MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS,

POST-WILDFIRE RISK ANALYSIS – PRELIMINARY REPORT

***NOTE*: The results given on this form are intended to be a preliminary warning of potential hazards and risks. If conducted, further work may alter or refine the conclusions. Interpretations are a result of a visual estimation of burn severity with limited field checking. Please contact the author for more information.**

FIRE: Talbott Fire N51250	**FIRE YEAR: 2020**	**DATE OF REPORT:** Oct. 30, 2020

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REPORT PREPARED FOR: Selkirk Resource District (Kootenay Lake FD), Southeast Fire Centre, Regional District Central Kootenay (RDCK)

FIRE SIZE, LOCATION, AND LAND STATUS:
1302 ha in size, located at the south end of Perry Ridge approximately 30 km north of Castlegar, B.C. Located on crown land situated upslope of private land.

VALUES AT RISK: Private property (including residences and inferred human safety), domestic water quality and supply, and public roads have been addressed below. Other downslope values not specifically addressed include fish habitat in the Slocan River and Little Slocan River, as well as existing forest roads.

COMMENTS: The attached burn severity map is based on visual estimates from the helicopter overview flight and ground observations. Satellite based burn severity mapping (BARC mapping) is not available for 30% of the fire area, and is believed to underestimate burn severity in many locations based on field work, so this report presents the results based on the visual estimations. Smoke reduced visibility on the northwest side of Perry Ridge during the overview flight, reducing the reliability of observations in this area. Based on the field work completed on the ground within the McFayden Creek, Talbott Creek, Unnamed #3, Unnamed #4, and Davout Creek watersheds, **soil burn severity was generally observed to be greater than vegetation burn severity**. This is likely a result of fire behavior which was often a creeping ground fire. Areas of hydrophobic soils were observed in high soil burn severity locations.

There are 21 main drainage areas which have been affected by the fire. The drainage areas on the east and south side of Perry Ridge are situated upslope of private land with residential development, and many of these private properties are exposed to risk from natural debris flow events, regardless of the fire. The fire has increased the risk to private properties with residences where there are sufficient areas of moderate to high burn severity in the watersheds. **The drainages with the most significant incremental increases in risk from debris flows as a result of the fire include:**

1. **Talbott Creek**
2. **Unnamed #4**
3. **Davout Creek**
4. **Unnamed #1**
5. **Edgar Creek**
6. **McFayden Creek**
7. **Draw Gullies**
8. **Draw Creek**
9. **Varney Creek**
10. **Tedesco Creek**

Other drainages affected by the fire may also have pre-existing risk to private property and residences from debris flows or debris avalanches, but the risks are not expected to be significantly increased from the fire.

POTENTIAL MITIGATION:
No treatment options to the burned area are recommended due to limited effectiveness expected based on the burned area properties.

Machine guards should be deactivated to maintain slope stability and runoff patterns.

Recommendation of mitigation options such as berms intended for risk reduction on private land situated on downslope fans is beyond the scope of this report; more detailed analysis would be required to better define risks to human safety on individual properties.

WATERSHEDS AFFECTED:	TOTAL WATERSHED AREA	AREA BURNED	BURN SEVERITY AS PERCENTAGE OF TOTAL WATERSHED
Talbott Creek	199 ha	120 ha / 60%	21% L, 21% M, 18% H
Unnamed 4	83 ha	42 ha / 50 %	27% L, 11% M, 13% H
Unnamed 3	46 ha	8 ha / 16 %	8% L, 7% M, 2% H
Davout Creek	73 ha	38 ha / 53 %	17% L, 27% M, 9% H
Unnamed 2	56 ha	7 ha / 13 %	9% L, 4% M, 0% H
Unnamed 1	34 ha	8 ha / 24 %	14% L, 10% M, 0% H
McFayden Face	72 ha	2 ha / 2 %	2% L, 0% M, 0% H
Edgar Creek	61 ha	35 ha / 58 %	41% L, 17% M, 0% H
McFayden Creek	575 ha	490 ha / 85 %	40% L, 32% M, 13% H
Draw Gullies	57 ha	22 ha / 38 %	18% L, 20% M, 0% H
Draw Face	34 ha	3 ha / 10 %	10% L, 0% M, 0% H
Draw Creek	210 ha	61 ha / 29 %	8% L, 7% M, 14% H
Newcomen Creek	96 ha	12 ha / 13 %	6% L, 5% M, 2% H
Nathan Creek	203 ha	11 ha / 5 %	52% L, 48% M, 0% H
Watson Creek	407 ha	4 ha / 1%	3% L, 2% M, 0% H
Lower Little Slocan Drainage	571 ha	45 ha / 8 %	6% L, 1% M, 1% H
Varney North	61 ha	2 ha / 3 %	3% L, 0% M, 0% H
Varney Creek	322 ha	158 ha / 49%	23% L, 21% M, 5% H
Tedesco Creek	290 ha	124 ha / 43%	23% L, 17% M, 2% H
Tedesco West	364 ha	57 ha / 16 %	7% L, 7% M, 1% H
Tedesco-Talbott Face	458 ha	49 ha / 11 %	4% L, 5% M, 3% H

SUMMARY OF HAZARDS AND RISKS: *1. Hazard = P(H), the probability of occurrence of a hazardous event* *2. Risk = Partial risk P(HA) = P(H) × the probability of it reaching or affecting an element at risk* **Location – Hazard Type : Element at Risk**	**HAZARD** [1] (pre fire / post fire)	**RISK** [2] (pre fire / post fire)
Talbott Creek – debris flows : private property (including residences) Talbott Creek – debris flows : domestic water Talbott Creek – debris flows : Little Slocan South Road Talbott Creek – flood : private property Talbott Creek – flood : domestic water Talbott Creek – flood : Little Slocan South Road *There is private land with residences on the Talbott Creek fan; residences are situated both upslope and downslope of the Little Slocan River Road which crosses the fan. There are four known water licenses in Talbott Creek for domestic and irrigation purposes.* *Talbott Creek is a drainage that is naturally subject to periodic debris flow events. Smaller events which do not reach valley bottom are estimated to occur with a frequency on the order of several decades, and larger events capable of reaching the valley bottom are estimated to occur with a frequency on the order of centuries. The stream currently is incised up to 5 m deep along the northern edge of the valley bottom fan, but avulsion could occur near the apex in the event of a debris flow.* ***The extent of moderate and high burn severity in the upper watershed connected to the gully headwall areas where debris flows could initiate results in an increase in debris flow hazard and associated risk to elements located on the fan at valley bottom, including private property with residences.*** *Talbott Creek is sufficiently contained in a gully through the valley bottom fan such that the risk to private property associated with floods has been estimated to be low, with an increase to moderate due to the burn. Flood risks to domestic water points of diversion (PODs) and the Little Slocan South Road culvert are increased to high as they are more likely to be affected.*	M / H M / H M / H M / H M / H M / H	H / VH H / VH H / VH L / M H / VH H / VH
Unnamed #4 – debris flows : private property (including residences) Unnamed #4 – debris flows : Little Slocan South Road Unnamed #4 – flood : private property Unnamed #4 – flood : Little Slocan South Road *There is private land with residences on the Unnamed #4 creek fan; residences are situated both upslope and downslope of the Little Slocan River Road which crosses the fan. There are no known licensed domestic POD's in the Unnamed #4 drainage.* *Unnamed #4 is a drainage that is naturally subject to periodic debris flow events. Smaller events which do not reach valley bottom are estimated to occur with a frequency on the order of several decades, and larger events capable of reaching the valley bottom are estimated to occur with a frequency on the order of centuries. The stream currently appears to have varied levels of confinement on the valley bottom fan, and avulsion is assumed possible in the event of a flood or debris flow.* ***The extent of moderate and high burn severity in the upper watershed connected to the gully headwall areas where debris flows could initiate results in an increase in debris flow hazard and associated risk to elements located on the fan at valley bottom, including private property with residences.***	M / H M / H M / H M / H	H / VH H / VH H / VH H / VH

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Unnamed #3 – debris flows : private property (including residences)	M / M	H / H
Unnamed #3 – debris flows : Little Slocan South Road	M / M	H / H
Unnamed #3 – open slope debris avalanche: private property	M / M	H / H
Unnamed #3 – open slope debris avalanche: Little Slocan South Road	M / M	H / H
There is private land with residences located downslope of Unnamed #3; the downslope terrain merges with the Unnamed #4 fan downslope of the Little Slocan South Road. There are no known licensed domestic POD's associated with streams in the Unnamed #3 face unit. *Unnamed #3 is a face unit with a few gullies that may be naturally subject to periodic hazardous debris flow events with a frequency estimated to be on the order of centuries. The valley bottom fan associated with the western gullies in this unit merges with the fan of Unnamed #4 downslope of the Little Slocan South Road, and avulsion is assumed possible in the event of a flood or debris flow. There is less connectivity between the burn area and the gullied slopes where landslides are more likely to initiate.* ***As a result, there is less of an incremental increase in the likelihood of a hazardous landslide in Unnamed #3 than in adjacent drainages, and risk ratings have not been increased as a result of the fire.***		
Davout Creek – debris flows : private property (including residence)	M / H	H / VH
Davout Creek – debris flows : Little Slocan South Road	M / H	H / VH
Davout Creek – flood : private property	M / H	H / VH
Davout Creek – flood : Little Slocan South Road	M / H	H / VH
There is private land on the Davout Creek fan, with a residence located downslope of the Little Slocan South Road. There are no known licensed domestic POD's in Davout Creek. *Davout Creek is a drainage that is naturally subject to periodic debris flow events. Smaller events which do not reach valley bottom are estimated to occur with a frequency on the order of several decades, and larger events capable of reaching the valley bottom are estimated to occur with a frequency on the order of centuries. The seasonal stream is crossed by the Little Slocan South Road with a 450 mm culvert. Reforested debris flow deposits exist immediately upslope of this crossing.* ***The extent of moderate and high burn severity in the upper watershed connected to the gully headwall areas where debris flows could initiate results in an increase in debris flow hazard and associated risk to elements located on the fan at valley bottom, including private property with residences.***		

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Unnamed #2 – debris flows : private property (including residences)	M / M	H / H
Unnamed #2 – debris flows : Little Slocan South Road	M / M	H / H
Unnamed #2 – open slope debris avalanche : private property (including residences)	H / H	VH / VH
Unnamed #2 – open slope debris avalanche : Little Slocan South Road	H / H	VH / VH
There is private land with residences located downslope of Unnamed #2. There are no known licensed domestic POD's associated with streams in the Unnamed #2 face unit, and one spring source POD is mapped a short distance to the east of the drainage area which is unlikely to be affected by the fire. *Unnamed #2 is a face unit with numerous gullies which appear to be primarily formed by erosional processes during the early post-glacial period based on the gully headwall morphology. However, some of these gullies do appear likely subject to periodic debris flow events with a frequency estimated to range from several decades to centuries, and there is evidence of these more recent landslide events apparent on the LiDAR based bare earth models. There are small fans downslope of the gullies extending onto the glaciofluvial terrace located at valley bottom with private residences situated on the fans. There is limited potential for surface flow connectivity between the burn area and the gullied slopes where landslides are more likely to initiate due to the lack of converging drainage patterns within the burn area, and the predominantly low vegetation burn severity. As a result,* ***there is less of an incremental increase in the likelihood of a hazardous landslide in Unnamed #2 than in adjacent drainages with converging drainage patterns, and as a result hazard and risk ratings have not been increased as a result of the fire.***		

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Unnamed #1 – debris flows : private property (including residences)	H / VH	VH / VH
Unnamed #1 – debris flows : domestic water	H / VH	VH / VH
Unnamed #1 – debris flows : Little Slocan South Road	H / VH	VH / VH
Unnamed #1 – flood : private property (including residences)	H / VH	VH / VH
Unnamed #1 – flood : domestic water	H / VH	VH / VH
Unnamed #1 – flood : Little Slocan South Road	H / VH	VH / VH
There is private property with residences on the Unnamed #1 fan. Residences are situated on the southeastern edge of the fan, approximately 100 m downslope of the apex. There is a domestic POD mapped near the apex of the fan labeled as Harrison Spring; the connectivity of this POD to the stream is undetermined, but has been assumed connected. *Unnamed #1 is a relatively small drainage that is naturally subject to periodic debris flow events with a frequency estimated to range from several decades to centuries. The most recent known debris flow event occurred during on March 12, 2007 based on local media reports. This was a time when several other landslides and flooding events occurred in the region, with record warm temperatures on March 12 following a significant rain on snow event on March 10 and 11. This debris flow reached the valley bottom and spread onto the fan reaching the Little Slocan South Road and covering it with saturated debris on the order of 0.5 m deep. Sediment laden flow continued past the road on to the gentle gradient glaciofluvial terrace to the south. Residences situated on the fan apparently evacuated at the time, but building locations were apparently not directly impacted. Taking this recent event into account, the hazard rating for this gully has been estimated higher than the adjacent gullies and face units to the west.* ***The extent of moderate vegetation burn severity in the upper watershed connected to the gully headwall area where debris flows could initiate results in an increase in debris flow hazard and associated risk to elements located on the fan at valley bottom, including private property with residences.***		
McFayden Face – debris flows : private property (including residences)	M / M	L / L
McFayden Face – debris flows : Slocan River Road	M / M	L / L
McFayden Face – debris avalanche : private property (including residences)	M / M	M / M
McFayden Face – debris avalanche : Slocan River Road	M / M	L / L
McFayden Face – rock fall : private property (including residences)	H / H	VL / VL
McFayden Face – rock fall : Slocan River Road	H / H	VL / VL
There is private land with residences downslope of McFayden Face, but no known domestic water licenses. *McFayden Face contains numerous bedrock bluffs and a few gullies with only a small portion of the upper drainage area situated within the fire perimeter. There are no streams or converging drainage patterns in this upper watershed area. As a result,* ***there is limited potential for the burned area to have adverse effects on slope stability within the face unit.*** *Rockfall is an active process within the unit, as well as the potential for open slope debris avalanches or possibly debris flows in the two southern gullies within the unit; however, the frequency and magnitude of these processes are unlikely to be significantly increased by the fire. Areas of gentle gradient terrain approaching the valley bottom and prior to private property limit the potential for a spatial effect, and the private residences closest to the toe of the slope are situated on remnant glaciofluvial terraces between gullies.*		

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Edgar Creek – debris flows : private property (including residences)	M / H	H / VH
Edgar Creek – debris flows : domestic water	M / H	H / VH
Edgar Creek – debris flows : Slocan River Road	M / H	M / H
Edgar Creek – flood : private property (including residences)	M / H	H / VH
Edgar Creek – flood : domestic water	M / H	H / VH
Edgar Creek – flood : Slocan River Road	M / H	H / VH
There is private land with residences on the Edgar Creek fan, and four water licenses in Edgar Creek for domestic purposes.		
Edgar Creek is a drainage that is naturally subject to periodic debris flow events with a frequency estimated to be on the order of centuries. The ephemeral stream currently appears to have sufficient confinement on the valley bottom fan such that flood avulsion is unlikely, but avulsion would be possible in the event of a debris flow. Debris flow deposits are not apparent where the stream is crossed by the Slocan River Road with a 600 mm culvert. Private residences appear to be located only on the lower fan where fluvial processes dominate as opposed to debris flow processes.		
The majority of the burn area within Edgar Creek drainage is sparsely forested with common bedrock outcrops and the majority of the area burned appeared to be low burn severity. However, considering the lack of on the ground field work in this area and the high value elements at risk, it has been conservatively estimated that ***an increase in the likelihood of a debris flow or flood event in Edgar Creek is possible, so hazard and risk ratings have been increased.***		

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McFayden Creek – debris flows : private property (including residences)	H / VH	VH / VH
McFayden Creek – debris flows : domestic water	H / VH	VH / VH
McFayden Creek – debris flows : Slocan River Road	H / VH	H / VH
McFayden Creek – flood : private property (including residences)	H / VH	VH / VH
McFayden Creek – flood : domestic water	H / VH	VH / VH
McFayden Creek – flood : Slocan River Road	H / VH	VH / VH
There is private land with residences on the McFayden Creek fan, and numerous water licenses in McFayden Creek for domestic and irrigation purposes as well as power production.		
McFayden Creek is naturally subject to periodic debris flow events with a frequency estimated to range from several decades to centuries for events which reach the valley bottom fan; however, average frequency does appear to be greater than some adjacent watersheds with a similar frequency range. Reforested debris flow deposits exist along the channel where observed in the field near 1240 m elevation, and the upper fan is between 15% and 20% which is typical for debris flow fans in the region. The perennial stream has variable confinement on the valley bottom fan and avulsion would be possible in the event of a flood or debris flow. Debris flow deposits are not apparent where the stream is crossed the Slocan River Road with a 1200 mm culvert, and the fan at this location is 10% gradient.		
McFayden Creek has not had a large debris flow event in recent history, but is capable of producing large events. Sediment within the channel has built up over this time resulting in the potential for a large debris flow if initiated.		
Within the McFayden Creek watershed soil burn severity was generally observed to be higher than vegetation burn severity. There are areas of high soil burn severity with hydrophobic soil properties at and upslope of some gully headwalls which appear to be initiation zones for periodic debris flow events. As a result, ***the likelihood of both flood and debris flow events is estimated to have increased as a result of the fire. While this is not reflected in the pre- and post-fire risk ratings due to the already Very High partial risk, there is an increase in risk to private property (including residences), domestic water supply, and the Slocan River Road as a result of the fire.***		
The frequency and magnitude of snow avalanches may also increase on the southwest aspect slopes of the upper McFayden Creek watershed where natural size 2 avalanches close between a 1:1 and 1:5 year frequency, with up to size 3 avalanches at a frequency of approximately 1:10 years. These larger snow avalanches extend to the main gully and appear to terminate between 1000 m and 1100 m elevation, but do not extend to private land near valley bottom.		

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Draw Gullies – debris flows : private property (including residences)	M / H	H / VH
Draw Gullies – debris flows : Slocan River Road	M / H	M / H
Draw Gullies – open slope debris avalanche : private property (including residences)	M / H	H / VH
Draw Gullies – open slope debris avalanche : Slocan River Road	M / H	M / H
There is private land with residences downslope of Draw Gullies, but no known water licenses. *The Draw Gullies consist of two separate gully systems on the face between McFayden Creek and Draw Creek. Bedrock bluffs are common in the watershed and are subject to rockfall, but it does not appear that rock fall events extend beyond the gentle gradient kame terrace near the lower drainage unit boundary. There are colluvial fans downslope of the gullies which have incised through the kame terrace, with private land and residences on the fans. There is no evidence of recent debris flow activity on the fans or streams where crossed by the Slocan River Road. The frequency of hazardous debris flows in these gullies is uncertain, but likely on the order of centuries with smaller rockfall and debris avalanche events more common.* *The majority of the burn area appeared to be low to moderate vegetation burn severity. However, considering the lack of ground field work in this area and the high value elements at risk, it has been conservatively estimated that* ***an increase in the likelihood of a debris flow or debris avalanche event is possible, so hazard and risk ratings have been increased.***		
Draw Face– rock fall : private property (including residences)	H / H	H / H
Draw Face – rock fall : Slocan River Road	H / H	M / M
Draw Face – open slope debris avalanche : private property (including residences)	M / M	M / M
Draw Face – open slope debris avalanche : Slocan River Road	M / M	L / L
There is private land with residences downslope of Draw Face, but no known water licenses. *Draw Face contains numerous bedrock bluffs and no continuous gullies with only a small portion of the upper drainage area situated within the fire perimeter. There are no streams or converging drainage patterns in this upper watershed area. As a result,* ***there is limited potential for the burned area to have adverse effects on slope stability within the face unit.*** *Rockfall is an active process within the unit, as well as the potential for open slope debris avalanches; however, the frequency and magnitude of these processes are unlikely to be significantly increased by the fire.*		

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Draw Creek – debris flows : private property (including residences)	H / VH	VH / VH
Draw Creek – debris flows : domestic water	H / VH	VH / VH
Draw Creek – debris flows : Slocan River Road	H / VH	H / VH
Draw Creek – flood : private property (including residences)	H / VH	VH / VH
Draw Creek – flood : domestic water	H / VH	VH / VH
Draw Creek – flood : Slocan River Road	H / VH	VH / VH
Draw Creek – snow avalanches :private property (including residences)	H / H	H / H
Draw Creek – snow avalanches : domestic water	H / H	H / H
There is private land with residences on the Draw Creek fan, and numerous water licenses in Draw Creek for domestic and irrigation purposes.		
Draw Creek is naturally subject to periodic debris flow events with a frequency estimated to range from several decades to centuries for events which reach the valley bottom fan; however, average frequency does appear to be greater than some adjacent watersheds with a similar frequency range. The fan immediately upslope of the Slocan River Road is generally between 10% and 20% which is typical for debris flow runout on fans in the region, and common boulders with old channels and levees are apparent on the fan surface typical of debris flow dominated fans. The perennial stream has variable confinement on the valley bottom fan and avulsion would be possible in the event of a flood or debris flow. The stream is crossed the Slocan River Road with a 600 mm culvert, and the fan at this location is 16% gradient.		
There are numerous snow avalanche start zones within the Draw Creek watershed, many of which converge into the main Draw Creek gully. The main avalanche path in the gully appears to extend to near the apex of the fan with size 3 events likely on the order of 1:10 year frequency, but development on the private land downslope of this location makes the maximum runout difficult to identify based on vegetation evidence. Snow avalanches are very unlikely to reach the Slocan River Road considering the separating distance of gentle gradient fan. The frequency and magnitude of snow avalanche in the Draw Creek watershed is unlikely to be significantly affected by the burn as there are numerous start zones which are unaffected.		
The proportion of Draw Creek watershed which is moderate to high vegetation burn severity in combination with the 2009 burn area is sufficient to assume that ***the likelihood of both flood and debris flow events and associated risks are likely increased as a result of the fire.***		

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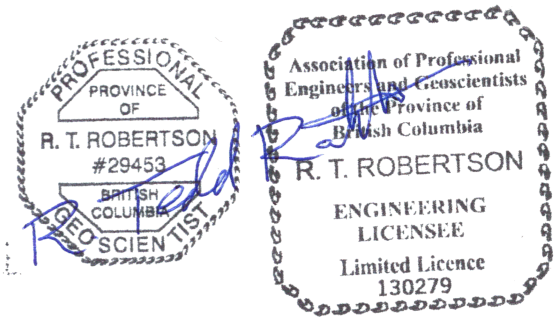
Newcomen Creek – debris flows : private property (including residences)	H / H	VH / VH
Newcomen Creek – debris flows : domestic water	H / H	VH / VH
Newcomen Creek – debris flows : Slocan River Road	H / H	VH / VH
Newcomen Creek – flood : private property (including residences)	H / H	VH / VH
Newcomen Creek – flood : domestic water	H / H	VH / VH
Newcomen Creek – flood : Slocan River Road	H / H	VH / VH
There is private land with residences on the Newcomen Creek fan, and eight water licenses in Newcomen Creek for domestic and irrigation purposes. *Newcomen Creek is naturally subject to periodic debris flow events with a frequency estimated to range from several decades to centuries for events which reach the valley bottom fan. No field work was completed in the watershed due to limited access and considering the limited burn area. The stream has variable confinement on the valley bottom fan and avulsion would be possible in the event of a flood or debris flow. Reforested debris flow deposits are apparent where the stream is crossed the Slocan River Road with a 450 mm culvert, and the fan at this location is 18% gradient. Private residences are situated on the fan downslope of the Slocan River Road.* *Newcomen Creek has not had a large debris flow event in recent history. Sediment within the channel has likely built up over this time resulting in the potential for a large debris flow event if initiated.* *There is separation between the burn area in the upper watershed and the steeper gullied terrain in the middle elevations where natural debris flow events initiate. The separating terrain is gentle gradient and forested for a distance of approximately 450 m, and would help attenuate runoff from the burn area, reducing the effect of the burn on downslope stability.* ***As a result, the likelihood of both flood and debris flow events and associated risks are not expected to be significantly increased as a result of the fire.*** *Natural snow avalanches occur within the steep and gullied mid elevations of the Newcomen Creek drainage; these avalanches appear to remain at size 2 and size 3 events, and do not appear to reach valley bottom. The burn area is upslope of and separated from the avalanche terrain, and as a result the frequency and magnitude of snow avalanches in the Newcomen Creek gully will not increase as a result of the fire.*		

SUMMARY OF HAZARDS AND RISKS: *1. Hazard = P(H), the probability of occurrence of a hazardous event* *2. Risk = Partial risk P(HA) = P(H) × the probability of it reaching or affecting an element at risk* **Location – Hazard Type : Element at Risk**	**HAZARD** [1] (pre fire / post fire)	**RISK** [2] (pre fire / post fire)
Nathan Creek – debris flows : private property (including residences) Nathan Creek – debris flows : domestic water Nathan Creek – debris flows : Slocan River Road Nathan Creek – flood : private property (including residences) Nathan Creek – flood : domestic water Nathan Creek – flood : Slocan River Road *There is private land with residences on the Nathan Creek fan, and numerous licensed POD's in Nathan Creek for domestic and irrigation purposes.* *Nathan Creek is naturally subject to periodic debris flow events with a frequency estimated to range from several decades to centuries for events which reach the valley bottom fan. No field work was completed in the watershed due to limited access and considering the limited burn area. There are private residences on the valley bottom fan. Considering the small burn area with mostly low burn severity, and the divergent drainage pattern at the burn location within Nathan Creek watershed,* ***the likelihood of a hazardous debris flow or flood in Nathan Creek and associated risks are not expected to be significantly increased as a result of the fire.***	H / H H / H H / H H / H H / H H / H	VH / VH VH / VH VH / VH VH / VH VH / VH VH / VH
Watson Creek – debris flows : private property (including residences) Watson Creek – debris flows : domestic water Watson Creek – debris flows : Slocan River Road Watson Creek – flood : private property (including residences) Watson Creek – flood : domestic water Watson Creek – flood : Slocan River Road *There is private land with residences on the Watson Creek fan, and numerous licensed POD's in Watson Creek for domestic and irrigation purposes.* *Watson Creek is naturally subject to periodic debris flow events with a frequency estimated to be on the order of centuries for events which reach the valley bottom fan. No field work was completed in the watershed or the fan due to limited access within the watershed and considering the limited burn area. There are private residences on the valley bottom fan. Considering the very small burn area with low burn severity,* ***the likelihood of a hazardous debris flow or flood in Watson Creek and associated risks are not increased as a result of the fire.***	M / M M / M M / M H / H H / H H / H	H / H H / H M / M VH / VH VH / VH VH / VH
Lower Little Slocan Drainage – debris flows : private property Lower Little Slocan Drainage – flood : private property *There is private land on the valley bottom alluvial fan, but no PODs or private buildings are located downslope of Lower Little Slocan Drainage.* *Lower Little Slocan Drainage is naturally subject to periodic debris flow events with a frequency estimated to be on the order of centuries for events which reach the valley bottom fan. No field work was completed in the watershed due to limited access. Considering the relatively small burn area with predominantly low burn severity,* ***the likelihood of a hazardous debris flow or flood in Lower Little Slocan Drainage and associated risks are not expected to be significantly increased as a result of the fire.*** *Debris flow events reaching this valley bottom fan appear to initiate more frequently in the watershed directly to the north, with the confluence of these two adjacent watershed streams approximately 300 m upslope of the fan apex.*	M / M M / M	H / H H / H

SUMMARY OF HAZARDS AND RISKS: *1. Hazard = P(H), the probability of occurrence of a hazardous event* *2. Risk = Partial risk P(HA) = P(H) × the probability of it reaching or affecting an element at risk* **Location – Hazard Type : Element at Risk**	**HAZARD** [1] (pre fire / post fire)	**RISK** [2] (pre fire / post fire)
Varney North – debris flows : private property	M / M	H / H
Varney North – flood : private property	H / H	VH / VH
There is private land on the valley bottom alluvial fan, but no PODs or private buildings are located downslope of Varney North. *Varney North is naturally subject to periodic debris flow events with a frequency estimated to be on the order of centuries for events which reach the valley bottom fan. No field work was completed in the watershed due to limited access and considering the very small burn area. Considering the very small burn area with low burn severity,* ***the likelihood of a hazardous debris flow or flood in Varney North and associated risks are not increased as a result of the fire.***		
Varney Creek – debris flows : private property (including cabins)	H / VH	VH / VH
Varney Creek – debris flows : domestic water	H / VH	VH / VH
Varney Creek – flood : private property	H / VH	VH / VH
Varney Creek – flood : domestic water	H / VH	VH / VH
There is private land with at least three cabin structures on the Varney Creek fan, and there is a domestic POD license in Varney Creek in the mid fan position. *Varney Creek is naturally subject to periodic debris flow events with a frequency estimated to range from several decades to centuries for events which reach the valley bottom fan. No field work was completed in the watershed due to limited access. Based on LiDAR and orthomosaic imagery, reforested debris flow deposits exist on the fan which is between 15% and 20% gradient in the upper 2 / 3 of its length, which is typical for debris flow fans in the region. The stream has variable confinement on the valley bottom fan and avulsion would be possible in the event of a flood or debris flow.* *Considering the overall extent of burn are within the upper watershed area, and based on observations of soil burn severity generally being greater than vegetation burn severity where observed on the ground in adjacent McFayden Creek and Talbott Creek,* ***the likelihood of both flood and debris flow events is estimated to have increased as a result of the fire.*** *While this is not reflected in the pre- and post-fire risk ratings due to the already Very High partial risk, there is an increase in risk to private property (including cabins) and domestic water supply as a result of the fire.*		

SUMMARY OF HAZARDS AND RISKS: *1. Hazard = P(H), the probability of occurrence of a hazardous event* *2. Risk = Partial risk P(HA) = P(H) × the probability of it reaching or affecting an element at risk* **Location – Hazard Type : Element at Risk**	**HAZARD** [1] (pre fire / post fire)	**RISK** [2] (pre fire / post fire)
Tedesco Creek – debris flows : private property Tedesco Creek – flood : private property *There is private land but no known structures on Tedesco Creek fan, and there are no licensed POD's in Tedesco Creek.* *Tedesco Creek is naturally subject to periodic debris flow events with a frequency estimated to be on the order of centuries for events which reach the valley bottom fan. No field work was completed in the watershed due to the lack of downslope residences or structures on the private land. Based on LiDAR and orthomosaic imagery, reforested debris flow deposits exist on the fan which is between 15% and 25% gradient in the upper 2 / 3 of its length, which is typical for debris flow fans in the region. The stream has variable confinement on the valley bottom fan and avulsion would be possible in the event of a flood or debris flow.* *Considering the overall extent of burn are within the upper watershed area, and based on observations of soil burn severity generally being greater than vegetation burn severity where observed on the ground in adjacent McFayden Creek and Talbott Creek,* ***the likelihood of both flood and debris flow events is estimated to have increased as a result of the fire.***	M / H M / H	H / VH H / VH
Tedesco West – debris flows : private property Tedesco West – open slope debris avalanche : private property *There is private land on the valley bottom near the northwest corner of this area, but no PODs or private buildings are located downslope of Tedesco West.* *Tedesco West is a face unit that includes the Tedesco Road and has several previously harvested cutblocks at varied states of regeneration. There are few significant gullies within the face unit, and slope gradients are predominantly <60% with some steeper areas. The burned area in this unit is situated near ridgetop with generally linear or divergent drainage patterns, reducing the overall impact of the burn with respect to changes in runoff regime. Approximately 15 ha of the 57 ha of burned are in this unit has been previously harvested with limited growth of new forest. As a result of these factors,* ***the likelihood of hazardous debris flow or debris avalanche events is not expected to be significantly increased by the fire.***	L / L L / L	VL / VL VL / VL

SUMMARY OF HAZARDS AND RISKS: *1. Hazard = P(H), the probability of occurrence of a hazardous event* *2. Risk = Partial risk P(HA) = P(H) × the probability of it reaching or affecting an element at risk* **Location – Hazard Type : Element at Risk**	**HAZARD** [1] (pre fire / post fire)	**RISK** [2] (pre fire / post fire)
Tedesco-Talbott Face – open slope debris avalanche : Little Slocan South Road Tedesco-Talbott Face – debris flow : Little Slocan South Road *There is no private land on the valley bottom, and no PODs located downslope of Tedesco-Talbott Face. The Little Slocan South Road extends along the valley bottom adjacent to the Little Slocan River; road status with respect to use and maintenance responsibilities is uncertain for this section.* *Tedesco-Talbott Face is a drainage unit that has much past forest development of various ages including roads, trails, and cutblocks. There are two main bedrock cliff areas and a number of small gullies, typically less than 5 m in depth. Rockfall is an active process in these cliff areas, but rockfall runout does not extend to valley bottom. Based on interpretation of the LiDAR bare earth imagery, the southern bedrock cliff area appears to be the headscarp of a large bedrock slump / earth flow which shows evidence of past movement to valley bottom. Based on comparison with similar features in the region, it is likely that this instability initiated in the early post-glacial environment, and is no longer active under present day environmental conditions; however, no field work was completed in this area to confirm. The burn area is at the top of the drainage area with no streams expected, and generally divergent drainage patterns, reducing the overall impact of the burn with respect to changes in runoff regime. As a result of these factors,* ***the likelihood of hazardous debris flow or debris avalanche event is not expected to be significantly increased by the fire.***	L / L L / L	L / L L / L

SIGNATURE:	ATTACHMENTS:
 2020-10-30	1. Appendix A: Photographs 2. Appendix B: Figure 1: 1:20,000 scale Talbott Creek Fire #N51250 Post Wild-fire Risk Analysis Map with Burn Severity (visually estimated burn severity mapping as well as watershed and fan boundaries); 3. Appendix B: N51250 Burn Severity Mapping (BARC derived BC Burn Severity 2020 Same-Year Classification); 4. Appendix C: Post Wildfire Risk Analysis Definitions and Ratings; and 5. Appendix D: List of Water Licenses from affected drainages

Report form adapted from Southern Interior Forest Region, preliminary report form version 1.1, 2010

Appendix A

Photos

Photo 1: Aerial view looking northeast at upper elevations of Talbott Creek, Unnamed 4, and Davout Creek drainages with low vegetation burn severity in the lower area, moderate vegetation burn severity in the middle, and predominantly high vegetation burn severity in the upper area.

Photo 2: Aerial view looking northwest at upper elevations of Talbott Creek, Unnamed 4, Unnamed 3, Davout Creek, Unnamed 2, Unnamed 1, and McFayden Face drainages with low vegetation burn severity in the lower area, moderate vegetation burn severity in the middle, and predominantly high vegetation burn severity in the upper elevations.

Photo 3: Area of moderate to high vegetation burn severity and high soil burn severity in Talbott Creek drainage near 1700 m elevation.

Photo 4: Area of moderate to high vegetation burn severity, and high soil burn severity on west aspect slope near 1500 m elevation in McFayden Creek drainage.

Photo 5: View of low to moderate vegetation burn severity in upper McFayden Creek watershed on southeast aspect slopes 1700 m elevation.

Photo 6: View of recent moderate to high vegetation burn severity area in the upper Draw Creek drainage (foreground of photo), with 2009 burn area visible in the background.

Appendix B

Figures

Burn severity mapping derived from visual observations during overview flight and limited field checking. Available satellite derived burn severity mapping (BARC) coverage is incomplete, and appears to underestimate some areas of burn severity based in comparison with field checking.

PREPARED FOR:
FORESTS, LANDS, NATURAL RESOURCES OPERATIONS;
BC WILDFIRE SERVICE

TALBOTT CREEK FIRE #N51250
POST WILD-FIRE
RISK ANALYSIS MAP
WITH BURN SEVERITY

PREPARED BY:
SITKUM CONSULTING LTD.

LOCATION: PERRY RIDGE
MAPSHEETS: 82F016 / 17 / 26 / 27
NAD 1983 BC ENVIRONMENT ALBERS
PROJECT: 20-1645
DATE: OCTOBER 29, 2020
DRAWN BY: CR | CHECKED BY: TR
PAGE SIZE: CUSTOM 29" X 22"
FILE PATH: 20_1645_FIGURE1.MXD

0 200 400 600 800 1,000 Meters
SCALE:1:20,000

CONTOUR (LIDAR DERIVED):
INDEX/INTERMEDIATE — 100m 20m
STREAM / WATERCOURSE
HIGHWAY/SECONDARY ROAD
PRIVATE LOT
POWERLINE
WATERSHED BOUNDARY
POINTS OF DIVERSION: DOMESTIC / OTHER
STRUCTURES:
TRIM SOURCE / SCL FIELD OBSERVATION
FIRE PERIMETER
VISUAL ESTIMATION OF VEGETATION BURN SEVERITY
HIGH
LOW
MODERATE
TERRAIN STABILITY POLYGONS (TSIL C, D) — IV, V / P, U
FAN
FIELD DATA — TR12 CT34

FIELD WORK COMPLETED BY TEDD ROBERTSON, P.GEO ENG.L., AND CAITLIN TATHAM, G.I.T. M.SC., WITH HELICOPTER OVERVIEW FLIGHT ON SEPTEMBER 22, GROUND TRAVERSES WITHIN THE FIRE PERIMETER ON SEPTEMBER 29 AND 30, AND VALLEY BOTTOM OBSERVATIONS ON OCTOBER 6, 2020.

DATA SOURCES:
LIDAR- BCTS & INTERFOR
BASE-BC GEOGRAPHIC WAREHOUSE
ROADS- DIGITAL ROAD ATLAS
PRIVATE LOTS- CBM-INTEGRATED CADASTRAL FABRIC
WATERSHEDS AREA-SCL

WATERSHED AFFECTED:	TOTAL WATERSHED AREA (ha)	AREA BURNED WITHIN WATERSHED (ha)	AREA BURNED WITHIN WATERSHED (%)	BURN SEVERITY (% of burned area)	BURN SEVERITY (% of total watershed)
Davout Creek	73	39	53	32% L, 51% M, 17% H	17% L, 27% M, 9% H
Draw Creek	210	61	29	26% L, 25% M, 49% H	8% L, 7% M, 14% H
Draw Face	34	3	10	99% L, 1% M, 0% H	10% L, 0% M, 0% H
Draw Gullies	57	22	38	47% L, 53% M, 0% H	18% L, 20% M, 0% H
Edgar Creek	61	35	58	71% L, 29% M, 0% H	41% L, 17% M, 0% H
Lower Little Slocan Drainage	571	45	8	81% L, 4% M, 15% H	6% L, 1% M, 1% H
McFayden Creek	575	490	85	47% L, 37% M, 16% H	40% L, 32% M, 13% H
McFayden Face	72	2	2	78% L, 22% M, 0% H	2% L, 0% M, 0% H
Nathan Creek	203	11	5	59% L, 41% M, 0% H	3% L, 2% M, 0% H
Newcomen Creek	96	12	13	46% L, 40% M, 14% H	6% L, 5% M, 2% H
Talbott Creek	199	120	61	35% L, 35% M, 30% H	21% L, 21% M, 18% H
Tedesco Creek	290	124	43	55% L, 40% M, 5% H	23% L, 17% M, 2% H
Tedesco West	364	57	16	45% L, 46% M, 9% H	7% L, 7% M, 1% H
Tedesco-Talbott Face	458	49	11	34% L, 42% M, 24% H	4% L, 5% M, 3% H
Unnamed 1	34	8	24	60% L, 40% M, 0% H	14% L, 10% M, 0% H
Unnamed 2	56	7	13	67% L, 33% M, 0% H	9% L, 4% M, 0% H
Unnamed 3	47	8	16	48% L, 41% M, 11% H	8% L, 7% M, 2% H
Unnamed 4	83	42	50	53% L, 21% M, 26% H	27% L, 11% M, 13% H
Varney Creek	322	158	49	47% L, 43% M, 10% H	23% L, 21% M, 5% H
Varney North	61	2	3	100% L, 0% M, 0% H	3% L, 0% M, 0% H
Watson Creek	407	5	1	60% L, 0% M, 0% H	1% L, 0% M, 0% H

N51250
Burn Severity Mapping

BC Burn Severity 2020
(Same-Year Classification)

- High
- Medium
- Low
- Unburned
- Unknown

This burn severity mapping is created using a Differenced Normalized Burn Ratio (DNBR) calculation on pre- and post-fire imagery which is classified into four Burned Area Reflectance Classification (BARC) categories. Default breakpoints are used for all timber types across BC and therefore may not accurately reflect field conditions.

"Same-Year Classification" means that the burn severity mapping has been completed the same year the fire occurred (i.e. in summer/fall 2020 for 2020 fires).

Pre-Fire Scene Identifier:
LC08_L1TP_044025_20190807_20190820_01_T1

Post-Fire Scene Identifier:
LC08_L1TP_043026_20201005_20201015_01_T1

0 0.325 0.65 1.3
Kilometers

Ministry of Forests, Lands, Natural Resource Operations and Rural Development

Last updated: 2020-10-20
Updated by: camahood
Coordinate System: NAD 1983 BC Environment Albers

Document Path: Z:\burn_severity_runs\data\work\PBS_2020_same_year\burn_severity.mxd

Appendix C

Post Wildfire Risk Analysis Definitions and Ratings

Post Wildfire Risk Analysis
Definitions and Ratings

The following sections provide important definitions for terminology used in this report, and are based on definitions presented in Land Management Handbook 69 – Post-Wildfire Natural Hazards Risk Analysis in British Columbia (Hope et al. 2015) and Land Management Handbook 56 - Landslide Risk Case Studies in Forest Development Planning and Operations (Wise et al. 2004) (LMH-56).

Hazard**:** a source of potential harm, or a situation with the potential for causing harm, to a specified *element at risk*. With respect to landslide risk analysis, the landslide itself is the hazard.

Likelihood of occurrence**:** the qualitative estimate of probability (P), or the chance for an event to occur.

Elements at risk (elements): a thing of value that is known to be at risk. Elements at risk may include human safety, public and private property, transportation system/corridor, utility and utility corridor, domestic or community water quality and supply, fish habitat, wildlife habitat and migration, visual resource in a scenic area, timber value, and soil productivity (adapted from B.C. MoF, 2002).

Hazard analysis, P(H): an estimation of the probability of a specific hazardous event. With respect to landslide hazard analysis, it refers to the probability or likelihood of occurrence for a specific hazardous landslide.

Spatial probability, P(S:H)*:* relates to the potential for an event to reach or have a spatial effect on the location of a considered element, and mathematically can range from a value of 0 (certain not to reach the element) to 1 (certain to reach the element).

Temporal probability, P(T:S)*:* relates to the potential for a mobile element to be at the affected location, if the considered event occurs. If the element is of a fixed location and is always present (such as permanent infrastructure) then the temporal probability is numerically equal to 1, with a value of less than 1 applicable for mobile elements depending on the proportion of time exposed.

Consequence, C**:** the effect on a specified *element at risk*. With respect to landslide risk analysis, the consequence is the change, loss, or damage to the considered element caused by the landslide. Consequence takes into account the vulnerability as well as spatial and temporal probabilities of an event affecting an element.

Vulnerability, V: a measure of the robustness of an *element at risk* and its relative exposure to a hazard.

Partial risk analysis, P(HA): the product of the probability of occurrence and the probability of a spatial effect, taking into account both spatial and temporal probabilities. With respect to landslide risk analysis, it is the product of the probability for a specific hazardous landslide and the probability of that landslide reaching or otherwise affecting a considered element. It can also be referred to as *the probability of a specific hazardous affecting landslide*. Partial risk does not take into account the vulnerability of the element at risk, or the consequence of the event.

In general terms, risk is defined as the product of probability of occurrence and consequence (R=PXC). In the consideration of consequence to a specific element at risk, the vulnerability or robustness of the specific element must be understood. The vulnerability of specific elements is generally best assessed by specialists with a greater knowledge of the element than the terrain stability professional may have.

As a result, it is generally appropriate for a terrain stability professional to carry out a *partial risk analysis,* in which the likelihood of a specific hazardous landslide is determined, and whether or

not a specific element at risk could be spatially affected by the hazardous landslide; however, the vulnerability of the specific element, including an estimation of consequence, is not considered (Wise et al. 2004; LMH 56).

The following tables outline ratings presented in this report. Table 1 provides the qualitative descriptions for the relative likelihood of occurrence ratings for a considered hazard event (P(H)).

Table 1: Qualitative description of the likelihood of occurrence (hazard rating)[1]

Likelihood of Occurrence	Qualitative Description
Very High (VH)	A specific hazardous event[2] is very likely or imminent within the short term.
High (H)	A specific hazardous event can happen or is probable (likely) within the short term.
Moderate (M)	A specific hazardous event is not likely, but possible within the short term.
Low (L)	A specific hazardous event is a remote possibility (unlikely) within the short term.
Very Low (VL)	A specific hazardous event is a very remote possibility within the short term.

1) Adapted from Hope et al. (2015)
2) An event is most likely to occur under adverse weather conditions, such as high-intensity rainfall or rapid snowmelt.

Table 2 presents the relative ratings for the likelihood of an event reaching or affecting an element at risk, given that a hazardous event occurs (P(S:H)xP(T:S)). These ratings take into account both spatial and temporal probabilities.

Table 2: Likelihood of a spatial effect, given that a hazardous event occurs

Likelihood of a Spatial Effect	Qualitative Description
High	Event is expected to, or is very likely to have a spatial effect on the considered element at risk.
Moderate	Event could have a spatial effect on the considered element at risk under adverse conditions.
Low	Event is unlikely to have a spatial effect on the considered element at risk. A spatial impact could result if rare or exceptionally adverse conditions occur.

Table 3 presents the qualitative risk matrix that shows how partial risk ratings are derived from the combination of the likelihood of occurrence of a hazardous event and the likelihood that the event will reach or have a spatial effect on a specific element at risk. These ratings do not take into account the vulnerability of the element, or the potential consequence of the event. The risk ratings are also relative, and are not equivalent in likelihood to the hazard ratings.

Table 3: ***Qualitative risk matrix for determining partial risk with three levels of risk***[1]

Likelihood of occurrence of natural hazard	Risk (partial risk P(HA))			
	Likelihood that natural hazard will affect element:	**High**	**Moderate**	**Low**
Very High		Very High	Very High	High
High		Very High	High	Moderate
Moderate		High	Moderate	Low
Low		Moderate	Low	Very Low
Very Low		Very Low	Very Low	Very Low

[1]adapted from Hope et al. (2015) and Wise et al. (2004)

Table 4 presents ratings used for describing landslide magnitude based on approximate volume and affected area ranges.

Table 4: Magnitude ratings and approximate ranges of landslide area and volume[1]

Magnitude Rating	Quantitative Range	
	Area affected (ha)*	**Minimum Volume involved (m^3)****
Very Large	>5	50,000
Large	0.5-5	5,000-50,000
Medium	0.05-0.5	500-5,000
Small	0.005-0.05	50-500
Very Small	<0.005	< 50

[1]adapted from Wise et al. (2004)
*1 ha = 10,000 m^2
**Based on planimetric area and assumed depth/thickness of 1 m.

References

British Columbia Ministry of Forests 2002. Forest road engineering guidebook, 2nd ed. Forest Practices Code of British Columbia, Victoria, B.C.

Hope, G., P. Jordan, R. Winkler, T. Giles, M. Curran, K. Soneff, and B. Chapman. 2015. Post-wildfire natural hazards risk analysis in British Columbia. Prov. B.C., Victoria, B.C. Land Manag. Handb. 69. www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/LMH69.htm

Wise, M.P., G.D. Moore, and D.F. VanDine (editors). 2004. Landslide risk case studies in forest development planning and operations. B.C. Min. For., Res. Br., Victoria, B.C. Land Manage. Handb. No. 56.
www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh56.htm

Appendix D

Water Licences Report

Drainage	Source	PD number	License Number	Purpose	Latitude	Longitude	**Licensee Name**	**Licensee Address**
Talbott Creek	Talbott Creek	PD26426	C063114	Domestic	49.5684859	-117.7059555	MCGEE KENYON J & REYBURN ESTHER D	3096 LITTLE SLOCAN SOUTH WINLAW BC V0G2J0
Talbott Creek	Talbott Creek	PD26425	C124169	Irrigation	49.5662764	-117.7047011	HUDEC ANDREW MICHAEL	3250 LITTLE SLOCAN SOUTH WINLAW BC V0G2J0
Talbott Creek	Talbott Creek	PD24625	C126855	Domestic	49.5662764	-117.7047011	REDEKOP TEAGAN BRIANNA	3279 LITTLE SLOCAN SOUTH WINLAW BC V0G2J0
Talbott Creek	Talbott Creek	PD184498	C126856	Domestic	49.5635402	-117.7029126	RICHARDS DENNIS BLAINE & DARLENE JUANIT	4160 LYNN VALLEY ROAD NORTH VANCOUVER BC V7K2T2
Varney Creek	Varney Creek	PD62312	C100668	Domestic	49.6277825	-117.694948	Little Slocan Varney & Sons	Po Box 3566, AB, T0M 0N0
Draw Creek	Draw Creek	PD26446	C024106	Domestic	49.5799272	-117.6380268	LABELLE GASTON R	4546 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C024106	Irrigation	49.5799272	-117.6380268	LABELLE GASTON R	4546 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C024107	Domestic	49.5799272	-117.6380268	SLOOTWEG MARTINUS & JUDITH A	4556 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C024107	Irrigation	49.5799272	-117.6380268	SLOOTWEG MARTINUS & JUDITH A	4556 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C112288	Domestic	49.5799272	-117.6380268	LOCK RYAN WILLIAM ALEXANDER & LONNIE ANN	4545 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C121324	Irrigation	49.5799272	-117.6380268	HEPPER ROBERT BRADLEY	4538 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C121324	Domestic	49.5799272	-117.6380268	HEPPER ROBERT BRADLEY	4538 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C121325	Domestic	49.5799272	-117.6380268	OSACHOFF JOHN D	3829 BONNINGTON ROAD

Drainage	Source	PD number	License Number	Purpose	Latitude	Longitude	Licensee Name	Licensee Address
								BONNINGTON BC V0G2G3
Draw Creek	Draw Creek	PD26446	C121325	Irrigation	49.5799272	-117.6380268	OSACHOFF JOHN D	3829 BONNINGTON ROAD BONNINGTON BC V0G2G3
Draw Creek	Draw Creek	PD26446	C117330	Domestic	49.5799272	-117.6380268	CALDWELL GEOFFREY GLENDON & CHRISTOPHER	485 HOLBROOK ROAD W KELOWNA BC V1X1S4
Draw Creek	Draw Creek	PD26446	C120803	Irrigation	49.5799272	-117.6380268	MCKAY OLIN W & MARNIE L	4525 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C120803	Domestic	49.5799272	-117.6380268	MCKAY OLIN W & MARNIE L	4525 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Draw Creek	Draw Creek	PD26446	C026100	Irrigation	49.5799272	-117.6380268	HALISHEFF MICHAEL R	BOX 3391 CASTLEGAR BC V1N3N8
Draw Creek	Draw Creek	PD26446	C026100	Domestic	49.5799272	-117.6380268	HALISHEFF MICHAEL R	BOX 3391 CASTLEGAR BC V1N3N8
Newcomen Creek	Newcomen Creek	PD68994	C107807	Domestic	49.5845691	-117.6319938	SANDERS ADRIAN JASON	PO BOX 404 MANSON'S LANDING BC V0P1K0
Newcomen Creek	Newcomen Creek	PD26455	C043062	Domestic	49.5844109	-117.6319913	SULLIVAN KEVIN PATRICK	4762 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Newcomen Creek	Newcomen Creek	PD26453	C114788	Domestic	49.5842205	-117.6319739	CARPENDALE MONICA J	204 CHATHAM STREET NELSON BC V1L3Y9
Newcomen Creek	Newcomen Creek	PD26453	C114793	Domestic	49.5842205	-117.6319739	MARTIN DENNIS A. & MARTIN A. LINDA	4654 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Newcomen Creek	Newcomen Creek	PD26448	C114767	Domestic	49.5838687	-117.6318032	WARNER MARGARETE ELLEN	4720 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Newcomen Creek	Newcomen Creek	PD26448	C114767	Irrigation	49.5838687	-117.6318032	WARNER MARGARETE ELLEN	4720 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Newcomen Creek	Newcomen Creek	PD26447	C114778	Domestic	49.5837113	-117.6314074	CARPENDALE MONICA J	204 CHATHAM STREET NELSON BC V1L3Y9
Newcomen Creek	Newcomen Creek	PD26447	C114779	Irrigation	49.5837113	-117.6314074	CARPENDALE MONICA J	204 CHATHAM STREET NELSON BC V1L3Y9
Newcomen	Newcomen	PD26447	C114768	Domestic	49.5837113	-117.6314074	TIBERTI LAURA L	4692 SLOCAN RIVER ROAD

Drainage	Source	PD number	License Number	Purpose	Latitude	Longitude	Licensee Name	Licensee Address
Creek	Creek							WINLAW BC V0G2J0
Newcomen Creek	Newcomen Creek	PD26447	C114768	Irrigation	49.5837113	-117.6314074	TIBERTI LAURA L	4692 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD78434	C119440	Residential Power	49.5720535	-117.6567602	CHART CHRISTOPHER MARTIN & VIERHEILIG CH	616 RAILWAY STREET NELSON BC V1L1H4
McFayden Creek	McFayden Creek	PD26423	F053120	Domestic	49.5705908	-117.6537685	TODD REBECCA MARY RUTH & THOMPSON EVAN T	SUITE 106-3428 WESBROOK MALL VANCOUVER BC V6S0G9
McFayden Creek	McFayden Creek	PD26423	F053306	Irrigation	49.5705908	-117.6537685	HENRIQUE DANIEL LUIS & WAY SARAH JANE	4344 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	F053306	Domestic	49.5705908	-117.6537685	HENRIQUE DANIEL LUIS & WAY SARAH JANE	4344 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C131560	Irrigation	49.5705908	-117.6537685	CEROLI JUDITH	4335 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	F055933	Domestic	49.5705908	-117.6537685	BRAUN BRADLEY JAMES & LANA RENE	4380 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	F053202	Domestic	49.5705908	-117.6537685	BRAUN BRADLEY JAMES	4380 SLOCAN RIVER ROAD N WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	F053202	Irrigation	49.5705908	-117.6537685	BRAUN BRADLEY JAMES	4380 SLOCAN RIVER ROAD N WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C114000	Domestic	49.5705908	-117.6537685	BRAUN BRADLEY JAMES	4380 SLOCAN RIVER ROAD N WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C114004	Domestic	49.5705908	-117.6537685	BRAUN BRADLEY JAMES	4380 SLOCAN RIVER ROAD N WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C114001	Domestic	49.5705908	-117.6537685	RILEY GARTH GEOFFERY	4265 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C114005	Domestic	49.5705908	-117.6537685	RILEY GARTH GEOFFERY	4265 SLOCAN RIVER ROAD WINLAW BC V0G2J0

Drainage	Source	PD number	License Number	Purpose	Latitude	Longitude	Licensee Name	Licensee Address
McFayden Creek	McFayden Creek	PD26423	F053327	Domestic	49.5705908	-117.6537685	DWYER	3855 LITTLE SLOCAN SOUTH WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	F053327	Irrigation	49.5705908	-117.6537685	DWYER	3855 LITTLE SLOCAN SOUTH WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C131591	Domestic	49.5705908	-117.6537685	LIBOIRON JOSEPH J & THOMPSON LORI	4320 NATLAMP ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C041251	Irrigation	49.5705908	-117.6537685	CARSON VICTORIA NATALIE	PO BOX 63 SLOCAN PARK BC V0G2E0
McFayden Creek	McFayden Creek	PD26423	F053240	Irrigation	49.5705908	-117.6537685	DI PASQUALE SALVATORE & TRUDY	206 ROBSON ST NELSON BC V1L4Z9
McFayden Creek	McFayden Creek	PD26423	F053240	Domestic	49.5705908	-117.6537685	DI PASQUALE SALVATORE & TRUDY	206 ROBSON ST NELSON BC V1L4Z9
McFayden Creek	McFayden Creek	PD26423	F052926	Domestic	49.5705908	-117.6537685	BURGOON MARILYN	4403 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	F052926	Irrigation	49.5705908	-117.6537685	BURGOON MARILYN	4403 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C041250	Domestic	49.5705908	-117.6537685	CARSON VICTORIA NATALIE	PO BOX 63 SLOCAN PARK BC V0G2E0
McFayden Creek	McFayden Creek	PD26423	C037260	Domestic	49.5705908	-117.6537685	HYATT SAUL	4304 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C037262	Irrigation	49.5705908	-117.6537685	HYATT SAUL	4304 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C037261	Domestic	49.5705908	-117.6537685	HYATT SAUL	4304 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	C104866	Domestic	49.5705908	-117.6537685	LIBOIRON JOSEPH J & THOMPSON LORI	4320 NATLAMP ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	F053121	Domestic	49.5705908	-117.6537685	TODD REBECCA MARY RUTH & THOMPSON EVAN T	SUITE 106-3428 WESBROOK MALL VANCOUVER BC V6S0G9
McFayden	McFayden	PD26423	F053122	Irrigation	49.5705908	-117.6537685	TODD REBECCA MARY	SUITE 106-3428 WESBROOK

Drainage	Source	PD number	License Number	Purpose	Latitude	Longitude	Licensee Name	Licensee Address
Creek	Creek						RUTH & THOMPSON EVAN T	MALL VANCOUVER BC V6S0G9
McFayden Creek	McFayden Creek	PD26423	F053122	Domestic	49.5705908	-117.6537685	TODD REBECCA MARY RUTH & THOMPSON EVAN T	SUITE 106-3428 WESBROOK MALL VANCOUVER BC V6S0G9
McFayden Creek	McFayden Creek	PD26423	C113711	Domestic	49.5705908	-117.6537685	CEROLI JUDITH	4335 SLOCAN RIVER ROAD WINLAW BC V0G2J0
McFayden Creek	McFayden Creek	PD26423	F019660	Domestic	49.5705908	-117.6537685	SMITH JONATHAN PATRICK TERENCE	555 FULFORD GANGES ROAD SALT SPRING ISLAND BC V8K2K1
Edgar Creek	Edgar Creek	PD26419	C100609	Domestic	49.5700581	-117.6625618	VAIL MARK	4049 LITTLE SLOCAN S ROA WINLAW BC V0G2J0
Edgar Creek	Edgar Creek	PD26419	C100609	Irrigation	49.5700581	-117.6625618	VAIL MARK	4049 LITTLE SLOCAN S ROA WINLAW BC V0G2J0
Edgar Creek	Edgar Creek	PD82824	C132099	Domestic	49.5699722	-117.6622991	MARTIN CARY D	4654 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Edgar Creek	Edgar Creek	PD26417	C100402	Domestic	49.5683284	-117.6591664	TARR HEATHER ANNE	4235 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Edgar Creek	Edgar Creek	PD26417	C121385	Domestic	49.5683284	-117.6591664	ROBERT CHANTAL	4227 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Edgar Creek	Edgar Creek	PD26417	C121387	Irrigation	49.5683284	-117.6591664	CORDEIRO GERALD RAYMOND MANUEL & EBERT	RR 1 4217 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Unnamed #1	Harrison Spring	PD26411	F021285	Domestic	49.5582808	-117.6759986	NELSON MURRAY A	3793 LITTLE SLOCAN SOUTH WINLAW BC V0G2J0
Unnamed #1	Harrison Spring	PD26411	C124494	Domestic	49.5582808	-117.6759986	RURAL ALTERNATIVE RESEARCH AND TRAINING	3762 LITTLE SLOCAN ROAD WINLAW BC V0G2J0
Unnamed #2	Burns Spring	PD26413	C058290	Domestic	49.5610762	-117.6862829	PARKER MARGARET E	3627 LITTLE SLOCAN SOUTH WINLAW BC V0G2J0

Drainage	Source	PD number	License Number	Purpose	Latitude	Longitude	**Licensee Name**	**Licensee Address**
Nathan Creek	Nathan Creek	PD75692	C115770	Domestic	49.5936976	-117.6166231	BROCKLEBANK STEPHEN W & CAROLYN M	4951 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD75692	C115770	Irrigation	49.5936976	-117.6166231	BROCKLEBANK STEPHEN W & CAROLYN M	4951 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD75692	C115774	Domestic	49.5936976	-117.6166231	MILNER ANDREW PHILIP & WENDY LEAH	335 MURRAY DRIVE TRAIL BC V1R2J5
Nathan Creek	Nathan Creek	PD26466	C071017	Irrigation	49.5919551	-117.6153164	EVDOKIMOFF WILLIE	4879 SLOCAN RIVER ROAD WINLAW BC V0G-2J0
Nathan Creek	Nathan Creek	PD26466	C066074	Domestic	49.5919551	-117.6153164	EVDOKIMOFF WILLIE	4879 SLOCAN RIVER ROAD WINLAW BC V0G-2J0
Nathan Creek	Nathan Creek	PD26466	C037668	Domestic	49.5919551	-117.6153164	INWOOD ROBERT LEYH	4823 SLOCAN RIVER ROAD RR 1 WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD26466	C036212	Irrigation	49.5919551	-117.6153164	INWOOD ROBERT LEYH	4823 SLOCAN RIVER ROAD RR 1 WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD26466	C071016	Domestic	49.5919551	-117.6153164	WHITAKER KARLA DANEE & DONALD FREDERICK	4855 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD26466	C071016	Irrigation	49.5919551	-117.6153164	WHITAKER KARLA DANEE & DONALD FREDERICK	4855 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD26465	C043350	Domestic	49.5906441	-117.6145677	EHLERS DAVID T	4868 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD26465	C043350	Irrigation	49.5906441	-117.6145677	EHLERS DAVID T	4868 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD70421	C109140	Domestic	49.5891648	-117.6122594	HARWOOD MICHAEL	PO BOX 731 NELSON BC V1L5R4

Drainage	Source	PD number	License Number	Purpose	Latitude	Longitude	**Licensee Name**	**Licensee Address**
Nathan Creek	Nathan Creek	PD70421	C115772	Domestic	49.5891648	-117.6122594	HALE DAVID & ILONA	HALE DAVID & ILONA 622 5TH AVE KIMBERLEY BC V1A2T2
Nathan Creek	Nathan Creek	PD70421	C115771	Domestic	49.5891648	-117.6122594	BARRE JAMES HENRY & ALAINA BRIE-ANN	4895 SLOCAN RIVER ROAD WINALW BC V0G2J0
Nathan Creek	Nathan Creek	PD75696	C115773	Domestic	49.5891742	-117.6121759	HARWOOD MICHAEL	PO BOX 731 NELSON BC V1L5R4
Nathan Creek	Nathan Creek	PD26464	C059578	Irrigation	49.5884966	-117.6106432	DEMARCO CAROLYN M	BOX 130 WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD26464	C059579	Domestic	49.5884966	-117.6106432	DEMARCO CAROLYN M	BOX 130 WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD26460	C059580	Domestic	49.5882323	-117.609169	CANNON STEVEN DHARMA & RANDALL LESLIE	4898 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Nathan Creek	Nathan Creek	PD26460	C059580	Irrigation	49.5882323	-117.609169	CANNON STEVEN DHARMA & RANDALL LESLIE	4898 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD26675	C050485	Domestic	49.6003246	-117.6012883	ROBERTS CAMILLE VALERIE	5205 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD26675	C050485	Irrigation	49.6003246	-117.6012883	ROBERTS CAMILLE VALERIE	5205 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD26490	F016406	Irrigation	49.598128	-117.5944902	ROBERTS CAMILLE VALERIE	5205 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD26490	C050104	Domestic	49.598128	-117.5944902	ROBERTS CAMILLE VALERIE	5205 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD26490	C050105	Domestic	49.598128	-117.5944902	SMITH CLARKE M & DIANA D	5361 DRAKE STREET WINLAW BC V0G1J0
Watson Creek	Watson Creek	PD26490	C100848	Irrigation	49.598128	-117.5944902	SMITH CLARKE M & DIANA D	5361 DRAKE STREET WINLAW BC V0G1J0
Watson Creek	Watson Creek	PD26489	C100844	Irrigation	49.5974192	-117.5903786	VERIGIN WILLIAM BRIANE ET AL	5323 SLOCAN RIVER ROAD WINLAW BC V0G2J0

Drainage	Source	PD number	License Number	Purpose	Latitude	Longitude	**Licensee Name**	**Licensee Address**
Watson Creek	Watson Creek	PD26488	C100842	Domestic	49.5975066	-117.5899727	VERIGIN BRIANE W & NINA S	5323 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD26488	C100844	Irrigation	49.5975066	-117.5899727	VERIGIN WILLIAM BRIANE ET AL	5323 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD26488	C100845	Irrigation	49.5975066	-117.5899727	VERIGIN BRIANE W & NINA S	5323 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD26488	C00841	Domestic	49.5975066	-117.5899727	VERIGIN WILLIAM BRIANE ET AL	5323 SLOCAN RIVER ROAD WINLAW BC V0G2J0
Watson Creek	Watson Creek	PD192926	500542	Misc. Industrial	49.5980939	-117.5863843	MINISTRY OF TRANSPORTATION AND INFRASTRURE	4TH FLOOR-310 WARD STREE NELSON BC V1L4S5
Watson Creek	Rogers Spring	PD62323	C100669	Greenhouse & Nursery	49.5979133	-117.5920529	SMITH CLARKE M & DIANA D	5361 DRAKE STREET WINLAW BC V0G1J0