APPENDIX A: METHODOLOGY

This section provides an overview of the assumptions and methodology that were required to develop each calculator.

A.1 Projecting Construction Growth for Pilot Cities

City representatives from New York City, Portland, and Austin provided the CLF team with available reports and data to project construction growth for each city. These datasets were used to calculate estimates of the embodied carbon savings potential associated with each policy scenario.

A.1.1 Area Growth Projections

The pilot cities provided either city-wide or district-wide total square footage projections for new construction. The projections provided by each city were largely based on local building trends and population growth projections derived from recently published comprehensive planning documents. They were adjusted for this study to reflect a 2020 - 2050 growth window.

New York City's 80x50 Technical Working Group report[30] and the City of Portland's 2007 analysis of baseline building stock and future growth[31] included anticipated growth up to the year 2050. City-wide data for anticipated growth by building typology was not available for the City of Austin. As a result, the 2016 district-wide comprehensive plan for South Central Waterfront (SCW) Vision Framework Plan was used for this pilot.[32] The anticipated completion date for the Austin development is unknown, and does not necessarily reflect a 2050 target.

A.1.2 Building Use

The same datasets that were used for the growth projections of each pilot city also contained total growth projections by building use for each city. These included uses such as multifamily residential, commercial, institutional, etc. The building uses reflect key differences in the fabric of each city and were used in the pilot report as provided (see Table A1).

30 New York City Mayor's Office of Sustainability. (2016). *One City Built to Last Technical Working Group Report*. http://www.nyc.gov/html/gbee/downloads/pdf/TWGreport_2ndEdition_sm.pdf

31 City of Portland. (2017). *Baseline & Projections Analysis Scenario Modeling.* [Private data set].

32 City of Austin. (2016). *South Central Waterfront Vision Framework Plan*. https://www.austintexas.gov/sites/default/files/files/Housing_%26_Planning/South%20Central%20Waterfront/2016%20South%20Central%20Waterfront%20Vision%20Framework.pdf

Table A1. Building uses for each pilot city

City	Building use
New York City	1-4 Family Rowhouse Multifamily Commercial Institutional
Portland	Single-Family Residential Multifamily Commercial
Austin SCW	Office Retail Multifamily Residential Hotel

A.1.3 Linear Growth

The calculators in this study all assume linear growth for each city and building typology. See Appendix B for considerations of the time value of carbon and the potential for future integration of nonlinear growth models.

A.2 Estimating the Embodied Carbon Intensity of Building Typologies

Estimating embodied carbon impacts associated with the future growth of cities requires data on the following variables, which are critical in determining the embodied carbon intensity of a building:

1. Area of growth for each building use (ft^2 or m^2), described in A.1;
2. Range of typical building height for each building use (i.e., whether the growth is of low-rise, mid-rise, or high-rise buildings, and what the typical range of building levels is for that category);
3. Typical construction type(s) for each building use (e.g., light-frame wood vs. metal construction for multi-family residential, etc.)
4. Typical embodied carbon intensity for that building use, height range, and construction type.

While each pilot city provided total projected growth and building use types, it was necessary to make assumptions for variables 2-4 listed above. Sensitivity analyses were conducted for assumptions that were highly variable or sensitive to total carbon impacts.

A.2.1 Building Size

Table A2 summarizes the methods used for each city to estimate what percentages of its growth area projections fall into specific use and height categories.

Table A2. Building size, percentages, and source methodologies used for each pilot city.

City	Source	Building use	Building size	Building size as percentage of total building use
New York City	Aggregated 2021 DOB filings from YIMBY Report[33] into total square footage groupings	1-4 Family	1-4 Family	100%
		Multifamily & Commercial	1-7 Stories	21%
			>7 Stories	48%
			Very Large (buildings > 500,000 ft^2, typically highrises)	31%
		Institutional	1-7 Stories	80%
			> 7 Stories	20%
Portland	Aggregated existing building stock data provided by the City of Portland into total square footage groupings. Heights inferred from square footages	Single Family	Single Family	100%
		Multifamily	Low Rise 1-5 Stories	65%
			Mid Rise 6-10 Stories	26%
			High Rise > 10 Stories	9%
		Commercial	Low Rise 1-5 Stories	38%
			Mid Rise 6-10 Stories	46%
			High Rise > 10 Stories	16%
Austin SCW	All SCW buildings were considered "High Rise >10 Stories." Of the 23 buildings described in the SCW,[34] 19 of them were 100' or taller, while only 3 were less than 100' tall (90', 90', and 60' respectively).	Office	High-rise >10 Stories	100%
		Retail	High-rise >10 Stories	100%
		Multifamily	High-rise >10 Stories	100%
		Hotel	High-rise >10 Stories	100%

A.2.2 Building Typologies

In this report, building typology refers to a category of buildings with the same building use and building size. For example, "commercial" is a building use, whereas "commercial mid-rise (6-10 stories)" is a building typology. When a projected growth area is broken down by building typology it provides the value for building typology growth area (BTGA).

A.2.3 Building Embodied Carbon Intensity (BECI)

BECI is derived from conducting a whole building LCA and varies widely.[35] There are many factors that may influence the total embodied carbon intensity of buildings, such as:

33 New York YIMBY. (2021). *YIMBY's 2021 Construction Report Shows 30,036 New Residential Unit Filings In New York City*. https://newyorkyimby.com/2021/01/yimbys-2021-construction-report-shows-30036-new-residential-unit-filings-in-new-york-city.html

34 City of Austin. (2016). *South Central Waterfront Vision Framework Plan*. https://www.austintexas.gov/sites/default/files/files/Housing_%26_Planning/South%20Central%20Waterfront/2016%20South%20Central%20Waterfront%20Vision%20Framework.pdf

35 Simonen, K., Rodriguez, B., McDade, E., Strain, L. (2017). *Embodied Carbon Benchmark Study: LCA for Low Carbon Construction*. Available at https://carbonleadershipforum.org/embodied-carbon-benchmark-study-1/

- LCA modeling decisions, such as what building scope was included;
- Building characteristics, such as a primary use, height, structural system, mechanical system, interior finish selection, and aesthetic preferences; and
- Site factors, such as seismic zone, climate zone, and geographic location.

Table A3 shows the BECI factors that were used for this pilot study. The values are based on published research regarding the trends about the carbon intensity of different building typologies from three primary sources:

- CLF Embodied Carbon Benchmark Study[36]
- OneClick European Benchmark[37]
- CLF reference model collection for this study (see A.2.4)

These values are order-of-magnitude estimates, as no available research quantifies the BECI of buildings in the United States with enough regional and typological specificity to provide representative estimates for the building typologies in this study. They are intended to reflect A1-A3 life cycle impacts with a physical scope of primary structure, enclosure, and interiors.

Table A3. Estimated Building Embodied Carbon Intensity in $kgCO_2e/m^2$ per building typology. Values listed below are order-of-magnitude only and should not be used outside this study, particularly as baseline BECI to compare against individual buildings.

Building use	Building size	BECI ($kgCO_2e/m^2$)
Single Family Residential	1-3 stories	200
1-4 Family Rowhouse	1-3 stories	300
Multifamily, Commercial, Institutional	1-7 Stories, >7 Stories, Low Rise 1-5, Mid Rise 6-10,	500
Multifamily, Commercial	Very Large, High Rise >10	700

A.2.4 Reference Model Collection

The CLF collected embodied carbon data on over 70 projects from six architecture firms around the country to help support this study. The reference models cover a wide geography of the United States and are primarily multifamily residential and commercial office buildings. They range from projects early in design all the way to fully constructed buildings and represent a broad range of sizes and structural systems.

The sample size of this database was not large enough and the LCA scope of each project was not consistent enough to provide reliable embodied carbon estimates for any one building typology or location. However, it provided valuable real-world references to compare against other third-party benchmarks and studies. Each reference model was associated with a building use (see Section A.1.2). The embodied carbon intensity data ($kgCO_2e/m^2$) was then used in aggregate to compare against the assumptions and calculations made in this pilot study. The reference model collection also informed the concrete volume factors used for each typology.

36 Simonen, K., Rodriguez, B., Barrera, S., Huang, M. (2017). *CLF Embodied Carbon Benchmark Database, database*. Available at https://carbonleadershipforum.org/embodied-carbon-benchmark-study-1/

37 One Click LCA. (2021). *Embodied Carbon Benchmarks for European Buildings*. Available at https://www.oneclicklca.com/eu-embodied-carbon-benchmarks/

Aggregated BECI values from the reference model collection for each building use and size were on average less than the BECI values used for this study which is likely due to the lack of physical scope for many reference models and the high amount of light wood frame construction types that were included. The aggregated BECI values did, however, reinforce our assumptions about the increase in BECI for building size as well as construction type and concrete volume factors (see Section A.4.1).

A.3 BECI Reduction Policy Calculator Methodology

Baseline Scenario

The baseline scenario is the estimated embodied carbon associated with all new buildings that would be needed to meet the projected growth of each pilot city under typical design and construction practices. The calculator applies a fixed carbon intensity to the total projected area of growth and does not take into consideration accumulative growth over time, or changes in embodied carbon intensity over time.

Baseline Calculation

(BTGA) x (BECI) = (Baseline Scenario)

Where:

- *BTGA* is the Building Typology Growth Area (see A.2.2)
- *BECI* is the Building Embodied Carbon Intensity (see A.2.3)

Reduction Scenario

The reduction scenario is the estimated embodied carbon associated with all new buildings that would be needed to meet the projected growth of each pilot city with a custom reduction percentage applied to the concrete embodied carbon intensity of the baseline scenario. The calculator assumes the reduction percentage (policy) is implemented immediately and in full, rather than slowly integrated over time or in steps.

Reduction Calculation

(Baseline Scenario) x (BECI Reduction) = (Reduction Scenario)

Where: *BECI Reduction* is a reduction percentage selected by the user that is applied to the baseline BECI value.

A.4 Low-Carbon Concrete Policy Calculator Methodology

Baseline Scenario

The baseline scenario is the estimated embodied carbon associated with all concrete that would be needed for new construction to meet the projected growth of each pilot city. Baseline values are representative of typical construction practices and typical concrete production for each region.

The calculator applies a fixed concrete carbon intensity to the total projected area of growth and does not take into consideration accumulative growth over time, or changes in embodied carbon intensity of concrete over time.

Baseline Calculation

(BTGA) x (CT) = (CMQ)

(CMQ) x (CECI) = (Baseline Scenario)

Where:

- *BTGA* is the Building Typology Growth Area (see A.2.2)
- *CT* is the Construction Type (see A.4.1)
- *CMQ* is the Concrete Material Quantity (see A.4.1)
- *CECI* is the Concrete Embodied Carbon Intensity (see A.4.2)

Reduction Scenario

The reduction scenario is the estimated embodied carbon associated with all concrete that would be needed for new construction to meet the projected growth of each pilot city with a custom reduction percentage applied to the concrete embodied carbon intensity. The calculator assumes the reduction percentage (policy) is implemented immediately and in full, rather than slowly integrated over time or in steps.

Reduction Calculation

(Baseline Scenario) x (Reduction %) = (Reduction Scenario)

A.4.1 Construction Type (CT)

Construction type (CT) refers to the assumed percentage of buildings from any one building typology that share the same primary structural system. The structural system of a building, whether it be steel, concrete, or wood, is also an important indicator of the total volume of concrete a building will use. Estimating total embodied carbon of a city's growth thus requires assumptions about the type of structural systems that will be used.

Each construction type corresponds to a unique concrete volume factor that was used to determine the total concrete material quantity per building typology.

Table A4 lists the construction types and concrete volume factors that were used in this study. The concrete volume factors represent the total volume of concrete (yd3) per unit of area (m2) for each construction type. Steel/Concrete Hybrid (High Rise) contains the most volume of concrete per area, whereas Wood: Light Frame contains the least volume of concrete per area. The factors were derived by equally averaging steel, concrete, and steel/concrete hybrids by the values from two primary sources listed below.

- Background Data from the Early Phase Integrated Carbon (EPIC) Calculator[38]
- CLF Reference Model Database from this study (see Section A.2.4)

The values for both wood type constructions were weighted by 75% towards the reference model database.

38 EHDD Architects. (2021). *Early-Phase Integrated Carbon EPIC (Summer 2021 BETA Version)*. [Spreadsheet] https://epic-documentation.gitbook.io/epic/

Table A4. Construction Type and Concrete Volume Factors used for determining the total material quantity of concrete for each building typology.

Construction Type	Concrete Volume Factor (yd^3 concrete/m^2 area)
Steel/Concrete Hybrid (High Rise)	0.78
Concrete	0.75
Steel	0.48
Wood: Mass Timber	0.39
Wood: Light Frame	0.24

For each city and building typology a set of assumptions was created for both a "low range" and "high range" of construction types. The assumptions took into consideration local building practices, markets, seismic concerns, and future growth projections.

Low Range represents a reasonable construction type mix for the building typology that would be built with less concrete-intensive construction types (more Steel and Wood buildings).

High Range represents a reasonable construction type mix for the building typology that would be built with more concrete-intensive construction types (more Steel/Concrete Hybrid and Concrete structural systems).

Multiplying a building typology growth area by its construction type will yield an estimate of the total Concrete Material Quantity (CMQ) for that building typology.

The low-rise building categories (NYC 1-7 Stories, Portland 1-5 Stories) represented the widest range of concrete material quantities. Both the 2012 and 2015 International Building Code allows for the construction of wood-frame structures up to five stories for many residential occupancy groups, and six stories for office buildings. This means that a hypothetical "low range" construction type for low-rise buildings could be almost entirely light-wood framed, using very little concrete or steel for their construction. The "high range" assumptions for the low-rise category included upwards of 50% steel, or steel/concrete-framed structures.

Alternatively, high-rise buildings showed the narrowest range of concrete material quantities. This is due to the fact that these size types, regardless of their location, tend to be built almost exclusively with steel, concrete, or steel/concrete hybrid structural systems. Mid-rise buildings were assumed to still be largely made up of steel and concrete structural systems, but with a smaller percentage of steel/concrete hybrids. The "low range" for mid-rise buildings also included a small percentage of mass timber buildings. Table A5 lists all construction types and percentages assumed for each pilot city. They were derived from assumptions about local construction requirements and markets. Estimated percentages are orders of magnitude, and intended to be replaced with city-provided data in the future (see Appendix B, Opportunities for Expanding Research).

Table A5. All construction type percentages used for each pilot city and building typology. Estimated percentages are order-of-magnitude, and are intended to be replaced with city-provided data in the future.

New York Multifamily, Commercial, and Institutional

	1-7 Stories		>7 Stories		Very Large	
	Low Range	High Range	Low Range	High Range	Low Range	High Range
Steel Framed	25.00%	50.00%	55.00%	30.00%	50.00%	0.00%
Concrete	20.00%	45.00%	30.00%	60.00%	25.00%	0.00%
Hybrid (High Rise)	0.00%	0.00%	0.00%	10.00%	25.00%	100.00%
Wood Light Frame	50.00%	5.00%	0.00%	0.00%	0.00%	0.00%
Wood Mass Timber	5.00%	0.00%	15.00%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Portland Multifamily and Commercial

	Low Rise 1-5		Mid Rise 6-10		High Rise >10	
	Low Range	High Range	Low Range	High Range	Low Range	High Range
Steel Framed	10.00%	35.00%	35.00%	50.00%	50.00%	20.00%
Concrete	5.00%	20.00%	25.00%	40.00%	25.00%	30.00%
Hybrid (High Rise)	0.00%	0.00%	0.00%	0.00%	15.00%	50.00%
Wood Light Frame	80.00%	45.00%	25.00%	5.00%	0.00%	0.00%
Wood Mass Timber	5.00%	0.00%	15.00%	5.00%	10.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Austin SCW All Typologies

	All > 10 stories	
	Low Range	High Range
Steel Framed	50.00%	20.00%
Concrete	25.00%	30.00%
Hybrid (High Rise)	15.00%	50.00%
Wood Light Frame	0.00%	0.00%
Wood Mass Timber	10.00%	0.00%
Total	100.00%	100.00%

A.4.2 Concrete Embodied Carbon Intensity (CECI)

Concrete embodied carbon intensity refers to the average carbon intensity in $kgCO_2e/yd^3$ of concrete for specific regions of the USA. The source data used for CECI values is the National Ready-Mix Concrete Association (NRMCA) regional baselines[39] which were adjusted for this study. The NRMCA embodied carbon intensities cover cradle-to-gate life cycle impacts and NRMCA provides multiple carbon intensities for a range of concrete strengths in pounds per square inch (psi).

Table A6 lists the concrete embodied carbon intensities used in this report, which were averaged for multiple concrete strengths to represent the mixes of concrete that are commonly used for each building size type. Because embodied carbon intensities of concrete for real-world individual projects can vary greatly, the values used for this study are only intended to represent reasonable averages for current typical construction practices, concrete specification, and concrete production of each region based on the best available data.

Table A6. Concrete Embodied Carbon Intensities per building size type. Based on NRCMA regional baselines that were averaged across anticipated strengths for each building size type.

Building Typologies	Concrete strengths (psi)	Average Concrete Embodied Carbon Intensities ($kgCO_2e/yd^3$)		
		Eastern Region (New York City)	PNW Region (Portland)	South Central Region (Austin)
1-4 Family Row Houses; Single Family Residential	3000, 4000	240	252	218
1-7 Story; 1-5 Story	4000, 5000	288	304	257
>7 Story; 6-10 Story	4000, 5000, 6000	304	321	270
Very Large; High Rise >10	4000, 5000, 6000, 8000, 4000 LW	351	371	313

A.5 Adaptive Reuse Policy Calculator Methodology

Baseline Scenario

The baseline scenario is the estimated embodied carbon associated with all new buildings that would be needed to meet the projected growth of each pilot city under typical design and construction. The calculator assumes 100% new construction and zero reuse. Calculator does not take into account demolition rates or carbon impacts from demolition, waste disposal, or reuse/recycling.

Baseline Calculation

(BTGA) x (BECI) = Baseline Scenario

Where:

39 Athena Sustainable Materials Institute. (2019). *A Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by NRMCA Members Version 3.0 - Appendix D: NRMCA Member National and Regional LCA Benchmark (Industry Average) Report – Version 3.* https://www.nrmca.org/wp-content/uploads/2020/02/NRMCA_LCA_ReportV3_20200416.pdf

- BTGA is the Building Typology Growth Area (see A.2.2)
- BECI is the Building Embodied Carbon Intensity (see A.2.3)

Reduction Scenario

The reduction scenario is the estimated embodied carbon associated with all new built area that would be needed to meet the projected growth of each pilot city with a custom percentage of built area being achieved through adaptive reuse/renovation rather than brand new construction. Scenario assumes there are enough existing buildings available to be reused to meet the reuse percentage. Calculator does not take into account demolition rates or carbon impacts from demolition.

Reduction Calculation

BTGA x RP = Reuse Area

Reuse Area x RT x RECI = Reuse EC

(BTGA - Reuse Area) x BECI = EC New Construction

EC New Construction + Reuse EC = Reduction Scenario

Where:

- *BTGA* is the Building Typology Growth Area (see A.2.2)
- *RP* is the Reuse Percentage of each typology (see A.5.1)
- *Reuse Area* is the total area (m2) of reuse
- *RT* is the Reuse Type (see A.5.2)
- *RECI* is the Reuse Embodied Carbon Intensity (see A.5.2)
- *Reuse EC* is the embodied carbon impacts from all reuse area
- *BECI* is the Building Embodied Carbon Intensity (see A.2.3)
- *EC New Construction* is the embodied carbon impact from the area of construction (not reuse) that still would need to occur to meet the city's growth area projections.

A.5.1 Reuse percentage

Reuse percentage (RP) is the percentage of total area from a building typology that would be expected to be achieved through reusing or renovating existing buildings, rather than constructing new buildings. This percentage is customizable by the user of the calculator to test different impacts of varying levels of reuse.

A.5.2 Reuse type (RT) and reuse embodied carbon intensity (RECI)

Reuse type (RT) is a percentage breakdown that indicates what level of reuse and/or renovation of a hypothetical existing building would need to occur to meet the reuse percentage. Examples of reuse types include interior remodels, envelope replacement, or substantial structural modifications. Reuse embodied carbon intensity (RECI) refers to the embodied carbon intensity associated with each reuse type definition based on background data and carbon intensity factors from the Carbon Avoided Retrofit

Calculator[40] which were averaged and adjusted to fit the typologies of this study. Table A7 lists both the reuse types, their definitions, and the reuse embodied carbon intensity factors used for each.

Table A7. Reuse type definitions and their associated reuse embodied carbon intensity (RECI) based on adjusted and averaged data from the Carbon Avoided Retrofit Calculator.

Reuse Type	Definition	RECI ($kgCO_2e/m^2$)
Minor	50-100% of interior replaced with new	38
Moderate	50-100% of interior and exterior envelope replaced with new	98
Major - Light	50-100% of interior, envelope, and light structural system replaced with new (applies to 1-4 Family Row Houses and Single Family Residential typologies)	123
Major - Heavy	50-100% of interior, envelope, and heavy structural system replaced with new (applies to Multifamily, Commercial, and Institutional typologies)	198

The following reuse type percentages that were used for the Adaptive Reuse Policy Calculator based on CLF assumptions about typical types of reuse:

- Minor: 50%
- Moderate: 25%
- Major - Light / Major - Heavy: 25%.

A.6 Housing Policy EC Calculator Methodology

Baseline Scenario

The baseline scenario is the estimated embodied carbon associated with all new residential buildings that would be needed to meet the approximate projected growth of each pilot city assuming typical unit sizes.

Baseline Calculation

Baseline Number of Units x Unit Size x BECI = Baseline Scenario EC

Where:

- *Baseline Number of Units* is the estimated units of growth to meet total projected growth area (see A.6.2)
- *Unit Size* is the average unit size for each typology (see A.6.1)
- *BECI* is the building embodied carbon intensity (see A.2.3)

Reduction Scenario

The reduction scenario is the estimated embodied carbon associated with all new residential buildings that would be needed to construct a custom number of units with a

40 Net Zero Carbon Collaboration. (2021). Carbon Avoided: Retrofit Calculator (CARE) (Summer 2021 BETA Version). [Spreadsheet Calculator]

custom unit size. Whereas all other calculators assume a fixed area of growth as provided by each city, the reduction scenario for housing policy allows users to test different growth scenarios for each typology based on unit size and number of units and see the potential impacts against the baseline. For the reduction scenarios run in this report, all numbers of units remained the same between baseline scenarios and reduction scenarios. Unit size was the only variable used.

Reduction Calculation

Custom Number Units x Custom Unit Size x BECI = Reduction Scenario

Where:

- *Custom Number of Units* is a user-entered number of units of growth to test against the baseline.
- *Custom Unit Size* is a user-entered unit size to test against the baseline.
- *BECI* is the building embodied carbon intensity (see A.2.3)

A.6.1 Unit Size

Unit size indicates the average area per dwelling unit for residential properties. Unit sizes are typically derived from averaging the sizes of all residential units of a specific type across an entire city or region, regardless of number of bedrooms or occupants living in the unit. Baseline unit sizes were provided for the calculator, whereas custom unit sizes are to be manually entered by users.

Table A8 shows the unit sizes for the baseline scenario of each city and typology that were used for this study. Values listed are in square feet per unit and based on CLF assumptions. Real estate market data and average unit sizes for cities are available from multiple online sources such as Rentcafe.[41] However, due to the sensitivity of unit size for the housing policy calculator, this pilot study uses CLF assumptions about generic and typical unit sizes with the intention that they would be replaced by the best available up-to-date data from each pilot city in future versions of the calculators.

Table A8. Baseline unit sizes for each city and typology that were used for this study. Values listed are in square feet per unit and based on CLF assumptions and intended to be placeholder values only.

City	Typology	Average Unit Size (sqft per unit)
New York City	1-4 Family Row House	1200
New York City	Multifamily 1-7 Stories, > 7 Stories, Very Large	800
Portland	Single Family	1900
Portland	Multifamily Low Rise 1-5, Mid Rise 6-10, High Rise >10	800
Austin SCW	Residential	1000

41 Balint, Nadia. (2018 November 30th). *As Apartments Are Shrinking, Seattle Tops New York with the Smallest Rentals in the U.S. Rent Cafe.* https://www.rentcafe.com/blog/rental-market/real-estate-news/us-average-apartment-size-trends-downward/

The unit size for the reduction scenario is a custom unit size that is intended to be a user-entered value to test against the embodied carbon impacts against the baseline.

A.6.2 Number of Units

"Number of units" refers to the anticipated growth in residential dwelling units for each city and typology. For New York City and Portland the baseline number of units were calculated by dividing the BTGA by the baseline unit size and rounding to the nearest five thousand units. This produces a number of units for the baseline that closely aligns with the projected growth in area for each city and building typology. For Austin SCW the baseline units of growth were provided and used as-is. Future versions of this calculator could allow cities to manually enter the number of units they expect to be required by a given date.

The number of units for the reduction scenario are intended to be a user-entered number of units to test against the baseline scenario.

Table A9 lists the baseline number of units of growth for each city and typology that were used in the housing policy calculator. Estimates of growth by units were only provided in the Austin SCW. All others are based on CLF assumptions and are intended to be placeholder values until city specific data can be acquired.

Table A9. Baseline number of units of growth used for the housing policy calculator based on CLF assumptions and as placeholder values until city-specific data can be acquired.

City	Typology	Baseline # of Units
New York City	1-4 Family Row House	85,000
	Multifamily 1-7	50,000
	Multifamily >7	120,000
	Multifamily Very Large	80,000
Portland	Single Family	25,000
	Multifamily Low Rise 1-5	140,000
	Multifamily Mid Rise 6-10	60,000
	Multifamily High Rise >10	15,000
Austin SCW	Residential (all)	2,702