GOLDEN MILE SLOPES GEOGRAPHICAL INDICATION

Sept 2020

Technical Description and Geographic Extent

Documentation in support of a formal application to the BC Wine Authority for the creation of a new GI named Golden Mile Slopes.

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Golden Mile Slopes Geographical Indication

TECHNICAL DESCRIPTION AND GEOGRAPHIC EXTENT

EXECUTIVE SUMMARY

The fundamental approach accepted by the BC Wine Authority to define the geographic extent of Geographic Indications (GIs) is to use, wherever possible, natural features to place boundaries. In the Golden Mile area of the southern Okanagan Valley we used several different natural features to delineate the extent of a proposed GI, tentatively named Golden Mile Slopes. The GI covers an area of just under 600 ha. The GI extends from Fairview Road in the north to Fruitvale Way in the south. It encompasses the landscape west of the Okanagan River floodplain below the Golden Mile Bench GI in its northern portion and up to the bedrock-controlled topography of the valley wall in its southern portion. Detailed maps and the rationalization for boundary placement are given in the report along with descriptions of the surficial geology, soils, climate and viticulture of the target area.

The landscape was formed as the result of Pleistocene glacial retreat, specifically sediment deposited by glacial meltwater (outwash) and subsequent post-glacial erosion and re-deposition. Glaciofluvial sands and gravels, and alluvial fan deposits provide the parent materials upon which the soils of the GI are formed. Vineyards are located on a range of coarse-textured stony soil types. Soils are generally alkaline and of mixed mineralogy. When cultivated, they provide a suitable growing medium for wine grapevines.

The GI has a climate well suited to the production of both red and white *Vitus vinifera* cultivars. Average daily maximum summer temperature is 30°C. Historically, 10 days per year experienced temperatures over 35 °C. Over the last 20 years the area has received between 1400 and 1800 growing degree days (base 10°C) of heat between April 1 and October 31, and averages around 1600 GDDs. There are currently approximately 130 ha of vineyards in the GI area with roughly equal area of red and while cultivars. Principle red wine cultivars grown are Merlot, Cabernet Franc and Syrah. The principle white wine cultivars grown are Pinot Gris with lesser amounts of Chardonnay and Sauvignon Blanc.

BACKGROUND

Following an initial meeting in February 2019 hosted by Maverick Winery and chaired by Lynn Bremmer, Scott Smith was retained by Cassini Cellars on behalf of a group of neighboring wineries to help define the extent of a proposed Golden Mile Slopes sub-Geographical Indication (GI) in the south Okanagan Valley and to compile technical (biophysical) information to describe and define its nature.

A field inspection of the proposed GI area was made with Lynn Bremmer in April 2019 and a preliminary report outlining a suggested boundary configuration resulted. Communications between Lynn and area growers confirmed that there was general support among area growers for the suggested boundary but with some discussion on the best placement of the northern boundary in the vicinity of Road 5. Following subsequent field work, modifications in boundary placement were made and that expanded boundary, and the biophysical environment of the proposed Golden Mile Slopes GI, are presented herein.

The intent of this document is to support the submission of an application to the British Columbia Wine Authority seeking formal establishment of this proposed GI.

GEOGRAPHIC EXTENT AND BOUNDARY

The concept of the Golden Mile Slopes GI is to encompass the alluvial fan foot slopes and glaciofluvial landforms that exist between the western valley wall of Mount Kobau and the floodplain of the Okanagan River (Figure 1). The extent of the proposed GI covers an area of approximately 590 ha.

As with the delineation of other GIs in the Okanagan Valley, we have used wherever possible natural features to place boundaries. For Golden Mile Slopes we used several different natural features to define the extent of the GI. In some locations, in order to not bisect individual property lots, we used cadastral features (roads and rights-of-way) to approximate the actual landform boundary. The details of how the boundary was established and the ground features used are described in the following section on boundary rationalization.

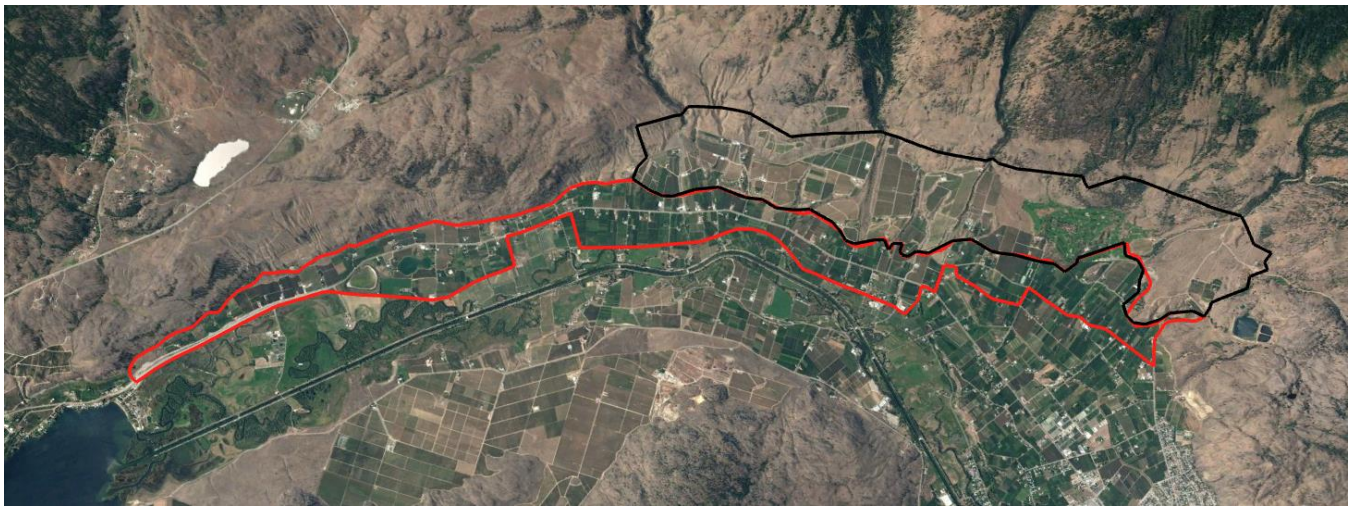

Figure 1. Overview of the boundary configuration for the proposed GI. The boundary shown in red is described in more detail in Figures 2-4. The boundary for the Golden Mile Bench GI is shown in black.

Boundary Rationalization

The details of the boundary placement are shown in Figures 2, 3 and 4. The northern-most boundaries of the GI extend to Fairview Road bounded by a coincident boundary with the Golden Mile GI to the west and Sumac Street to the east. Placing the boundary along Sumac and Sunflower Streets is a good approximation of the termination of the local alluvial fan slope. The boundary then runs along Road 7 to Hwy 97 then jogs eastward to Haynes Road. In this way the northern portion of the GI covers all the foot slopes of the alluvial fans emanating from Tinhorn and Reed Creeks systems.

Figure 2. The boundary configuration for the northern portion of the GI. The western boundary of the proposed GI is coincident with the eastern boundary of the Golden Mile Bench GI.

Haynes Road has been used to locate the boundary between footslopes and the floodplain of the Okanagan River. The concept of the Golden Mile Slopes GI excludes the floodplain of the Okanagan River which is poorly suited to viticultural production due to high water table and shoulder season frosts.

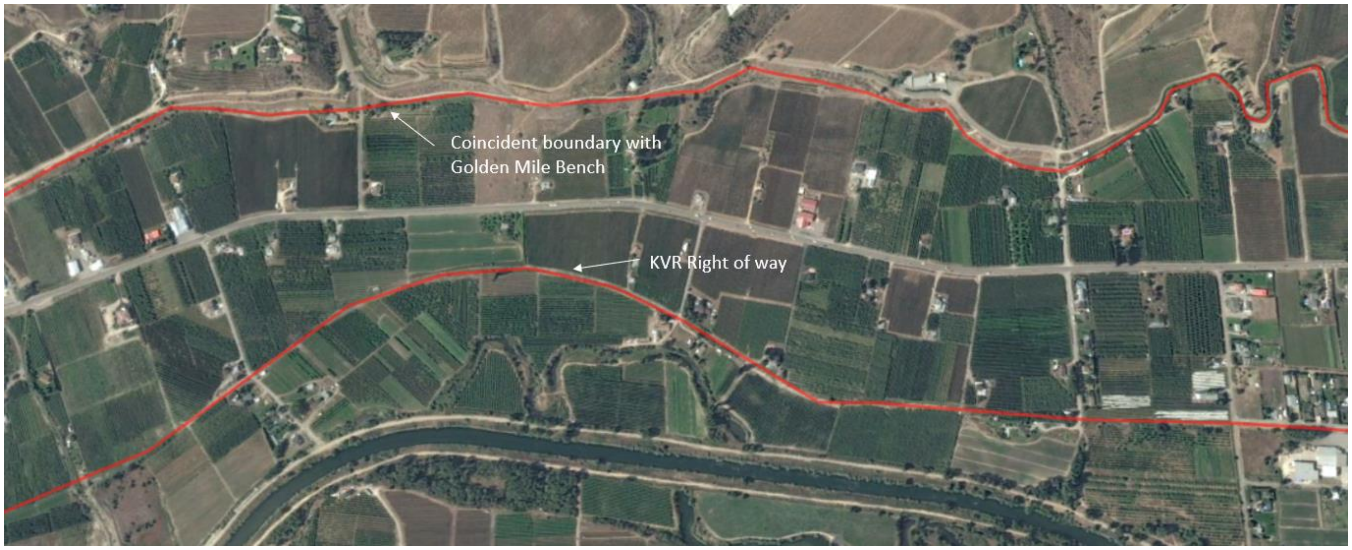

Figure 3. The mid-portion of the GI below Hester and Testalinden Creeks. The western boundary of the GI is coincident with the eastern boundary of the Golden Mile Bench GI. The eastern boundary of the GI is at the interface between the footslopes of the alluvial fans and the edge of the Okanagan River floodplain. The KVR right-of-way was built along this interface and is used for boundary placement.

The middle portions of the GI are bounded to the west by the Golden Mile Bench GI and to the east by the Okanagan River floodplain (Figure 3). The Kettle Valley Railway (KVR) right-of-way runs along the interface between the footslopes and the river floodplain and provides a legal property boundary with which to define this landform break. In so doing, no property lots are cut by the boundary configuration.

The GI extends some 6 km south from the Testalinden Creek fan almost to Osoyoos Lake. Along this stretch, the western boundary is defined by the steep bedrock topography of the valley wall and the eastern boundary by the floodplain of the Okanagan River (Figure 4 and 5). For the most part, the GI is composed of gentle east-facing alluvial fan footslopes. The exception is the hummocky (rolling) topography north of Deadman Lake east of Hwy 97 that is underlain by gravelly glaciofluvial materials that are well elevated above the level of the adjacent river floodplain. There is one area of low-lying land between Roads 18 and 19 that has been excluded as it is composed of poorly drained soils largely unsuited for viticulture. The termination of the fan materials and sloping glaciofluvial gravels define the southern boundary of the GI adjacent to Fruitvale Way Road.

The landforms used to define the boundaries and extent of the GI are described in detail in the section on Surficial Geology and Landforms.

Figure 4. The middle portion of the GI from Testalinden Creek south to Deadman Lake.

Figure 5. In the southern extent, the GI becomes quite narrow as the floodplain of the Okanagan River extends right to the edge of the highway.

CLIMATE

While there is no long-term weather station record from within the boundary of the GI, long-term weather data are available from just outside of the GI from the townsites of Oliver and Osoyoos. Climate records were kept by Environment and Climate Change Canada (ECCC) from two weather stations within the town of Oliver, both of which ceased recording in 2007. One of these was located only a few kilometres north of the GI and represents well the historic climate conditions of the area (Figure 6).

The Golden Mile region has a warm, semi-arid climate with less than 350 mm of precipitation per year and often less than 300 mm per year. Summertime daily maximum temperatures average 30°C and maximum daytime highs of >35°C are not uncommon. Wintertime daily minimum temperatures of just below freezing and fewer than 10 days per year reach -10°C (Figure 6). Extreme minimum temperatures have reached as low as -30°C but no new minimum temperature records have been set for over 50 years (Environment and Climate Change Canada 2019). However, without the moderating influence of a large lake, winter temperatures do occasionally drop to the point where some winter damage to vines can occur, mainly in low lying landscape positions.

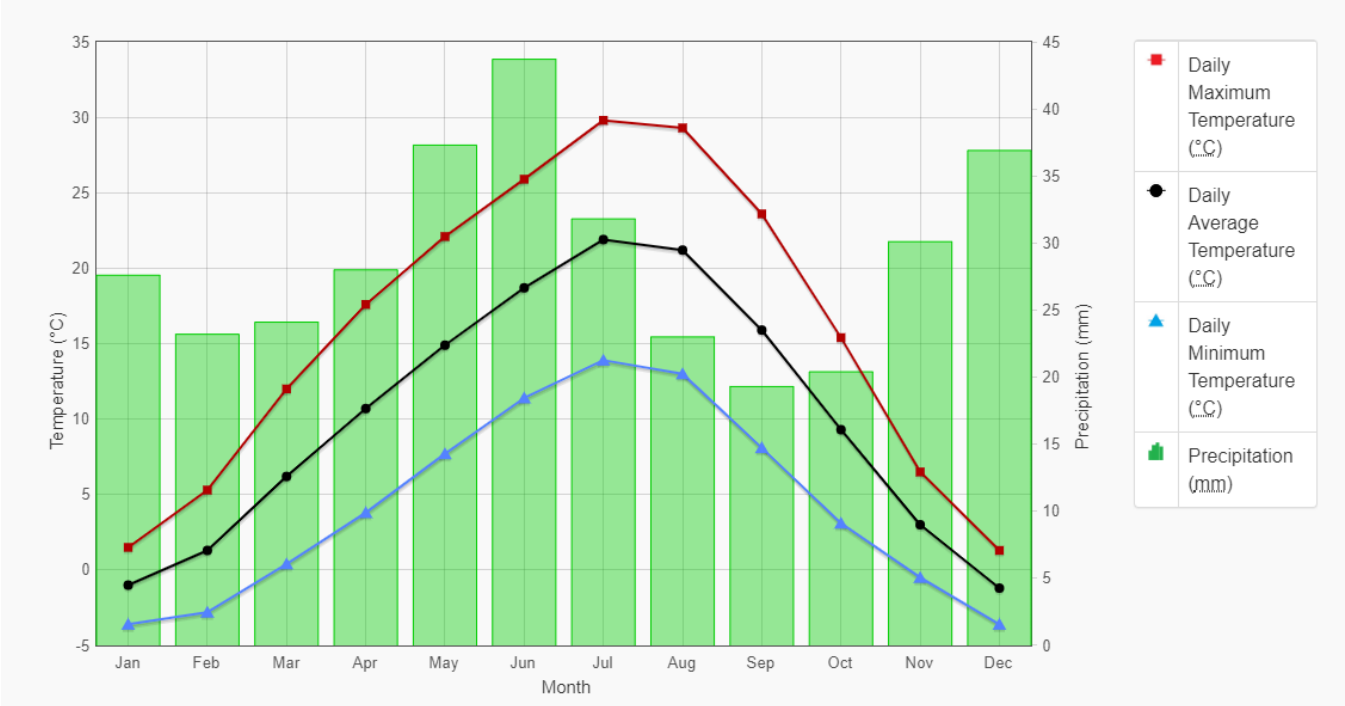

Figure 6. Graph of monthly temperature and precipitation for the Oliver area, 1981 to 2007. Data are 26-year climate normals calculated for the Oliver weather station (no longer operational). Graph accessed May 15, 2019 online at http://climate.weather.gc.ca/climate_normals/index_e.html

The only currently active ECCC weather station in the south Okanagan is situated within the town of Osoyoos about 10 km south of the southern extent of the GI. Figure 7 shows selected annual total GDD values calculated from the Osoyoos dataset. Over the last twenty years the annual

GDD totals have varied between 1400 and 1800. The last two years have been close to the 10-year average of 1600 GDD. Some growers perceive a difference in climate between the northern and southerly extents of the GI. However, there is little difference in monthly or annual mean temperatures between the Oliver and Osoyoos weather stations. In all cases, there is ample heat in the region to produce a wide range of red and white grape cultivars.

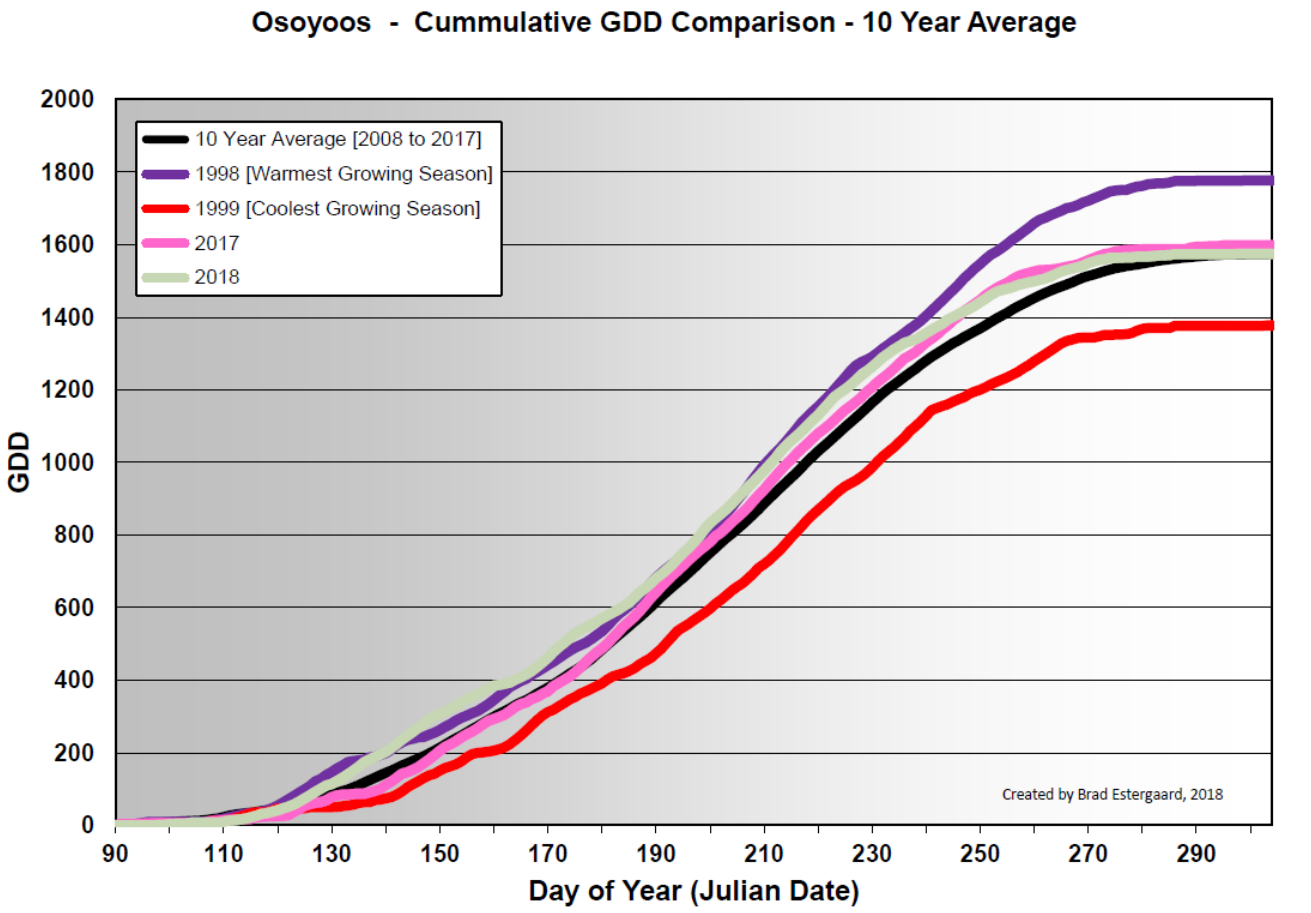

Figure 7, Annual growing degree-day base 10°C (GDD) totals calculated from the Osoyoos East weather station for various time periods. Calculation is based on the growing season April 1 to October 31. Data supplied by Brad Estergaard, Summerland Research and Development Centre.

It is important to recognize that local site conditions within individual vineyard properties and general landscape position generate a range of temperature conditions both cooler and hotter than the regional climate.

Table 1 shows growing degree day totals from two ECCC stations, and one operated by Summerland Research and Development Centre (SRDC) staff located just outside the GI boundary on the property of Inniskillin winery. Summerland is shown for comparison and is considerably cooler than the two south Okanagan stations. The Inniskillin station is located

immediately west of the GI boundary and within the Golden Mile Bench GI. It has recorded temperatures slightly warmer than those at the Osoyoos station. Temperatures at the Osoyoos station are likely moderated somewhat by its proximity to Osoyoos Lake.

Table 1. Growing degree-day totals for three active weather stations.

Location	Growing Degree Day totals[1,2]		
	10 yr average	**2017**	2018
Summerland	1350	1420	1330
Inniskillin	m	1650	1640
Osoyoos West	1590	1600	1580

[1] Growing Degree Day is calculated on a 10°C base. All values are rounded.

[2] Data prepared by Brad Estergaard, Summerland RDC.

Within the proposed GI, east-facing slopes predominate and provide for warm morning temperatures but may be shaded by Mount Kobau during the maximum heat of the day. During the shoulder seasons and during the winter, vineyards located on the valley floor adjacent to or on the river floodplain are more likely to experience temperatures that are colder than the regional averages. This effect is most pronounced at night under calm weather conditions.

Temperatures recorded within the GI on the property of Lynn and John Bremmer since 2000 indicate that the last spring frost is usually experienced in mid-April but has been as early as March 26 and the first fall frost typically occurs mid-October but has occurred as early as Sept 23 and as late as Nov 11th (Lynn Bremmer, pers comm.). The growing season averages 180 days in length.

SURFICIAL GEOLOGY AND LANDFORMS

Most of the landforms found at low elevation in the Okanagan Valley originated as the result of deglaciation some 12,000 years ago or, as a result of erosion and re-deposition of these materials in the early post-glacial time (Roed and Fulton 2011, Nasmith 1962). The proposed GI is characterized by two landscape elements – alluvial fans and glaciofluvial deposits.

The best examples of landforms created through erosion and re-distribution are the many alluvial fans found within the GI. These early post-glacial landforms are the defining feature of the proposed GI extent. Typically, alluvial fans have long uniform slopes and stony soils. In the north, the predominant landscape element is the alluvial fans that emanate from Mount Kobau to the west. Situated immediately below the raised alluvial fans and terraces of Hester and Tinhorn Creeks (i.e. the Golden Mile Bench GI), much of the GI is located on the footslopes of these fan deposits (Figure 8). In the southern portion of the GI, small, steeper alluvial fans that have formed immediately at the base of the valley wall are common and used extensively for viticultural production (Figure 9).

Figure 8. Delineation of the alluvial fan landscape element of the Golden Mile Slopes GI. The northern portion of the GI rests on the foot slopes below the raised alluvial fans of the Golden Mile Bench. Approximate boundaries of the GI are shown by the dashed lines.

Figure 9. To the south, the landscape is composed of shorter, steeper fans that have formed at the base of the west wall of the valley. Arrows point to the top of two of these fans.

The most common deglaciation features in the GI are the deposits of sands and rounded gravels. These were deposited directly by melting glacier water (also referred to as outwash). These materials make up the second landscape element of the GI, seen today as the distinctive hummocky (hilly) landform with depressions found in the southern portion of the GI.

Most prominent is the landform that sits immediately east of Hwy 97 where the Kismet Estate Winery is located (Figure 10). This hummocky glaciofluvial landform is composed of what is referred to as ‘kettled’ outwash generated by the gravelly sediment and ice blocks deposited by a retreating or stagnant ice front. Kettles form where blocks of glacier ice were buried and later melted leaving a depression or hole (kettle hole) on the land surface. Deadman Lake is an example of a kettle that is now filled with water (a kettle lake). In contrast to the fan landforms which generate smooth uniform slopes, the hummocky glaciofluvial landform is characterized by a complex of various short, slope angles and slope aspects (directions) that occur over short distances.

Figure 10. Kettle lake set within the hummocky glaciofluvial landform east of Hwy 97 in the southern portion of the GI.

The other form of glaciofluvial landscape is level to gently sloping and can be found as terraced or planar surfaces. This landform is composed of similar materials as the hummocky outwash sediment. The two forms of the glaciofluvial landscape are differentiated based on this difference in surface form.

The concept for this GI does not include the level floodplain landform of the Okanagan River. Therefore, the eastern boundary of the GI is defined as the margin of the modern Okanagan River floodplain. This floodplain is underlain by high water table and historically was subject to flooding although river channelization has reduced this risk. The high water table and the landscape position on the valley floor, render this landform largely unsuited to viticultural production and hence its exclusion from the GI extent.

SOIL DEVELOPMENT AND PROPERTIES

Soils form as the result of the weathering of the surficial geological parent materials described in the previous section of the report. This weathering is controlled by climate, topography, biological activity and time. Different parent materials generate different soil types, but all hold a few common properties. All are coarse-textured, meaning that the soils are most often composed of sands and gravels as opposed to silts and clays. All are alkaline (opposite of acidic) and many contain secondary calcium carbonate (lime) which is typical of soils formed under a semi-arid climate. The soils have formed (weathered) over many thousands of years under a predominantly shrubby grassland vegetation cover and belong to the class of soils known in Canada as Brown Chernozems. Brown Chernozems are typified by a thin brown-coloured topsoil layer. The main

differentiating features of soils in the GI are the amount and shape of stones within the soil profile (Figure 11).

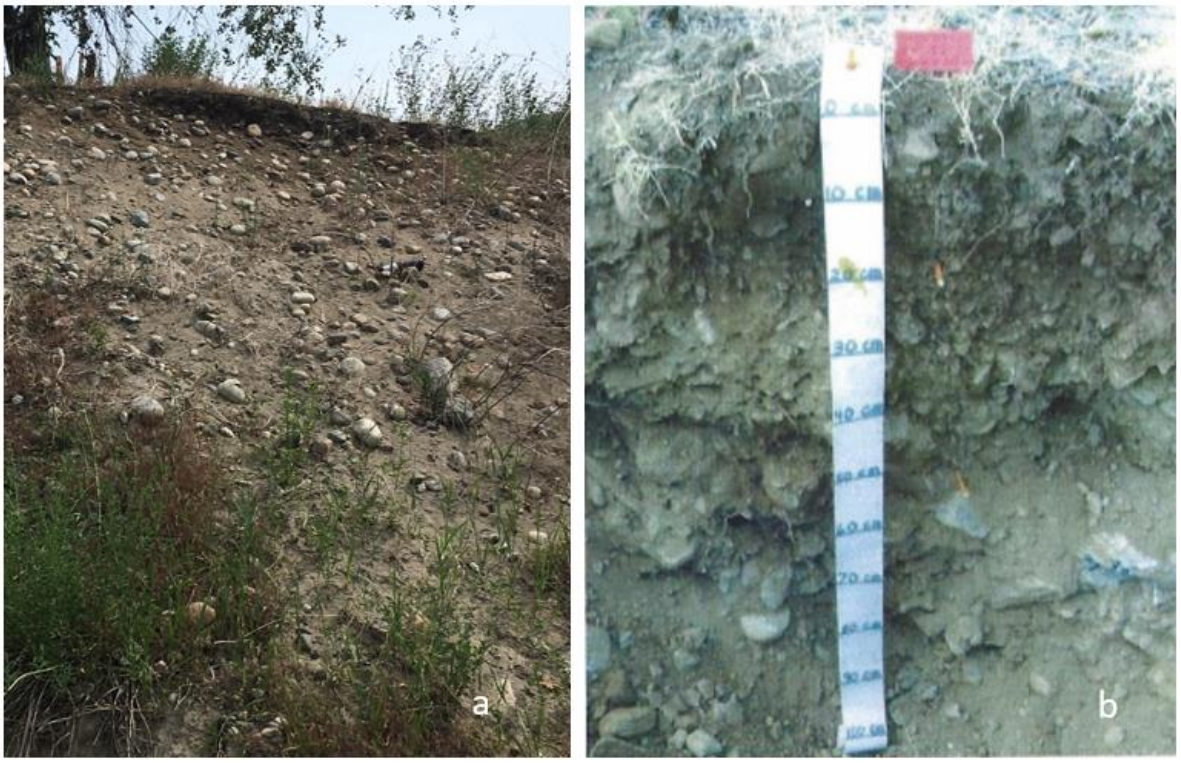

Figure 11. All the soils of the GI are stony; however, the amount and shape of the stones varies depending on the origin of the soil parent material. The Rutland soil is formed in sandy glaciofluvial material with many round stones (a). The Stemwinder soil is formed in alluvial fan deposits and is composed of a wider range of particle sizes. This soil is often sandy loam-textured but with a large volume of angular rock fragments of various size (b).

The northern portion of the GI (Figure 12a) is composed of soils formed on alluvial fan deposits. These soils are characterized by a very high volume of angular rock fragments varying from gravel to boulder size. The matrix of finer material between the angular rock fragments is often sandy loam textured. Soils within the alluvial fan group are differentiated based on the expression of weathering (soil horizon development) or texture of the matrix. Ratnip and Stemwinder are the two predominant soils found on the alluvial fans. Table 2 outlines the major soil types and their properties mapped in the GI extent.

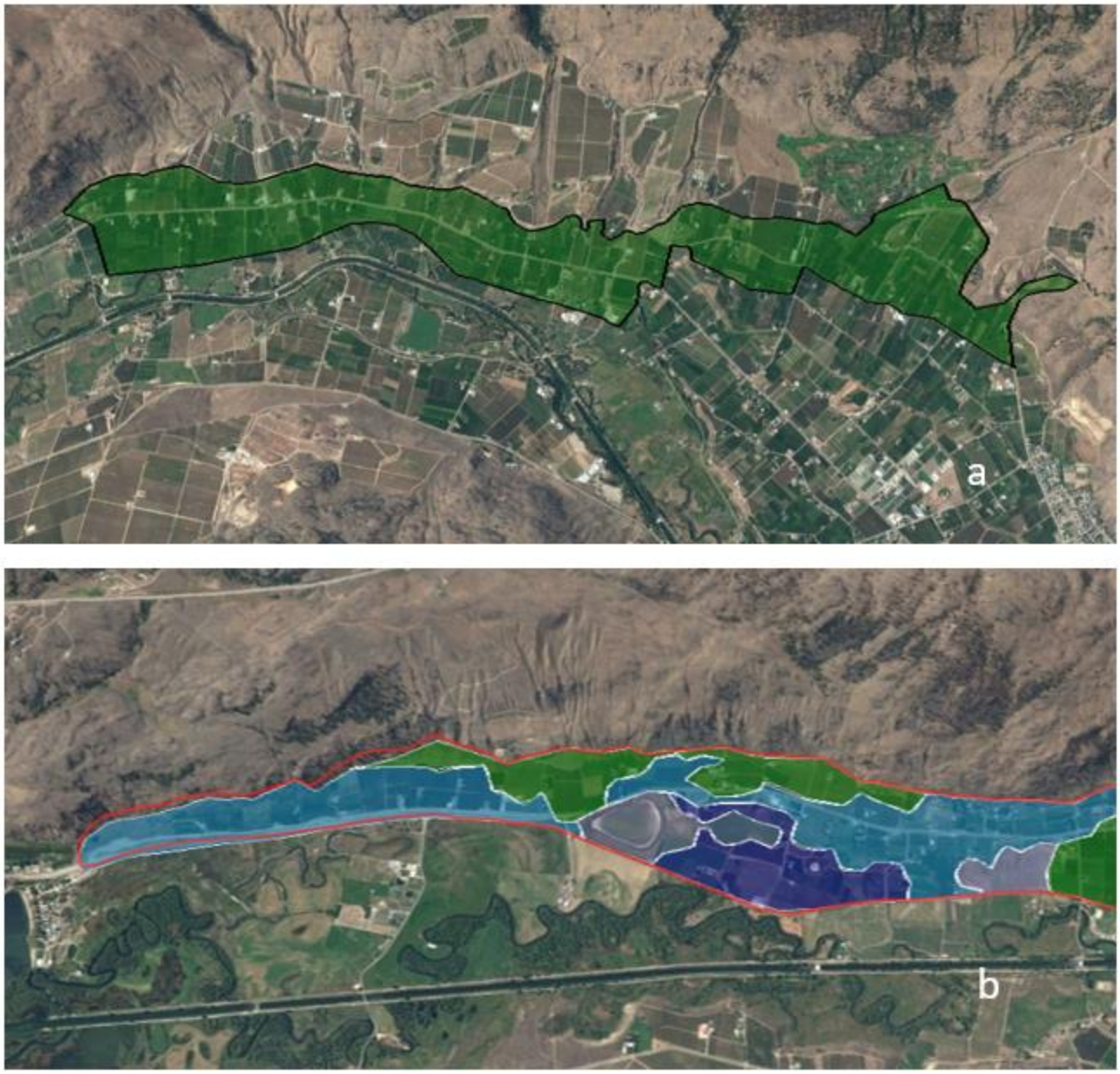

Figure 12. Generalized soil map for the northern (a) and southern (b) portions of the GI. Areas highlighted in green are mainly alluvial fans, areas in light blue are sloping gravelly glaciofluvial materials and dark blue marks the area of the hummocky glaciofluvial material (also referred to as 'kettled' outwash). Wetland areas are marked in grey.

Glaciofluvial parent materials are more common in the southern portion of the GI both as level and as hummocky landforms (Figure 12b). The Rutland soil is most common and is characterized by a veneer of sandy loam over very gravelly loamy sand. Some of the hummocky landform includes areas of windblown cover sands over the gravelly glaciofluvial materials. These are the Haynes soils. The cover of windblown sands relates to early post glacial time when little vegetation existed

on the valley floor and winds moved fine sands over wide areas. Subsequent erosion has removed this cover in most places, but they still exist in a few locations throughout the valley.

Within the hummocky glaciofluvial landform are depressional areas, some of which are occupied by small lakes. These kettle lakes are often surrounded by wet soils which are classified into one of two soil series depending on the texture of the soil material. There is also one small low-lying area that is used mainly for vegetable production between Roads 18 and 19 that is underlain by floodplain soils belonging to the Cawston and Kinney soil types.

Table 2. Description of the main soil types found within the GI. The soil names listed come from the detailed soil survey conducted in the Okanagan Valley by the provincial government some 35 years ago. Local surface amendments and land leveling have modified to some extent the properties of these soils.

Generalized group	Soil Name[1]	Description
Alluvial Fan	Ratnip	Gravelly to very gravelly sandy loam, angular gravels and stones
	Stemwinder	Gravelly to very gravelly sandy loam, angular gravels and stones
	Ponderosa	Lime-rich gravelly sandy loam grading to very gravelly loamy sand
	Similkameen	Gravelly silt loam grading to loamy sand, calcareous phase
Hummocky Glaciofluvial	Rutland	Thin layer of sandy loam over very gravelly (rounded) loamy sand
	Haynes	Very gravelly loamy sand with wind-blown cover of fine sand
Level to gently sloping Glaciofluvial	Rutland	Thin layer of sandy loam over very gravelly (rounded) loamy sand
	Gartrell	Thick layer of sandy loam over very gravelly (rounded) loamy sand

1. Soil names as defined by Wettneben 1986.

VITICULTURAL CHARACTERIZATION

Viticulture is the dominant land use within the GI followed by various tree fruits and annual vegetable production on low-lying areas and wetter soils. There are currently 165 ha (408 acres) of *Vitis vinifera* wine grapes produced by 37 growers and processed by nine. Most land holdings are small, typically less than 4 ha in size.

The predominately coarse-textured and stony vineyard soils, along with low growing-season rainfall, enable growers to manipulate water and nutrients supplied to vines to achieve ideal vine vigor and water stress levels essential for producing premium quality wines. These conditions also allow for suppression of cover crop growth from mid to late season which increases growing season heat and the ability to mature and extend hang-time for long-season red wine cultivars (Bowen et al. 2012).

Climatic conditions in the GI allow for production of a range of noble red and white wine grape cultivars. Red wine cultivars currently occupy 60% of the grape acreage (Table 3). Long-season red wine cultivars, including Cabernet Sauvignon, Cabernet Franc, and Syrah, are well suited to the warm climate and gently sloping topography of the GI. Merlot, which is widely grown in the Okanagan Valley, performs well in the GI and leads the area occupied by red wine cultivars. The dominant western aspect and position east of Mount Kobau expose fruit clusters to sunlight mostly during morning hours when daytime ambient temperatures are coolest, and limit afternoon exposure during the heat of the day. Cool katabatic wind flows nightly from Mount Kobau, cooling clusters and preserving fruit acidity. With careful management of vine canopies, cluster temperatures are kept at near optimum to achieve the fruit composition required for producing superior quality red wines with good balance, deep color, ripe fruit flavors and aroma, and ample body.

Pinot gris leads the white wine grape cultivars grown in the GI, followed by a nearly equal combined area of Chardonnay, Sauvignon blanc and Gewurztraminer. White wines from the GI have great acidity and body, and abundant aroma and flavor.

Table 3. Listing of the principle grape cultivars currently grown in the area of the proposed Golden Mile GI. Together these principle cultivars account for 90% of the production area. The remaining 10% is covered by a mix of cultivars including Malbec, Viognier, Gamay, Pinot Blanc, Muscat, and Petite Verdot.

Red Wine Cultivars	% of area	**White Wine Cultivars**	% of area
Merlot [1]	27	Pinot Gris	13
Cabernet Franc	18	Chardonnay	5
Syrah	8	Sauvignon blanc	5
Cabernet Sauvignon	3	Gerwurztraminer	4
Pinot Noir	4	Riesling	3
Total	60	Total	30

[1] Data provided by Lynn Bremmer of Mount Kobau Wine Services

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