



Bolton Long Range Planning Committee
663 Main Street
Bolton, Massachusetts 01740

Bolton Population Study

Phase I and II Report

February 2002

Population Task Group:
Advisors:

Lisa Shaw (Chair), Andrew Keane
Ken Troup, Ed Sterling



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Prepared for the Long Range Planning Committee
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Contributors: Lisa Shaw
Andrew Keane

Advisors: Kenneth Troup
Edward Sterling

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BOLTON POPULATION STUDY

Phase I and II Report

General Summary

The Population Subcommittee was formed by the Long Range Planning Steering Committee to collect and analyze population data. The goal was to create a population forecast sensitive to local variables. Annual census figures, affordable housing scenarios, the Rate of Development Bylaw and the Build Out Study were used to develop a graph that identifies the potential for maximum growth.

In Section 1, the graph uses housing resources as a symptomatic indicator to predict growth. This is the holding capacity method described in Population Forecasting Methods: A Report on Forecasting and Estimating Methods, published by the U.S. Department of Transportation Federal Highway Administration Bureau of Public Roads. When using this method “areas currently zoned for low density may be changed to density when demand arises”. Therefore it is valid to consider that zoning changes (or exemptions such as the ones allowed by affordable housing regulations) could affect population maximums.

The other sections of the document contain background and supporting information that could be used as a resource by a consultant or other party.

- Section 2: Population Forecasts
- Section 3: Regional, State, and Federal Information
- Section 4: Local Data
- Section 5: Forecast Methodologies

The Build Out Study created for Bolton by the Executive Office of Environmental Affairs predicted a cap for population at 9,622 people. There is potential for the population to exceed the maximum number represented in the Build Out Study if affordable housing developments exempt to the Rate of Development Bylaw are constructed. Employment opportunities, development strategies and town planning all play a role in the type and quantity of housing potentially built. The I-495 Technology Corridor Initiative/Campaign for Shared Solutions expresses in the summer 1999 edition of I-495 Dialogue, a need for apartments, condos and other opportunities for middle income employees. Recent shifts in the economy could create an even greater market for affordable housing.

Employment levels influence population growth more than any other factor. Economic fluctuations make forecasting a complex task. The linear trend set by the last decade (line four of the graph) predicts a population of 6500 in 2022. It also predicts the population reaching the Build Out Study cap of 9,6200 in 2045. The maximum affordable housing scenario increases the number to 12,000 people by 2022. Line seven of the graph (50% town built, 50% 40B development) predicts 10,000 people by 2022. These predictions assume economic incentive for affordable housing. Town initiatives that retain local control could reduce population significantly.

Further analysis of school enrollment is recommended. In 1994 the town hired the MAPC as a consultant to forecast school enrollment. An update of the forecast could be contracted for a fee of \$3500. The MAPC proposes six to eight weeks to complete this forecast. The 1994 projection for enrollment in the year 2003 was 629 elementary students (K-8). The actual enrollment was 652 as of October 2001. In the Bolton Space Use Committee report of 1998, former Superintendent Eugene Chasin is quoted stating a growth rate of one classroom per year, at 22 students per class. The MAPC study projected a growth of 15 students per year, with a projected growth of 30% in 2003 over 1994.

Forecasting a specific number for population is very difficult in a time of economic fluctuation and can suffer from subjectivity. A rough estimate of school populations could be extrapolated from line four (the linear trend for the last decade). A contract with the MAPC to create an enrollment forecast would provide a more specific number and take into consideration more complete data including the effects of generations (Baby Boomers, Echo Boomers and Generation X).

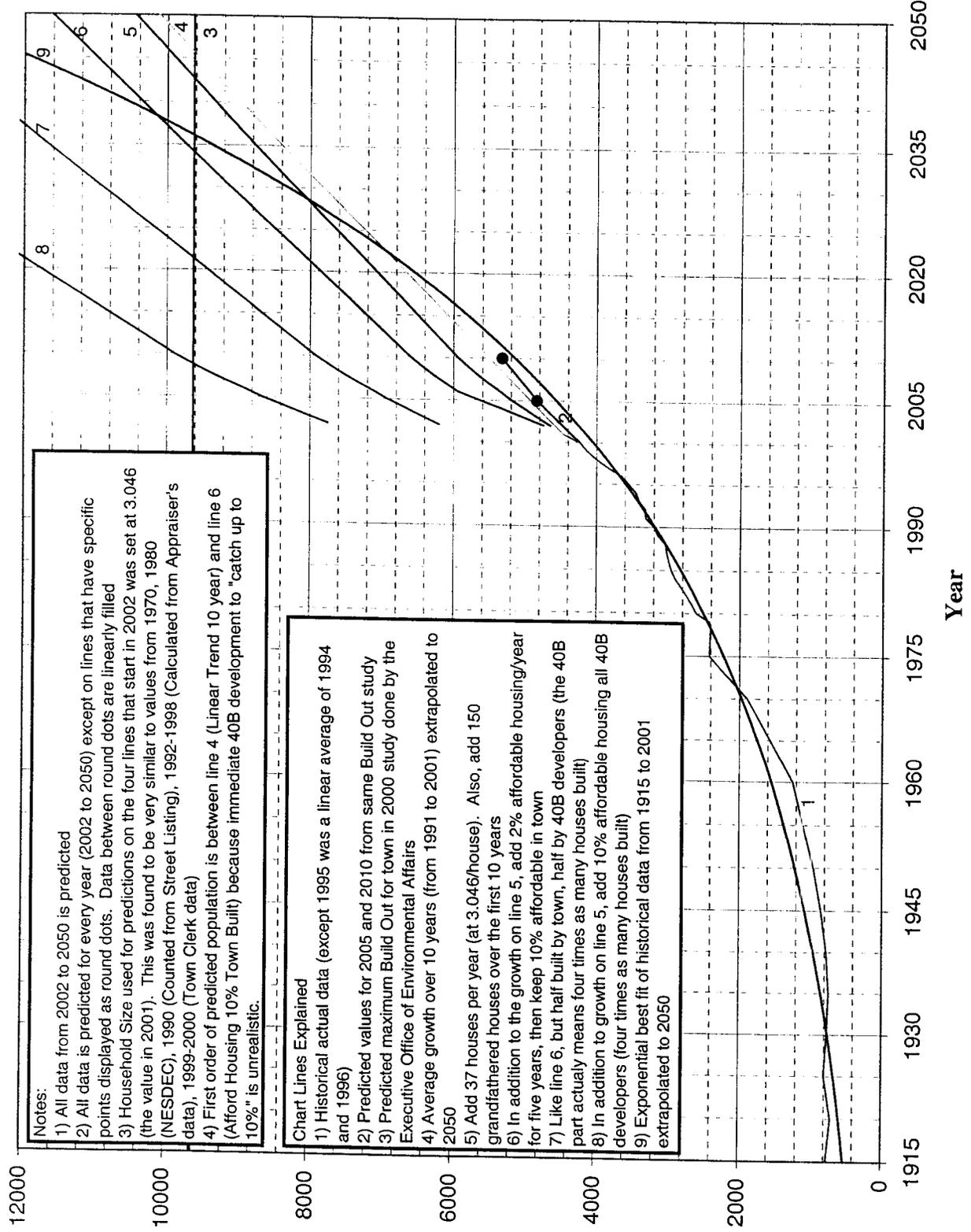
Section One: Maximum Growth Forecast

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Data Supporting Holding Capacity Graph

Bolton Maximum Growth

Population History (Town Annual Census) [1]
Build Out Study (2000) Prediction [2]
Build Out Study (2000) Max [3]
Rate of Development (ROD) Bylaw [5]
Afford Housing at 10% Above ROD (Town Built) [6]
Afford Housing at 10% Above ROD (All 40B) [8]
Affordable at 10% Above ROD (Half Town, Half 40B) [7]
Linear Trend 10 year (1991-2001) [4]
Expon. (Population History (Town Annual Census) [1])



Notes:

- 1) All data from 2002 to 2050 is predicted
- 2) All data is predicted for every year (2002 to 2050) except on lines that have specific points displayed as round dots. Data between round dots are linearly filled
- 3) Household Size used for predictions on the four lines that start in 2002 was set at 3.046 (the value in 2001). This was found to be very similar to values from 1970, 1980 (NESDEC), 1990 (Counted from Street Listing), 1992-1998 (Calculated from Appraiser's data), 1999-2000 (Town Clerk data)
- 4) First order of predicted population is between line 4 (Linear Trend 10 year) and line 6 (Afford Housing 10% Town Built) because immediate 40B development to "catch up to 10%" is unrealistic.

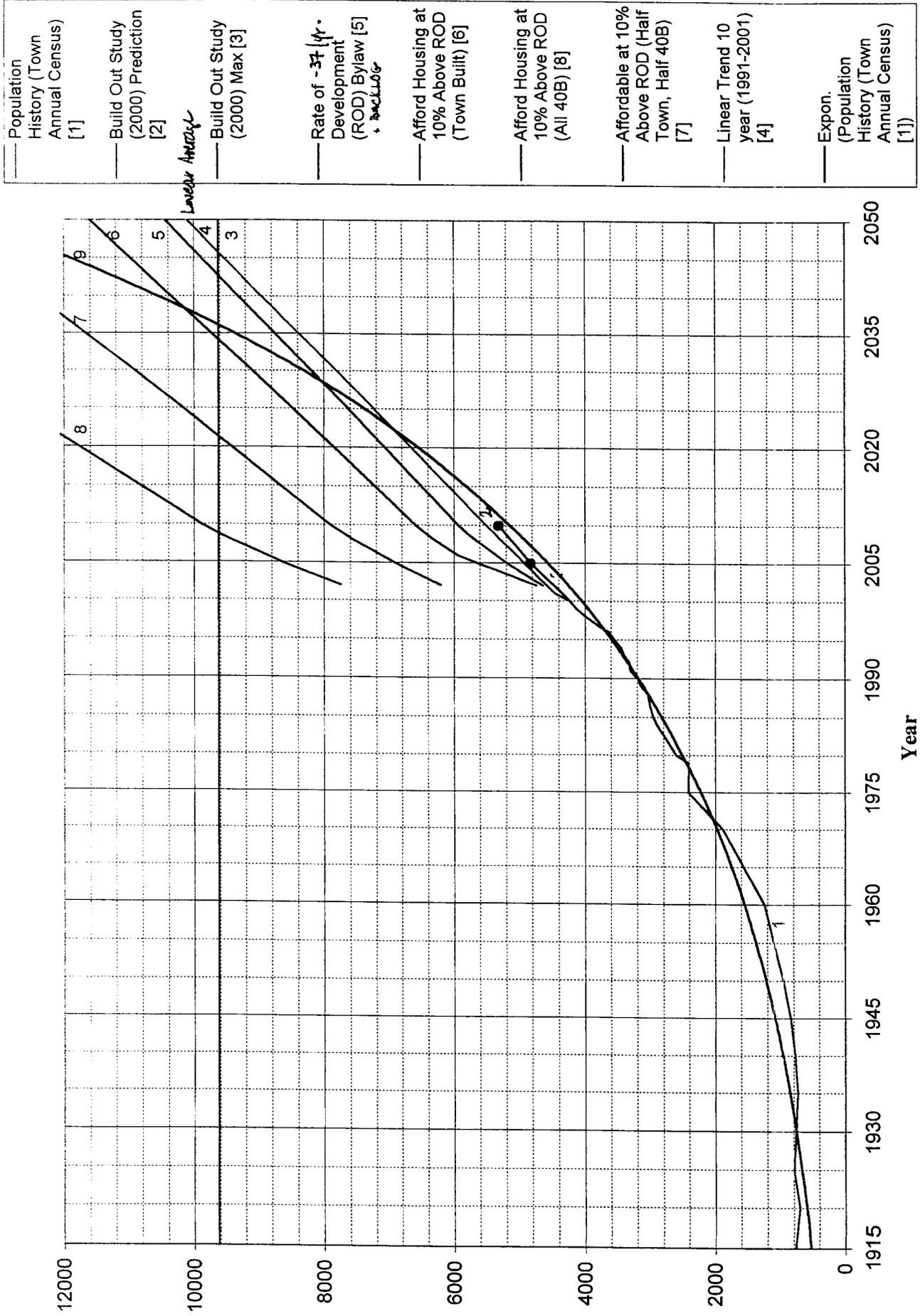
Chart Lines Explained

- 1) Historical actual data (except 1995 was a linear average of 1994 and 1996)
- 2) Predicted values for 2005 and 2010 from same Build Out study
- 3) Predicted maximum Build Out for town in 2000 study done by the Executive Office of Environmental Affairs
- 4) Average growth over 10 years (from 1991 to 2001) extrapolated to 2050
- 5) Add 37 houses per year (at 3.046/house). Also, add 150 grandfathered houses over the first 10 years
- 6) In addition to the growth on line 5, add 2% affordable housing/year for five years, then keep 10% affordable in town
- 7) Like line 6, but half built by town, half by 40B developers (the 40B part actually means four times as many houses built)
- 8) In addition to growth on line 5, add 10% affordable housing all 40B developers (four times as many houses built)
- 9) Exponential best fit of historical data from 1915 to 2001 extrapolated to 2050

Holding Capacity Graph 1915-2050 with Notes

Holding Capacity Graph 1915-2050

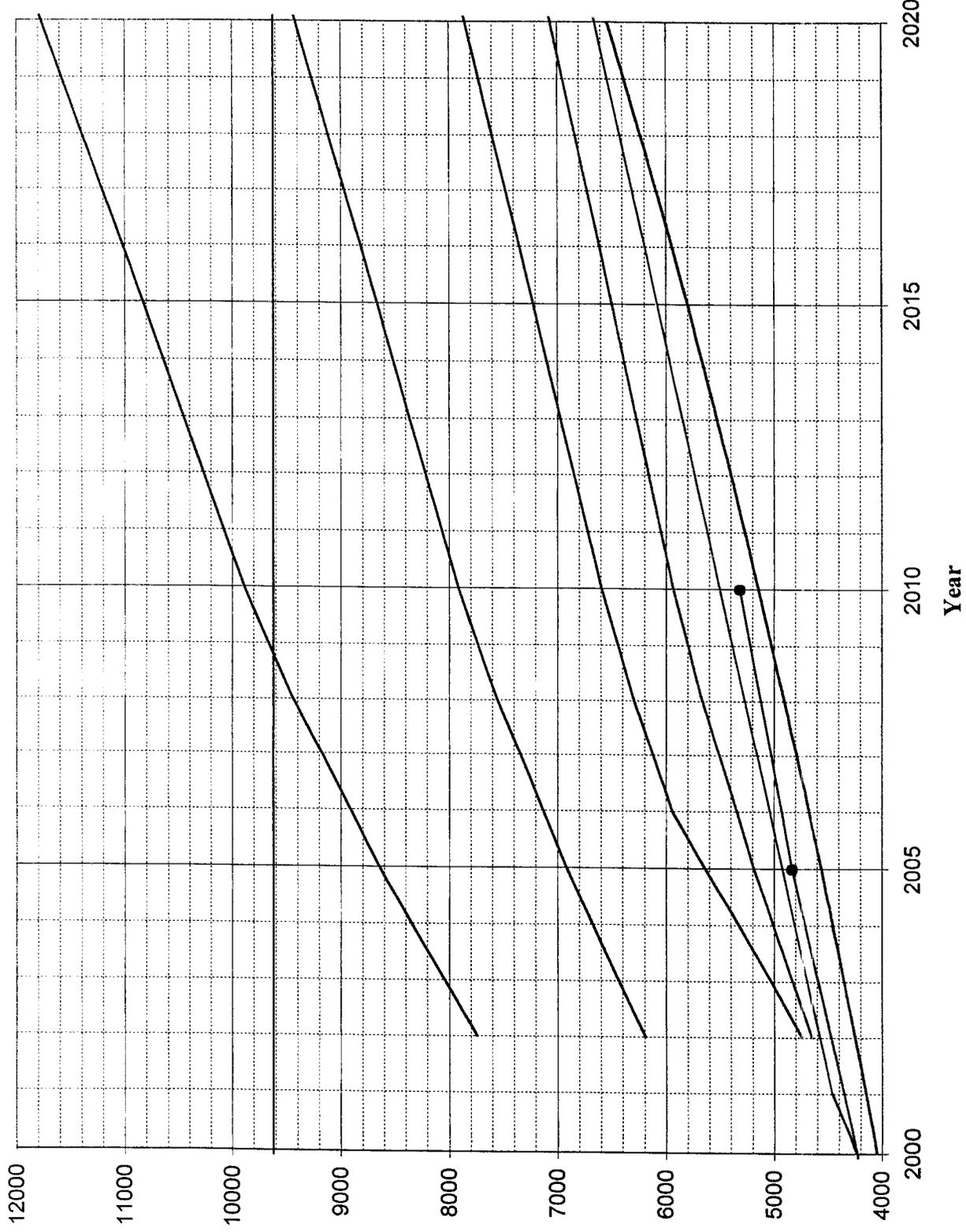
Bolton Maximum Growth



Holding Capacity Graph 2000-2020

Bolton Maximum Growth - Present to 2020

- Population History (Town Annual Census) [1]
- Build Out Study (2000) Prediction [2]
- Build Out Study (2000) Max [3]
- Rate of Development (ROD) Bylaw [5]
- Afford Housing at 10% Above ROD (Town Built) [6]
- Afford Housing at 10% Above ROD (All 40B) [8]
- Affordable at 10% Above ROD (Half Town, Half 40B) [7]
- Linear Trend 10 year (1991-2001) [4]
- Expon. (Population History (Town Annual Census) [1])



Bolton Population Data Explanations

Year	Population History (Town Annual Census) [1]	Future Population (Add 43/year)	Linear Trend 10 year (1991-2001) [4]	w/By-Law (No Grndfthr)	% Exclusions Added In	Rate of Development (ROD) Bylaw [5]	Build Out Study (2000) Prediction [2]	Percentage Affordable Housing in the Town	Afford Housing at 10% Above ROD (Town Built) [6]
1915	768								
1920	708								
1925	801								
1930	764								
1935	739								
1940	775								
1945	850								
1950	956								
1955	1101								
1960	1248								
1970	1886								
1975	2422								
1978	2405								
1979	2420								
1980	2605								
1981	2671								
1983	2823								
1984	2902								
1985	2958								
1986	2992								
1987	3020								
1988	3040	2nd Min of	Average of						
1989	3142	1990-2000	1991-->2001						
1990	3195	43	115.20						
1991	3313								
1992	3321								
1993	3408								
1994	3451								
1995	3551								
1996	3651								
1997	3841								
1998	4005								
1999	4132								
2000	4232						4232		
2001	4465	4465	4465						
2002		4508	4580		15%			2%	4741
2003		4551	4695		15%			4%	5029
2004		4594	4811		15%			6%	5328
2005		4637	4926		15%		4832	8%	5641
2006		4680	5041		10%			10%	5943
2007		4723	5156		10%			10%	6118
2008		4766	5271		10%			10%	6294
2009		4809	5387		5%			10%	6445
2010		4852	5502		5%		5318	10%	6596
2020		5282	6654					10%	7848
2030		5712	7806					10%	9100
2040		6142	8958					10%	10352
2050		6572	10110					10%	11604
					100%				
Data Sources	Town Clerk, 1995=guess	Minimum of 1990-2000 was 8 (1992, throw away). Next minimum was 43 (1994)	Minimum of 1990-2000 was 8 (1992, throw away). Next minimum was 43 (1994)	(Housing Units) * (Household Size)	Guess of distribution	ROD By-Law	Add in By-Law #/year (37) + percentage of Exclusions and multiply by typical (Household Size)	Stated on BuildOUT Study, blue=linear fill	(Future Population w/By-Law + Exclusions) * (1/0.9) -- That's 10% extra
						House/yr On Books	37		150

General Information About the Holding Capacity Graph

- 1) All data from 1915 through 2001 is actual data from the Town Clerk
- 2) All data from 2002 through 2050 is predicted values based on formulation
- 3) All data is predicted for every year (2002 to 2050) except on lines that have specific points displayed as round dots. Data between round dots are linearly filled
- 4) Household Size used for predictions on the four lines that start in 2002 was set at 3.046 (the value in 2001). This was found to be very similar to other historic values:
 - a) 1970 (NESDEC): 3.303 (8.4% over)
 - b) 1980 (NESDEC): 3.019 (0.9% under)
 - c) 1990 (Counted from Street Listing): 2.910 (4.5% under)
 - d) 1992-1998 (Calculated from Appraiser's data)
 1. 1992: 3.115 (2.3% over)
 2. 1993: 3.081 (1.1% over)
 3. 1994: 3.003 (1.4% under)
 4. 1995: 3.017 (1.0% under)
 5. 1996: 3.017 (1.0% under)
 6. 1997: 3.058 (0.4% over)
 7. 1998: 3.062 (0.5% over)
 - e) 1999-2001 (Town Clerk data)
 1. 1999: 3.036 (0.3% under)
 2. 2000: 3.038 (0.3% under)
 3. 2001: 3.046 (0.0%) = (4465 people) / (1466 units)
- 5) Lines #7 and #8 on the graph both include some 40B development. Both lines are unrealistic in the early years because they show projects "catching up" to the 10% affordable housing requirement set by the state. No projects would be able to instantly create houses represented for the early part of the first decade. Over time though, the lines could be more obtainable. Based on this fact, it is believed that a reasonable prediction of future population is between line #4 (Linear Trend 10 year) and line #6 (Afford Housing 10% Town Built).

Explanations of Chart Lines and Hidden Formulas

- 1) Population History (Town Annual Census): Taken from historical census data as reported by the Town Clerk
- 2) Build Out Study (2000) Prediction: Report done for the Town of Bolton by the Executive Office of Environmental Affairs in 2000. Report gave predicted values for 2005 (4832) and 2010 (5318).
- 3) Build Out Study (2000) Max: Report done for the Town of Bolton by the Executive Office of Environmental Affairs in 2000. The predicted maximum is 9622

- 4) Linear Trend 10 year (1991-2001): Extension of the same growth rate from 1991 to 2001.

$$\frac{[(\text{population } 2001) - (\text{population } 1991)]}{(\text{number of year})} =$$

$$\frac{[(4465) - (3313)]}{10} =$$

$$1152 / 10 = 115.2$$
- 5) Rate of Development (ROD) Bylaw: Bolton's new Rate of Development Bylaw allows for 37 new houses to be built in town per year. In addition, 150 houses already planned are excluded from the restriction. Adding 37 houses per year with 3.046 people in each house, adds about 113 people per year. The extra 150 houses were spread across the first decade (2002-2010) adding to the annual increases. The 150 houses were split for each year in the following ratio:
- 2002: 15%
2003: 15%
2004: 15%
2005: 15%
2006: 10%
2007: 10%
2008: 10%
2009: 5%
2010: 5%
- 6) Afford Housing at 10% Above ROD (Town Built): This line represents what happens if the town takes the initiative to create affordable housing. The town would satisfy state requirements if it built 2% affordable housing per year until reaching the 10% required. So, line #6 is equal to:
- 2002: (line #5) / 98% (town adds 2%)
2003: (line #5) / 96% (town has added 4%)
2004: (line #5) / 94% (town has added 6%)
2005: (line #5) / 92% (town has added 8%)
2006 to 2050: (line #5) / 90% (town has added and keeps adding up to required 10%)
- 7) Affordable at 10% Above ROD (Half Town, Half 40B): This is very similar to line #6, but half of the affordable houses are in town-sponsored projects and the other half are in 40B projects. Through 40B, a developer may actually build three houses at market value for every one house that is affordable. That means four times as many houses end up getting built.
- 8) Afford Housing at 10% Above ROD (All 40B): This is very similar to line #6, but all of the houses are built by 40B development projects. Through 40B, a developer may actually build three houses at market value for every one house that is affordable. That means four times as many houses end up getting built.
- 9) Expon. (Population History): Root-Mean-Square best fit of an exponential curve matching the population data (line #1) from 1915 through 2001 and then extended out to 2050.

Population Projections and 40B Development, LRPC Housing Task Force 2001

Housing Task Force Phase 1 Report

Bolton Population Projections

Assumptions: Population baseline +100 per year, 3 persons per HH, 40B units 25% of total HH added

Option 1 - No Town Initiative, One 40B Development Per Year

Year	Town Pop.	Total Housing Units	No. Affordable Units	Percent Affordable	No. Units At 10%	No. Units Needed For 10%	40B Units Added Each Year	Addl Pop. 40 B Units
2001	4351	1472	14	0.95%	147	133	8	96
2002	4547	1516	22	1.45%	152	130	12	144
2003	4695	1565	34	2.17%	157	123	12	144
2004	4843	1614	46	2.85%	161	115	12	144
2005	4991	1664	58	3.49%	166	108	12	144
2006	5139	1713	70	4.09%	171	101	12	144
2007	5287	1762	82	4.65%	176	94	12	144
2008	5435	1812	94	5.19%	181	87	12	144
2009	5583	1861	106	5.70%	186	80	12	144
2010	5731	1910	118	6.18%	191	73	60	720
2015	6471	2157	178	8.25%	216	38	60	720
2020	7211	2404	238	9.90%	240	2		0

Option 2 - Town Initiative To Retain Local Control at 2% Growth of Affordable Stock Per Year

Year	Town Population	Total Housing Units	No. Affordable Units	Percent Affordable	No. Units At 10%	No. Units Needed For 10%	2% Units LIP	Addl Pop. LIP Units
2001	4351	1472	14	0.95%	147	133	30	360
2002	4541	1514	44	2.91%	151	107	31	372
2003	4734	1578	75	4.75%	158	83	32	384
2004	4930	1643	107	6.51%	164	57	33	396

2005	5129	1710	140	8.19%	171	31	25	300
2006	5304	1768	165	9.33%	177	12	0	0
2007	5404	1801	165	9.16%	180	15	16	192
2008	5552	1851	181	9.78%	185	4	0	0
2009	5652	1884	181	9.61%	188	7	0	0
2010	5752	1917	181	9.44%	192	11	0	0
2015	5852	1951	184	9.43%	195	11		0
2020	5952	1984	260	13.10%	198	-62		0

Option 3 - Mix Of 40B Development and Local Initiative Development

Year	Town Population	Total Housing Units	No. Affordable Units	Percent Affordable	No. Units At 10%	No. Units Needed For 10%	40B & LIP Units	LIP/40 B Units	
								40 B Units	Addl Pop.
2001	4351	1472	14	0.95%	147	133	28	8	180
2002	4631	1544	42	2.72%	154	112	0	0	0
2003	4731	1577	42	2.66%	158	116	32	12	240
2004	5071	1690	74	4.38%	169	95	0	0	0
2005	5171	1724	74	4.29%	172	98	25	12	219
2006	5490	1830	99	5.41%	183	84	0	0	0
2007	5590	1863	99	5.31%	186	87	16	12	192
2008	5882	1961	115	5.87%	196	81	0	0	0
2009	5982	1994	115	5.77%	199	84	16	12	192
2010	6274	2091	131	6.26%	209	78	0	0	0
2015	6374	2125	184	8.66%	212	28	32	32	480
2020	6954	2318	260	11.22%	232	-28	32	32	480