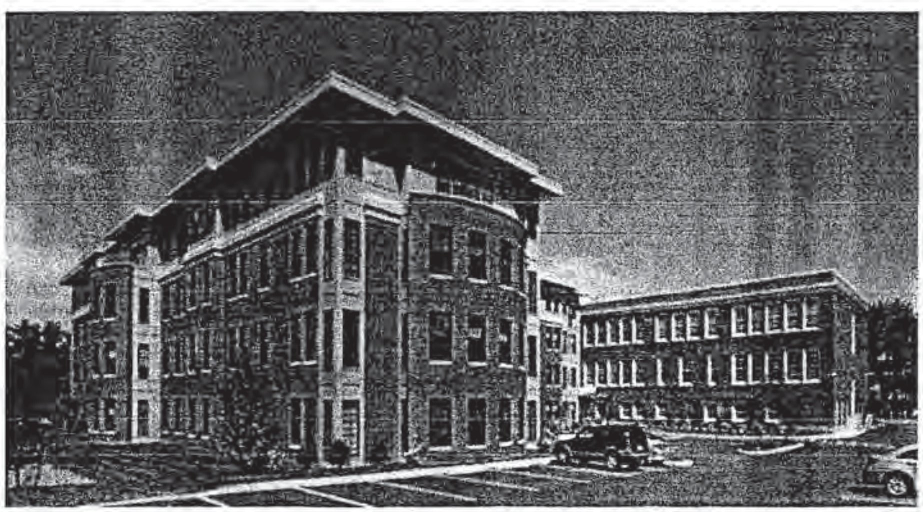
Our capabilities include due diligence, pre-development, development consulting, project management, sustainability planning, move coordination, and lender representation. We offer a full range of services within each of these categories, from high-level strategy and consulting to project management services and other daily processes.

WaypointKLA's principals – each with deep expertise and more than 25 years of experience in architecture, construction management, engineering, investment, and other real estate-related disciplines – are active participants in every project. Their cross-disciplinary, total-project perspective brings new ideas to our work, and fosters an entrepreneurial culture where projects are staffed, planned and managed according to the needs of each client. And we actively collaborate with all members of the client, design, construction, and approvals team, involving them in every step of the process. It is an approach that results in more successful project planning and execution.

We provide the expertise, resources, and focus required to manage real estate and development projects in today's highly complex construction market. By offering complete technical and financial visibility, we minimize cost overruns, drive projects to completion, and protect the reputation and financial interests of our clients. They stay focused on their core competencies, confident that their valuable investment is being overseen by a true industry leader.

In House Expertise

- Architecture
- Engineering
- Construction Management
- Permitting



WHY WE ARE DIFFERENT

With you every step of the way

Our capabilities encompass every aspect of a real estate and development project, from pre-planning and design to construction and closeout. We offer a full range of services in each of these areas, including high-level consulting and planning, and more tactical construction oversight and administration activities. We're able to partner with clients through every phase of a project, providing greater visibility, accountability, and control.

Multi-disciplinary + entrepreneurial

WaypointKLA's principals have deep expertise in architecture, construction, and engineering. As active participants in every project, they take a multi-disciplinary, total-project approach to their work, bringing fresh ideas and perspectives and sharing them with clients. And because no two projects are quite alike, we foster a flexible, entrepreneurial work culture where each is staffed, planned and managed according to its specific needs and requirements.

Committed to true collaboration

Projects succeed when every stakeholder feels invested and heard, and we collaborate with all members of the client, design, construction, and approvals team, forming relationships built on trust and mutual respect. Their input allows us to plan and execute the best possible project.

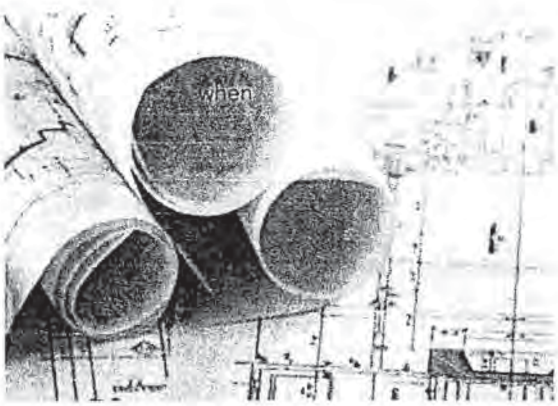
We do our homework, and we do it up front

We believe that opportunities and concerns are best addressed when identified early on. Whether it is our Project Diagnostic, a rigorous preliminary analysis that we complete as soon as we begin working with a client, or early review of industry best practices, strategies, and trends that might impact design and construction, we perform insightful, thorough research at the earliest stages of a project to manage costs and improve the design and construction process.

CAPABILITIES

Development consulting

As sole representative throughout design, development, and construction delivery, we provide project management, owners' representation, tenant representation, clerk of the works activities, and dispute resolution support. With deep hands-on experience in entitlement, procurement, design, construction buy out, project management, and close out, we identify and manage resources and milestones to achieve budget, schedule, and quality control goals.



Pre-development

We believe that project opportunities and concerns are best managed they are identified at the inception of a project. We offer a range of predevelopment capabilities, including constructability review, quality control of contract documents, contract negotiation, permitting, and variance negotiation.

Due diligence

We support clients at every phase of the due diligence process, including project feasibility assessment, development strategy, and planning. We provide Property Condition Assessments (PCA) and Replacement Reserve Studies; manage entitlement assessment preparation, budgets, cash flows, and project analysis/evaluation schedules; and have decades of experience working with the individuals and agencies that often govern project development.

Owners Project Management

OPM services represent WaypointKLA's commitment to the work we produce, as well as improving the ways we work with our clients. Relationships are important to us, and with open and innovative lines of communication, we will establish a forum to exchange ideas, facilitate alternative solutions, and listen to both the financial and technical needs for every client we service.

OPM Solutions

- Bidding & Contractor Procurement
- CM-at-Risk Management
- Construction Oversight
- Cost Estimating & Controls
- Designer Selection & Design Management
- Negotiation & Contract Administration
- Program Adherence & CO Reviews
- Commissioning & Turnover

Lender representation

We represent investors, banks, mortgage and long-term lenders, financial institutions and other construction lenders, providing a thorough review of existing properties and proposed projects, and ongoing monitoring of projects during the design and construction process

HOW WE WORK

Our deep experience and multidisciplinary approach allows us to provide our clients with consulting, management, and oversight for a wide range of one-time and ongoing tasks related to project planning, execution, and completion.

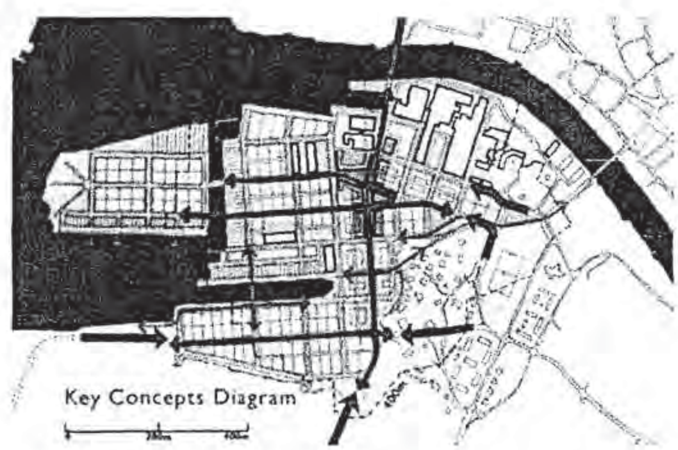
MANAGEMENT PRINCIPALS

WaypointKLA maintains a project management system that is adaptable and flexible to the nuances of a given project, while providing a clear armature for budget management, quality assurance, and full team collaboration. Just as our work with clients is collaborative and consensus based, our management approach is built on collaboration and trust. We follow the principals of integrated project delivery.

- Mutual Respect and Trust
- Mutual Benefit and Reward
- Collaborative Innovation and Decision Making
- Early Involvement of Key Participants
- Early Goal Definition
- Intensified Planning
- Open Communication
- Appropriate Technology
- Organization and Leadership

THE PROJECT DIAGNOSTIC

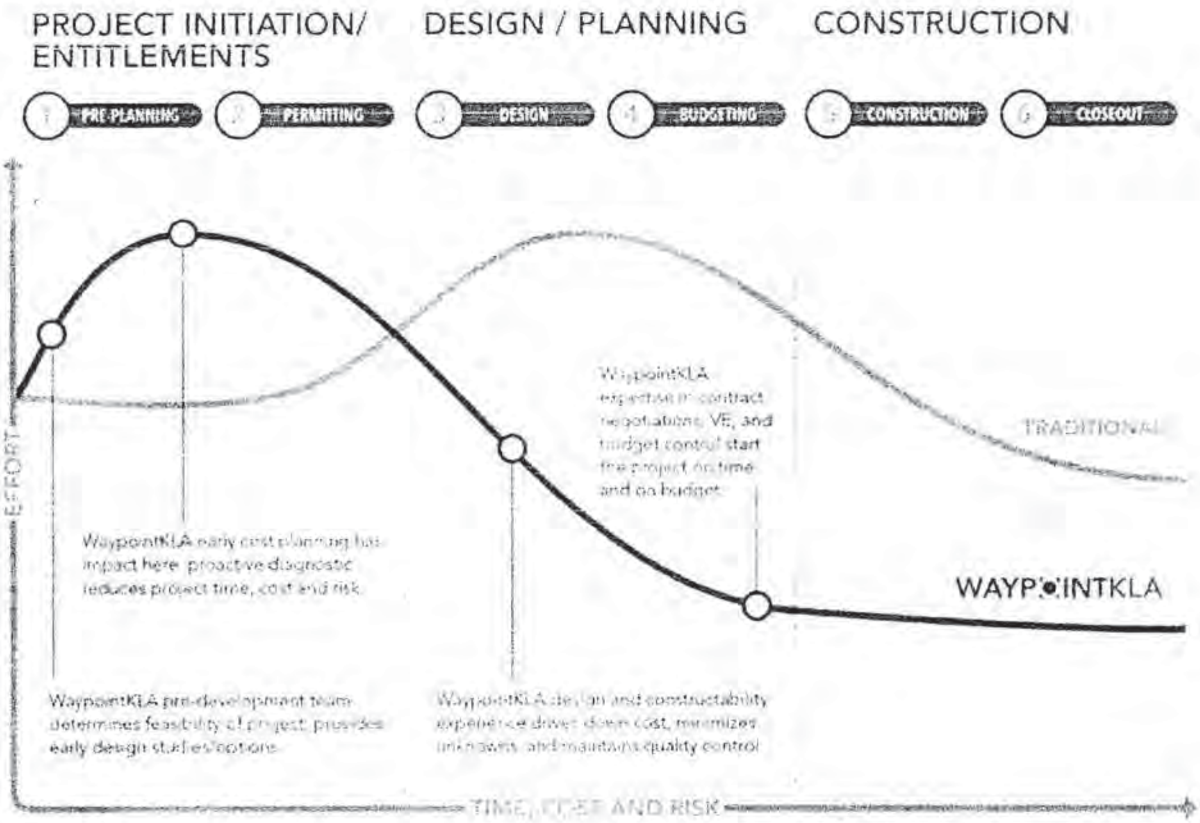
From the earliest stages of our project involvement, we collaborate with our clients to complete a comprehensive review known as the Project Diagnostic. This rigorous analysis closely examines a range of different considerations that might influence a project's design, schedule, total cost, or viability. Examining these factors before our work begins gives our team the information and insight it needs to ensure project success. It is a crucial first step that will impact the entire project plan, and sets the stage for an open, honest, collaborative working process with our clients.



Factors examined vary by project, but often include:

- Abutters
- Special permits
- Utilities
- Zoning
- Site impacts
- Budget
- Schedule
- Mechanical systems
- Lighting
- Boards and commissions

COST PLANNING FROM THE START



Cost planning is an essential part of our process. The volatile market and overall state of the economy require that we take aggressive action in developing and monitoring project costs. During the pre-development phase a projection of overall project costs is prepared which is based on the client's proforma and project programming objectives. Our cost analysis focuses not only construction but also "soft costs" that are directly attributed to the project including FF&E, fees, back charges and appropriate contingencies to cover the design to cover design and program variables, escalation of costs due to market conditions and probable unknowns.

WaypointKLA recommends that estimates of probable construction cost be developed at major milestones of each project. Such estimates may be done by independent estimators working for WaypointKLA, the CM working on the project or both.

We have found that a process of milestone estimates, reconciliation of estimates, and setting contingencies to match a job's definition and progress all work toward assuring the greatest value for the resources spent. This leads to a design solution and finished project that reflects our client's budget and goals.