District of Tumbler Ridge
Community Wildfire Protection Plan

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Executive Summary

The District of Tumbler Ridge (DTR) initiated an update to the 2006 Community Wildfire Protection Plan (S. Hope, and ASIM Ltd. 2006) due to a suite of factors that include: town expansion plans, a new Official Community Plan (2012), updates to Zoning Bylaws (2012), modification of earlier prescriptions and changes to forest fuel dynamics and wildfire hazard. The following report followed the procedures outlined by the 2012 Strategic Wildfire Prevention Initiative, managed by the Union of BC Municipalities (UBCM), to highlight areas of unacceptable hazard within a 2km radius of the town of Tumbler Ridge (i.e. the Wildland Urban Interface).

Treatment units have been identified and described for areas of high and extreme wildfire threat within the Wildland Urban Interface. The treatments are aimed at altering the fuel structure and composition to improve the management and control of a wildfire, should one occur.

Key areas of concern include a south-westerly slope to the west of the golf course, the pine stand to the west and east of the golf course road, and pockets of timber to the east of the town, just uphill of highway 52. The fuel types in these areas are susceptible to fires of high intensity and rates of spread. The proximity to structures, slope and aspect were other key factors in rating these fuel types as High or Extreme.

The 2006 Hourglass Creek wildfire and the recent 2014 Red Deer creek wildfire highlight an obvious threat facing the DTR. Wildfire occurrence are historically common in the surrounding ecosystem and with increased fuel loading from beetle killed lodgepole pine, it is important to take a proactive and strategic approach to the management of forest fuels and the potential for fire in the wildland urban interface.

1.0 Introduction

The District of Tumbler Ridge initiated the development of a Community Wildfire Protection Plan (CWPP) in 2006 to identify the potential wildfire hazard and risks associated with the wildland urban interface. Since then the availability, structure and composition of the surrounding fuels have changed and pose a different wildfire threat to the town. With this change, among changes to community zoning and expansion plans, Silvicon Services Inc. was employed to identify current hazard classes and develop fuel management strategies and prescriptions to reduce potentially adverse fire behavior from wildfires encroaching the town perimeter and fires that may initiate from within the town and travel outwards through crown land.

The plan addresses fuel management based on the following criteria:

1. Prescriptions for fuel treatment projects originate from within the interface area, but may extend beyond the boundaries of the local government.
2. Preparation will be conducted in cooperation with the Ministry of Forests, Lands and Natural Resources Operations and Fire Centre Fuel Management Specialist.
3. Prescriptions for fuel treatment that will be undertaken are to be signed off by a Registered Professional Forester.
4. Treatments will include measures to lower the Wildland Urban Interface Wildfire Threat Rating by addressing a combination of the following:
    a. Lowering crown bulk density, reducing ladder fuels, decreasing surface fuel loadings.
5. Defining the Wildland Urban Interface and associated Wildfire Threat Rating(s) for the given treatment area(s).

1.1 *Land Management Referrals*

Land management referrals were not included within the scope of the contract between the District of Tumbler Ridge and Silvicon. It is anticipated that the District will embark on a referral process with line agencies and stakeholders prior to the implementation of the treatments described in this report.

1.2 *First Nations Consultation*

First Nations consultation was not included within the scope of the contract between the District of Tumbler Ridge and Silvicon. It is anticipated that any consultation with local First Nations will be undertaken by the District prior to the implementation of the prescriptions described in this report, if required.

2.0 Area Description

Tumbler Ridge is located in the Prince George Forest Region in northeastern BC near the confluence of the Murray and Wolverine Rivers (Latitude 55.11^{o}, Longitude 120.97^{o,} elevation 830 meters). The area is set within the foothills of the Rocky Mountains and is characterized by rolling terrain with common steep relief and escarpments, with primarily southerly aspects.

The town sight itself is located to the east of the Murray River, and down slope and west of the Tumbler Ridge escarpment. Highway 52 and 29 offer two egress routes to the north, with Highway 52 running south. Within the town there is a high percentage of pure dead and green lodgepole pine stands, and a mixture of coniferous and deciduous vegetation around its perimeter. The species mix includes an overstory of lodgepole pine, white spruce, trembling aspen, and black cottonwood (the latter occurring alongside the Murray River).

2.1 *Biogeoclimatic Ecosystem Classification[1] - Boreal White Black Spruce Zone*

2.1.1 Ecology

The entire project area lies within the Boreal White Black Spruce (BWBS) zone with the moist-warm variant (BWBSmw) west of highway 52 (flat to rolling terrain) (750-1050 meters) and the wet-cold variant (BWBSwk1) in the higher, sloped elevations associated with the Tumble ridge escarpment east of town; 850-1200 meters). The zone is dominated by a northern continental climate frequented by arctic air masses, long very cold winters and short, dry and warm summers. Mean annual temperature ranges from -2.4 to 3.6 Celsius and annual precipitation ranging from 341 to 897mm. The shrub and herbaceous vegetation is floristically rich and productive. Common herbs and shrubs include soopalallie, black huckleberry, highbush-cranberry, prickly rose and Labrador tea.

2.1.2 Disturbance

Fire within the BWBS zone exists as a frequent stand-initiating disturbance agent with the natural succession of trembling aspen, trembling aspen and spruce, or lodgepole pine filling in the disturbance site following a fire. Fires here have the historic ability to reach well over 1000 hectares in size, often with a high fire severity rating (a measure of the amount of biomass consumed by fire). The dominant seral species are lodgepole pine and trembling aspen; as a result of frequent fire occurrence the forests rarely reach climax stages (white and black spruce stands greater than 200 years of age) and leave behind a landscape-level mosaic of multiple stand types, most often that are even-aged.

[1] A Field Guide to Ecosystem Identification for the Boreal White and Black Spruce Zone of British Columbia, Ministry of Forests and Range, Forest Science Program, 2011

With mountain pine beetle affecting most of the pine surrounding and within the town, much of the canopy and surface fuels (fine fuels such as small branches) are now available for consumption by fire. Current research[2] suggests increased crown fire behavior within the red and grey stages of standing lodgepole pine and in the short term an increased fire behavior with surface fuels due to the availability of broken branches. Over time beetle-killed pine becomes susceptible to windthrow and increases the abundance of large woody debris. Under average fire weather conditions the fire behavior potential will be lower at this time as larger diameter fuels become difficult to ignite. However, with high to extreme fire weather conditions, these fuels will promote aggressive surface fire intensity.

Root diseases such as tomentosus and the defoliator spruce budworm are common biotic agents of disturbance within the BWBS that target white spruce and often lead to aspen dominated stands, which can reduce localized wildfire behavior (i.e. rate of spread and fire intensity). This is due to the increased foliar moisture content of aspen.

2.2 *Local Fire Weather[3]*

Fire Danger rating is used by fire professionals to describe a suite of weather variables (precipitation, relative humidity, wind speed and temperature) and their influence on ignition and difficulty in suppression. The Wildfire Management Branch (WMB) of BC has three weather stations surrounding the area of Tumbler Ridge that were used to quantify the fire danger rating in the area (see Tables 1 and 2). The fire weather history for the last ten years (2000-2009) is available on the WMB website and is used to determine the average number of days in the year the weather conditions are conducive for aggressive wildfire behavior.

Though there is variability in weather between each station, the number of days wildfire can be supported based on a 10 year average ranges from 59 – 81 days annually. By contrast, a town with highly volatile fuels conducive to aggressive wildfire activity such as Merritt experiences 137 fire danger days above moderate and Smithers in the Northwest Fire Centre sees an average of only 51-59 days between moderate to extreme.

During the July 2014 Red Deer Creek wildfire, the Tumbler Ridge fire weather station (16km south of Tumbler Ridge) was reporting an extreme danger class leading to aggressive fire behavior and reduced efficacy in suppression tactics.

Table 1 defines each danger class characterized by the WMB as having the ability to support fires and challenge suppression efforts. Table 2 summarizes the average number of days Tumbler Ridge is exposed to moderate, high or extreme danger class days (only the years of 2000 to 2009 were available for review).

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[2] Schoennagel T, Veblen T, Negron JF, Smith JM (2012) Effects of Mountain Pine Beetle on Fuels and Expected Fire Behavior in Lodgepole Pine Forests, Colorado, USA. PLoS ONE 7(1): e30002. doi:10.1371/journal.pone.0030002

[3] Average Annual Danger Class 3-5 Days. Wildfire Management Branch, Ministry of Forests, Lands and Natural Resources Operations, 2014. http://bcwildfire.ca/Industry_Stakeholders/industry/DangerClass.htm

Table 1: Definition of Fire Danger by Class

Danger Class	*Definition*
Moderate	Forest fuels are drying and there is an increased risk of surface fires starting.
High	Forest fuels are very dry and the fire risk is serious. Fires may start easily, burn vigorously and challenge suppression tactics.
Extreme	Extremely dry forest fuels with a serious fire risk (consequence of damage to life, property and ecosystem). Fires start easily, spread rapidly and lead to aggressive fire behavior that challenge all suppression tactics (ground and aerial).

Table 2: Average Number of Days with Danger Class of 3 and Higher for Tumbler Ridge (Moderate, High, Extreme; Fire Weather Data; 2000-2009)

Weather Station	*2005-2009 (5 years)*	*2000-2009 (10 years)*
Tumbler (Denison)	99	81
Noel	67	59
Red Deer	100	95

2.3 *Fire History*[4]

Forest ecosystems within the province of BC are separated into 4 Natural Disturbance Types (NDTs). These NDTs are used to characterize the types and size of forest modifying or initiating events. The forests surrounding the community of Tumbler Ridge are in the NDT 3 type and are described as having frequent stand-initiating fires ranging from small spot fires to conflagrations covering over 10,000 hectares in size. By comparison the Red Deer creek fire reached over 33,000ha and the Mt. McAllister fire was over 16,000ha. Average fire size within the study area is around 300 hectares with a mean fire return interval between 100 – 125 years (i.e. the time between two fires in a given area).

[4] Biodiversity Guidebook 1995. Forest Practices Code, Ministry of Forests, Land and Natural Resources Operations.

3.0 Wildfire Threat Rating Methodology

The area surrounding the community has been evaluated at a strategic planning level for an approximate distance of 2000 metres from the most current municipal infrastructure (as of June 2014), and does not take into account future developments and expansions. This distance has been established by professionals to balance a practical approach to wildfire mitigation efforts (cost and size) and the physical characteristics that will influence the rate of spread and intensity of a wildfire.

The threat rating attempts to quantify the potential of wildfires advancing into and across municipal boundaries based on the potential for existing forest fuels to support wildfires. The area was stratified using four distinct wildfire threat classes (see Table 3 for Threat Class definitions). Stratification of the project area based on Wildfire Threat Classes (WTC) followed protocols described in the 2012 "Wildland Urban Interface Wildfire Threat Assessment Guide" and worksheet available through the Union of British Columbia Municipalities Strategic Wildfire Prevention Initiative[5]. A blank copy of the Worksheet can be found in Appendix A.

Table 3: Wildfire Threat Class Definitions

Threat Class	*Definition*
Low	Developed and undeveloped land that will not support significant wildfire spread. Developed and undeveloped areas without combustible forest fuels.
Moderate	Developed and undeveloped land that will support surface wildfire spread only.
High	Forested land that will support intermittent crown or continuous crown fires. Multi-aged Spruce and Lodgepole Pine stands > 0.5 hectares in size. Coniferous dominated forested areas close to high public use areas and on steep slopes and on solar aspects. Lodgepole pine stands downslope from homes and infrastructure.
Extreme	Continuous conifer-dominated crown fuel that will support intermittent and continuous crown fires adjacent to and within communities or surrounding individual homes. Areas of unhealthy immature conifer forests with continuous surface fuels and close to the community. Steep slopes and solar aspects are common.

3.1 *Wildfire Threat Class Mapping*

The wildfire threat class mapping was conducted using aerial imagery provided by the Tumbler Ridge Community Forest. Maps were created at a 1:5,000 scale and include the defined WUI, threat classes and treatment units. Prior to field data collection, fuel types were created based on forest cover types provided through the Ministry of Forest's vegetation resource inventory (VRI). Polygons of tree species, age, height and diameter class, and shrub layers were used to provide a direction for the location and number of plots needed for field data collection. All sites were then field checked to determine the extent and health of the forest canopy, surface fuel quality and continuity, topographic

[5] http://www.ubcm.ca/EN/main/funding/lgps/current-lgps-programs/strategic-wildfire-prevention.html

features (slope and aspect) and any new harvesting or land clearing activities that would change the threat class in the area. From here, threat class polygons were created based on what was seen on the ground and validated by the threat class assessment worksheet. The area covered by each threat class is summarized in Table 4 (maps are provided in Appendix - C).

Table 4: Area Summary - Wildfire Threat Class

Wildfire Threat Class	*Total Area (Ha)*
Moderate (TU A)	29.55
High (TU B)	66.94
High (TU C)	85.82
High (TU D)	36.92
High (TU E)	318.23
High (TU F)	184.75
High (TU G)	60.29
High (TU H)	13.89
Total (Ha)	**3903.10**

4.0 Wildfire Threat Reduction Options

Reducing the wildfire threat to existing communities, homes and to future developments can be a very complex planning process. All plans and prescriptions for wildfire threat reduction must be site specific, aesthetically pleasing, economically feasible and environmentally sensitive.

The objective of wildfire threat reduction efforts should not be focused on stopping all fires. Stopping all wildfires is not achievable. The objectives should be:

1. Through forest fuel management, prevent aggressive wildfire behavior to greatly reduce the potential for house and structure losses; and,
2. To construct houses with perimeter landscaping designed to withstand a wildfire.

Improving structure survivability through forest fuel management has two key components:

1. Reducing or modifying the forest fuels adjacent to the structures to reduce the wildfire intensity, rate of spread, spotting potential, and crown fire initiation
2. Separating the structures in the forest interface with FireSmart landscaping.

Table 7: FireSmart Wildfire Fuel and Behavior Description

Threat Class	*Forest Fuel Description*	*Wildfire Behavior*
Low	Little to no flammable vegetation as a result of altered fuel (e.g. golf course)	None / Little to no Spread
Moderate	Deciduous stands, very little surface fuels	Slow spreading surface fires
	Coniferous stand with moderate surface fuel cover and low canopy closure (%)	Surface fires with candling
High	Grasslands / deciduous stands – surface fuels only	Surface Fires
	Deciduous dominated stands with heavy conifer component	Surface fires with candling / crown fire potential
	Continuous conifers and high surface fuel cover	Candling / Crown Fires
Extreme	Continuous dense conifers and abundant surface fuels	Aggressive Crown Fires

Landowner awareness and buy-in are critical to reducing the wildfire hazard to their own property. FireSmart information needs to be distributed to the private landowners. The District of Tumbler Ridge should consider working closely with the local fire department and WMB Fuel Specialists to ensure any future developments have an abatement strategy/FireSmart Landscape built into the design before construction begins. By ensuring new developments are adequately planned and managed for wildfire threats, many of the present problem areas will pose a lower hazard.

4.1 *FireSmart Landscaping*[6]

Separating the house and other structures from the forest environment involves establishing FireSmart landscaping so a wildfire cannot burn up to the structure. Removing combustible materials such as mulch, grasses, small or large woody debris (saw dust, branches, fire wood) between a structure and a forested area will reduce the chance of a building ignition. Private landowner-FireSmart landscaping occurs within 'Priority Zone One' as defined by the FireSmart manual and is discussed in detail in Chapter Three of that publication. A minimum of ten meters (33 feet) of FireSmart landscaping from the structure to forested land is recommended. This distance should be increased with increasing slopes and the extent of the wildfire threat in the adjacent forest. Figure 1 displays the Priority Zones defined in the FireSmart Manual.

Unprotected buildings shrouded by forest fuels may not be prioritized for protection by fire fighters due to the unlikelihood of safe and successful suppression; thus it is in the homeowner's best interest to remove all fuels immediately adjacent to their homes. Secondly, there is potential liability should a fire start within a private property and destroy structures, crown forests, and threaten the public.

FireSmart landscaping can be a tool used by private land owners on their property when adjacent to Low and Moderate Wildfire Threat Class areas as identified on the maps attached to this report. FireSmart landscaping alone is not enough to significantly improve house survivability in the areas identified as High and Extreme. These Threat Class areas will need much wider fuel modification and treated under the responsibility of the local government (i.e. the District of Tumbler Ridge, through the guidance of professional consultation).

[6] FireSmart Canada. FireSmart: Protecting Your Community From Wildfire. https://www.firesmartcanada.ca/resources-library/protecting-your-community-from-wildfire

Figure 1. FireSmart Priority Zones within the Wildland Urban Interface [7]

[7] For more information visit http://bcwildfire.ca/Prevention/firesmart.htm

4.2 *Forest Fuel Modification*

Wildfire behavior is based on three factors.

1. *Forest Fuel*: the horizontal and vertical continuity of material available to burn.
2. *Weather*: temperature, relative humidity, wind and precipitation.
3. *Topography*: elevation, slope, aspect and terrain (deep gullies, rolling ground, etc.).

Of these three factors, only the forest fuels are within our control. Reducing the volume and continuity of the forest fuels can reduce the intensity and the rate of spread of a wildfire, thus reducing the wildfire threat. The objectives for *forest fuel management* should be:

a) Reducing the crown fire potential, and

b) Reducing the surface fire intensity.

Other important benefits include easier access into an area, better firefighter safety and greater effectiveness of aerial wildfire suppression resources.

There are two basic approaches to wildfire threat reduction or forest fuel management. The chosen method will depend on numerous site specific factors.

Timber Harvesting

In large areas of commercially viable forest, a form of timber harvesting to remove a portion of the stand is the most logical option. The wildfire threat reduction work can be self-funding and a valuable resource gets properly utilized. The intensity and method of harvesting will depend on the topography, tree species, forest health, degree of wildfire threat, community acceptance and a variety of other site specific factors. Clear-cut harvesting, while usually not a very popular option for many communities may be the only solution in pure pine forest stands decimated by pine beetles. Where necessary, a form of partial or selective harvesting is better accepted. Removal of targeted tree species based on forest health, wind firmness and a wide assortment of other factors is a common practice. Harvesting for fuel management is significantly different from conventional commercial harvesting. The emphasis should be directed towards the final product left behind in the forest, not necessarily the timber removed from the site.

'It's not what you remove, but what you leave behind.' (Unknown)

Non-harvest forest fuel management

In immature, inaccessible, small patches of forestland where harvesting is not an option, wildfire threat reduction efforts can be completed without timber extraction. Treatments can be carried out by hand, with equipment or a combination of the two. These treatments are rarely self-funded and require a funding source for completion. Treatments vary in cost from $500 to $10 000 per hectare (these costs/ha are estimates). Reducing the amount and configuration of the forest fuels usually consists of three basic activities.

Spacing

Spacing, thinning or tree removal involves the reduction of the number of stems and associated branches and needles within the forest canopy. There are a number of different techniques. The spacing treatment necessary is dependent on many factors, including: tree species, forest health, age of the stand, stand structure and other factors. Spacing treatments must be designed on a site specific basis. In some cases, small scale forest harvesting may be the best method to space the area and cover the costs of the treatment. Any forest harvesting in interface areas must be well planned and supervised by a trained professional.

One commonly used convention in relatively even aged stands is to space the trees so the crowns are at least one-half of the average tree crown diameter apart. This inter-crown distance should be increased on slopes. This spacing distance is also dependent on crown base height and the amount of surface fuel remaining after the site treatment.

Multi-aged stands are often 'thinned from below'. The understory, suppressed and/or co-dominant trees are targeted for removal. This usually increases the crown base height and creates a healthier, more vigorous forest. Caution must be taken to ensure the multi-aged characteristics of the stand are maintained.

Figure 2. Before and after thinning examples (images taken from the FireSmart Manual, Chapter 3).

Pruning

Pruning involves the removal of the lower branches of coniferous tree species to separate the crown fuels from the surface fuels. By raising the Crown Base Height (CBH) within the stand, it will be more difficult for a surface fire to spread upwards into the tree canopy where it will spread quickly, greatly increase the wildfire intensity and create ember showers, or spotting, onto adjacent structures. The required height of the pruning is variable depending on canopy closure, tree species, topography and amount of surface fuels remaining after the site treatment. One commonly used convention for pruning is a three meter crown base height in the co-dominant and dominant portion of the stand. This is based as much on the crew's reach as on crown fire initiation concerns. Again, there is no one prescription to manage all situations. Pruning must take into account the tree height and amount of live crown. The tree must be left a certain portion of its live crown to remain healthy and vigorous.

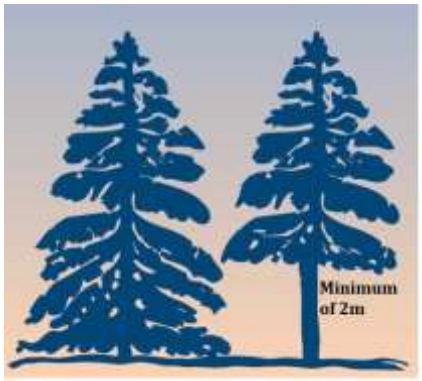


Figure 4. Example of adequate pruning, where the Live Crown Base Height should be no lower than 2 meters from the ground and will depend upon the surrounding timber, crown closure, common height of surfaces fuels, and the reach of hand tools used by field crews.

Surface Fuel Reduction

Surface and ground fires differ by fuel type structure and composition. Slow, creeping ground fires ignite the duff or 'LFH' layer (mosses and needles) and surface fires consume small woody debris (branches and woody stems less than 7cm in diameter) and herbaceous shrubs (woody or deciduous such as alder, grasses or berry species) – essentially a layer of fuel that is elevated from the ground. Targeting the surface fuel is the most feasible and effective when attempting to reduce rapid surface fire spread and intensity. Reduction often involves chipping and/or burning of all material that will contribute to a surface fire and possible canopy ignition. Removal of the fine (small diameter) fuels and woody shrubs is the priority as these fuels dry out quickly, ignite easily and are the main contributor to surface fire spread on most sites. Burning is the most efficient in terms of fuel removal and cost, either via piles or prescribed burns, but is often neglected due to public perspective and smoke management. Chipping normally costs around $1,000/ha (estimate) and the material can be managed in two ways:

1) Spread throughout the treatment area, so long as the treated area is a heavily thinned or cleared, or
2) Piled for burning or removed from that site if the treatment area still has standing structure or a large volume of consumable material that could ignite as a result of a fire travelling through the chipped material.

Chipped material is often considered of low hazard, but is still a fine fuel and responds quickly to changes in temperature, relative humidity, wind and precipitation. A chipped layer may take up to 5 years to fully decompose before it poses low ignitability, but in the short term must be seen as a flammable fuel. This can easily contribute to a ground fire and lead into a surface or canopy fire if the surrounding fuel layers have not been adequately managed.

Surface fuel treatments are often considered the most important component of any fuel modification activities and the most expensive. Overly aggressive surface fuel clean up can cause serious environmental impacts including erosion, introduction of noxious weeds and loss of wildlife habitat (small mammal shelter and herbivory potential for larger mammals). Surface fuel removal is often very difficult or impossible in the winter. Snow conditions often do not allow this type of treatment. This fuel layer will return quickly after treatment (5-10 years) due to light and moisture availability and requires regular treatment.

4.3 *Wildfire Threat Reduction Maintenance*

Done properly, only the surface fuel treatment requires regular maintenance. Spacing and pruning treatments should last decades before further work is required. The amount of maintenance on the surface fuels will depend on tree species, mortality in the stand, tree ingress, grass growth and other factors that increase the amount of dead and down forest fuel, but in general will not last as long as spacing and pruning.

4.4 *Implications of Wildfire Threat Reduction Work*

Reducing wildfire threats through the reduction of the forest fuels sounds simple enough, but forest fuel treatments can have a wide variety of implications. Fuel treatments can have both positive and negative effects on wildfire hazards. The application of spacing, pruning and surface fuel removal techniques creates a more open forest, facilitating the following:

1) Allows more light to reach the surface, often drying out the site or allowing more grass, herb and shrub growth (i.e. more fine fuels),
2) Can lengthen the fire season on the site by allowing the site to dry up faster and stay dry longer,
3) Allows more wind to move through the stand and along the surface, possibly increasing the rate of spread of surface fires, and
4) Often have lower relative humidity in the summer months from the increased sunlight and temperatures.

The *positive effects* of wildfire threat reduction through forest fuel reduction include;

5) Lower probability of crown fires due to the more open forest canopy and higher crown base height,
6) Lower intensity surface fires from the reduced forest fuels,
7) Easier and safer access for wildland firefighters, and
8) More effective wildfire control efforts with aerial wildfire suppression resources.

In general, properly planned and implemented forest fuel reduction work reduces the crown fire potential and overall intensity of wildfires within the treatment area. This will increase the survivability of the trees in the stand and of adjacent homes and structures. Forest fuel reduction work can also increase the dryness on the site, and allow more wind to reach the surface, creating conditions for fast moving, low intensity wildfires to spread.

5.0 Wildfire Hazard Analysis

5.1 *Treatment Overview*

The treatment prescriptions contained in this document are aimed at reducing the threat of wildfire to the District of Tumbler Ridge. The treatment regimes have not looked in depth at other resources or values that are associated with the treatment unit, such as recreation degradation or loss of value. For this reason, consultation with local residents should be undertaken prior to implementation. All treatments should be carried out in an environmentally sensitive manner with aesthetics and cultural values given great consideration.

5.2 *Treatment Unit Descriptions*

Treatment Unit #	***Type of Treatment***	***Area (Ha)***	***Priority***
B	Timber Harvesting / Thinning / Surface Fuel Reduction	66.94	1
C	Thinning / Pruning / Surface Fuel Reduction	85.82	2
A	Thinning / Pruning / Surface Fuel Reduction	29.55	3
F & G	Thinning / Pruning / Surface Fuel Reduction	245.04	4
D	Thinning / Pruning / Surface Fuel Reduction	36.92	5
H	Timber Harvesting / Pruning / Surface Fuel Reduction	13.69	6
E	No Treatment	318.23	7
Total		**3903.10**	

5.2.1 Treatment Unit A

This Treatment Unit (TU) is located east of the Murray River and the west of the golf course.

The terrain has slopes of 40-50% that continue for 30-50 meters on a west-southwesterly slope, immediately at the golf course edge.

This TU is characterized by a thick surface layer of deciduous and woody shrubs up to 1 meter in height (juniper, alder, soopolallie), ladder fuels of balsam and spruce saplings (1.5-4 meters tall), and mature stems of spruce and grey lodgepole pine (average DBH of 30cm and 23meters tall). Much of the spruce have a low crown base height that will facilitate a surface to crown fire; the caveat here being a low crown closure (<20%) that will alleviate the potential for an aggressive and active crown fire.

TU A has a Moderate Wildfire Threat Classification (a score of 83) and an Extreme Wildland Urban Interface Threat Classification (a score of 45).

Despite the moderate wildfire threat class score of 83, the concern here is the slope that could enable aggressive wildfire behavior. Spotting would be likely with an active or intermittent crown fire on this slope given the dominant southwesterly winds. This concern is reduced somewhat due to the proximity of the TU to the Murray River, a natural fire break to the west, as well as the golf course providing a fuel break to the east.

Plot 1 – Plot 46, westerly slope below the ridge crest west of the TR golf course. Wildfire Behavior Threat Class (WBTC): Moderate, 83; Wildland Urban Interface Threat Class (WUITC): Extreme. 45.

Photo 2 – Below ridge crest west of the TR golf course. Old piles from previous (unknown) activity.

5.2.2 Treatment Unit B

This TU is found to the west and east of the golf course road, just south of the golf course property. Generally characterized by flat, rolling terrain, the fuel type is composed of deciduous shrubs and herbs (soopalallie, prickly rose, Labrador tea) and spruce and pine regen. Large woody debris covers roughly 10-25% of the surface (dead lodgepole pine). As a result of the abundant grey pine, sunlight is now reaching the forest floor and stimulating the spruce to sprout branches near their stem base. This and a healthy regen and sapling layer are adding to the ladder fuel potential. The canopy is dominated by dead lodgepole pine affected by mountain pine beetle.

Three plots were established in the TU, with wildfire behavior threat scores of 83, 97 and 106. It is expected that in the next 1 to 5 years, surface fuel loading and corresponding threat scores will increase due to increased ingrowth, branch fall and blowdown.

This TU contains commercial timber and harvesting could be considered a viable treatment for the reduction of wildfire threat. However, there are also high recreation values associated with the adjacent golf course, suggesting that treatment measures be developed in close consultation with local golfers.

Photo 3 – Plot 2, east of golf course road. WBTC: High, 97; WUITC: High, 27

Photo 4 – Plot 3, west of golf course road. WBTC: High, 106; WUITC: High, 27

Photo 5 – Plot 4, west of golf course road, north of plot 3. WBTC: Moderate, 83; WUITC: High, 27

Photo 6 – Plot 7, southwest of golf course road, transition from the pure pine stand into a spruce leading conifer mix. WBTC: High, 108; WUITC: Moderate, 25

5.2.3 Treatment Unit C

This TU is located north of the water treatment facility and west of the saddle club. Dominated by flat and rolling terrain with some benign breaks in slope, the major hazard here is the continuous forest cover with limited restrictions to wildfire spread.

The surface fuel layer covers much of the ground (41-60%) and is dominated by deciduous shrubs and large woody debris (>7cm diameter). 25-50% of the mature timber is dead and standing or partially down.

Since northerly winds are less common to the Tumbler Ridge area, a wildfire spreading south is not as likely and therefore less of a concern. However, the potential is still there for a continuous crown fire either traveling towards the town or exiting the town and spreading north. The Wildfire Behavior Threat Class is High (104 and 106 for two plots) and High (38) for the Wildland Urban Interface Threat Class.

Photo 7 – Plot 35, north of the water treatment facility and west of the saddle club.
WBTC: High, 106; WUITC: High, 38

Photo 8 – Plot 37, north of the water treatment facility and northwest of the saddle club.
WBTC: High, 102; WUITC: High, 38

5.2.4 Treatment Unit D

Located north of Tumbler Ridge on the east side of highway 52 (beside the main bend in the highway), the terrain is steep, westerly and continuous (50-70% for 20-35m). The fuel type is characterized by a surface layer of herbs, deciduous shrubs and spruce regen that covers 20-40% of the ground. Both fine and large woody debris covers 10-25% of the ground and are available for combustion. The majority of mature spruce have a low crown base height and are surrounded by a vibrant understory of saplings and poles (1001 – 2000 stems/ha). The Wildfire Behavior Threat Class ranked High (115).

What elevates the threat class of this TU the most is the combination of available fuels on a steep slope. Ignition sources include the highway (cigarettes or vehicle fires) and lightning. Given the location of the TU to the town (the town being south and downslope), the Wildland Urban Interface Threat Class is Low (9). One plausible danger would be the exposure to the plantations above the slope and the wind turbines further east.

Photo 9 – Plot 41, east of highway 52 near the main bend in the road, north of town. WBTC: High, 115; WUITC: Low, 9

5.2.5 Treatment Unit E

TU E is an old plantation of lodgepole pine found above the main escarpment east of town. This stand is likely 15-20 years old; given the high stems/hectare (> 2000) and low canopy base height (~1m average), there is potential for aggressive fire behavior (WBTC: High, 119). The percent cover of fine and large woody debris is low, as well as the surface fuel layer of herbs and shrubs, thus hindering a fast spreading surface fire.

Since this TU is above the town and to the east, very little threat is present to the town of Tumbler Ridge (WUITC: Low, 9). Potential hazard exists to the east, outside of the WUI

2km buffer, to the wind turbines. This area was noted due solely for the high wildfire behavior potential but again poses little threat to the town.

Photo 10 – Plot 43, plantation east of town and above Tumbler Ridge / escarpment. WBTC: High, 119; WUITC: Low, 9

Photo 11 – Plot 43, same location, looking into plantation canopy to portray the continuity of canopy fuel.

5.2.6 Treatment Unit F

TU F is the largest area where 3 plots all displayed high wildfire behavior threat. Located in the southeast of town, east of highway 52, the forest type is a conifer mix with sporadic patches of deciduous species. The Wildfire Behavior Threat Class is High for all three plots found within this TU (scores of 101, 105 and 114).

Percent cover of fine fuels throughout the TU range from 10-25% with a deciduous shrub layer of prickly rose and soopalallie covering 10-40% of the area. All of the lodgepole pine are within the grey stage from mountain pine beetle attacks and have elevated the hazard rating. The terrain is a continuous west facing slope that ranges from 10-40% incline; deep draws are present and no fuel breaks are found across the TU.

The TU is located on a slope above the town, any future wildfire would likely travel uphill and away from town. Accidental ignition sources may occur from vehicle fires or cigarettes along highway 52. Highway 52 also acts as a fuel break between this TU and the town should adverse winds push southeast or downslope.

Photo 12 – Plot 32, east of highway 52 in the southeast corner of town. WBTC: High, 114; WUITC: Low, 9. Conifer mix with low canopy and ladder fuels, and 25-50% partly down, dead timber.

Photo 13 – Plot 34, east of highway 52. WBTC: High, 105; WUITC: Low, 9

Photo 14 – Plot 27, east of highway 52. WBTC: High, 101; WUITC: Moderate, 23

5.2.7 Treatment Unit G

TU G is located on either side of highway 29, just southeast of town at the junction of highways 29 and 52. Dominated by attacked pine (grey stages) and spruce with low crown base heights, three plots found High Wildfire Behavior Threat Classification (98, 103, 105). Here the terrain is rolling with consistent ridges of dead pine on the southern slopes (that are short in length but range 15-30%).

Here the duff layer depth was ~6-10cm on average and 41-60% coverage of surface fuels (herbs, deciduous shrubs and fine fuels). Large woody pine debris from blow down was common. The grey pine seems more prone to blow down here, likely due to the ridges, shallow soils and exposure to wind.

Photo 15 – Plot 23, west of gravel pit and north of highway 29. WBTC: High, 103; WUITC: High, 35

Photo 16 – Plot 26, south of gravel pit/highway 29. WBTC: High, 98; WUITC: Moderate, 14

Photo 17 – Plot 28, southeast of gravel pit and south of highway 29. WBTC: High, 105; WUITC: Moderate, 14

5.2.8 Treatment Unit H

TU H is found south of flatbed creek and north of a previous harvesting block. Along the edges of this cut block the remnant pine have been blown down and subsequently added a large volume of volatile fuel to the surface fuel horizon. Fine fuels are abundant along the cut block edge. Deciduous species are found through this TU but as single stems surrounded by pine and spruce, rather than in large and pure patches.

The terrain is generally flat with occasional rolling slopes less than 16%. Progressing into the stand, spruce becomes more dominant but with a low canopy base height (1-2m on average) as a result of the light now entering the forest floor (due to grey-staged pine). The sapling and pole layer was not abundant here and pose little risk for ladder fuel potential.

This treatment area can be seen as a wildfire reduction and revenue generating operation from valuable timber harvesting. Even though flatbed creek and highway 29 separate this TU from the town, there is much space and available surface / canopy fuel for a wildfire to build up with intensity and speed.

Photo 18 – Plot 12, south of flatbed creek along a cut block edge. WBTC: High, 118; WUITC: Moderate, 14

Photo 19 – Plot 14, south of flatbed creek and east of plot 12. WBTC: High, 97; WUITC: Moderate, 24

6.0 Recommended Treatments

Of the eight Treatment Units identified and described above, only the following TU's are recommended for fuel modification; treatments have been developed at a planning-level and a follow-up field visit is still required to complete more detailed treatment prescriptions at a stand-level. Detailed prescription development should refine the evaluation of surface fuel loading characteristics and define (layout) the boundaries of specific treatments.

The TU's not selected for fuel modification were the result of prioritization of threats and proximity to the town. For example, TU E displays High hazard but is uphill and to the east of town (prevailing winds will push any fire within this area away from town), thus fuel modification is not recommended. TU H also displays High hazard as a result of a volatile fuel type and being south of town, but is a lower priority due to Highway 29 and Flatbed Creek separating this area from the town.

A practical and common sense approach is required for identifying areas for fuel modification and it should be stressed that areas of low and moderate hazard can at times pose just as great a threat as areas of high hazard (e.g. during extreme fire weather days). Given the extent of moderate threat classes within and surrounding the municipal boundary, treatment costs would be exorbitant and time consuming if these areas were chosen by the town for treatment. Therefore it is again recommended that at a municipal level and individual citizen level, the continual use of FireSmart practices be employed. This is a practical approach to decreasing the site hazards, is cost effective and requires less time as the individual may take responsibility without going through a bureaucratic application process.

6.1 *Priority 1 - Treatment Unit B*

***Location*:** West and East of Golf Course Road, just south of the Golf course.

***Concerns*:** Extent of dead lodgepole pine in the overstory and surface layer; sapling layer is abundant and pose ladder fuel threat.

Treatment	*Rationale*	*Comments*
Timber Harvest/Thinning	Reduce canopy fire potential via selective harvest or clearcut; remaining stems can be assessed for windthrow hazard. Removal of dead stems from spruce beetle and mountain pine beetle attack should be a priority, while leaving deciduous stems. Dominated by dead lodgepole pine, this area poses both high fire and windthrow hazard. Revenue would be generated by the removal of mature timber. Due to past selective harvest treatments seeing most of the remaining timber fallen by wind, a clearcut is recommended.	A portion of fallen timber may be left on site and should be scattered as whole logs or bucked into large pieces, as the potential for ignition is lower for larger material (consider leaving lower value, rotten timber behind). This area is highly visible and may be a candidate for recreation such as picnicking, trail extensions or an RV site for tourism. Regardless of options, town consultation is important and the rationale must be emphasized (fire hazard reduction and revenue generation). Plant deciduous species following treatment,

		intermixed with pine.
Surface fuel reduction	Reduce the potential surface fire intensity and rate of spread. Target finer down and dead material as well as branches. Avoid coarse woody debris unless larger accumulations are encountered. This will reduce potential for a fire to travel into the canopy.	Surface fuels should be piled for chipping given the proximity of the TU to the Golf Course road (easy access). Depending on the final treatment of the area, if a clearcut is chosen then the chipped material can be spread throughout the modification area. If pruning and thinning is completed then chipped material should be burned in piles or haul away and disposed of elsewhere.
Pruning	Increase the Height to Live Crown up to 3 meters given the steep and continuous slope will promote easy access for flames to reach the lower canopy.	Hand tools such as pruning saws will be required, and the fallen material should be piled and burn under the appropriate conditions.

6.2 *Priority 2 - Treatment Unit C*

***Location*:** North of Water treatment facility and west of Saddle club.

***Concern*:** Mixed coniferous stand with dead lodgepole pine and thick understory/surface layer of fine fuels, regen/saplings and deciduous shrubs.

Treatment	*Rationale*	*Comments*
Thinning	Reduction of crown closure by the removal of intermediate and suppressed conifers in denser portions of the unit (reduce crown closure to below 40%). Deciduous stem should be avoided. Removal of dead stems from past spruce beetle and mountain pine beetle attack should also be a priority.	Trees fallen should be scattered as whole logs or bucked into large pieces, as the potential for ignition is lower for larger material.
Pruning	Low branches on spruce and pine should be removed to reduce ladder fuels. Target a 3 metre pruning height.	Branches should be piled for burning under appropriate conditions or chipped/ mulched. Any chipped material should be removed from this site as standing timber still remains and the chipped material increases surface fire potential and thus threatens standing timber with canopy fire potential.
Surface fuel reduction	Reduce the potential surface fire intensity and rate of spread by removing some surface fuel. Target finer down and dead material as well as branches. Avoid coarse woody debris unless larger accumulations are encountered.	Surface fuels should be piled for burning under appropriate conditions or chipped/ mulched. Any chipped material should be removed from this site.

6.3 *Priority 3 - Treatment Unit A*

***Location*:** West of Golf course on main slope between the Murray River and the golf course.

***Concern*:** Steep slope on a westerly aspect, below golf course structures, with thick understory and surface layer and dense canopy.

Treatment	*Rationale*	*Comments*
Thinning	Reduction of crown closure by the removal of intermediate and suppressed conifers in denser portions of the unit (reduce crown closure to below 40%). Deciduous stem should be avoided. Removal of dead stems from past spruce beetle and mountain pine beetle attack should also be a priority.	Trees fallen should be scattered as whole logs or bucked into large pieces, as the potential for ignition is lower for larger material.
Pruning	Low branches on spruce and balsam should be removed to reduce ladder fuels. Target a 3 metre pruning height.	Branches should be piled for burning under appropriate conditions or chipped/ mulched.
Surface fuel reduction	To reduce the potential intensity and rate of surface fires some surface fuel reduction should be undertaken. Target finer down and dead material as well as branches. Avoid coarse woody debris unless larger accumulations are encountered.	Surface fuels should be piled for burning under appropriate conditions or chipped/ mulched.

6.4 *Priority 4 - Treatment Units F and G*

***Location*:** SE of town along highways 29 and 52.

***Considerations*:** Mixed coniferous stand with dead lodgepole pine and thick understory/surface layer of fine fuels, regen/saplings and deciduous shrubs. A water tower is found just north of this TU and should be considered for FireSmart landscaping.

Treatment	*Rationale*	*Comments*
Thinning	Reduction of crown closure by the removal of intermediate and suppressed conifers in denser portions of the unit (reduce crown closure to below 40%). Deciduous stem should be avoided. Removal of dead stems from past spruce beetle and mountain pine beetle attack should also be a priority.	Trees fallen should be scattered as whole logs or bucked into large pieces, as the potential for ignition is lower for larger material.
Pruning	Low branches on spruce and balsam should be removed to reduce ladder fuels. Target a 3 metre pruning height.	Branches should be piled for burning under appropriate conditions or chipped/ mulched.
Surface fuel reduction	To reduce the potential intensity and rate of surface fires some surface fuel reduction should be undertaken. Target finer down and dead material as well as branches. Avoid coarse woody debris	Surface fuels should be piled for burning under appropriate conditions or chipped/ mulched.

	unless larger accumulations are encountered.	

6.5 *Priority 5 - Treatment Unit D*

***Location*:** NE of town along highways 52.

***Considerations*:** Steep slope with mixed coniferous stand with dead lodgepole pine and thick understory/surface layer of fine fuels, regen/saplings and deciduous shrubs. Poses low threat to town due to being northeast and uphill of town, but potential ignition sources would be vehicle fires; suppression efforts would be difficult due to steep slope and availability of fuel in the surface and canopy layers.

Treatment	*Rationale*	*Comments*
Thinning	Reduction of crown closure by the removal of intermediate and suppressed conifers in denser portions of the unit (reduce crown closure to below 40%). Deciduous stem should be avoided. Removal of dead stems from past spruce beetle and mountain pine beetle attack should also be a priority.	Trees fallen should be scattered as whole logs or bucked into large pieces, as the potential for ignition is lower for larger material.
Pruning	Low branches on spruce and balsam should be removed to reduce ladder fuels. Target a 3 metre pruning height.	Branches should be piled for burning under appropriate conditions or chipped/ mulched.
Surface fuel reduction	To reduce the potential intensity and rate of surface fires some surface fuel reduction should be undertaken. Target finer down and dead material as well as branches. Avoid coarse woody debris unless larger accumulations are encountered.	Surface fuels should be piled for burning under appropriate conditions or chipped/ mulched.

6.6 *Priority 6 - Treatment Unit H*

***Location*:** Between Flatbed creek and recent harvest block/plantation, directly south of town.

***Considerations*:** Mixed coniferous stand with wind-thrown lodgepole pine and a thick understory/surface layer of fine fuels, regen/saplings and deciduous shrubs. Poses lower threat to town due to highway 29, Flatbed creek, and a north facing slope of mixed deciduous and spruce all separating the town from this TU. Due to proximity to recent logging block and abundance of dead lodgepole pine, this TU will pose some revenue potential and further field recces are recommended.

Treatment	*Rationale*	*Comments*

Thinning	Reduction of crown closure by the removal of intermediate and suppressed conifers in denser portions of the unit (reduce crown closure to below 40%). Deciduous stem should be avoided. Removal of dead stems from past spruce beetle and mountain pine beetle attack should also be a priority.	Trees fallen should be scattered as whole logs or bucked into large pieces, as the potential for ignition is lower for larger material.
Pruning	Low branches on spruce and balsam should be removed to reduce ladder fuels. Target a 3 metre pruning height.	Branches should be piled for burning under appropriate conditions or chipped/ mulched.
Surface fuel reduction	To reduce the potential intensity and rate of surface fires some surface fuel reduction should be undertaken. Target finer down and dead material as well as branches. Avoid coarse woody debris unless larger accumulations are encountered.	Surface fuels should be piled for burning under appropriate conditions or chipped/ mulched.

6.7 *Priority 7 - Treatment Unit E*

***Location*:** Plantations above and east of Tumbler Ridge.

***Considerations*:** Plantation (10-20 years old) of lodgepole pine that poses potential for 'crown' fire due to low canopy base height and large volume of stems/hectare. Plantations can burn intensely but are easily extinguishable with aerial suppression techniques; the current Wildfire Behavior Threat Assessment does not distinguish a plantation from a stand of mature timber with a dense understory layer and thus needs to be approached practically. Given the stand is uphill and to the east, very low threat is presented to the town.

Treatment	*Rationale*	*Comments*
Thinning	Reduction of crown closure by the removal of intermediate and suppressed conifers in denser portions of the unit (reduce crown closure to below 40%). Deciduous stem should be avoided. Removal of dead stems from past spruce beetle and mountain pine beetle attack should also be a priority.	Trees fallen should be scattered as whole logs or bucked into large pieces, as the potential for ignition is lower for larger material.
Pruning	Low branches on spruce and balsam should be removed to reduce ladder fuels. Target a 3 metre pruning height.	Branches should be piled for burning under appropriate conditions or chipped/ mulched.
Surface fuel reduction	To reduce the potential intensity and rate of surface fires some surface fuel reduction should be undertaken. Target	Surface fuels should be piled for burning under appropriate conditions or chipped/

	finer down and dead material as well as branches. Avoid coarse woody debris unless larger accumulations are encountered.	mulched.

7.0 Additional Considerations

7.1 *Landscape Level Wildfire Considerations*

Wildfire is a natural disturbance agent throughout most terrestrial lands and within British Columbia its presence influences many ecosystem types, their form, and function. A plethora of research is being conducted into the effects climate change is having on wildfire activity – that is, the lengthening of our fire season, the increased number of high and extreme danger days, and fire intensity. In concert with the current availability of forest fuels for consumption as a result of mountain pine beetle, the surrounding landscape of Tumbler Ridge will likely see continual and potential increases to wildfire occurrence and severity.

Mountain Pine Beetle (*Dendroctonus ponderosae*) has reached epidemic population levels in the province of BC. While the rate of pine beetle infestation has been declining since 2005, on a provincial level the epidemic has affected over 18.3 million hectares of B.C. forest with a cumulative total of 723 million cubic meters of timber.

It should be noted that that while pine forests infested with mountain pine beetle represent a wildfire threat at the strategic or landscape level, pure pine stands are only common within the municipal boundary of Tumbler Ridge; outside of the immediate District boundary is an abundant mix of conifer and deciduous species (e.g. West of the Murray River). Notwithstanding other resources values such as visual quality and recreation it would be possible to undertake the required fuel modification treatments through a combined commercial harvest and hazard abatement prescription. Subsequent plantation establishment and maintenance prescriptions should also incorporate hazard abatement measures.

The proximity of the District of Tumbler Ridge to vast tracks of forested land highlights the need to consider the strategic management of forest fuels at a landscape level. The continuous forest land surrounding DTR is a conifer dominated mixed forest that would support an aggressive crown fire – as was seen by the multiple fires within the region this summer. This is of particular concern in the event of a wildfire starting in the significant tracts of dead and dying pine forests (or generally, high and extreme wildfire threat classes) that lie within reasonable proximity of the DTR. The dominant fire season winds throughout B.C. blow from the west, southwest and south, pushing any wildfire in this area towards the municipal infrastructure.

With these facts in mind, the District should participate with the Ministry of Forests, Lands and Natural Resources Operations and other stakeholders in any discussions involving a broader landscape wildfire protection strategy.

7.2 *Protection of Community Water Resources*

The District of Tumbler Ridge's water system consists of a reservoir just east of highway 52 and in the southwest of town near Flatbed creek. This infrastructure lies adjacent to mature coniferous forest and should be considered a candidate for fuel management treatments.

7.3 *Recreational Values*

The diversity of visual and outdoor opportunities in the river valleys of Tumbler Ridge will continue be a significant recreation features in the area. Outdoor recreation pursuits include quading, biking, hiking, hunting, fishing, cross-country skiing, and snowmobile riding. The community members have great value in these pursuits and that perspective should be discussed as it affects possible fuel management plans.

FireSmart landscaping that occurs near these sites should be carried out with special consideration to the recreational values affected. In high-use areas with walking trails, a balance must be struck between fuel modification, aesthetics, and safety; for example, the DTR has experienced continual windthrow with dead pine left standing and this of course will pose a hazard to the public in high-traffic areas.

7.4 *Deciduous Composition Targets*

Manage for deciduous composition in all harvested areas adjacent to interface areas. Deciduous trees have high moisture content and do not significantly contribute to crown wildfires or spotting. Their leaves decompose quickly and do not contribute to surface fuel loadings. Local, native deciduous trees such as trembling aspen and black cottonwood can act as convective heat shields between a wildfire and buildings, reducing the overall wildfire threat to interface communities. Deciduous trees should be encouraged as the dominant tree species in and around Tumbler Ridge.

This can be conducted by:

1. Not planting conifer seedlings for approximately one hundred meters from all developed areas in harvested blocks.
2. Not conducting brushing activities that target deciduous tree removal for at least one hundred meters from all developed areas in harvested blocks.
3. Accepting cottonwood/trembling aspen as a commercially acceptable tree or as 'ghost trees' during silvicultural surveys to allow for their retention in the stands adjacent to interface areas.
4. Retain deciduous trees whenever safely and practically possible in all Treatment Units.

7.5 *Removal of dead pine within interface areas and access roads*

Though the overall abundance of pine in the area considered for this report is low (relative to spruce), dead tree removal should be still be undertaken. All pine trees that

could block access or egress routes, or the safety of individuals and their property should be targeted for removal in a timely fashion

7.6 *Provide FireSmart information to all households*

Deliver FireSmart hand-outs to all households to encourage personal responsibility in FireSmart landscaping. Forest fuel management to reduce wildfire threat to the community and individual households is only one component of a FireSmart plan. All households should play their part by looking after the wildfire threats in and around their buildings. The FireSmart home guide provides information and ideas on how to make homes more FireSmart and to reduce the possibility of a local wildfire impacting on their structures.

7.7 *Fire Department Training and Equipment*

The volunteer fire department should ensure that individuals involved in fire suppression activities are adequately trained in wildland suppression techniques and the organizational structure of the Wildfire Management Branch (WMB; which, similar to the fire department utilizes the hierarchical Incident Command System). The minimum standard for all field personnel should be the Ministry of Forests S-100 Basic Wildfire Suppression training course. This course provides information on aerial and ground suppression techniques that are not common to structural fire suppression. The variables that influence fire behavior (fuel, weather and topography) are discussed and would ensure awareness of the changing environmental hazards for the fire department. The department should also assess its equipment needs for effective wildland fire suppression activities, such as water pumps, chainsaws, hand tools (e.g. Pulaski's), relevant personal protective equipment, and that the use and handling of that equipment is adequate to the standards of the WMB. The following website has been designed for fire departments to provide tools for successful prevention, preparation and action in wildfire suppression within the wildland urban interface (https://www.firesmartcanada.ca/become-firesmart/firefighters).

7.8 *Quad and Recreational Trails*

Extensive networks of 1-3m wide quad and biking trails are found within the municipal boundary, most of which expose the mineral soil. These offer advantages to access for fire fighters and act as a suppression line for ground and surface fires, which will slow a fire and increase suppression success. A recommendation would be to GPS and have available these lines for the local fire department, municipality and Wildfire Management Branch for tactical suppression planning should a fire occur in or spread though the municipal boundary.

It is not recommended that woody chipped material be laid onto the trails as the quads and people traveling through these areas expose an ignition source (flammable material sticking to mufflers, sparks, engine fires and cigarettes). This would only be the case for 1-5 years as the chipped material needs time to decompose into the humus layer; in the short term adding any chipped wood will act as a fine fuel and facilitate ground and surface fires.

8.0 Summary

The District of Tumbler Ridge is surrounded by mature coniferous forest that is abundant with dead lodgepole pine in the grey stage. Over the next 10 years that timber will begin to fall and load the surface layer with further fuel; in that time wildfire threat behavior will elevate but eventually decrease as the pine decomposes. Within these mixed coniferous stands, more light is now penetrating the forest floor and stimulating growth of shrubs, regen and lower canopy branching. This fuel horizon (surface and ladder fuels) is of concern as wildfire behavior can increase rapidly and the ease of ground suppression becomes difficult. Treating this layer is often most expensive and does not last as long due to future ingrowth of vegetation.

Benefiting the town is the Murray and Flatbed Rivers to the west and south, with deciduous dominated stands to the west of the Murray River. The Tumbler Ridge escarpment is found east and uphill of town and offer a significant level of fire abatement given the significant slope (fires rarely travel downhill and the dominant wind comes from the southwest).

Within the District of Tumble Ridge wildfire/urban interface areas of high, moderate and low wildfire threat classes have been identified. Approximately 21% (808.5ha) of the area is occupied by high threat class designations, which, in general also have high treatment priorities. The majority of the area exhibit moderate wildfire threat classes (60%; 2348ha). However despite the moderate designation, it is important to note that when combined with high or extreme fire weather, wildfire risk would be significant. For this reason it is also prudent to implement FireSmart landscaping across the range of threat classes.

Fire weather can be considerably variable from year to year and therefore difficult to forecast accurately. When coupled with potential changes that may result from a changing climate, accurate fire weather forecasts are anticipated to be even more difficult to make. Further, climate change research in BC suggests a lengthening of fire season and an increase in the quantity of high and extreme fire weather days.

To address fuel management and related fire management issues, the project area has been divided into treatment priorities to which general fuel management prescriptions have been recommended. Prescriptions, following-up on the recommendations of this plan, should be site specific, aesthetically pleasing, economically feasible and environmentally sensitive. Only experienced BC Forest Professionals should complete wildfire threat reduction prescriptions, in consultation with the public and District Council.

Appendix – A: Wildland Urban Interface Wildfire Threat Assessment Worksheet

WILDLAND URBAN INTERFACE WILDFIRE THREAT ASSESSMENT WORKSHEET ☐ Pre-treatment ☐ Post-treatment

Plot #:	Community:
Assessor:	Geographic Location/Street Name:
Date:	GPS/UTM:
Photos: Y N #:	Land Ownership: ☐ Crown ☐ Private ☐ I.R. Other (specify)

	COMPONENT /Subcomponent	LEVELS				
	Fuel	**A**	**B**	**C**	**D**	**E**
1	*Duff Depth and Moisture Regime (cm)*	1–<2 3	2–<5 Dry Zonal Wet 5 3 1	5–<10 Dry Zonal Wet 10 6 2	10–20 Dry Zonal Wet 12 8 4	>20 Dry Zonal Wet 15 10 5
2	*Surface Fuels Continuity (% cover)*	<20 0	20–40 2	41–60 3	61–80 4	>80 5
3	*Vegetation Fuel Composition*	Moss, Herbs, Irrigated Crops, Low Flammability Weeds 1	Herbs, Deciduous Shrubs 2	Lichen, Conifer Shrubs 3	Pinaceae, Juniper 4	Sagebrush, Bunchgrass, Antelope Brush, Scotch Broom 5
4	*Fine Woody Debris Continuity (<=7cm) (% cover)*	<1 coverage 1	Scattered, <10 coverage 5	10-25 coverage 7	>25 coverage, < 10 cm deep 10	>25 coverage, > 10 cm deep 15
5	*Large Woody Debris Continuity (>7cm) (% cover)*	<1 coverage 1	Scattered, <10 coverage 2	10-25 coverage 5	> 25 coverage, not elevated 7	>25 coverage, partially elevated 10
6	*Live and Dead Coniferous Crown Closure (%)*	<20 2	20–40 5	41–60 10	61–80 15	>80 10
7	*Live Deciduous Crown Closure (%)*	>80 or <40% coniferous crown closure 0	61-80 2	41–60 3	20–40 4	<20 5
8	*Live and Dead Conifer Crown Base Height (m)*	5+ or <20% conifer crown closure 0	3–5 5	2–<3 7	1–<2 10	< 1 15
9	*Live and Dead Suppressed and Understorey Conifers (stems/ha)*	0-500 2	501-1000 5	1001-2000 10	2001-4000 20	>4000 30
10	*Forest Health (% of dominant and co-dominant stems)*	Standing Dead and Partly Down < 5 or <20 stems/ha 0	Standing Dead and Partly Down 5-25 5	Standing Dead and Partly Down >25-50 10	Standing Dead and Partly Down >50 - 75 20	Standing Dead and Partly Down >75 30
11	*Continuous Forest/Slash Cover within 2km (%)*	0-20 0	21-40 3	41-60 5	61-80 7	>80 10
					Sub Total	**/155***
	Weather	**A**	**B**	**C**	**D**	**E**
12	*Biogeoclimatic Zone*	AT, Irrigated 1	CWH, CDF, MH Dry Zonal Wet 5 3 1	ICH, SBS, ESSF Dry Zonal Wet 10 7 3	IDF, MS, SBPS, CWH ds1 & ds2, BWBS, SWB – Dry Zonal Wet 15 10 5	PP, BG 15
13	*Historical Wildfire Occurrence (by WMAS Fire Zone)*	G5, R1, R2, G6, Y5, R9, Y9, Y3, R5, R8, Y7 1	G3, G8, R3, R4, W6, G1, G9, Y8 5	G7, C5, G4, C4, V1, C1, N6 8	K1, K5, K3, C2, C3, N5, K6, N4, K7, N2 10	N7, K4, K2, N1 15
					Sub Total	**/30**
	Topography	**A**	**B**	**C**	**D**	**E**
14	*Aspects (>15% slope)*	North 0	East 5	<16% slope all aspects 10	West 12	South 15
15	*Slope (%)*	<16 1	16–29 and max score for North slopes 5	30–44 10	45-54 12	>55 15
16	*Terrain*	Flat 1	Rolling 3	Sloped terrain, minor low relief draws 5	Consistent slope, deep draws or shallow gullies 7	Consistent slope, deep gullies 10
17	*Landscape/Topographic Limitations to Wildfire Spread*	< 5 ha isolated forest land 1	North and/or east aspects dominate, wildfire spread restricted from South and/or West 2	Mountainous terrain, broken topography, regular aspect and slope changes, multiple restrictions to wildfire spread large water bodies 5	Rolling terrain, minor water bodies, minimal aspect and slope changes, minor restrictions to wildfire spread 10	Continuous, consistent topography No restriction to wildfire spread 15
					Sub Total	**/55**
	FUEL, WEATHER AND TOPOGRAPHY				**WILDFIRE BEHAVIOUR THREAT SCORE**	**/240****
	Structural	**A**	**B**	**C**	**D**	**E**
18	*Position of Structure/ Community on Slope*	No Structures Values within 2 km 0	Bottom of slope, valley bottom 5	Mid-slope benchland, elevated valley, <16% slope 10	Mid-slope continuous, >15% slope 12	Upper 1/3 of Slope 15
19	*Type of Development*	No Structures Values within 2 km 0	Perimeter interface, no inclusions 3	Perimeter interface, with inclusions 5	Intermix > 1 structure/ha 8	Intermix <1 structure/ha Infrastructure 10
20	*Position of Assessment Area Relative to Values*	No Structures Values within 2 km 0	Above >500 200-500 <200 m 1 10 20	Sidehill >500 200-500 <200 m 1 12 25	Flat/Rolling >500 200-500 <200 m 1 12 25	Below >500 200-500 <200 m 1 15 30
					WILDLAND URBAN INTERFACE WILDFIRE THREAT SCORE	**/55**
					TOTAL WILDFIRE THREAT SCORE	**/295**

*Proceed only if Fuel sub total is >29.

** Proceed to Structural component only if Wildfire Threat Behaviour Score is >95 for untreated polygons.

Wildfire Behaviour Threat Class (check applicable class)

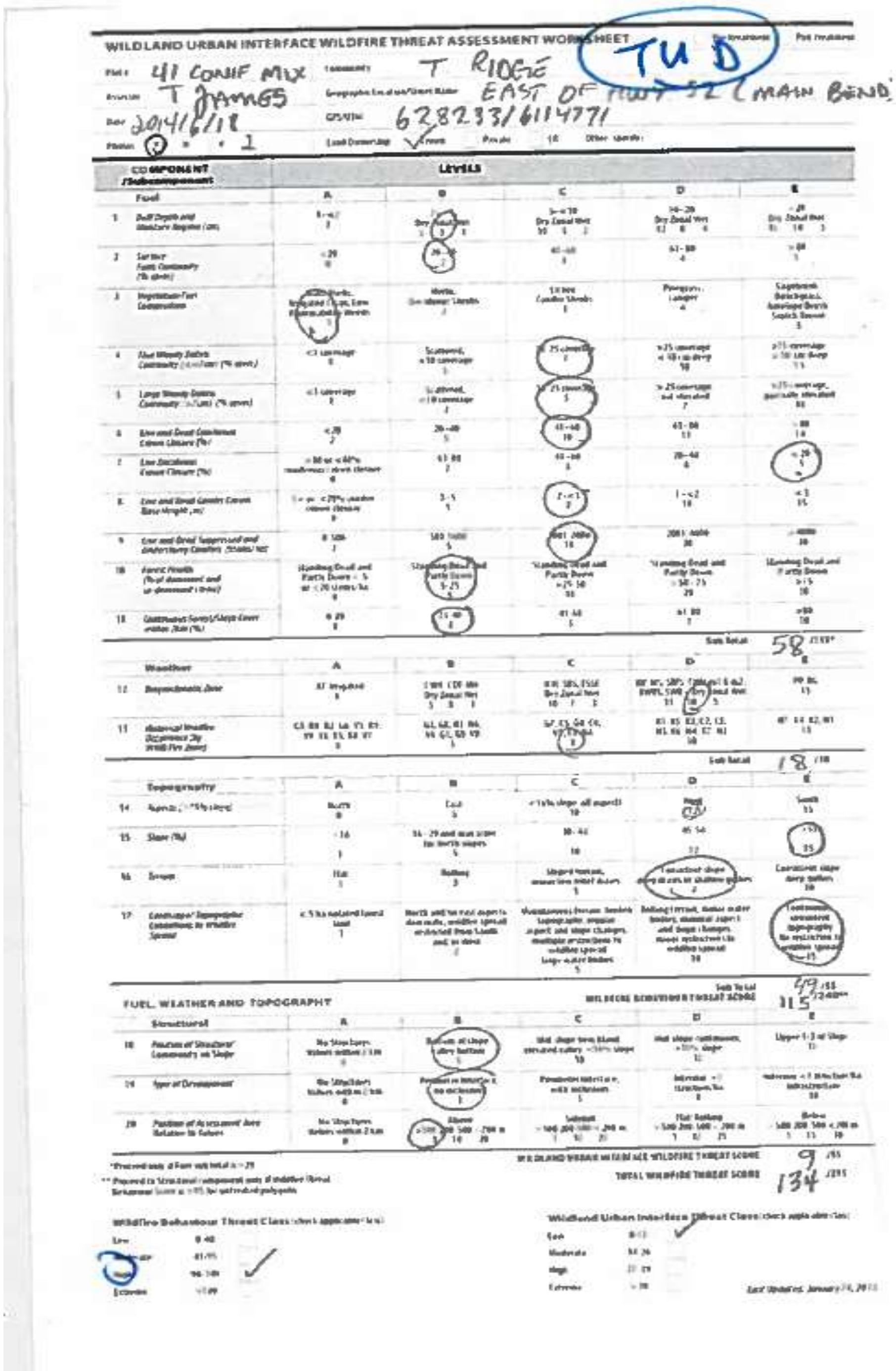
Low	0-40	☐
Moderate	41-95	☐
High	96-149	☐
Extreme	>149	☐

Wildland Urban Interface Threat Class (check applicable class)

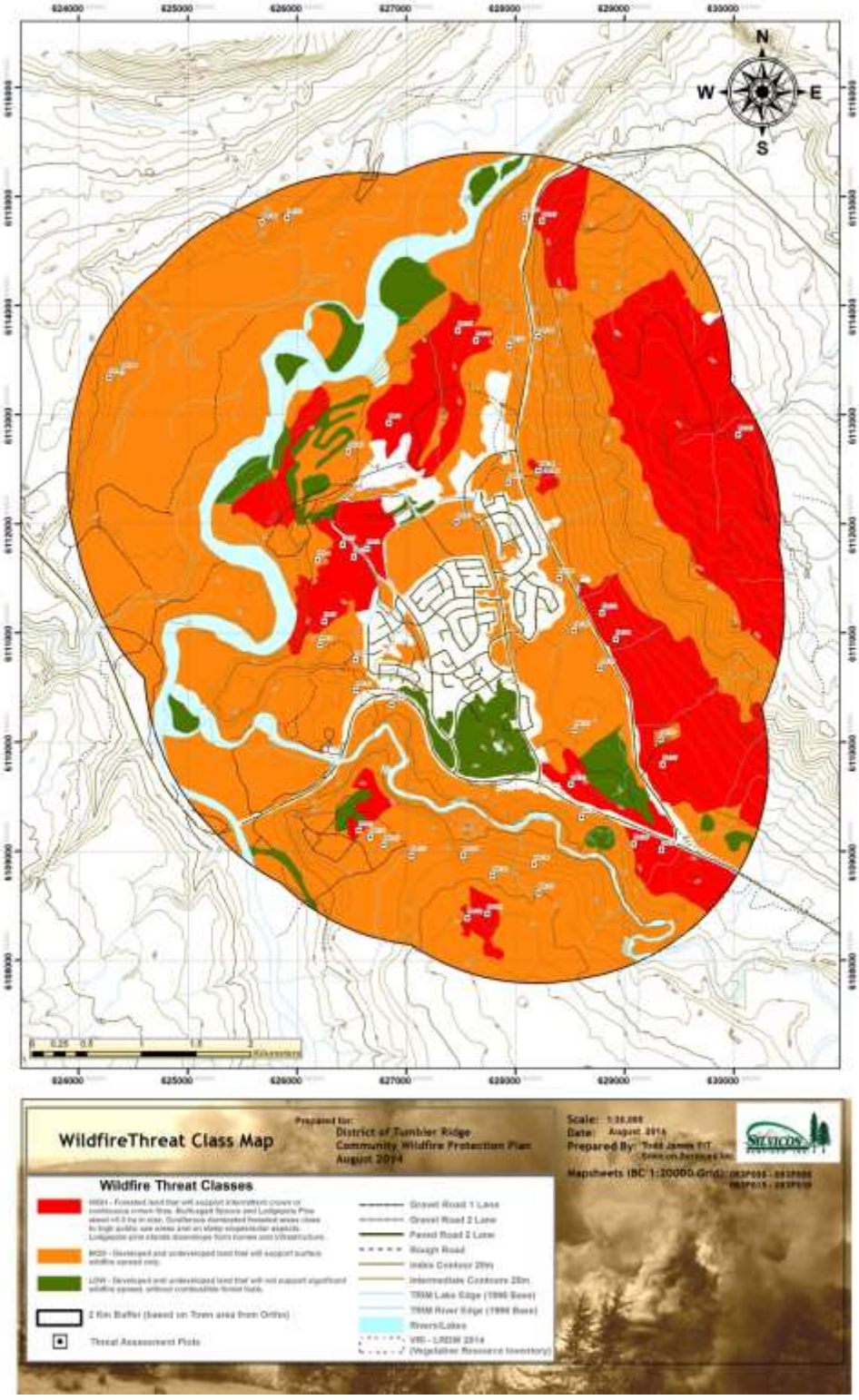
Low	0-13	☐
Moderate	14-26	☐
High	27-39	☐
Extreme	>39	☐

Last Updated: January 24, 2013

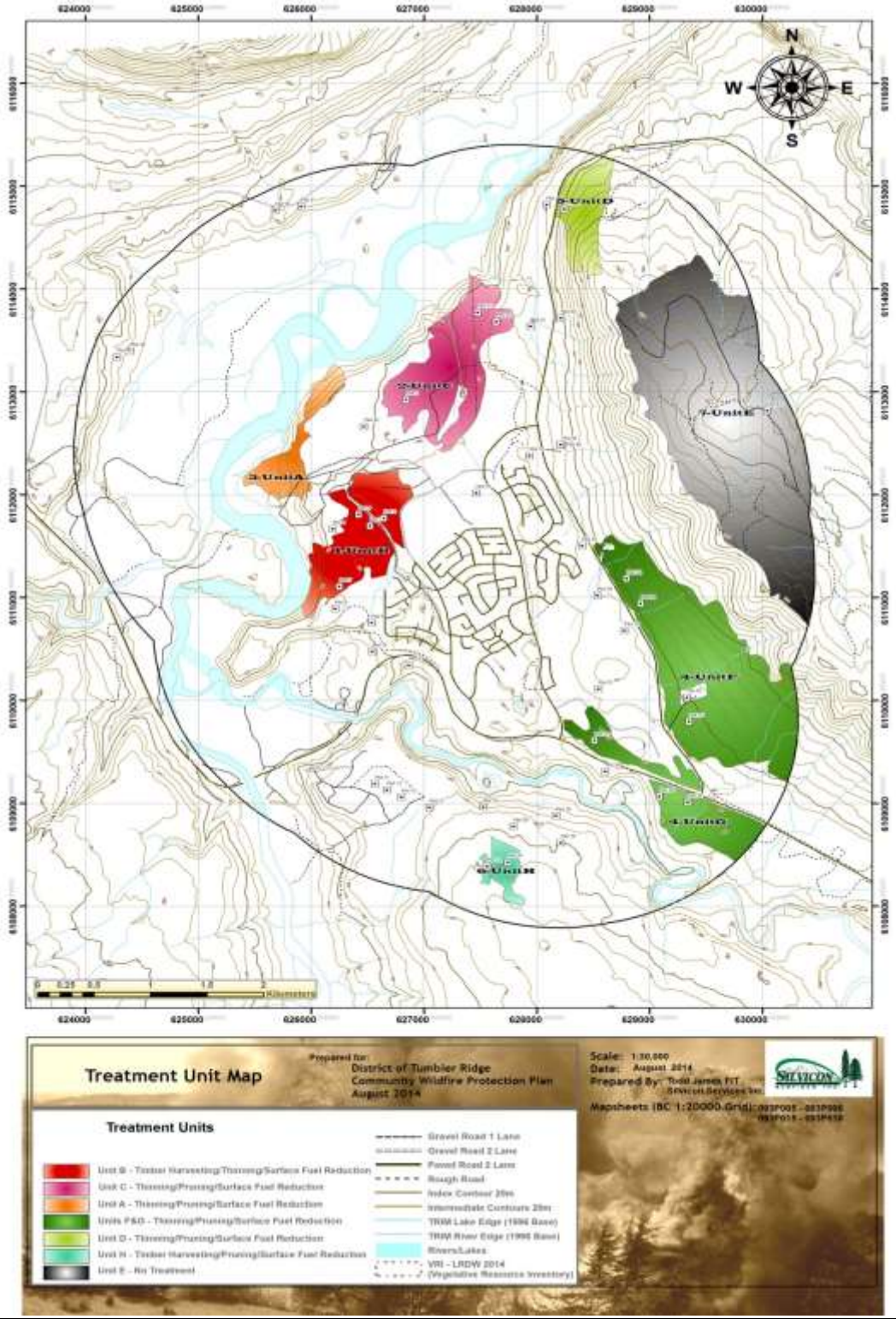
Appendix – B: Example of completed WUI Wildfire Threat Assessment Worksheet


WILDLAND URBAN INTERFACE WILDFIRE THREAT ASSESSMENT WORKSHEET

Appendix - C: Wildfire Behavior Threat Class Map

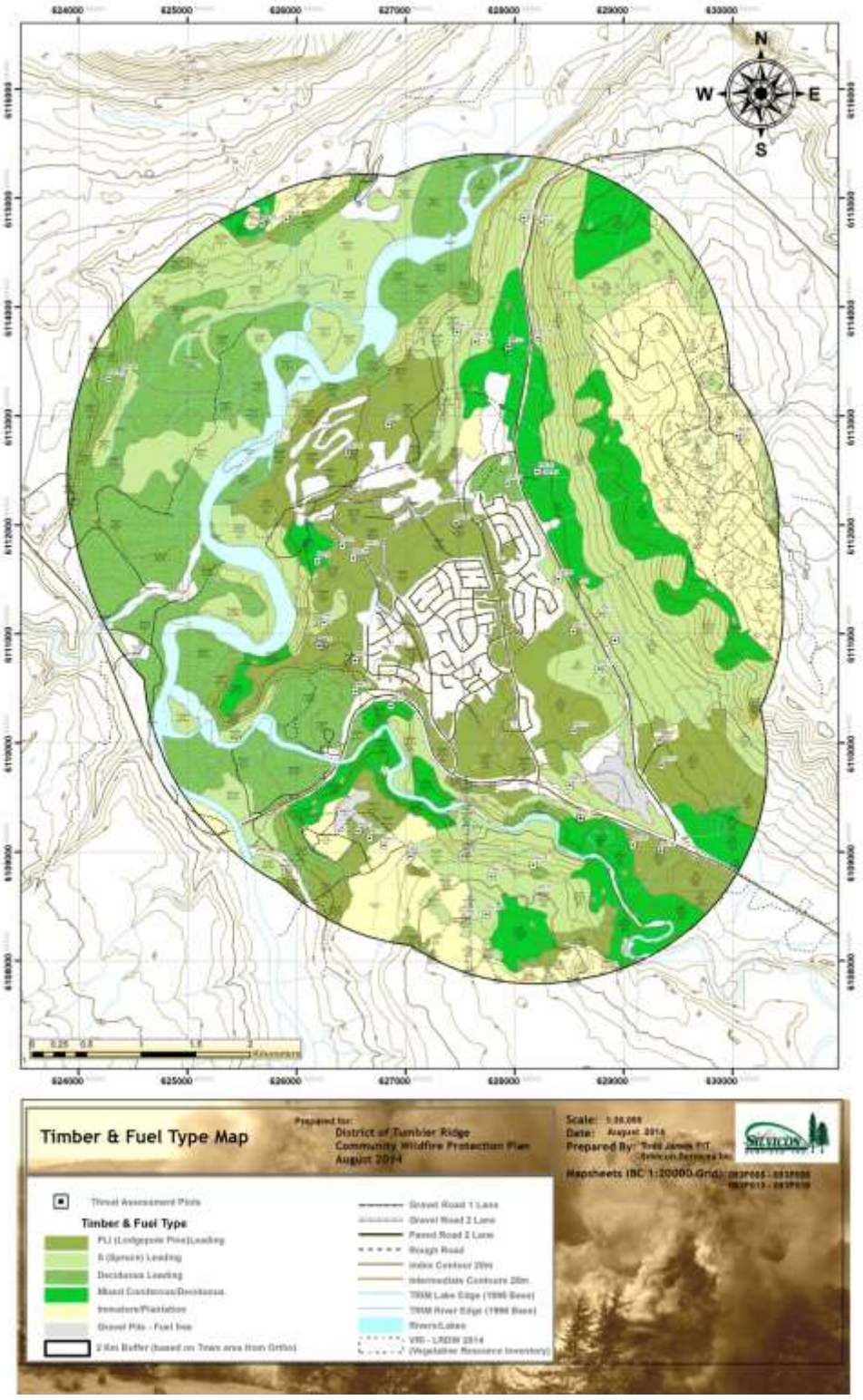


Appendix - D: Treatment Unit Map



Prepared By: Silvicon Services Inc.

Appendix - E: Fuel Type Map



Appendix - F: Wildfire Threat Plot Map