28 POPULATION AND DEMOGRAPHICS

28.1 Approach

The Project demand for skilled labour during construction would exceed the local labour supply, resulting in an in-migration of workers and a resultant change in local population and demographics. Population change is a determinant of other potential Project effects on housing and on community infrastructure and services. The key indicators for population and demographics are number of persons (gender, age profile, labour force participation), households, and demographic characteristics, including marital status and dependents.

28.1.1 Regulatory and Policy Setting

The assessment was prepared in accordance with Section 17.2 of the Site C Clean Energy Project Environmental Impact Statement Guidelines (the Minister of Environment of Canada and the Executive Director of the BCEAO 2012) (EIS Guidelines).

28.1.2 Key Issues and Identification of Potential Effects

Issues, concerns, and interests identified during consultation with the public, Aboriginal groups, and government agencies informed the population assessment (Volume 1 Section 9 Information Distribution and Consultation). The key issues identified and the approaches used to address issues are outlined in Table 28.1.

Table 28.1 Key Issues: Population and Demographics

Key Issues	Approach to Addressing Key Issues
• Large construction projects like Site C provide employment opportunities that attract a variety of workers. Some choose to live in the local area with their families and others commute to distant homes. All these employees must access local services, but consideration is rarely given to the ability of communities to provide for its own growing local population as well as those accessing services as a non-resident.	• Estimates of the average annual number of persons residing in and outside the Project's on-site accommodations are provided in this section. The effect , or demand, on community services and infrastructure by this population along with the baseline population is addressed in Volume 4 Section 29 Housing, and Volume 4 Section 30 Community Infrastructure and Services.
• First Nations concern that additional workers from outside the region would add pressure on the limited social resources available to members. They are also concerned with increased cost of living associated with in-migration.	• The timing and magnitude of the forecasted population changes presented in this section, along with information gathered through First Nations Community Baseline reports, inform the assessment addressed in Volume 4 Section 29 Housing, and Volume 4 Section 30 Community Infrastructure and Services. Issue is addressed in view of results of population projections and mitigations.

Key Issues	Approach to Addressing Key Issues
• First Nations concern with potential changes to family unity and resources due to out-migration (T8TA).	• Issue is addressed through BC Hydro commitments regarding capacity building, education, and training, or directed procurement in Impact Benefit Agreements. Specific details of these commitments will be subject to confidentiality provisions.
• First Nations concern with social effects of worker camps and transient workers (SFN; T8TA).	• Issue is addressed in view of community vulnerability and Project workforce management policies, including cross-cultural training.
• First Nations concern with potential skills drain (i.e., loss of individuals with trades from First Nations to Fort St. John, or less availability of urban-based contractors) (T8TA).	• Issue is addressed in view of mitigation and BC Hydro commitments respecting capacity building, education, and training, or directed procurement in Impact Benefit Agreements. Specific details of these commitments will be subject to confidentiality provisions.
• First Nations concern that general population increase results in increased competition for resources and loss of solitude on the land (T8TA).	• Issue is addressed in view of presenting population projections and Project workforce management policies.
• First Nations concern that population increase exacerbates their position as a minority and brings about racism, and creates social behaviour or cultural awareness issues.	• Issue is addressed in view of Project workforce management policies, including cross-cultural training.
• The determination of demographic baseline and the analysis of potential demographic effects need to be performed separately for the affected First Nations communities.	• Community baseline studies were undertaken, at BC Hydro's request, by Project area First Nation communities, and the information relevant to population and demographics baseline is presented in this section.
• First Nation concern that the Project may cause in- and out-migration in Aboriginal community populations, in relation to Project employment opportunities or housing market pressures.	• Issue is addressed in effects assessment on population and demographics considerations for Aboriginal people.

NOTES:
SFN – Saulteau First Nations
T8TA – Treaty 8 Tribal Association

The key issues highlight the close connection between changes in the population and demographics valued component and other valued components that are sensitive to changes in population, specifically Housing (Volume 4 Section 29) and Community Infrastructure and Services (Volume 4 Section 30).

Potential project interactions with population and demographics are summarized in Volume 2 Appendix A Project Interactions Matrix, Table 2. As defined in Volume 2 Section 10 Effects Assessment Methodology, a "2" ranking is assigned where an interaction may result in an adverse effect and the nature of the effect and/or the effectiveness of mitigation measures is uncertain. These interactions were taken forward through the effects assessment.

Project interactions with a ranking of "2 are set out in Table 28.2 below.

Table 28.2 Interactions of the Project with Population and Demographics

Project Activities and Physical Works	Key Aspects	
	Project effects on labour market and effects on population and demographics	The Peace River Regional District population, with specific reference to the City of Fort St. John
Construction	✓	✓

Project effects are assessed for the construction phase only, as it is during this phase that the Project's labour requirements would be high, and would likely exceed the capacity of the labour force in the local assessment area (LAA) (Volume 3 Section 17 Labour Market). Consequently, persons from outside the area would be hired. Project expenditure in the local area is also anticipated to create new employment opportunities that would attract persons to settle in the area. Some of the workers will bring their families.

The Project's effect on population and demographics is examined at the phase level for construction, because the concerns expressed are with respect to the total change in population and demographics, rather than changes due to specific project components.

28.1.3 Standard Mitigation Measures and Effects Addressed

In the Project Interactions Matrix (Volume 2 Appendix A, Table 2), a "1" ranking was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and well understood to be effective, and any residual effect is negligible. These interactions were not carried forward through the effects assessment.

A "1" ranking of potential effects on population and demographics was assigned to the Project's operations phase, corresponding to the relatively low labour demand during this phase (Volume 3 Section 17 Labour Market). A local workforce of about 13 full time positions would be required to operate the Project, and about 12 positions in BC Hydro but outside the local area. This would give rise to negligible supply industry jobs (Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats). Even if all of the operation positions are filled by new workers moving to the area, the increment would still be small, relative to the resident population of Fort St. John or the Peace River Regional District.

In the operations phase, sustaining capital projects would also be completed, which would create temporary employment that might attract in-migrants. The first sustaining capital expenditure is estimated to occur in about the 40th year of operation, with other sustaining capital expenditures distributed over the following 60 years. The levelized average annual labour force requirement associated with these sustaining capital projects is about 50 positions, commencing in year 40. The labour force implications are expected to be minimal because the labour force can be expected to grow from current levels, and standard mitigation measures would also be expected to evolve and become more effective (Volume 3 Section 17 Labour Market). In addition, the receiving population is forecast to grow over the period such that the increment to the receiving population would be declining over time. Given these considerations, a "1" was assigned to the operations phase.

28.1.4 Selection of Key Indicators

The key indicators for assessing Project effects on population and demographics are summarized in Table 28.3. Population trends are described in terms of number of persons and number of households, while demographic trends are described in terms of average age, marital status, and labour force participation rate.

Table 28.3 Key Indicators for Population and Demographics

Key Aspects	Key Indicators	Rationale for Selection of the Key Indicators [a]
Project effects on labour market, and effect on population and demographics	Population numbers (gender, age profile, labour force participation) Household number and demographic characteristics, including marital status and dependents	Particular attributes of the incoming population have implications to other valued components e.g., number of households has implications on housing and family size for various social services.
Changes to Peace River Regional District population, with specific reference to City of Fort St. John	Population numbers	Measures the approximate length of time that the "with" Project's peak population approximates the expected "without" Project population total.

NOTE:

[a] Includes input from consultation with regulators, First Nations, affected stakeholders, and the public, as well as regulatory guidelines, policies and programs

28.1.5 Spatial and Temporal Boundaries

28.1.5.1 Spatial Boundaries

The potential Project-related effects on population and demographics are directly related to the potential effects of the Project on the labour market. Therefore, the Local Assessment Area (LAA) is the Peace River Regional District (PRRD). While the majority of existing residents in the PRRD are within commuting distance of the Project, the majority of in-migrating new residents would likely live in communities in close proximity to the Project work site. Therefore, the assessment specifically focuses on potential population changes in Fort St. John.

Where available, baseline population and demographic information is specifically presented for First Nations communities and the Aboriginal population of the LAA. The Aboriginal population refers to those persons who reported identifying with at least one Aboriginal group, i.e., North American Indian, Metis, or Inuit, or those who reported they were members of an Indian band or First Nation, or reported being a Treaty Indian or a Registered Indian. This population includes Aboriginal residents of First Nations communities and of non-First Nations communities, such as municipalities.

The borders of the PRRD and First Nations traditional territories and communities do not precisely overlap (Volume 1 Section 4 Project Description).The First Nations with Indian Reserve communities situated within or near the boundaries of the LAA are the Doig River First Nation, Halfway River First Nation, Prophet River First Nation, West Moberly First Nations, Blueberry First Nations, and Saulteau First Nations. Where First Nations outside the LAA have identified interests in potential effects on population and

demographics, these are discussed in Volume 5 Section 34 Asserted or Established Aboriginal and Treaty Rights, Aboriginal Interests and Information Requirements.

The Regional Assessment Area (RAA) is the same as the LAA, as it includes the area where other projects may result in changes to labour market and associated regional population levels. Projects outside the RAA would not lead to population or demographic change in the RAA.

Spatial boundaries are presented in Table 28.4 and Figure 28.1.

Table 28.4 Spatial Assessment Areas for Population and Demographics

Local Assessment Area	Regional Assessment Area
Peace River Regional District	Peace River Regional District

28.1.5.2 Temporal Boundaries

The temporal boundaries are the Project construction phase, an eight-year period as described in Volume 1 Section 4 Project Description. This period includes the time during which labour market demand would result in a change in population and demographics in the LAA.

As discussed above, the temporal boundaries of the assessment do not consider the Project's operations phase, due to the relatively low local labour demand during this phase relative to the baseline population. Hence, the interaction during operations is not carried forward through the effects assessment.

28.2 Information Sources and Methodology

28.2.1 Literature Review

Data on population and demographics were obtained for all PRRD communities from the Census of Canada and periodic updates prepared by Statistics Canada and BC Stats. Data on the Aboriginal population in the LAA were gathered from Statistics Canada and community profiles prepared and submitted by First Nations. Where available, the 2011 census data were used for this assessment (e.g., population), and where not yet available (e.g., demographics) the 2006 census was used as the most recent available data. Prior census years were also reported to show historical trends.

The August 2011 population forecast from BC Stats is the most recent forecast available, and is generated from the P.E.O.P.L.E. projection model, projection number 36 (BC Stats 2011a), which provides population forecasts for local health areas. The North Peace and South Peace Local Health Areas include all population centres in the LAA, with the exception of the sparsely populated area west of Williston Reservoir (Figure 28.1).

Assumptions regarding the population and demographic characteristics of potential in-migrants (average age, sex, number of dependents) were informed by census information of the LAA demographic attributes, and by reference to a survey of the demographic characteristics of the construction workforce in the Regional Municipality of Wood Buffalo (i.e., oil sands construction projects).

28.2.2 Interviews

Community officials in the PRRD (e.g., community planners, economic development officers) were contacted with respect to baseline population levels and population forecasts in the absence of the Project. Construction industry and labour representatives were interviewed to obtain information and opinions regarding workers demographic characteristics, employment choices, and demand for trades (e.g., carpenter, electrician, pipefitter). Volume 4 Appendix A Social Assessment Supporting Documentation, Part 1 Social Assessment Interview Methodology provides details on interview methodology.

28.2.3 Data Management, Mapping, and Modelling

BC Stats August 2011 population projections included potential population increments attributed to Project construction. BC Stats officials assisted in modifying the published population forecasts for the two Local Health Areas by identifying the population increment attributed to Project construction so that it could be removed from the base case forecasts presented here.

A population model was developed to forecast Project effects on local population, using both a base case (without Project) population forecast, and a “with Project” population forecast that converted the Project’s total labour requirements (Volume 3 Section 17 Labour Market) to local population increments by adopting assumptions regarding the proportion of the incoming workforce that would become new residents in the local area. The base case population forecast (without the Project) model adjusts the BC Stats forecast by removing the Project, and is reported in Volume 4 Appendix A Social Assessment Supporting Documentation, Part 2 Population and Demographic Base Case Forecast. The Project population forecast, as well as key model sensitivities for the Project forecast, is reported in Volume 4 Appendix A Social Assessment Supporting Documentation, Part 3 Population Effects Model.

28.2.4 Aboriginal Community and Traditional Knowledge

Aboriginal community and traditional knowledge related to the population and demographics VC were gained through review of results of BC Hydro’s consultation with Aboriginal groups and of First Nations community baseline studies prepared by the following First Nations in the LAA: Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations. While the communities and traditional territories of the Blueberry First Nations and Saulteau First Nations are also within the boundaries of the LAA, BC Hydro had not received community baseline information from them at the time of writing.

Baseline information and data as well as First Nations concerns and interests relevant to population and demographics are incorporated into the baseline and effects assessment. The First Nations community baseline reports are provided in Volume 3 Appendix B First Nations Community Baseline Reports.

BC Hydro’s approach to gathering community-based social and economic data with First Nations is described in Volume 3 Appendix B First Nations Community Baseline Reports, Part 1 Approach to Gathering and Integrating Community Baseline Information.

28.3 Baseline Conditions

28.3.1 Population Numbers

The historical and current (1986–2011) profile of population in the LAA and several of its larger communities is presented in Table 28.5. In 2011, the population in the LAA was estimated at 64,280, having grown 8.3% since 2006. The provincial population grew 8% over the same period. Fort St. John had the highest population among LAA communities and the highest localized growth rate between 2006 and 2011 at 13.8%, followed by Dawson Creek at 10.4%, and Taylor at 8.3%.

Although the overall population in the LAA has grown since 1986, the growth concentration areas have changed over the years. Prior to 1995, the majority of the LAA's population resided in Peace River South Local Health Area, but since 1995, the majority reside in the Peace River North Local Health Area (Figure 28.2).

The spatial distribution of the population in the vicinity of the Project in 2011 is shown in Figure 28.3.

Table 28.5 Population Estimates and Comparative Growth Rates, 1986–2011 (Number of People)

Region or Community	1986	1991	1996	2001	2006	2011
LAA (PRRD including unincorporated areas)	53,908	54,844	58,770	56,159	59,330	64,280
North Peace Communities						
Fort St. John	13,875	14,589	15,683	16,437	17,933	20,408
Taylor	736	844	1,075	1,156	1,386	1,501
Hudson's Hope	1,196	1,010	1,163	1,048	1,012	1,055
South Peace Communities						
Chetwynd	2,880	2,933	3,113	2,726	2,722	2,706
Dawson Creek	10,921	11,298	11,579	10,788	11,094	12,257
Pouce Coupe	841	853	928	834	738	804
Change from previous period (%)						
LAA	NA	1.7	7.2	−4.4	5.6	8.3
Fort St. John	NA	5.1	7.5	4.8	9.1	13.8
B.C.	NA	12	15	5	4	8

NOTE:
NA – not available
Source: BC Stats (2011b)

28.3.1.1 Population – Determinants of Population Change

The determinants of population growth are the rate of natural increase (births minus deaths) and net migration. As shown in Figure 28.4, the natural increase has averaged about 600 persons per year in the LAA. The annual change has declined in recent years, which aligns with an aging population in the LAA.

Migration relates to the movement of persons entering (in-migrants) and leaving (out-migrants) a specified area. Net migration is the number of in-migrants less the number of out-migrants, and may be positive or negative. Migration is the more unpredictable component of population change, since it is influenced by economic and

employment activity. Table 28.6 summarizes the main components of migration over the most recent 25-year and 10-year periods. The comparison of the two time periods indicates that the magnitudes of the components of migration are similar. The following discussion focuses on the most recent 10 years of data.

Over the past 10 years, the components of inter- and intra-provincial migration are similar in magnitude, with in-migration from the rest of B.C. or other parts of Canada averaging 3,227 persons, while out-migration averaged 3,509. That is, inter- and intra-provincial migration contributed an average net outflow of 282 persons per year to the LAA population. The net contribution for international migration averaged a positive 59 persons per year, resulting in a total net migration deficit of 223 persons per year. The positive population growth experienced in the LAA during the period is attributable to positive natural increase exceeding the net population loss attributed to the migration component.

Table 28.6 Migration Statistics for Peace River Regional District (LAA)

Migration	Average 1985 – 2010 (No. of Persons)	Average 2000 – 2010 (No. of Persons)
Inter-provincial		
In	1,649	1,441
Out	-1,844	-1,810
Intra-provincial		
In	1,816	1,786
Out	-2,040	-1,699
Total inter/intra provincial In	3,465	3,227
Total inter/intra provincial Out	-3,884	-3,509
International net contribution	123	59
Total Net Migration	**-296**	**-223**

NOTE:
Source: BC Stats (2012a)

28.3.2 Population: Age, Gender, Marital Status, and Household Characteristics

Demographic characteristics are described for the LAA and for Aboriginal communities within the LAA. Demographic data were not yet available from the 2011 Census.

The median age of the population living in the LAA in 2006 was 34.2 years, compared to 40.8 years for the province (BC Stats 2010). In 2010, the median age of people living in the LAA was estimated to be 34.7 years (BC Stats 2011a).

Males made up 51% of the population in 2006, as compared to 49% for the province (BC Stats 2010).

The marital status of the population in the LAA at 49% (of the population 15 years and older) is comparable to the provincial rate of 50%. The LAA has a relatively higher proportion of single and separated persons at 39%, as compared to 35% provincially.

In 2006, the average size of private households in the LAA was 2.6 persons versus 2.5 persons for the province. The lower proportion of one-person households and the

higher share of multiple-person households in the LAA are consistent with the higher average household size.

For families (excluding one-person private households), there was an average of 1.1 children at home, compared to 1.0 provincially.

The Aboriginal population in the LAA was approximately 12% of the overall population of the LAA. The median age of the Aboriginal population is young, at 26 years compared to 34 generally. The gender split and mobility data for the Aboriginal population mirror that of the general population, in that there are more males than females and there is considerable population movement.

Population and demographic information for Aboriginal people in the LAA is presented in Table 28.7.

Table 28.7 First Nation Population Profile in the Local Assessment Area (Peace River Regional District), 2006

Demographic Description	Aboriginal Population (On- and Off-reserve)	Percentage (%)	Non-Aboriginal Population	Percentage (%)
Population count	6,985	-	58,264	-
Median age	26.0	-	34.2	-
Gender				
Male	3,615	51.7	29,895	51.3
Female	3,375	48.3	28,370	48.7
Mobility				
Lived at the same address 1 year ago	5,380	78.4	46,320	81.1
Lived at the same address 5 years ago	3,210	50.0	28,750	53.4

NOTE:
Source: Statistics Canada (2007a, 2007b)

Population and demographic information for the First Nations communities of Doig River First Nation, West Moberly First Nations, Prophet River First Nation and Halfway River First Nation are shown in Table 28.8. The on-reserve populations are small but fluctuate over time: Doig River First Nation had 139 people living on-reserve in 2001, and 128 in 2011. Halfway River First Nation also saw a decline in their on-reserve population, from 160 in 2003 to 145 in 2012. Each of the Doig River, Prophet River, and Halfway River First Nations saw population increases of 15% to 30% between census years. West Moberly population change is difficult to estimate, as information about its population in 2006 was not available. Mobility statistics are not available for all communities; however, for West Moberly First Nations and Prophet River First Nation, less than 50% of members lived in the same community five years prior and West Moberly First Nations saw only 20% of members living in the same community five years earlier.

Table 28.8 First Nation Community Population Profiles

First Nation	Population		Population Under the Age of 15 (%) (2011)	Gender – On-Reserve Population (2012)		Gender – Off-Reserve Population (2012)		On-Reserve population		Mobility (% of Population) (2006) [a]
	(2003)	(2012)		Male (%)	Female (%)	Male (%)	Female (%)	(2003)	(2012)	
West Moberly	NA	237	70.0	41 (48)	44 (52)	68 (46)	81 (54)	NA	85	25
Doig River	NA	NA	NA	NA	NA	NA	NA	139 [b]	128 [c]	NA
Prophet River	195	260	25.8	55 (52)	50 (48)	NA	NA	NA	105	50
Halfway River	225	255	27.1	80 (55)	65 (45)	NA	NA	160	145	70

NOTES:

Population information is not consistently available for First Nations groups on an annual basis. As such, this table reports on the closest approximate annual population.

[a] Mobility refers to the population that has lived in the same community for five or more years

[b] Population information for Doig River First Nation is for 2006

[c] Population information for Doig River First Nation is for 2011

NA – data not available

Source: Volume 2 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table - Doig River First Nation, Halfway River First Nation, Prophet River First Nation, West Moberly First Nations

28.3.3 Population Forecast

BC Stats has projected population growth to the year 2036 for the two health areas that make up the LAA. The forecasts assume continued economic expansion and specifically acknowledge the construction of the Project as a future event that will contribute to migration.

Figure 28.4 presents the BC Stats projection for the population in the LAA to 2036 without the Project. The LAA's relatively young population currently supports a positive natural increase of about 600 people per year, as indicated in Figure 28.4. As the population ages, the fertility rate is projected to decline and bring the natural increase down to about 300 persons per year by 2036. Net migration is predicted to be positive over the forecast period, averaging about 400 persons per year. Positive net migration is forecast to exceed the contribution from natural increase by 2025. The LAA population is forecast to be 84,600 in 2036, about a 30% increase from current levels. Growth is expected to be greatest in the Peace River North Local Health Area, increasing by 40% between 2012 and 2036, as compared to 18% growth in the Peace River South Local Health Area.

28.4 Effects Assessment

The potential for the Project to affect population and demographics was assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- The results of the assessment of the Project on the labour market are used to assess the effects on population and demographics
- The Peace River Regional District population, with specific reference to the City of Fort St. John
- An out-migration of Aboriginal people between First Nations communities and non-Aboriginal communities in proximity to the Project

28.4.1 Effects Assessment – Construction – Project Effects on Labour Market and Effects on Population and Demographics

28.4.1.1 Labour Market Effects and Assumptions

The Project has the potential to affect population during construction. Volume 3 Section 17 Labour Market determined that the Project would draw people seeking direct, indirect, and induced employment opportunities to the LAA. The number would vary depending on the actual economic conditions (i.e., the unemployment rate) at the time labour is required.

To characterize the Project's population effect on the general population, three categories of in-migrants were identified.

- Camp Direct Workers: Workers working directly for the Project, residing in on-site workforce camps during their shifts, and maintaining a permanent residence outside the LAA. Their families and dependents would remain at the workers' normal place of residence.
- Community Direct Workers and their Families: Workers working directly for the Project, and who take up normal residence in the LAA. It is assumed that their families and dependents will accompany them to the LAA.
- Community Indirect/Induced Workers and their Families: Workers for supplier industries (i.e., indirect) and consumer service sectors (i.e., induced), who are not working directly for the Project, and who take up normal residence in the LAA. It is assumed that their families and dependents will accompany them to the LAA.

The demographic characteristics of workers forecast to reside in the community is assumed to be similar to that of the existing population in the LAA. This assumption is supported by interviews that indicated B.C. trade workers are reflective of the general populations in B.C. and the LAA in terms of marital status and household size (Cochrane 2011, pers. comm.). Furthermore, the current labour force in the LAA has a high proportion of trade workers (Volume 3 Section 17 Labour Market, Table 17.7) and the Project would attract in-migrants from similar occupations. The demographics of in-migrating indirect and induced workers and their families are also assumed to be reflective of existing demography. Therefore, changes in the demography of the LAA are not anticipated.

With respect to the demographic characteristics of the camp direct workforce, a survey of mobile workers in similar circumstances in Alberta found that, on average, 92% were male, with a median age of 35 years (Nichols Applied Management 2007). It is assumed that the Project construction workforce would have a similar gender and age profile, with the median age of the construction workforce estimated to be the same as the LAA age of 34.7 years. Because workers taking temporary residence in the construction camp would retain their normal place of residence, they would not occupy households or bring dependents, and therefore would have no effect on other aspects of LAA demography.

See Volume 4 Appendix A Social Assessment Supporting Documentation, Part 3 Population Effects Model for full discussion of key assumptions and detailed results of the population model.

28.4.1.2 Projected Population Effects

Figure 28.5 shows the projected population increment by type of in-migrant and their dependents during construction. The timing of population change would be driven by the Project's labour force requirements (i.e., rise in Years 0 to 2, relative stability in Years 3 and 4, rise to peak population in Year 5, and decline thereafter to baseline). The Project's peak population would occur in Year 5, along with the peak in labour demand, with an estimated 1,372 workers residing in on-site accommodations and 1,614 community direct and community indirect/induced workers and dependents living in the LAA.

28.4.1.3 Aboriginal Peoples

Decisions to move to another community are complex and not based on economic considerations alone; therefore, general population modelling cannot be used to forecast expected in- and out-migration to and from First Nations communities. Methods for assessing population effects on First Nations communities in the LAA are necessarily qualitative.

In terms of in-migration to Aboriginal communities, there is the potential for the Project to increase the Aboriginal population in the LAA, should Aboriginal people who have left the LAA return in search of project construction employment. Aboriginal people in the LAA will have opportunities to participate in the Project through employment and procurement.

Employment participation in the Project would not require Aboriginal persons to leave their home Aboriginal community on a permanent basis, as they could either commute daily, or reside during their shift in Project workforce camps and return home between shifts. Additionally, any new on-reserve employment or business associated with the Project may serve to keep people in their home community, rather than leave for economic opportunities in larger centres.

Should demand for accommodation in Fort St. John place pressure on rents and housing costs, Aboriginal persons, who can be vulnerable to rising costs, may move back to their home communities with neither an employment guarantee nor secure housing. Volume 4 Section 29 Housing indicates a potential Project effect on the local apartment rental market and prices when low vacancy rates intersect with Project labour demand and increasing local population. The housing assessment concludes that, as the market would be expected and able to adjust to supply and demand imbalances, Project effects on housing are not considered significant.

In terms of out-migration from Aboriginal communities, those people with the required skill sets who find the construction shift work manageable could choose to move out of Aboriginal communities into communities closer to the Project; however, numbers are not expected to be large, given the small size of the on-reserve First Nations populations in the LAA. Out-migration from First Nations communities has been observed in the LAA and is attributed to a number of issues, including lack of training and employment opportunities, and opportunities for better housing and amenities in the larger non-Aboriginal centres. However, even a small amount of out-migration from smaller First Nations communities of employed, well-paid people and their families could be regarded as an adverse effect on the economic and social development of these communities (i.e., for example, the departure of just three workers with families could represent a population decrease of 10% on some reserves). Family members left behind also lose the benefits of having other well-paid, securely employed family members. Community cohesion and family unity are also cited as concerns when people leave their communities.

A report from Treaty 8 First Nations (T8FNs) Community Assessment Team and The Firelight Group Research Cooperative contained expressions of concern about in-migration of the general population for Project jobs, and indirect and induced population growth in and around Fort St. John during the labour- and capital-intensive construction stage of the Project. In particular, concern was expressed regarding an influx of non-Aboriginal people into an area where Aboriginal persons are already a visible minority group, with potential for increased racism and socio-economic marginalization of Aboriginal persons living in the Fort St. John area. The T8FN members also raised concern that an influx of young men may lead to increased social dysfunction in and around Fort St. John, and increases in drugs, alcohol, crime, and decreased sexual health (including pregnancy among young women). These effects may disproportionately affect First Nations individuals, many of whom live, work, or go to school in Fort St. John and are vulnerable to social dysfunction for a variety of pre-existing systemic reasons (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012b).

As BC Hydro is proposing to use workforce camps, and is anticipating the majority of its workforce to reside in the camps, the potential for negative interactions between new non-Aboriginal and existing Aboriginal persons will be less than if the entire workforce resided in the community, as the camp residents would spend less time in the community at large.

28.4.2 Effects Assessment – Construction – Population Change for the City of Fort St. John

The forecasted change in (non-camp) population in the LAA attributable to the Project is illustrated in Figure 28.6, with a summary of the LAA Fort St. John population changes presented separately in Figure 28.9.

The projected change in population in Fort St. John attributable to the Project is illustrated in Figure 28.7. It is anticipated that the majority of in-migrants would settle in Fort St. John because of its proximity to the Project, as well as because of the relatively larger housing stock of various types available (see Volume 4 Section 29 Housing). The population increment is estimated to range from a low of 163~~158~~ in Year 0 to a peak of

877~~852~~ people in Year 5, equivalent to a 0.74% ~~0.72%~~ and 3.76% ~~3.65%~~ increase over the base case population forecasts for those respective years.

In the absence of the Project (the base case), the population of Fort St. John is forecast to grow at over 2% per year in the first two years of the forecast period, then at about 1% per year for the remainder of the period shown (Figure 28.9). Over the forecast period reported in the table, annual population growth in Fort St. John averages 1.5% per year without the Project. The Project affects Fort St. John's population growth by increasing the growth rate above the base case rate in the Project's first five years of construction, and less than the base case rate as construction winds down and workers (and their dependents) depart. Average population growth in Fort St. John over the construction phase would be about 1.6%.

In summary, the Project would result in Fort St. John's forecast population increases being realized sooner, by about three years, than is forecast in the base case (Figure 28.9). Similarly, for the LAA, the Project would advance by about two years the population level that would be expected in its absence.

28.4.3 Mitigation Measures – Construction

28.4.3.1 General Population

Project-induced changes in population (in the PRRD with reference to Fort St. John, and the effects on labour market and effects on population and demographics) will be addressed through mitigation measures proposed in Volume 3 Section 17 Labour Market, Volume 4 Section 29 Housing, and Volume 4 Section 30 Community Infrastructure and Services. For those valued components, changes in population potentially give rise to adverse effects; therefore. mitigation includes measures that reduce the effect of population change. For instance, Labour Market mitigation includes measures to increase the local labour supply, thus reducing the need to hire persons living outside the LAA. Housing mitigation includes an on-site workforce camp, thus reducing the number of persons seeking accommodation in the LAA (and the related increased demand for social services).

28.4.3.2 Aboriginal Peoples

Specific mitigation measures in relation to potential adverse effects of the Project on Aboriginal peoples in the LAA are outlined in Volume 3 Section 17 Labour Market, Volume 4 Section 29 Housing, and Volume 4 Section 30 Community Infrastructure and Services. If implemented in collaboration with Aboriginal organizations and First Nations communities, these measures will eliminate the adverse effect of certain population and demographic changes from the Project.

- BC Hydro will implement workforce management policies to require contractors to offer cross-cultural awareness training to their workers and to adopt and monitor codes of conduct. BC Hydro will work with local area First Nations to develop and deliver the cross-cultural awareness training.
- BC Hydro will support Aboriginal persons working on the Project to maintain permanent residence within their home communities by providing camp housing and, where demand warrants, by providing commuter support

A summary of project effects and mitigation measures that would reduce the Project's effect on Population and Demographics is presented in Table 28.9.

Table 28.9 Project Effects and Mitigation Measures on Population and Demographics

Project Phase	Potential Effects	Mitigation Measures	Mitigation Effectiveness	Responsibility
Construction	• The results of the assessment of the Project on the labour market were used to assess the effects on population and demographics • Changes to PRRD population, with specific reference to City of Fort St. John	General Population: • Mitigation measures proposed for Volume 3 Section 17 Labour Market, Volume 4 Section 29 Housing, and Volume 4 Section 30 Community Infrastructure and Services will mitigate population effects.	These mitigation measures are expected to be effective, as they are common approaches for large construction projects to address migration and population effects. With mitigation, there will be residual changes to population, and therefore there will be residual population and demographic effects.	
	• Changes to Aboriginal community populations	Aboriginal Populations: • Support Aboriginal persons in maintaining permanent residence in home communities by providing camp housing and commuter support where demand warrants • Implement workforce management policies to require contractors to offer cross-cultural awareness training to their workers and to adopt and monitor codes of conduct. BC Hydro will work with local area First Nations to develop and deliver the cross-cultural awareness training. • Procurement of local Aboriginal businesses for Project construction contracts		BC Hydro will mandate its contractors to deliver introductory cross-cultural awareness training to their employees and adopt and monitor an employee code of conduct.

NOTE:
N/A – not applicable

28.4.4 Other Mitigation Options Considered

There were no other mitigation measures considered for effects on Population and Demographics.

28.5 Residual Effects

28.5.1 Characterization of Residual Effects

With the application of the above mitigation measures, there would be residual project effects on population. This residual effect is characterized according to the residual effects criteria and associated definitions in Table 28.10. For several criteria, the descriptor is relative to the base case condition. The base case is the expected future status of population and demographics in the absence of the project.

Table 28.10 Characterization Criteria for Residual Effects on Population and Demographics

Criterion	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	Direction of change in relation to base case conditions.	**Increase:** An increase in populations in relation to base case conditions
		Decrease: A decrease in population in relation to base case conditions
		Neutral: No change in population in relation to base case conditions
Magnitude	The amount of change in a measurable parameter or variable relative to baseline case (low, moderate, high).	**Low:** change is detectable but variability is less than historical baseline conditions
		Moderate: change is comparable to variability seen in historical baseline conditions
		High: change would exceed variability seen in historical baseline conditions
Geographical Extent	The geographic area in which an effect of a defined magnitude occurs.	**Local:** Peace River Regional District
		Regional: Peace River Regional District
Frequency	The number of times during the construction phase that an effect may occur.	**Once:** Occurs once
		Sporadic: Occurs rarely and at irregular intervals
		Continuous: Occurs on a regular basis and at regular intervals
Duration	The period of time required until the VC returns to its baseline condition, or the effect can no longer be measured or otherwise perceived.	**Short-term:** Effect is limited to <1 year
		Medium-term: Effect occurs >1 year but not beyond the construction of the Project
		Long-term: Effect lasts beyond the construction phase and up to 10 years of the operations phase
		Far future: effect extends >10 years for the life of the Project
Reversibility	The likelihood that a measurable parameter will recover from an effect.	Effect **reversible** with reclamation and/or over time
		Effect **permanent** and cannot be reversed with reclamation and/or over time

Criterion	Description	Quantitative Measure or Definition of Qualitative Categories
Context	Capacity of socio-economic systems and processes to accept change, resilience, or the level of change relative to base case or base line variation typically experienced	**Low:** Effect occurs in environments of low resiliency and/or high vulnerability
		High: Effect occurs in an environment of high resiliency and/or low vulnerability
Level of Confidence	Certainty in quantifying or estimating the effect; the quality and quantity of data; the understanding of the effect mechanisms; and the effectiveness of mitigation.	**Low:** Assessment based on professional judgment and experience, but hampered by incomplete understanding of cause-effect relationships, and or lack of data
		Moderate: Assessment based on professional judgment and experience, including a reasonable understanding of cause-effect relationships, and adequate data
		High: Assessment based on professional judgment and experience, including a good understanding of cause-effect relationships, and ample data
Probability	The likelihood that an adverse effect will occur	**Low:** Unlikely to occur
		High: Very likely to occur
		Unknown: Not sufficient information or understanding to form an view or estimate probability

Although the overall projected population direction during construction is an increase (i.e., above the forecast population), the annual increment would be positive in the first six years of construction (i.e., net in-migration), and negative (i.e., net out-migration) thereafter. The magnitude would be low for the LAA. The variability is within historical baseline conditions, as expected in-migration and out-migration levels would be comparable to the LAA experience over the last decade and would not exceed peak historical levels. The magnitude for Fort St. John is considered moderate because it is expected to receive a higher proportion of new residents, but the rate of growth is only slightly above the community's expected population growth rate in the absence of the Project. Absolute change in the LAA population would peak in Year 5 of construction and would be equivalent to a 2.2% increase over the base case. In the same year, the Fort. St. John population would be 3.6% above the base case. The estimated peak population values for Year 5 of Project construction are forecast to occur in the base case in the LAA and in Fort St. John two and three years later, respectively.

Effects would be continuous throughout the construction phase and would cease when construction is complete, at which time the population would return to near base case conditions. Even if workers and their families stayed in the LAA or Fort St. John after construction, this would not be a Project-related effect as the effect would be attributable to some other economic or social causal factor, such as taking up a local employment opportunity.

All effects would be reversible at the completion of construction. The LAA is a diversified economy with past and future expected population growth rates comparable to the province.

The probability of an adverse effect occurring is rated as low since the LAA and Fort St. John have experienced high in- and out-migration levels over the last decade (see Table 28.6), and continue to build their communities in the context of an economy characterized by numerous major development and construction projects.

Residual population effects on Aboriginal peoples and First Nations communities as a result of the Project cannot be predicted with a degree of accuracy. However, local contracting and recruitment would help address the potential related changes to population and demographics in First Nation communities. Beneficial measures such as local procurement opportunities may serve to maintain the on-reserve population.

A summary of residual project effects on population is presented in Table 28.11.

1 **Table 28.11 Summary of Residual Effects Ratings for Population**

Activity	Effect	Residual Environmental Effect							
		Direction	Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Context	Probability	Level of Confidence
Construction	The results of the assessment of the Project on the labour market will be used to assess the effects on population and demographics	Increase	Low	Local (LAA)	Medium term Continuous	Reversible	High resiliency	Low	Medium
Construction	Changes to PRRD population, with specific reference to City of Fort St. John	Increase	Moderate	Local (Fort St. John)	Medium term Continuous	Reversible	High resiliency	Low	Medium

NOTE:
N/A – not applicable

28.5.2 Standards or Thresholds for Determining Significance

There are no regulatory standards specifying limits to acceptable changes in population. The threshold adopted is with reference to the following:

- Record of net migration in the LAA between 1996 and 2007 (recent historical experience, using available data)
- Absolute population growth between 2006 and 2011
- Duration as a variable of amplitude

With the implementation of mitigation, Figure 28.8 shows the expected annual population change in the LAA (i.e., non-camp population) attributed to the Project, as compared to migration flows to the LAA for the most recent eigth-year period for which information is available (i.e., the 1998 to 2006 period). Migration flows are important because they dictate the timing of demand for community infrastructure and services. The figure indicates that, even though the population in the LAA would increase temporarily with the Project, annual in-migration would not exceed the extreme levels of net migration experienced between 1998 and 2006. Similarly, at the end of the construction phase, the level of out-migration is less than recent experience.

28.5.3 Determination of Significance of Residual Effects

Population change would be distinguishable from baseline conditions, but the peak changes in Year 5 of construction and variability between 2014 and 2022 would not exceed recent historical experience in the LAA or Fort St. John. Fort St. John experienced 13.8% population growth between 2006 and 2011, equivalent to a 3.3% annual increase. The peak population effect attributable to the Project in Fort St. John would be 3.6%, but the duration of that peak would be measured in months, not years. The net effect of the Project on population would be to bring forward in time – by about two years in the LAA, and three years in Fort St. John – growth that is forecast to occur in the base case. For these reasons, the Project's effect on population is deemed to be not significant (Table 28.12).

The determination of residual effects is based on a comparison of the Project's labour requirements with historical and future expected population and demographic trends as published by Statistics Canada and BC Stats. Cause-effect relationships between changes in the labour market and population are well understood and suitable for quantitative modelling. However, there is uncertainty about where workers choosing to live in the LAA would actually reside. Further, population forecasts by BC Stats are not available at a municipal level. Therefore, the confidence in this assessment and its predicted outcomes are medium.

A summary of potential effects, key mitigation measures, and significance ratings is presented in Table 28.12. The Project would create change in in-migration and out-migration to the LAA, but the effect would be short term and within the bounds of recent historical experience.

Table 28.12 Summary of Assessment of Potential Significant Residual Adverse Effects

Valued Component	Project Phase	Potential Adverse Effect	Key Mitigation Measures	Significance Analysis of Residual Effects
Population and Demographics	Construction	Increased population in the region Changes to PRRD population with respect to the City of Fort St. John Changes to Aboriginal community populations	General Population: Mitigation measures proposed for Volume 3 Section 17 Labour Market, Volume 4 Section 29 Housing, and Volume 4 Section 30 Community Infrastructure and Services will mitigate population effects. Aboriginal Populations: • Support Aboriginal persons in maintaining permanent residence in home communities by providing camp housing and commuter support where demand warrants • Implement workforce management policies to require contractors to offer cross-cultural awareness training to their workers and to adopt and monitor codes of conduct. BC Hydro will work with local area First Nations to develop and deliver the cross-cultural awareness training. • Procurement of local Aboriginal businesses for Project construction contracts	Change in population does not exceed variations in in-migration and out-migration levels or absolute population change, and peak effects occur for the short term No significant adverse effect

28.6 Cumulative Effects Assessment

The Project would act cumulatively with any project that would affect the population in the LAA during the construction period. However, projections of population for the region made by BC Stats and other agencies do not assume that population will remain static; rather, they acknowledge that growth will occur and attempt to predict the behaviour of variables that contribute to that growth. Key among these is the expectation that economic and employment activity will expand, due in part to the development of future projects.

The forecasted net in-migration included in the baseline forecast is about 400 persons per year, which is higher than the net out-migration of some 200 persons observed in the 1996 to 2007 period. The cumulative effects of economic activity in the region, drawing permanent population to the LAA, are incorporated into population forecasts for the Peace River North and Peace River South local health areas prepared by BC Stats, by including population from specific known projects and a general attribution to expected regional economic growth. For these reasons, an assessment of cumulative effects is embedded in the effects assessment for the Project. Additional consideration of projects in the Project Inclusion List for potential cumulative effects on population and demographics would likely result in double-counting, and therefore a cumulative effects assessment was not undertaken.

28.7 Monitoring and Follow-Up

No monitoring or follow-up is proposed.

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