Regional, Sub-regional & TAZ-level Projections for the Capital Regional District

Data, Methodology & Summary Output

Prepared for

Making a difference...together

by

URBAN FUTURES
Strategic Research to Manage Change

1 December 2014

Table of Contents

I Overview

Between 2009 and 2011, the Capital Regional District (CRD) commissioned Urban Futures to develop long-range projections of population, housing occupancy demand, and employment for the CRD region as a whole, as well as for sub-regions and traffic analysis zones (TAZs) within it. The region-wide and sub-regional projections were incorporated into the CRD's Regional Growth Strategy, while the TAZ-level projections were developed under multiple scenarios (using the regional and sub-regional projections as a foundation) for use in regional transportation planning.

With data from the 2011 Census and National Household Survey having subsequently been made available, the CRD has requested that Urban Futures update the regional, sub-regional, and TAZ-level projections to a 2011 base year, incorporating the latest land use information and policy objectives from the region's current Regional Sustainability Strategy.

This document serves as a technical backgrounder to the updated projections, and consists of a number of sections. Following this overview, Section II describes differences in the data used in the current set of projections versus those used in the previous model run (from 2011).

Next, an overview of the approach used to develop the regional and sub-regional population, housing occupancy demand, and employment projections, along with a series of summary tables presenting the output of the modelling process, is presented in Section III.

Section IV presents the findings from two sensitivity tests that were performed on two specific inputs into the regional demographic model (fertility and migration) to determine the extent to which this would impact the projection of total population and its age composition.

Finally, Section V describes the approach used to develop the latest TAZ-level projections of population, housing, and employment a Business as Usual (BAU) scenario, a Current Trends and Development Policies (CTDP) scenario, and a Best-Case (B-C) scenario.

II Comparing the Data used in the Current & Previous Projections

The data sources used to update the regional, sub-regional, and TAZ-level projections of population, housing, and employment presented in this report remain largely unchanged since Urban Futures first produced its forecasts for the CRD between 2009 and 2011.

For starters, data on employment by industry from the Labour Force Survey, GDP from the Provincial Economic Accounts, and age specific birth rates from BC Stats were simply updated to include the most recent year (2013).

Detailed historical data describing the CRD's population by age and sex, along with the components of population change used in the development of the regional population projection were obtained from the same source as in 2011: Statistics Canada's Demographic Estimates Compendium. While the specific elements included as part of this database have remained consistent over time (births, deaths, and migration), the most recent demographic information used in the current projections have been adjusted to reflect population data from the 2011 Census.

The biggest differences in the data inputs being used to develop the current projections (versus those produced in 2011) are seen in two places: a) the OCP land use information provided to Urban Futures and error-checked by CRD staff for TAZ-level modelling (specifically in the BAU scenario); and b) the data obtained from the 2011 National Household Survey (NHS), which replaced the mandatory long-form Census questionnaire after 2006.

For the current model run, geospatial land use information was collected by the CRD from its member municipalities and provided to Urban Futures for use in the BAU projection scenario. As this scenario of future change is a mathematically-driven exercise in modelling—with projections of population, housing, and employment at the TAZ-level being directly influenced by the land use information that was provided—any differences in the land use input used in the modelling for this run versus the 2011 run would yield differences in the long-run assessment of change. Further to this, given that there were significant differences in the geospatial land use input used in this model run versus the 2011 run, the result was a set of projections under the current BAU scenario that differed from those produced as part of the previous BAU scenario level at the TAZ and municipal levels.

The NHS was relied upon for data describing age and structure type specific household maintainer rates (used to develop projections of housing occupancy demand) as well as place of work employment by industry data (used to develop projections of employment). Due to the voluntary nature of the NHS, two quality issues arise that pertain to these housing and employment data, with both related to survey response rates.

First, in some instances where data tabulations are complex (involving dimensions with many sub-categories, as was the case with the employment data), some data may be suppressed, resulting in published totals that differ from the sum of the underlying numbers. In some smaller geographic areas, data may be completely suppressed due to what has been deemed an unacceptably-high global non-response rate by Statistics Canada (that is, above 50 percent).

Second, there is a possibility of non-response bias in the data if those who chose not to respond to the NHS were systematically different from those who did respond. For example, if non-immigrants were more likely to respond than recent immigrants, than the NHS may over-represent the characteristics associated with non-immigrants and under-represent the characteristics of recent immigrants. The extent to which this occurs is dependent on both the specific data dimensions and geography being considered, and thus it cannot be specifically identified or measured.

The quality of the data considered at more aggregate geographic levels (such as at the national, provincial, or regional level) is generally higher than at smaller ones (such as TAZs), where there is a greater likelihood of data suppression and response bias. In response to this, Urban Futures has taken the necessary steps to ensure that all published totals wholly comprise the underlying data (that is, total employment in a particular TAZ will be precisely equal to the sum of employment in the underlying industry sectors within that TAZ).

Within this context it is important to note that 2011 estimates based on previous Census data (from 2006 or earlier) may differ from actual counts seen in the 2011 NHS data. While some of this difference may be attributed to short-term changes and trends in, for example, the level of employment, some of the difference will be due to the changes in the collection methodology for the NHS data itself. Unfortunately it is not possible to determine the degree to which either factor is contributing to temporal changes in the data.

A Note on 2011 Population & Housing Data for the Juan de Fuca Electoral Area

The CRD undertook a 2011 Census Formal Challenge Review of Population and Dwelling Counts for the Juan de Fuca Electoral Area, resulting in Statistics Canada identifying that:

- in the 2011 Census, 57 dwellings (occupied by 99 residents) were missed in Juan de Fuca; and
- in the 2006 Census, 41 dwellings (occupied by 77 residents) were allocated incorrectly to Juan de Fuca instead of to Sooke.

In both cases, Statistics Canada was only able to identify missed dwellings and population at the municipal level; that is, for Juan de Fuca and Sooke. In total, these misallocations accounted for approximately two percent of Juan de Fuca's population in both years.

While Statistics Canada's acknowledgement is hereby noted, Urban Futures did not re-allocate base-year population or dwellings as part of the modelling process. The reason for this is that the adjustments would have to be made at a municipal level; within the current model framework, however, forecasts have been developed for individual TAZs, with each municipal total representing the sum of its underlying TAZs. As such it was not possible to determine which (or how many) of Juan de Fuca's TAZ population and occupied dwelling counts should be adjusted for 2006 and 2011.

III Regional & Sub-regional Projections: General Approach & Output

The approach used in the development of regional demographic, housing, and employment projections builds on a foundation of empirically-observed, long-run trends in the factors underlying historical change. That said, these trends are considered against other evidence that may indicate divergence from their longer-run historical paths. The resulting modification of long-run trends in light of recent changes yields projections that are *trend-based* in nature, as opposed to simply being *trend* projections.

The data used to develop the CRD-wide projections are from a range of sources, including the latest (2011) Census and National Household Survey, Statistics Canada's 2013 Demographic Estimates Compendium, BC Stats' Vital Statistics, and Statistics Canada's Provincial Economic Accounts and Labour Force Survey.

Projections were developed for the Capital Region as a whole, as well as four sub-regions within it: the Gulf Islands (including Salt Spring), Peninsula (Sidney, North Saanich, and Central Saanich), Core (Victoria, Saanich, Oak Bay, View Royal, and Esquimalt), and the West Shore (Langford, Colwood, Highlands, Sooke, Metchosin, and the Juan de Fuca Electoral Area).

Projection Framework

The regional analysis of demographic and housing change considers a range of internal and external factors to the CRD that will ultimately shape the future of the region and its underlying communities. The region's external context is represented by the broader BC- and Canada-wide demographic contexts, as trends and policies in these larger geographic spheres will have a direct impact on the CRD's demography in the coming years. This will occur primarily through future levels of immigration to Canada and inter-provincial migration to British Columbia. As such, in developing a population projection for the CRD, it is necessary to first consider the long-term population prospects for Canada and for BC, and in turn how these prospects may affect future levels of international, inter-provincial, and intra-provincial (within-BC) migration to the CRD.

Once the external context for the CRD has been established, attention is turned to trends in the region's age-specific fertility rates and age- and sex-specific mortality rates in order to determine future levels of natural increase (the annual difference between the number of births and deaths) in the CRD. Combining these future levels of births and deaths with migration to and from the CRD, as well as with the aging of the region's current population, results in annual projections that describe the size, and the age and sex composition, of the CRD's population between 2011 and 2038.

The regional population projection provides the basis for the development of a CRD-wide projection of housing occupancy demand, which is delineated by structure type of dwelling (ground oriented and apartment). The behavioural link between demographic change and housing demand is represented by the lifecycle pattern of household maintainer rates (which is the percentage of people in an age group that is primarily responsible for their household's finances). In looking forward, a trend-based projection of changes in household maintainer rates has been developed, acknowledging the unique occupancy pattern of housing in the CRD. Relating these trends in age- and structure type-specific maintainer rates to the projected size and composition of the region's future population then yields a trend-based projection of the number of additional dwelling units, by structure type, that would be required to accommodate the region's future residents annually between 2011 and 2038.

The projection of regional employment by industry sector was, in its first instance, independent of the demographic projection. The initial iteration of the regional employment projections was a product of the historical relationship between provincial economic activity (as measured by BC's real Gross Domestic

Product, or GDP) and changes in sectoral employment in the CRD. Changes in this historical relationship, along with a long-range assessment of provincial GDP, allowed for an assessment of future employment within the region to be made.

At this point an important junction in the modeling process was reached, one where the employment projections were compared against the potential supply of workers in the CRD as per the projection of regional population and labour force (the latter of which was developed through consideration of long- and short-term trends in age and sex specific labour force participation rates). These two dimensions—the demand for, and supply of, workers—were then resolved with each other through the unemployment rate mechanism. In undertaking this resolution, it was necessary to ensure that the projected rate of unemployment would fall within a reasonable range (comparable to historical levels) to ensure that projections of the CRD's demography were consistent with its economic outlook over the course of the projection period.

Combined, these three series of projections (population, employment, and housing) at the regional level established the dimensions of change and the future context for the sub-regional and TAZ-level projections.

The sub-regional projections for the Gulf Islands, Peninsula, Core, and West Shore geographies were undertaken within a community lifecycle modeling framework. As the future distribution of housing within the region will in large part determine the distribution of future population, the community lifecycle modeling framework relies on a land use approach to move from the projections of additional housing occupancy demand at the regional level to projections of population in its sub-regions. In allocating future dwelling units to sub-regions in the CRD, consideration was given to both historical patterns of growth and development amongst sub-regions in the CRD as well as expected patterns of growth as reflected by the collection of plans and development policies throughout the Region. To account for the demographic characteristics of new residents moving into new units within the CRD's sub-regions, a custom data tabulation of household mobility status by age, household size, dwelling period of construction, and structure type of dwelling for the Capital Regional District was purchased from Statistics Canada and used to describe the composition of households moving into new dwellings.

Along with the allocation of future housing and the demographic characteristics of future occupants, modeling the sub-regional populations required consideration of the natural demographic changes occurring within each sub-region's existing population, including aging, natality, mortality and outward mobility. These demographic changes, combined with additions due to net growth in housing, determined the projected population described by age and sex for each of the four sub-regions annually between 2011 and 2038.

Some of the factors considered in the allocation of regional employment to sub-regions included: historical trends in sub-regional sectoral employment; the magnitude of employment in each sector that would serves residents of the local communities (population-serving employment); major employment-related projects planned within each sub-region over the medium-term; and long-range economic development plans and policies.

Capital Regional District - Output

Population by Age Group, Capital Regional District

Estimates from 2001-2011; Projections to 2038

Age	2001	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
<15	50,947	47,918	47,316	48,564	52,697	56,819	59,771	60,036	59,776	12,460	26%
15-24	44,543	45,990	46,187	43,858	40,708	39,595	41,355	44,666	46,256	69	0%
25-34	44,686	43,174	50,487	55,681	58,209	55,890	52,634	51,691	52,095	1,608	3%
35-44	53,076	48,986	46,051	48,012	54,517	61,361	64,347	62,199	60,966	14,915	32%
45-54	53,181	55,458	55,281	52,122	50,529	53,705	60,399	67,315	68,743	13,462	24%
55-64	33,916	46,199	54,923	56,708	56,354	54,150	52,892	56,203	58,664	3,741	7%
65-74	27,052	27,361	33,598	45,745	53,418	55,348	55,308	53,486	52,650	19,052	57%
75+	31,784	33,423	33,789	35,153	40,965	51,742	61,494	69,118	71,341	37,552	111%
Total	**339,185**	**348,508**	**367,632**	**385,843**	**407,396**	**428,609**	**448,199**	**464,713**	**470,492**	**102,860**	**28%**

Housing Occupancy Demand by Structure Type, Capital Regional District

Estimates from 2001-2011; Projections to 2038

ST	2001	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
GO	102,392	105,003	111,789	118,589	125,802	132,490	138,228	142,991	144,550	32,762	29%
Apt	45,083	48,447	51,230	55,345	59,571	63,452	67,168	70,763	72,221	20,991	41%
Total	**147,475**	**153,450**	**163,019**	**173,934**	**185,373**	**195,942**	**205,396**	**213,755**	**216,771**	**53,753**	**33%**

Employment by Industry Sector, Capital Regional District

Estimates from 2006-2011; Projections to 2038

Industry	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
Primary	1,996	2,981	2,126	2,038	1,916	1,837	1,764	1,735	-1,246	-42%
TWU	6,900	6,978	6,826	7,301	7,401	7,507	7,619	7,663	686	10%
Construction	14,933	12,417	14,524	15,802	16,736	17,665	18,592	18,957	6,540	53%
Manufacturing	7,621	6,465	6,880	7,275	7,443	7,399	7,366	7,354	889	14%
Trade	29,660	27,912	30,686	32,515	33,731	34,954	36,188	36,675	8,764	31%
FIRE	31,720	37,558	40,160	42,454	45,629	48,778	51,903	53,132	15,575	41%
Edu., Health, Info.	46,241	47,820	53,558	54,668	56,893	59,127	61,375	62,262	14,442	30%
Accomm. & Food	16,272	15,906	17,436	18,671	19,306	19,946	20,594	20,850	4,944	31%
Other Services	5,973	7,696	8,093	8,233	8,223	8,221	8,230	8,235	539	7%
Public Admin.	23,549	26,084	26,154	26,852	26,640	26,462	26,321	26,269	185	0.7%
Total	**184,863**	**191,816**	**206,443**	**215,811**	**223,915**	**231,896**	**239,951**	**243,133**	**51,317**	**27%**

Core - Output

Population by Age Group, Core

Estimates from 2001-2011; Projections to 2038

Age	2001	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
<15	31,214	29,866	28,368	28,551	30,757	32,441	32,521	30,467	29,426	1,058	4%
15-24	32,416	32,903	32,106	26,904	23,387	21,500	21,648	22,935	23,494	-8,611	-27%
25-34	33,260	32,192	36,136	40,748	40,210	35,148	32,142	30,837	30,823	-5,313	-15%
35-44	34,880	32,425	30,066	31,284	36,685	42,769	42,644	37,487	36,404	6,338	21%
45-54	35,167	36,409	35,163	32,595	31,060	32,957	38,483	45,094	45,465	10,302	29%
55-64	21,733	29,403	34,707	35,033	34,147	32,215	30,817	32,908	34,954	247	1%
65-74	18,139	17,654	20,849	27,592	32,001	32,684	32,195	30,731	29,966	9,117	44%
75+	23,493	23,790	23,192	22,535	24,501	29,909	35,000	38,766	39,802	16,611	72%
Total	**230,301**	**234,643**	**240,586**	**245,243**	**252,746**	**259,623**	**265,451**	**269,225**	**270,335**	**29,748**	**12%**

Housing Occupancy Demand by Structure Type, Core

Estimates from 2006-2011; Projections to 2038

ST	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
GO	62,659	65,988	68,040	70,177	72,053	73,611	74,873	75,281	9,293	14%
Apt	44,355	46,139	48,944	51,785	54,272	56,545	58,656	59,492	13,353	29%
Total	**107,014**	**112,127**	**116,984**	**121,962**	**126,325**	**130,156**	**133,529**	**134,772**	**22,646**	**20%**

Employment by Industry Sector, Core

Estimated 2011; Projections to 2038

Industry	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
Primary	949	682	653	614	589	565	556	-393	-41%
TWU	4,017	3,933	4,201	4,258	4,317	4,379	4,404	387	10%
Construction	7,394	8,034	8,566	8,932	9,269	9,537	9,628	2,234	30%
Manufacturing	2,916	3,067	3,225	3,291	3,274	3,263	3,260	344	12%
Trade	18,868	19,720	20,447	20,869	21,268	21,609	21,731	2,863	15%
FIRE	28,949	30,201	31,377	32,949	34,442	35,803	36,313	7,364	25%
Edu., Health, Info.	37,786	39,698	40,131	40,959	41,740	42,413	42,656	4,870	13%
Accomm. & Food	11,899	12,790	13,522	13,890	14,255	14,610	14,747	2,848	24%
Other Services	5,716	5,821	5,868	5,865	5,865	5,867	5,868	152	3%
Public Admin.	23,669	23,735	24,234	24,084	23,959	23,864	23,829	159	0.7%
Total	**142,163**	**147,679**	**152,226**	**155,709**	**158,977**	**161,911**	**162,992**	**20,829**	**15%**

Peninsula - Output

Population by Age Group, Peninsula

Estimates from 2001-2011; Projections to 2038

Age	2001	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
<15	6,380	5,430	5,114	4,356	4,232	4,619	5,317	5,817	5,924	810	16%
15-24	4,381	4,435	4,548	4,988	4,511	4,266	4,416	4,899	5,222	673	15%
25-34	3,294	2,821	3,238	2,934	3,811	4,116	3,377	2,930	2,879	-359	-11%
35-44	5,818	4,683	3,962	3,111	2,464	2,530	3,778	4,392	4,159	197	5%
45-54	6,903	6,504	6,365	5,289	4,510	4,104	3,652	3,880	4,437	-1,928	-30%
55-64	4,948	6,486	7,386	7,621	7,439	6,777	6,294	6,029	5,892	-1,495	-20%
65-74	4,063	4,213	5,272	7,330	8,519	8,947	8,980	8,534	8,365	3,093	59%
75+	4,636	5,281	5,626	6,380	7,694	9,521	11,029	12,336	12,682	7,056	125%
Total	**40,423**	**39,854**	**41,511**	**42,010**	**43,179**	**44,880**	**46,842**	**48,817**	**49,559**	**8,048**	**19%**

Housing Occupancy Demand by Structure Type, Peninsula

Estimates from 2006-2011; Projections to 2038

ST	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
GO	14,267	14,946	15,595	16,404	17,136	17,739	18,224	18,380	3,434	23%
Apt	2,365	2,387	2,577	2,752	2,945	3,160	3,386	3,481	1,093	46%
Total	**16,632**	**17,333**	**18,172**	**19,155**	**20,081**	**20,899**	**21,610**	**21,860**	**4,527**	**26%**

Employment by Industry Sector, Peninsula

Estimated 2011; Projections to 2038

Industry	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
Primary	809	595	572	539	518	498	491	-318	-39%
TWU	1,936	1,897	2,023	2,050	2,078	2,108	2,120	184	9%
Construction	1,760	1,866	1,932	2,002	2,089	2,193	2,237	477	27%
Manufacturing	2,593	2,655	2,736	2,771	2,762	2,754	2,752	158	6%
Trade	3,130	3,274	3,409	3,519	3,650	3,800	3,862	732	23%
FIRE	3,676	3,862	4,037	4,325	4,644	4,992	5,135	1,459	40%
Edu., Health, Info.	3,811	3,783	3,854	4,039	4,261	4,518	4,625	814	21%
Accomm. & Food	1,311	1,444	1,537	1,590	1,647	1,710	1,735	424	32%
Other Services	623	626	635	634	634	635	636	13	2%
Public Admin.	1,256	1,304	1,341	1,328	1,316	1,306	1,302	46	3.7%
Total	**20,906**	**21,307**	**22,076**	**22,797**	**23,600**	**24,515**	**24,895**	**3,989**	**19%**

West Shore - Output

Population by Age Group, West Shore

Estimates from 2001-2011; Projections to 2038

Age	2001	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
<15	11,460	10,949	12,149	14,082	15,891	17,566	19,302	20,846	21,463	9,314	77%
15-24	6,605	7,429	8,361	10,472	11,414	12,486	13,818	15,132	15,682	7,321	88%
25-34	7,056	7,157	10,077	10,837	12,531	14,554	15,185	16,123	16,637	6,561	65%
35-44	10,591	10,321	10,515	12,222	13,918	14,293	15,536	17,427	17,484	6,969	66%
45-54	8,494	9,983	11,571	12,362	13,092	14,692	16,173	15,917	16,176	4,606	40%
55-64	4,978	7,087	9,365	11,189	12,339	12,890	13,434	14,837	15,356	5,991	64%
65-74	3,054	3,634	5,000	7,398	9,370	10,698	11,476	11,686	11,763	6,763	135%
75+	2,257	2,665	3,250	4,135	5,851	8,358	10,963	13,396	14,272	11,022	339%
Total	**54,495**	**59,226**	**70,288**	**82,697**	**94,406**	**105,537**	**115,887**	**125,364**	**128,834**	**58,546**	**83%**

Housing Occupancy Demand by Structure Type, West Shore

Estimates from 2006-2011; Projections to 2038

ST	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
GO	21,141	24,142	27,960	31,821	35,422	38,578	41,241	42,120	17,978	74%
Apt	1,683	2,703	3,810	4,966	6,095	7,248	8,430	8,926	6,222	230%
Total	**22,824**	**26,845**	**31,771**	**36,786**	**41,517**	**45,826**	**49,671**	**51,046**	**24,201**	**90%**

Employment by Industry Sector, West Shore

Estimated 2011; Projections to 2038

Industry	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
Primary	406	250	237	219	208	197	192	-214	-53%
TWU	684	661	718	731	743	757	763	79	12%
Construction	2,448	3,700	4,317	4,755	5,197	5,684	5,886	3,438	140%
Manufacturing	564	785	922	979	964	951	947	383	68%
Trade	4,987	6,645	7,504	8,106	8,714	9,367	9,634	4,647	93%
FIRE	3,665	4,705	5,539	6,675	7,825	9,049	9,551	5,886	161%
Edu., Health, Info.	4,788	8,701	9,247	10,315	11,393	12,551	13,025	8,237	172%
Accomm. & Food	2,133	2,554	2,911	3,092	3,277	3,474	3,554	1,421	67%
Other Services	1,062	1,347	1,422	1,417	1,416	1,421	1,424	362	34%
Public Admin.	1,027	941	1,086	1,043	1,007	977	965	-61	-6.0%
Total	**21,764**	**30,288**	**33,905**	**37,330**	**40,743**	**44,428**	**45,942**	**24,178**	**111%**

Gulf Islands - Output

Population by Age Group, Islands

Estimates from 2001-2011; Projections to 2038

Age	2001	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
<15	1,893	1,673	1,684	1,575	1,817	2,193	2,631	2,905	2,963	1,278	76%
15-24	1,141	1,222	1,172	1,494	1,397	1,343	1,473	1,700	1,858	686	59%
25-34	1,076	1,004	1,036	1,162	1,657	2,072	1,930	1,800	1,756	720	69%
35-44	1,787	1,557	1,508	1,394	1,450	1,769	2,388	2,893	2,918	1,411	94%
45-54	2,617	2,561	2,183	1,876	1,867	1,953	2,091	2,425	2,665	482	22%
55-64	2,257	3,222	3,465	2,864	2,429	2,268	2,346	2,430	2,463	-1,002	-29%
65-74	1,797	1,860	2,478	3,425	3,528	3,018	2,656	2,534	2,557	79	3%
75+	1,398	1,687	1,721	2,103	2,919	3,953	4,502	4,619	4,585	2,863	166%
Total	**13,966**	**14,786**	**15,247**	**15,893**	**17,065**	**18,569**	**20,018**	**21,307**	**21,763**	**6,517**	**43%**

Housing Occupancy Demand by Structure Type, Islands

Estimates from 2006-2011; Projections to 2038

ST	2006	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
GO	6,936	6,714	6,994	7,401	7,879	8,300	8,653	8,770	2,056	31%
Apt	44	0	14	69	140	216	291	323	323	-
Total	**6,980**	**6,714**	**7,008**	**7,469**	**8,019**	**8,515**	**8,945**	**9,093**	**2,379**	**35%**

Employment by Industry Sector, Islands

Estimated 2011; Projections to 2038

Industry	2011	2016	2021	2026	2031	2036	2038	2011-2038 Change	
Primary	816	600	577	544	523	503	495	-321	-39%
TWU	341	335	358	363	368	374	376	35	10%
Construction	814	925	987	1,048	1,111	1,178	1,205	391	48%
Manufacturing	392	373	393	402	399	397	397	5	1%
Trade	927	1,046	1,155	1,237	1,323	1,413	1,449	522	56%
FIRE	1,268	1,393	1,500	1,681	1,866	2,058	2,134	865	68%
Edu., Health, Info.	1,434	1,376	1,435	1,581	1,733	1,892	1,955	521	36%
Accomm. & Food	562	648	702	734	766	800	814	251	45%
Other Services	296	299	307	306	306	307	307	11	4%
Public Admin.	132	174	190	184	179	175	173	41	30.8%
Total	**6,984**	**7,169**	**7,604**	**8,079**	**8,575**	**9,097**	**9,304**	**2,321**	**33%**

IV Regional Sensitivity Testing

As part of the update to the regional outlook, the CRD requested that Urban Futures conduct sensitivity tests on key inputs to the population model in order to assess how modifications to specific components of change (fertility and migration) could impact the long-run outlook of population. To this end, two sensitivity tests were carried out at the regional level.

The first tested the impact that changes to the total fertility rate (and by extension, age specific fertility rates) would have on both total population and its age composition by 2038. With the region's TFR increasing since it reached a low of 1.17 in 2002, the specific test that was carried out was to increase the CRD's projected total fertility rate (TFR) by ten percent above the baseline projection of 1.39 in 2038. This would bring the TFR, and its associated age specific rates, up to 1.53 over the next three decades. As expected, a change in the TFR of this magnitude would not significantly alter the CRD's total population by 2038, bringing it up to 475,223 residents versus 470,492 under the baseline projection, a difference of 4,731 people, or 1.0 percent of the CRD's total population in 2038.

The difference in total population would be entirely the result of changes in the younger cohorts, with the under-15 age group being 6.7 percent larger and the 15 to 24 group being 1.7 percent larger in 2038 under this higher fertility rate scenario than under the baseline projection.

The second test was to assess the impact that changes to the long-run outlook of migration to the region would have on total population and its age composition. Specifically, in place of using the long-run average of 12.2 percent of BC's interprovincial migrants moving to the CRD as was done as part of the baseline projection, 10.8 percent was used. This represented the region's lowest share of BC's interprovincial migration over the past decade. The resulting impact on the CRD's total population is, in this case, more significant than what was observed through changing fertility rates: with a lower proportion of all interprovincial migrants to BC settling in the CRD (from 12.2 percent to 10.8 percent over the long-term), the regional population would only reach 449,334 by 2038. This is 21,158 fewer people than envisioned as part of the baseline projection, a difference of 4.5 percent three decades from now.

As with changes to the long-run outlook for fertility, changes to migration levels to the CRD would disproportionately affect the younger part of the regional age profile (and those age groups most closely associated with migration) as opposed to the older part. More specifically, the 4.5 percent difference in the CRD's total population by 2038 under the lower-migration scenario would comprise a 6.8 percent smaller 25 to 34 age group and a 6.7 percent smaller 35 to 44 group by 2038 versus the baseline scenario. Linked to this latter age group would be a commensurate reduction in the size of the cohort representing their kids: a 6.2 percent smaller under-15 population. The least affected group would be those aged 85-plus in 2038, with this segment being 1.2 percent smaller in that year under the lower-migration scenario.

It is worth noting that in addition to these direct population-related impacts that changing fertility and migration rates would have, both housing occupancy demand (through the lifecycle pattern of maintaining a household) and employment (through the labour force and the capacity of the region to fill future jobs) would also be affected.

V Traffic Analysis Zone (TAZ) Projections: General Approach & Output

The TAZ population estimates were produced using a cohort survival model to describe the demographic consequences of aging, natality, mortality and net migration by age for each TAZ in the region—an approach consistent with that used for the regional (CRD) and sub-regional (Peninsula, Core, West Shore, and Gulf Islands) projections. The net migration vector (the addition of net new residents) for each TAZ was derived from projected changes in housing additions (by structure type) within each zone as a share of its parent sub-region, subject to land use constraints or policies as described in the applicable scenario. The additional dwelling units were then populated using the age and sex composition of dwelling units by structure type that prevailed in the respective sub-region to estimate net migration to each TAZ.

The traffic zone employment projections were based on the composition of existing employment within each zone as described by the 2011 National Household Survey. Projected future changes were determined by each zone's share of its parent sub-region's growth in sectoral employment, again subject to land use constraints or policies as described in the applicable scenario. In order to apply land use constraints, it was necessary to convert employment (which was tabulated for the industry sectors commonly used in transportation modelling) to five general land use categories: commercial and mixed use; public and institutional; industrial; K to 12 education; and defence. This was done using an occupation by industry matrix for the region from the NHS.

All scenarios build on a 2011 Census/NHS base and recognize the higher-level sub-region and regional projections, which represent control totals for the underlying TAZs. As such, the scenarios detailed here model future change for zones within each of the sub-regions, while holding the distribution between sub-regions constant.

The BAU scenario was developed using a mathematical-rules approach that was applied uniformly to all TAZs within the region. As such, parcel-specific instances of changes in land use or recent development not reflected in future land use policy may not necessarily be represented at the individual TAZ level. Under the BAU scenario, OCP land use (the area of land in each land use category for each TAZ) was used to influence the distribution of sub-regional growth that would be seen, based on historical trends, towards zones that had capacity to grow (as measured by available land and density).

The second scenario—the CTDP scenario—built on information obtained through a comprehensive consultation process that took place in 2011 between Urban Futures, CRD Regional Planning, and staff from planning departments in each of the CRD's member municipalities to identify TAZs where growth in housing and employment could be expected, and not expected, in the coming years.

Note that the numerical output produced for each scenario has been provided by Urban Futures to the CRD in Microsoft Excel workbooks.

Business As Usual (BAU) Scenario

Within each of the four sub-regions, the BAU scenario establishes projections of TAZ-level housing, population, and employment based on historical changes in each zone's share of sub-regional growth, subject to each zone's capacity to accommodate additions (housing or jobs) as reflected in its landscape of Official Community Plan (OCP) land use (refer to the flow charts on pages 17 and 18).

As the availability of housing will, in large part, determine where future population is accommodated, housing provides the functional link between regional, sub-regional, and TAZ population projections. The regional and sub-regional projections developed for the CRD's Regional Sustainability Strategy generate

future net new housing additions in each sub-region, which are further allocated to component TAZs. It is useful to briefly re-visit the general approach used to develop the regional and sub-regional projections here.

The regional population projection considered age specific components of population change, commencing with the biological factors of aging, births, and deaths, followed by domestic and international migration. This resulted in a projection of changes in the region's population over the next three decades, given the composition of its current population and trends in natality, mortality, and migration on an age and sex specific basis. On this demographic base, a regional housing occupancy demand projection was generated by linking projected change in the size and composition of the region's population to a projection of household maintainer rates by age of household maintainer and structure type of dwelling. Thus, regionally, population change is the given, with the regional housing market responding to accommodate demographic growth and change through the addition of housing units by various structure types.

Within the region, however, it is the availability of housing that will largely determine where population is accommodated. The approach used to model this functional linkage begins with the current housing stock and current residents in each of the CRD's four sub-regions. The first step is to model the annual demographic change for each of the sub-region's existing populations to determine their future housing requirements by structure type (ground oriented and apartment) as they age through the lifecycle of housing maintainership demonstrated in their part of the CRD. This includes consideration of the degree to which current residents will move in the coming years, thereby accounting for turnover within each sub-region's housing stock.

The next step is to allocate annual growth in regional housing occupancy demand by structure type to each of the sub-regions, and then to add this new housing to the existing dwelling stock. This allocation to sub-regions is based on the historical patterns of housing development as reflected in the annual patterns of housing starts over the past two decades, and the patterns of regional growth implied by the landscape of OCPs throughout the CRD.

Once dwellings are allocated to each sub-region, they are occupied with people by age and sex based on the structure type of dwelling being added. This approach therefore accounts for the housing occupancy of each sub-region's base population as it grows and changes (including the turnover of the dwelling stock as this population ages) and new residential development (and hence, residents) that will be added to each area, each year, over the coming three decades.

A similar land use based approach was used to move from the sub-region to the TAZ level, with each zone's historical share of sub-regional housing growth by structure type, and the underlying residential land uses, determining where future allocations of housing growth would be accommodated within each sub-region. The TAZ modeling approach is therefore a constrained allocation process within sub-regions, based on recent trends (using the 2006 to 2011 growth in housing and employment as a starting point) and land use constraints based on OCP land uses within the region. The land use constraints are based on the availability and density of land in each TAZ that has been deemed to be available for residential or commercial uses, as implied by the land use information provided to Urban Futures by the CRD. Municipal land uses were grouped into broad categories, including residential uses for ground oriented and apartment housing, commercial and mixed use, public and institutional, and industrial employment uses. Other land use categories included agricultural land reserve, park, and rural and resource categories.

Allocations of additional housing to TAZs for the BAU scenario commence with each zone's share of sub-regional housing growth by structure type over the previous five-year period, subject to the following constraints:

a) **Availability**: there must land in the TAZ that permits the specific form of residential or commercial development;

b) **Density**: the density of residential land use (dwelling units per hectare) on eligible land cannot exceed a sub-region specific maximum density, which is calculated by excluding zones with very small areas of a particular land use, or where densities become very high and do not reflect reasonable development densities within the sub-region;

c) **Diminishing maximum growth rates:** the share of growth in TAZs that saw large shares of sub-regional growth over the previous time period is reduced to isolate the effect of large development projects being completed in specific zones, skewing sub-regional patterns of growth;

d) **Diminishing maximum density**: the share of growth allocated to TAZs that are approaching the maximum density within the sub-region is reduced to isolate the effect of zones approaching build-out; and

e) **Incremental development**: historically, a TAZ may not have had a positive share of sub-regional growth (that is, a zone may have seen its population decline historically despite its parent sub-regional experiencing growth). In the vein of carrying forward historical trends, this would result in this zone never having a positive share of growth in future years, even if suitable land were available. To provide the opportunity for such zones to share in projected future growth within the sub-region, these zones were allocated a small number of dwelling units to reflect individual-unit construction, subject to underlying land uses and the TAZ not exceeding the maximum density constraint.

Based on these parameters, the resulting additional dwelling units allocated to each TAZ are then populated using sub-region specific persons-per-unit occupancy ratios and occupants' age and sex distribution for each structure type (based on 2011 NHS data). The resultant population vectors represent the net migration inputs that are added to the demographic modeling of each TAZ's existing resident population (aging, deaths, and births).

Consistent with the approach used in moving from the regional to sub-regional levels, projected demographic changes for each TAZ build on the base of existing residents by five-year age group and sex within each zone, with their aging and mortality over the subsequent five-year period being modelled given prevailing regional age and sex specific mortality rates. The next step is to apply sub-regional age specific birth rates to the female population to estimate the number of births that would occur in each TAZ for that five-year period based on resident demography. The result is a projection of natural change (accounting for aging, deaths, and births) in each zone's resident population. Added to these residents is the number of net migrants from the housing allocation process, which produces projected traffic zone population by age and sex between 2011 and 2041 based on five-year projection increments.

The employment model is structured along the same lines as the demographic model, in part based on historical growth trends and in part on existing land use policy as represented by the landscape of uses described in municipal OCPs. Sub-regional employment growth by industry sector (office; industrial; main services; retail; arts, entertainment and recreation; and health care and social assistance) is allocated to component TAZ on the basis of each zone's historical share of sub-region growth in employment, subject to the same constraints of availability of land with appropriate density.

Employment in two industry sectors was allocated to TAZs using an alternative process. Growth in defence employment was allocated based on the current TAZ distribution of defence employment within each sub-region, and the growth in the number of K to 12 educators was allocated on the basis of the change in each TAZ's population between the ages of five and 17 as a share of the total population in this age range.

Current Trends & Development Policies (CTDP) Scenario

The CTDP scenario reflects current and expected development activity, as well as current and expected municipal policies, plans, and objectives (refer to the flow charts on pages 17 and 18). This scenario was first developed in conjunction with planners from each member municipality in the Capital Regional District in 2011. Land use and planning information was provided by each member municipality to Urban Futures on the future potential spatial patterns and overall magnitude of growth in ground oriented and apartment housing and employment, for the 2006 to 2038 period. While this current update to the existing projections yielded new values of population, housing, and employment at the regional and sub-regional levels, the distribution of growth in each of these dimensions implied by the CTDP first developed in 2011 was used to produce the current TAZ-level projections under this scenario.

As in the BAU scenario, projections of net additional housing units provided the basis for developing projections of population, with new housing units and units vacated by out-movers (turnover) being populated in the same manner as under the BAU scenario. When combined with the output from the cohort survival modelling of aging, mortality and natality of existing residents, a long-run projection of population by age and sex was established for each TAZ, recognizing the existing composition of population and their future housing needs, the magnitude of housing growth expected at the sub-regional level, and the expectations of local planners for where this growth could be accommodated.

As was the case with the development of the housing projections under this CTDP scenario, input on the expected magnitude of future employment growth within each TAZ was provided directly to Urban Futures by each member municipality in the CRD (in 2011). The pattern of growth and change implied by these inputs in turn provided the basis for developing an updated projection of net additional employment by TAZ while acknowledging the existing employment by industry in each TAZ. As a final step, it was ensured that the sum of the underlying TAZ projections of employment by industry controlled to the relevant sub-regional total.

Differences Between the BAU & CTDP Scenarios

While the BAU and CTDP scenarios yield generally similar results in terms of the magnitude and spatial distribution of future growth and change across the CRD's TAZs, each scenario uses a unique input that distinguishes it from the other.

As stated earlier in this report, the BAU scenario is a quantitative modelling scenario, relying directly on a land use input (provided to Urban Futures by the CRD) as a means of allocating future regional and sub-regional growth to TAZs. In contrast, the CTDP scenario—while implicitly, but not directly, based on an assessment of land use—has been developed based on information yielded through extensive consultations with planning departments in each of the CRD's municipalities in 2011. More specifically, the distribution of growth in population, housing, and employment that was identified through those consultations for the existing TAZ system (at that time, 2011) was used to allocate projected regional and sub-regional growth for the CRD's revised and more detailed TAZ system as part of this current project.

In order to show how these two scenarios differ from one another in terms of output, it is useful to consider a specific TAZ. For example, TAZ 6830, which is located in Langford's downtown, was home to 286 occupied dwellings in 2011. Under the BAU scenario, which considers the landscape of available and developable land throughout the region as a means of allocating growth at the TAZ level, the 24.85 hectares of available and developable land in TAZ 6830, combined with areas of available and developable land throughout the rest of the West Shore sub-region, resulted in a total of 946 dwellings in the TAZ by 2038. In contrast, the CTDP scenario yielded a projection of 292 units by 2038—very little change from the

Difference in Projected 2038 Totals
BAU vs CTDP

Relative Difference	Population	Housing	Employment
	Count of TAZs		
0% < 5%	160	176	217
5% < 10%	91	94	124
10% < 25%	155	151	160
25% < 50%	128	121	113
50% < 100%	126	121	77
100%+	77	82	66
iserror	20	12	0

base year and significantly different from the magnitude of growth projected under the BAU scenario. This more constrained outlook for TAZ 6830 developed as part of the CTDP scenario is based on discussions about the spatial distribution of growth that is anticipated within Langford over the coming three decades.

The table to the left summarizes the magnitude of differences in the projected 2038 totals for population, housing, and employment between the BAU and CTDP scenarios. For instance, 160 TAZs had 2038 populations that were less than five percent different under the BAU scenario than they were under the CTDP scenario. The *iserror* row indicates the number of TAZs where the projection was equal to zero in 2038 under the BAU scenario.

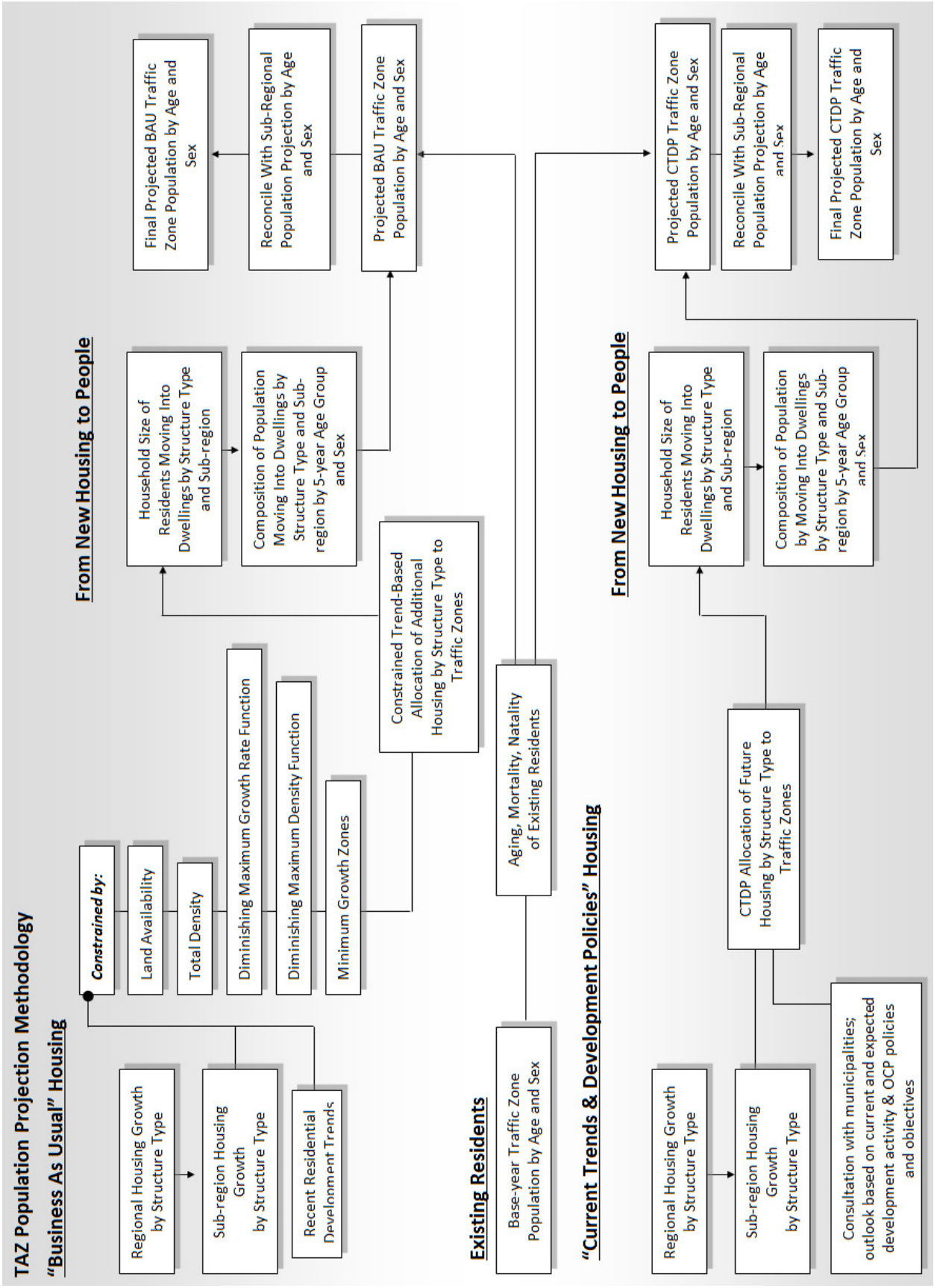
Best-Case (B-C) Scenario

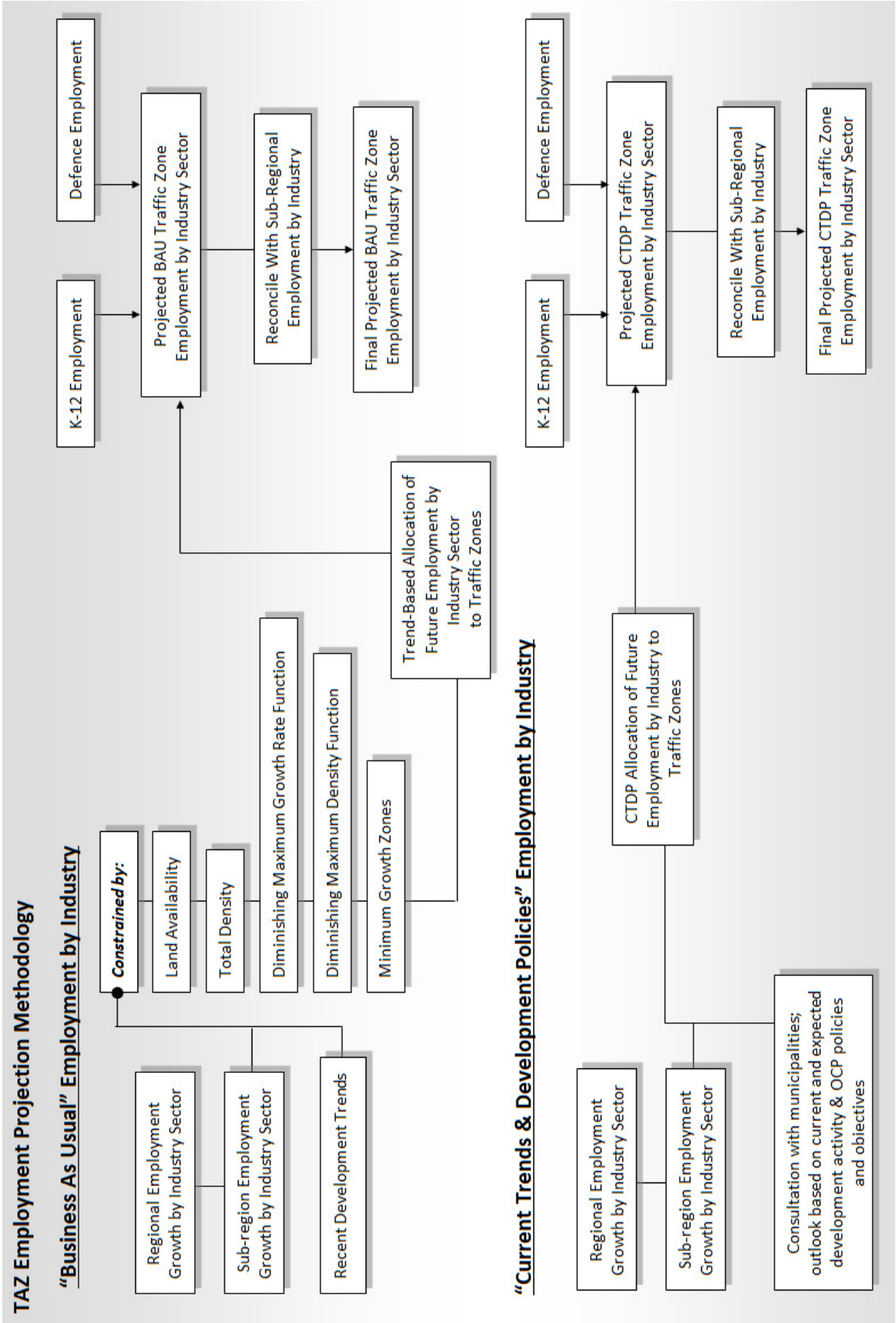
The final scenario, termed "Best-Case" (or B-C), closely resembles the CTDP scenario, with the B-C scenario actually being predicated on it. The major difference between the CTDP and B-C scenarios is that for the B-C scenario, the magnitude of housing additions was adjusted at the sub-regional level (that is, for the Core, Peninsula, West Shore, and Islands sub-regions) away from the pattern presented as part of the CTDP scenario in order to better align them with the collection of long-run plans provided to Urban Futures by individual CRD member municipalities. (Note that as part of the B-C scenario the region-wide totals remained unchanged from what was used as part of the BAU and CTDP scenarios). In addition, numerous TAZ-specific modifications were made to the housing projections as part of the B-C scenario when compared to the CTDP scenario in order to reflect the expectations (in some cases, minimum expectations) by individual municipal planning departments for housing growth and change.

Net Addtional Dwelling Unit Projections, 2011-38
CTDP vs B-C

Sub-Region	CTDP	B-C	Difference
Core	22,646	26,324	3,678
Peninsula	4,527	4,999	471
West Shore	24,201	19,967	-4,234
Islands	2,379	2,463	84
CRD Total	**53,753**	**53,753**	**0**

The table to the left summarizes the differences in dwelling additions at the sub-regional level between the CTDP and B-C scenarios. For instance, 3,678 more dwelling units were projected for the Core sub-region between 2011 and 2038 under the B-C scenario when compared to the CTDP scenario. Again, it should be noted that the regional totals (for the CRD as a whole) remained unchanged between the two scenarios.


TAZ Population Projection Methodology
"Business As Usual" Housing
Constrained by:
Land Availability
Total Density
Diminishing Maximum Growth Rate Function
Diminishing Maximum Density Function
Minimum Growth Zones
Regional Housing Growth by Structure Type
Sub-region Housing Growth by Structure Type
Recent Residential Development Trends
From New Housing to People
Household Size of Residents Moving Into Dwellings by Structure Type and Sub-region
Composition of Population Moving Into Dwellings by Structure Type and Sub-region by 5-year Age Group and Sex
Constrained Trend-Based Allocation of Additional Housing by Structure Type to Traffic Zones
Final Projected BAU Traffic Zone Population by Age and Sex
Reconcile With Sub-Regional Population Projection by Age and Sex
Projected BAU Traffic Zone Population by Age and Sex
Existing Residents
Base-year Traffic Zone Population by Age and Sex
Aging, Mortality, Natality of Existing Residents
"Current Trends & Development Policies" Housing
Regional Housing Growth by Structure Type
Sub-region Housing Growth by Structure Type
Consultation with municipalities; outlook based on current and expected development activity & OCP policies and objectives
CTDP Allocation of Future Housing by Structure Type to Traffic Zones
From New Housing to People
Household Size of Residents Moving Into Dwellings by Structure Type and Sub-region
Composition of Population by Moving Into Dwellings by Structure Type and Sub-region by 5-year Age Group and Sex
Projected CTDP Traffic Zone Population by Age and Sex
Reconcile With Sub-Regional Population Projection by Age and Sex
Final Projected CTDP Traffic Zone Population by Age and Sex


TAZ Employment Projection Methodology
"Business As Usual" Employment by Industry
Regional Employment Growth by Industry Sector
Sub-region Employment Growth by Industry Sector
Recent Development Trends
Constrained by:
Land Availability
Total Density
Diminishing Maximum Growth Rate Function
Diminishing Maximum Density Function
Minimum Growth Zones
Trend-Based Allocation of Future Employment by Industry Sector to Traffic Zones
K-12 Employment
Defence Employment
Projected BAU Traffic Zone Employment by Industry Sector
Reconcile With Sub-Regional Employment by Industry
Final Projected BAU Traffic Zone Employment by Industry Sector
"Current Trends & Development Policies" Employment by Industry
Regional Employment Growth by Industry Sector
Sub-region Employment Growth by Industry Sector
Consultation with municipalities; outlook based on current and expected development activity & OCP policies and objectives
CTDP Allocation of Future Employment by Industry to Traffic Zones
K-12 Employment
Defence Employment
Projected CTDP Traffic Zone Employment by Industry Sector
Reconcile With Sub-Regional Employment by Industry
Final Projected CTDP Traffic Zone Employment by Industry Sector