Deroche Neighbourhood Plan
Final Report

Fraser Valley Regional District

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APPENDICES

1.0 Introduction

1.1 Purpose

The Deroche Neighbourhood Plan, located within the Fraser Valley Regional District (FVRD), provides a policy framework that will guide potential neighbourhood development, and ensure that it is consistent with the overall vision for the community. This study is intended to build on the objectives and policy framework reflected in the FVRD Electoral Area 'G' Official Community Plan (OCP), and provide a finer grained study of the area identified in the OCP as the "Deroche Bench Special Planning Area".

Previous research and community consultation was undertaken by the FVRD in conjunction with the Advisory Planning Commission (APC). This was supported by documents such as the Area 'G' Official Community Plan and FVRD Regional Growth Strategy. The results of that initial work have provided further guidance for the development of additional policies and implementation strategies throughout this neighbourhood planning and design process.

The Deroche Neighbourhood Plan is the mechanism to ensure that development occurs in a planned and organized fashion and in a manner that meets the ideals of a sustainable, rural community.

1.2 Community Setting

The Deroche Neighbourhood is located along the Lougheed Highway approximately 20 km east of Mission, BC, within Electoral Area 'G' of the Fraser Valley Regional District. The community is bordered by the Canadian Pacific Railway and Nicomen Slough to the south and the Leq'á:mel First Nation settlement of Lakahahmen IR #11 to the west. The area is largely rural in nature with a number of natural features situated within a series of topographic benches, with a population of approximately 100 to 150 residents. The lower bench area of Deroche includes a number of community amenities including an elementary school, community hall, general store, post office, and service station in addition to a number residential parcels. The upper bench area is accessed by North Deroche Road, and consists of medium to large rural lots at the base of Mount Deroche. The location of the Deroche Neighbourhood Plan is shown in Figure 1.1, with a few representative community images provided in Figure 1.2.

Figure 1.1: Location Plan

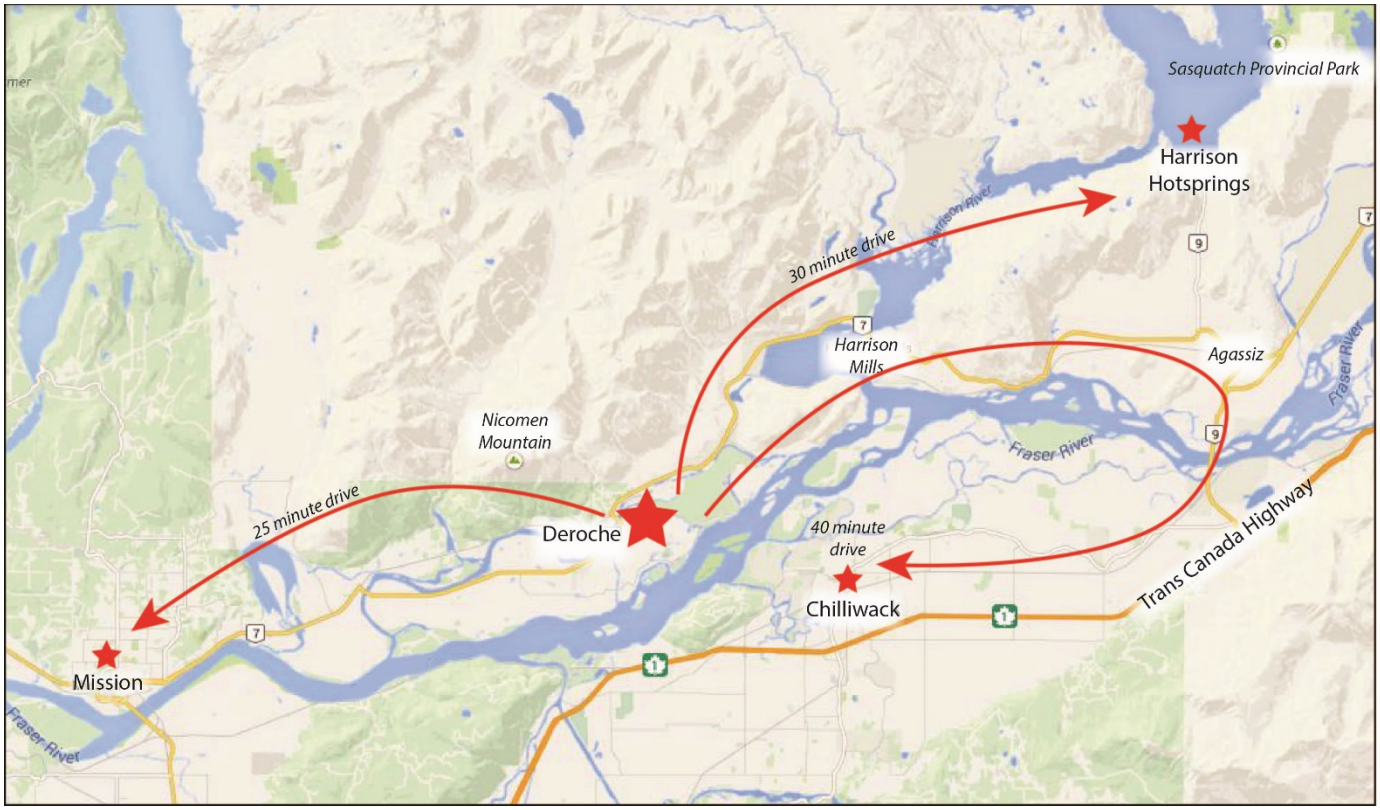


Figure 1.2: Deroche Neighbourhood Community Images

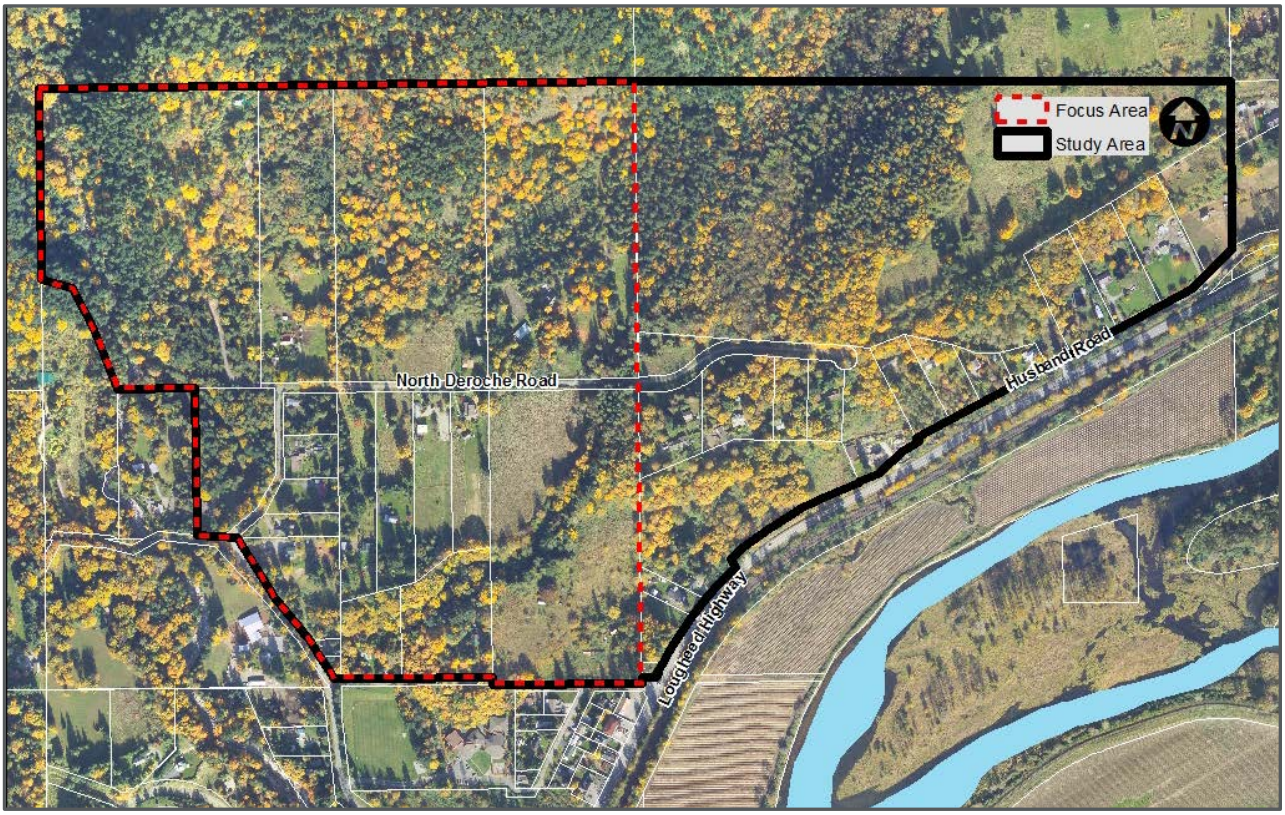
1.3 Study Area and Focus Area

The overall Deroche Neighbourhood Plan study area is comprised of approximately 90 hectares of land including the majority of the upper bench lands, as well as a small portion of the undeveloped lower community. As previously described, the bench lands consist of medium to large rural lots situated on generally flat terrain, which lie immediately at the southern base of Deroche Mountain. Deroche Creek lies along the western edge of the study area, and Lougheed Highway delineates the south-eastern boundary.

The study area is further divided (approximately in half) by a moderately steep ravine encompassing Burn Brae Creek, which separates the upper bench lands on the western half from one large rural parcel on the eastern half, as well a series of existing properties fronting an access road (Husband Road) adjacent to the Lougheed Highway. At the time of this report, the owners of the large rural parcel at the eastern end of North Deroche Road indicated they were not interested in being part of the Deroche Neighbourhood Plan study process. Therefore, a Focus Area was developed for this neighbourhood plan which will concentrate on the western portion of the upper bench area, approximately 52 hectares in size, as shown in red in the figure below. Although provisions for future access and infrastructure connections have been considered within the eastern portion of the study area, at this time potential development opportunities have been limited to the properties within the Focus Area.

The boundaries of the Focus Area, within the Deroche Neighbourhood Plan Study Area, are depicted in Figure 1.3 below.

Figure 1.3: Study and Focus Areas



2.0 Background

2.1 Electoral Area 'G' Official Community Plan

In 2004, the FVRD conducted a community survey which reported that the majority of Deroche residents believe the preservation of the rural landscape and environmental protection / conservation should be central principles used to guide land use planning decisions for the Deroche neighbourhood. Additional consultation between the FVRD and Deroche residents throughout 2007 and 2008 built upon these principles by consolidating those ideas into a community vision and a series of development objectives.

The 2008 update of the FVRD Electoral Area 'G' Official Community Plan (OCP) further enhanced these ideas and identified the need for a Local Area Plan or Neighbourhood Plan for the "Deroche Bench Special Planning Area". Throughout the consultation process, residents identified the need for a comprehensive plan for Deroche – one which implements innovative approaches to ensure that future development reflects local values and visions. The OCP stated that a Deroche-focused plan shall include the following:

- Identification of community values through a community-based design charrette or similar process;
- Cataloguing environmental features, habitats, and values to identify goals for green space preservation, trail development, and natural asset protection;
- Determining suitable and sustainable densities for parcels on the Deroche bench lands;
- Developing objectives and guidelines for the management of stormwater;
- Outlining a liquid waste management plan to determine sustainable sewage disposal strategies;
- Assessing the capacity of the Deroche community water system;
- Addressing the condition of North Deroche Road and identify mechanisms for upgrade;
- Developing a conceptual plan for development based on principles such as Conservation Subdivision Design (CSD), clustered development, and rural 'smart growth'; and
- Setting out policies and regulations necessary to achieve the development vision.

The OCP, which includes a community plan vision and objectives for Electoral Area 'G' was finalized in 2008. The collective vision for Area G, which includes the communities of Hatzic Lake, Dewdney, Nicomen Island, and Deroche is as follows:

Vision for Electoral Area 'G'

To maintain the rural character and lifestyle of our agricultural and rural-residential community in an environmentally sustainable manner while providing opportunities for outdoor recreational activities

In addition, the Official Community Plan incorporates the following planning principles and objectives for the entire Electoral Area 'G':

- Conserve agricultural lands;
- Preserve fish, wildlife, and water resources;
- Encourage sustainable development and environmental stewardship;
- Maintain and enhance rural character;
- Safeguard human health;
- Ensure development is appropriately planned and serviced; and
- Protect people and development from natural hazards.

2.2 Neighbourhood Planning Principles

In 2010, the FVRD established and worked with an Advisory Planning Committee (APC) made up of community volunteers to help develop ideas and directives to refine the neighbourhood planning principles and objectives for the Deroche Neighbourhood Plan. Through the process, the APC further established a series of planning directives, outlined below. These directives reiterate the community's support for sustainable forms of development, the need to protect the rural character of the community, and the importance of preserving quality of life for current and future Deroche residents.

Within the Deroche Neighbourhood Plan, each of the planning directives are labeled as "addressed", "not addressed", or "further analysis required", as appropriate.

- Allow for flexibility and creativity in the design of residential developments *(addressed)*;
- Avoid suburban hillside development patterns *(addressed)*;
- Protect and maintain natural areas such as riparian or wildlife corridors *(addressed)*;
- Avoid development within geotechnical or floodplain hazard areas *(addressed)*;
- Minimize impacts on significant and mature forested areas, especially those containing many mature trees or significant wildlife habitat *(addressed)*;
- Ensure efficient and low impact servicing for new development *(further analysis required)*;
- Maintain scenic views and vistas unblocked or uninterrupted *(further analysis required)*;
- Provide contiguous open space and conservation areas *(addressed)*;
- Provide community trail connections to ensure residents can walk safely and easily between the upper and lower bench area *(addressed)*;
- Allow for a variety of parcel sizes to meet affordability and modern day lifestyle needs *(addressed)*; and
- Avoid suburban features such as curb and gutter, wide road widths, extensive street lighting, etc. *(addressed)*.

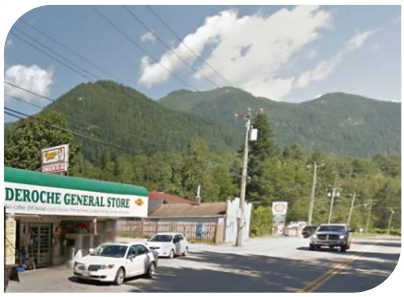
2.3 Overview of Development Considerations

Agricultural Land Reserve

Approximately 5% of British Columbia is designated as Agricultural Lands Reserve (ALR). This may seem like a low percentage province wide; however, about 55% of Electoral Area 'G' lands north of the Fraser River are within the ALR. Located outside of the ALR, the Deroche bench lands offer the potential for residential development for projected growth in the Fraser Valley.

Community Amenities

The community of Deroche is unique in that it is rural, yet has a strong base of amenities providing local services to the neighbourhood. Within a five minute walk from the Deroche bench lands are the Deroche Community Hall, Deroche Community Park, Deroche Elementary School, a Fraser Valley Regional District office, and commercial services including a gas station, general store, liquor store, tourist accommodation, and pizzeria.



Lifestyle and recreational amenities are also located at the doorstep of the community. Perched on the Deroche bench, residents enjoy beautiful views across the Fraser River towards the coast mountain range with prominent features such as Welch Peak, Sowerby Peak, and Williams Peak. Notable recreational destinations including Cascade Falls Regional Park, Rolley Lake Provincial Park, Sasquatch Provincial Park, Harrison Hot Springs, and Hemlock Resort are also within a short driving distance.

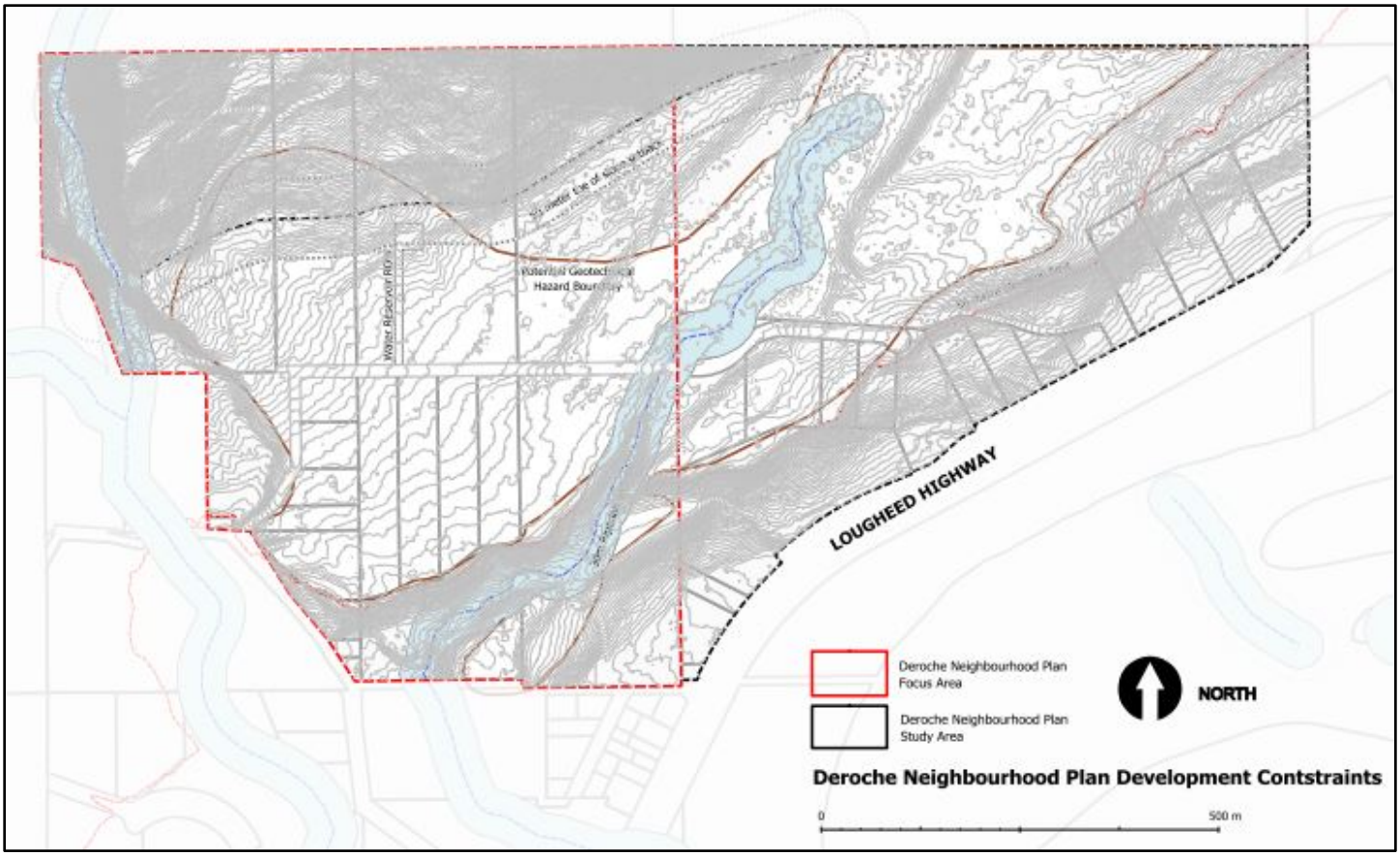
Surficial Geology

One of the reasons why the Deroche bench lands are attractive from a development perspective is the large area of generally flat terrain situated at an elevation above the Fraser River floodplain. The topography gradually rises to the north up to the toe of Deroche Mountain. Previous studies have indicated that development within a 50m horizontal setback from the toe of slope is not advisable due to geohazards such as rock fall risks. This potentially limits the development footprint within the northern portion of the Focus Area. However, the FVRD has not formally adopted a policy with respect to the 50m setback from the toe of slope; further site specific analysis would be required in order to refine the development area.

Burn Brae Creek flows in a southwesterly direction bisecting the Focus Area. This creek lies within a deep ravine densely vegetated with mature trees and undergrowth. Previous geotechnical studies recommend maintaining a minimum horizontal setback of 15 m from the edge of the ravine. However, the environmental setback of 30 m from riparian areas would govern in this case, until a Riparian Area Regulation (RAR) assessment was undertaken on the proposed development site.

Figure 2.1 on the following pages identifies the potential development constraints within the Focus Area, including the 30m riparian setback, 50m toe of slope setback, and geotechnical hazard boundary. As noted above, these setback areas are not definitive, as they could be refined through additional professional assessment (e.g. Qualified Environmental Professional, geotechnical study) as part of the development application process.

Figure 2.1: Constraints Mapping



Water System

The lands that make up the Focus Area are either within or immediately adjacent to the current service area of the FVRD's community water system. This offers the potential to upgrade and expand the existing water system to service future development. However, the following considerations should be noted:

- The existing water system is supplied by a single groundwater production well. Servicing new development could trigger the need for additional source capacity.
- The existing water system provides a rural level of fire protection in accordance with FVRD bylaws. Additional storage and conveyance capacity would be required to provide fire protection to commercial / institutional facilities or higher density rural developments.
- Due to the elevation of the existing reservoir, a small booster pump station is used to address low water pressure issues for existing properties along North Deroche Road. Although this booster station has some surplus capacity, it is not sized to service significant development on the bench lands nor is it capable of conveying fire flows.

Wastewater

The majority of the existing homes and buildings in Deroche are serviced by on-site septic systems. The Fraser Health Authority Guideline requires a minimum lot size of 0.2 hectares (1/2 acre) for on-site septic systems. However, Fraser Health has approved smaller lot sizes (e.g. 1/3 acre) where soil and groundwater conditions are considered optimal for sewage disposal.

The subsurface conditions on the Deroche bench are suspected to be favourable for on-site septic systems; however, this needs to be confirmed through further investigation. Lot sizes for any proposed new development will need to consider minimum requirements for on-site septic.

For higher density areas, such as along the Lougheed Highway corridor, a community sewer system may be warranted. This could benefit new development on the lower bench in addition to existing properties that may not be adequately serviced.

Drainage

Stormwater is currently managed via overland flow and ditching along the street network. The rural nature and permeable soil conditions promote infiltration of rainwater to ground resulting in minimal runoff volumes. Burn Brae Creek, which flows southwesterly through the Focus Area, forms a major drainage flow path for the bench lands. Consistent with the vision to maintain a rural feel for the Deroche community, low impact development techniques for stormwater management and drainage will be strongly encouraged for any new development.

Transportation

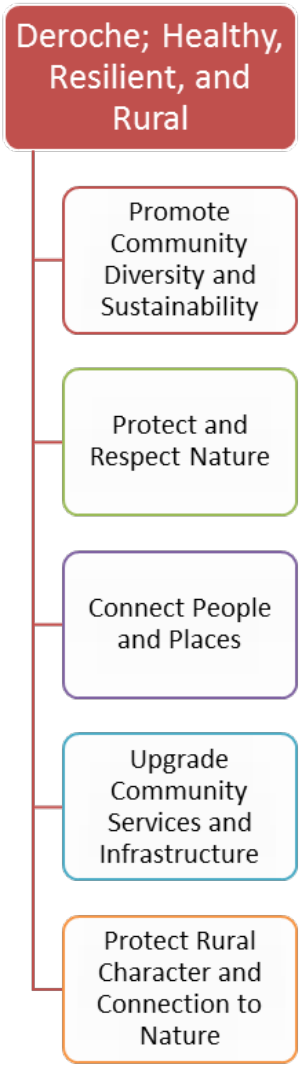
In order to support the vision for the neighbourhood, the bench lands need to be safely accessible for both vehicles and pedestrians. This will require an upgraded road and trail network throughout the bench lands that will also provide connectivity to the lower portion of the community where the school and commercial properties are located.

Currently, the bench lands are only accessible via North Deroche Road. There are concerns regarding the safety and condition of this road, specifically near the intersection of Morton Road. The Ministry of Transportation and Infrastructure (MOTI) has indicated that improvements to this section of North Deroche Road are necessary to support any new development on the bench lands.

3.0 Objectives and Land Use Concept

3.1 Development Objectives

The Deroche Neighbourhood Plan has been developed based on the following five objectives. These objectives have been developed in consultation with the community and the FVRD's Advisory Planning Committee. They form the basis for the land use and development policies outlined in Section 4.0.



1. Plan for community diversity and sustainable living

- Provide a mixture of housing types, parcel sizes, and affordability levels;
- Ensure appeal for a varied demographic including families and empty nesters;
- Implement neighbourhood design to bring residents together and build stronger community connections; and
- Create and support existing community services and facilities such as trails, schools, community amenities, commercial areas and a base of passionate volunteers to support.

2. Plan and design in a way that is respective to nature

- Protect riparian areas;
- Conserve surrounding forest areas;
- Retain stormwater on-site where possible;
- Manage and limit impervious surfaces;
- Promote conservation of water though the use of tools such as low flow fixtures and consumption based billing using water meters;
- Ensure that septic systems produce effluent quality that can safely re-enter the receiving environment; and
- Create roads that minimize paved surfaces and reduce driving speeds.

3. Connect people and places

- Provide a natural trail along the riparian corridor between the bench lands, school, and commercial community core;
- Provide gravel surfaced roadside trails parallel to North Deroche Road as well as future roads throughout the bench lands;
- Provide access via pathways within the neighbourhood along road and riparian corridors; and
- Ensure trail corridors maintain privacy and uphold high safety standards.

4. ***Maintain and improve community services and existing infrastructure***

- Upgrade North Deroche Road to provide safe vehicular access to the bench lands;
- Ensure new development will enhance the community in the long-term; and
- Upgrade the community water system to provide a higher level of service, specifically fire protection.

5. ***Protect the rural character and enhance the community's connection to nature***

- Maintain natural features for community enjoyment including forest, creek, and wildlife corridors;
- Ensure a sense of place and privacy through careful house and vegetation placement and parcel layout;
- Provide views to mountains, forests, and lands beyond such as the Fraser River and Mount Cheam; and
- Provide access to undeveloped areas adjacent to the community, particularly to the north and west of the Study Area.

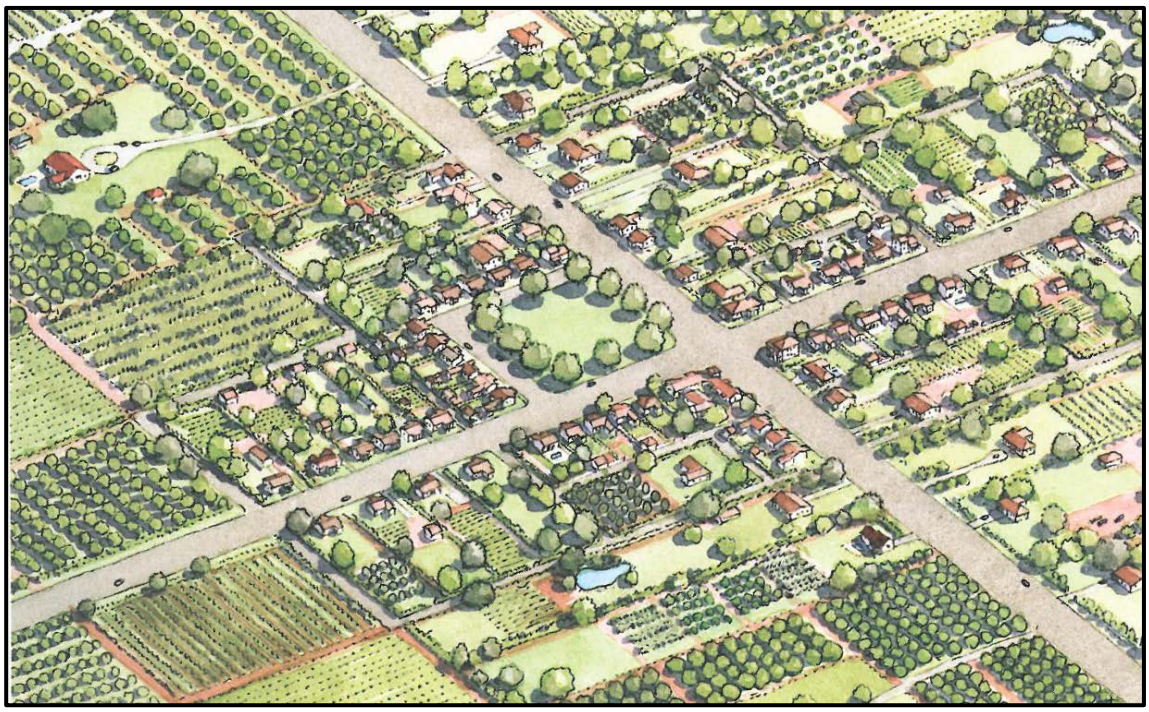
3.2 Land Use Concept

Based on the preceding development objectives for the Deroche neighbourhood, the objective in developing the land use concept is to provide enough flexibility in the land use designations to promote a mixture of lot sizes at a density large enough to support the required infrastructure upgrades (e.g. water, roads) while respecting and protecting the rural character of the area.

There are a number of design techniques that can be utilized in order to provide a mixture of lot types and protect surrounding environmental features. The potential difference between a "traditional" rural subdivision and a "clustered" approach are shown in Figures 3.1 and 3.2 respectively. Note that these are illustrations only for discussion, and do not reflect the challenging topographical constraints found through the Deroche Neighbourhood bench lands. However, they do provide a visual reference for neighbourhood clustering which can concentrate civil infrastructure and reduce servicing costs, preserve surrounding farmland, woodland, riparian corridors and enhance community cohesion.

Figure 3.1: Traditional Rural Subdivision Layout

Figure 3.2: Clustered Rural Subdivision with varied lot sizes



Source: Sprawl Repair Manual, Tachieva, G., Island Press, 2010.

The Land Use Concept Plan for the Deroche neighbourhood is illustrated in the figure below. Further discussion regarding land use designations and areas is provided in subsequent sections. This concept has been prepared based on the guiding principles and development objectives derived from previous consultation with the Deroche community and Advisory Planning Committee. Additional site layout considerations are provided for reference in Appendix A.

Figure 3.3: Land Use Concept Plan

3.3 Land Use Designations and Areas

The land use designations illustrated in Figure 3.1 are described further in the following sections. Table 3.1 summarizes the areas of each land use designation included in the Land Use Concept Plan.

Table 3.1: Land Use Areas

Designation	Area (Ha)	% of Total
Open Space	25.6	49%
Suburban Residential	23.6	45%
Compact Residential	1.2	2%
Institutional	1.9	4%
TOTAL	**52.3**	**100%**

3.3.1 *Open Space*

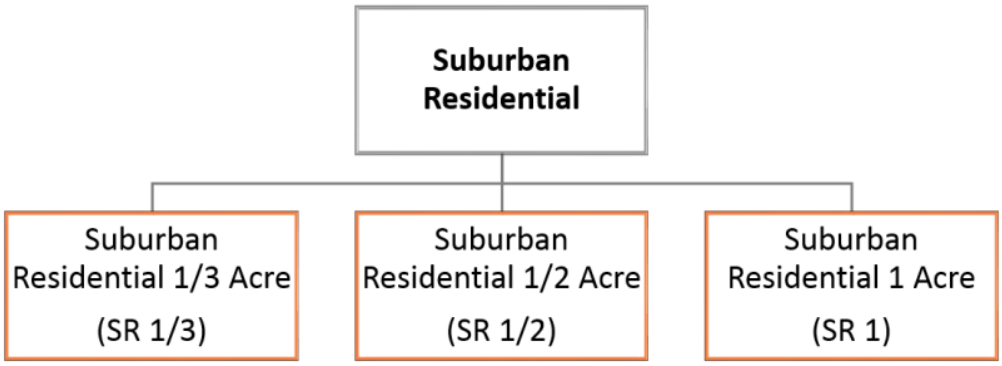
The Open Space designation is applied to lands which are to remain in their natural state. The designation is intended for the protection of natural and environmentally sensitive areas that should be protected from development. The Open Space designation also applies to lands that are intended for the long-term enjoyment of the public, including both active and passive outdoor recreation activities.

3.3.2 *Suburban Residential*

Single family residential development is intended for the lands identified as “Suburban Residential” (SR). The SR designation is broken out into three land use designation that are further defined by minimum lot sizes and policy provisions. These designations are as follows:

- Suburban Residential 1/3 Acre (SR 1/3)
- Suburban Residential 1/2 Acre (SR 1/2)
- Suburban Residential 1 Acre (SR 1)

Figure 3.4: Suburban Residential Designation sub-categories



The specific locations of the SR 1/3, SR 1/2 and SR 1 designations are not identified within the Suburban Residential designation boundary on the Land Use Concept. The locations for each will be determined as part of the development application process for rezoning and subdivision.

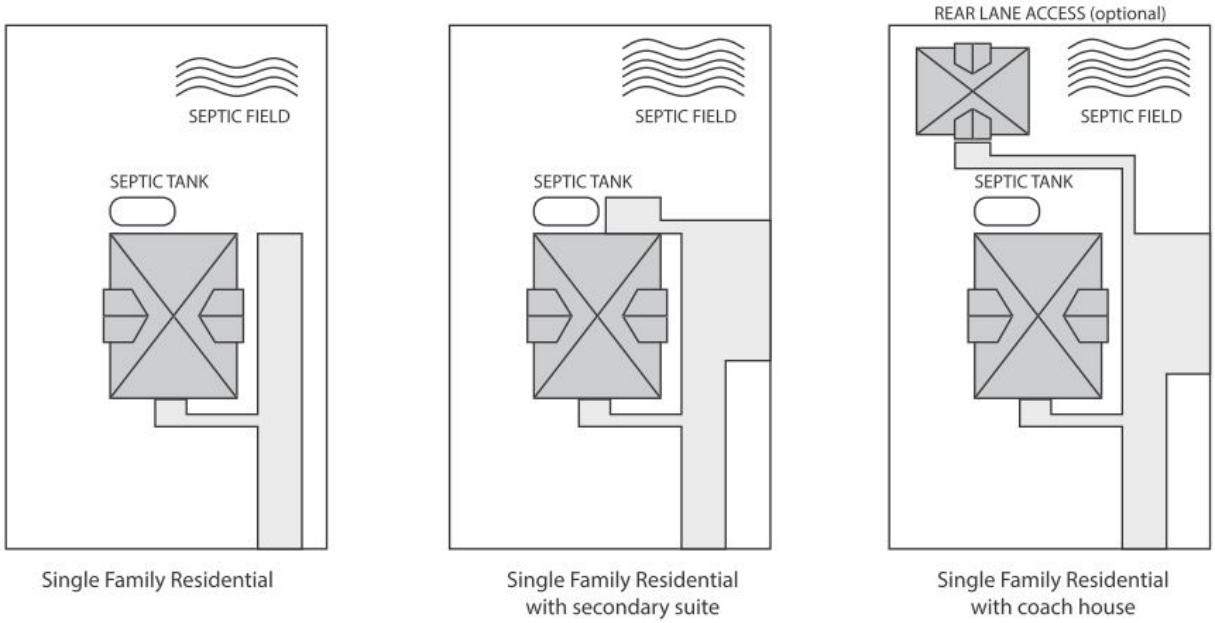
For each of the three land use designations, only a certain number of lots associated with each land use designation will generally be supported within the Suburban Residential area identified on the Land Use Concept Map (Figure 3.1). The table below indicates the range of lots allocated for each land use designation, as well as the minimum lot size for each category.

Table 3.2: Land Use Designations and Density Targets

Land Use	Minimum Lot Size	Estimated Number of Lots
Suburban Residential		
SR 1	1.00 ac (0.4 Ha)	7 to 10
SR 1/2	0.50 ac (0.2 Ha)	50 to 55
SR 1/3	0.33 ac (0.13 Ha)	18 to 20

Finally, in order to promote efficient use of the lands as well as increase housing choice and affordability, all lands within the Suburban Residential land use designation should accommodate the potential for secondary suites (within the primary dwelling) or coach houses (within an accessory dwelling) as a permitted use within the zoning bylaw, as shown in the following graphic. The primary factor in determining whether or not the additional units can be accommodate will likely be septic field capacity, usually based on the total number of bedrooms on the parcel. This factor, along with additional criteria with respect to coach house siting and massing, will be included in the residential policy section in Chapter 4 of this report.

Figure 3.5: Secondary Suites and Coach Houses on Septic



3.3.3 *Compact Residential*

The Compact Residential (CR) land use designation accommodates single family homes on smaller lots, duplexes, or townhomes. The Compact Residential designation is the highest density land use designation within the Deroche Neighbourhood and allows for a minimum lot size of 0.05 Ha (1/8 acre). This translates to approximately 12 lots within the area identified as Compact Residential, or approximately 10 units per hectare. Alternatively, the area could be considered as one strata development site for higher density development such as ground-oriented townhouses, which could increase density in the 25 to 30 units per hectare.

Given that the densities projected in the Compact Residential designation would exceed those permitted under septic field regulations, a community sewer system would need to be explored. Given the potential costs, it would feasible to consider an expanded service area to include Cooper Road, the commercial properties fronting Lougheed Highway (e.g. Deroche General Store, gas station), as well as the Deroche Elementary School. Further discussion and a conceptual cost estimate for community sewer service has been provided in Section 6.2 of this report.

3.3.4 *INSTITUTIONAL*

The construction of a new Formation House (Chapel and Religious Uses) began in the summer of 2015. A 1.9 hectare portion of 10789 North Deroche Road was rezoned from Rural to Institutional to permit this new land use. The Formation House project is advancing ahead of the completion of the Deroche Neighbourhood Plan because the project does not impact the availability of lands for potential future development. The project's developers also contributed a voluntary development cost charge equivalency in advance of a water system development cost charge bylaw to be used for future improvements to the existing community water system.

The proposed project consists of an approximately 11,475 square foot single level facility including:

- Twenty dormitory-style rooms at approximately 450 square feet each
- Commercial kitchen and dining room to serve at least 45 people
- Chapel for 45 people
- Parlor to meet with a small group of 12 people
- Library for meditation, reading, research and WIFI connection
- Office for Executive Director, 2 accounting and secretarial staff
- Washrooms
- Lobby and vestibules
- Utility rooms and storage.

The Deroche Neighbourhood Plan includes and incorporates the Formation House project.

4.0 Land Use and Development Policies

This section outlines policies that support the Deroche Neighbourhood Plan based on the Development Objectives and the Land Use Concept Plan.

4.1 Residential

Residential development is permitted in the following land use designations:

- Suburban Residential
    - Suburban Residential 1/3 Acre (SR 1/3)
    - Suburban Residential 1/2 Acre (SR 1/2)
    - Suburban Residential 1 Acre (SR 1)
- Compact Residential

The intent for the Deroche neighbourhood is to provide a mix of residential land uses throughout the development area. The following policies are intended to guide decision making on the part of both developers and the FVRD and to provide clarity as to how development proposals will be assessed and evaluated.

Policies:

a. A mixture of lot sizes, housing types, and unit sizes shall be encouraged throughout the Suburban Residential area.

b. The following minimum lot size requirements and density allocation targets will be upheld for all residential development within the Suburban Residential area:

Land Use	Minimum Lot Size	Estimated Number of Lots	Gross Density Target (units per ha)
Suburban Residential (SR)			
SR 1	1.00 ac (0.4 Ha)	7 to 10	2.5 uph
SR 1/2	0.50 ac (0.2 Ha)	50 to 55	5 uph
SR 1/3	0.33 ac (0.13 Ha)	18 to 20	8 uph
Total:		**75 to 85**	

c. Secondary suites or coach houses should be permitted within the Suburban Residential designation, and incorporated within the respective zoning regulations, based on the following criteria:

- The additional bedrooms can be supported by the proposed septic tank and field, as approved by the Fraser Health Authority.
- Either a secondary suite or a coach house is permitted as an ancillary use to the primary use of the property, and should account for no more than 40% of the total floor space.

- Additional parking and access requirements should be provided for secondary suites and coach houses within the zoning regulations.

d. The following land use density allocation targets will be upheld for the lands designated Compact Residential:

Land Use	Minimum Lot Size	Estimated Number of Lots	Gross Density Target (units per ha)
Compact Residential (CR)	0.125 ac (0.05 Ha)	12	10 uph (single detached) or up to 30 uph (townhouse)

e. Grade-level, street-fronting units within the Compact Residential area will be designed to have direct access from the street.

f. The minimum lot size proposed for Compact Residential lots will require a community sewer system or package treatment system. In the event that this is not feasible, the FVRD would consider rezoning applications to lower the density to meet Fraser Health requirements for a Type 1 septic system (e.g. proposed SR 1/3 or SR 1/2).

g. The FVRD will establish additional zoning typologies to provide a level of density greater than a minimum parcel size of 0.5 Hectares within the Suburban Residential and Compact Residential area designation with guidance from the suggested conceptual zoning typologies listed in Section 5.0.

h. The FVRD will modify the boundaries of the 'Rural' and 'Suburban Residential' land use designations in the Electoral Area 'G' OCP – Bylaw 0866, 2008 Schedule 2 to align with the Deroche Neighbourhood Plan.

i. The Focus Area lands that fall within the boundaries of the "Geologic and Stream Hazard Development Permit Area No 1-G" must comply with the guidelines established in Section 15.1 of the Electoral Area 'G' OCP – Bylaw 0866, 2008.

j. The Focus Area lands that fall within the boundaries of the "Riparian Areas Development Permit Area No 2-G" must comply with the guidelines established in Section 15.2 of the Electoral Area 'G' OCP – Bylaw 0866, 2008.

4.2 Open Space

The plan development area is surrounded by lands designated for Open Space, which make up approximately half of the Focus Area site. These Open Space lands must remain protected from development and will continue to provide the community with opportunities for passive and active recreation.

Policies:

a. Ensure the lands designated for Open Space remain protected and free from development. Regardless of ownership or future subdivision configuration, all lands designated for Open Space will not be developed.

b. Should the FVRD determine that due to potential geological hazards or environmentally sensitive areas, additional lands (either private or publically owned) should be re-designated as Open Space, it is at the discretion of the FVRD to do so.

c. During subdivision of lands within the Focus Area boundary, lands outside of the Suburban Residential or Compact Residential boundaries will be placed under the Open Space designation and will;

i. be held in trust by a non-profit charitable foundation (such as the Habitat Conservation Trust Foundation, Nature Trust of BC, or the Land Trust Alliance of BC);

ii. be held by private ownership with a covenant placed on the portion of the land which will be designated Open Space; or

iii. be returned to the Crown.

d. Open Space lands may be re-designated if studies show that an area can accommodate a broader range of uses without being affected by geological hazards or damaging environmentally sensitive areas, and where access and other requirements can be met.

4.3 Form, Character, and Land Use Mix

The Deroche community is characterized by its rural cultural values and attractive neighbourhood setting. To ensure that new developments uphold a level of privacy and maintain rural character, the placement of homes, landscape screening, and aesthetic consistency will be considered throughout the development permit process.

Policies:

a. The FVRD shall encourage a mixture of lot sizes based on the Suburban Residential land use designations (i.e. SR 1, SR 1/2, SR 1/3) throughout the Suburban Residential area, in order to provide both a diversity of housing choices and a lot yield sufficient to support infrastructure requirements.

b. While striving for a mix of lot sizes within the Suburban Residential area, the FVRD should consider locating larger parcels, (i.e., SR 1) along the outer limits of the Suburban Residential area where they can border Open Space towards Deroche Mountain, Deroche Creek, or Burn Brae Creek.

c. While striving for a mix of lot sizes within the Suburban Residential area, the FVRD should consider locating smaller parcels (i.e., SR 1/3) in areas that are easily accessible, such as along North Deroche Road.

d. Frontage setbacks and landscaped buffers will be required to protect the rural nature of the Deroche neighbourhood and privacy amongst residences.

4.4 Environmental Stewardship

To minimize the impact of development on the surrounding environment within the Deroche lands, environmental constraints will define the development envelope and environmental protection buffers will be established to minimize adverse environmental impacts.

Policies:

a. The lands designated for Open Space are to be maintained in their natural state in order to protect the ecological benefits they support and the recreational benefits they provide to the community.

4.5 Water Servicing

The Focus Area is within (or immediately adjacent to) the existing service area of the FVRD community water system. The following policies apply to the provision of water servicing for development within the Focus Area.

Policies:

a. All parcels shall be serviced by a piped community water system.

b. Wherever possible, water infrastructure will align with the rights-of-way associated with roads and trails to minimize impact on the land.

c. An exterior pit water meter must be installed at the property line of all lots serviced by the FVRD water system.

d. Pressure reducing valves shall be installed on all water services within the lower pressure zone.

e. The water system must be capable of supplying and conveying a fire flow of 30 L/s for 2 hours to all residential homes spaced at least 30 metres apart.

f. Commercial or institutional developments must provide Fire Underwriters Survey calculations to confirm compliance with a fire flow of 90 L/s for 1.85 hours. The water system must be capable of supplying and conveying this fire flow to all approved commercial or institutional developments.

g. The use of combustible construction materials shall be minimized.

h. The Fraser Valley Regional District Board will pursue grant opportunities to facilitate required infrastructure improvements.

4.6 Wastewater Servicing

The collection, treatment, and disposal of wastewater needs to be conducted in a manner that does not pose risks to human health or the environment.

Policies:

a. All parcels 0.2 Ha (1/2 acre) or larger shall be serviced by on-site septic systems.

b. For proposed 0.13 Ha (1/3 acre) parcels, on-site septic systems will only be considered if soil and groundwater conditions are considered ideal for sewage disposal to ground, as determined by a site specific study and approved by the Fraser Health Authority.

c. All parcels within the Compact Residential designation that are less than 0.2 Ha (1/2 acre) shall be serviced by a community sewer system.

d. Clustered wastewater systems are not supported by the FVRD, except within bareland strata developments.

e. All septic systems shall be designed in accordance with the standards of the day for and shall meet the requirements of the Authority Having Jurisdiction over said systems (e.i. Fraser Health Authority or the Province of British Columbia)

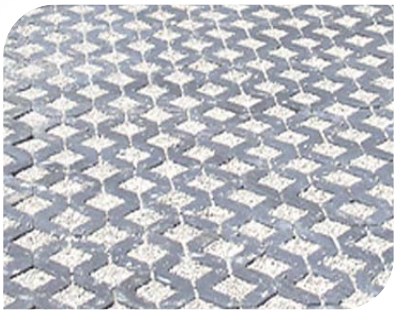
f. There shall be one approved septic system per property, including residences containing secondary suites or coach houses.

g. The FVRD may establish a Sanitary Operations and Maintenance (O&M) Bylaw for all privately-owned on-site septic systems in the Focus Area and Deroche neighbourhood.

4.7 Stormwater Management

The management of stormwater is necessary to control flooding and drainage. As development occurs, the amount of impervious area within a community often increases, as does the amount of surface run-off. The following policies have been implemented to mitigate potential negative effects of development from stormwater.

Policies:



a. Low impact development techniques for managing stormwater and drainage are strongly encouraged. New development should not increase flows over pre-development flow rates.

b. Impervious surfaces are to be minimized throughout the Focus Area. This applies to road rights-of-way and residential lots.

c. Porous driveway surfaces (e.g. unit pavers, grasscrete, compacted gravel) are encouraged for all lots within Suburban Residential and Compact Residential areas.

d. Roads shall be designed to a rural standard with roadside drainage based on techniques such as bio-swales and grassed ditches.

e. The design and alignment of roads and trails will encourage surface run-off to be directed into the riparian corridors in order to minimize overland run-off, based on recommendations from a qualified professional.

f. Any drainage infrastructure that discharges to a riparian area or watercourse shall include provisions to protect against the discharge of sediments or other contaminants into sensitive areas (e.g. silt fencing, constructed wetland), based on recommendations from a qualified professional.

4.8 Transportation

The future development of Deroche is dependent on improved access by safe roads which will provide connectivity through the community and shall encourage multi-modal transportation choices for locally generated trips.

Policies:

a. Narrow roads with impervious surfacing (i.e. asphalt) will be encouraged throughout the Deroche neighbourhood and designed to the standards approved by the Ministry of Transportation and Infrastructure. Gravel roads are encouraged to be considered by MoTI for local rural roads supporting less than 10 properties.

b. Residential dwellings shall front roads on both sides wherever possible to maximize servicing efficiency and reduce infrastructure costs.

c. The intersection at North Deroche Road and Morton Road shall be upgraded to meet the Ministry of Transportation and Infrastructure's design standards, or approved alternative. See preliminary design in Appendix D of the Deroche Neighbourhood Plan.

d. A looped road network shall be encouraged as much as possible in order to create a permeable transportation network throughout the bench lands.

e. Secondary (emergency) access is strongly encouraged in order to connect North Deroche Road to Husband Road and the Lougheed Highway (see Figure 4.1).

f. The Fraser Valley Regional District Board will pursue grant opportunities to facilitate road improvements in conjunction with lobbying senior levels of government for necessary road safety improvements.

Figure 4.1: Secondary (Emergency) access to Husband Road

4.9 Trails and Pedestrian Connections

Trails provide important connections for pedestrians to destinations both within and outside of the Deroche Neighbourhood. In particular, trails are intended to provide safe walking routes to the Deroche Elementary School, the Deroche Community Centre, and local commercial services.

Policies:

a. Trails are to be provided throughout the Focus Area in accordance with the Neighbourhood Concept Plan.

b. Trails that parallel roads will be within the Ministry of Transportation and Infrastructure (MOTI) right-of-way.

c. Trails that are not within a MOTI right-of-way will be designated as a separate lot, defined as a conservation land trust, or placed under covenant.

d. The development of multi-use trails within Open Space areas will be encouraged.

e. Where streets terminate as “dead ends”, trails should be provided to promote a permeable active transportation network and to encourage walking and cycling throughout the community.

f. Encourage local groups to maintain neighbourhood trails via partnership agreements.

4.10 Multiple Property Ownership

Although the Deroche Neighbourhood Plan provides a great deal of flexibility in lot sizes and potential layout, development of the site in a comprehensive fashion is complicated due to the fractured nature of property ownership – twenty-four (24) private lots with over twenty (20) separate property owners. A coordinated effort between property owners will be required in order to develop the Deroche Neighbourhood lands in an efficient and cost-effective manner.

Policies:

a. Due to the varying lot sizes and multiple property owners within the neighbourhood plan area, the development of the concept will require property owners to work collectively and sequentially in order to ensure orderly development and a financially-viable build-out.

5.0 Zoning Considerations

The existing zoning designations that currently apply to the Deroche Focus Area are established in the FVRD's Areas C, F, G – Zoning Bylaw No. 559. Once the Deroche Neighbourhood Plan is approved, amendments to Zoning Bylaw No. 559 will be required in order to establish specific development criteria for the land uses described in the Neighbourhood Plan. Existing zoning designations must be reviewed to ensure that the zoning designations that apply to the lands within the Deroche Focus Area correspond to the land use designations in the Deroche Neighbourhood Plan. Table 5.1 identifies the zoning criteria that should be considered when amending the Zoning Bylaw No. 559 in order to apply the land uses in the Deroche Land Use Plan.

Table 5.1: Zoning Criteria

Designation	Description	Zoning Criteria
Suburban Residential	• Single family residential (Minimum 1.0 acre)	• Not to occupy more than 15% of the development footprint within the Deroche Neighbourhood Plan.
	• Single family residential (Minimum 1/2 acre)	• Not to occupy more than 65% of the development footprint within the Deroche Neighbourhood Plan.
	• Single family residential (Minimum 1/3 acre)	• Not to occupy more than 15% of the development footprint within the Deroche Neighbourhood Plan.
	• Secondary Suite or Coach House	• Permitted as an ancillary use on any single family residential lot. • Not to occupy more than 40% of the total building footprint. • Requires an additional off-street parking space • Requires approval from the Fraser Health Authority for septic tank / field requirements.
Compact Residential	• Single family, duplexes, townhomes, or condominium (Minimum 1/8 acre)	• Not to occupy more than 5% of the development footprint within the Deroche Neighbourhood Plan.
Institutional	• Proposed rezoning of a portion of 10789 North Deroche Road to support the Canadian Carmelite Charitable Society	• Proposed 11,475 square feet of building to accommodate: - Twenty hotel style rooms, approx. 450 sf each - Commercial kitchen and dining room - Chapel, library and parlor - Office for Executive Director, 2 accounting and secretarial staff - Washrooms, utility rooms and storage.

6.0 Infrastructure Servicing

The following sections discuss the infrastructure servicing considerations for the land use concept representing future development in Deroche. To recap, this concept consists of approximately 100 new properties comprised of the following mixture of lot sizes:

- Approximately 15% 0.4 Ha (1 acre) lots;
- Approximately 65% 0.2 Ha (1/2 acre) lots;
- Approximately 15% 0.13 Ha (1/3 acre) lots; and
- Approximately 5% 0.05 Ha (1/8 acre) lots.

In addition, infrastructure servicing has been provided to accommodate the potential institutional uses proposed for the Canadian Carmelite Charitable Society, with uses noted in Section 3.0

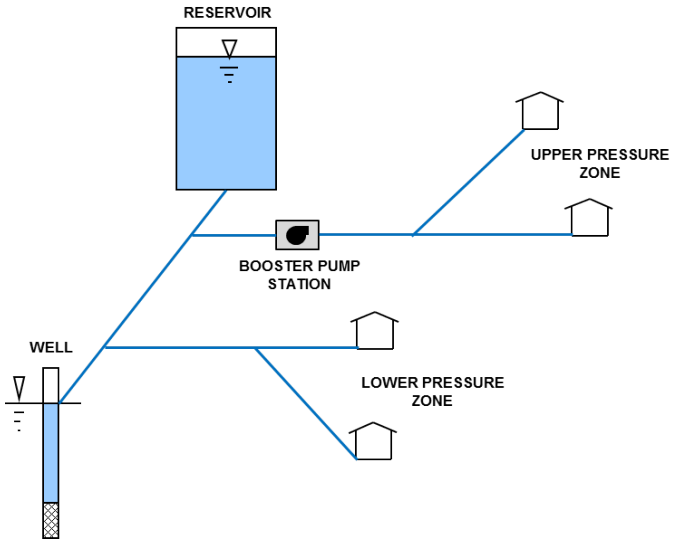
The ability of existing infrastructure systems to service this future development is discussed and "triggers" for infrastructure expansion are identified.

6.1 Water

6.1.1 *Existing Water System*

The existing Deroche community water system serves approximately 100 residents and is supplied by a single groundwater production well located adjacent to the FVRD office building. The source water is not currently treated or disinfected. The submersible well pump simultaneously feeds the distribution system and an aboveground reservoir located on the upper bench. A booster pump station located adjacent to the reservoir services an upper pressure zone via a watermain along North Deroche Road. The existing water system configuration is depicted in the figure below and is discussed further in the following sections.

Figure 6.1: Existing Water System Schematic



6.1.2 *Level of Service*

The ability of the existing water system to service future development is dependent upon the desired level of service for the community. The FVRD policy document entitled *Sustainable Service Provision for Community Water Systems* outlines the base and expanded levels of service for various water delivery components. The water servicing objectives for the Deroche community include:

Base Level of Service

- Water quality that meets the requirements of the Fraser Health Authority operating permit.
- Sufficient water quantity (under normal supply conditions) for indoor domestic use, as well as, institutional, commercial, and industrial domestic demands.
- Target water pressure of approximately 400 kPa (excluding fire flow conditions) consistent with the *FVRD Subdivision and Development Control Bylaw*.

Expanded Level of Service

- Sufficient water quantity (under normal supply conditions) for household irrigation.
- Domestic fire protection for a rural residential development density.
- A "reasonable" level of fire protection for commercial and institutional facilities supported by Fire Underwriters Survey calculations.

The Policy also identifies the following per capita water demands:

- Average Day Demand = 300 L/person/day
- Maximum Day Demand = 600 L/person/day
- Peak Hour Demand = 1,200 L/person/day

The table below summarizes the anticipated water demands for the existing and projected future service areas based on the target per capita water consumption identified in the Policy.

Table 6.1: Water Demands

	Existing Service Area	New Development	Total
Population	100	315 *	415
ADD (L/s)	0.35	1.1	1.45
MDD (L/s)	0.7	2.2	2.9
PHD (L/s)	1.4	4.4	5.8

* Based on an assumed occupancy of 3.15 people per home for 100 new future lots.

6.1.3 *SOURCE*

The existing water system is supplied by a single 200 mm diameter groundwater production well with a sustainable yield of 15 L/s and installed pumping capacity of 9.5 L/s. This exceeds the projected future MDD of roughly 3 L/s. In fact, based on a MDD of 600 L/c/d, this well could theoretically supply up to 1,370 people.

Although there appears to be surplus source capacity, the lack of supply redundancy becomes a concern with a larger service area. Construction of a backup well is recommended along with provision of a standby generator. This would improve the level of service for the existing population as well as future development.

6.1.4 *WATER QUALITY*

Water quality testing results indicate that the raw groundwater from the existing Deroche well meets the requirements of the Guidelines for Canadian Drinking Water Quality (GCDWQ). There is currently no treatment or disinfection of the source water and the Fraser Health Authority operating permit does not require that the source water be disinfected, provided that the FVRD complies with water quality monitoring and source protection requirements.

If a new or secondary groundwater well was constructed, testing and monitoring would be required to determine if the water quality met the GCDWQ without treatment. Similarly, expansion of the distribution system for future development would require an expanded monitoring program throughout the service area. That being said, the subject development is not expected to trigger the need to construct water treatment or disinfection infrastructure (under the current regulatory environment).

6.1.5 *STORAGE*

The existing reservoir has a capacity of approximately 325 m^3, which includes domestic / balancing and fire storage, but no emergency storage volume. The existing storage and conveyance capacity is sufficient to provide 30 L/s of fire flow for a minimum of 2 hours as per the *FVRD Subdivision and Development Control Bylaw* for rural developments consisting of homes with a maximum of two storeys and spaced at least 30 metres apart. However, there is insufficient capacity to supply fire flows to any commercial or institutional users.

The future land use concept will trigger the need for additional reservoir capacity for fire protection storage due to:

- Development densities resulting in homes spaced closer than 30 metres apart; and
- Provision of fire protection to commercial and institutional customers.

In other areas of the FVRD, a fire flow of 90 L/s has been adopted for commercial / institutional land uses. This is considered a “reasonable” level of fire protection under an expanded level of service. This is a representative fire flow value and would need to be confirmed based on actual Fire Underwriters Survey (FUS) calculations for the types and sizes of existing and proposed buildings. For a fire flow of 90 L/s, the FUS guidelines recommend a duration of 1.85 hours, which correlates to a required storage volume of approximately 600 m^3. This storage capacity would also be adequate for the residential density under the land use concept.

The total required reservoir capacity is based on the total of A + B and sometimes C as described below:

A = fire protection storage capacity

B = domestic balancing storage capacity (25% of MDD)

C = emergency storage capacity (25% of MDD)

Under the land use concept for the potential future development area, this correlates to:

A = 90 L/s for 1.85 hours = 600 m^3

B = 0.25 x 2.9 L/s x 24 hours = 63 m^3

C = 0.25 x 2.9 L/s x 24 hours = 63 m^3

This results in a total required reservoir volume of 726 m^3 with emergency storage or 663 m^3 without emergency storage. The decision whether or not to provide emergency storage capacity in the reservoir depends on the reliability of the water source, specifically the presence of a backup generator.

6.1.6 *Operating Pressure*

The existing reservoir has a top water elevation of approximately 88.5 metres, which provides the minimum operating pressure of 250 kPa (stated in the FVRD Bylaw) to areas lower than about 63 metres in elevation. The majority of the bench lands are above this elevation and rely on a booster pump station to provide adequate pressure. The booster pumps are sized for domestic peak hour demands, but are not capable of conveying fire flows.

Options to meet the desired level of service for future development on the bench lands include:

1. Construct a new reservoir for the entire future service area with pressure reducing valve (PRV) stations for the lower pressure zone.
2. Add fire pumps parallel to the existing booster pumps.
3. Expand the existing reservoir storage capacity.
4. Construct a new secondary reservoir at a higher elevation for the upper pressure zone.

After considering operational and financial factors, the forth option has been identified as the preferred servicing concept. Note that the well pump(s) would need to be sized to supply water to this higher reservoir elevation.

6.1.7 *Distribution System*

The existing distribution system will need to be expanded to service the new development identified in the land use concept. New watermains should be at least 200 mm diameter and follow the street and trail network in a manner that promotes looping. The FVRD Bylaw indicates that hydrants should be located so that all homes are within 100 metres of a hydrant. Consistent with existing serviced lots in Deroche, all new properties will require a water meter located in a pit at the property line.

As mentioned in the previous section, if a single new reservoir is constructed for the entire service area, at least one pressure reducing valve (PRV) station will be required for the lower pressure zone. Premise pressure reducing valves will also be required for homes or buildings located within the lower pressure zone, particularly those at lower elevations.

New watermains required to service future development are expected to improve looping in the distribution system. As a further benefit, the FVRD could consider establishing watermain connections between School Road and Pullin Road as well as between Cooper Road and Husband Road / North Deroche Road. These connections are considered “optional”.

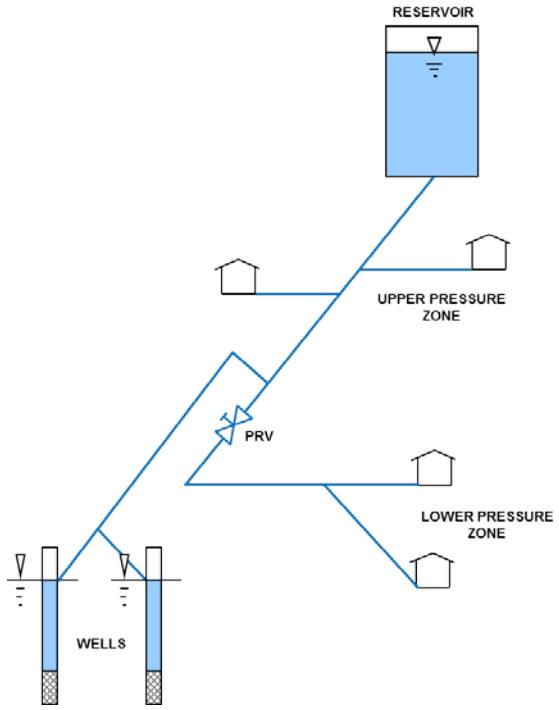
6.1.8 *Water Servicing Concept*

To summarize, the land use concept for future development is expected to trigger the following water system upgrades:

- A second groundwater well;
- A new reservoir;
- A pressure reducing valve station; and
- Expansion of the distribution system to service new lots.

The configuration for the upgraded water servicing concept is depicted in the figure below.

Figure 6.2: Future Water Servicing Concept



6.1.9 *Cost Estimates*

A Class 'D' capital cost estimate for the proposed and optional water system upgrades is included in Appendix A. An accompanying figure is also provided. It is important to recognize that some of the upgrades are specifically required to service future development, while others would benefit the entire service area (including existing customers). The table below provides a potential breakdown of the approximate costs that could be attributed to new development versus a mutual improvement to all customers.

Table 6.2: Water System Upgrade Cost Breakdown

Item	Total Estimated Cost
New Wells	$300,000
New Reservoir	$561,500
Pressure Reducing Stations	$150,000
Distribution System Expansion	$470,000
Distribution System Looping	$455,000
Subtotal:	**$1,936,500**
Contingency (25%):	$484,000
Engineering (15%):	$290,500
Total:	**$2,711,000**

Based on the cost estimate above, the total water servicing cost per lot is estimated as follows:

Estimated Cost of Development Triggered Water System Upgrades:	$2,711,000
Estimated Number of New Lots:	100 (equivalent lots)
Approximate Water Servicing Cost per Lot (rounded):	$27,000 per lot

This is a significant cost for water capital upgrades, one which would not likely be cost effective for new development to bear in its entirety. The FVRD is currently and separately reviewing the potential for implementing Development Cost Charges (DCCs) for water in the Deroche Neighbourhood. As part of that project, consideration should be given towards phasing the capital works, as well as allocating a portion of the costs to existing residents who will also benefit from the capital improvements.

As an alternative, consideration may be given towards the use of individual residential sprinkler systems or fire suppression, as a means of maximizing the development potential supported by the existing water system. This could potentially allow homes to be constructed closer than 30 metres apart if they are equipped with sprinklers. However, further analysis would be required as appropriate FUS calculations would still need to be maintained, as well as sprinkler system monitoring and maintenance protocols would need to be established.

6.2 Wastewater

6.2.1 *Existing Systems*

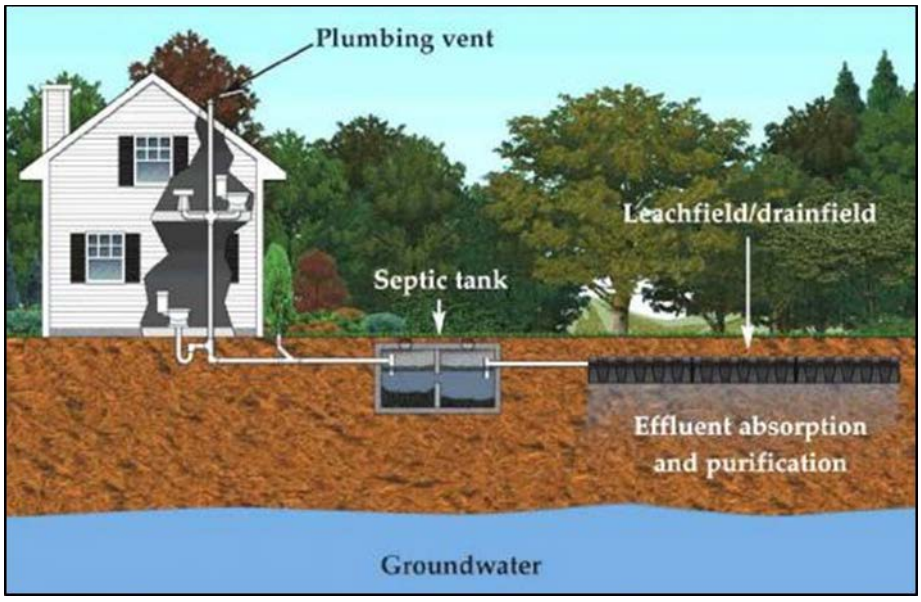
Most of the existing homes and buildings in Deroche are serviced by Type 1 on-site septic systems. According to Fraser Health records, there is one Type 2 system and one Type 3 system registered in the Deroche area; however, the records do not provide a location or address for these systems.

The condition of the existing privately-owned septic systems is also largely unknown and there are currently no measures in place to ensure that systems in higher-risk areas are sufficiently maintained, as enforcement is currently a provincial responsibility.

6.2.2 *Applicable Regulations*

The Fraser Health Authority is the approving agency for on-site septic systems in the FVRD. On-site systems can generally be defined as any septic system with a design flow less than 22.7 m^3/day that discharges to ground. Based on the FVRD's current sewer design criteria (i.e. 410 litres per capita per day), this works out to a population equivalent of about 55 people, or about 20 single family homes. The BC Ministry of Health *Sewerage System Standard Practice Manual* provides a basis for the design of on-site septic systems. An illustration of a typical on-site septic system is provided below.

Figure 6.3: Typical On-Site Septic System (Type 1)



Systems with a design flow greater than 22.7 m^3/day fall under the jurisdiction of the BC Ministry of Environment under the *Municipal Wastewater Regulation* (MWR). Any septic systems involving effluent discharge to surface water are also governed by the MWR, regardless of flow.

The Deroche Elementary School is serviced by a Type 1 system that is registered under the MWR. All other septic systems in Deroche fall under the jurisdiction of the Fraser Health Authority.

The FVRD recently completed a Sewer Gap Analysis, which recommended the development of the following tools:

- A Sanitary O&M Bylaw for private on-site septic systems with a strong focus on systems located in priority areas (ie. near watercourses, steep slopes, wells, etc.).
- A Local Sanitary Servicing Plan (LSSP) for areas where significant growth is projected at densities that warrant a piped communal sanitary system.

Additionally, the *FVRD Subdivision and Development Control Bylaw* specifies the design criteria for community sanitary system infrastructure.

6.2.3 *Bench Lands*

The land use concept proposes a mixture of lot sizes for future development on the Deroche bench including 0.4 Ha (1 acre), 0.2 Ha (1/2 acre), and 0.13 Ha (1/3 acre) lots. The Fraser Health Authority Guideline requires a minimum lot size of 0.2 hectares (1/2 acre) for on-site septic systems; however, it has allowed for smaller lot sizes in the FVRD, where soil and groundwater conditions were considered optimal for sewage disposal (e.g. 1/3 acre).

On-site septic systems are the preferred method of servicing future lots on the Deroche bench. Therefore, it becomes a question of whether the Fraser Health Authority considers the site conditions suitable for on-site systems at the proposed lot sizes.

In July 2013, Western Geotechnical Consultants Ltd. (WesternGeo) completed a geotechnical investigation in the northeast section of the Focus Area. The subsurface conditions observed in ten shallow test pits are described as organic silt (topsoil) to a depth of approximately 0.4 metres underlain by gravel with boulders, cobbles, and trace sands to a depth of about 2.1 metres, where the test pits were terminated. The report indicates that no significant groundwater seepage was encountered in any of the test pits. Percolation tests were completed at two of the test pits, which yielded rates of 0.3 min/2.5cm and 0.6 mm/2.5cm at depths of 0.7 m and 1.2 m. respectively.

Although the findings of WesternGeo's investigation appear to support the potential for on-site septic systems, the following considerations should be noted:

- The investigation was limited to the northeast section of the Focus Area. Further investigation is required to confirm the subsurface conditions throughout the bench lands.
- Where percolation rates are faster than 2 min/2.5cm, provisions to slow down the infiltration of effluent (such as placement of sand) may be warranted.

- There are portions of the Focus Area with slopes greater than 10% in grade. Septic systems in these areas need to consider horizontal setbacks from slopes to prevent effluent breakout.
- A minimum horizontal setback of 30 metres must be maintained between septic disposal systems and any watercourse (such as Burn Brae Creek).
- Any private wells in the Focus Area need to be identified to ensure that no septic systems are constructed within the required setback.

The implementation of a Sanitary O&M Bylaw (as identified in the Sewer Gap Analysis) would be a mechanism of enforcing specific site requirements, such as the setbacks mentioned above.

Based on available information, the subsurface conditions on the Deroche bench appear “favourable” for on-site septic systems, including the potential for 0.13 Ha (1/3 acre) parcels. However, further investigation is required to determine if subsurface considerations are considered “optimal” for effluent disposal to ground throughout the Focus Area. A detailed geotechnical studied would be required to demonstrate acceptable percolation rates, seasonal un-saturated soil depth, slope, subsurface effluent travel times to property boundaries, and other key criteria, in accordance with Fraser Health Authority regulations.

6.2.4 *Community Sewer System*

The land use concept includes Compact Residential lots that could be as small as 0.05 Ha (1/8 acre) in size. Servicing for these lots would require construction of a piped community wastewater system with centralized treatment and disposal.

The possibility to include existing commercial and / or residential properties in the service area for a future community wastewater system should be explored. This would provide an improved level of service for any homes or businesses that currently suffer from undersized or underperforming septic systems. Recognizing the economies of scale, it could also be a means of making construction of a community sewer system more cost effective.

A suitable site would need to be selected for the centralized treatment and disposal facility. It is assumed that servicing options involving effluent discharge to surface water would be cost prohibitive due to enhanced treatment and monitoring requirements. Accordingly, a ground discharge servicing concept is recommended for any piped wastewater system.

A sanitary system with a service area including existing properties as well as future Compact Residential lots would most likely be owned and operated by the FVRD. In the case of a sanitary system constructed solely for a Compact Residential development, options such as a strata owned and operated system could be explored.

The suitability and effectiveness of a Sanitary O&M Bylaw or Local Sanitary Servicing Plan would need to consider several factors including the size of the service area, system ownership, and operational responsibility.

6.2.5 *Cost Estimates*

On-Site Septic Systems

The costs to construct a new on-site septic system vary depending on several factors, such as the design flow, lot size, and soil conditions. An example is provided below based on the following *Sewerage System Standard Practice Manual* assumptions:

- Design flow for a typical three bedroom home = 1,363 L/day
- Required septic tank working volume = 4,089 L
- Wastewater loading rate for a Type 1 system in gravelly sand = 34 L/m^2/day
- Required leaching field size = 40 m^2

A Type 1 septic system for this scenario would consist of a septic tank with a capacity of about 5,000 L and a leaching field approximately 40 m^2 in size. Based on discussions with a local septic system installation contractor, the costs for a gravity system of this size would be in the order of $10,000. However, the cost would increase to about $20,000 to $25,000 if soil conditions require a pumped system with a raised sand mound disposal field.

Community Sewer Systems

Similar to on-site systems, the cost of a community sewer system depends on a number of factors. For community systems, the availability of space for the centralized treatment and disposal facility is often a driving factor. The following scenario is based on several assumptions, but is intended to provide a rough estimate of the cost to construct a community sewer system for the Compact Residential portion of the Land Use Plan.

Assumptions:

- Assume 12 new lots with an average of 3.15 people per home.

  Service Population = 12 lots x 3.15 people/lot = 37.8 people = 40 people (rounded)

- The *FVRD Subdivision and Development Control Bylaw* recommends a minimum sanitary design flow of 410 L/c/d.

  Base Flow = 410 L/c/d x 40 people = 16,400 L/day = 16.4 m^3/d

- The *FVRD Subdivision and Development Control Bylaw* recommends an inflow and infiltration (I&I) allowance of 8,500 L/Ha/day.

  I&I = 12 lots x 0.05 Ha x 8,500 L/Ha/day = 5,100 L/day = 5.1 m^3/d

- Assumed design flow of:

  Design Flow = 16.4 m^3/d + 5.1 m^3/d = 21.5 m^3/d = 0.9 m^3/hour = 1 m^3/hour (rounded)

- Assuming a Type 2 system (based on limited space) with percolation rates between 2 to 5 min/2.5cm, the *Sewerage System Standard Practice Manual* states a wastewater loading rate of 59 L/m^2/day.

Ground Disposal Area = 24,000 L/day / 59 L/m^2/day = 406 m^2 = 400 m^2 (rounded) = 20 m x 20 m

Based on the above, the community sewer system could consist of:

- A gravity collection system consisting of 200 mm diameter PVC sewers, 1050 mm diameter precast concrete manholes, and 100 mm diameter PVC sanitary laterals;
- An equalization tank sized for 3 hour retention for peak flows (3 m^3);
- A package treatment plant with effluent pump sized for 1 m^3/hour; and
- A ground disposal leaching field approximately 20 m x 20 m in size.

The estimated cost to construct a community sewer system as described above is in the order of $300,000 including allowances for contingency and engineering. For a service area limited to 12 new lots, this correlates to roughly $25,000 per lot. Increasing the density (e.g. townhouses) or expanding the service area to include existing lots in the area could be a means of reducing the cost per connection.

6.3 Drainage

6.3.1 *Existing Infrastructure*

Existing drainage infrastructure in the Focus Area is generally limited to ditches parallel to North Deroche Road. The large rural lots generate minimal runoff with most rainwater infiltrating to ground. Burn Brae Creek crosses North Deroche Road through a corrugated steel pipe (CSP) culvert. This creek forms a major drainage flow path for the bench lands.

6.3.2 *Stormwater Management Approach*

Future development will have an impact on drainage in the Focus Area, even if impervious surfaces are minimized. An environmentally sustainable, low impact approach to stormwater management is proposed.

Drainage flow paths should parallel road and trail corridors as much as possible to avoid impacts to developable area. Drainage infrastructure should promote infiltration to ground, but also be able to convey flows when required (ie. bio-swales or grassed ditches). Any drainage infrastructure that discharges to a riparian area or watercourse will need to consider potential impacts from sediments or other contaminants.

Lot development should minimize impervious surfaces and maximize infiltration to ground wherever possible. For example, gravel driveways and paths offer drainage benefits over concrete or asphalt surfaces. Roof runoff can be directed to a suitable infiltration point or could be collected in rain barrels and used to water plants / gardens. These types of low impact drainage features are consistent with a rural development concept.

6.4 Transportation

6.4.1 *Access to Bench Lands*

Current vehicular access to the bench lands is via North Deroche Road, which provides the only access route to the Focus Area. The Ministry of Transportation and Infrastructure (MOTI) has expressed concerns regarding the segment of North Deroche Road near the intersection of Morton Road. As an approving agency, MOTI has denied previous development applications on the Deroche bench due to the safety concerns associated with this segment of road. A proposed upgrade to North Deroche Road at Morton Road was prepared by MOTI in 2005, and is attached in Appendix D for reference.

6.4.2 *Potential Road Cross Sections*

While it is acknowledged that the Ministry of Transportation and Infrastructure (MOTI) has jurisdiction and ownership of the road right-of-way, the Deroche Neighbourhood Plan is proposing some context-sensitive road cross-sections based on various right-of-way (ROW) widths – 20m ROW for North Deroche Road, 18m ROW for the major local roads, and 14m ROW for minor local roads. The conceptual cross-sections are provided in the figures below.

Figure 6.4: Potential 20 m Right-of-Way Cross Section

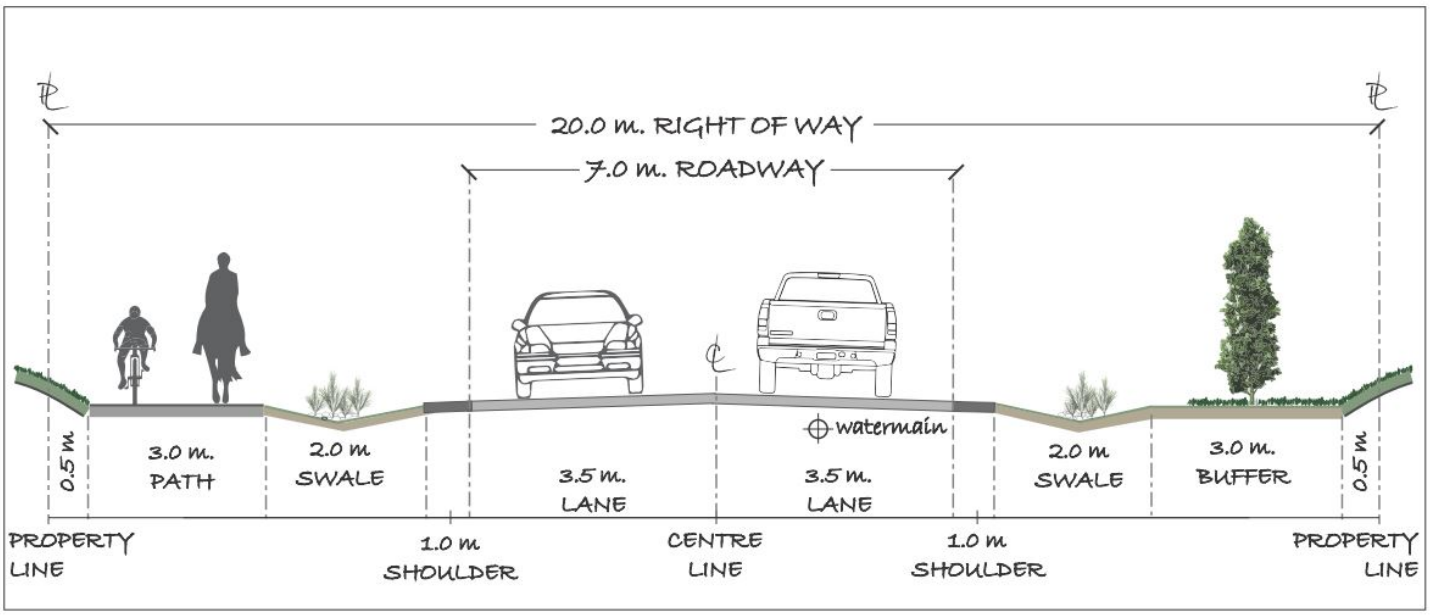


Figure 6.5: Potential 18 m Right-of-Way Cross Section

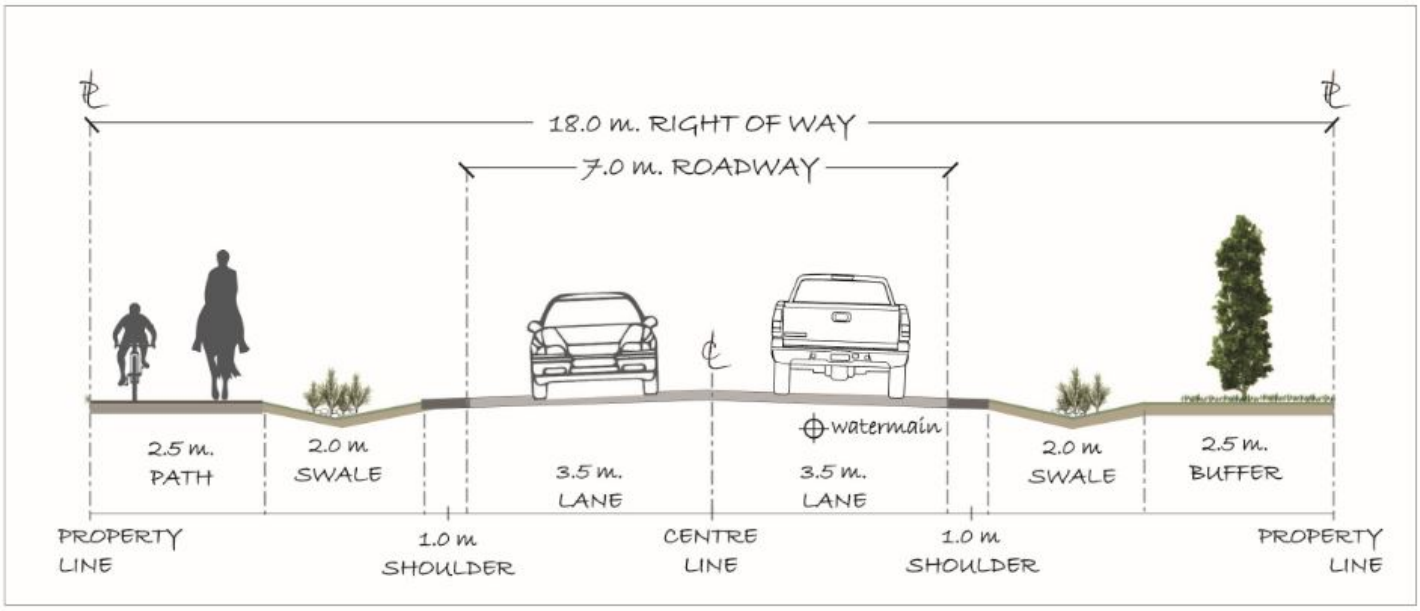
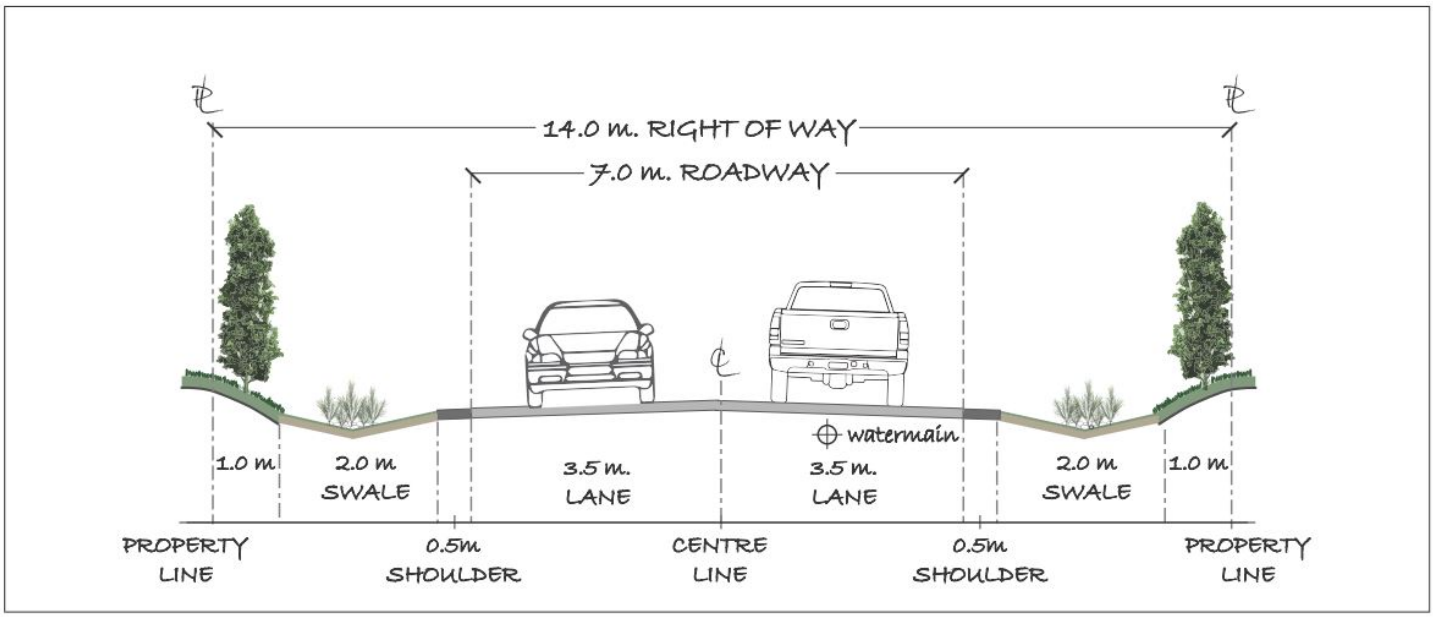


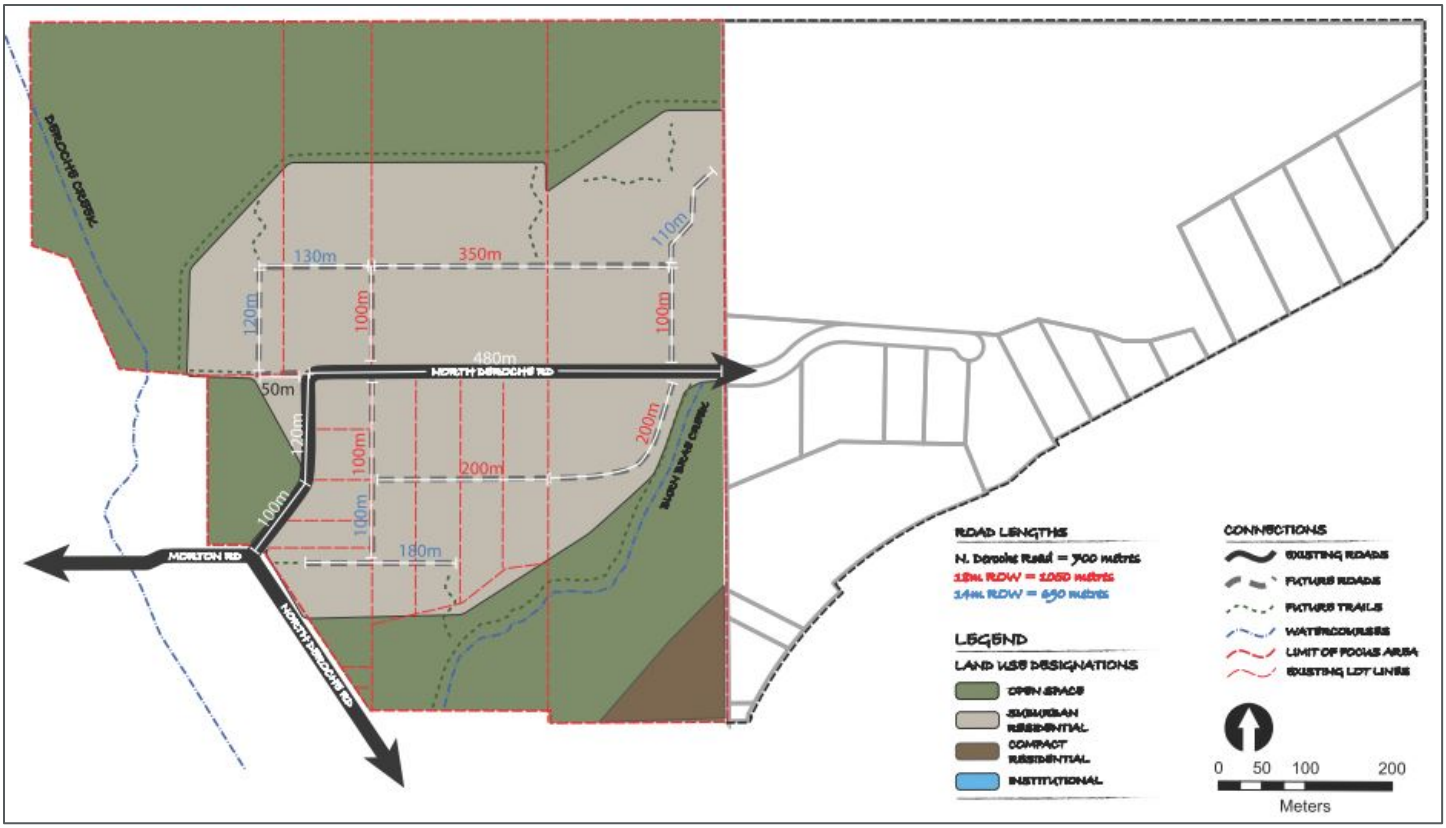
Figure 6.6: Potential 14m Right-of-Way Cross Section



6.4.3 *Potential Road Cost Estimates*

In order to determine the potential road cost estimates within the Deroche neighbourhood, a high-level road network concept was laid out in Figure 6.7 below, and assigned either an 18m ROW or 14m ROW classification. Based on this concept, approximately 1740 metres of new roads would be required to service the additional lots within the Suburban Residential designation area. This is further divided into approximately 1050 metres of 18m ROW roads, and approximately 690 metres of 14m ROW roads.

Figure 6.7: Conceptual Access Roads Layout



Appendix D includes Class D capital cost estimates per lineal metre of road, based on the 18 metre ROW (at $750 per lineal metre) and 14 metre ROW (at $600 per lineal metre). Based on these assumptions, new road costs work out to approximately $1.2 million ($787,500 + $414,000 for 18m and 14m ROW roads respectively). Note that these are very broad assumptions, and will vary depending on the actual road layout provided by the developer at time of subdivision application.

North Deroche Road will continue to function as the main connection into the neighbourhood. As previously noted, the Ministry of Transportation and Infrastructure have determined that North Deroche Road at Morton Road requires an upgrade to improve sight lines and the turning radius at the corner. In 2005, a cost estimate of $569,500 was developed which included both land and capital construction costs. Using a 1% inflation factor for both land and construction costs, the estimated 2014 construction cost of this

improvement to North Deroche Road is approximately $623,000. This does not include any frontage works to improve North Deroche Road (e.g. adding the 3 metre multi-use pathway) which would have to happen at time of subdivision, since the FVRD cannot collect funds for this upgrades (e.g. Road DCCs). However, other Regional Districts have implemented alternative methods of funding road improvements (e.g. local service areas); alternative road funding solutions should be reviewed and explored as possible options for the Deroche Neighbourhood.

Table 6.2 provides a breakdown of the potential road cost estimates based on the discussion in this section.

Table 6.2: Potential Road Cost Estimates

Item	2005 Cost Estimate	2014 Cost Estimate (inflation at 1%)	Estimated Cost
North Deroche Road Intersection Upgrade	$569,500 (construction and land costs)	$622,854	$623,000
Item	**Approximate Length**	**Approx. Construction Cost per lineal metre**	**Estimated Cost**
18m Rural Road	1050 metres	$750 / l.m.	$787,500
14m Rural Road	690 metres	$600 / l.m.	$414,000

Based on the preceding assumptions, the estimated road costs total approximately $1,824,500, not including road improvements to North Deroche Road other than the intersection at Morton Road. In addition, road cost estimates have not been provided for the Compact Residential designation area, as there are a number of options available in this area including dedicated rural road, bareland strata road, or common property driveway as part of a strata development (e.g. townhouse).

As previously noted, the actual road costs will vary widely depending on the actual road network and cross-section proposed by the developer(s) and agreed to by the Ministry of Transportation and Infrastructure.

7.0 Financial Strategy

7.1 Capital Cost Estimate Summary

Based on the analysis and assumptions outlined in previous sections of this report, the following is a summary of the capital cost estimates for each infrastructure component, and a discussion regarding the potential opportunities and challenges for capital cost recovery.

7.1.1 *Water*

Water upgrades comprise a significant capital cost – approximately $2.7 million – which is required to provide fire protection (fire flow and storage) for any new development within the Deroche Neighbourhood Plan. With an estimated buildout of approximately 100 lots in the Focus Area, this works out to approximately $27,000 per lot, and can be incorporated into the FVRD's Development Cost Charge (DCC) program for water. However, these improvements will also provide added benefit to the existing Deroche residents and as such, part of the benefit allocation should be apportioned to existing users accordingly, which would lower the potential DCC rate. This information will feed into the DCC water update, which is being undertaken as a separate initiative for the Deroche neighbourhood.

Developers who initially construct DCC works (i.e. "DCC front-ender") will be eligible for DCC contributions from all future developers. Although there are ways to share some of the water capital costs between existing and new development, the challenge will be the fact that a minimal amount of new development will trigger a significant upgrade (e.g. new well, new reservoir, upgraded distribution system) due to fireflow requirements. There may be unique solutions to reduce the initial capital costs through phasing, use of sprinklers, and so forth, which should be considered on its own merits at the time of development.

7.1.2 *Roads and Drainage*

Roads and drainage costs are also fairly significant, estimated at approximately $1.8 million based on the road cross sections and future road network identified in Figure 6.7. At approximately 100 lots, this works out to $18,000 per lot, and the cost per lot would be higher if the Compact Residential units were not included in the calculation. However, calculating the estimated cost per lot for roads and drainage construction is a fairly moot point, since a regional district does not have jurisdiction over these capital items to implement a Development Cost Charge. Therefore, either an agreement would have to be negotiated with MOTI to potentially phase-in the improvements, especially the North Deroche / Morton Road intersection. Otherwise, one small development could trigger the entire North Deroche intersection upgrade, estimated at $623,000. Further discussion with MOTI is required to review the North Deroche upgrade requirements and examine options including a secondary access for North Deroche Road on to Husband Road and Lougheed Highway.

7.1.3 *Wastewater*

Development within the Suburban Residential designation in the upper bench area is expected to comprise of individual Type 1 septic systems for the potential single family lots (some of which may have secondary suites or coach houses). The cost of an approved septic tank and field is approximately $10,000 to $15,000

per lot, although depending on soil conditions this could increase to $20,000-$25,000 if a raised sand mound disposal field is required.

Proposed development in the Compact Residential area is of a density which would require a community sewer system. Capital costs are estimated at approximately $300,000 for a small package treatment plant and ground disposal leaching field to service 12 compact single detached lots ($25,000 per lot). The cost per unit could be decreased if the site density was increased to accommodate alternative housing forms (e.g. townhouses) or if existing residents were connected to the community sewer system which would increase the capital cost but also increase the number of units contributing.

7.2 Assessment Values

Property assessments within the Deroche Bench lands, as assessed by BC Assessment (2014), provide a basis for understanding the potential land values within the Focus Area. The list below provides a summary of the assessed values of the properties within the Deroche Focus Area:

- Number of Properties = 24
- Total Assessed Land Value = approximately $8 million
- Total Assessed Improvement Value = approximately $3 million
- Average parcel size = 5.6 acres
- Average assessed land value = $333,417
- Average assessed building value = $131,274
- Land assessment for large lot (20 acres) = $450,000 to $700,000 ($22,500 to $35,000 per acre)
- Land assessment for small lot (0.15 acres) = $155,000 ($1,000,000 per acre)
- Current MLS® listing for a house (1800 square foot, 1975) on a 5.7 acre lot = $475,000

Of the total assessment (land and improvements) within the Focus Area, the land value comprises over 70 percent of the total assessment ($8 million of $11 million total assessment), indicating that the neighbourhood consists of relatively large land areas (e.g. 5 to 20 acres) with moderate improvements on the properties. It is important to note that of the large parcels, a significant portion of the lands are undevelopable due to topographic or geological conditions, and as such are designated Open Space. For example, if a 20 acre parcel assessed at $700,000 had 50% of the lands designated Open Space and the other half designated Suburban Residential, the net developable lands on the site would be 10 acres, yielding a net land value of $70,000 per acre (see table below).

Table 7.1: Sample Land Assessment (Gross and Net)

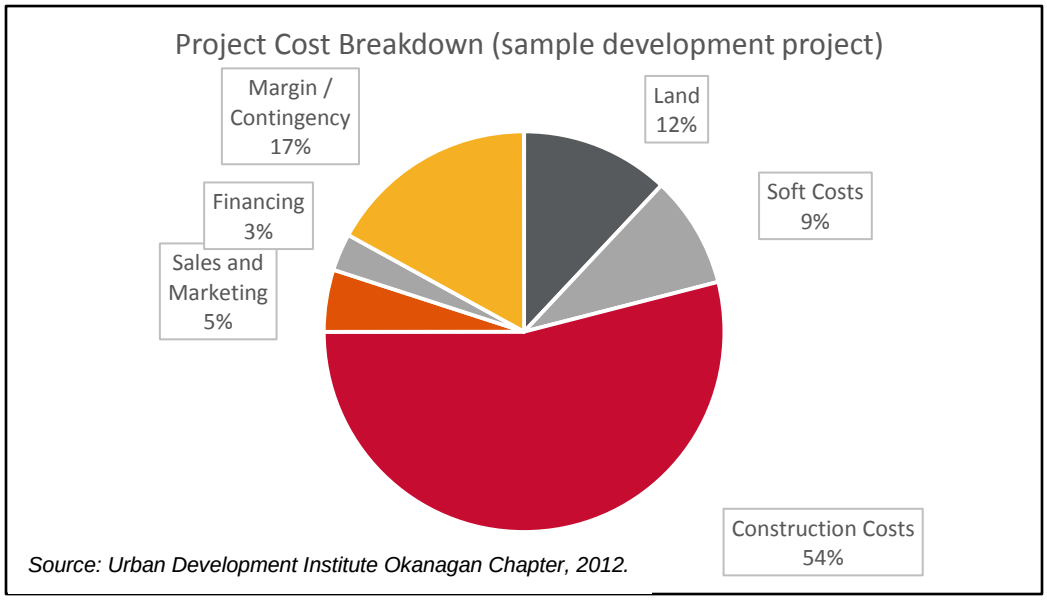
Gross Land Assessment	Property Size	Percentage Open Space	Net Developable Area	Net Developable Land Value
$700,000	20 acres	0%	20 acres	$35,000 / acre
$700,000	20 acres	50%	10 acres	$70,000 / acre

7.3 Basic Pro Forma

While detailed pro forma analysis was outside of the scope of this project, some basic cost and revenue indicators are outlined in this section in order to determine the financial potential of the proposed neighbourhood plan concept. In any development scenario, it is common to follow a process similar to the Deroche Neighbourhood Plan – develop a vision and guiding development principles, determine conceptual layout(s), estimate construction costs, and develop the financial model. This may lead to re-visiting the development principles and concepts in order to make the project more economically viable.

Typical project costs can vary widely depending on location and development scenario, the following is an example of the project percentage breakdown for a typical development project, based on research undertaken by the Urban Development Institute. It should be noted that this sample likely represents a re-development of a property to a higher density (e.g. apartment, mixed use), as the development of more rural and greenfield sites would likely have a slightly higher percentage apportioned to land costs (e.g. perhaps 15-20% of total revenues).

Figure 7.1: Project Cost Breakdown



Source: Urban Development Institute Okanagan Chapter, 2012.

Based on the information and analysis presented in this report, the following tables represent some base calculations of potential revenues and potential expenditures for the development of the Deroche Neighbourhood Plan.

Table 7.2: Potential Base Revenue Forecast

Item	Estimated Value per Lot	Estimated Number of Lots	Estimated Revenue
SR1 Suburban Residential (1 acre)	$180,000 / lot	7 to 10	$1,260,000 – $1,500,000
SR2 Suburban Residential (1/2 acre)	$150,000 / lot	50 to 55	$7,500,000 – $8,250,000
SR3 Suburban Residential (1/3 acre)	$125,000 / lot	18 to 20	$2,250,000 – $2,500,000
Compact Residential (1/8 acre)	$125,000 / lot	12 to 15	$1,500,000 – $1,875,000
Total Base Revenues (land only)			$12,510,000 – $14,125,000

Table 7.3: Potential Base Expenditure Forecast

Item	Estimated Expenditure
Land Acquisition (2014 land and total assessment)	$8,000,000 – $11,000,000
Water	$2,711,000
Roads and Drainage	$1,824,500
Community Sewer	$300,000
Total Base Expenditures (not including soft costs, financing, or marketing)	$12,835,500 – $15,835,500

It is clear from the tables that the Deroche Neighbourhood Plan in its current concept is financially challenging, as the potential expenditures equal or exceed potential revenues, not including soft costs, financing, marketing or profit. In order to improve the financial position of this concept, either the cost of land acquisition would have to drop significantly (from $8 to $11 million to say $3 million), or the number of potential units would have to increase dramatically (from 100 units to say 150 to 200 units).

Unfortunately, the vision and development principles envisioned for the Deroche Neighbourhood Plan are not currently financially viable given the high land values based on current BC assessment, multiple owners (land assembly required), and high infrastructure costs with immediate upgrade triggers. In order to proceed further, additional options should be explored, based on one of two directions:

1. Reduce the number of potential lots significantly (from 100 lots to say 20-40) in order to fully preserve the rural character of the neighbourhood (e.g. 1, 5 and 10 acre lots) and potentially reduce the infrastructure upgrades (e.g. roads and water) required. This would require further engineering analysis and discussions with MOTI to determine if this was acceptable to the regulators as well as financially feasible.

2. Expand the development area to include the entire Study Area, not just the Focus Area, which could connect North Deroche Road to Husband Road / Lougheed Highway and increase the number of potential lots significantly (from 100 lots to say 150 to 200 lots). The additional capital costs would likely not exceed the potential revenues generated from the additional units, and it may make the concept financially viable. This option would require additional engineering analysis consultation with the property owners in the Study Area, who had previously indicated that they did not want to be part of the Deroche Neighbourhood Plan.

7.4 Expanded Pro Forma

As discussed above, the pro forma for the Deroche Neighbourhood Plan could potentially improve if the density of the upper bench land were increased to include the entire study area. While a detailed analysis of this approach was outside the scope the assignment, we have provided a basic expanded pro forma below, using relative costs additional length of infrastructure (water and roads) divided by the estimated number of additional units of an expanded development concept.

Table 7.4: Base Infrastructure Costs Per Lot

Item	Estimated Infrastructure Costs	Estimated Number of Lots	Estimated Infrastructure Costs Per Lot
Base Infrastructure - Water, Sanitary Sewer, Roads / Drainage	$ 4,835,500	100	$48,355 / lot

Table 7.5: Expanded Infrastructure Costs Per Lot

Item	Estimated Infrastructure Costs	Estimated Number of Lots (9 x 1 acre, 46 x 0.5 acre, 6 x 0.3 acre)	Estimated Infrastructure Costs Per Lot
Additional Water Infrastructure	$ 432,500	61	$7,090
Additional Sewer Infrastructure (septic)	N/A	N/A	$0 (individual private septic services)
Additional Roads / Drainage Infrastructure	$1,311,000	61	$21,490
Total Additional Infrastructure Costs (Estimate)	**$1,743,500**	**61**	**$28,580 / lot**
Base Concept Infrastructure Costs (Estimate)	$ 4,835,500	100	$48,355 / lot
Total Expanded Concept Infrastructure Costs (Estimate)	**$6,579,500**	**161**	**$40,860 / lot**

While this is a very basic pro forma calculation which would require more detailed cost estimates and lot analysis, it does show that an expanded development area could reduce the per lot infrastructure costs by approximately 15% (from $48,355 per lot down to $40,860 per lot). The additional infrastructure costs in the expanded are much lower (estimated at $28,580 per lot) as initial infrastructure (e.g. additional water reservoir) is required for the first 100 lots. Note that the costs above do not take into consideration costs to acquire and assemble the land.

8.0 Implementation

The Deroche Neighbourhood, within Electoral Area 'G' of the Fraser Valley Regional District, presents a unique opportunity to incorporate sustainable rural development principles and improve infrastructure for existing residents and property owners. The Deroche Bench lands offer potential development opportunities that are not generally found elsewhere in the FVRD. As such, this neighbourhood plan was developed to provide additional detailed information and the policy framework needed to guide future development, consistent with the Electoral Area "G" OCP and the overall vision for the community.

The concepts and design elements presented in this Neighbourhood Plan will require additional review and discussions with various agencies, stakeholders, and the community, prior to review and endorsement by the FVRD Regional Board.

The next steps towards refining and implementing the Deroche Neighbourhood Plan are:

1) Review and edit the draft Deroche Neighbourhood Plan – FVRD Staff

2) Refer the final draft Deroche Neighbourhood Plan to external agencies for review and comment:

    a. Ministry of Transpiration and Infrastructure

    b. Fraser Health Authority

    c. Mission School District

3) Fraser Valley Regional District Board to resolve to lobby senior levels of government to facilitate necessary improvements to North Deroche Road that restore public safety for first responders and the travelling public.

4) Initiate community consultation making the final draft Deroche Neighbourhood Plan available for public review and comment.

5) FVRD to host community stakeholder meetings to review and discuss the final draft Deroche Neighbourhood Plan.

6) Revise the final draft Deroche Neighbourhood Plan based on community feedback.

7) Prepare a Development Cost Charge Bylaw for consideration by the Fraser Valley Regional District Board to fund necessary improvements to the existing community water system (charges to be payable by new development).

8) Fraser Valley Regional District Board to resolve to pursue grant opportunities to facilitate required water system infrastructure improvements.

9) Prepare draft amendments to the Official Community Plan to incorporate the Deroche Neighbourhood Plan as part of the Official Community Plan.

10) Prepare draft amendments to the zoning bylaw that are consistent with the draft Official Community Plan amendments.

11) Fraser Valley Regional District Board to consider forwarding any Official Community Plan amendments and zoning bylaw amendments to a public hearing.

12) Fraser Valley Regional District Board to consider further readings and adoption of any Official Community Plan amendments and zoning bylaw amendments.