metrovancouver

Barnston Island Agricultural Viability Study

January 2019

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Acknowledgements

The Barnston Island Agricultural Viability Study was developed for Metro Vancouver by Upland Agricultural Consulting Ltd.

We would like to acknowledge the input and expertise of Barnston Island landowners and farmers, Katzie First Nation, and members of the Metro Vancouver Agricultural Advisory Committee.

Acronyms

AAC	Agricultural Advisory Committee
AAFC	Agriculture and Agri-Food Canada
AGRI	BC Ministry of Agriculture
ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
BCA	BC Assessment
BIDD	Barnston Island Diking District
BMPs	Best Management Practices
CFIA	Canadian Food Inspection Agency
CLI	Canadian Land Inventory
CSA	Community Supported Agriculture
ENV	BC Ministry of Environment
LGA	Local Government Act
MV	Metro Vancouver
OCP	Official Community Plan
RGS	Regional Growth Strategy
SWOT	Strengths, Weaknesses, Opportunities, and Threats
ZBL	Zoning Bylaw

Executive Summary

Metro Vancouver (MV), through the development of the Official Community Plan (OCP) for Electoral Area 'A', has identified the need for an *Agricultural Viability Study* for Barnston Island. Katzie First Nation has traditional territory that includes the island, and some Katzie members currently live within a reserve on the island. Over the last 100 years or so, Barnston Island was utilized for a variety of agricultural uses, including dairy, forage, cranberries, and vegetables.

About the Study

The objectives of the *Barnston Island Agricultural Viability Study* are to:

1. Compile baseline information relevant to agriculture on Barnston Island including: land use, land cover, soil type, soil class, current farm activities, drainage and irrigation, access and transportation constraints;
2. Engage with stakeholders (agricultural industry, academic, government representatives and farmers and property owners on Barnston Island) to understand challenges facing farming, and what can be done to encourage farming on the island;
3. Determine what types of farm uses are best suited for Barnston Island based on a SWOT (strengths, weaknesses, opportunities and threats) analysis that considers how Barnston Island fits within a regional agricultural context;
4. Identify and prioritize specific actions that should be taken to increase the long-term viability of agriculture and to increase the amount of actively farmed land on Barnston Island; and
5. Acknowledge and seek integration opportunities with other initiatives.

In order to meet these objectives, the following key steps were completed:

- A background review of the study area;
- An analysis of the opportunities and challenges facing farmers on the island;
- An investigation into the economic opportunities of potential agricultural uses;
- Consultation with MV's Agricultural Advisory Committee (AAC) on the development of recommendations for MV;
- The presentation of the draft plan to the community and involved stakeholders; and
- Compilation of a final report for MV and presentation to the Electoral Area Committee.

Results

The SWOT analysis indicates that Barnston Island has great growing conditions for a wide variety of crops, including access to irrigation water. Farmland is relatively affordable as compared to other land in the region. However, poor drainage conditions hamper the suitability of some agricultural activities, and infrastructure upgrades would be required to reach optimal growing conditions. This is similar to conditions on agricultural land in Surrey, Richmond, and other areas of the Fraser Valley. Challenges include attracting new and emerging farmers to stimulate production on underutilized farmland. This is related in part to limitations involved in access to the island as well as to changes in land tenure which have resulted in more non-farmers owning land on Barnston Island and a lack of long term leases (e.g. more than 10 years long) being made available.

Given these challenges, an agricultural suitability assessment was conducted to examine the viability of a range of crops and livestock production systems. Many were found to have a high suitability ranking. Three crops were selected to develop into more detailed business scenarios in order to explore their economic potential. Estimates for capital inputs, operating costs, and gross revenues were calculated. Results indicate that perennial crops, such as lavender, require a higher level of initial investment but also result in higher potential revenues over time (Table i). This points to the importance of secure land tenure, whereby ownership and long term leases

can result in a more diverse set of suitable agricultural activities, as they are more likely to see infrastructure improvements made, such as drainage, than land cultivated under short term leases.

Table i. Summary of economic development scenarios for lavender, specialty mushrooms, and strawberries.

Scenario	Land Area	Capital Inputs (Start Up)	Operating Costs (Annual)	Gross Revenue (Annual)	Net Revenue (Gross – Operating)
1: Lavender	10 acres	$290,000	$52,550	$250,000	$197,450
2: Specialty mushrooms	1 acre	$20,000	$3,500	$19,200	$15,700
3: Strawberries	15,000 sqft (polyhouse)	$81,000	$26,552	$120,000	$93,448

Recommendations

As a result of the study the following eight recommendations were identified that Metro Vancouver can play a lead role in (presented in no particular order):

1. Continue to Work with the Province towards Improved Ferry Service and Road Safety
2. Continue to Support Katzie First Nation Endeavours
3. Conduct a Drainage Study for the Island
4. Increase Efforts Around Compliance and Enforcement of Derelict Residences
5. Consider Working with the Community on an Agri-Tourism Strategy
6. Investigate Ways to Increase Long-term Land Tenure to Support Farming
7. Promote Metro Vancouver Agricultural Policies and Regulations
8. Erect Agricultural Signage

Based on soil, water, and climate, the diversity of what can be cultivated on Barnston Island should not be underestimated. The biophysical needs combined with a supportive rural community create a strong potential for farming success on the Island. However, there are major limitations to increasing production and attracting new farmers due to land tenure, whereby over 50% of the island is owned by a single non-farming landowner. This would be considered a limitation regardless of whether the majority landowner were a private individual, a corporation, or other non-farming owner. This change in tenure has shifted land availability away from farmers owning the land or obtaining long term (> 10 year) leases, to non-farmer ownership with short-term (5 years or less) leases being made available to producers. These short term leases limit the ability for producers to provide investments in infrastructure, which would be necessary to build new profitable agricultural businesses on the island. These tenure challenges are combined with a lack of capacity for the current ferry system to support agricultural equipment and transportation needs. Furthermore, location of Barnston Island can pose difficulties for farm labour to access jobs due to a lack of public transit connections.

In order for the agricultural vision of Barnston Island to be realized, farmers will need to collectively decide if they want to leverage the agricultural potential of the island and support investments in infrastructure. There is an incredible opportunity for Barnston Island to become the agricultural jewel of Fraser and to capitalize on the number of visitors seeking agricultural tourism experiences. Metro Vancouver can assist in attracting new farmers to the island, which would contribute to more direct market opportunities and a more vibrant and economically sustainable farming community.

1.0 Introduction

Barnston Island is an island community of approximately 622 ha (1,537 acres) in size, surrounded by the Fraser River with a long history of agriculture. It is home to a diverse community, comprising of Katzie First Nation members, retirees, renters, hobby farmers and industry farmers. According to the 2016 Census, the Island has 176 residents, including 49 residents on Katzie First Nation Reserve No. 3[1]. Anecdotal evidence suggests that the population may currently be lower than 150 residents[2]. Barnston Island has a long history of agricultural activities. The island contains Metro Vancouver's Barnston Island Regional Park, which provides scenic riverfront rest areas and protects important riparian habitat. A dike surrounds Barnston Island to protect the island from the floodwaters of the Fraser River, and this dike also serves as the main transportation route. The vision for Barnston Island, as developed through the Electoral Area 'A' Official Community Plan (OCP) (2018), is a thriving agricultural community (Figure 1)[3].

Farms, parks and a dike — a jewel in the Fraser shared with neighbours

Figure 1. Barnston Island Vision Statement.

1.1 Scope and Intent of the Barnston Island Agricultural Viability Study

The development of this *Barnston Island Agricultural Viability Study* (the 'Study') is the result of Policy 5.2 from the Electoral Area 'A' OCP:

Policy 5.2 (43): *Protect the island as part of the ALR and work with the ALC, the Ministry of Agriculture, and other agencies to complete a comprehensive study on how to improve the viability and potential of agriculture on Barnston Island.*

The scope of the Study is to provide clear direction and actions that Metro Vancouver can pursue to increase the long-term viability of agriculture and to increase the amount of actively farmed land on Barnston Island. The Study includes actions that strengthen farming on the island and contribute to agriculture and the community's long-term sustainability.

1.2 Study Site Location

Barnston Island is located in the Fraser River between Surrey and Pitt Meadows, within Metro Vancouver Electoral Area A, and is home to Katzie First Nation Reserve No. 3 (Figure 2). Barnston Island is within the traditional territory of the Katzie First Nation and was settled by Europeans in the mid 1800's. The island is accessed through the Barnston Island Ferry which connects the island from Surrey (on 104 Avenue) across Parsons Channel and is an approximately 5 minute crossing. Metro Vancouver owns Barnston Island Regional

[1] Statistics Canada 2016 Census Data. https://www150.statcan.gc.ca
[2] Personal communication, John and Susan Russell, November 2018.
[3] Metro Vancouver Regional District Electoral Area A Official Community Plan, 2017.

Park with park amenities at Robert Point Rest Area on the western tip of the island, and undeveloped Mann Point on the eastern end. The regional park sites comprise an area of 27 hectares[4].

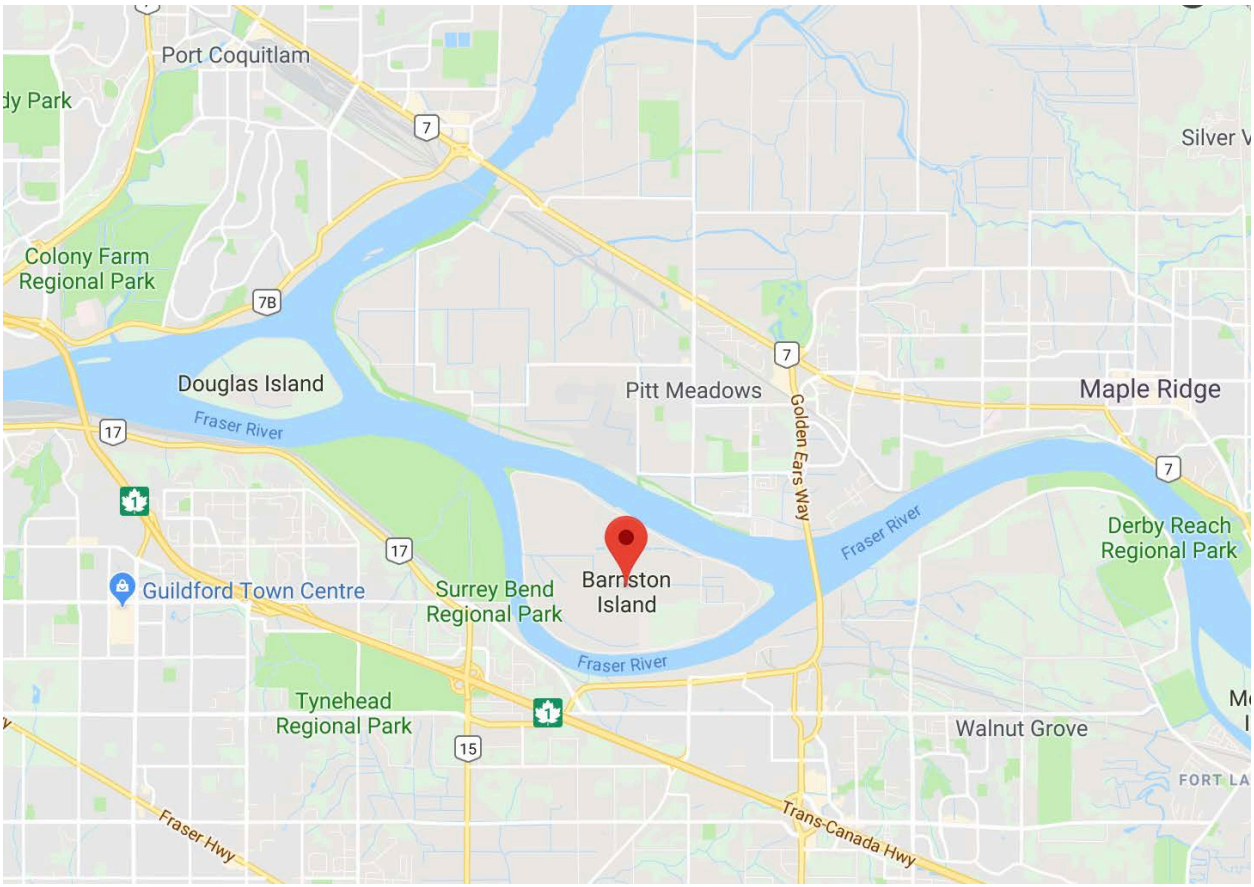

Figure 2 Location map of Barnston Island (source: Google Maps).

Barnston Island has a diking system that encircles the entire island for protection against floodwaters. There is a 10 km paved road that sits on top of the dike and another road that stretches across the island, which is paved in most sections. Metro Vancouver provides planning and building regulations for the Island except the Katzie First Nation reserve, which manages its own planning and construction. Residents of Barnston Island must leave the island for basic goods and services as there are no commercial or health services on the island. The regional park, located on the west and east ends of the island, attract cyclists and hikers. The park is walk-in or cycle-in only, as no public parking is provided to discourage extra vehicles. There are two farming agreements also on the regional parkland at each of the western and eastern tips of the island. These operations are considered interim uses until a park management plan and program are implemented

[4] Metro Vancouver, 2012. Barnston Island OCP Background Report.

2.0 Agricultural Context

2.1 Farmland on Barnston Island

Nearly 99% (618 ha) of Barnston Island is entirely located within the provincial Agricultural Land Reserve (ALR). Metro Vancouver has zoned the island 'Agricultural B-1' with park uses permitted at the regional park sites and protected areas. The first zoning bylaw for the Island came into effect in 2005, with minimum lot sizes of 20 hectares. There are a number of lots which pre-date this first zoning bylaw and are considered legal non-conforming[5] (Figure 3). Agriculture has been a prominent land use on Barnston Island for over a century. Agricultural operations on Barnston Island today are primarily hay, cranberries and pastures for the beef and dairy farms. Forage crops are very productive, with as many as four crops of hay per year. There is a culinary herb farm operating on the island, a small-scale chicken operation with farm-gate egg sales and several small mixed hobby farms with sheep, goats and horses.

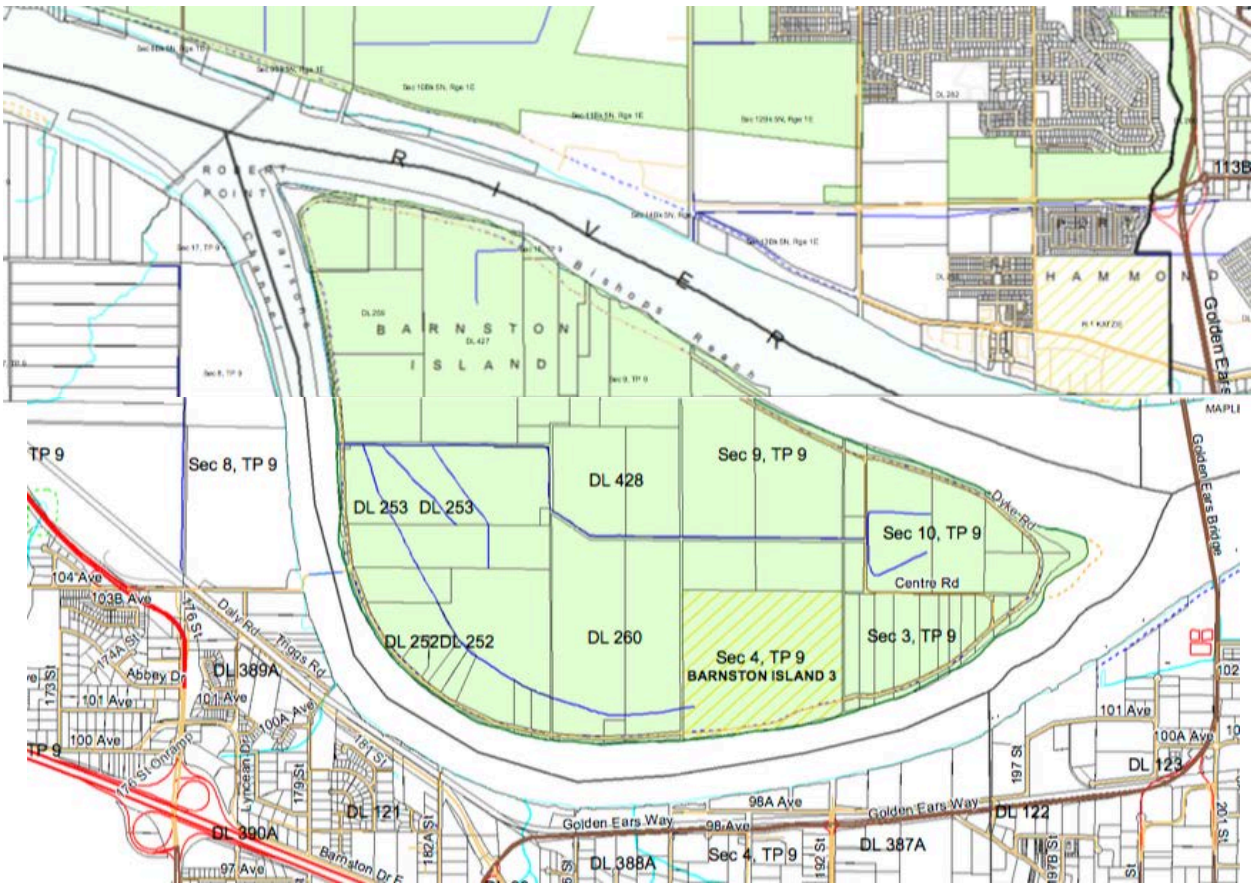

Figure 3. Agricultural Land Reserve and Barnston Island.

[5] Barnston Island OCP Background Report, 2012.

2.2 Farming: Local Historical Context

Barnston Island is located within the traditional territory of the Katzie First Nation and was settled by Europeans in the mid 1800's. The Island was named after George Barnston, a Hudson's Bay Company clerk[6]. Agriculture has been a prominent land use on Barnston Island for over a century. In the 1910s and 1920s, families came mainly from the USA and UK to farm on the island[7]. According to historical records, many of the early settlers proved that the fertility of the soil made the island a desirable place for agriculture, primarily sheep, dairy, and cattle raising. The main drawback was the river's spring freshet which caused the threat of flooding from the Fraser River. The first dike was built in 1912, which increased capacity for agriculture on the island. Records from minutes of the Barnston Island Farmers Institute indicate that farmers voted to ask the Provincial government for an upgrade to the ferry service frequently between 1915 and 1970. Much of the information regarding early agriculture is informed by the meeting minutes of the Barnston Island Farmers Institute and the essays of residents from the 1920s and 1930s. The predominant agricultural activity was dairy, characterized by herds of cattle (Guernsey, Jersey, Ayrshire, Holstein). These were supplying upwards of 100 cans of milk a day and the milk was shipped to Vancouver by truck. Cheese-making was undertaken by the Scott-Walker family.

In contrast to agricultural activities found on Barnston Island today, there were historically a diverse number of farm types: sheep farms for meat and wool, large crops of peas for canning were cultivated and shipped to canneries; oats, barley, and hay were grown on the larger farms; potatoes and root crops compared well with those of other lowland areas in the Fraser Valley or Delta. Prior to the second world war, raspberries and strawberries were grown successfully in small holdings[8]. The Charnley family members, who were in the beef business, took much of their beef and veal to New Westminster market in a row boat. River boats served the farmers with heavy freight such as cattle, grain, and hay. Electricity arrived at the island in 1938 which had a positive impact on agriculture and allowed for dairy operators to invest in milking machines. There was a breach of the dike during the flood of 1948, which was subsequently repaired. When the dairy quota system was introduced, there were three main dairies remaining on the island producing milk and cheese.

In 2006, there was a major application for exclusion of Barnston Island from the ALR made by developers with support from some island landowners to the Agricultural Land Commission. The application was refused[9].

2.3 Land Tenure and Agricultural Viability

Purchase to own (fee simple ownership) is not the only farmland tenure option in BC. Approximately 40% of farmland in the province is leased. Leasing is an excellent way for farmers to expand production and for start-up farmers to get access to land. A lease gives a person all of the use and occupation rights of a landowner to use either a full parcel or portion of a parcel of land for a determined period of time in exchange for rent, or other forms of payment, paid to the landowner. The property owner retains the right to dispose of the land (sell it) while the tenant has exclusive possession of the land under the lease and the responsibility of maintaining it according to the terms in the lease. When the lease is over, the land reverts to the landowner[10].

The ability for a farmer to lease land for a long tenure period is important. It provides security, which makes investing in the farm in terms of infrastructure (drainage, irrigation, fencing) and equipment less risky and more appealing.[11] It

[6] Metro Vancouver, 2012. Barnston Island OCP Background Report.
[7] Personal Communication, Susan Russell.
[8] Local records and essays as accessed through John and Susan Russell, November 2018.
[9] Metro Vancouver, 2012. Barnston Island OCP Background Report.
[10] Wittman, H. 2009. Community Farms in BC: Building Local Food Systems for Sustainable Communities. Community Farms Survey Report. A collaborative effort between FarmFolk/CityFolk, The Land Conservancy of BC, and Simon Fraser University http://ffcf.bc.ca/programs/farm/CFPdocs/community_farms_in_bc_survey_report.pdf.
[11] Shirlene Côte, farmer. Personal communication.

also provides the farmer with leveraging when attempting to access financing through a lending institution. This need for tenure security is especially important for crops that may take several years to mature, or for livestock-based agriculture. Farmers with long term leases know that resources spent on infrastructure will pay itself back over time, therefore having tenure on a piece of land that enables that return on investment is important for financial viability.

A long-term lease agreement typically has a term of 10 years or more. Legally, a long-term lease agreement can be up to 99 years[12]. Long-term leases provide more security to the farmer, allowing them to make long-term decisions. Farmers may be more likely to invest in improving the soil, undertaking conservation measures, or building structures if the term will enable them to achieve the business benefits of their investment and stewardship[13].

A short-term lease agreement is typically for one year, with an option for renewal, but could be for up to 5 years. These offer both landlord and tenant flexibility and can be used as a trial period as both tenant and landowner determine if the match will be successful. The drawback is that it's difficult to make longer-term investments and decisions in this short time frame. Landlords with such a short lease should consider how they will promote tenure confidence. This may include agreeing to pay for infrastructure improvements. It is worth noting that short-term leases are not appropriate for producers wishing to obtain organic certification, which requires a three-year transition period. Lease agreements can include a clause whereby any investments in infrastructure (e.g. irrigation, drainage, fencing, soil quality) made by the lessee can be purchased back by the landowner at the end of the lease. This provides some motivation for those leasing to disburse funds into land that they do not own.

The main benefit that a non-farming landowner obtains from leasing lands to a farmer is Farm Class Tax Status through BC Assessment. Farm Class Tax Status applies to land that is producing a minimum threshold of farm income per year. This threshold is based on the size of the parcel. One barrier to the creation of long term leases is that BC Assessment will provide Farm Class Tax Status for land associated with leases that are only one year in length, thereby removing any motivation for landowners to offer long-term leases.

Table 1 lists examples of infrastructure and housing that farmers with long term leases will typically direct investments towards [14,15,16,17].

Table 1. Infrastructure needs for long term leasehold farming

Infrastructure Type	Description
Fencing	Fencing provides some amount of security from crop damage (due to humans and/or wildlife). It is also needed along riparian areas.
Drainage	Producers will be more likely to invest in perennial plants and will be more confident about seeding dates and yield expectations if drainage is in place.
Irrigation systems	A secure water source is very important. The producer will want to know where the water is coming from (groundwater or creek-fed), if the water is regularly tested, and if water costs for irrigation will be in addition to the lease/licence rate.
Cold storage and dry storage	These areas are especially important to maintain produce quality between harvest time and delivery to markets and/or clients.
Sheltered area for processing	An area away from wind and rain is key to ensuring that the quality of the product isn't compromised after harvest during washing and packing.
Secure equipment storage	Need to have a locked building that is secure to store equipment such as tractors.
Berms	This infrastructure can provide additional support for flood mitigation.
Farm Buildings	These structures, such as barns and greenhouses, can require significant levels of economic investment.

[12] Land For Good: Farmland leasing for private landowners – a short guide
[13] A Guide to Farmland Access Agreements. Farm Folk City Folk and The Land Conservancy BC, 2009.
[14] FarmFolk/CityFolk, 2010. Community Farms Network.
[15] Richmond Food Security Society. 2011. Small farms resource guide.
[16] Wittman, H. 2009. Community Farms in BC: Building Local Food Systems for Sustainable Communities. Community Farms Survey Report. A collaborative effort between FarmFolk/CityFolk, The Land Conservancy of BC, and Simon Fraser University
[17] Hannah Cavendish-Palmer, Shirlene Côte, Amy Kitchen. Personal communication.

Currently, more than half of Barnston Island is owned by a non-farming landowner who does not reside on the Island. This land is mainly being leased out at terms of 5 years or less. This is a change from previous tenure whereby most of the island was owned by farmers or was made available to farmers for long term agricultural leases (e.g. longer than 10 years). As discussed above, the viability and suitability of certain agricultural activities is reduced when farmland is only available in short term leases (1 – 5 years).

2.4 Current Agricultural Land Use

The Agricultural Land Use Inventory (ALUI) completed for Barnston Island[18] by the BC Ministry of Agriculture in 2010 found that more than half (57%) of the island is currently used for farming, 17% of the island is not available for farming and more than a quarter (26%) is available for farming activities but is not currently being used. Of the land that is farmed on Barnston, nearly two-thirds (63%) is being used to grow forage, 14% is being used for livestock pasture, and nearly a quarter (23%) is in cranberries. Barnston Island hay fields are capable of turning up to four cuttings per year, making it some of the most productive haying lands in the region. Livestock on the island include two dairy farms with over 100 cows each, a beef farm with 50-100 cows, small hobby farms with goats, chickens and sheep, and a small-scale chicken farm has some farm gate egg sales. The cranberry farms have created drainage ditches to control water levels for crop production. There is a culinary herb farm (Barnston Island Herbs) that grows herbs hydroponically in polyhouses. A mixed vegetable farm grew a variety of crops on a small scale quite successfully over the last few years. However, due to personal circumstances that farm has now ceased operation[19].

There are 52 separate titles on Barnston Island, most of them in residential or agricultural use. The average parcel size is 11.9 hectares and the median parcel size is 5.0 hectares.
Of the 52 parcels in the ALR:

- 4% (2 parcels) are less than 1 hectare.
- 40% (21 parcels) are less than 4 hectares.
- 17% (9 parcels) are between 4 and 8 hectares.
- 15% (8 parcels) are between 8 and 16 hectares.
- 27% (14 parcels) are greater than 16 hectares.

Of the 52 parcels in the ALR, 28 parcels or 54% are “Used for farming” while 24 parcels or 46% are “Not used for farming”. Of those 24 parcels in the ALR and “Not used for farming”, 14 or 58% are less than four hectares. Although parcels of all sizes are “Used for farming”, large parcels are more likely to be farmed.

2.5 Barnston Island Access

One of the key characteristics of living and farming on Barnston Island is the reliance on a small ferry to access the island. The ferry runs 7 days a week, from approximately 6am to midnight. Ferry capacity is 5-6 vehicles and 52 passengers, subject to the approved load capacity of the vessel (Figure 4). The maximum capacity of the ferry is 50 tonnes, however limitations from the ramp access reduce the gross vehicle weight on the ferry to 40 tonnes, with a maximum length of 54 feet. Trucks with a gross vehicle weight in excess of 20 tonnes must be transported separately from other passengers and vehicles[20]. All drivers must also back off the ferry when

[18] This inventory was first conducted in 2010 and was updated in 2017, however the 2017 data has not yet been publicly published.
[19] Laurie Stackl, personal communication.
[20] Barnston Island Ferry Information Page, BC Government.

arriving at Barnston Island and back onto the ferry when departing the island[21]. There are no reservations for the ferry - the principle of "first come, first transported" is adhered to.

Figure 4. Barnston Island Ferry

The jurisdiction of the ferry lies with the Provinces of BC, specifically the Ministry of Transportation and Infrastructure (MoTI). The ferry is funded by the Province of BC and is administered through the Inland Ferry program. Western Pacific Marine is the company managing the ferry service. In the next few years MoTI will begin planning for a replacement vessel as the ferry barge comes to the end of its service life[22]. MoTI has said they will engage the community and other stakeholders as they proceed through the planning and implementation process of replacing the ferry vessel.

There is one access point to the Barnston Island ferry from the City of Surrey and this access has been a concern of Barnston Island residents for many years (Figure 5). The intersection of South Fraser Perimeter Road and 104th Avenue can be a site of traffic delays and is of safety concern to residents due to the traffic patterns, lack of signage, and confusing traffic light design. There is a CN rail crossing at 104th Avenue that can also cause long delays for people coming to and leaving the island. On October 10th, 2017 a community meeting occurred where residents discussed the transportation issues with government and industry representatives. The community meeting raised important concerns of the residents' and dialogue is continuing to address the concerns.

The lack of a fixed access influences the response time of emergency services to the island. There is no structural fire service. In 2005, residents voted against paying for fire service from the City of Surrey. This can lead to a sense of insecurity amongst some residents, while others seem to understand that it comes with the territory and that they do not expect around the clock emergency services.

[21] Electoral Area A Emergency Management Plan, 2018.
[22] Update Following October 10th, 2017 Meeting, January 2018.

In a report summarized by EveCo (2006)[23], the access issue and its impact on agriculture is described. It was noted that the ferry regularly transports conventional trucks for hauling bulk milk and fuel, manure, grain, hay, farm supplies, heavy equipment and produce. However, animals are not usually transported commercially, due to safety concerns and because the ferry is not able to accommodate the larger, long-distance haul cattle liners. Current ferry size permits one full milk truck and no cars, which leads to traffic delays at peak periods. In recent years, at least half a dozen milk trucks a day were accessing the island to haul milk.

While the scope of this Study, and Metro Vancouver's jurisdiction more broadly, lies outside of ferry and highway planning, the access to Barnston Island is a key factor to consider for agricultural activities. Throughout the engagement process for the Study, local farmers noted limitations the ferry poses for their activities. The size and weight restrictions reduce the capacity for large agricultural equipment and trucks to reach the Island. Some farm products and services will not deliver to Barnston Island. At times there can be long waits for the ferry on both sides of Parsons Channel, which delay farm activities, and impede labour from reaching employment sites. Farm operators note that the lack of public transportation services to the ferry access in Surrey represent a challenge for hiring, retaining and ensuring the safety of farm labourers.

While the majority of residents contacted for this study indicated a preference for an improved ferry, it is important to note that improvements to island access is not supported by all island residents. As a result of the ferry, the island is somewhat protected from urban development pressure. For example, there are no reports of farm-related odour and noise complaints. At the same time, many residents reported that trespass, vandalism, and illegal dumping have been occurring regardless of the level of access between the island and the mainland.

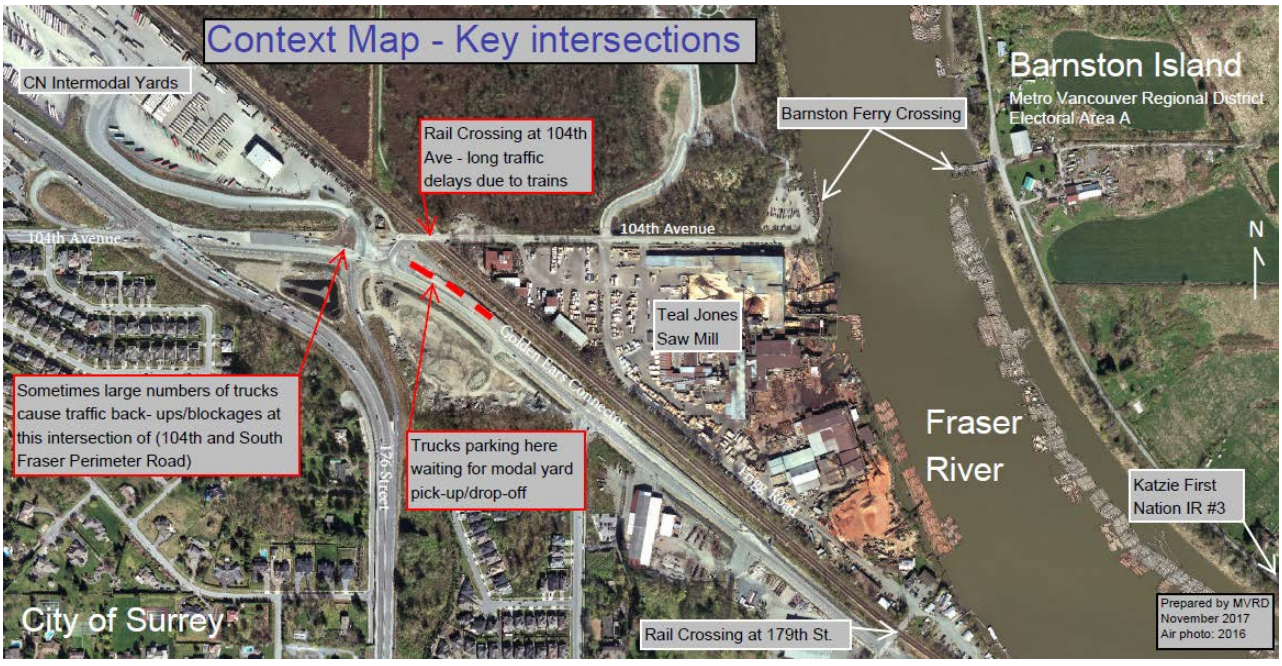

Figure 5. Access to Barnston Island.

[23] EveCo Consulting Ltd. 20016. Barnston Island Agricultural Assessment.

3.0 Environmental Context

This section of the report provides an overview of the natural resources on the island that are critical for farming: water, soils, and climate.

3.1 Water

3.1.1 Drainage and Diking

The Fraser River and tidal influences from Georgia Strait control Barnston Island's hydrologic regime. The water table therefore fluctuates in response to these influences. Risk of seasonal flooding is pervasive across the island and is the highest during the spring "freshet", when the water levels in the Fraser River are at its highest due to melting snow from the surrounding mountains and increased rainfall. Periodic episodes of surface-ponding have been known to occur during extreme precipitation events during the late fall and winter[24].

The Islands' first known dike was built in 1912. Currently, Barnston Island is encircled by a ten kilometre paved Dike Road that sits on top of the dike system surrounding the Island[25]. Approximately 820 metres of the dike is through the Katzie First Nation Reserve, which is co-managed between the Katzie First Nation and the federal government. Barnston Island is within the 200-year flood inundation level of the Fraser River, with the dike approximately sitting two feet below the 200 year flood level standard outlined by the ENV[26]. There was a breach of the dike during the flood of 1948 which was subsequently repaired, and no other breaches of the dike have occurred since that time. In May 2018, an evacuation alert was issued by Metro Vancouver for Barnston Island in anticipation of rising floodwaters from the Fraser River[27]. An evacuation order was never issued as risk of flooding subsided.

In 2012, a study, the *Barnston Island Dike Assessment Technical Report*[28], was undertaken to assess the condition of the dike. The report found that the dike is in less than favourable condition and may fail from seepage, piping or erosion prior to water coming over the top of the dike. While it is unclear why improvements to the dike have not been made in the interim, it is likely that costs and associated levels of funding are a large factor. The dike, pump station, flood-box and some drainage ditches are maintained by the Barnston Island Diking District (BIDD), comprising local property owners and residents. Most of the required work is carried out by volunteers living on the island.

The pump station located on the island was found to have several safety deficiencies and is expected to reach the end of its useful life within the next few years. The volunteer-run BIDD, established in 1909, has authority under the provincial *Drainage Ditch and Dike Act* to collect an acreage tax and manages maintenance under the *Dike Maintenance Act*. The Commission is responsible for maintaining the main dike and ditch system. In recent years the province has suggested that the Diking Commissions will become the responsibility of local and regional governments, although this has not yet occurred.

There are several main drainage ditches on the island. A large drainage ditch bisects the island in an east-west direction and lateral ditches exist that follow property boundaries and/or natural swales in the landscape, which feed into this main ditch. Water from the main ditch is pumped over the dyke back to the Fraser River at its west end and the lateral ditches that feed into the main ditch are constructed and managed by landowners or groups

[24] EveCo Consulting Ltd. 20016. Barnston Island Agricultural Assessment.
[25] Barnston Island OCP Background Report, 2012.
[26] Electoral Area A Emergency Management Plan, 2018.
[27] Evacuation Alert Issued for Barnston Island (2018). Metro Vancouver.
[28] Barnston Island Dike Technical Assessment Report, 2013.

of landowners[29]. Anecdotal evidence suggests that many of the agricultural properties have subsurface drainage, although the current state of condition of these underdrains is unclear. Some of these systems are very old, consisting of clay weeping tiles and even wooden box drains, and are thus are likely in need of repair. The *Barnston Island Dike Assessment Technical Report*[30] determined that the drainage network inside the dike was also found to be in poor condition as ditches on private land are not maintained, several culverts are under-sized or plugged and there are no ditches draining the Katzie First Nation Reserve Land No. 3. Over 80% of Barnston Island was found to be limited by a high water table. Most of the island, therefore, benefits from dikes and drainage ditches. The supplementary installation and maintenance of underdrains, surface and sub-irrigation, floodgates and collector pumps will enhance that benefit.

3.1.2 Irrigation and Drinking Water

Residents of Barnston Island access individual wells for drinking water and have individual septic systems for residential purposes. The Katzie First Nation Reserve No. 3 has had a drinking water supply agreement with the City of Surrey since 1990[31]. Irrigation water is mainly supplied by well water, with some operations (e.g. cranberries) pumping water from the Fraser River directly. The cranberry crops are irrigated using a sprinkler system. Other fields (e.g. hay, pasture) are not irrigated[32]. The floodgates for the drainage ditch system are closed in the summer by the BIDD to prevent the water from draining into the Fraser River, which helps to keep the water table high. Most crops, except for cranberries, (73% of all cultivated land) are relying exclusively on this unmanaged subsurface water during summer months[33]. There are two or three wells on the island with adequate water for irrigation. One of the water quality challenges on the island is high levels of iron (e.g. iron oxides)[34].

3.2 Soils and Geology

Barnston's geological materials consist of variably textured deltaic sediments (deposited in swales), accreted silty and fine sandy overbank deposits (deposited in ridges) and peat accumulations over and under mineral soil (in flat areas in the north middle portion of the island)[35].

There are several soil types on Barnston Island (Figure 6). The most common include: Hjorth (HJ), Fairfield (F), Monroe (M) and Hallert (HT). These soils are medium-textured, laterally accredited floodplain deposits with mostly poor drainage and high groundwater table[36]. There is a large area of Lumbum (LM) and Glen Valley (GV) organic (peat) soils which are more than 1.5 m of partially decomposed organic material, with poor drainage and a high groundwater table. This type of soil is ideal for berry production (e.g. cranberries). The topography of the island is mainly level with some very gentle undulation. Elevations on the island lie between 1 m and 4 m above sea level, as such without the diking system much of the island would be routinely inundated[37].

[29] EveCo Consultants, Ltd, 2006. Barnston Island Agricultural Assessment.
[30] Barnston Island Dike Technical Assessment Report, 2013.
[31] Barnston Island OCP Background Report, 2012.
[32] Barnston Island Agricultural Land Use Inventory (2010). BC Ministry of Agriculture.
[33] Ibid.
[34] Personal communication, John and Susan Russell. November 2018.
[35] EveCo Consultants, Ltd, 2006. Barnston Island Agricultural Assessment.
[36] Luttmerding, H. 1981. Soils of the Langley – Vancouver Map Area. Report No. 15. British Columbia Soil Survey. Vol. No. 1.
[37] Barnston Island Dike Technical Assessment Report, 2013.

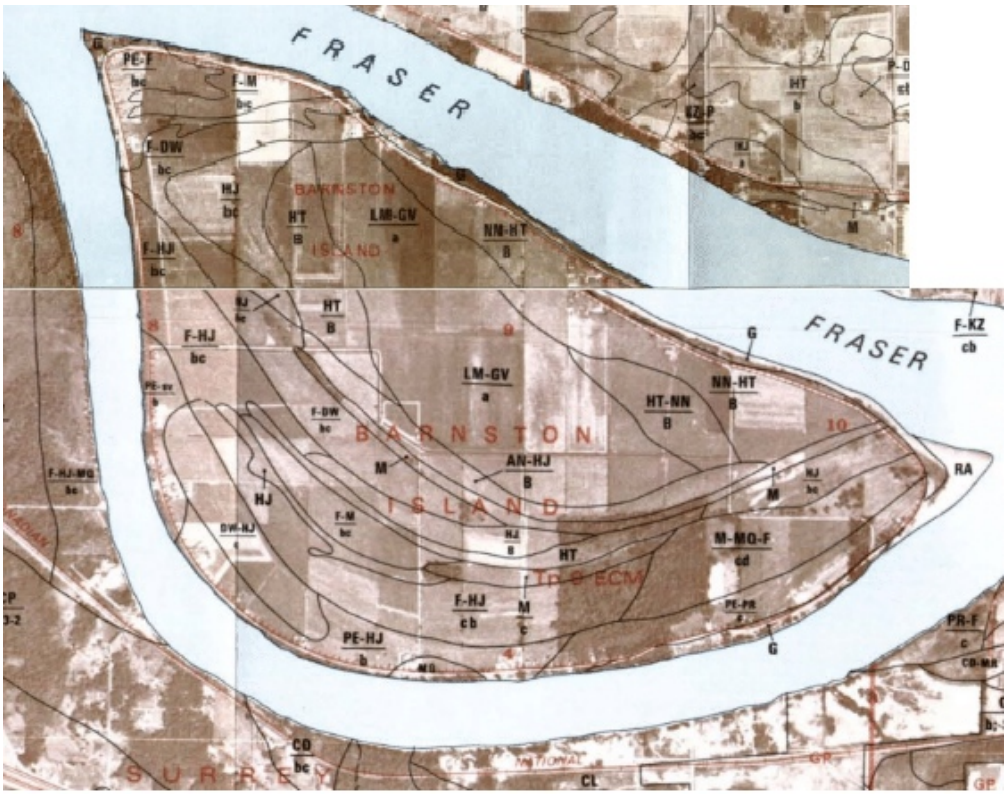

Figure 6. Soil Map of Barnston Island. (Source: Soils of the Langley – Vancouver Map Area. Report No. 15. Vol. 1).

The results of fieldwork conducted by EveCo Consulting (2006)[38] indicated there are 13 soil series on Barnston Island. Soil pits excavated at that time indicated a full range of soil textures from coarse sand (usually at depth) through silt loams to silty clay. These soils were all stone-free with a relatively high capacity to store water and nutrients.

3.3 Agricultural Capability

The Canada Land Inventory (CLI), developed in the 1980s, uses defensible criteria to apply agricultural capability rating for soils in the ALR. There are seven classes, with Classes 1-3 considered the best for agriculture (or "prime") and Classes 4-6 are considered "marginal". Class 7 is generally applied to waterbodies, steep slopes, or other locations where agriculture is not viable.

Agricultural capability Barnston Island is generally excellent (Figure 7), with most soils listed as Classes 2 to 5 in their unimproved states with limitations predominantly due to excess water, and often improvable to prime (Classes 1, 2 or 3)[39]. Improvements may include irrigation and drainage. EveCo Consultants (2006) further determined that inundation is not a risk to agriculture, since it is only a factor outside the dike where farming is not occurring.

[38] EveCo Consultants, Ltd, 2006. Barnston Island Agricultural Assessment.

[39] Agricultural capability maps were developed in 1978 and 1979 by Talisman Projects Inc and are published by the BC Ministry of Agriculture. The maps are at a 1:50,000 scale.

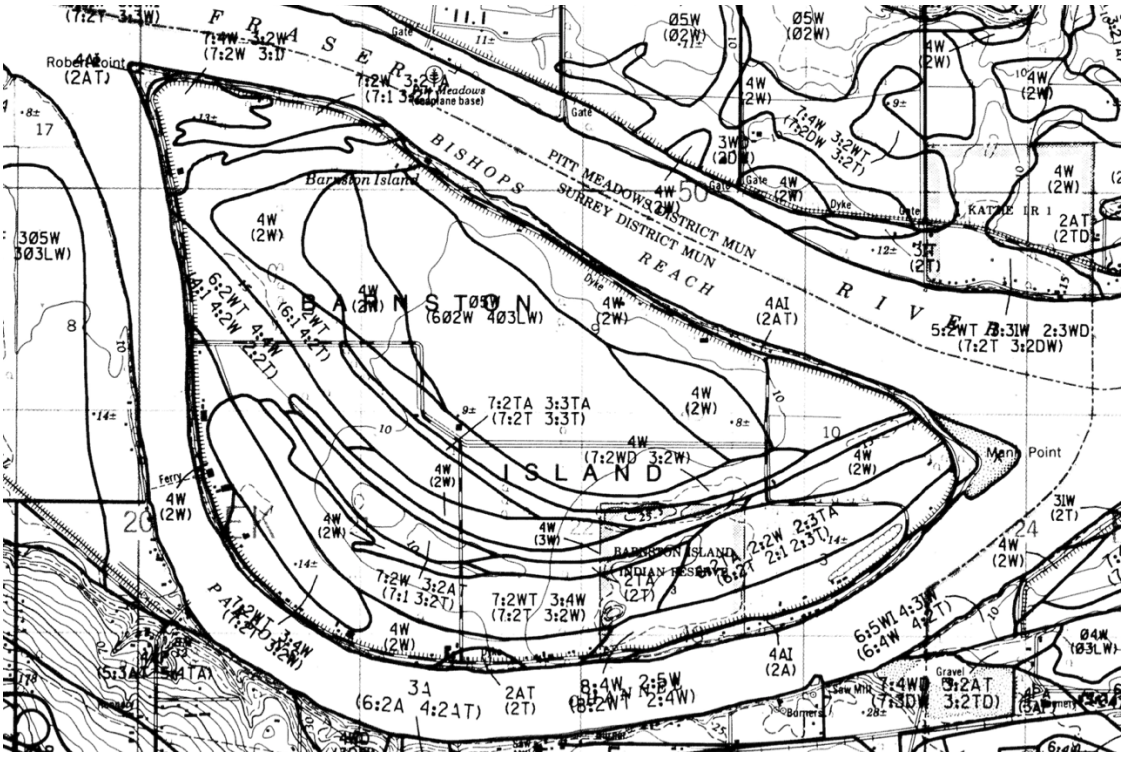

Figure 7. Agricultural Capability map for Barnston Island (source: BC Ministry of Environment).

3.4 Weather and Climate

The climate on Barnston Island is typical of BC's Lower Mainland, with mild winters of heavy rainfall and dry summers, often with a deficiency in rain during the late summer months (July and August). The temperate climate of the South Coast allows for a diversity of field crops, annual vegetables, tree fruits, berries, poultry, beef, and some dairy. Average daytime high temperatures peak at over 23°C in August, with spring and fall average highs closer to 12°C [40]. Average nighttime lows are 10 °C in the summer[41]. Precipitation in the region averages more than 1,000 mm annually, with 20% falling during the summer months (May-September)[42].

Data from Environment Canada provides the following information for the region based on extensive data collection from a weather station located in Abbotsford :

Monthly Temperature (°C)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average high	5.8	8.5	11.3	14.5	17.8	20.3	23.4	23.8	21	15	9.1	5.9
Average low	-0.6	0.8	2.3	4.4	7.2	9.9	11.5	11.5	8.8	5.4	2.3	-0.3

[40] Metro Vancouver Climate Projections.
[41] Ibid.
[42] Moore, R.D., Spittlehouse, D.L., Whitfield, P.H., and Stahl, K. 2010. Chapter 3, Weather and Climate. Compendium of Forest Hydrology and Geomorphology in British Columbia. Volume 1 of 2.

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly rainfall (mm)	174	148	142	120	99	79	50	49	76	145	234	191
Monthly snowfall (cm)	23	13	4	0	0	0	0	0	0	0	6	17
Monthly precipitation (mm)	198	160	146	120	99	79	50	49	76	145	241	209

Growing Degree-Days

Growing degree days (GDD) are a weather-based indicator for assessing crop development. It is a measure of heat accumulation used to predict plant and pest development rates such as the date that a crop reaches maturity. Daily GDD values are added together from the beginning of the season, providing an indication of the energy available for plant growth. GDD units can be used to assess the suitability of a region for production of a particular crop; estimate the growth-stages of crops, weeds or the life stages of insects; predict maturity and cutting dates of forage crops; estimate the heat stress on crops; plan spacing of planting dates to produce separate harvest dates. The following GDDs are calculated using weather data and a base temperature of 5°C. The equation for each month is {(Max. Temp + Min. Temp)/2 – 5} x #days/month.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Above 5 °C (Growing Degree days)	19	33	67	135	235	303	387	392	298	162	52	21
Above 0 °C	107	139	212	284	390	453	542	547	448	316	176	109
Below 0 °C	27	7	1	0	0	0	0	0	0	0	6	22

Sunshine Hours

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total hours bright sunshine	67	90	126	169	210	215	283	256	194	127	67	63
Days with measurable bright sunshine	18	20	24	26	28	27	29	29	28	24	18	16

3.5 Climate Change

Farmers are accustomed to the weather influencing their activities and weather-dependent decisions are a part of farming life. Adapting to climate change, however, involves a more systematic assessment and response. Agriculture is highly vulnerable to changes in climatic conditions and even small shifts could have significant consequences for farm viability and food production. Despite the challenges of applying broad climate models, some projections are anticipated for Barnston Island between now and 2050 as described in Table 2[43].

[43] BC Agriculture and Food Climate Action Initiative. Regional forecasting. http://www.bcagclimateaction.ca/

Table 2. Potential impacts of climate change on agriculture on Barnston Island.

Climate Change Condition	Potential Agricultural Impacts
Changing hydrological regime, decrease in summer precipitation	More frequent Fraser River freshet flooding risks, emergency evacuation alerts and orders.
Increasing precipitation and variability of precipitation (especially in spring & fall)	Interruptions to planting, input applications and harvesting, increase in excessive moisture and site-specific flood risk, increase in pressure on drainage and water management, interruptions to pollination.
Changing crop suitability ranges	Increase in suitability for new varieties of forage and field vegetable crops, increase in suitability of new crops
Changes in pests and disease	Increase in winter survival rates, increase in number of cycles in a year, introduction of new pests and diseases, increase in management costs, complexity, uncertainty, increase in delays or prevention of pollination
Increase in extreme weather events (storms, wind, extreme heat)	Changes to heating costs, in cooling and ventilation costs, interruptions to ferry access.

The Metro Vancouver region, within which Barnston Island is situated, is expected to continue to be impacted by climate change. Projections indicate the region can expect more than a doubling in the number of hot summer days above 25°C, from an average of 22 days per year to 55 days per year, by the 2050s[44]. This may translate into a 30% increase in the length of the growing season, and a 45% increase in growing degree days. Winters will be warmer as well, with a decrease of 60% in number of frost days. By the 2050s, precipitation is expected to increase by 5%, however precipitation is expected to fall during extreme events of high intensity rainfall, with October and November seeing the greatest increases in precipitation. Due to the increase in precipitation in fall and spring, the increase Growing Degree Days may be curtailed by reduced opportunities to work the land. The amount of rain in the summer is expected to decrease by 20%, increasing drought risk. In terms of impacts to agriculture, while the length of the growing season may increase, the extreme heat episodes and increase in potential for drought will present challenges for farming operations. The increasingly variable snowpack, combined with increasingly intense precipitation events, will serve to add pressure to the dike system, as the Fraser River freshet reaches increasingly high levels.

Although there is general consensus regarding the impacts of climate change, how these might impact specific microclimates is uncertain, yet critical for agricultural producers concerned with the effects of climate change and precipitation within their specific locale.

[44] Metro Vancouver Climate Projections.

4.0 Opportunities for Barnston Island Agriculture

Despite challenges associated with access to Barnston Island and the associated costs related to farming in a more isolated area, several opportunities for new farming endeavours do exist. A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis is provided for agriculture on Barnston Island. This is followed by a crop feasibility assessment and the development of potential revenues and expenses associated with three production scenarios.

4.1 Strengths, Weaknesses, Opportunities, and Threats for Agriculture on Barnston Island

A SWOT analysis was completed to determine the strengths, weaknesses, opportunities and threats to agricultural viability and feasibility on Barnston Island (Table 3). The desired outcome of the SWOT analysis is to determine what farm uses are best suited for Barnston Island. The strengths and weaknesses are internal factors that farmers and Metro Vancouver have some control over. The opportunities and threats are external influences that local residents and agencies have little control over.

Table 3. SWOT Analysis for Agriculture on Barnston Island.

Strengths	Weaknesses
• Great conditions for forage and pasture • Long history of farming on island • Farmland is relatively affordable in comparison to rest of Lower Mainland • Irrigation water sources include wells and the Fraser River • Potential for land leasing from MV and other landowners • Land is cleared and in a feasible condition for growing a variety of crops • Current Metro Vancouver policies and zoning support farming • Good relationship with Katzie First Nation	• Poor surface drainage (ditch) conditions • Subsurface drainage has not been maintained • Dike is in poor condition, leading to increased potential for freshet flooding of Fraser River • Lack of signage indicating that farming is occurring on the Island • No local consensus regarding agri-tourism
Opportunities	**Threats**
• Central location to potential markets • Possible location for niche market products • Small-scale agri-tourism is possible, based on current popularity of biking around the island • Climate change is projected to increase length of growing season in coming decades • Potential opportunities with MV for long-term leases including term extensions of the two existing multi-year farming agreements • Potential for partnerships with universities, schools, not-for-profit societies • Isolation minimizes urban:rural conflicts • Investment in drainage infrastructure (subsurface drainage is also valuable for subsurface irrigation) • Unique character (rural island within a city) • Isolation presents an opportunity for organic agriculture	• Reliance on Provincial agencies to control ferry access • Farm labour shortages • Noxious weeds and invasive species proliferating on derelict/abandoned properties • Climate Change impact - potential for increased severe rain events leading to temporary flooding • Very little private land for sale • Aging farmers • No natural gas leads to high energy costs for farms • Irrigation and livestock water may be high in iron • No investments in agriculture infrastructure

4.2 Agricultural Feasibility Assessment

Based on the agricultural capability and climate of Barnston Island, the ability to accommodate a diverse base of agricultural activities is assessed (crops are assessed in Table 4 and livestock is assessed in Table 5). Major limiting factors include the lack of long term leases or land ownership by farmers, challenges associated with the ferry capacity, and seasonal high water tables. Drainage is a common problem in agricultural areas of Coastal BC, and many communities deal with this issue by developing and implementing drainage programs. It is therefore assumed that some basic infrastructure, such as drainage, may be required in order for any new agricultural endeavours to succeed. Other considerations include whether or not crops are perennials, or are tolerant to high water tables. In addition, products that can be sold dry, or as a value-added, are also recommended. Livestock are already common on Barnston Island. However, adding intensive poultry, hog, or cattle operations is not recommended, although Barnston Island could be a source of forage for off-island livestock farms. This is partly because of the ferry's ability to load large livestock trucks, but also because the amount of manure that a high concentration of animals would produce would be difficult to manage on the island over the long term.

In order to develop a viable agricultural business on Barnston Island, a certain amount of capital investment will be required. This would be the case for any farming operation in any location, in order to build a business and remain competitive in today's market. This speaks again to the benefit of long term leasing and ownership for farmers. Incorporating some amount of value-added products and direct farm sales will make the operation more economically competitive as well.

Tables 4 and 5 provide an overview of potential crop and livestock production scenarios that could be viable for most land on Barnston Island and describes the strengths & opportunities as well as weaknesses & threats associated with each, relative cost of start-up for a new business, and the relative return on investment. The suitability ranking of High, Medium, or Low is provided based on the factors outlined above.

Table 4. Crop feasibility assessment for Barnston Island.

Crop		Strengths and Opportunities	Weaknesses and Threats	Relative Cost of Start-Up	Relative Return on Investment	Suitability Ranking
	Forage, hay, grass	It is known that hay crops do very well on the island, with up to 4 cuttings per year. There is a need both on and off-island for good quality hay.	Equipment is becoming larger and heavier, becomes a challenge when transporting equipment and hay on the ferry.	Low	Low-Medium	High
	Root Vegetables (potato, onion, carrot, radish, beets)	Soil and climate are well suited to vegetable crops, and potatoes have been historically cultivated on the island. If small and medium scale, then no big machinery will be required.	Drainage and irrigation will be required. Some crop loss due to seasonal flooding may occur. Annual soil fertility testing and nutrient program is recommended.	Medium-Low	Medium - High	High
	Green vegetables (Lettuce, celery, cabbage, broccoli, spinach, herbs, bok choy, Asian vegetables)	Soil and climate are well suited to growing greens. If the threat of flooding is of concern, the crops can be grown in raised beds, or in hoophouses on elevated areas. This is a fairly easy crop to transport off island and no big machinery is required.	Drainage and irrigation will be required. Some crop loss due to seasonal flooding may occur.	Medium-Low	Medium - High	High

Crop		Strengths and Opportunities	Weaknesses and Threats	Relative Cost of Start-Up	Relative Return on Investment	Suitability Ranking
	Cranberries	Production of cranberries has a successful track record on the island.	Requires large tracts of land and secure access to water. Would require long term lease or land ownership. Requires specialized equipment. Labour needs are high during harvest. Not possible to do farm gate sales and the producer does not have price control.	High	Medium - High	High
	Strawberries	The climate is well suited to strawberry production. If the threat of flooding is of concern, the strawberry plants can be grown in raised beds, or in hoophouses on elevated areas. This is a fairly easy crop to transport off island and no big machinery is required.	May require some expertise in Integrated Pest Management, access to extension resources, in order to achieve the best possible yields. May require netting or other bird deterrents.	Medium	Medium	High
	Vine vegetables: Tomatoes, sweet peppers, cucumbers	Hoophouses will allow for better daytime high temperatures.	These vine vegetables but they are highly susceptible to frost. Will need to sell at the farm gate or at a farmers market in order to fetch the best possible price returns.	Low-Medium	Medium - High	High

Crop		Strengths and Opportunities	Weaknesses and Threats	Relative Cost of Start-Up	Relative Return on Investment	Suitability Ranking
	Currants, gooseberries, blackberries	Connections to traditional foods, opportunities to develop value-added products (e.g. juices, jams).	Currant bushes will need irrigation to become established. Drainage would also be needed.	Medium - Low	Medium	High
	Lavender	There are many marketable uses for the end product, and it can be sold dried, which facilitates ferry transportation. There are many tried and tested varieties of lavender to choose from, including those that do well in wet soils.	Would require long term lease or land ownership. Drainage is a must as lavender is a perennial plan, so investment may be somewhat risky. Irrigation may be required. Pests such as insects and birds may require mitigation.	Medium	High	High
	Specialty mushroom	Niche market, may be easy to dry and transport off the island to other markets. Ferry access improvements would allow for more intensive mushroom production.	Would require long term lease or land ownership. Establishment may take time. Production and harvesting is typically staggered over a 4-6 year cycle.	Medium low	High	High

Crop		Strengths and Opportunities	Weaknesses and Threats	Relative Cost of Start-Up	Relative Return on Investment	Suitability Ranking
	Field flowers	Flowers could be a beautiful addition to the area, and would likely sell well locally or at a farmers market. Sunflowers, tulips, or other popular varieties could be sold at the farm gate.	Perennial bulbs should be grown in a small area as a test before a large investment is made. High water tables may result in poor yields or disease. Drainage and irrigation may be required. Pests such as insects and birds may require mitigation.	Medium	Medium	Medium
	Blueberries	The soils found in Richmond and Surrey are similar to Barnston soils and are known to be able to produce blueberries.	Would require long term lease or land ownership. Intensive site preparation may be required. This may include wood chips for the bushes to root in. Perennials, therefore drainage will be required.	Medium-High	Medium - High	Medium
	Fruit and nut trees	Heritage fruit trees can be found on the island.	May be susceptible to fungal pressure. Nut production requires processing facilities. Pollinators will be required and pests such as birds may require netting or other deterrents. Would require long term lease or land ownership.	High	High to Very High	Medium

Crop		Strengths and Opportunities	Weaknesses and Threats	Relative Cost of Start-Up	Relative Return on Investment	Suitability Ranking
	Cereal grains	Based on the success of hay crops, cereals present another opportunity. The local craft beer market could be interested in barley.	Requires deep water table. May require investment in combines, tractors, and other large equipment. Ferry capacity will likely be an impediment.	Medium-Low	Medium - Low	Medium
	Pumpkins, zucchini, squash, melon	Squash are well suited to this climate, and melons could do well too. A pumpkin patch could be a good tourist attraction.	Not clear if all famers are supportive of a tourist-based crop attraction.	Medium-Low	Medium	Medium
	Corn	Corn and hay rotations are commonly planted around the Lower Mainland and the Fraser Valley. Corn is often grown for livestock consumption. A corn maze could be a good tourist attraction.	Corn requires a deep water table, therefore drainage would be required. May require large, heavy farm equipment.	Medium-Low	Medium - Low	Medium

Crop		Strengths and Opportunities	Weaknesses and Threats	Relative Cost of Start-Up	Relative Return on Investment	Suitability Ranking
	Cannabis	Market is somewhat volatile but demand for the crop is expected to be strong over the long term. Isolated nature of the island may provide a good location in terms of security.	Requires Health Canada license, which can take a long time to obtain, intense security requirements, possible odour control issues. Mixed support from island residents. Would require long term lease or land ownership.	High	High	Medium
	Hops	Lots of information on how to grow hops is widely available. Strong demand from the local craft beer market for hops. Can be sold fresh (wet) or dry, which may facilitate movement of the product by ferry.	Requires deep soils for rooting. Prone to fungal diseases. Establishment may be costly, with trellising required. Drainage will be needed. Can be labour-intensive during the harvest season. Would require long term lease or land ownership.	High	High	Low

Table 5. Livestock feasibility assessment for Barnston Island.

Livestock and Poultry		Strengths and Opportunities	Weaknesses and Threats	Relative Cost of Start-Up	Relative Return on Investment	Suitability Ranking
	Honey bees	Will benefit agricultural and non-agricultural plants through increased presence of pollinators. Local sales of honey could be done at the farm gate, or in the Lower Mainland. Product is easy to ship by ferry.	May require some expertise in honeybee management, may need electric fencing. Bees can be susceptible to disease and hive die-offs.	Medium low	Medium	High
	Poultry (small to medium scale, free range)	Eggs, particularly organic eggs, sell well at the farm gate.	Coops, shelters, fencing, drinking water, and heating will all need to be considered. Will require transportation for abattoir. May require more visitors to the island for farm gate sales, unless the eggs are transported off-island for sales.	Medium	Medium	High
	Sheep and goats (small to medium sized flock)	There are already some small scale sheep and goat operators on the island, therefore the knowledge base already exists.	Barns, drinking water, and heating for shelters will all need to be considered. Sheep and goats will require grass, hay, alfalfa, or other forage crops for grazing.	Medium low	Medium - Low	High

Livestock and Poultry		Strengths and Opportunities	Weaknesses and Threats	Relative Cost of Start-Up	Relative Return on Investment	Suitability Ranking
	Dairy cows	There is a strong tradition of dairy production on the island. There is an opportunity to establish a small dairy processing facility. For example, Qualicum Cheeseworks on Vancouver Island processes all of the milk produced on the farm into cheese. There is an opportunity to focus on quality over quantity, as Avalon Dairy has done.	Approximately 25 acres of grass/hay production is typically required for an average herd of dairy cattle. This provides food for the animals and adequate land for manure application. Quota system may need to be purchased for new dairy production and all raw milk will need to be shipped off the island for processing.	High	Medium - High	High
	Beef cattle	There are several producers raising cattle on the island already. There is ample hay produced on the island to feed the cattle. An opportunity exists to move towards exotic or niche breeds to increase value.	Land required for forage. Must be shipped off island for finishing and abattoir.	Medium	Low	High
	Llamas, alpacas	These animals can help to keep predators away from livestock. Opportunity to produce fibre.	Fencing, barns, drinking water, and shelters will all need to be considered.	Medium	Low	High

4.3 Sample Farm Business Scenarios

While many crops were determined to be highly feasible for Barnston Island, the following three scenarios were selected for crops that are both highly feasible and also would not require extensive reliance on the small ferry for bringing in inputs or making product deliveries. For the purposes of these business plan scenarios, the cost of land is not included as a capital investment. This is because the plans are developed to be suited to land that is either owned or leased. Land ownership requires (and provides) a level of long term investment that is not captured through leasing. All scenarios would all require mild to moderate investments in infrastructure, including drainage, agricultural buildings, and site improvements. In other words, these crops were chosen as the most suitable to Barnston Island given current conditions. The crops selected are:

- Lavender
- Specialty mushrooms
- Strawberries

The scenarios as presented are high level, but attempt to take into consideration all of the specific issues relative to Barnston Island. It should be noted that these are presented for information only, and anyone wishing to start a new agricultural operation on Barnston Island should undertake a full and detailed business planning exercise. Crop business planning templates (or "enterprise budgets") are available for a wide variety of crops, with a focus on BC growing conditions. These include the BC Ministry of Agriculture resources[45] and Kwantlen Polytechnic University templates[46].

4.3.1 Scenario 1 – Lavender Production

Under this scenario, 10 acres of lavender are planted and cultivated for a variety of end uses, such as floriculture, essential oils, soaps, and culinary lavender. Of the 52 parcels of land on Barnston Island, 31 are over 10 acres in size. This business plan can be scaled up or down to suit parcels of different sizes.

Lavender Capital Investments/Inputs

Capital investment estimates capture one-time costs and do not include the purchase or leasing of land, ongoing equipment maintenance, labour, or plant fertilizer needs (Table 6). Lavender is a perennial plant and would require some moderate site preparation, including drainage.

Table 6. Capital investments for lavender production.

Item	Cost	Note
Equipment & machinery	$100,000	Includes a small tractor.
Site preparation and surface drainage	$80,000	Ditch clearing, some new surface drainage and connection to existing culverts
Lavender plants	$75,000	2,500 plants per acre at $3 per plant over 10 acres
Irrigation	$20,000	Infrastructure for drip irrigation.
Soil amendments - start-up	$8,000	Includes compost
Certifications and permits	$2,000	
Pest deterrents, nets, supports	$5,000	
Total	**$290,000**	

[45] BC Ministry of Agriculture, 2013-2015. Enterprise budgets for various crop and livestock production scenarios.
[46] Kwantlen Polytechnic University, 2016. Agricultural Enterprise Budgets.

Lavender Potential Profits and Losses

The assumptions used when calculating the potential revenues (Table 7) for lavender include:

- Economies of scale suggest a minimum of 5 acres. For this exercise a 10 acre planting is used, but the plan can be scaled up or down to better suit the results of a market opportunities analysis.
- Lavender plants will require 5 years to reach peak harvest, but some harvest will be possible after year 1. The figures provided are for an average harvest over a 15 year lifespan of the plant.
- Lavender plants cost approximately $3 each and 2,500 plants can be established per acre.
- Many value-added products can be produced with lavender, including dried lavender sachets, essential oils, and edibles. For simplicity the net revenues are calculated on the primary lavender plant sales only. Therefore actual revenues may be higher.
- Part-time labour is calculated at $15 hourly.

Table 7. Profits and losses for lavender production.

Proposed area (acres)	10
Number of plants per acre	2,500
Average yield (bundle) per plant per year	2
Total bundles/year	50,000

				Qty (bundles)	Price/ bundle	Value
Revenue						
				50,000	$5	$250,000
Gross Revenue						**$250,000**
Direct Costs		per acre	acres	Units	Price/unit	Cost
	Compost (yd3)	25	10	250	$30	$7,500
General Costs						
	Fuel (L)	55	10	550	$1.4	$770
	Repairs & Maintenance	1	10	10	$125	$1,250
	Integrated Pest Mgmt	1	10	10	$300	$3,000
	Hives for pollinators	3	10	30	$65	$1,950
Transportation	Truck deliveries	3	10	30	$80	$2,400
	Driver fees	3	10	30	$36	$1,080
	Fuel	20	10	200	$5	$1,000
Labour	Machine labour (per hr)	24	10	240	$15	$3,600
	Harvesting (hrs)	200	10	2,000	$15	$30,000
Total costs						**$52,550**
Total Net Revenue						**$197,450**

4.3.2 Scenario 2 – Specialty Mushroom Production

Under this scenario, logs are inoculated with the spores of specialty mushrooms (e.g. shiitake). These mushrooms can be cultivated in a staggered manner over time so that there is an ample harvest every year. The products can be dried and relatively easily shipped. The scenario requires relatively little oversight once established, and could be a good choice for those who also maintain work off of the farm.

Specialty Mushroom Capital Investments/Inputs

Capital investment estimates capture one-time costs and do not include land purchase or leasing, ongoing equipment maintenance, and/or labour expenses (Table 8).

Table 8. Capital investment estimates for specialty mushrooms.

Capital Investments	Cost	Note
Food safety certifications, permits	$1,000	
Small tools and equipment	$7,000	Includes hand tools
Pest deterrents, nets, supports	$5,000	Netting to keep birds off of logs
Mushroom Inoculations logs	$1,500	$2/log for mushroom production. Could be reduced if hardwood found on the property.
Mushroom spawn	$1,500	
Mushroom equipment	$4,000	Wax, drills, stop collars, soak tank, scales, etc
Total	**$20,000**	

Specialty Mushroom Potential Profits and Losses

These revenues (Table 9) have been calculated based on the following assumptions:

- The mushroom production will involve approximately 600 nurse logs. These 600 logs are to be inoculated on a staggered basis, over 4 year period. By year 4 all 600 logs are in production and then the rotation begins again.
- Net revenue estimates do not include repayments of capital investment costs.

Table 9. Profits and losses for specialty mushroom production.

Shiitake Mushroom Production[47]– Annual Estimates						
Proposed production (logs/acre)		600				
Expected yield per acre (lbs)		1,200				
Expected yield per log (lbs)		2				
		% market	Qty (lbs)	Price/lb (fresh)		Value
Revenue	Direct market	100	1,200	$16		$19,200
Total Gross Revenue						**$19,200**
Expenses		Units/log area	Log areas	units	cost/unit	Cost
	Fuel (L) or electricity	10	30	300	$1	$300
	Disease control	1	15	15	$30	$450
	Harvesting	10	15	150	$15	$2,250
	Packaging			500	$1	$500
Total costs						**$3,500**
Total Net Revenue						**$15,700**

4.3.3 Scenario 3 – Strawberry Production in Polyhouses

In this scenario strawberries are cultivated in three 5,000 sqft polyhouses for a total of 15,000 sqft. It would require level ground within the dike system.

Strawberry Capital Investments/Inputs

This scenario requires some basic infrastructure (Table 9), including $30,000 for polyhouses and a conservative estimation of $10,000 of land grading (this may be lower depending in the site selection).

Table 10. Capital investment estimates for strawberry production.

Capital Investments	Cost	Note
Polyhouses	$30,000	Includes 3 x 5,000 sqft polyhouses
Site grading and preparation	$10,000	Grading and debris removal, general clean up
Soil amendments, mulch, compost	$10,000	Includes soil and compost for berry bedding
Utility hookups and upgrades	$8,000	This is an estimate. The cost may be lower.
Wash station	$7,000	For washing produce prior to sale
Small tools	$6,000	Includes hand tools
Irrigation infrastructure	$4,000	Hoses, drip irrigation
Integrated Pest Management	$3,000	For pest and disease control
Certifications and permits	$2,000	
Berry plants	$1,000	
Total	**$81,000**	

[47] The yield numbers and income estimates for mushrooms provided in this scenario are based on shiitake production. Pricing is based on fresh wet weight of mushrooms, however potential also exists to dry the mushrooms, which will increase shelf life and may improve product value.

Strawberry Production Potential Profits and Losses

This scenario assumes that the strawberries will be sold at the farm gate and/or at farmers markets (direct sale) (Table 10). Additional revenues could be obtained from value-added sales (e.g. jams).

Table 11. Profits and losses for strawberry production.

Strawberry Production – Annual Estimates				
Area (Square Feet)	15,000			
Yield (lbs)	24,000			
Revenues	% market	Yield (lbs)	Price ($/lbs)	Revenue
Direct Market	100%	24,000	$5	$120,000
Total Gross Revenue				**$120,000**
Direct Expenses	units/site	Total units	Price ($/unit)	Expense
Planting				
Site Preparation (hrs)	16	16	$15	$240
Compost (yd3)	20	20	$55	$1,100
Planting labour (hrs)	100	100	$15	$1,500
Maintenance				
Fuel (Tilling in L)	45	45	$1.6	$72
Repairs & Maintenance	10	10	$60	$600
Bird/animal control	20	20	$60	$1,200
Weeding/watering labour (hrs)	1000	1000	$15	$15,000
Harvesting				
Trucking (per load)	36	36	$60	$2,160
Harvesting (hrs)	300	300	$15	$4,500
Packaging (cartons)	1,200	1,200	$0.15	$180
Total expenses				**$26,552**
Net Revenue				**$93,448**

4.4 Comparison of the Three Production Scenarios

It is useful to compare the estimated start-up costs, profits, and losses from each scenario (Table 12). Start-up costs are much higher for lavender, but the associated revenues are also higher. Mushrooms have lower estimated net revenues, however the number of logs could easily be scaled up and the crop requires minimal attention. Each scenario is economically viable in that a profit is expected within the first five years of operation. A portion of the net revenue could be viewed as the "income" for the farmer or it could also be returned to the capital inputs to help pay down any initial debts. However, it is important to note that the cost of land and existing improvements (buildings) are not included in the calculation of capital inputs. This is because a range of tenure options are possible, of which fee simple purchase and ownership is only one option. These examples demonstrate the importance of long term land tenure to recoup the infrastructure investments necessary for profitable farms.

Table 12. Summary of capital inputs, operational costs, and potential revenues.

Scenario	Land Area	Capital Inputs (Start Up)	Operating Costs (Annual)	Gross Revenue (Annual)	Net Revenue (Gross – Operating)
1: Lavender	10 acres	$290,000	$52,550	$250,000	$197,450
2: Mushrooms	1 acre	$20,000	$3,500	$19,200	$15,700
3: Strawberries	15,000 sqft (polyhouse)	$81,000	$26,552	$120,000	$93,448

4.5 Direct Farm Marketing

The prices included in the production scenarios in the above discussion are predicated on direct farm sales. This means that the product would not be sold wholesale or going through an intermediary and the farmer would benefit from the full return of the price point. Direct sales are popular with both producers and consumers. Producers retain the largest proportion of revenues by selling directly to customers, thereby effectively eliminating the middle man. Conversely, customers enjoy the opportunity to purchase directly from farmers in order to get a better understanding of how their food is grown.

However, relying on direct sales could require more interactions between producers and island visitors (tourists) unless farmers choose to bring their items off-island for sale. It is clear that not all current residents are fully supportive of the potential to open up Barnston Island to increased agri-tourism-based activities. This is in part due to concerns about lack of parking for visitors, lack of public washrooms and garbage facilities, increased wait times at the ferry, and increased potential for trespass.

Fortunately, several examples of off-island direct market opportunities exist. A Community Supported Agriculture (CSA) program is one such opportunity. Several Barnston Island producers could collaborate to offer a CSA program. A CSA is a pre-arranged agreement between a farmer (or group of farmers) and a specific number of people to purchase a box of produce (or products) from the farm(s) on a set schedule. The customer essentially pre-purchases a share of the harvest. A big difference between CSAs and other direct marketing methods is that the customers pay for a season of produce at the beginning of the season. While this provides guaranteed cash-flow, it also puts pressure on the farm enterprise to deliver the farm products in a timely manner. The farm(s) involved in the CSA would be responsible for aggregating and packing weekly boxes of produce and either bringing them to a collective meet-up point for the customers, or have the customers come and pick up the box directly from the farm.

The other popular method for direct sales is through farmers markets. There are several markets in nearby Surrey and Langley that could be accessed by Barnston Island producers. One vegetable producer had success selling produce at the Cloverdale Farmers Market, where her items would regularly sell out[48]. Vancouver farmers markets are further away but may offer a higher price point. The island ferry would need to be negotiated at an early time in the morning in order to arrive at the market in good time to set up a vendors stall. Other unexplored opportunities include developing a market or farm stand in the parking lot across from Parsons Channel and the delivery of supplies and distribution of farm products by barge.

Conversely, wholesale presents another opportunity for producers. While the price point for wholesale retail is lower than direct markets it can represent a fairly simple transaction for producers and less face-to-face time with customers. These may be desirable attributes for some producers.

5.0 Potential Partnerships

There is the potential for several types of partnerships to emerge if new agricultural endeavours are initiated on Barnston Island. They are all described here. At this point, no commitments have been made by either Metro Vancouver or the listed potential partners. Therefore, further communication with each group would be required if any collaborations were to be undertaken in the future.

5.1 Katzie First Nation

Government to government outreach was conducted for this project by way of email, phone, and invitation to community stakeholder events. At the time of writing, there had not been a reply received from Chief and Council, however a conversation was held with the Katzie Traditional Resource Specialist. Members of Katzie First Nation are involved with several food-related initiatives on the island. There is an active harvesting and foraging presence, with stinging nettle being of particular interest[49]. Preliminary discussion with the Traditional Resource Specialist suggest that infrastructure to support a community garden would be welcomed. There is also a project involving support for developing barn owl habitat (e.g. nesting boxes) on the island that could be coordinated to include sites on Barnston Island farms. At an open house held on the island to present the draft Study, Katzie members in attendance indicated interest in future work towards a drainage study for the island.

5.2 BC Ministry of Agriculture

There are many business advisory resources available to farmers through the BC Ministry of Agriculture. These include:

- BC Indigenous Agriculture Program, which supports Indigenous agriculture ventures through the delivery of planning programs, knowledge transfer events and linkages to information resources and supports. The newly launched B.C. Indigenous Agriculture Planning Program[50] is available for First Nations and Indigenous economic development organizations to assess agricultural opportunities as well as provide more in depth business planning and capacity to work towards those opportunities.
- BuyBC Partnership Program provides up to $2M in funding per year over the next three years to increase the competitiveness of B.C.'s agrifood and seafood industry in the domestic market. The Program includes both cost-shared funding as well as Buy BC logo licensing.

[48] Laurie Stackl, personal communication, November 2018.
[49] Roma Leon, personal communication, December 2018.
[50] For more information contact: Erica Nitchie, 250-241-0973 erica.nitchie@gov.bc.ca or visit the program website.

- BC Land Matching Program provides land matching and business support services to new farmers looking for land to farm as well as landowners interested in finding someone to farm their land.
- BC Agri-Business Advisory Program to enable B.C. producers and processors to make more informed decisions and strengthen their business.
- Canada-BC Agri-Innovation Program provides cost-shared funding to support promising new products, practices, processes and technologies that have the potential to generate a benefit to the agriculture sector.

5.3 Academic Institutions and Non-Governmental Organizations

Initial outreach to the representatives from academic institutions and non-governmental organizations suggests a high level of interest in partnering with Metro Vancouver and/or other Barnston Island landowners on shared food and farming initiatives. While no commitments have been made at this juncture, the Table 13 provides a list of potential projects and associated collaborators. This list would need to be informed by additional outreach and coordination with potential partners before any initiatives get underway.

Table 13. Potential projects and partnerships on Barnston Island.

Project	Partner(s)
Land access for practicum program alumni	University of British Columbia (UBC), Kwantlen Polytechnic University (KPU)
Connections with Katzie for indigenous food systems research	Katzie First Nation, UBC
Seed trials and seed harvesting to improve Canadian seed security	FarmFolk/CityFolk, University of the Fraser Valley (UFV)
Crop trials to test varieties of crops that are tolerant to soils with high water tables	UBC, UFV, KPU
Alternative farm tenure arrangements and farmland trusts	FarmFolk/CityFolk, Young Agrarians
Incubator farming and land linking	Young Agrarians
Experiments in shared infrastructure arrangements	KPU

6.0 Policy Context

This section summarizes some of the more influential regional policies and regulations influencing agriculture on Barnston Island. A more complete list of Federal and Provincial initiatives and policies is provided in the

Appendix and a full discussion is provided in Deborah Curran's Agricultural Legal & Policy Scan (2009)[51].

The manner in which agriculture is considered at the policy level is through the *Local Government Act* (LGA), Metro Vancouver Regional Growth Strategy (RGS), and the Official Community Plan (OCP) of the Electoral Area A. These documents are critical to the way in which local governments can support local food production and increase farm viability. Both the RGS and OCP provide long-term visions and strategies for future land use, development, and servicing, among other areas regulated by the LGA. The zoning bylaw regulates and permits uses within these land uses, or zones, representing current land use. Both the OCP and the zoning bylaw are described in greater detail below. Other policies and plans related to agriculture on Barnston island are also described below.

6.1 Metro Vancouver 2040: Shaping our Future, Regional Growth Strategy

The Metro Vancouver 2040 – Shaping our Future, *Regional Growth Strategy* (Bylaw 1136) was adopted in 2011 and updated in 2017. Strategies within the RGS that support the overall goal of the Barnston Island Agricultural Plan include:

- Goal 2: Support a Sustainable Economy
    - Strategy 2.3: Protect the supply of agricultural land and promote agricultural viability with an emphasis on food production
    - Strategy 2.3.3: [Metro Vancouver], In collaboration with the province and the Agricultural Land Commission, identify and pursue strategies and actions to increase actively farmed agricultural land, emphasize food production, reduce barriers to the economic viability of agricultural activities, ensure the management of farmlands is in concert with groundwater resources, and minimize conflicts among agricultural, recreation and conservation, and urban activities.

The agricultural land use designation in the RGS is defined as: Agricultural areas are intended primarily for agricultural uses, facilities and supporting services with an emphasis on food production where appropriate. These areas reinforce provincial and local objectives to protect the agricultural land base of the region.

6.2 Metro Vancouver's Regional Food System Strategy

Metro Vancouver completed a Regional Food System Strategy in 2011[52]. There are goals within the Food system strategies that support farming on Barnston Island. Goals and strategies include:

- Goal 1: Increased capacity to produce food close to home
    - Strategy 1.1: Protect agricultural land for food production
    - Strategy 1.3: Enable expansion of agricultural production
    - Strategy 1.4: Invest in a new generation of food producers

Sample actions for Goal #1 that Metro Vancouver can do include: Establish a small number of incubator farms on Metro Vancouver lands to provide new farmers with a site to start their business.

- Goal 2: Improve the Financial Viability of the Food Sector
    - Strategy 2.1: Increase the capacity to process, warehouse and distribute local foods
    - Strategy 2.2: Include local foods in the purchasing policies of large public institutions
    - Strategy 2.3: Increase direct marketing opportunities for local foods

[51] Curran, D. 2009. Capital Regional District Agricultural Legal & Policy Scan.
[52] Metro Vancouver, 2011. Regional Food System Strategy

Sample actions for Goal #2 that Metro Vancouver can do include*:* Commit to buying more local food.

- Goal 5: A Food System Consistent with Ecological Health
    - Strategy 5.1: Protect and Enhance Ecosystem Goods and Services
    - Strategy 5.3: Facilitate adoption of environmentally sustainable practices
    - Strategy 5.4: Prepare for the impacts of climate change

6.3 Metro Vancouver's Regional Food System Action Plan

The Regional Food System Action Plan, adopted in 2016, is the implementation plan for the Regional Food System Strategy[53]. The Action Plan advances implementation of the Regional Food System Strategy by identifying actions local governments are planning to undertake in the next 3-5 years and to identify several new strategic and collaborative actions that local governments can undertake together to advance efforts toward a resilient and sustainable food system in Metro Vancouver. There are actions recommended in the Action Plan that support the recommendations of the Agricultural Area Plan for Barnston Island. Specifically, the Action Plan promotes that Metro Vancouver and municipalities:

- Advocate for the preservation and enhancement of the ALR for food production
- Advocate for provincial and federal funding to support irrigation and drainage infrastructure necessary to maintain and expand food production in the ALR, especially in the face of climate change;
- Support the ability of new farmers to access land and start a farm business
- Expand municipal involvement in programs that enable new farmers to start a business such as Surrey's Virtual Incubator Farm Project Online system
- Investigate the feasibility and desirability of a regional land trust to increase access to agricultural land
- Collectively advocate to senior governments for funding programs to expand investments in irrigation and drainage infrastructure necessary to adapt to climate change
- Convene bulk food purchasers to explore how to increase local food purchasing

6.4 Metro Vancouver Electoral Area A OCP (Bylaw 1250) and Zoning

The first Electoral Area A OCP was completed in 2018. It identifies many policies and actions that align with and support the Barnston Island agriculture[54]. Land-use designation of Agriculture in the OCP states that "Uses shall be consistent with the Agricultural Land Commission Act, Agricultural Land Reserve Use, Subdivision and Procedure Regulation, and any Orders of the Agricultural Land Commission regulation. Supported uses include farming, accessory agri-tourism and dike servicing uses." The following are the most relevant policies and actions to agriculture on Barnston Island.

Relevant Electoral Area "A" OCP Policies and Actions:

5.2: Manage Land Development to Maintain Rural Character

- *43. Agriculture:* Protect the island as part of the ALR and work with the ALC, the Ministry of Agriculture, agricultural industry representatives, and other agencies to complete a comprehensive study on how to improve the viability and potential of agriculture on Barnston Island.
- *44. Subdivision:* Subdivision of agricultural land is not supported in accordance with the Agricultural Land Commission (ALC) Act and the Agricultural Land Reserve Use, Subdivision and Procedure Regulation B.C. Reg. 171/2002 (ALR Regulation). Subdivision of these lots for residential development

[53] Metro Vancouver, 2016. Regional Food System Action Plan
[54] Electoral Area A Official Community Plan, 2017

is not supported.

- *48. Tourism/visitors:* Consider ways to encourage limited agricultural tourism in accordance with the Agricultural Land Commission Act and Agricultural Land Reserve Use, Subdivision and Procedure Regulation, and any Orders of the Agricultural Land Commission and ensure that visitors to the Island do not negatively impact the operations of the agricultural community. Also consider signage for recreational users to respect farmland and farming activities.

5.4. Ensure Safety for Residents and Property

- *20. Dike:* Coordinate with the Diking Commission and the Province to maintain the dike and manage acceptable levels of risk to properties in the context of floods and sea level rise. In recognition of ongoing erosion along parts of the Island, investigate stockpiling riprap for emergency bank protection (subject to ALC and other agency approvals, as required) and encourage the Province to implement other recommendations from the 2012 Barnston Island Dike Assessment.
- *22. Ferry safety:* Work with the Ministry of Transportation and Infrastructure to improve safety on the island for loading and unloading the ferry, particularly through improving night-time visibility and implementing an "on-off ferry" that does not require vehicles to back on/off.
- *23. Flooding*: Establish a flood construction level and adaptive construction approaches to flooding.

5.5 Manage Access

- *11. Island access*: Work with the Ministry of Transportation and Infrastructure to improve access, including improving the roads and intersections leading to the Island. The intent is to allow access for residents, including the Katzie First Nation, convenient access for deliveries on and off Island to support both residents and agriculture, move required farm and construction equipment, secure access in case of medical and other emergencies, and increase safety. Work with CN Rail to minimize rail crossing wait times at the 104 Avenue and
- *12. Parking:* Encourage the Ministry of Transportation and Infrastructure to enforce the 'no parking' signs on the Island to keep Dyke Road clear for active agricultural uses, particularly around the two regional park areas

Barnston Island agricultural areas are zoned BI-1 in the Electoral Area A OCP and Zoning Bylaw 1144 and 1231[55]. The minimum lot size allowed under the BI-1 zone is 20 hectares. The parcels zoned BI-1 are within the ALR. The purpose of the BI-1 zone is to accommodate agricultural operations and related activities located on parcels that are typical within the ALR. Principal Uses, Buildings and Structures within the BI-1 zone include:

a) Agricultural
b) Single Residential Dwelling
c) Agri-tourism

6.5 Electoral Area A Emergency Management Plan and Considerations

The Electoral Area A Emergency Management Plan guides the operations, organization, responsibilities, and coordination necessary to provide for effective response to emergencies or disasters in Metro Vancouver Regional District Electoral Area A, inclusive of Barnston Island[56]. The Emergency Management Plan and the accompanying Barnston Island Flood Plan are the two guiding documents for responding and managing emergencies in Barnston Island.

[55] Metro Vancouver, 2016. Electoral Area A Zoning Bylaw, 2016.
[56] Metro Vancouver, 2018. Electoral Area A Emergency Management Plan, 2018.

Emergency preparedness is an important consideration for residents and farmers of Barnston Island. High water levels of the Fraser River during the spring freshet (late May through late June) increase risk of significant flooding on Barnston Island. As outlined in the Emergency Plans[57] [58]:

- Residents of the island are expected to mitigate, prepare, respond and recover their own personal safety and property.
- Residents and farmers who own livestock are responsible for disposal and/or transport off the island, if necessary.
- When a Flood Alert (Evacuation Alert) is issued by Metro Vancouver Regional District for Barnston Island it means the residents are not required to leave at this time but are advised to prepare for the possibility of an Flood Order (Evacuation Order).
- When the Evacuation Alert is issued, Metro Vancouver advises owners of large pets and livestock to relocate the animals to a safe area immediately, and farmers would qualify for relocation compensation.
- When the Evacuation Order is issued the remaining people on the island are ordered to evacuate. No large animals are allowed on the Barnston Ferry until all people have been evacuated safely, after an Evacuation Order is issued.

Livestock farmers should have an emergency preparedness plan for their livestock to evacuate their animals and for temporary relocation. Government relocation policy indicates that it is the responsibility of the producer to protect their assets and livestock. Farmers may want to consider preventative actions to mitigate flood impacts, for example proper drainage ditch maintenance. It would also be prudent to have supplies to protect property from damage, for example sand bags. Emergency Farm Plan Templates are available for farmers to use, including a template for an Emergency Livestock Relocation and Management Plan created for the Cowichan region, created in partnership with the local government, provincial and federal governments[59].

BC Ministry of Agriculture has produced several guidebooks and templates to assist farmers with Evacuation Planning, which are all available for download from their Emergency Management webpage and Livestock Relocation webpage. Resources include:

- Emergency Management Guide for BC Small Mixed Farms
- BC Pork Emergency Guide
- Beef Emergency Guide
- Dairy Emergency Guide
- Poultry Emergency Guide

There are also several resources available from the province regarding Flood Preparedness, including tips specific to flood plains, well disinfection, and flood forecasting. Other potential emergencies that could impact agriculture are power outages, severe storms and fires. There are no fire services provided on the island except for five fire hydrants located on the Katzie First Nation Reserve and fires on the reserve may be responded to by the Surrey Fire service under an agreement[60]. Fire trucks may use water from river or ditches if necessary. Farmers should be prepared with fire prevention and response measures and can request information from Metro Vancouver about the FireSmart Program. Farmers may also want to consider the preparedness measure of a generator to provide some power to crucial farm systems in the case of a power outage.

7.0 Recommended Actions

[57] Ibid.
[58] Barnston Island Flood Plan, Electoral Area A Emergency Plan, Appendix J, 2018.
[59] Climate Action Initiative, Cowichan Livestock and Relocation Management Plan
[60] Electoral Area A Emergency Plan

Some of the most persistent challenges to expanding agricultural production include infrastructure improvements that are outside of the purview of Metro Vancouver, such as access to the Island and highway interchange design. However, there are several potential actions to improve agricultural viability on Barnston Island. They are listed below, in no particular order, with the recommendation that Metro Vancouver could play a leadership role in implementation. It is also acknowledged that implementation would require further decision-making authority and the adequate allocation of funds. The recommendations are therefore presented here for information, discussion, and consideration of further steps.

Recommendation #1: Continue to Work with the Province towards Improved Ferry Service and Road Safety

Action: Based on the input received from stakeholders, Metro Vancouver should continue to work with the Province to advocate for improvements to the ferry service and for better road safety. Specific requests to accommodate agriculture include:

- Increased space for vehicle number capacity and reduce wait times (currently 5 to 6 vehicles and 52 passengers);
- Increased gross vehicle weight capacity, including loading ramp capacity to enable 50 ton trucks;
- Priority loading system for commercial vehicles and local residents;
- Improved safety by allowing drive on, drive off usage capability (eliminating the need to back on and back off); and
- 24 hour per day service.

Metro Vancouver could pursue the following issues with MOTI regarding road infrastructure:

- Improved lighting and signage at the CN Rail crossing and 104th Ave.;
- Increased number of pull offs from the dike road to reduce farm equipment conflicts with pedestrians and bikers; and
- Review public signage and messages for recreationists for both in and outside of the park sites in order to have a more integrated signage system and prevent parking on the inside curve of the dike.

This recommendation must also be weighed against the potential drawbacks of increasing access to the island. Currently, Barnston Island can be described as a "remote" rural farming community in the middle of a residential and industrial area. The benefits associated with this unique situation include a minimal number of agri-odour and noise nuisance complaints, and land prices that are relatively lower than farmland in Surrey.

Timeframe: On-going.

Resources required: Staff time.

Recommendation #2: Continue to Support Katzie First Nation Initiatives

Action: As previously noted, several initiatives being led by Katzie support biodiversity, traditional food harvesting, and foraging. Metro Vancouver could meet with Katzie representatives to ensure that agriculture and food-related endeavours are best supported whenever objectives align. This open communication could result in the application for funding for specific projects, such as an Island-wide drainage study or an on-reserve community garden. Katzie First Nation input would also be sought towards the implementation of other recommendations.

Timeframe: On-going.

Resources required: Staff time.

Recommendation #3: Consider Conducting a Drainage Study for the Island

Action: Metro Vancouver could initiate a drainage study for Barnston Island, in order to more fully and accurately assess the status of surface and subsurface drainage on the island. If the current maintenance strategy (involving upkeep by individual landowners and groups of landowners) is not lending itself to the best standards, then this should be reconsidered, with Metro Vancouver potentially playing a more active role in drainage management and maintenance.

Timeframe: Short term (within the next 2 years).

Resources required: Staff time, consulting fees.

Recommendation #4: Increase Efforts Around Compliance and Enforcement of Derelict Residences

Action: Metro Vancouver could play a more active role in the monitoring of derelict residences on the island (not including those on Katzie First Nation Reserve lands). Some of the buildings on the island present varying levels of concern, and their state of abandon helps to proliferate noxious weeds, and invasive species, among other unwanted uses of the abandoned sites. Greater enforcement of Metro Vancouver's *Electoral Area "A" Unsightly Premises Bylaw No. 1198, 2014*[61] could be used to address this issue and, in the long term, eliminate existing derelict residences on the island. Provisions of the bylaw state that no owner or occupant shall cause or allow a property to become or remain unsightly. This includes:

- Maintain a building in a structurally sound condition so as to be capable of safely sustaining its own weight;
- Maintain exterior doors and windows in good repair;
- Ensure the roof is free from leaks that have the potential to cause significant damage to the building.

This bylaw allows officers, employees, or agents of Metro Vancouver to enter on to any property to inspect and determine whether remedial action is required. Metro Vancouver may issues fines up to $10,000 for contraventions to the bylaw. Other opportunities for island cleanliness include provide more waste receptacles and exploring the possibility of help to coordinate regular waste removal from the island.

Timeframe: Beginning in the short term, then ongoing on an as-need basis.

Resources required: Staff time, possible funding to update polices and bylaws.

Recommendation #5: Consider Working with the Community on an Agri-Tourism Strategy

Action: There is some level of interest, and many questions, regarding agri-tourism on Barnston Island, however there does not appear to be a strong consensus amongst community members as to whether or not more tourists are desired. While it was acknowledged that tourists could potentially support farming by spending money at the farm gate, many pointed out that visitors arrive without their wallets. This could be alleviated with some simple signage and promotion of farm gate retail on the island, if so desired. Similarly, the lack of public parking and washrooms is seen as an impediment to both attracting visitors to the island and minimizing the potential negative impacts of visitors to the farms. A review of public information provided by Regional Parks, such as existing park and public amenities on the island, may be helpful. Additional signs provided at the ferry arrival could be considered. Westham Island was pointed to as one example of a farming island that has done a good job of balancing working farms and attracting tourism dollars.

Timeframe: Medium term (within the next 5 years).

Resources required: Staff time, consulting fees.

Recommendation #6: Investigate Ways to Increase Long-term Land Tenure to Support Farming

Action: Due to the current concentrated ownership of over 50% of the island, some residents have expressed concern over the ability to make Barnston Island a thriving agricultural community, as envisioned in the OCP. In order to support the vision, Metro Vancouver should investigate ways to increase long-term land tenure to support farming on the island. Some of the potential ways to improve tenure conditions for farming include:

- Bring existing programs such as FarmFolk/CityFolk's and Foodlands Co-operative of BC alternative land tenure pilot projects[62],[63] and Young Agrarians Land Linking program to the island to increase farming activity;
- Work with land owners to facilitate long term tenure agreements through the Young Agrarians program;
- Use existing grant funds and seek other grant opportunities to support tenure arrangements that promote farming;

[61] Metro Vancouver, 2014. Electoral Area "A" Unsightly Premises Bylaw No. 1198.
[62] FarmFolk/CityFolk, 2018. Foodlands Trust Project.
[63] Foodlands Co-operative BC, 2018. Farmland Trusts.

- Consider allowing /expanding agricultural land uses on existing Metro Vancouver lands. Currently there is a Metro Vancouver Board policy that prohibits commercial agriculture on Regional Park lands, and that sets out the parameters for agricultural use in Regional Parks. This would require revisiting policy to consider expanding appropriate farming opportunities. However, it may also be worthwhile to explore what the parkland opportunities might be within the existing policy. The Metro Vancouver Regional Park currently has farm agreements at Robert Point for hay production and for cattle grazing at Mann Point – both areas are in the ALR;
- Collaborate with NGOs or Academic Institutes for an incubator farm or additional park benefits either on existing Metro Vancouver park land or through a tenure agreement on private land; and
- Investigate the feasibility of acquiring additional land on Barnston Island to support the expansion of farming.

Timeframe: Ongoing, as opportunities arise.
Resources required: Staff time, acquisition resources will be high.

Recommendation #7: Promote Metro Vancouver Agricultural Policies and Regulations

Action: Metro Vancouver plays an active role in supporting food and agriculture throughout the region. However, many new and emerging farm operators are unaware of the resources available through Metro Vancouver, and have difficulty navigating the myriad of policies and regulations that exist. Metro Vancouver could consider offering a pamphlet or web-based tool that assists farmers in determining which regional policies and regulations apply to them, particularly in Electoral Area 'A.' Other resources, such as Metro Vancouver's Regional Food Strategy and Food System Strategy, along with the findings of this study, could be shared with agricultural operators in Electoral Area 'A.'
Timeframe: Short term (within the next 2 years).
Resources required: Staff time.

Recommendation #8: Erect Agricultural Signage

Action: Depending on the outcomes of the Agri-Tourism Strategy (see Recommendation #5), consider erecting signs along the road to the ferry terminal in Surrey regarding information on Barnston Island agriculture. On the island, signs could point to specific business or agricultural activities. Heritage signs related to the history of farming on the island could be placed in the regional parks areas. Signs could also be developed to discourage trespass and indicate other areas where the public is discouraged from accessing (e.g. Katzie First Nation Reserve lands). Examples include:

- Active Farm Area
- No Trespass
- Livestock Area
- Slow Farm Vehicles
- Additional signs to Regional Park sites and amenities (including bathroom and garbage facilities)

Timeframe: Medium term (within the next 5 years).
Resources required: Staff time, sign costs.

8.0 Conclusion

In the heart of the Fraser River, Barnston Island is an incredibly fertile part of BC known for it's historically active farms. However, many farms and farmers are struggling with access and transportation needs, labour shortages, and land tenure changes, whereby a single owner/company owns (or has business interest) in over 50% of the

island. The attraction of new farmers to the island is critical, with may current farmers reaching the age of retirement with no apparent replacements. The OCP for Electoral Area 'A' includes direction to develop an *Barnston Island Agricultural Viability Study*, in part to highlight several possibilities for agricultural production in light of these challenges.

Based on soil, water, and climate, the diversity of what can be cultivated on Barnston Island is vast. The gaps that exist are a combination of lack of investment in agricultural infrastructure (e.g. drainage) and challenges with ferry services, land accessibility, availability of long term leases, and labour. The most sustainable agricultural opportunities, therefore, are those that do not rely on immediate access to services, supplies and markets. The agricultural suitability scenarios in this report focus on three possible opportunities (e.g. lavender, specialty mushrooms, and polyhouse strawberries) that are expected to generate good returns on investment over the long term. Significant parts of the report also explore tenure arrangements and alternative land access programs.

There is an incredible opportunity for Barnston Island to become the agricultural jewel that it is envisioned to be in the Electoral Area 'A' OCP vision statement. However, in order for this vision to be realized, land owners will need to make farmland available through long term leases (e.g. 10 years or longer), local farmers will need to be willing to invest in infrastructure (e.g. drainage), and Metro Vancouver will need to improve land access for new farmers to help increase the number of farmers undertaking agricultural activities on the Island.

Metro Vancouver can provide leadership and assistance in these areas, as outlined in the recommendations, which may range from conducting a drainage study and undertaking an agri-tourism strategy, to acquiring additional farmland for alternative tenure projects. Partnership amongst the current landowners, farmers, and Metro Vancouver will be key.

An increase in agricultural production on Barnston Island will support regional goals and objectives towards increasing the use of the ALR for farming and food production, while reinforcing the food security of Metro Vancouver. With support, agriculture can continue to be a significant contributor to the local economy and an important tool in strengthening local food security.

9.0 Appendices

Federal Policies and Programs

Strategic Initiatives

Growing Forward 2 is a partnership between the federal and provincial levels of government and is designed to help the agricultural industry position itself to respond to future opportunities and to realize its full potential as a significant contributor to the economy.

Canada Agricultural Products Act

The *Canada Agricultural Products Act* regulates the import, export, and inter-provincial trade and marketing of agricultural products. The Canadian Food Inspection Agency (CFIA) administers many of the agricultural import and export activities. This Act standardizes agricultural grading and inspecting procedures across Canada.

Additional Federal Legislation Affecting Agriculture

Additional federal legislation that influences various aspects of the agriculture industry include:

- *Fertilizers Act*
- *Canada Wildlife Act*
- *Fisheries Act*
- *Consumer Packaging and Labelling Act*
- *Food and Drugs Act*
- *Excise Tax Act*
- *Excise and Import Permits Act*
- *Pest Control Products Act*
- *Farm Debt Mediation Act*
- *Plant Protection Act*
- *Seeds Act*
- *Farm Products Agencies Act*
- *Species at Risk Act*

Provincial Policies and Programs

Agricultural Land Commission Act

Up to the 1970s nearly 6,000 hectares of prime agricultural land were lost each year to urban and other uses in BC. The Provincial government responded by introducing BC's *Land Commission Act* on April 18, 1973. The Agricultural Land Commission (ALC) was created with the following mandate:

- To preserve agricultural land;
- To encourage farming on agricultural land in collaboration with other communities of interest;
- To encourage local governments, first nations, the provincial government and its agents to enable and accommodate farm use of agricultural land and uses compatible with agriculture in their plans, bylaws, and policies.

The ALC administers the *ALC Act* and is responsible for the ALR, a provincial zone in which agriculture is recognized as the priority use. The purpose of the ALR is to ensure that the province's agricultural land base is preserved and

available for farm uses both now and in the future. The *ALC Act* takes precedence over, but does not replace, other legislation and bylaws that may apply to the ALR. Local and regional governments, as well as other Provincial agencies, are expected to plan in accordance with the Provincial policy of preserving agricultural land.

Agricultural Land Reserve Use, Subdivision and Procedure Regulation

The *Agricultural Land Reserve Use, Subdivision and Procedure Regulation*, adopted in 2002, specifies permitted land uses within the ALR. This regulation identifies farm activities and other, non-farm uses permitted in the ALR, notification requirements for soil removal and placement of fill, procedures for submitting applications, and filing requirements. Land use activities not included in the *Regulation*, such as subdividing land, building additional residences, or excluding land from the ALR, require approval by the ALC through the application process.

Farm Practices Protection Act

The *Farm Practices Protection (Right to Farm) Act* was passed in 1996. The intent of the Act is to protect farms, using "normal farm practices", from unwarranted nuisance complaints involving dust, odour, noise, and other disturbances. The Farm Practices Board, now called the Farm Industry Review Board (FIRB), was established to deal with complaints that arise from the Act and to determine whether the issue results from normal farm practices. The FPPA protects farms both in and outside of the ALR, although those outside the ALR must obtain Class 9 (Farm) status from BC Assessment.

BC Assessment Act

Section 23 of the *Assessment Act* and BC Reg 411/95, the *Classification of Land as a Farm Regulation* (the "Farm Class Regulation"), set out the requirements that must be met for land to be classified as "Farm" for assessment and tax purposes. Land classified as "Farm" must be used all or in part for primary agricultural production.

BC Environmental Farm Plan Program

The Canada-BC Environmental Farm Plan (EFP) Program is a voluntary program that assists farmers in developing an environmental action plan for their farm that enhances natural resources and reduces the possibility of accidental harm to soil, air, water and biodiversity values. Those who enroll in the program become eligible for cost-share funding for certain on-farm Best Management Practices projects through the Growing Forward ARDCorp program.