



## ELECTORAL AREA DIRECTORS COMMITTEE SPECIAL MEETING A G E N D A

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**Tuesday, April 9, 2019**  
in the Regional District Office Boardroom, 1981 Alaska Avenue, Dawson Creek, BC  
**Commencing at 10:00 a.m.**

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1. **CALL TO ORDER** - Director Goodings to Chair the Meeting
2. **ADOPTION OF AGENDA:**
3. **DELEGATIONS:**
  - D-1 (10:00) Dave Mitchell, Consultant with Dave Mitchell & Associates Ltd. and Ian MacDonald, Lawyer, Dave Mitchell & Associates Ltd. – As per R-1.
4. **REPORTS:**
  - R-1 April 3, 2019 – Report from Deborah Jones-Middleton, Protective Services Manager – Fire Protection Service Review Electoral Area C and Electoral Area D South to Kiskatinaw River Feasibility Study Report
  - R-2 April 3, 2019 – Report from Deborah Jones-Middleton, Protective Services Manager – Expansion of the Charlie Lake Fire Department
  - R-3 April 5, 2019 - Report from Deborah Jones-Middleton, Protective Services Manager – Peace River Regional District Flood Risk Assessment Report
5. **ADJOURNMENT:**



# REPORT

To: Chair and Directors

Date: April 3, 2019

From: Deborah Jones-Middleton, Protective Services Manager

**Subject: Fire Protection Service Review Electoral Area C and Electoral Area D South to Kiskatinaw River Feasibility Study Report**

## RECOMMENDATION #1:

1. That the Electoral Area Directors Committee receive the Fire Protection Service Review Electoral Area C and Electoral Area D South to Kiskatinaw River Feasibility Study Report prepared by Dave Mitchell and Associates Ltd. for discussion.

## BACKGROUND/RATIONALE:

On March 15, 2018 the Rural Budgets Administration Committee provided the following resolution:

“That the Rural Budgets Administration Committee approve \$45,000 to fund a feasibility study to examine options for the provision of fire protection services in all of Electoral Area ‘C’ and a portion of Electoral Area ‘D’, with \$38,350 from Electoral Area ‘C’ Fair Share and \$6,750 from Electoral Area D’ Fair Share.”

The Fire Protection Service Review Electoral Area C and Electoral Area D South to Kiskatinaw River Feasibility Study Summary and Recommendations is on page 49 of the feasibility study report. Dave Mitchell will present the information to the Electoral Area Directors Committee and be available to answer questions.

## ALTERNATIVE OPTIONS:

That the Electoral Area Directors Committee provide further direction.

## STRATEGIC PLAN RELEVANCE:

## FINANCIAL CONSIDERATION(S):

## COMMUNICATIONS CONSIDERATION(S):

## OTHER CONSIDERATION(S):

Attachments:

1. Fire Protection Service Review Electoral Area C and Electoral Area D South to Kiskatinaw River feasibility report from Dave Mitchell & Associates Ltd.

Staff Initials:

Dept. Head:

CAO:

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PEACE RIVER  
REGIONAL DISTRICT

Fire Protection Service Review  
Electoral Area C and  
Electoral Area D South to the Kiskatinaw River

Dave Mitchell & Associates Ltd.

December 2018

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## Executive Summary

The Peace River Regional District (the “PRRD”) is reviewing options to provide fire protection for Electoral Area C (“Area C”) as well as the portion of Electoral Area D (“Area D”) south to the Kiskatinaw River. At the present, Area C is protected in part, but not all, by the Charlie Lake Volunteer Fire Department (the “CLVFD”) the Fort St. John Fire Department (“FSJ”) and the Taylor Volunteer Fire Department (“Taylor”). The latter two departments provide fire protection under service contract with the PRRD.<sup>1</sup> Taylor also provides fire protection to a part of Area D south to the Kiskatinaw River under service contract.

The CLVFD and Taylor are volunteer fire departments each with a paid fire chief and deputy chief supported by volunteers. FSJ is a composite fire department having a paid fire chief and deputy as well as a complement of paid career staff who are members of the International Association of Fire Fighters, supported by volunteers. Each of the three departments has a single fire hall.

The number of properties lying outside of existing fire protection in Areas C and D south to the Kiskatinaw River total 503, with 325 in Area C and 178 in Area D. To estimate the population in these areas, the multiplier is 2.7 for Area C and 2.6 for Area D. As such the population for the unprotected portion of Area C is estimated to be approximately 878, and for Area D, approximately 463, for a total of about 1,341 persons. That said, some caution should be applied to these estimates as there has not been an audit to ensure residents live at every civic address. As well, in Area D there are two Hutterite Colonies, Peace View and South Peace, which may well exceed that multiplier based on the size of the residential structures.

Provision of fire protection for the remainder of Area C and the north portion of Area D will require a minimum of one additional fire hall in each area to address travel time and travel distance. Notionally fire protection from FSJ and Taylor could be increased for Area C and D but this would involve distances far beyond what would be considered acceptable by the Fire Underwriters (the “FUS”) and is not recommended.

One option would be to provide the two additional fire halls as standalone fire departments, but this is not recommended as this model would require a fire chief and other officers in addition to volunteer firefighters, it would require the establishment of two additional service areas and would add two additional parties to the existing service contracts. The recommended option is to establish the two additional fire halls as part of the PRRD fire service, making them part of the CLVFD. This model would allow for a more efficient administration for the enlarged service area in terms of training, operations and capital planning.

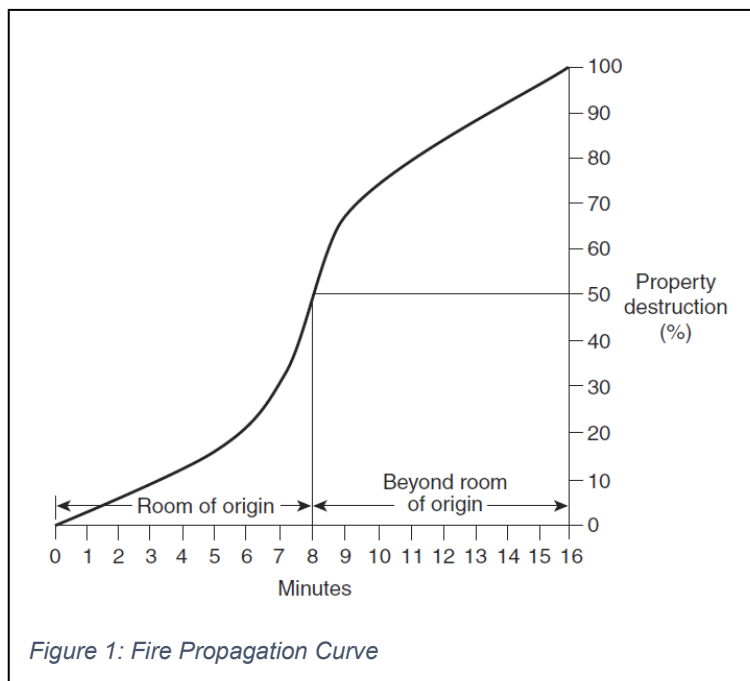
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<sup>1</sup> The agreement with the District of Taylor expires at the end of 2018; the agreement with the City of Fort St. John expires at the end of 2021.

## Response Standards—NFPA

The standards of service that apply to the fire service include those related to response time objectives. These are defined by the National Fire Protection Association (the “NFPA”) and include time intervals for 911 call handling, dispatch, turnout of crews and travel to the scene.

Each of these will be described in further detail in the following sections, however a key element for all fire responses is the relationship between time and the degree of fire damage. This is illustrated in Figure 1 which shows the rate of change / percentage of destruction from the time at which a fire ignites. This fire propagation model is well documented and explains why each element of fire response is critical because at or about eight minutes from ignition a fire will flashover and extend beyond the room of origin. This increases the risk to the occupants as well as to firefighters, and certainly increases the amount of resulting damage.



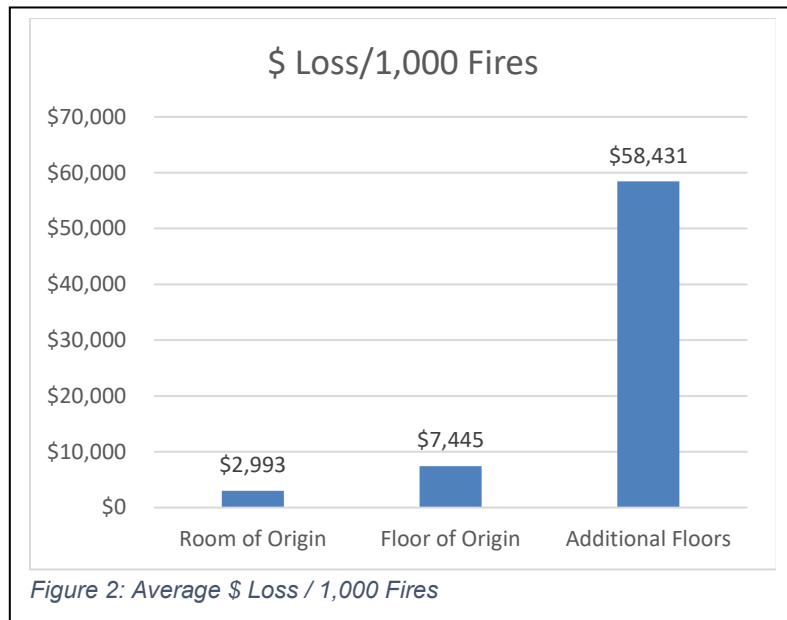
The relationship between the deployment of sufficient firefighters within a defined timeframe relative to fire loss and injury has been documented by the NFPA as shown in Table 1. From this it can be seen that confining a fire to the room of origin results in an average dollar loss of \$2,993.

Flame Spread	Civilian Deaths	Civilian Injuries	Average Dollar Loss per Fire
Confined fire or flame damage confined to object of origin	0.65	13.53	\$1,565
Confined to room of origin, including confined fires and fires confined to object	1.91	25.32	\$2,993
Beyond the room but confined to the floor of origin	22.73	64.13	\$7,445
Beyond floor of origin	24.63	60.41	\$58,431

Table 1: Death, Injuries and \$ Loss as a function of the fire's extension.

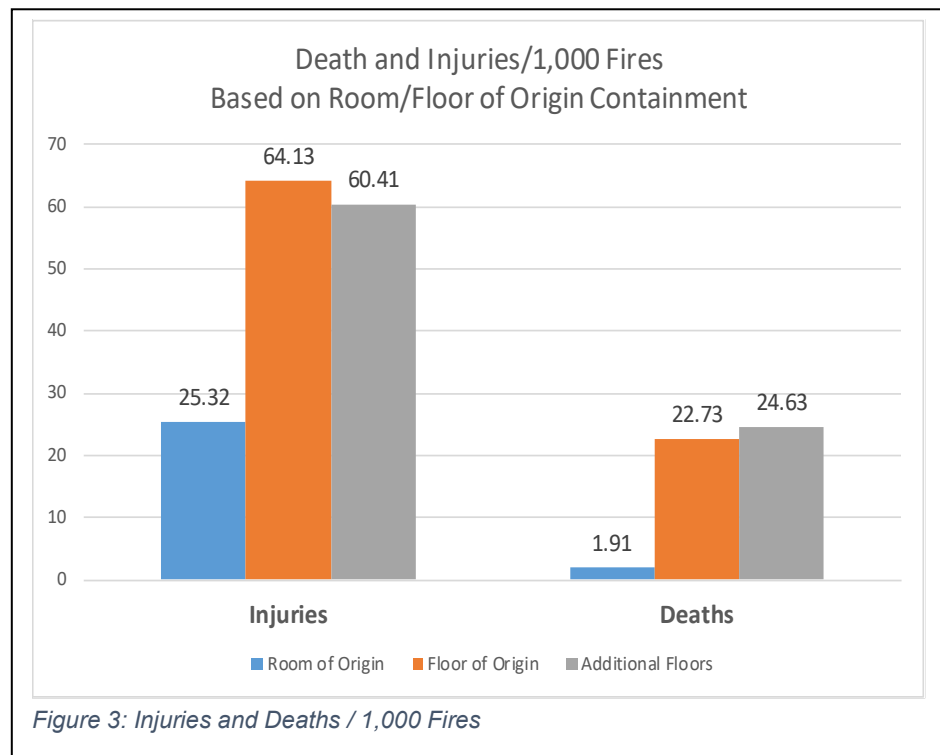
Fires which extend beyond the room of origin, but which are contained to the floor of origin result in an average dollar loss of \$7,445 while fires which extend beyond the floor of origin result in an average dollar loss of \$58,421.<sup>2</sup>

Similarly, where a fire is held to the room of origin civilian fire deaths do not exceed 1.91 per thousand fires, but where the fire extends beyond the room of origin there are 22.73 deaths per thousand fires. In terms of injuries we expect 25.32 per thousand fires when the fire is held to the room of origin, but this increases to 64.13 when the fire extends beyond that.



This data is shown graphically in Figure 2 in terms of dollar loss per 1,000 fires and in Figure 3 in terms of injuries and deaths per 1,000 fires.

In summary, fire damage, injuries and fatalities are mitigated by the promptest possible arrival of a competent fire department.



<sup>2</sup> The data used in this table is for the United States; there is no similar aggregation of national data in Canada.

## Response Standards—Fire Underwriters

This section examines the role and importance of FUS reviews for residents in a fire protection area and provides a brief background on the methodology that those surveys employ. Given that the rating provided by the Fire Underwriters materially impacts insurance costs for both residential and commercial buildings, it is important to understand how the rating system operates and the potential impact it has on the cost-benefit analysis of investing in the fire service. In particular, it is important to understand how investing in the fire service through civic taxes, to establish, maintain or improve an area's FUS rating, can potentially result in a net return (or the maintenance of major net savings) for residents and area businesses.

The Fire Underwriters are a national organization administered by Opta Information Intelligence. It has operated under a variety of names in the past (including SCM Risk Management Services Inc.), but in each instance, the organization was, and we believe still remains, owned or controlled by the insurance industry.

The primary purpose of the Fire Underwriters is to establish the Dwelling Protection Grade ("DPG") and Public Fire Protection Classification ("PFPC") for each community in the country.<sup>3</sup> The DPG rating generally applies to single family detached residences,<sup>4</sup> whereas the PFPC rating applies to multi-family residential, commercial, industrial and institutional buildings or districts, and generally is applied by the "commercial lines" arm of the insurance industry.<sup>5</sup>

Most residential homeowners and businesses carry fire and general perils insurance, and any person with a mortgage is required to maintain such insurance by the mortgagee bank or financial institution. Where a community has a fire department which meets FUS standards for performance, the cost of insurance can be significantly decreased. Thus, one of the cost-benefit analyses that underpins the investment required to establish or maintain an FUS-rated fire department is the trade-off between the taxes needed to pay for the department and the expected saving on insurance costs.

With a well-rated fire department, the savings on insurance premiums often will offset, in whole or in significant part, the costs of operating the department. For an individual with a house that

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<sup>3</sup> There is on-going consideration by the Fire Underwriters of the two types of classifications: it is possible that in the not-to-distant future, the two ratings will be combined so that only a single rating system exists, covering both residential and commercial/multi-family properties.

<sup>4</sup> Under the FUS definitions, the DPG ratings generally apply to the following: "One- and Two-Family Detached Dwellings (buildings containing not more than two dwelling units) in which each dwelling unit is occupied by members of a single family with not more than three outsiders, if any, accommodated in rented rooms." Also, under this system, a "typical" detached dwelling is a maximum of 3,600 square feet in size. Fire Underwriters Survey website, "Terms of Reference", <http://www.fireunderwriters.ca/dwelling-protection-grade.html> accessed on 20 July 2018.

<sup>5</sup> Fire Underwriters Survey website, "What is the PFPC" at <http://www.fireunderwriters.ca/public-fire-protection-classification.html>, accessed on 20 July 2018.

is assessed at a replacement cost for insurance purposes of \$300,000, a “protected” or “semi-protected” rating will generally result in cost saving on insurance of more than \$2,000. For commercial properties, significant reductions in insurance rates can be expected when the community obtains a PFPC rating of 7 or better. From the savings enjoyed on insurance, the tax cost of maintaining the service would then need to be deducted to determine the net direct financial benefit (or cost) of having a “rated” department.<sup>6</sup>

By way of example, the following tables are sometimes shown in FUS reviews.<sup>7</sup> They show the amount by which “average” insurance costs drop for residential and commercial properties as the DPG or PFPC rating improves:

Replacement Value \$	Unprotected Rate \$	60± % reduction	Semi Protected Rate \$	32± % reduction	Fully Protected Rate \$
100,000	1,165		465		315
125,000	1,470		585		400
150,000	1,750		700		475
175,000	2,040		815		555
200,000	2,710		1,215		739
250,000	3,290		1,475		893
300,000	3,880		1,741		1,053
350,000	4,422		1,987		1,201
400,000	4,953		2,226		1,349
450,000	5,489		2,465		1,491

Table 2: Dwelling Protection Grade, estimate of insurance Costs

<sup>6</sup> The rating system is described in greater detail in the next section. It must be stressed that the actual cost of insurance for any homeowner or business varies based on a number of individual and site-specific factors. While the FUS fire grading for the area has a significant impact, a host of other considerations are also involved in the setting of insurance rates, including matters specific to the individuals or properties involved, or the competitive forces at work in the region. It is also important to note that the insurance value of a dwelling or business is not the same as its assessed value for tax purposes (as the latter is based on the cost of building a replacement structure, not its estimated market value – the two can vary significantly).

<sup>7</sup> These tables are now several years old. A number of more recent reports we have seen have not included them, or, where they have been included, have involved insurance cost figures which are particular to the locale. These figures were calculated on broad-based national averages in the reports in which they were used.

Public Fire Protection Classification	U-Rate Percentage Decreases
PFPC 10 to PFPC 9	99.2%
PFPC 9 to PFPC 8	96.6%
PFPC 8 to PFPC 7	82.4%
PFPC 7 to PFPC 6	74.4%
PFPC 6 to PFPC 5	63.1%
PFPC 5 to PFPC 4	53.8%
PFPC 4 to PFPC 3	48.0%
PFPC 3 to PFPC 2	47.3%
PFPC 2 to PFPC 1	45.8%

Table 3: Public Fire Protection Classification, estimate of insurance costs savings

As can be seen, ratings improvements in the commercial classification do not result in linear decreases. From a cost-benefit perspective, moving a rating from PFPC 8 down to ~PFPC 4 provides the optimal savings for businesses and multi-family properties. That non-linear relationship is worthy of consideration on a cost-benefit analysis between the amount required to be invested in improving the service and the expected insurance savings for owners of commercial, industrial and multi-family properties.<sup>8</sup> Below PFPC 4, the amount required to be invested to obtain the improved rating likely will outweigh any insurance savings.

A complicating factor is that the ratings applied to a community are not necessarily uniform. FUS considers a series of issues (examined further below), which include distance from the fire hall and availability of water supplies. Depending on the size and nature of the service area, the insurance benefits may not be equally enjoyed by all ratepayers. Thus, if the fire zone is larger than eight kilometres in radius (assuming the hall in the centre), the residents outside of the eight-kilometre zone may not enjoy the cost savings received by those residents who live within the zone.

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<sup>8</sup> The amount of savings can also vary with the particular type of industry or commercial undertaking. See the more detailed discussion of PFPC ratings below. The table gives the average of all savings, across all industry types.

## Superior Tanker Shuttle Service Accreditation (“STSS”)

STSS accreditation is recognized by the FUS as being equivalent to hydrant protection.<sup>9</sup> This accreditation has been obtained by a number of fire services in the province and, where they are compliant in terms of water flow and distance, they are equivalent to the DPG Grade 3A which is considered “fully protected”, as opposed to DPG 3B, which is a semi-protected rating. The difference in insurance costs between semi- and fully-protected can be as much as 30%.

For the STSS accreditation to generate an insurance premium discount, FUS requires the property to be within eight kilometres of a fire station and five kilometres of a water supply point. Achieving an STSS accreditation would mean the responding fire department has access to a more secure water supply within the sub-regional area in addition to a potential reduction in fire insurance premiums. Accreditation is normally granted by the FUS for a period of five years.<sup>10</sup>

The accreditation would require a minimum of one Tender of appropriate capacity along with identified water supply points for each of the two additional fire halls. Achieving this capacity would require an optimized response by the CLVFD and if possible supported by FSJ and Taylor to provide this within the regional area.

Having the ability to provide a consistent water supply by tanker shuttle would be a benefit for both the PRRD service areas which are protected by the CLVFD as well as FSJ and Taylor, as this would assure an additional uninterrupted water supply capability regardless of whether accreditation is obtained or not.

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<sup>9</sup> *Ibid.*

<sup>10</sup> To be clear, STTS accreditation can only be granted by the FUS but regardless of whether accreditation is obtained or not, the ability to provide an enhanced water shuttle will be a benefit to any firefighting response.

## Forest Interface Risk

### Area C

Area C extends from the 253 Road to the Beaton River on the north and eastern sides and Peace River on the southern side.

The area that comprises Area C is classified by Natural Resources Canada as being “boreal plains”. The typical type of ecology found in this area is:

- Very large farmed fields of grain and hay crops; and
- Forested areas made up of aspen, balsam poplar, and spruce (white) trees.

Area C is a rural area with homes scattered throughout on large tracks of farm/field acreage. Most of the homes/residences in the area are surrounded by deciduous trees which have been planted to protect those homes from the effects of sun and wind. Those settled areas are then surrounded by large acreages of grass or grain fields.

The fire risk in Area C is mainly based on the time of year and weather patterns. The hay and grain fields particularly are extremely flammable during three periods: in the spring, after the winter thaw, when the fields of hay and grain grasses are dead and dry; any time the fire risk conditions are rated as high or extreme which is when local temperatures exceed 28 degrees Celsius and the humidity is below 20%; and in autumn when the grasses are once again dead and dry. During these three periods extreme fire behaviour can occur.

Under these conditions, Area C is at high risk to fast moving grass fires. These fires can also move into the broadleaf forest areas/interface areas when they occur. Broadleaf/deciduous trees under most conditions are not very flammable, but they are susceptible when exposed to extreme fire conditions created by a fast-moving wind-driven fire, which can adversely affect homes and other structures in the interface area.

Property owners in Area C should adopt and practice FireSmart<sup>11</sup> principles to protect their residences and farms. The CLVFD should be familiar with the risks of large-scale grass fires and preplan for emergency responses to them. CLVFD is well equipped to deal with small grass fires, as they have two bush trucks in their fleet. Fighting large scale grass fires, however, would present significant water supply and access challenges.

### Area D

Area D is also classified by Natural Resources Canada as being “boreal plains”.

The typical type of ecology found in Area D is:

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<sup>11</sup> <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/for-your-home-community>

- Very large farmed fields of canola seed, grain and hay crops; and
- Broad leaf forested areas made up of aspen, balsam poplar, spruce (black) and cottonwood trees.

The fire risk in Area D, like that of Area C, is mainly based on the time of year and weather patterns. In spring, after the winter thaw, the fields of canola and grasses are dead and dry. Canola fields particularly are extremely flammable when dried out. Later in the spring and summer when the local fire risk conditions are rated as high or extreme, extreme fire behaviour can occur. Under these conditions, Area D is at high risk to fast moving grass fires. These fires can also move into the broadleaf forest areas/interface areas when they occur.

The interface risk from wildfires moving into settled communities exists throughout Area D. An example would be the Lebell Road area which is a community of homes that were built in a broadleaf treed area that is surrounded by fields of grass. A fast-moving grass fire could extend into this community at a very fast pace under the right conditions.

An example of the high fire risk caused by hot, dry weather was evident in the spring of 2016. At that time a small burn pile fire was hit by high winds and extended through the forested area into the interface, with the resulting wildfire destroying two homes in the South Taylor area.

The other values at risk in Area D are industrial, mainly the natural gas industry. There are multiple infrastructure projects surrounded by canola/grass fields. A fast-moving grass fire may not destroy the infrastructure, but it would disrupt their operations for an extended period. The relevant industry owners must adopt and practice FireSmart principles to protect their infrastructure.

With predicted climate change over the next decade, the risk from grass, forest, and interface fires in both areas will most likely increase.

## Charlie Lake Volunteer Fire Department

The CLVFD is a PRRD department which operates from a single fire hall located at 13065 Firehall Road in Charlie Lake. It has a career fire chief and deputy chief and a complement of volunteer firefighters.

In terms of apparatus the CLVFD has two engines carrying a total of 3,000 gallons of water, three tenders with a total of 4,500 gallons of water, a rescue unit, two command vehicles and two brush units.

Designation	Type	Year	Manufacturer	Pump Capacity IGPM <sup>12</sup>	Water Capacity <sup>13</sup>	Seating
Engine 1	Engine	1999	Fort Gary	1,050	1,000	5
Engine 2	Engine	2006	Hub	1,050	2,000	6
Tender 1	Tender	2014	Rosenbauer	1,250	1,500	3
Tender 2	Tender	1987	Superior	840	1,500	3
Tender 3	Tender	2005	Superior		1,500	3
Rescue 1	Rescue	2005	Anderson, Ford F550			6
Squad 1	Fire Chief	2014	Chevrolet Silverado 1500			3
Squad 3	Deputy Chief	2014	GMC 3500		200 <sup>14</sup>	3
Brush 1	Utility	2006	GMC 3500		200 <sup>15</sup>	3
Brush 2	Utility	2016	Polaris Ranger 6x6		75 <sup>16</sup>	3

Table 4: CLVFD Apparatus

<sup>12</sup> IGPM is Imperial Gallons per Minute.

<sup>13</sup> Imperial Gallons

<sup>14</sup> April – October is equipped with a wildland skid unit with 200 gallons of water and wildland firefighting tools.

<sup>15</sup> Wildland skid unit with 200 gallons of water and wildland firefighting tools; tows the trailer with the UTV

<sup>16</sup> Wildland skid unit with 75 gallons of water and wildland fire fighting tools.

## Fort St. John Fire Department

The FSJ is operated by the City of Fort St. John (the “City” or “Fort St. John”) from a single fire hall located on 93 Avenue in the City. It has a career fire chief and deputy chief and a complement of career firefighters on each of four shifts, supplemented by a number of volunteers.

Designation	Type	Year	Manufacturer	Pump Capacity IGPM <sup>17</sup>	Water Capacity	Seating
Tender 1	Tender	2009	Smeal/Spartan	1,500	2,500	
Engine 1	Engine	2017	Smeal/Spartan	1,750	750	
Engine 2	Engine	2000	American Lafrance/Hub	1,050	1,000	
Ladder 1	Aerial Ladder: 100 foot		Smeal/Spartan	1,750	300	
Brush 1	Utility	2015	Profire/SVI brush truck	125	250	
Rescue 1	Heavy Rescue	2009	SVI/Spartan		60 CAFS <sup>18</sup>	
<p>**Note Rescue 1 is equipped with a 25,000-watt generator, a 6-head light tower, Holmatro rescue tools, an Eagle SCBA air bottle refilling system, assorted high angle rescue equipment, spill control equipment, 4 SCBA and assorted extrication equipment</p>						

Table 5: FSJ Apparatus

<sup>17</sup> IGPM is Imperial Gallons per Minute.

<sup>18</sup> Compressed Air Foam

## Taylor Volunteer Fire Department

Taylor is operated by the District of Taylor (the “District”) and operates from a single fire hall located at 100 Street. It has a career fire chief and deputy chief and a complement of volunteer firefighters.

Designation	Type	Year	Manufacturer	Pump Capacity IGPM	Water Capacity	Seating
Engine 11	Engine	1997	Fort Garry	1,050	1,000	5
Engine 12 <sup>19</sup>	Engine / Tender	2002	Fort Garry	1,050	2,000	5
Brush 3	Utility	2017	Ford F550	300	350 <sup>20</sup>	5
Rescue 10	Rescue <sup>21</sup>		Ford F550			5
Command	Fire Chief	2014	GMC 1500			2-5

Table 6: Taylor Apparatus

<sup>19</sup> Carries rescue tools, on-board foam.

<sup>20</sup> On-board Class A foam, brush fire setup.

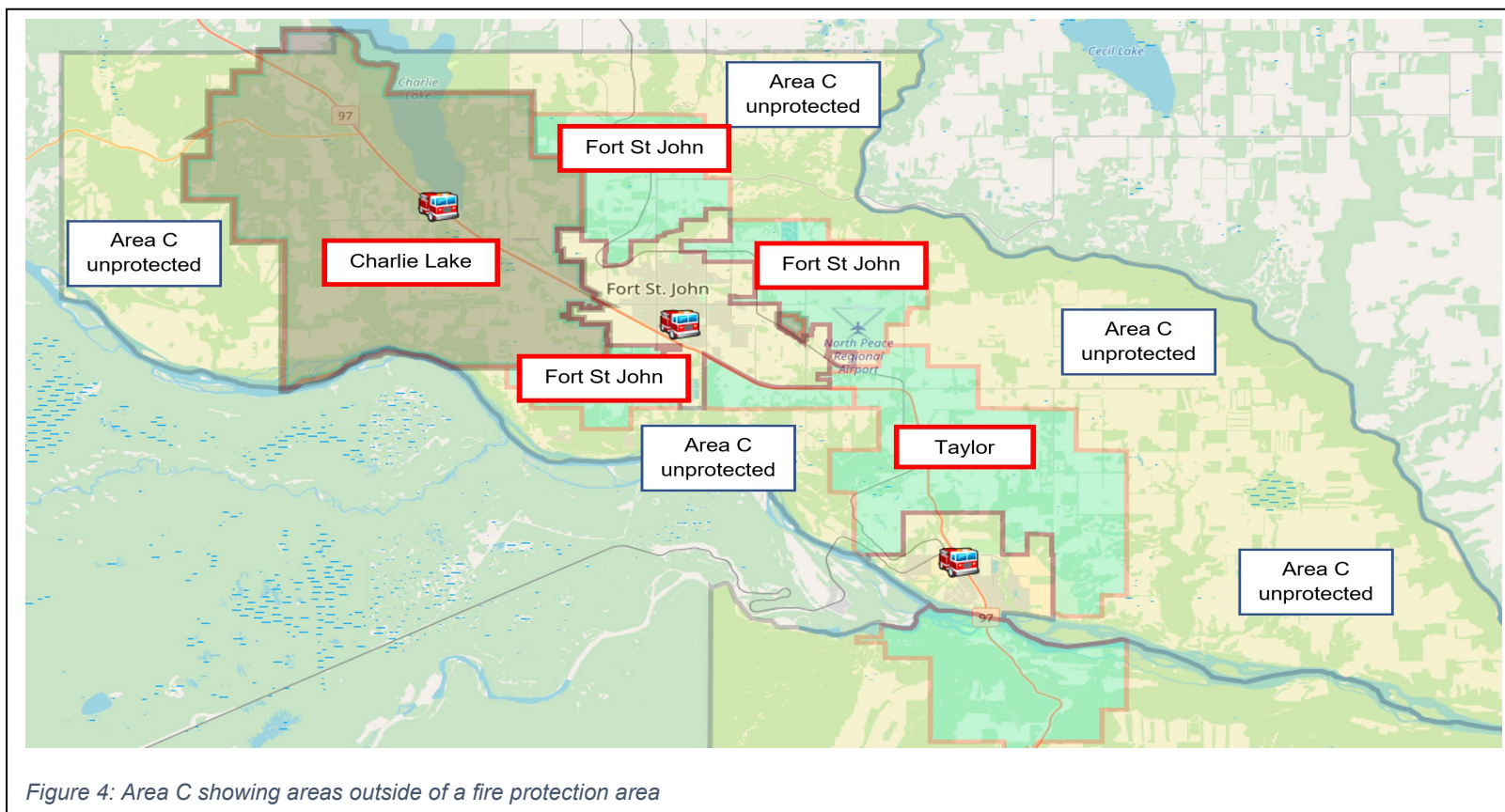
<sup>21</sup> Equipped for medical response, rope rescue, motor vehicle incidents.

## Area C

Fire protection in Area C is provided in part by the CLVFD from its single fire hall north-west of Fort St. John. Part of the remaining portion is covered under service contract with the FSJ and Taylor. However, there are portions of the area to the east of Fort St. John in the Baldonnel area, east to the Beaton River and to the area north and west of Charlie Lake to the boundary of Area C, that are not within the existing fire protection areas and do not receive structure fire protection.

## Current Coverage Deficit: Area C

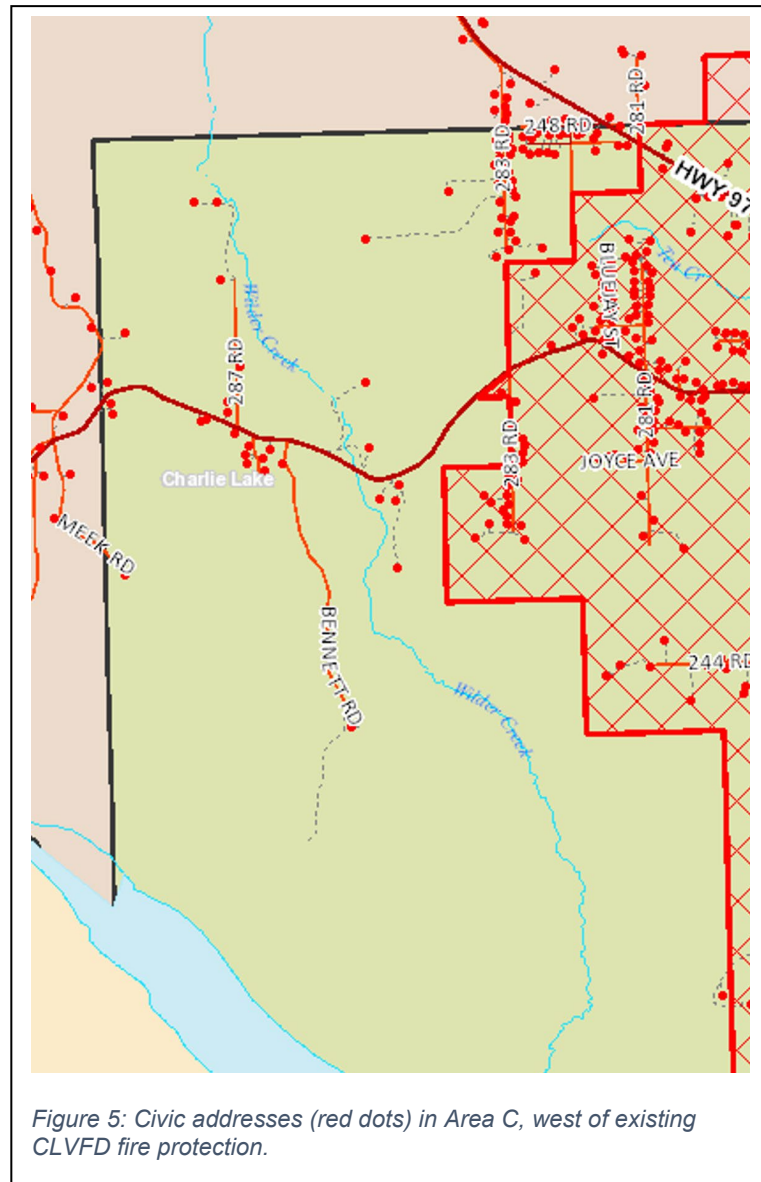
The portions of Area C that are not within a fire protection area are shown in Figure 4. These include the area west and north of



Charlie Lake, as well as a portion of Area C to the north, east and south of Fort St. John and a portion north and east of the District. The portions of Area C that have fire protection from Taylor, CLVFD and FSJ are identified by boxes with a red label.

### West of Charlie Lake

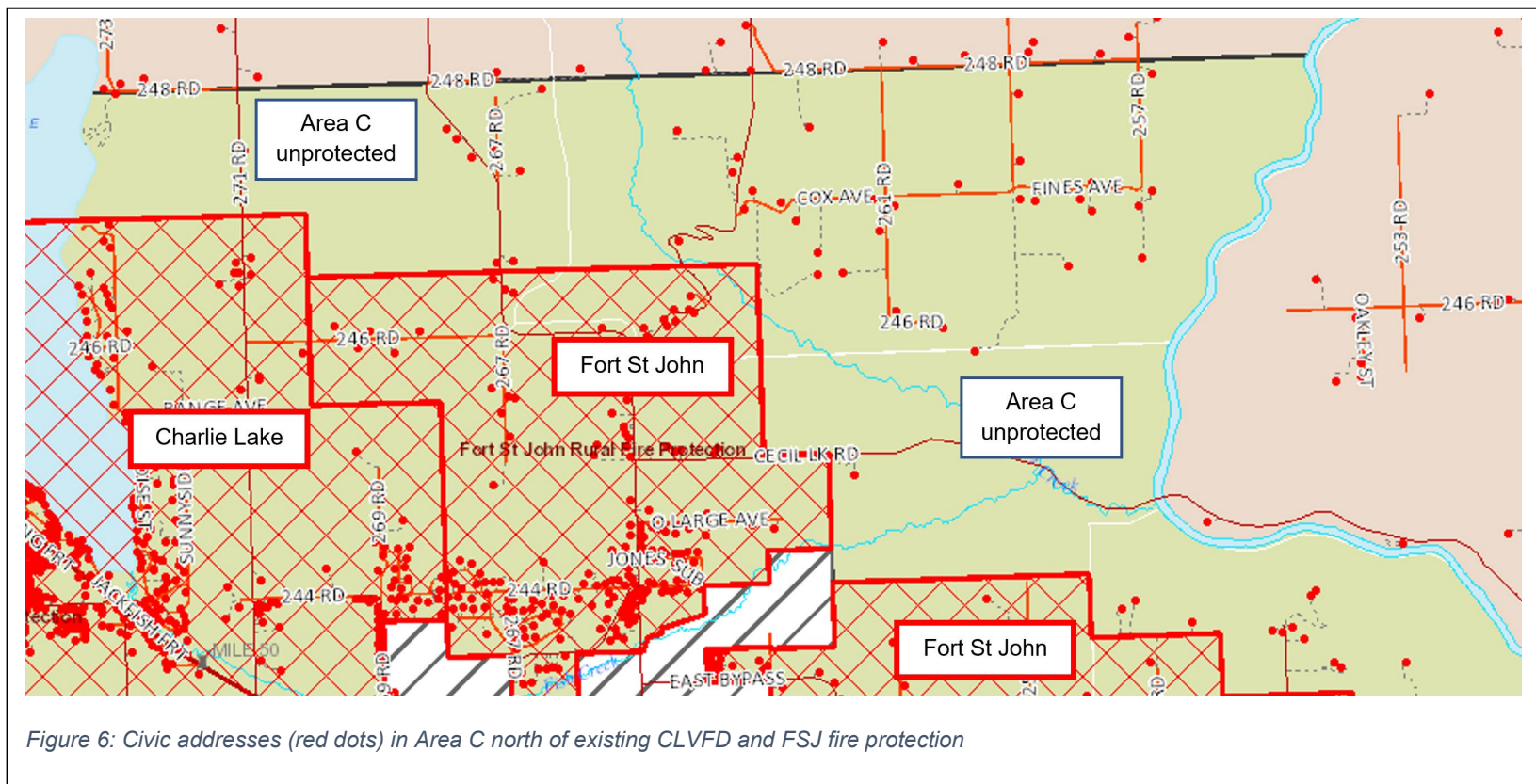
The area west of Charlie Lake that is outside of the protected area is shown in greater detail in Figure 5, which is taken from the PRRD online maps.<sup>22</sup> This map shows Area C with a light green in-fill; the limit of the current fire protection area from Charlie Lake is shown in red, with red dots for civic addresses. There are approximately 50 civic addresses that would be covered by the CLVFD if the coverage area was extended to the western limit of Area C.



<sup>22</sup> <https://prrd.bc.ca/services/mapping-gis/>

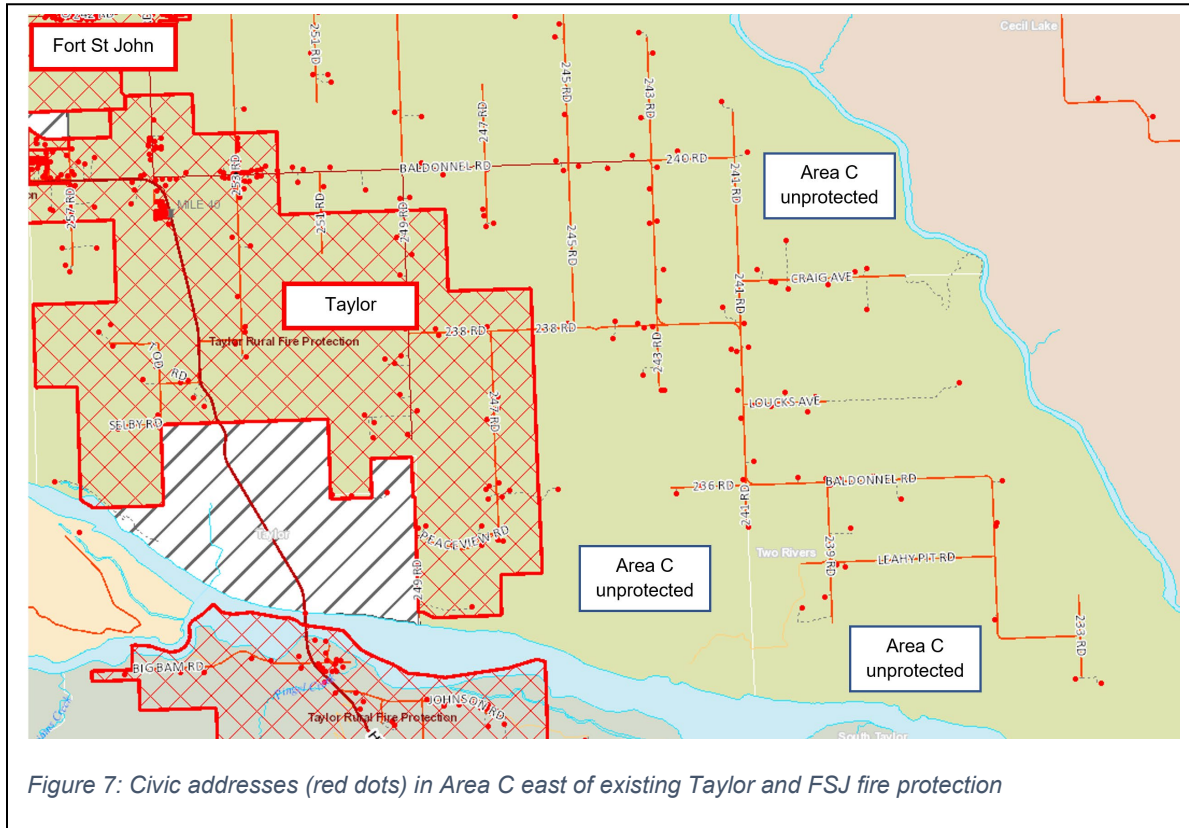
## North of Charlie Lake

The unprotected portion of Area C north of Charlie Lake and Fort St. John is shown in Figure 6. Area C is the portion shown in a light green in-fill; the fire protection area for the CLVFD and the FSJ are shown in the areas with red cross-hatching. The unprotected area is labelled and contains an estimated 75 civic addresses.



East of Fort St. John, North of the Peace River

The portion of Area C east of Fort St. John and north of the Peace River is shown in Figure 7. The District and Fort St. John fire protection areas are labelled, and the remainder is



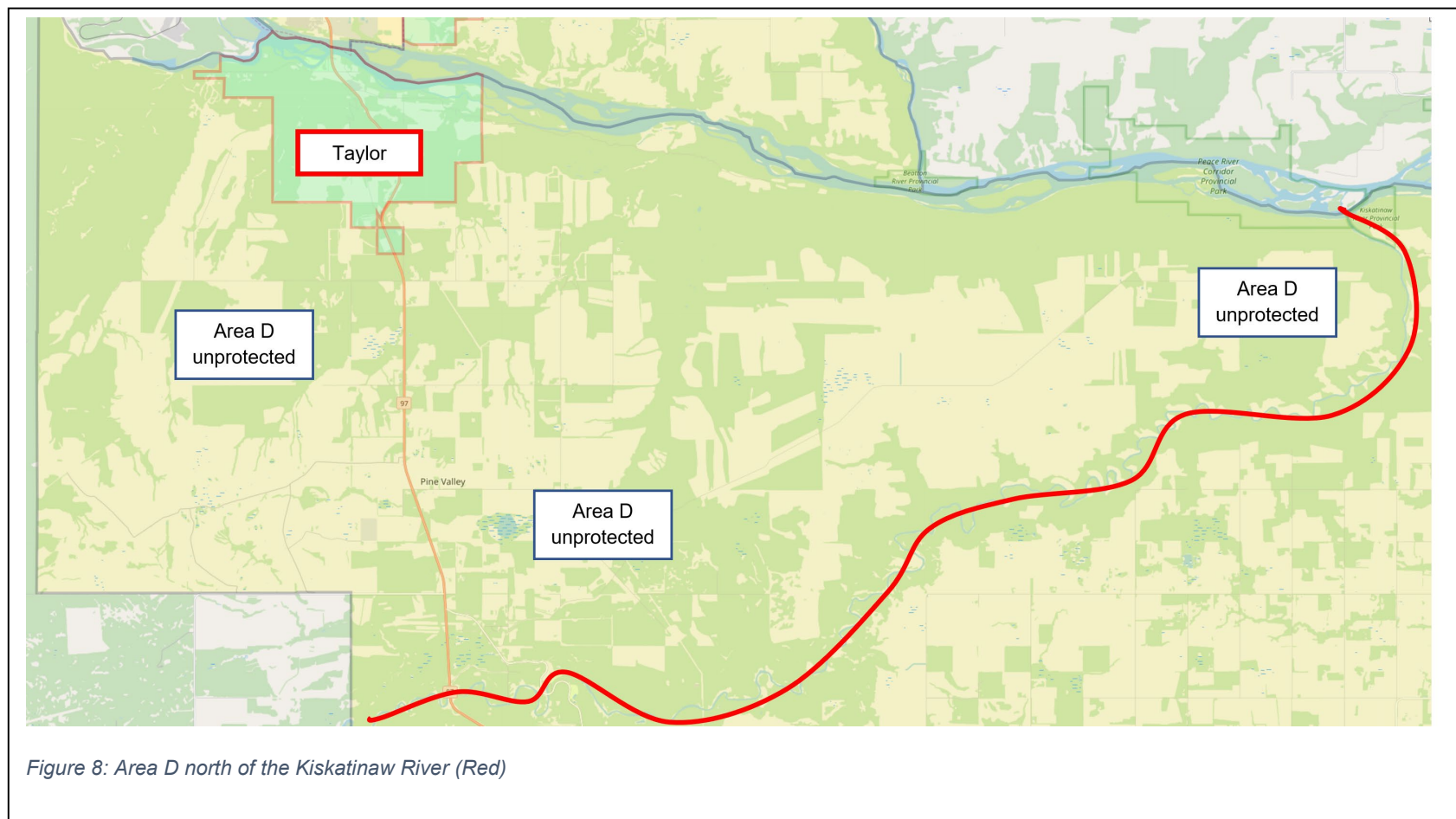
unprotected. The red dots show the location of civic address of which there are approximately 175 in this area.

## Area D

Fire protection in Area D is managed in part by Taylor from its single fire hall on the north side of the Peace River. The area between the south boundary of the fire protection area and the Kiskatinaw River is unprotected.

### Current Coverage Deficit: Area D

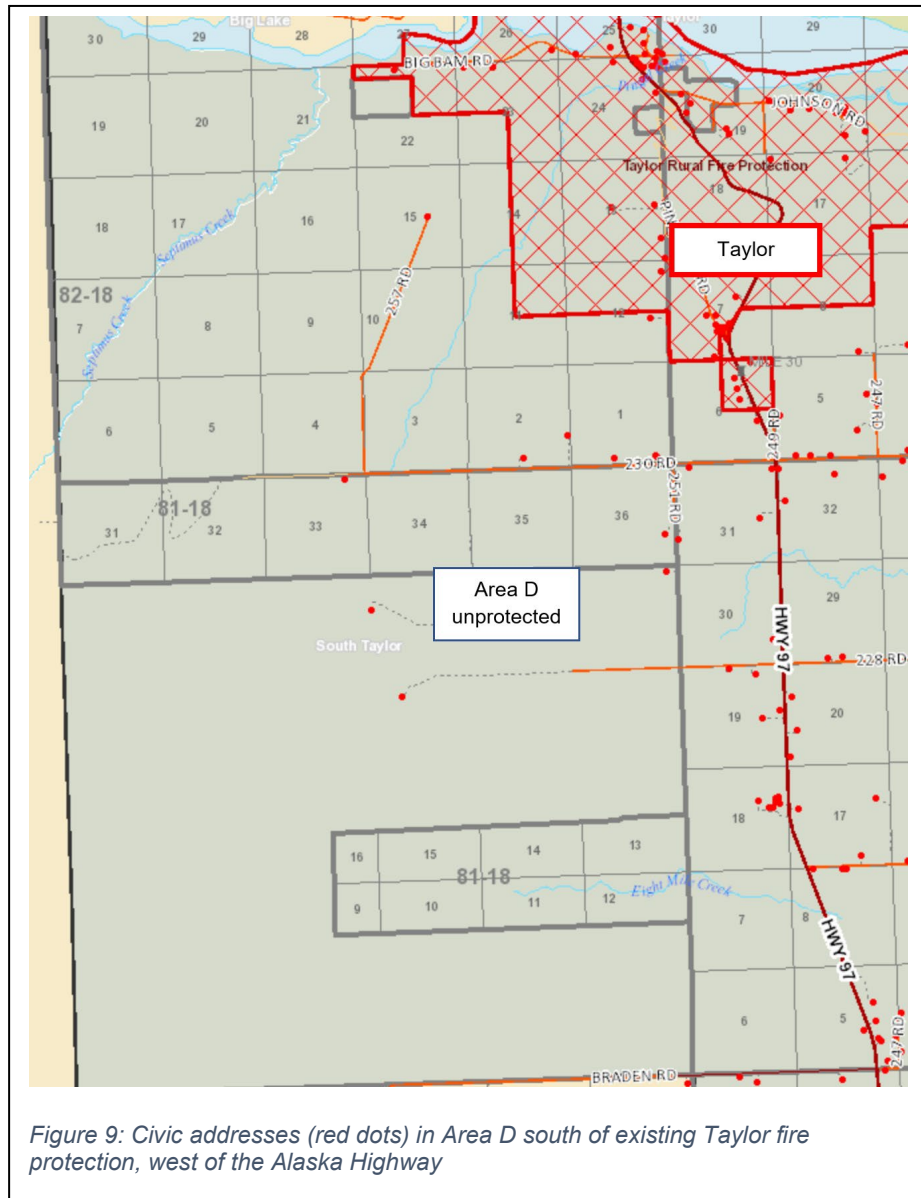
The coverage deficit in Area D, north of the Kiskatinaw River is shown in Figure 8. The current fire protection coverage from Taylor



is labelled; the remainder of Area D does not have fire protection.

## West of Highway 97

The portion of Area D west of Highway 97 and north of Braden Road is shown in Figure 9. The fire protection area from Taylor is labelled and the remainder, containing approximately 25 civic addresses, is unprotected.



East of Highway 97, north of the Kiskatinaw River

The portion of Area D that is north of the Kiskatinaw and east of Highway 97 is shown in Figure 10. This area is sparsely populated for the most part with approximately 150 civic addresses, the majority of which are clustered in the area around Lebell Road along the Old Alaska Highway, north of the river.

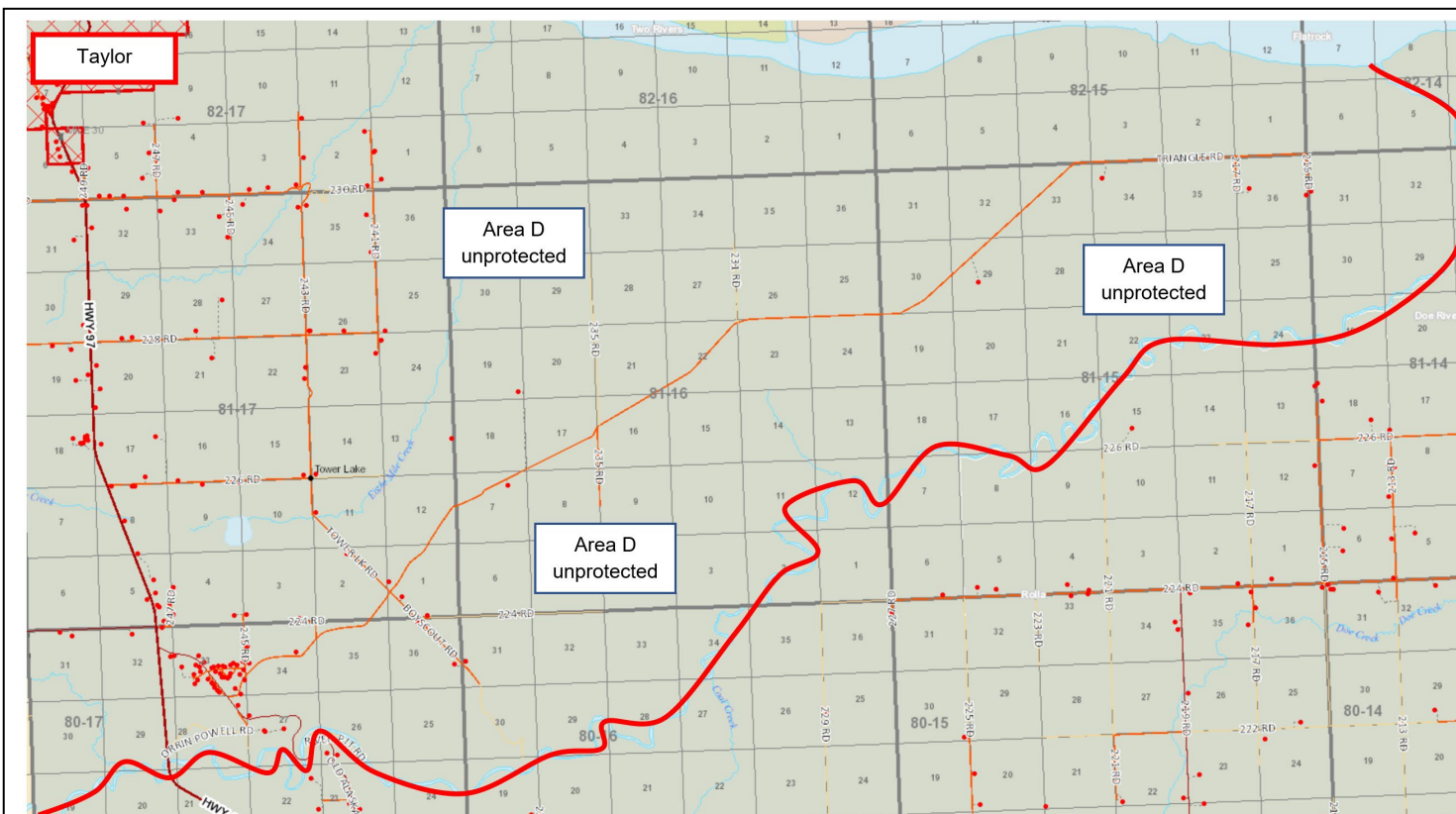


Figure 10: Civic addresses (red dots) in Area D south of existing Taylor fire protection, east of the Alaska Highway and north of the Kiskatinaw River

## Coverage Deficit and Remedy

Previous sections of this report have identified the portions of Area C and Area D south to the Kiskatinaw River which are not currently within a fire protection area. The following section will address the possible coverage in those areas and recommend one additional fire hall for each. The coverage will be discussed and reviewed in terms of one or more areas of risk as well as proposing a notional location for each new fire hall and identifying the resultant coverage in terms of the FUS criteria of five- and eight- kilometre limits. Some insurance underwriters, particularly those that specialize in rural risks will also consider the coverage up to 13 kilometres as being protected by a fire department.<sup>23</sup>

Establishment of additional fire halls will require their location to be as close as practical to the largest numbers of people who will provide the volunteer force. The location will also need to be adjacent to major transportation routes for that area.

### Area C

Fire protection for Area C can be improved by expanding the existing fire protection area for Charlie Lake as well as with the construction of an additional fire hall preferably in the Baldonnel area. Coverage from these two fire halls would continue to be supported by mutual aid from FSJ and Taylor, subject to renewal of the relevant the mutual aid agreements. In relation to those mutual aid agreements, consideration should be given to creating a single, area-wide agreement, which would reduce contract maintenance issues.

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<sup>23</sup> Note that it will be necessary to confirm with local insurers the degree to which a fire insurance credit is granted based on the distance between the protected property and a fire hall recognized by the FUS for insurance grading purposes.

The current areas of deficit in Area C were shown previously and are repeated in Figure 11.

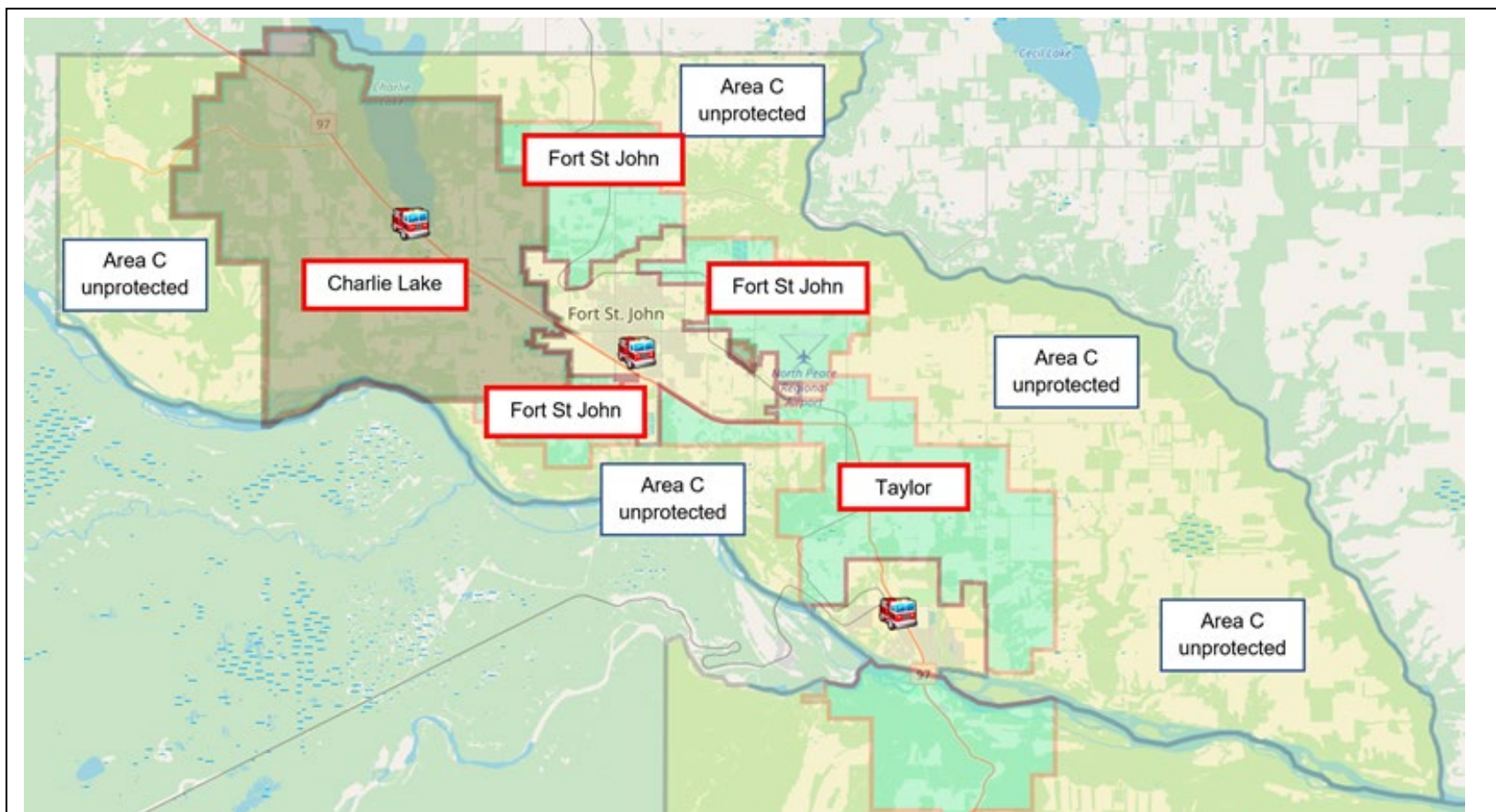


Figure 11: Area C showing areas outside of a fire protection area

The area west of the CLVFD is shown in Figure 12, and the portion currently within the CLVFD fire protection is labelled. The effect of increasing the fire protection district to the west and north limits of Area C at this point would provide additional coverage to one property that is within eight kilometres from the fire hall as shown in the bottom right. Most, but not all, of the remaining ~ 50 properties would be within 13 kilometres of the fire hall. As such, at least some insurers may treat them as protected and offer an insurance discount. Regardless, increasing the fire protection area to all of this portion of Area C will ensure that a response is provided, improving protection of life and property.

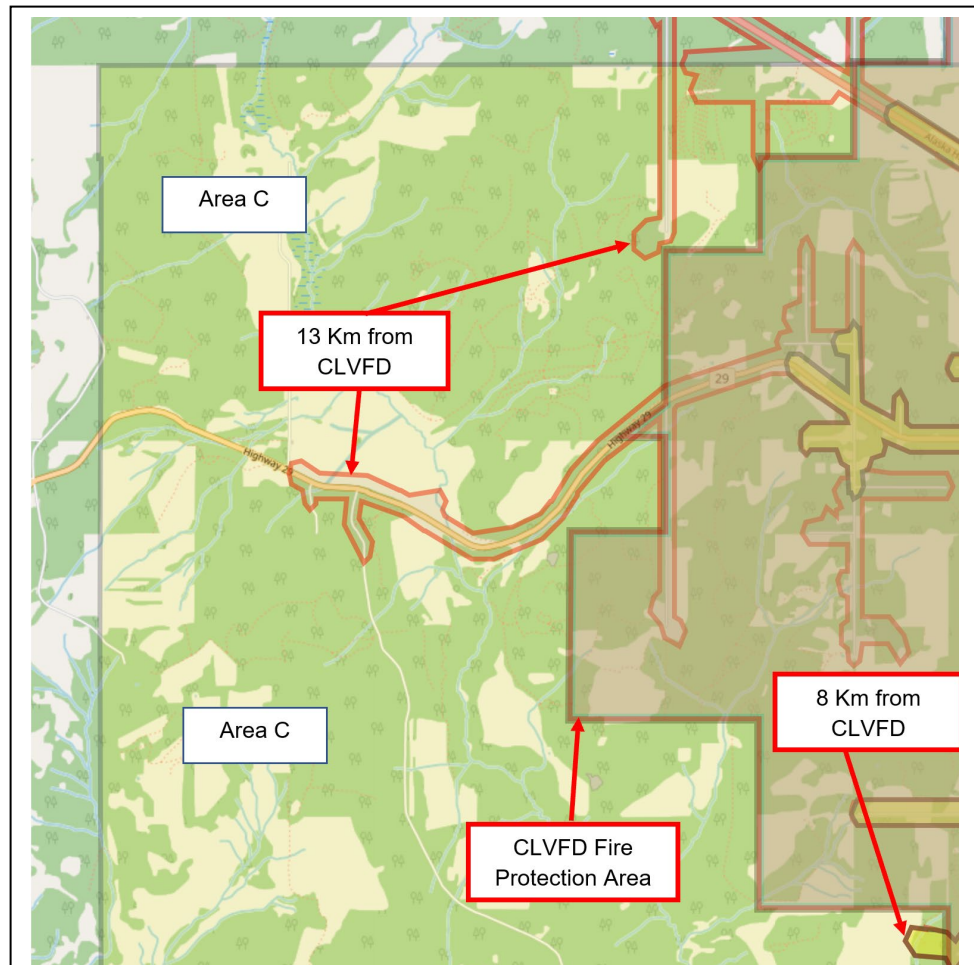
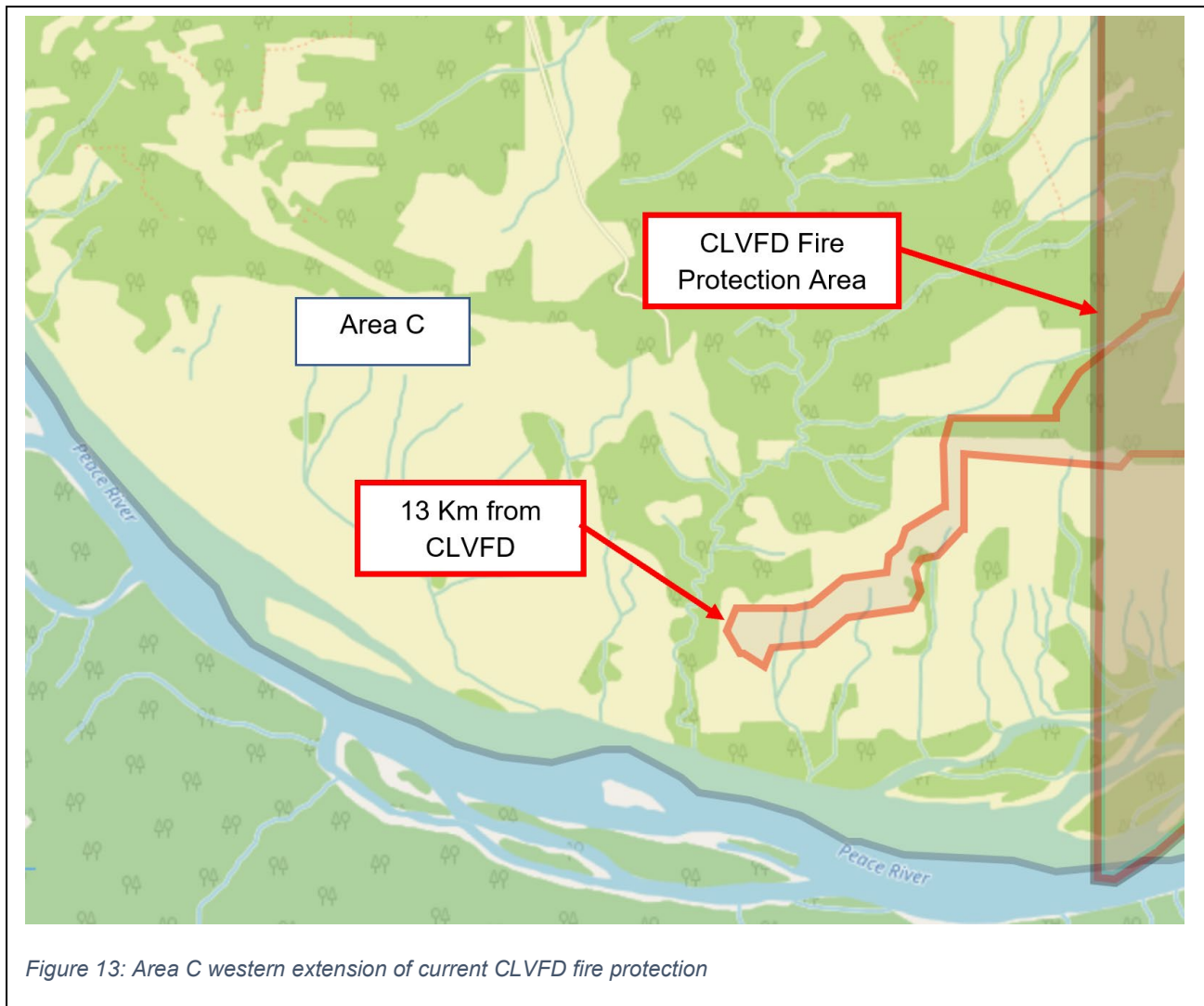


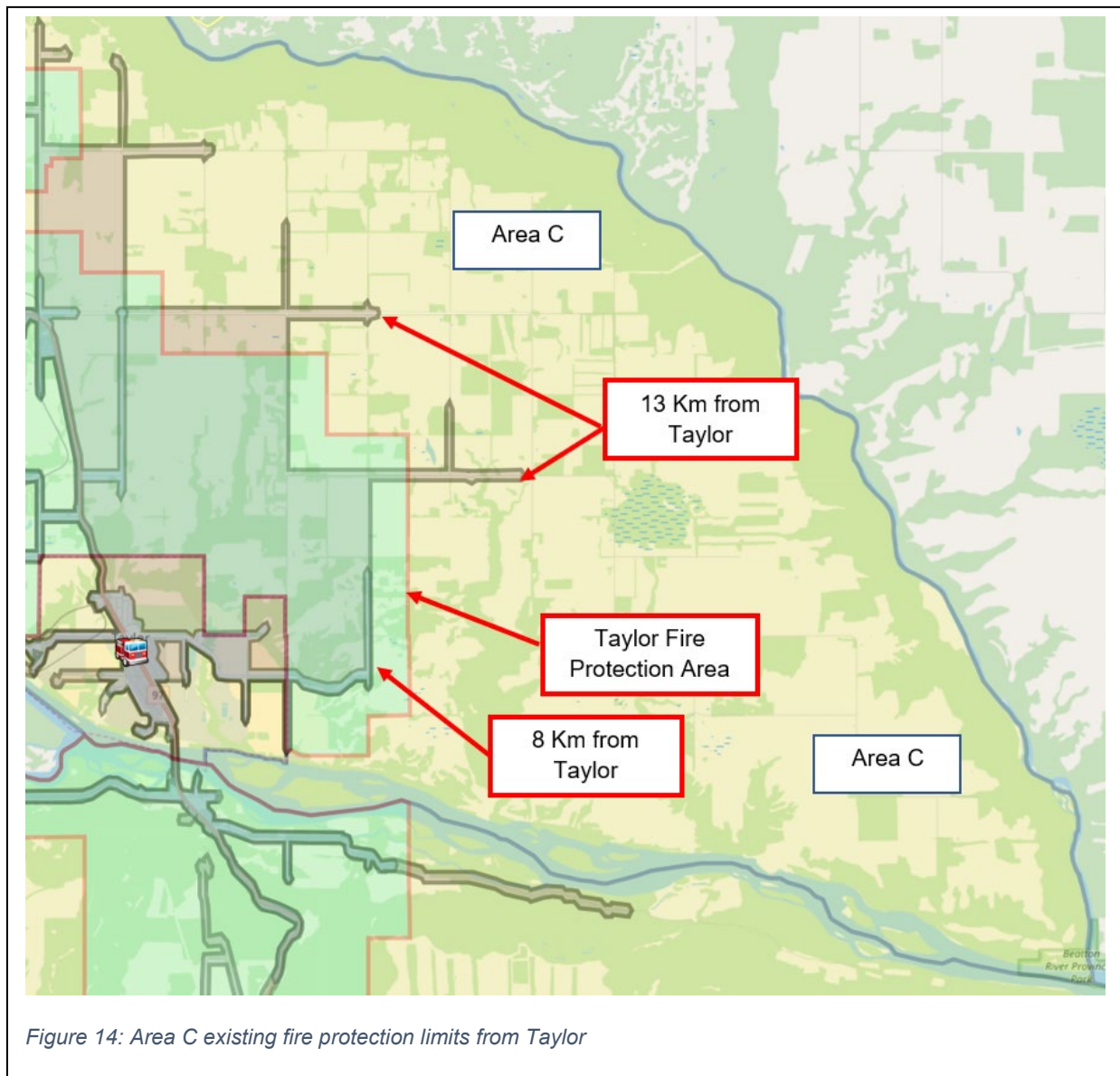
Figure 12: Area C western extension of current CLVFD fire protection

In the area immediately south of this region the coverage improvement is shown in Figure 13.



The limit of the CLVFD fire protection area is labelled, as is a new 13-kilometre limit based on the existing road network.

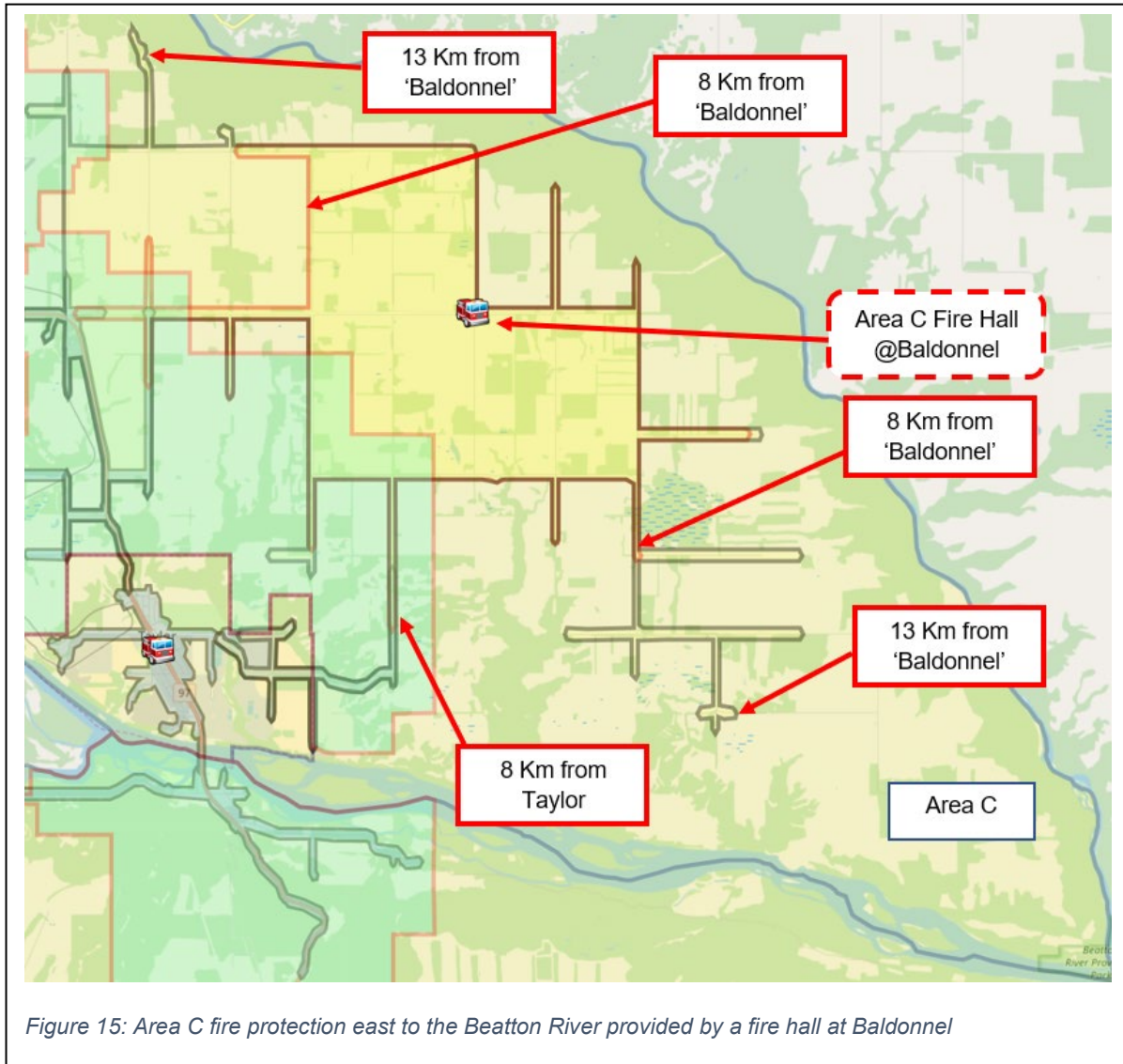
The area in the east portion of Area C west of the Beaton River is shown in Figure 14.



The existing limit of the fire protection area from Taylor is labelled (polygon with green in-fill). As well, the eight-kilometre and 13-kilometre polygons projected from Taylor are shown and from this it is clear that a significant portion of Area C at this point is well outside of a fire protection envelope.

### Area C Additional Fire Hall

Addressing the coverage deficit in Area C, east of the District would require an additional fire hall located in the Baldonnel area, at a location that is closest to the largest concentration of population from which volunteer firefighters could be recruited. For the purposes of assessing

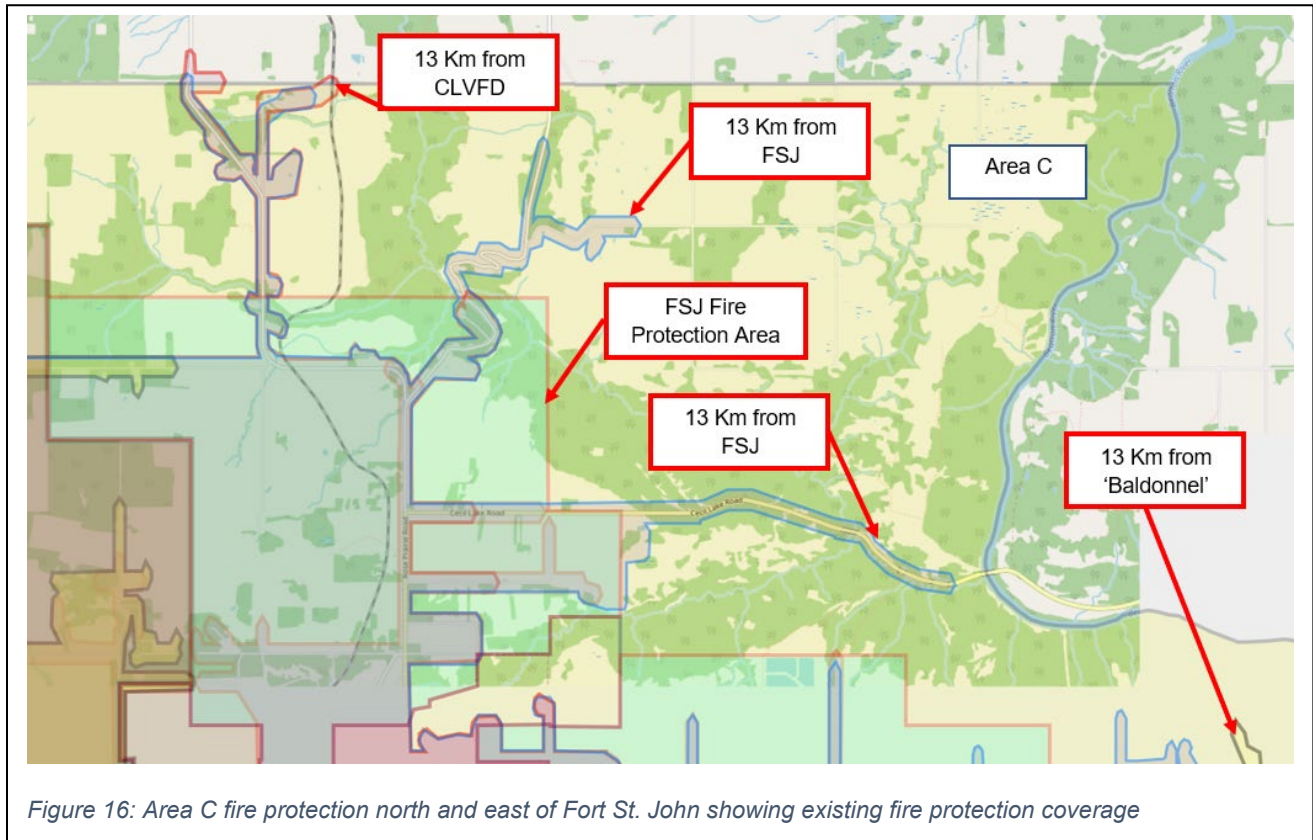


the coverage improvement, we have located a new fire hall at the intersection of Baldonnel Road and 245 Road and calculated eight-kilometre and 13-kilometre polygons.

The proposed coverage area is shown in Figure 15, in which the eight-kilometre coverage from the hall at Baldonnel extends to a number of properties not currently provided fire protection. These properties, if an FUS compliant fire hall can be established, could receive a fire insurance credit for residential properties. As well, the 13-kilometre polygon illustrates that coverage to that point would include much of the remaining area within the established road network.

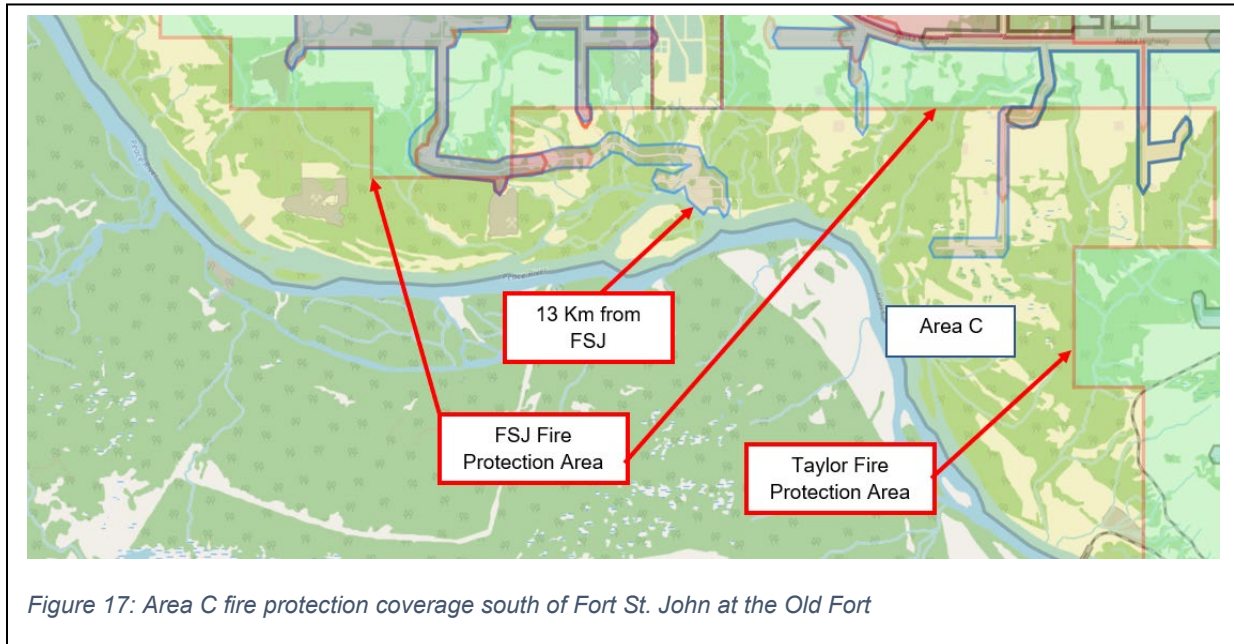
What is also obvious is that a fire hall at this location would provide coverage back into Taylor's area and could provide support to them which is not currently the case.

The portion of Area C north of the Fort St. John and outside of the existing fire protection area, is shown in Figure 16 and is complex. Some portion of this area would fall within 13 kilometres



of the CLVFD, others within 13 kilometres of FSJ and a small portion within 13 kilometres of the proposed Baldonnel fire hall. Given the scattered distribution of homes within this area, it is unlikely at this time that an additional fire hall could be successfully operated – both in terms of volunteer recruitment and overall cost. This area is likely to be best served by setting up a PRRD fire protection service area covered by a contracted fire services response involving the CLVFD, FSJ and the proposed fire hall in the Baldonnel area.

The final portion of Area C is that which is south of Fort St. John and north of the Peace and shown in Figure 17. This area is also complex in the sense of steep terrain, a limited road network and fewer residences. Similar to the portion of Area C north of the City, this area could not support an additional fire hall and should continue to receive coverage based on a



renegotiated service agreement supplemented by a mutual aid structure among CLVFD, FSJ and Taylor.

#### Area D

Fire protection for Area D can be improved with the construction of an additional fire hall, preferably in the Lebell Road area. Coverage from this fire hall would need to be supplemented by fire protection from Taylor subject to an agreement and renewal of the mutual aid agreement.

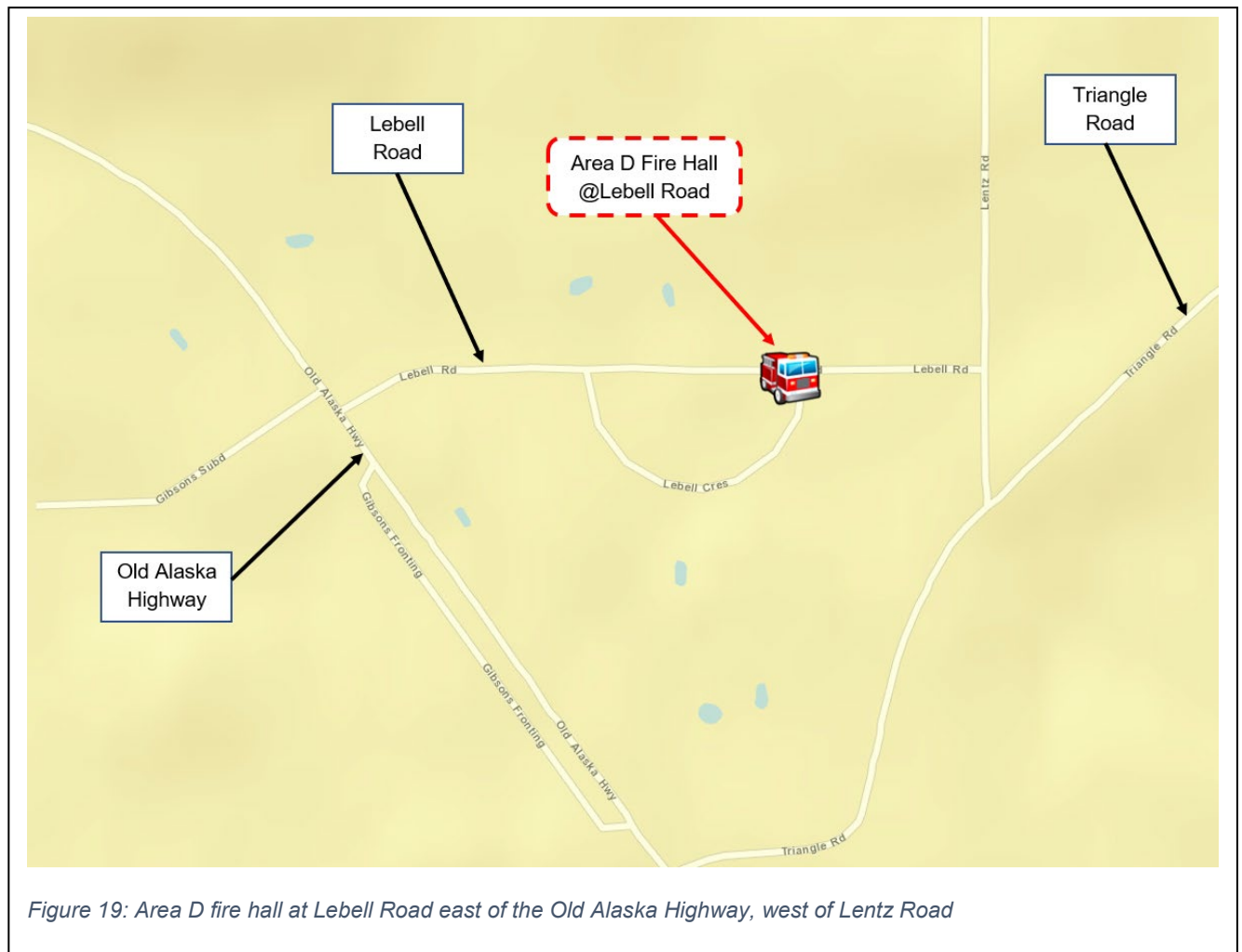
The current areas of deficit in Area D north of the Kiskatinaw River were shown previously and are repeated in Figure 18.



### Area D Additional Fire Hall

The location for a volunteer fire hall is driven for the most part by a requirement to be at or very near an area with enough population to provide at least 15 firefighters and officers, which is the minimum staffing required by FUS. In this portion of Area D, the area with the largest number of civic addresses is the Lebell Road area. A fire hall in this location would have good access to the Alaska Highway as well as Triangle Road, providing the best access to the service area.

The road network around this proposed location is shown in Figure 19 providing access to the north via the Alaska Highway and east primarily on Triangle Road.



The improvement for fire protection in Area D north of the Kiskatinaw and west from the Alaska Highway is shown in Figure 20. The existing fire protection area from Taylor is shown in the polygon with green in-fill.

As well the 13-kilometre polygon from Taylor is shown in the polygon with the dark grey outline.

The 13-kilometre polygon from 'Lebell' is shown by the polygon with the red outline and this provides for considerable coverage and provides a degree of overlap coverage from Taylor.

The 8-kilometre coverage from 'Lebell' is shown in the south portion of this area with the dark grey outline.

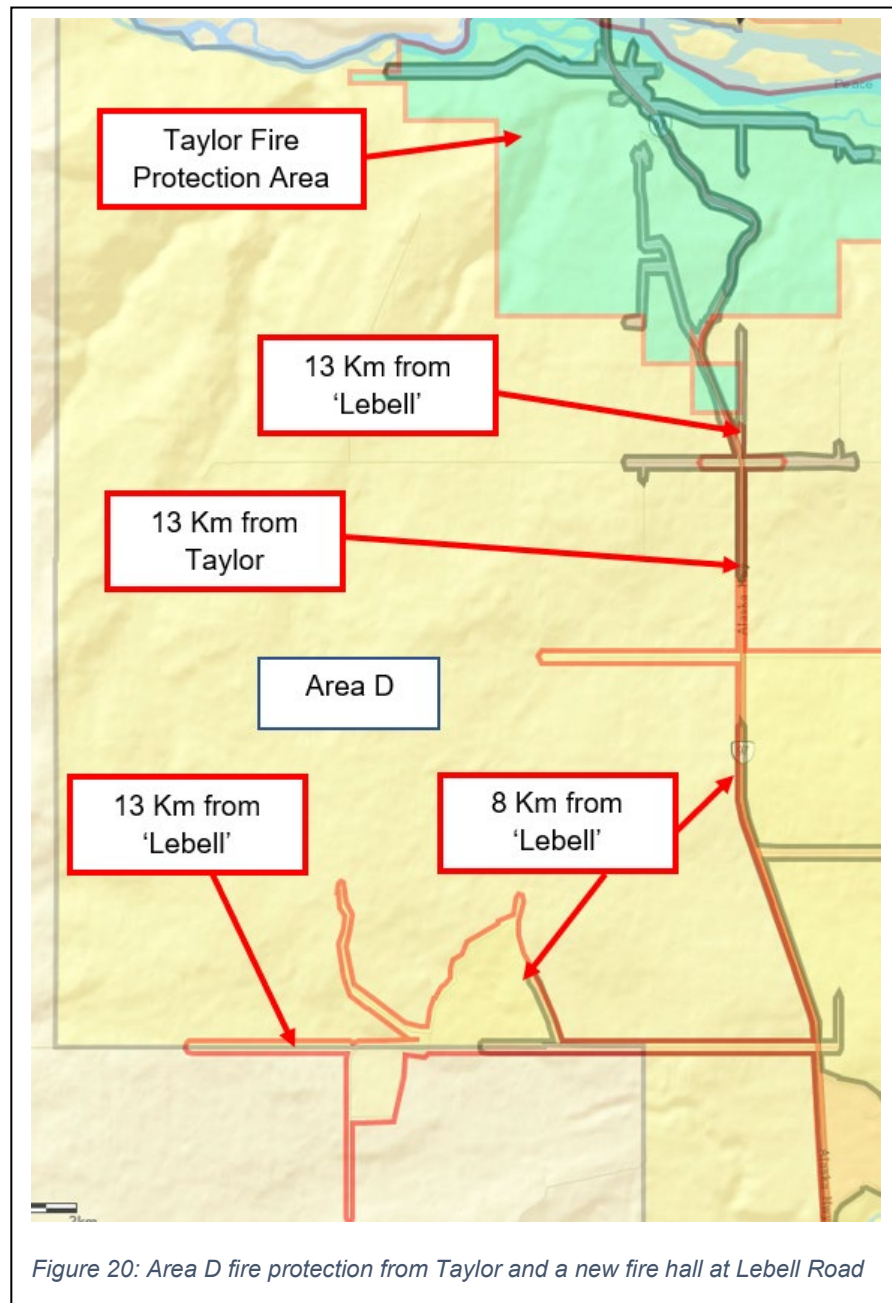
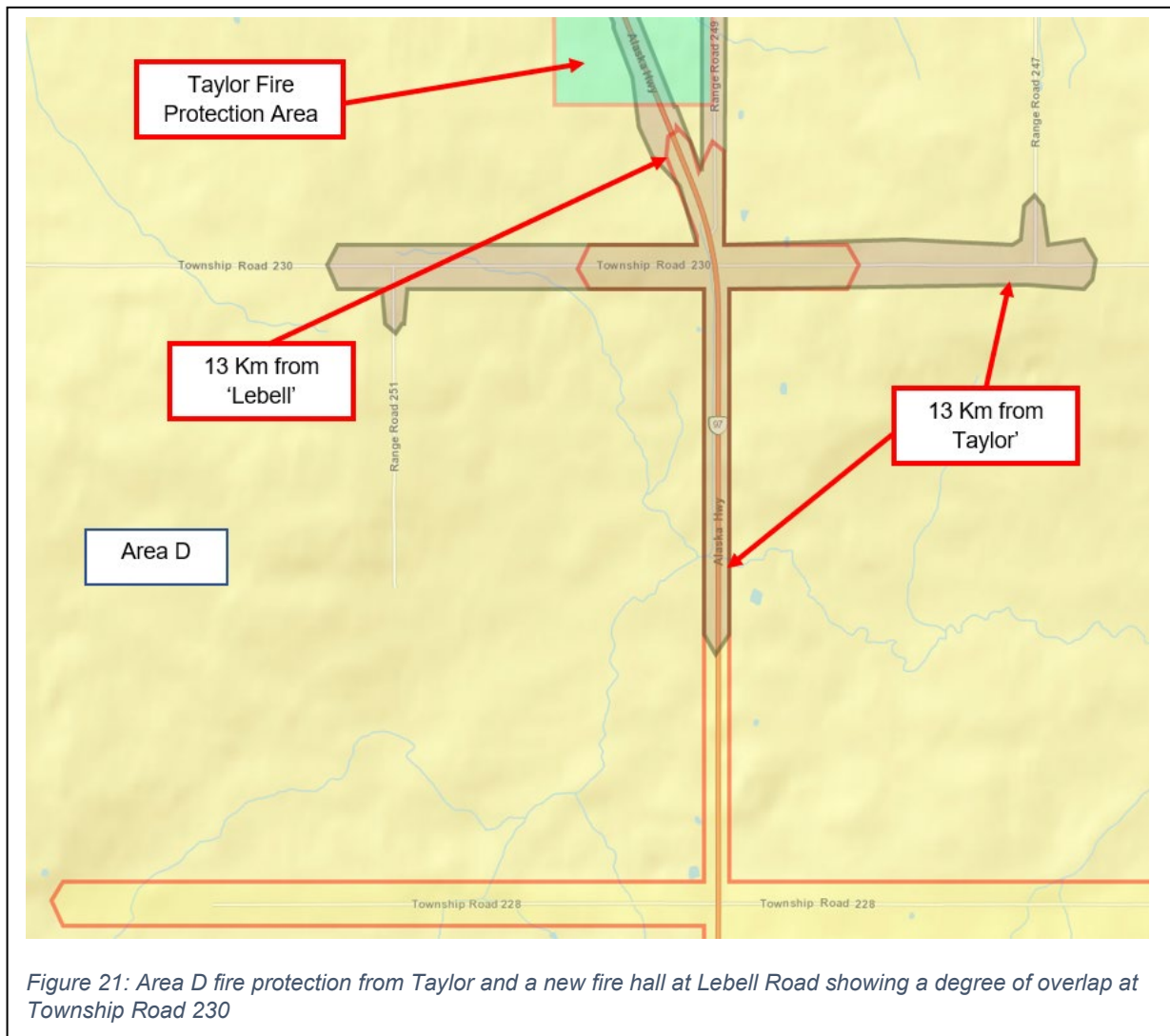


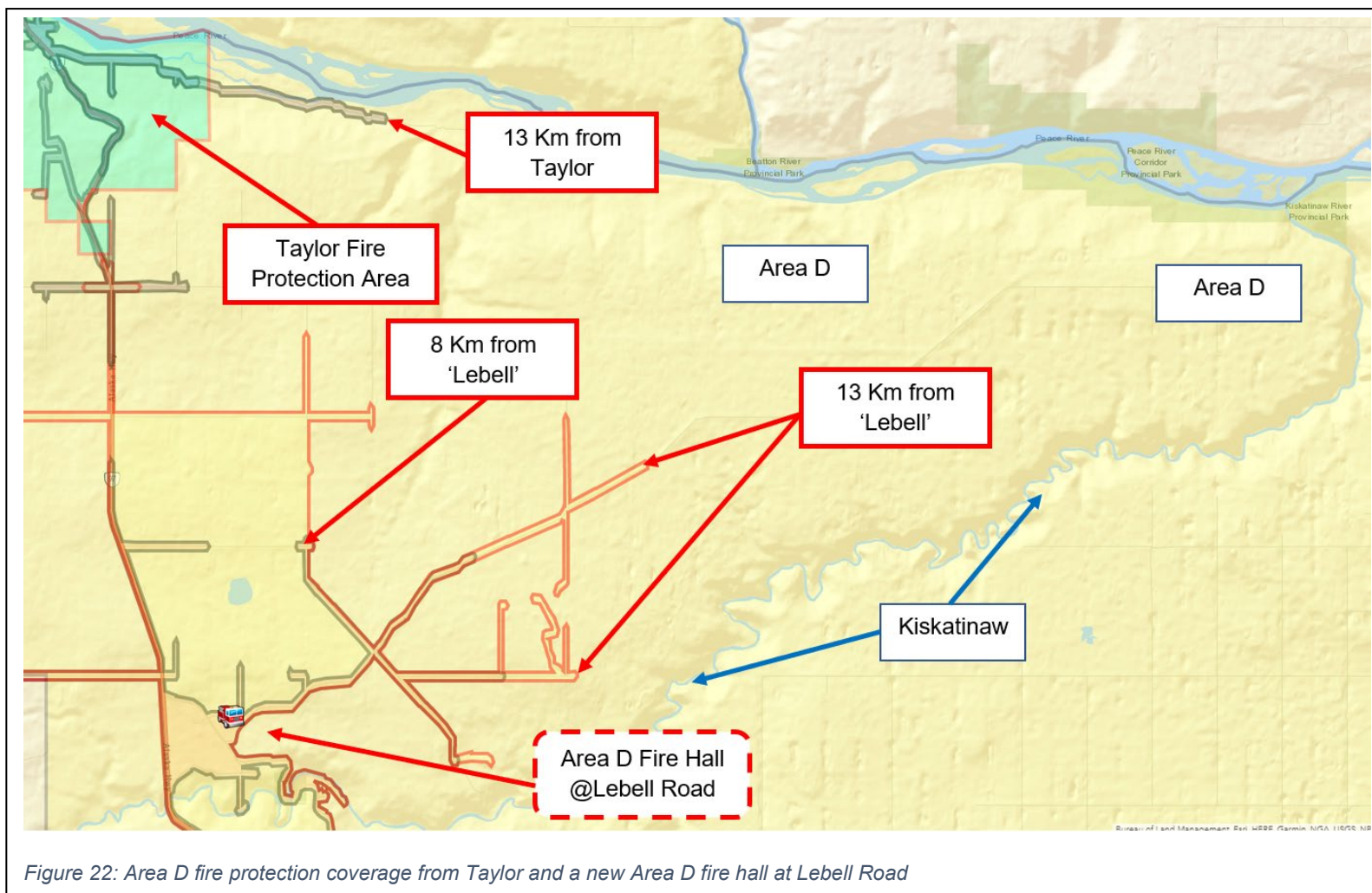
Figure 20: Area D fire protection from Taylor and a new fire hall at Lebell Road

The degree of overlap with the 13-kilometre coverage from Taylor is shown in Figure 21. This configuration would provide coverage to the area north of Township Road 230 from 'Lebell' with



coverage from Taylor extending south, nearly to Township Road 228.

In terms of the portion of Area D east of the Alaska, the coverage from a fire hall notionally located at Lebell Road is shown in Figure 22.



This map shows the extent of coverage east in terms of 13 kilometres (red outline) and 8 kilometres (grey outline).

The portion of the area that includes Tower Lake is shown in greater detail in Figure 23. This map shows that most of this area would be within 8 kilometres of the proposed 'Lebell' fire hall and that all of it between the Alaska Highway and Range Road 243 would be within 13 kilometres.

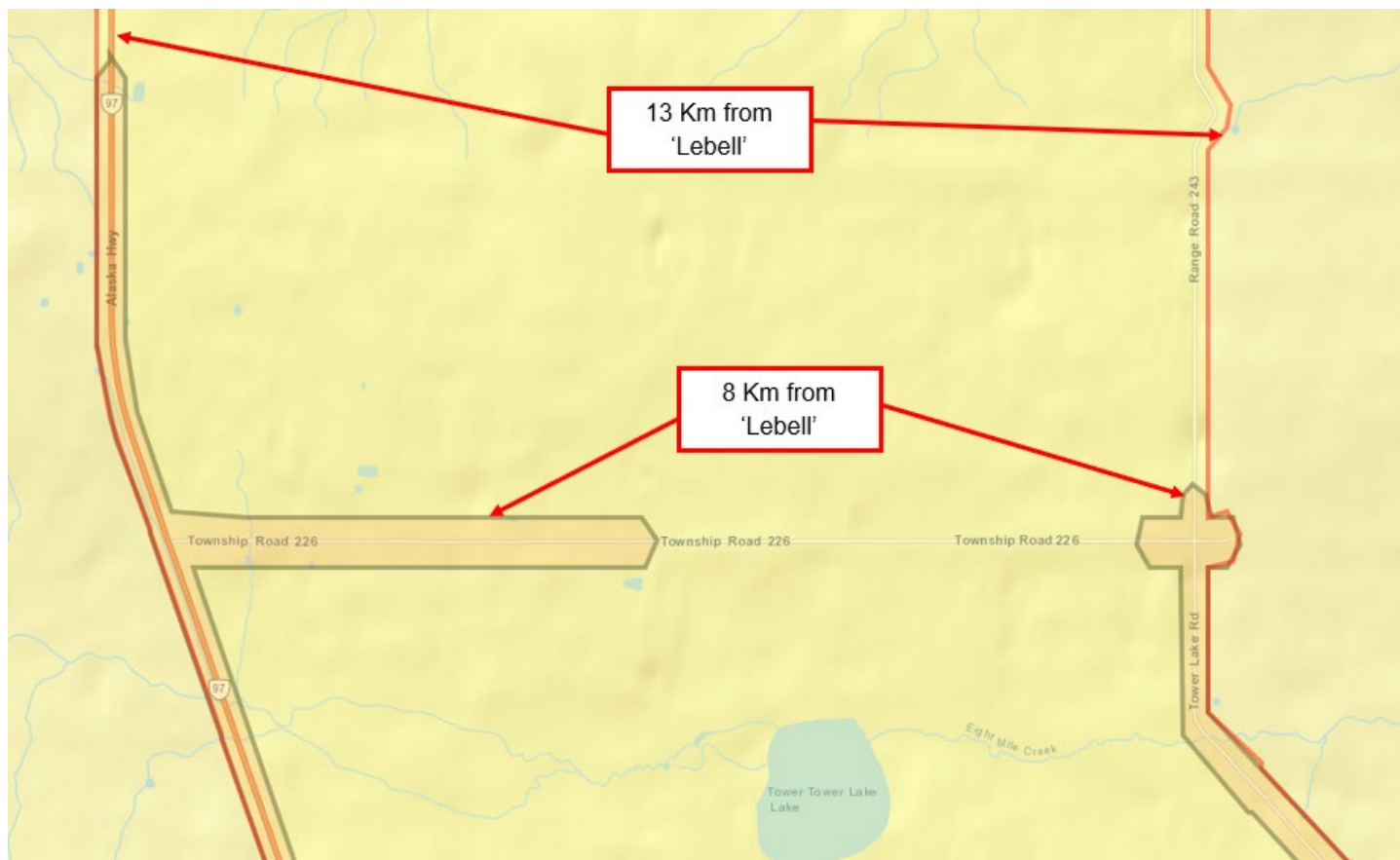
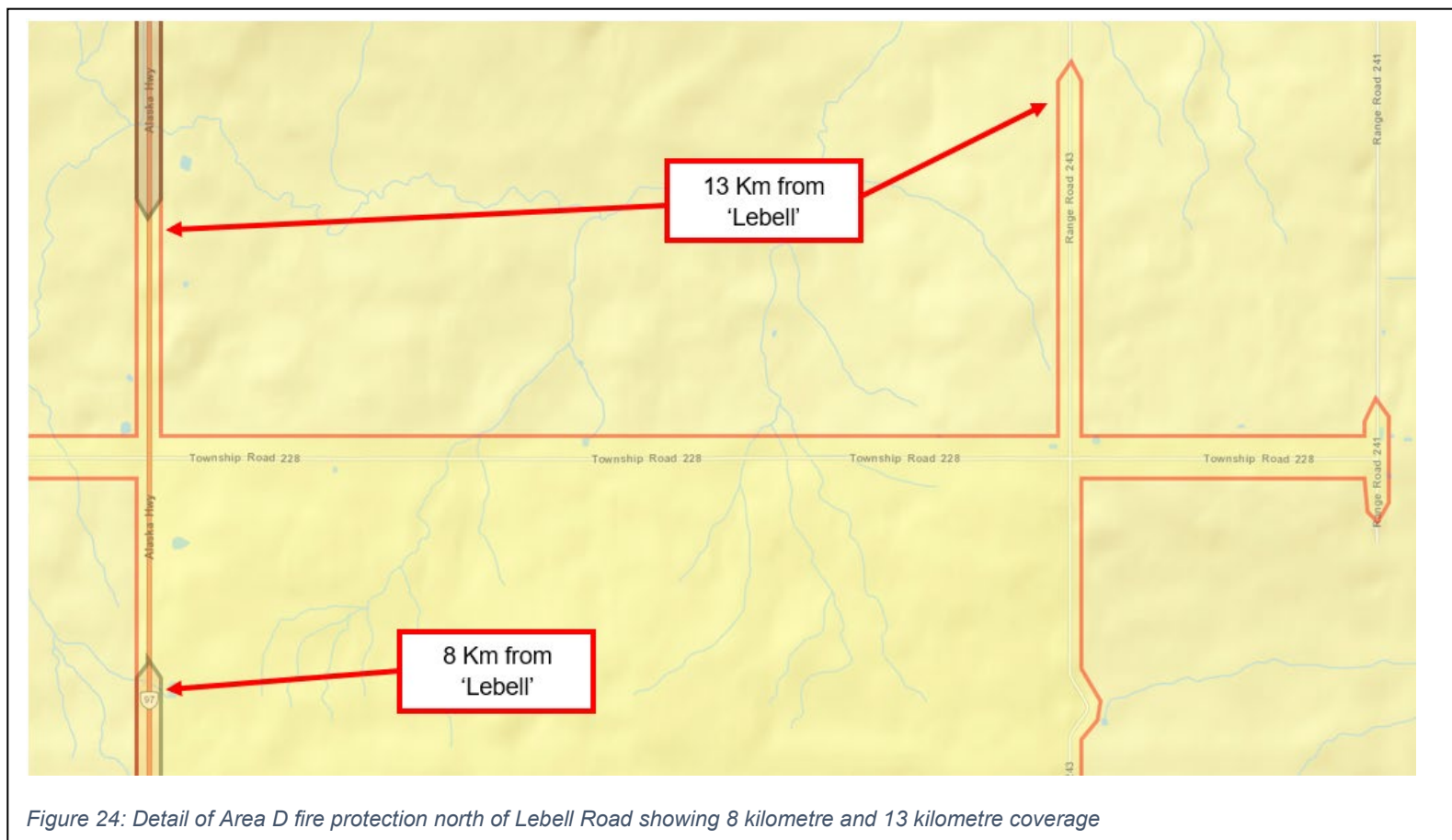


Figure 23: Detail of Area D fire protection the Tower Lake area from a fire hall at Lebell Road

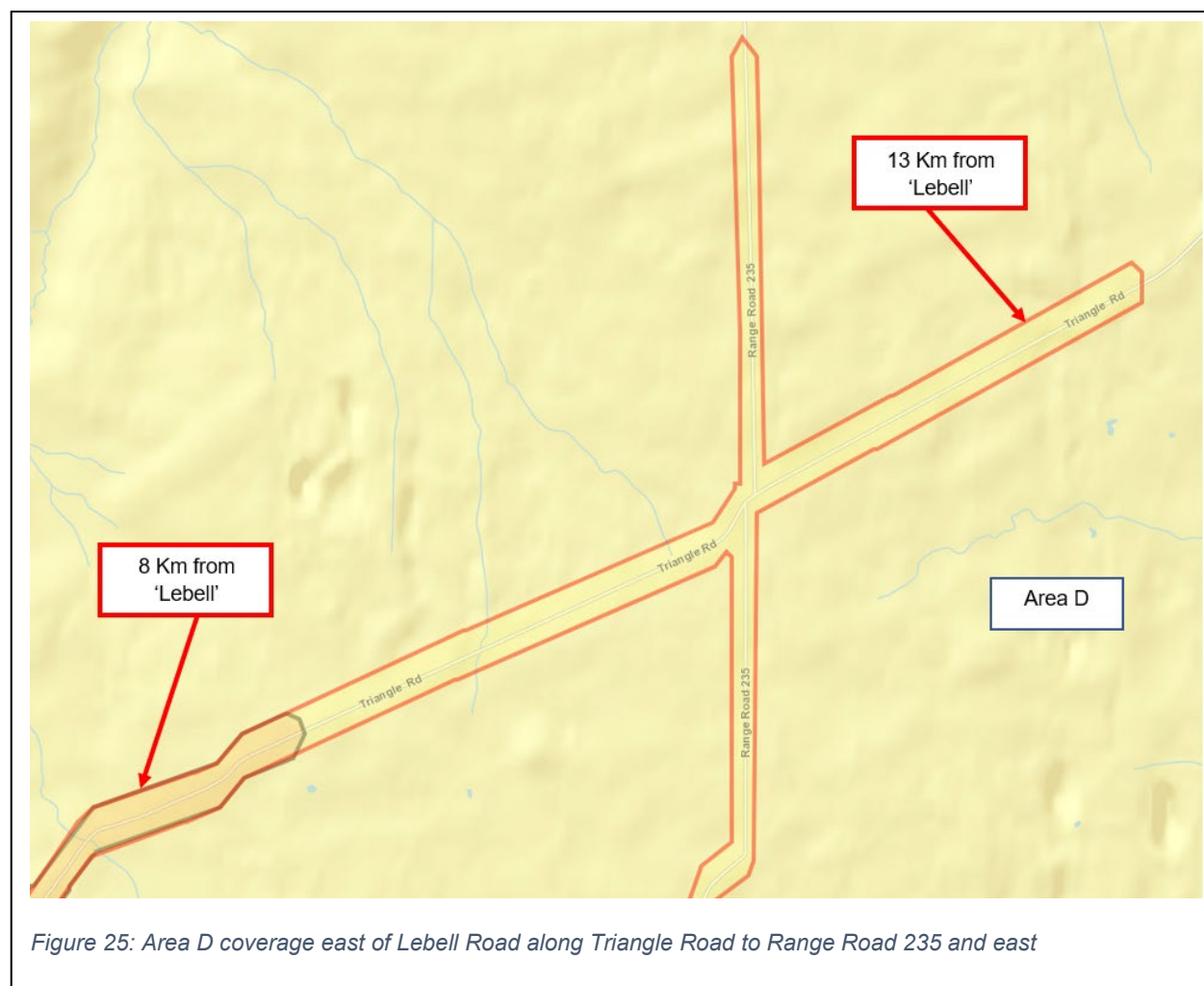
The portion immediately north of the proposed new hall is shown in Figure 24. It shows that 13-kilometre coverage would extend



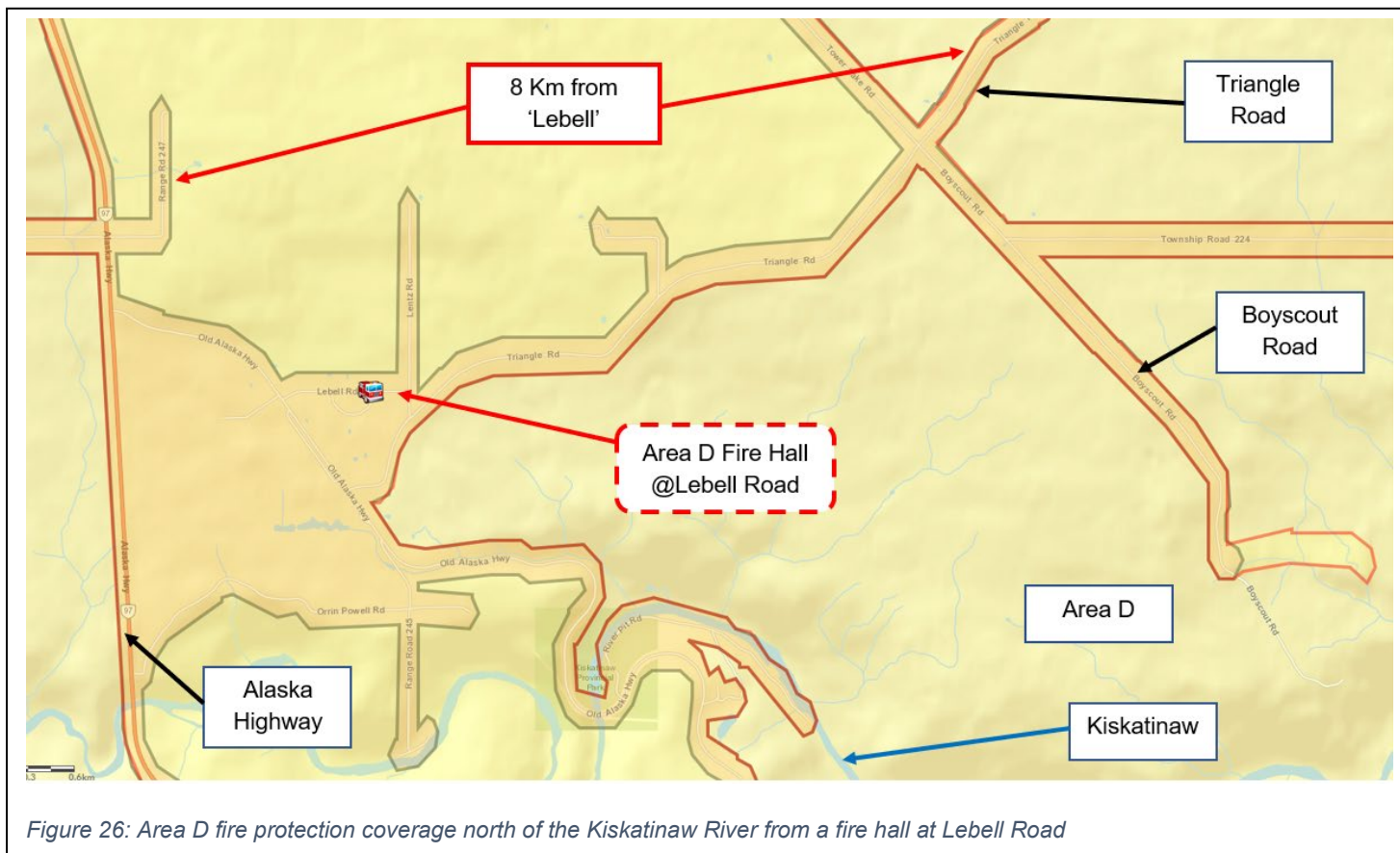
north to Township Road 228 and east of that to Range Road 241. In addition, 13-kilometre coverage continues west of the Alaska Highway on Township Road 228 and north as previously noted in Figure 21.

The portion east of Tower Road is shown in Figure 25. This map illustrates that the 13-kilometre coverage from a proposed fire hall at 'Lebell' would extend east along Triangle Road, east of Range Road 235.

The 8-kilometre coverage is also labelled and ends west of Range Road 235.



The coverage for the settled area around Lebell Road, the old Alaska Highway, Boyscout Road, Tower Lake Road and Triangle Road is shown in Figure 26. From this map it can be seen that all of this area is within 8 kilometres of a fire hall that may be located at Lebell. The only exception is the very eastern-most extension of Boyscout Road.



One additional feature of a fire hall located in the Lebell Road area is that it would also provide considerable coverage south of the Kiskatinaw River. This additional coverage is something of a bonus, and it results from locating the fire hall in the area that has the highest concentration of residents to draw from as volunteers.

The impact of this is illustrated in Figure 27.

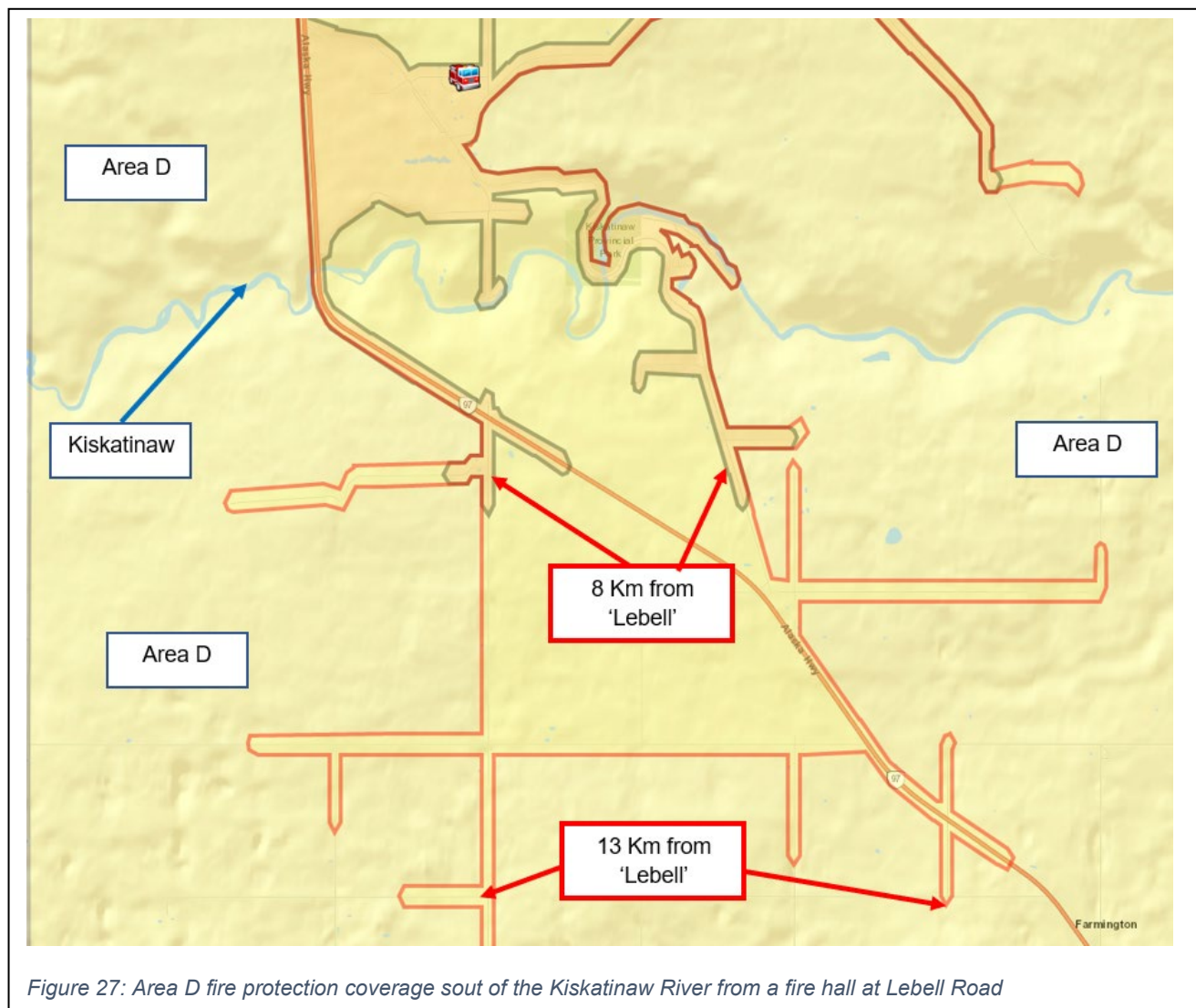
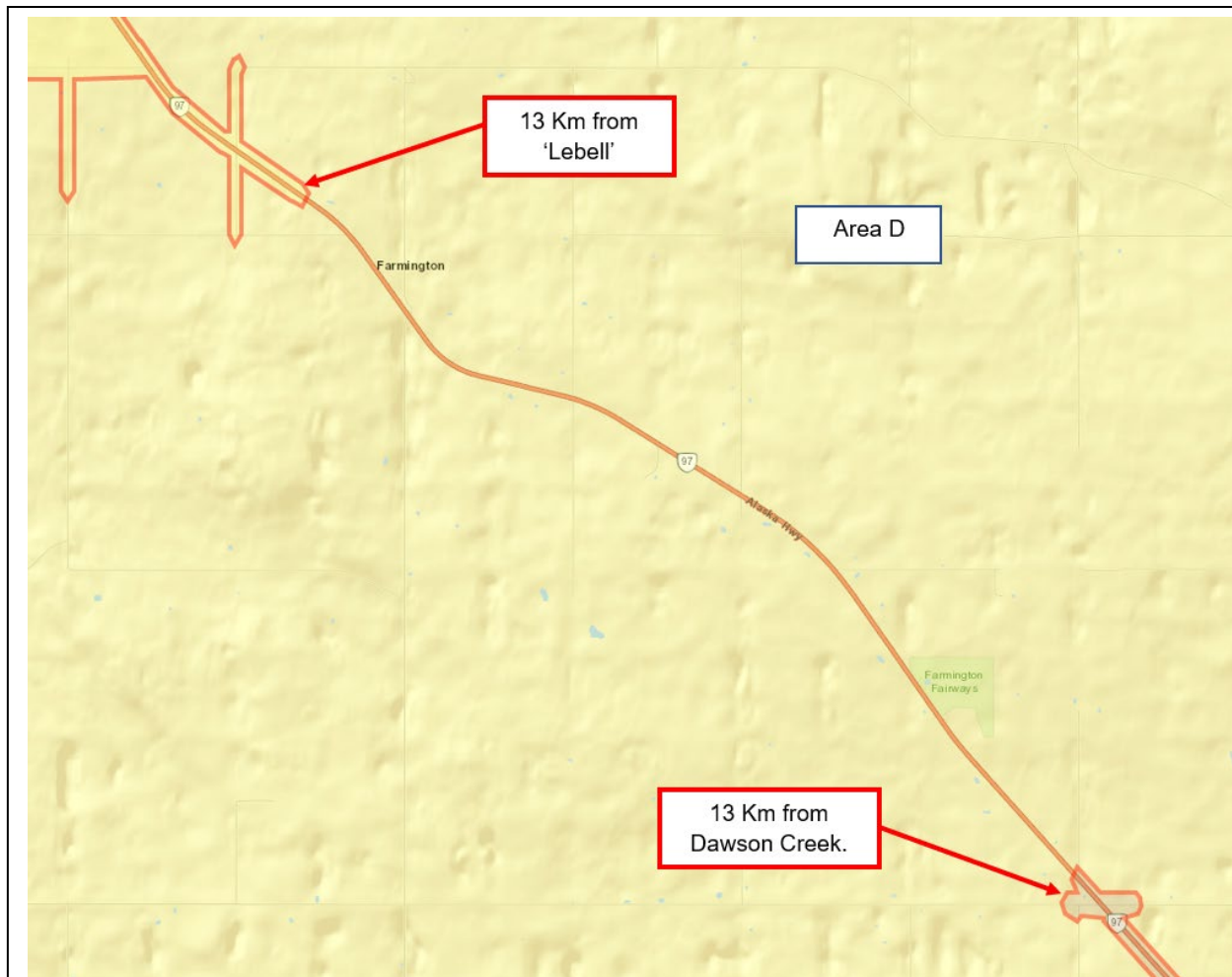


Figure 27: Area D fire protection coverage south of the Kiskatinaw River from a fire hall at Lebell Road

One additional benefit of the coverage south of the Kiskatinaw is the degree to which it can provide coverage almost to the northern limit of what could be available from Dawson Creek as shown in Figure 28. The Farmington area is outside of the 13-kilometre response from the



*Figure 28: Area D fire protection coverage at the south limit of a fire hall at Lebell Road*

Lebell fire hall, however it could still provide a level of intervention for Farmington where there is none at the present time.

## Fire Department Configuration Options

There are several options in terms of how the two additional fire halls could be configured from an administrative and governance perspective:

- either or both could be operated by the PRRD, as separate departments; or
- either or both could be operated as services provided under contract by Taylor and/or FSJ; or
- either or both could be integrated with the CLVFD and operated as a single department for administrative and operational purposes.

Regardless of which option is chosen a fire hall will be required for each of the two areas. For response purposes, each hall will need to be equipped with, at a minimum an engine and a tender, and the hall will require storage for personal protective equipment, air packs, air bottles, and washroom and shower facilities. In terms of fire hall requirements, the building must meet post-disaster standards in the BC Building Code, and WorkSafe requirements for matters such as air quality, and storage of SCBA and firefighters' personal protective equipment. As well, it is likely that a minimum of 15 firefighters (plus a chief officer, if separate departments) will need to be recruited, trained and equipped to meet FUS requirements (see discussion below).

### Separate Fire Departments

Operating either or both of the new fire halls as standalone fire departments would require an administrative structure for each, including a fire chief and deputy, separate records keeping, separate budgeting and both administrative and training space in addition to the items listed above. To meet FUS staffing requirements would require that each separate department have a minimum of 15 trained, regularly responding members, plus a chief officer. As compared to the other options considered below, separate fire departments will be most costly, would require additional recruitment and training, and require additional oversight to ensure that multi-department response are fully aligned for firefighter safety and efficiency.

### Contracted Model

The contracted model would see one or both of the new halls operated as extensions of either the Taylor (for the Lebell Hall) and/or the FSJ departments (for the Baldonnel Hall). This approach would, of course, be dependent on Taylor and FSJ being prepared to provide such services. This approach would mean that the administrative infrastructure of the two municipal departments would be responsible for developing and implementing the fire services. An advantage of this approach is that if each new fire hall is operated by an adjoining department (i.e., Taylor for Lebell and FSJ for Baldonnel), it is possible that FUS will accept fewer members responding out those new halls, if a response also is coming from the ordinary municipal halls.

We have seen situations where 10 to 12 responding members were considered adequate, if a response also was coming from another hall.<sup>24</sup>

The challenge in this approach would be developing a suitable, long term contractual arrangement, at an acceptable cost, that would meet the needs of the local service area. The contract would need to have a long minimum term, with automatic renewals, and limits on cost increases, to justify taking this approach. In addition, the PRRD would probably need a “long roll” termination clause (ideally, 24 to 36 months), to enable it to be able to develop an alternative approach if either of the municipalities were to terminate the service contract.<sup>25</sup>

In addition to contract maintenance, the PRRD would have to expect to assist in attracting volunteers and would be responsible for managing the fire hall construction. Apparatus procurement would need to be expressly addressed in any service contract.

We note that, as a general matter, the downside risk is that relations between the PRRD and some of its municipal members are not always fully aligned. If this route is taken, care would need to be taken in crafting the service agreement structure to minimize any potential disruption arising from any contention between the parties.

### Consolidated Model

Under the consolidated model, one or both of the new halls would be integrated into the CLVFD. This seems to us to be the preferred option: in essence, it would establish the two additional fire halls within the existing PRRD model, under the control and oversight of the fire chief in Charlie Lake. The consolidated model would enable the PRRD to ensure standardized training and emergency incident management, improve capital planning, create a significant tax base, and enable better control over occupational health and safety obligations. This approach would still require a close alignment with both the Taylor and FSJ departments, as the travel distances from the CLVFD main hall are significant. Moreover, given the CLVFD’s main hall location, it is likely that FUS would require at least 15 members (either plus or possibly including an officer) to be stationed in each hall.

It also would be possible, of course, to mix and match the approaches identified above. For example, operation of the Lebell Hall could be contracted out to Taylor, while the Baldonnel Hall could be integrated into the CLVFD. A more detailed review of these possibilities should probably be undertaken, particularly if the contracted model is considered a significant possibility.

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<sup>24</sup> If this approach is explored in greater detail, one of the tasks for PRRD staff will be to review with FUS what numbers they would accept out as responding out of each of the two halls, and still get a DPG rating.

<sup>25</sup> As ever, both parties could always agree to a shorter time frame, if appropriate.

## Service Area Legal Structure

The expansion of fire protection and related services into the unprotected portions of Areas C and D will require the establishment of local service areas in accordance with the requirements of the *Local Government Act*. These service areas, and the underlying service establishment bylaws, will need to be approved by the electors. There are two basic options worth considering:

1. Treat the new service areas as an expansion of the CLVFD's existing service area. If this approach is taken, serious consideration should be given to separating out the initial capital costs from on-going operational costs. The service areas are not contiguous, and the additional benefit that would be enjoyed by the residents of the existing CLVFD service would be limited. As such, the electors in the existing Charlie Lake fire service area should not be expected to subsidize the significant additional capital costs that would be required to start up these new halls. An additional disadvantage of this approach is that the electors of the existing CLVFD service area would have to be included in the referendum process. We would also note that this option should only be considered if the PRRD decides to proceed with the integration of the new halls into the CLVFD.
2. Establish both service areas as standalone entities. Services would then be provided under contract by the CLVFD to the new service areas. The capital and operating costs can then be better and more transparently managed.

Note that, when drafting the service establishment bylaws, we recommend that the description of the services be appropriately broad (and not just listed as "fire protection") given that modern fire departments typically provide a more comprehensive range of services than fire suppression and fire prevention. The establishment bylaws also should contemplate that mutual and automatic aid may be provided (so the assets from the service area may operate extra-jurisdictionally) and that the PRRD has the option as to how the service will be provided (directly, under contract with another PRRD department, or under a service arrangement with another party).

## Mutual Aid Issues

The PRRD has separate mutual aid agreements with the District and the City, respectively:

- (a) Agreement made as of 8 May 2017, between the City and the PRRD (the “FSJ Agreement”);
- (b) Agreement made as of 11 April 2017, between the District and the PRRD (the “Taylor Agreement”).

The content of the two agreements are substantively identical, except when noted below.

Each Agreement is for a five-year term from its execution date; neither of them automatically renews.

- Each Agreement specifically notes that a change in fire protection boundaries requires a written amendment, absent which “Emergency Resources” will not be provided to the newly added area. Unlike the Taylor Agreement, however, the FSJ Agreement only constrains the PRRD from changing the CLVFD’s service boundaries, and does not prevent the City from unilaterally changing the FSJ’s fire service area.<sup>26</sup> Each of the respective response areas are set out in maps attached as schedules to the two Agreements.
- In relation to the agreed response zones, however, the FSJ Agreement differs in one material respect: it specifically carves out and excludes the portion of the CLVFD’s fire protection zone that includes the Canfor sawmill.<sup>27</sup> This means that mutual aid assistance cannot be requested from FSJ by the CLVFD for an incident at the mill.
- Each of the Agreements specifies that “Primary Mutual Aid” constitutes a response by an Engine, a tender and/or a Wildland Unit. The FSJ Agreement stipulates that the response from FSJ will be from the duty crew; the Taylor Agreement states that it will be from each party’s “available personnel.” The Taylor Agreement also goes on to note that additional “personnel or apparatus” can be requested, but must be reimbursed at “British Columbia Inter-Agency Working Group Report Reimbursement Rates” (the “BC Rates”) for the current year.<sup>28</sup> It is not clear what “additional personnel” would be involved, since all available personnel already are offered up under the Taylor

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<sup>26</sup> Section 7(ii) in each of the FSJ Agreement and the Taylor Agreement. We would suggest that, in any amendment, the restriction on expansion of the service area in the FSJ Agreement should be made mutual.

<sup>27</sup> See the definition of the Charlie Lake Protection Area in section 1.

<sup>28</sup> These are the rates established by the Province in consultation with the Fire Chiefs Association of BC, in relation to reimbursement of provincial activations of structure fire fighting resources.

Agreement; however, it is clear that additional apparatus will be charged out at the BC Rates.

- Both Agreements specify the same process for activating mutual aid, and set out the same responsibilities in terms of emergency scene management. Both Agreements also note that a “Providing Party” has the same authority to operate in the “Requesting Party’s” jurisdiction as it enjoys in its home jurisdiction.<sup>29</sup>
- Both Agreements require the parties to use a common system of personnel accountability that permits ready identification of firefighters’ competencies and a uniform incident command system. They also require coordination with the dispatch provider to ensure mutual aid resources are properly activated.<sup>30</sup>
- Each Agreement contains identical indemnification/liability provisions and insurance requirements.<sup>31</sup> They also include identical reimbursement provisions in section 8, under which consumables (e.g., foam) used by a Providing Party valued in excess of \$1,500/year, can be billed to the Requesting Party. In addition, where a response to a commercial or industrial property exceeds the defined “Primary Mutual Aid” response, any additional assistance provided by a Providing Party can be billed out at the BC Rates.

These two Agreements contain all of the required provisions, and, as such, represent the “best of breed” in relation to mutual aid agreements.

For an expanded service model to be developed and maintained, each of these Agreements should be reviewed with the respective local governments and revised to address the additional areas to be served. It is likely that the provision of two additional fire halls and trained firefighters could provide an augmented fire service in the North Peace River area that would benefit the PRRD as well as Fort St. John and the District and we recommend further discussions to this end. We would also recommend that the three local governments consider constructing a single mutual aid agreement covering both existing and the two new proposed fire halls and related fire protection areas.

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<sup>29</sup> Activations are dealt with in section 2, “Requests For Mutual Aid” and are identical between the two Agreements. Section 4 of both Agreements deals with “Powers/Authority.”

<sup>30</sup> Sections 5 and 7.

<sup>31</sup> Section 6: in both cases, a “Providing Party” is responsible for its own negligence.

## Summary and Recommendations

Provision of fire service for the portions of Area C and Area D south to the Kiskatinaw River not currently within a fire protection service area will require a minimum of two additional fire halls with trained and equipped crews. These fire halls would be located in the areas currently unprotected, notionally in Baldonnel for Area C and at or near Lebell Road for Area D. The final location is to be determined but it should be close to transportation routes for the quickest possible response and adjacent to a population sufficient to provide a minimum of 15 firefighters. In terms of the priority order, Area C currently has the larger population not currently within a fire protection area and it could be the first priority with a fire hall located in the Baldonnel area, with a fire hall for Area D in the Lebell Road area, the second priority. The Lebell Road fire hall would also provide significant coverage south of the Kiskatinaw River, almost to the Farmington area.

There are three options for how this could be established including:

1. the creation of two new standalone fire departments,
2. contracting the provision of service in these areas to FSJ and Taylor, or
3. the addition of two new fire halls to be operated as a single authority by the PRRD as part of the CLVFD.

It is the recommendation of this report that option 3 is preferred as it would provide the most consistent level of service for this portion of the PRRD not serviced by FSJ or Taylor. Development of this three-hall model could also complement the service provided by FSJ and Taylor and would allow for a greater degree of equity and cooperation between the PRRD and the two cities; some further discussion with the District and Fort St. John is recommended. This type of cooperative model would potentially see a sub-regional form of fire service operating from five fire halls with upwards of 75 trained personnel able to respond. The provision of additional Tenders should also enhance the ability to provide STSS over a wider area enhancing fire suppression.

## Appendix 1: Superior Tanker Shuttle Service Accreditation

The following is from the FUS and describes alternate water supplies including Superior Tanker Shuttle.

### *Fire Underwriters Survey: Superior Tanker Shuttle*

#### *Alternative Water Supplies for Public Fire Protection<sup>32</sup>*

*Alternative water supplies include water supplies other than those that are defined as pressurized, municipal-type water supply systems. Generally speaking fire fighting operations are dependent on water and/or other extinguishing agents to succeed. In developed areas, water supplies are provided through a network of distribution pipes, storage and pumping facilities.*

*In areas without municipal-type water supplies, fire fighting presents a significantly greater challenge. Historically various methods have been utilized to deliver water from some source location to the fireground. The bucket line is an example of one of the historical methods of delivering water to a fire. Generally speaking these types of water supply delivery methods were not effective with respect to reducing property damage.*

*Since the advent of automotive fire apparatus and road infrastructure, the capacity to move water from a source location to the fire ground has improved dramatically. The fundamental steps in a shuttle operation are as follows:*

- set up pumper apparatus at fire event and deliver water from temporary storage facility (ex. portable tank) through fire pump to fire;*
- draft water (from a location where water supplies are known to be reliable and accessible) into a mobile water supply apparatus*
- move water from source location to fire event using mobile water supply apparatus*
- dump water into temporary storage facility (ex. portable tank) at fire event location*
- repeat shuttle cycle.*

### **Levels of Service**

#### **Unrecognized Shuttle Service**

*If the level of shuttle service provided by a community does not meet the minimum benchmarks set out in NFPA 1142, then the level of service will not be recognized for fire insurance grading purposes.*

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<sup>32</sup> [http://www.fireunderwriters.ca/superiortankershuttle\\_e.asp](http://www.fireunderwriters.ca/superiortankershuttle_e.asp), accessed 23 August 2017.

### **Standard Tanker Shuttle Service**

*To be recognized, for Standard Tanker Shuttle Service, the fire department must have adequate equipment, training and continuous access to approved alternative water supplies to deliver standard tanker shuttle service in accordance with NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting. A formal plan for use of alternative water supplies must be in place and available for review detailing the alternative water supply sources and characteristics. To be credited, fire department access to alternative water supplies must be 24 hours per day and 365 days per year. Refill capacity from alternative water supplies using drafting techniques requires a pump that has a minimum capacity of 450 LPM (100 Igpm) at 275-415 kPa (40-60 psi).*

### **Accredited Superior Tanker Shuttle Service**

*Accredited Superior Tanker Shuttle Service is a recognized equivalency to hydrant protection. To be accredited, fire departments must commit to maintaining a high standard of organization, and practice delivering the service regularly. The fire department must be able to show through testing and documentation that it can continuously provide water supplies in excess of the minimum required for hydranted municipal-type water supplies.*

*To be recognized for Accredited Superior Tanker Shuttle Service, the system of delivery of water supplies must be well-designed and well-documented. The system of delivery must meet all of the requirements specified for Standard Tanker Shuttle Service and must exceed the requirements in several key areas:*

- *The fire department must be able to prove through testing that the specified requirements of Superior Tanker Shuttle Service can be met.*
- *For personal lines insurance, the fire department must be able to deliver a flow rate of not less than 950 LPM (200 IGPM) within 5 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).*
- *For commercial lines insurance, the fire department must be able to deliver a flow rate of not less than 1900 LPM (400 IGPM) within 5 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).*
- *The fire department must be able to deliver the flow rate which will be accredited within 10 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).*
- *The volume of water available for fire fighting must be adequate to sustain the accredited flow rate for a duration in accordance with the Fire Underwriters Survey Water Supplies for Public Fire Protection*

*Further Notes*

- *To be recognized for fire insurance grading purposes, the protected property must be located within:*
  - *Commercial Lines (PFPC) - 5 km of a fire station AND 2.5 km of an approved water supply point*
  - *Personal Lines (DPG) - 8 km of a fire station AND 5 km of an approved water supply point*
- *To be recognized for fire insurance grading purposes, the water-delivery system must be available AND accessible 24 hours per day and 365 days per year;*
- *To be recognized for fire insurance grading purposes, the water capacity of alternative water supply sources must be documented for a 50-year drought cycle and documentation must be available for review. Alternative evidence of reliability of supply will be considered on a case by case basis.*
- *Fire Underwriters Survey treats dry hydrants with suction points in the same way as it treats standard (pressurized) fire hydrants. Any property within 300 metres of a dry hydrant may be eligible for a Dwelling Protection Grade better than 3B, provided the building is within eight kilometres by road of a responding fire station, the fire department is recognized as meeting the criteria for a Dwelling Protection Grade of 3A or better and the fire department has adequate apparatus to effectively utilize the dry hydrant through suction. Testing of the fire department's capacity to utilize the dry hydrant and documentation of the dry hydrant design and maintenance may also be required.*
- *Fire Underwriters Survey may extend credit beyond 300 metres of a fire hydrant when the responding fire company uses large-diameter hose, if the fire department can demonstrate a standard procedure for deployment of hose and also establish a relay operation as needed.*

*Historical Note: Fire Underwriters Survey has completed Superior Tanker Shuttle Service Testing since 1989 when the first such test was completed in Ontario. Past systems for testing were somewhat less formal. [See article: 1988 First Accreditation in Canada](#)*

#### **Noted changes to Accredited Superior Tanker Shuttle Service**

1. *Defined coverage areas*
2. *Formalized requirements for Approved Water Supply Points*
3. *Publication of accredited flow rates to the Canadian Fire Insurance Grading Index*
4. *5 year limit on accreditation period*
5. *Formalized requirements for documentation*

## 6. Formalized integration of NFPA 1142

*For communities that are currently accredited to deliver Superior Tanker Shuttle Service, a phase in period of 2 years will be used to allow communities time to prepare for the re-accreditation process.*

*Note: the full Superior Tanker Shuttle Accreditation document can be downloaded here:*

*[Superior Tanker Shuttle Service Accreditation Protocol](#)*

*The new protocol is in draft and comments/feedback are welcomed:*

*[feedback@fireunderwriters.ca](mailto:feedback@fireunderwriters.ca)*

### **Why become Accredited to deliver Superior Tanker Shuttle Service?**

*Property owners in communities with accredited Superior Tanker Shuttle Service are eligible for improved property insurance rates similar to those in communities with municipal-type water supply systems.*

*Fire Underwriters Survey does not set property insurance rates, however the organization is responsible for publishing the Canadian Fire Insurance Grading Index which is used by insurers across Canada to base insurance rates upon.*

*Fire Underwriters Survey is recognized by the Insurance Bureau of Canada as being the only organization authorised to publish fire insurance grades in Canada.*

### **Outside Agencies Testing Tanker Shuttle Service?**

*Communities that have been tested by agencies other than Fire Underwriters Survey may still be eligible to receive Fire Underwriters Survey accreditation. Documentation of test procedures followed and test results must be submitted to the offices of Fire Underwriters Survey in accordance with the Superior Tanker Shuttle Service Protocol document. Applicants that successfully meet the specified criteria will be accredited and receive certification through the Fire Underwriters Survey' Registry of Accredited Superior Tanker Shuttle Services. The Registry is promulgated to the Fire Insurance Grading Index to ensure that the community's fire insurance grades reflect the accreditation.*

## Appendix 2: Playbook Training Requirements

### Structure Firefighters Competency and Training

#### PLAYBOOK

Second Edition: May 2015

#### References to NFPA Standards for:

- Train the Trainer
- Exterior Operations Firefighter
- Interior Operations Firefighter
- Full Service Operations Firefighter
- Team Leader Exterior and Interior
- Risk Management Officer
- Company Fire Officer

#### Standards Referenced:

NFPA 220	Standard on Types of Building Construction
NFPA 921	Guide for Fire and Explosion Investigations
NFPA 1001	Standard for Fire Fighter Professional Qualifications
NFPA 1021	Standard for Fire Officer Professional Qualifications
NFPA 1041	Standard for Fire Service Instructor Professional Qualifications
NFPA 1407	Standard for Training Fire Service Rapid Intervention Crews
NFPA 1500	Standard on Occupational Safety and Health Program
NFPA 1584	Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises
NFPA 5000	Building Construction and Safety Code

Train the Trainer	Competency Met
NFPA 1041  4.2.1 – 4.2.4 / 4.3.2 – 4.3.3 / 4.4.1 – 4.4.4 / 4.5.1 – 4.5.3 and 4.5.5	
<b>4.2.1 Definition of Duty.</b> The management of basic resources and the records and reports essential to the instructional process.	
<b>4.2.2</b> Assemble course materials, given a specific topic, so that the lesson plan and all materials, resources, and equipment needed to deliver the lesson are obtained.  <b>(A) Requisite Knowledge.</b> Components of a lesson plan, policies and procedures for the procurement of materials and equipment, and resource availability.  <b>(B) Requisite Skills.</b> None required.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.2.3</b> Prepare requests for resources, given training goals and current resources, so that the resources required to meet training goals are identified and documented.  <b>(A) Requisite Knowledge.</b> Resource management, sources of instructional resources and equipment.  <b>(B) Requisite Skills.</b> Training schedule completion.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.2.4</b> Schedule single instructional sessions, given a training assignment, department scheduling procedures, instructional resources, facilities and timeline for delivery, so that the specified sessions are delivered according to department procedure.  <b>(A) Requisite Knowledge.</b> Departmental scheduling procedures and resource management.  <b>(B) Requisite Skills.</b> Training schedule completion.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.3.2*</b> Review instructional materials, given the materials for a specific topic, target audience, and learning environment, so that elements of the lesson plan, learning environment, and resources that need adaptation are identified.  <b>(A) Requisite Knowledge.</b> Recognition of student limitations and cultural diversity, methods of instruction, types of resource materials, organization of the learning environment, and policies and procedures.  <b>(B) Requisite Skills.</b> Analysis of resources, facilities, and materials	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.3.3*</b> Adapt a prepared lesson plan, given course materials and an assignment, so that the needs of the student and the objectives of the lesson plan are achieved.  <b>(A)* Requisite Knowledge.</b> Elements of a lesson plan, selection of instructional aids and methods, and organization of the learning environment.  <b>(B) Requisite Skills.</b> Instructor preparation and organizational skills.	Yes <input type="checkbox"/>  No <input type="checkbox"/>

Train the Trainer	Competency Met
<b>4.4.1 Definition of Duty.</b> The delivery of instructional sessions utilizing prepared course materials.	
<p><b>4.4.2</b> Organize the classroom, laboratory, or outdoor learning environment, given a facility and an assignment, so that lighting, distractions, climate control or weather, noise control, seating, audiovisual equipment, teaching aids, and safety are considered.</p> <p><b>(A) Requisite Knowledge.</b> Classroom management and safety, advantages and limitations of audiovisual equipment and teaching aids, classroom arrangement, and methods and techniques of instruction.</p> <p><b>(B) Requisite Skills.</b> Use of instructional media and teaching aids.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.4.3</b> Present prepared lessons, given a prepared lesson plan that specifies the presentation method(s), so that the method(s) indicated in the plan are used and the stated objectives or learning outcomes are achieved, applicable safety standards and practices are followed, and risks are addressed.</p> <p><b>(A)* Requisite Knowledge.</b> The laws and principles of learning, methods and techniques of instruction, lesson plan components and elements of the communication process, and lesson plan terminology and definitions; the impact of cultural differences on instructional delivery; safety rules, regulations, and practices; identification of training hazards; elements and limitations of distance learning; distance learning delivery methods; and the instructor's role in distance learning.</p> <p><b>(B) Requisite Skills.</b> Oral communication techniques, methods and techniques of instruction, and utilization of lesson plans in an instructional setting.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.4.4*</b> Adjust presentation, given a lesson plan and changing circumstances in the class environment, so that class continuity and the objectives or learning outcomes are achieved.</p> <p><b>(A) Requisite Knowledge.</b> Methods of dealing with changing circumstances.</p> <p><b>(B) Requisite Skills.</b> None required</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<b>4.5.1* Definition of Duty.</b> The administration and grading of student evaluation instruments.	
<p><b>4.5.2</b> Administer oral, written, and performance tests, given the lesson plan, evaluation instruments, and evaluation procedures of the agency, so that bias or discrimination is eliminated the testing is conducted according to procedures, and the security of the materials is maintained.</p> <p><b>(A) Requisite Knowledge.</b> Test administration, agency policies, laws and policies pertaining to discrimination during training and testing, methods for eliminating testing bias, laws affecting records and disclosure of training information, purposes of evaluation and testing, and performance skills evaluation.</p> <p><b>(B) Requisite Skills.</b> Use of skills checklists and oral questioning techniques.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Train the Trainer	Competency Met
<p><b>4.5.3</b> Grade student oral, written, or performance tests, given class answer sheets or skills checklists and appropriate answer keys, so the examinations are accurately graded and properly secured.</p> <p><b>(A) Requisite Knowledge.</b> Grading methods, methods for eliminating bias during grading, and maintaining confidentiality of scores.</p> <p><b>(B) Requisite Skills.</b> None required.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.5.5*</b> Provide evaluation feedback to students, given evaluation data, so that the feedback is timely; specific enough for the student to make efforts to modify behavior; and objective, clear, and relevant; also include suggestions based on the data.</p> <p><b>(A) Requisite Knowledge.</b> Reporting procedures and the interpretation of test results.</p> <p><b>(B) Requisite Skills.</b> Communication skills and basic coaching.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>Emergency Scene Traffic</b></p> <p>NFPA 1001 5.3.3</p>	
<p><b>5.3.3*</b> Establish and operate in work areas at emergency scenes, given protective equipment, traffic and scene control devices, structure fire and roadway emergency scenes, traffic hazards and downed electrical wires, an assignment, and SOPs, so that procedures are followed, protective equipment is worn, protected work areas are established as directed using traffic and scene control devices, and the fire fighter performs assigned tasks only in established, protected work areas.</p> <p><b>(A) Requisite Knowledge.</b> Potential hazards involved in operating on emergency scenes including vehicle traffic, utilities, and environmental conditions; proper procedures for dismounting apparatus in traffic; procedures for safe operation at emergency scenes; and the protective equipment available for members' safety on emergency scenes and work zone designations.</p> <p><b>(B) Requisite Skills.</b> The ability to use personal protective clothing, deploy traffic and scene control devices, dismount apparatus, and operate in the protected work areas as directed.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Safety &amp; Communications</b></p> <p>NFPA 1001 5.1.1, 5.1.2, 5.2, 5.2.1, 5.2.2, 5.2.3, 5.3.2, 5.3.17, 5.3.18</p>	
<p><b>5.1 General.</b> For qualification at Level I, the fire fighter candidate shall meet the general knowledge requirements in 5.1.1; the general skill requirements in 5.1.2; the JPRs defined in Sections 5.2 through 5.5 of this standard; and the requirements</p> <p>defined in Chapter 5, Core Competencies for Operations Level Responders, and Section 6.6, Mission-Specific Competencies: Product Control, of NFPA 472, <i>Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents</i>.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.1.1 General Knowledge Requirements.</b> The organization of the fire department; the role of the Fire Fighter I in the organization; the mission of fire service; the fire department's standard operating procedures (SOPs) and rules and regulations as they apply to the Fire Fighter I; the value of fire and life safety initiatives in support of the fire department mission and to reduce fire fighter line-of-duty injuries and fatalities; the role of other agencies as they relate to the fire department; aspects of the fire department's member assistance program; the importance of physical fitness and a healthy lifestyle to the performance of the duties of a fire fighter; the critical aspects of NFPA1500, <i>Standard on Fire Department Occupational Safety and Health Program</i>.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.1.2 General Skill Requirements.</b> The ability to don personal protective clothing, doff personal protective clothing and prepare for reuse, hoist tools and equipment using ropes and the correct knot, and locate information in departmental documents and standard or code materials.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>5.2 Fire Department Communications.</b> This duty shall involve initiating responses, receiving telephone calls, and using fire department communications equipment to correctly relay verbal or written information, according to the JPRs in 5.2.1 through 5.2.4.</p>	
<p><b>5.2.1*</b> Initiate the response to a reported emergency, given the report of an emergency, fire department SOPs, and communications equipment, so that all necessary information is obtained, communications equipment is operated correctly, and the information is relayed promptly and accurately to the dispatch center.</p> <p><b>(A) Requisite Knowledge.</b> Procedures for reporting an emergency; departmental SOPs for taking and receiving alarms, radio codes, or procedures; and information needs of dispatch center.</p> <p><b>(B) Requisite Skills.</b> The ability to operate fire department communications equipment, relay information, and record information.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.2.2</b> Receive a telephone call, given a fire department phone, so that procedures for answering the phone are used and the caller's information is relayed.</p> <p><b>(A) Requisite Knowledge.</b> Fire department procedures for answering nonemergency telephone calls.</p> <p><b>(B) Requisite Skills.</b> The ability to operate fire station telephone and intercom equipment.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.2.3</b> Transmit and receive messages via the fire department radio, given a fire department radio and operating procedures, so that the information is accurate, complete, clear, and relayed within the time established by the AHJ.</p> <p><b>(A) Requisite Knowledge.</b> Departmental radio procedures and etiquette for routine traffic, emergency traffic, and emergency evacuation signals.</p> <p><b>(B) Requisite Skills.</b> The ability to operate radio equipment and discriminate between routine and emergency traffic.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.3.2*</b> Respond on apparatus to an emergency scene, given personal protective clothing and other necessary personal protective equipment, so that the apparatus is correctly mounted and dismounted, seat belts are used while the vehicle is in motion, and other personal protective equipment is correctly used.</p> <p><b>(A) Requisite Knowledge.</b> Mounting and dismounting procedures for riding fire apparatus, hazards and ways to avoid hazards associated with riding apparatus, prohibited practices, and types of department personal protective equipment and the means for usage.</p> <p><b>(B) Requisite Skills.</b> The ability to use each piece of provided safety equipment.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>5.3.17</b> Illuminate the emergency scene, given fire service electrical equipment and an assignment, so that designated areas are illuminated and all equipment is operated within the manufacturer's listed safety precautions.</p> <p><b>(A) Requisite Knowledge.</b> Safety principles and practices, power supply capacity and limitations, and light deployment methods. supply and lighting equipment, deploy cords and connectors, reset ground-fault interrupter (GFI) devices, and locate lights for best effect.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.3.18</b> Turn off building utilities, given tools and an assignment, so that the assignment is safely completed.</p> <p><b>(A) Requisite Knowledge.</b> Properties, principles, and safety concerns for electricity, gas, and water systems; utility disconnect methods and associated dangers; and use of required safety equipment.</p> <p><b>(B) Requisite Skills.</b> The ability to identify utility control devices, operate control valves or switches, and assess for related hazards.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>PPE and Self Contained Breathing Apparatus</b></p> <p>NFPA 1001 5.1.2, 5.2, 5.3, 5.3.1, 5.3.2, 5.5.1</p>	
<p><b>5.1.2 General Skill Requirements.</b> The ability to don personal protective clothing, doff personal protective clothing and prepare for reuse, hoist tools and equipment using ropes and the correct knot, and locate information in departmental documents</p> <p>and standard or code materials.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.2 Fire Department Communications.</b> This duty shall involve initiating responses, receiving telephone calls, and using fire department communications equipment to correctly relay verbal or written information, according to the JPRs in 5.2.1</p> <p>through 5.2.4.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.3 Fireground Operations.</b> This duty shall involve performing activities necessary to ensure life safety, fire control, and property conservation, according to the JPRs in 5.3.1 through 5.3.20.</p>	

Exterior Operations – Firefighter	Competency Met
<p><b>5.3.1*</b> Use self-contained breathing apparatus (SCBA) during emergency operations, given SCBA and other personal protective equipment, so that the SCBA is correctly donned, the SCBA is correctly worn, controlled breathing techniques are used, emergency procedures are enacted if the SCBA fails, all low-air warnings are recognized, respiratory protection is not intentionally compromised, and hazardous areas are exited prior to air depletion.</p> <p><b>(A) Requisite Knowledge.</b> Conditions that require respiratory protection, uses and limitations of SCBA, components of SCBA, donning procedures, breathing techniques, indications for and emergency procedures used with SCBA, and physical requirements of the SCBA wearer.</p> <p><b>(B) Requisite Skills.</b> The ability to control breathing, replace SCBA air cylinders, use SCBA to exit through restricted passages, initiate and complete emergency procedures in the event of SCBA failure or air depletion, and complete donning procedures.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.3.2*</b> Respond on apparatus to an emergency scene, given personal protective clothing and other necessary personal protective equipment, so that the apparatus is correctly mounted and dismounted, seat belts are used while the vehicle is in motion, and other personal protective equipment is correctly used.</p> <p><b>(A) Requisite Knowledge.</b> Mounting and dismounting procedures for riding fire apparatus, hazards and ways to avoid hazards associated with riding apparatus, prohibited practices, and types of department personal protective equipment and the means for usage.</p> <p><b>(B) Requisite Skills.</b> The ability to use each piece of provided safety equipment.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.5.1</b> Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools, given cleaning tools, cleaning supplies, and an assignment, so that equipment is clean and maintained according to manufacturer's or departmental guidelines, maintenance is recorded, and equipment is placed in a ready state or reported otherwise.</p> <p><b>(A) Requisite Knowledge.</b> Types of cleaning methods for various tools and equipment, correct use of cleaning solvents, and manufacturer's or departmental guidelines for cleaning equipment and tools.</p> <p><b>(B) Requisite Skills.</b> The ability to select correct tools for various parts and pieces of equipment, follow guidelines, and complete recording and reporting procedures.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Ropes and Knots</b></p> <p>NFPA 1001 5.1.2, 5.3.20, 5.5.1</p>	
<p><b>5.1.2 General Skill Requirements.</b> The ability to don personal protective clothing, doff personal protective clothing and prepare for reuse, hoist tools and equipment using ropes and the correct knot, and locate information in departmental documents and standard or code materials.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>5.3.20</b> Tie a knot appropriate for hoisting tool, given personnel protective equipment, tools, ropes, and an assignment, so that the knots used are appropriate for hoisting tools securely and as directed.</p> <p><b>(A) Requisite Knowledge.</b> Knot types and usage; the difference between life safety and utility rope; reasons for placing rope out of service; the types of knots to use for given tools, ropes, or situations; hoisting methods for tools and equipment; and using rope to support response activities.</p> <p><b>(B) Requisite Skills.</b> The ability to hoist tools using specific knots based on the type of tool.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.5.1</b> Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools, given cleaning tools, cleaning supplies, and an assignment, so that equipment is clean and maintained according to manufacturer's or departmental guidelines, maintenance is recorded, and equipment is placed in a ready state or reported otherwise.</p> <p><b>(A) Requisite Knowledge.</b> Types of cleaning methods for various tools and equipment, correct use of cleaning solvents, and manufacturer's or departmental guidelines for cleaning equipment and tools.</p> <p><b>(B) Requisite Skills.</b> The ability to select correct tools for various parts and pieces of equipment, follow guidelines, and complete recording and reporting procedures.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Fire Streams, Hose and Appliances</b></p> <p>NFPA 1001 5.3.7, 5.3.8, 5.5.1, 5.5.2</p>	

Exterior Operations – Firefighter	Competency Met
<p><b>5.3.7*</b> Attack a passenger vehicle fire operating as a member of a team, given personal protective equipment, attack line, and hand tools, so that hazards are avoided, leaking flammable liquids are identified and controlled, protection from flash fires is maintained, all vehicle compartments are overhauled, and the fire is extinguished.</p> <p><b>(A) Requisite Knowledge.</b> Principles of fire streams as they relate to fighting automobile fires; precautions to be followed when advancing hose lines toward an automobile; observable results that a fire stream has been properly applied; identifying</p> <p>alternative fuels and the hazards associated with them; dangerous conditions created during an automobile fire; common types of accidents or injuries related to fighting automobile fires and how to avoid them; how to access locked passenger, trunk, and engine compartments; and methods for overhauling an automobile.</p> <p><b>(B) Requisite Skills.</b> The ability to identify automobile fuel type; assess and control fuel leaks; open, close, and adjust the flow and pattern on nozzles; apply water for maximum effectiveness while maintaining flash fire protection; advance 1½ in. (38 mm) or larger diameter attack lines; and expose hidden fires by opening all automobile compartments. in stacked or piled and small unattached structures or storage containers that can be fought from the exterior, attack lines, hand tools and master stream devices, and an assignment, so that exposures are protected, the spread of fire is stopped, collapse hazards are avoided, water application is effective, the fire is extinguished, and signs of the origin area(s) and arson are preserved.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.3.8*</b> Extinguish fires in exterior Class A materials, given fires in stacked or piled and small unattached structures or storage containers that can be fought from the exterior, attack lines, hand tools and master stream devices, and an assignment, so that exposures are protected, the spread of fire is stopped, collapse hazards are avoided, water application is effective, the fire is extinguished, and signs of the origin area(s) and arson are preserved.</p> <p><b>(A) Requisite Knowledge.</b> Types of attack lines and water streams appropriate for attacking stacked, piled materials and outdoor fires; dangers — such as collapse — associated with stacked and piled materials; various extinguishing agents and their effect on different material configurations; tools and methods to use in breaking up various types of materials; the difficulties related to complete extinguishment of stacked and piled materials; water application methods for exposure protection and fire extinguishment; dangers such as exposure to toxic or hazardous materials associated with storage building and container fires; obvious signs of origin and cause; and techniques for the preservation of fire cause evidence.</p> <p><b>(B) Requisite Skills.</b> The ability to recognize inherent hazards related to the material's configuration, operate handlines or master streams, break up material using hand tools and water streams, evaluate for complete extinguishment, operate hose lines and other water application devices, evaluate and modify water application for maximum penetration, search for and expose hidden fires, assess patterns for origin determination, and evaluate for complete extinguishment</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>5.5.1</b> Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools, given cleaning tools, cleaning supplies, and an assignment, so that equipment is clean and maintained according to manufacturer's or departmental guidelines, maintenance is recorded, and equipment is placed in a ready state or reported otherwise.</p> <p><b>(A) Requisite Knowledge.</b> Types of cleaning methods for various tools and equipment, correct use of cleaning solvents, and manufacturer's or departmental guidelines for cleaning equipment and tools.</p> <p><b>(B) Requisite Skills.</b> The ability to select correct tools for various parts and pieces of equipment, follow guidelines, and complete recording and reporting procedures.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.5.2</b> Clean, inspect, and return fire hose to service, given washing equipment, water, detergent, tools, and replacement gaskets, so that damage is noted and corrected, the hose is clean, and the equipment is placed in a ready state for service.</p> <p><b>(A) Requisite Knowledge.</b> Departmental procedures for noting a defective hose and removing it from service, cleaning methods, and hose rolls and loads.</p> <p><b>(B) Requisite Skills.</b> The ability to clean different types of hose; operate hose washing and drying equipment; mark defective hose; and replace coupling gaskets, roll hose, and reload hose.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Ventilation</b></p> <p>NFPA 1001 5.3.11, 5.5.1</p>	
<p><b>5.3.11</b> Perform horizontal ventilation on a structure operating as part of a team, given an assignment, personal protective equipment, ventilation tools, equipment, and ladders, so that the ventilation openings are free of obstructions, tools are used as designed, ladders are correctly placed, ventilation devices are correctly placed, and the structure is cleared of smoke.</p> <p><b>(A) Requisite Knowledge.</b> The principles, advantages, limitations, and effects of horizontal, mechanical, and hydraulic ventilation; safety considerations when venting a structure; fire behavior in a structure; the products of combustion found in a structure fire; the signs, causes, effects, and prevention of backdrafts; and the relationship of oxygen concentration to life safety and fire growth.</p> <p><b>(B) Requisite Skills.</b> The ability to transport and operate ventilation tools and equipment and ladders, and to use safe procedures for breaking window and door glass and removing obstructions</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>5.5.1</b> Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools, given cleaning tools, cleaning supplies, and an assignment, so that equipment is clean and maintained according to manufacturer's or departmental guidelines, maintenance is recorded, and equipment is placed in a ready state or reported otherwise.</p> <p><b>(A) Requisite Knowledge.</b> Types of cleaning methods for various tools and equipment, correct use of cleaning solvents, and manufacturer's or departmental guidelines for cleaning equipment and tools.</p> <p><b>(B) Requisite Skills.</b> The ability to select correct tools for various parts and pieces of equipment, follow guidelines, and complete recording and reporting procedures.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Water Supply</b></p> <p>NFPA 1001 5.3.15, 5.5.1, 5.5.2</p>	
<p><b>5.3.15*</b> Connect a fire department pumper to a water supply as a member of a team, given supply or intake hose, hose tools, and a fire hydrant or static water source, so that connections are tight and water flow is unobstructed.</p> <p><b>(A) Requisite Knowledge.</b> Loading and off-loading procedures for mobile water supply apparatus; fire hydrant operation; and suitable static water supply sources, procedures, and protocol for connecting to various water sources.</p> <p><b>(B) Requisite Skills.</b> The ability to hand lay a supply hose, connect and place hard suction hose for drafting operations, deploy portable water tanks as well as the equipment necessary to transfer water between and draft from them, make hydrant-to-pumper hose connections for forward and reverse lays, connect supply hose to a hydrant, and fully open and close the hydrant.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.5.1</b> Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools, given cleaning tools, cleaning supplies, and an assignment, so that equipment is clean and maintained according to manufacturer's or departmental guidelines, maintenance is recorded, and equipment is placed in a ready state or reported otherwise.</p> <p><b>(A) Requisite Knowledge.</b> Types of cleaning methods for various tools and equipment, correct use of cleaning solvents, and manufacturer's or departmental guidelines for cleaning equipment and tools.</p> <p><b>(B) Requisite Skills.</b> The ability to select correct tools for various parts and pieces of equipment, follow guidelines, and complete recording and reporting procedures</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>5.5.2</b> Clean, inspect, and return fire hose to service, given washing equipment, water, detergent, tools, and replacement gaskets, so that damage is noted and corrected, the hose is clean, and the equipment is placed in a ready state for service.</p> <p><b>(A) Requisite Knowledge.</b> Departmental procedures for noting a defective hose and removing it from service, cleaning methods, and hose rolls and loads.</p> <p><b>(B) Requisite Skills.</b> The ability to clean different types of hose; operate hose washing and drying equipment; mark defective hose; and replace coupling gaskets, roll hose, and reload hose.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Ladders</b></p> <p>NFPA 1001 5.3.6, 5.5.1</p>	
<p><b>5.3.6*</b> Set up ground ladders, given single and extension ladders, an assignment, and team members if needed, so that hazards are assessed, the ladder is stable, the angle is correct for climbing, extension ladders are extended to the necessary height with the fly locked, the top is placed against a reliable structural component, and the assignment is accomplished.</p> <p><b>(A) Requisite Knowledge.</b> Parts of a ladder, hazards associated with setting up ladders, what constitutes a stable foundation for ladder placement, different angles for various tasks, safety limits to the degree of angulation, and what constitutes a reliable structural component for top placement.</p> <p><b>(B) Requisite Skills.</b> The ability to carry ladders, raise ladders, extend ladders and lock flies, determine that a wall and roof will support the ladder, judge extension ladder height requirements, and place the ladder to avoid obvious hazards.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.5.1</b> Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools, given cleaning tools, cleaning supplies, and an assignment, so that equipment is clean and maintained according to manufacturer's or departmental guidelines, maintenance is recorded, and equipment is placed in a ready state or reported otherwise.</p> <p><b>(A) Requisite Knowledge.</b> Types of cleaning methods for various tools and equipment, correct use of cleaning solvents, and manufacturer's or departmental guidelines for cleaning equipment and tools.</p> <p><b>(B) Requisite Skills.</b> The ability to select correct tools for various parts and pieces of equipment, follow guidelines, and complete recording and reporting procedures.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Rehabilitation Area (REHAB)</b></p> <p>NFPA 1001 5.1.1, NFPA 1500, NFPA 1584</p>	

Exterior Operations – Firefighter	Competency Met
<p><b>5.1.1 General Knowledge Requirements.</b> The organization of the fire department; the role of the Fire Fighter I in the organization; the mission of fire service; the fire department's standard operating procedures (SOPs) and rules and regulations as they apply to the Fire Fighter I; the value of fire and life safety initiatives in support of the fire department mission and to reduce fire fighter line-of-duty injuries and fatalities; the role of other agencies as they relate to the fire department; aspects of the fire department's member assistance program; the importance of physical fitness and a healthy lifestyle to the performance of the duties of a fire fighter; the critical aspects of NFPA1500, <i>Standard on Fire Department Occupational Safety and Health Program</i>.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>+ <b>NFPA 1500</b> Standard on Occupational Safety and Health Program</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>+ <b>NFPA 1584</b> Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Introduction to Basic Fire Behavior and Building Construction</b></p> <p>NFPA 220, NFPA 921, NFPA 1001 5.3.11, 5.3.12, 5.3.13 NFPA 5000</p>	
<p><b>5.3.11</b> Perform horizontal ventilation on a structure operating as part of a team, given an assignment, personal protective equipment, ventilation tools, equipment, and ladders, so that the ventilation openings are free of obstructions, tools are used as designed, ladders are correctly placed, ventilation devices are correctly placed, and the structure is cleared of smoke.</p> <p><b>(A) Requisite Knowledge.</b> The principles, advantages, limitations, and effects of horizontal, mechanical, and hydraulic ventilation; safety considerations when venting a structure; fire behavior in a structure; the products of combustion found in a structure fire; the signs, causes, effects, and prevention of backdrafts; and the relationship of oxygen concentration to life safety and fire growth.</p> <p><b>(B) Requisite Skills.</b> The ability to transport and operate ventilation tools and equipment and ladders, and to use safe procedures for breaking window and door glass and removing obstructions.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>5.3.12</b> Perform vertical ventilation on a structure as part of a team, given an assignment, personal protective equipment, ground and roof ladders, and tools, so that ladders are positioned for ventilation, a specified opening is created, all ventilation barriers are removed, structural integrity is not compromised, products of combustion are released from the structure, and the team retreats from the area when ventilation is accomplished.</p> <p><b>(A) Requisite Knowledge.</b> The methods of heat transfer; the principles of thermal layering within a structure on fire; the techniques and safety precautions for venting flat roofs, pitched roofs, and basements; basic indicators of potential collapse or roof failure; the effects of construction type and elapsed time under fire conditions on structural integrity; and the advantages and disadvantages of vertical and trench/strip ventilation.</p> <p><b>(B) Requisite Skills.</b> The ability to transport and operate ventilation tools and equipment; hoist ventilation tools to a roof; cut roofing and flooring materials to vent flat roofs, pitched roofs, and basements; sound a roof for integrity; clear an opening with hand tools; select, carry, deploy, and secure ground ladders for ventilation activities; deploy roof ladders on pitched roofs while secured to a ground ladder; and carry ventilation-related tools and equipment while ascending and descending ladders.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.3.13</b> Overhaul a fire scene, given personal protective equipment, attack line, hand tools, a flashlight, and an assignment, so that structural integrity is not compromised, all hidden fires are discovered, fire cause evidence is preserved, and the fire is extinguished.</p> <p><b>(A) Requisite Knowledge.</b> Types of fire attack lines and water application devices most effective for overhaul, water application methods for extinguishment that limit water damage, types of tools and methods used to expose hidden fire, dangers associated with overhaul, obvious signs of area of origin or signs of arson, and reasons for protection of fire scene.</p> <p><b>(B) Requisite Skills.</b> The ability to deploy and operate an attack line; remove flooring, ceiling, and wall components to expose void spaces without compromising structural integrity; apply water for maximum effectiveness; expose and extinguish hidden fires in walls, ceilings, and subfloor spaces; recognize and preserve obvious signs of area of origin and arson; and evaluate for complete extinguishment.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>+ <b>NFPA 220</b> Standard on Types of Building Construction</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>+ <b>NFPA 921</b> Guide for Fire and Explosion Investigations</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>+ <b>NFPA 5000</b> Building Construction and Safety Code</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Exterior Operations – Firefighter	Competency Met
<p><b>Dangerous Goods or Hazmat Awareness</b> <i>(from NFPA 472)</i></p> <ul style="list-style-type: none"> <li>Can utilize any training provider, including internal, that meets the competencies of NFPA 472 – Awareness Level [Playbook: Page 16, note1]</li> </ul>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Gas &amp; Electrical Safety for Firefighters</b> <i>(supplied by a BC Utility utilizing an evaluation mechanism)</i></p> <ul style="list-style-type: none"> <li>Can utilize any program, developed by a registered Gas or Electrical Utility within the Province of BC, which includes an evaluation instrument based upon current recommended practice [Playbook: Page 16, note 2]</li> </ul>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Incident Command System 100</b> <i>(from BCERMS curriculum)</i></p> <ul style="list-style-type: none"> <li>Can utilize any training provider, including internal, using certified training and evaluation based upon the BCEMS model. [Playbook: Page 16, note 3]</li> </ul>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Interior Operations – Firefighter	Competency Met
<i>All of Exterior Operations Firefighter PLUS the following:</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>Organization, Safety and Communications</b> NFPA 1001 5.2.4	
<p><b>5.2.4*</b> Activate an emergency call for assistance, given vision obscured conditions, PPE, and department SOPs, so that the fire fighter can be located and rescued.</p> <p><b>(A) Requisite Knowledge.</b> Personnel accountability systems, emergency communication procedures, and emergency evacuation methods.</p> <p><b>(B) Requisite Skills.</b> The ability to initiate an emergency call for assistance in accordance with the AHJ's procedures, the ability to use other methods of emergency calls for assistance.</p>	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>RIT Training</b> – pertinent to jurisdictional hazards NFPA 1001 5.3.9 NFPA 1407, NFPA 1500	
<p><b>5.3.9*</b> Conduct a search and rescue in a structure operating as a member of a team, given an assignment, obscured vision conditions, personal protective equipment, a flashlight, forcible entry tools, hose lines, and ladders when necessary, so that ladders are correctly placed when used, all assigned areas are searched, all victims are located and removed, team integrity is maintained, and team members' safety — including respiratory protection — is not compromised.</p> <p><b>(A) Requisite Knowledge.</b> Use of forcible entry tools during rescue operations, ladder operations for rescue, psychological effects of operating in obscured conditions and ways to manage them, methods to determine if an area is tenable, primary and secondary search techniques, team members' roles and goals, methods to use and indicators of finding victims, victim removal methods (including various carries), and considerations related to respiratory protection.</p> <p><b>(B)* Requisite Skills.</b> The ability to use SCBA to exit through restricted passages, set up and use different types of ladders for various types of rescue operations, rescue a fire fighter with functioning respiratory protection, rescue a fire fighter whose</p> <p>respiratory protection is not functioning, rescue a person who has no respiratory protection, and assess areas to determine tenability.</p>	Yes <input type="checkbox"/> No <input type="checkbox"/>
+ <b>NFPA 1407</b> Standard for Training Fire Service Rapid Intervention Crews	Yes <input type="checkbox"/> No <input type="checkbox"/>

Interior Operations – Firefighter	Competency Met
+ <b>NFPA 1500</b> Standard on Fire Department Occupational Safety and Health Program	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>Self-Contained Breathing Apparatus</b>  NFPA 1001 5.3.1, 5.3.5, 5.3.9	
<p><b>5.3.1*</b> Use self-contained breathing apparatus (SCBA) during emergency operations, given SCBA and other personal protective equipment, so that the SCBA is correctly donned, the SCBA is correctly worn, controlled breathing techniques are used, emergency procedures are enacted if the SCBA fails, all low-air warnings are recognized, respiratory protection is not intentionally compromised, and hazardous areas are exited prior to air depletion.</p> <p><b>(A) Requisite Knowledge.</b> Conditions that require respiratory protection, uses and limitations of SCBA, components of SCBA, donning procedures, breathing techniques, indications for and emergency procedures used with SCBA, and physical requirements of the SCBA wearer.</p> <p><b>(B) Requisite Skills.</b> The ability to control breathing, replace SCBA air cylinders, use SCBA to exit through restricted passages, initiate and complete emergency procedures in the event of SCBA failure or air depletion, and complete donning procedures.</p>	Yes <input type="checkbox"/> No <input type="checkbox"/>
<p><b>5.3.5*</b> Exit a hazardous area as a team, given vision-obscured conditions, so that a safe haven is found before exhausting the air supply, others are not endangered, and the team integrity is maintained.</p> <p><b>(A) Requisite Knowledge.</b> Personnel accountability systems, communication procedures, emergency evacuation methods, what constitutes a safe haven, elements that create or indicate a hazard, and emergency procedures for loss of air supply.</p> <p><b>(B) Requisite Skills.</b> The ability to operate as a team member in vision-obscured conditions, locate and follow a guideline, conserve air supply, and evaluate areas for hazards and identify a safe haven.</p>	Yes <input type="checkbox"/> No <input type="checkbox"/>

Interior Operations – Firefighter	Competency Met
<p><b>5.3.9*</b> Conduct a search and rescue in a structure operating as a member of a team, given an assignment, obscured vision conditions, personal protective equipment, a flashlight, forcible entry tools, hose lines, and ladders when necessary, so that ladders are correctly placed when used, all assigned areas are searched, all victims are located and removed, team integrity is maintained, and team members' safety — including respiratory protection — is not compromised.</p> <p><b>(A) Requisite Knowledge.</b> Use of forcible entry tools during rescue operations, ladder operations for rescue, psychological effects of operating in obscured conditions and ways to manage them, methods to determine if an area is tenable, primary and secondary search techniques, team members' roles and goals, methods to use and indicators of finding victims, victim removal methods (including various carries), and considerations related to respiratory protection.</p> <p><b>(B)* Requisite Skills.</b> The ability to use SCBA to exit through restricted passages, set up and use different types of ladders for various types of rescue operations, rescue a fire fighter with functioning respiratory protection, rescue a fire fighter whose respiratory protection is not functioning, rescue a person who has no respiratory protection, and assess areas to determine tenability.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Search and Rescue</b></p> <p>NFPA 1001 5.3.9</p>	
<p><b>5.3.9*</b> Conduct a search and rescue in a structure operating as a member of a team, given an assignment, obscured vision conditions, personal protective equipment, a flashlight, forcible entry tools, hose lines, and ladders when necessary, so that ladders are correctly placed when used, all assigned areas are searched, all victims are located and removed, team integrity is maintained, and team members' safety — including respiratory protection — is not compromised.</p> <p><b>(A) Requisite Knowledge.</b> Use of forcible entry tools during rescue operations, ladder operations for rescue, psychological effects of operating in obscured conditions and ways to manage them, methods to determine if an area is tenable, primary and secondary search techniques, team members' roles and goals, methods to use and indicators of finding victims, victim removal methods (including various carries), and considerations related to respiratory protection.</p> <p><b>(B)* Requisite Skills.</b> The ability to use SCBA to exit through restricted passages, set up and use different types of ladders for various types of rescue operations, rescue a fire fighter with functioning respiratory protection, rescue a fire fighter whose respiratory protection is not functioning, rescue a person who has no respiratory protection, and assess areas to determine tenability.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Fire Behavior</b></p> <p>NFPA 1001</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Interior Operations – Firefighter	Competency Met
<p><b>Fire Extinguishers</b></p> <p>NFPA 1001 5.3.16</p>	
<p><b>5.3.16*</b> Extinguish incipient Class A, Class B, and Class C fires, given a selection of portable fire extinguishers, so that the correct extinguisher is chosen, the fire is completely extinguished, and correct extinguisher-handling techniques are followed.</p> <p><b>(A) Requisite Knowledge.</b> The classifications of fire; the types of, rating systems for, and risks associated with each class of fire; and the operating methods of and limitations of portable extinguishers.</p> <p><b>(B) Requisite Skills.</b> The ability to operate portable fire extinguishers, approach fire with portable fire extinguishers, select an appropriate extinguisher based on the size and type of fire, and safely carry portable fire extinguishers.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Building Construction</b></p> <p>NFPA 1001 5.3.11, 5.3.12</p>	
<p><b>5.3.11</b> Perform horizontal ventilation on a structure operating as part of a team, given an assignment, personal protective equipment, ventilation tools, equipment, and ladders, so that the ventilation openings are free of obstructions, tools are used as designed, ladders are correctly placed, ventilation devices are correctly placed, and the structure is cleared of smoke.</p> <p><b>(A) Requisite Knowledge.</b> The principles, advantages, limitations, and effects of horizontal, mechanical, and hydraulic ventilation; safety considerations when venting a structure; fire behavior in a structure; the products of combustion found in a structure fire; the signs, causes, effects, and prevention of backdrafts; and the relationship of oxygen concentration to life safety and fire growth.</p> <p><b>(B) Requisite Skills.</b> The ability to transport and operate ventilation tools and equipment and ladders, and to use safe procedures for breaking window and door glass and removing obstructions.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Interior Operations – Firefighter	Competency Met
<p><b>5.3.12</b> Perform vertical ventilation on a structure as part of a team, given an assignment, personal protective equipment, ground and roof ladders, and tools, so that ladders are positioned for ventilation, a specified opening is created, all ventilation barriers are removed, structural integrity is not compromised, products of combustion are released from the structure, and the team retreats from the area when ventilation is accomplished.</p> <p><b>(A) Requisite Knowledge.</b> The methods of heat transfer; the principles of thermal layering within a structure on fire; the techniques and safety precautions for venting flat roofs, pitched roofs, and basements; basic indicators of potential collapse or roof failure; the effects of construction type and elapsed time under fire conditions on structural integrity; and the advantages and disadvantages of vertical and trench/strip ventilation.</p> <p><b>(B) Requisite Skills.</b> The ability to transport and operate ventilation tools and equipment; hoist ventilation tools to a roof; cut roofing and flooring materials to vent flat roofs, pitched roofs, and basements; sound a roof for integrity; clear an opening with hand tools; select, carry, deploy, and secure ground ladders for ventilation activities; deploy roof ladders on pitched roofs while secured to a ground ladder; and carry ventilation-related tools and equipment while ascending and descending ladders.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Forcible Entry</b></p> <p>NFPA 1001 5.3.4</p>	
<p><b>5.3.4*</b> Force entry into a structure, given personal protective equipment, tools, and an assignment, so that the tools are used as designed, the barrier is removed, and the opening is in a safe condition and ready for entry.</p> <p><b>(A) Requisite Knowledge.</b> Basic construction of typical doors, windows, and walls within the department's community or service area; operation of doors, windows, and locks; and the dangers associated with forcing entry through doors, windows, and walls.</p> <p><b>(B) Requisite Skills.</b> The ability to transport and operate hand and power tools and to force entry through doors, windows, and walls using assorted methods and tools.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Ventilation</b></p> <p>NFPA 1001 5.3.12</p>	

Interior Operations – Firefighter	Competency Met
<p><b>5.3.12</b> Perform vertical ventilation on a structure as part of a team, given an assignment, personal protective equipment, ground and roof ladders, and tools, so that ladders are positioned for ventilation, a specified opening is created, all ventilation barriers are removed, structural integrity is not compromised, products of combustion are released from the structure, and the team retreats from the area when ventilation is accomplished.</p> <p><b>(A) Requisite Knowledge.</b> The methods of heat transfer; the principles of thermal layering within a structure on fire; the techniques and safety precautions for venting flat roofs, pitched roofs, and basements; basic indicators of potential collapse or roof failure; the effects of construction type and elapsed time under fire conditions on structural integrity; and the advantages and disadvantages of vertical and trench/strip ventilation.</p> <p><b>(B) Requisite Skills.</b> The ability to transport and operate ventilation tools and equipment; hoist ventilation tools to a roof; cut roofing and flooring materials to vent flat roofs, pitched roofs, and basements; sound a roof for integrity; clear an opening with hand tools; select, carry, deploy, and secure ground ladders for ventilation activities; deploy roof ladders on pitched roofs while secured to a ground ladder; and carry ventilation-related tools and equipment while ascending and descending ladders.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Loss Control</b></p> <p>NFPA 1001 5.3.13, 5.3.14</p>	
<p><b>5.3.13</b> Overhaul a fire scene, given personal protective equipment, attack line, hand tools, a flashlight, and an assignment, so that structural integrity is not compromised, all hidden fires are discovered, fire cause evidence is preserved, and the fire is extinguished.</p> <p><b>(A) Requisite Knowledge.</b> Types of fire attack lines and water application devices most effective for overhaul, water application methods for extinguishment that limit water damage, types of tools and methods used to expose hidden fire, dangers associated with overhaul, obvious signs of area of origin or signs of arson, and reasons for protection of fire scene.</p> <p><b>(B) Requisite Skills.</b> The ability to deploy and operate an attack line; remove flooring, ceiling, and wall components to expose void spaces without compromising structural integrity; apply water for maximum effectiveness; expose and extinguish hidden fires in walls, ceilings, and subfloor spaces; recognize and preserve obvious signs of area of origin and arson; and evaluate for complete extinguishment.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Interior Operations – Firefighter	Competency Met
<p><b>5.3.14</b> Conserve property as a member of a team, given salvage tools and equipment and an assignment, so that the building and its contents are protected from further damage.</p> <p><b>(A) Requisite Knowledge.</b> The purpose of property conservation and its value to the public, methods used to protect property, types of and uses for salvage covers, operations at properties protected with automatic sprinklers, how to stop the flow of water from an automatic sprinkler head, identification of the main control valve on an automatic sprinkler system, forcible entry issues related to salvage, and procedures for protecting possible areas of origin and potential evidence.</p> <p><b>(B) Requisite Skills.</b> The ability to cluster furniture; deploy covering materials; roll and fold salvage covers for reuse; construct water chutes and catch-alls; remove water; cover building openings, including doors, windows, floor openings, and roof openings; separate, remove, and relocate charred material to a safe location while protecting the area of origin for cause determination; stop the flow of water from a sprinkler with sprinkler wedges or stoppers; and operate a main control valve on an automatic sprinkler system.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Live Fire Exterior</b></p> <p>NFPA 1001 5.3.7, 5.3.8, 5.3.10, 5.3.19</p>	
<p><b>5.3.7*</b> Attack a passenger vehicle fire operating as a member of a team, given personal protective equipment, attack line, and hand tools, so that hazards are avoided, leaking flammable liquids are identified and controlled, protection from flash fires is maintained, all vehicle compartments are overhauled, and the fire is extinguished.</p> <p><b>(A) Requisite Knowledge.</b> Principles of fire streams as they relate to fighting automobile fires; precautions to be followed when advancing hose lines toward an automobile; observable results that a fire stream has been properly applied; identifying alternative fuels and the hazards associated with them; dangerous conditions created during an automobile fire; common types of accidents or injuries related to fighting automobile fires and how to avoid them; how to access locked passenger, trunk, and engine compartments; and methods for overhauling an automobile.</p> <p><b>(B) Requisite Skills.</b> The ability to identify automobile fuel type; assess and control fuel leaks; open, close, and adjust the flow and pattern on nozzles; apply water for maximum effectiveness while maintaining flash fire protection; advance 1½ in. (38 mm) or larger diameter attack lines; and expose hidden fires by opening all automobile compartments.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Interior Operations – Firefighter	Competency Met
<p><b>5.3.8*</b> Extinguish fires in exterior Class A materials, given fires in stacked or piled and small unattached structures or storage containers that can be fought from the exterior, attack lines, hand tools and master stream devices, and an assignment, so that exposures are protected, the spread of fire is stopped, collapse hazards are avoided, water application is effective, the fire is extinguished, and signs of the origin area(s) and arson are preserved.</p> <p><b>(A) Requisite Knowledge.</b> Types of attack lines and water streams appropriate for attacking stacked, piled materials and outdoor fires; dangers — such as collapse — associated with stacked and piled materials; various extinguishing agents and their effect on different material configurations; tools and methods to use in breaking up various types of materials; the difficulties related to complete extinguishment of stacked and piled materials; water application methods for exposure protection and fire extinguishment; dangers such as exposure to toxic or hazardous materials associated with storage building and container fires; obvious signs of origin and cause; and techniques for the preservation of fire cause evidence.</p> <p><b>(B) Requisite Skills.</b> The ability to recognize inherent hazards related to the material's configuration, operate handlines or master streams, break up material using hand tools and water streams, evaluate for complete extinguishment, operate hose lines and other water application devices, evaluate and modify water application for maximum penetration, search for and expose hidden fires, assess patterns for origin determination, and evaluate for complete extinguishment.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.3.10*</b> Attack an interior structure fire operating as a member of a team, given an attack line, ladders when needed, personal protective equipment, tools, and an assignment, so that team integrity is maintained, the attack line is deployed for advancement, ladders are correctly placed when used, access is gained into the fire area, effective water application practices are used, the fire is approached correctly, attack techniques facilitate suppression given the level of the fire, hidden fires are located and controlled, the correct body posture is maintained, hazards are recognized and managed, and the fire is brought under control.</p> <p><b>(A) Requisite Knowledge.</b> Principles of fire streams; types, design, operation, nozzle pressure effects, and flow capabilities of nozzles; precautions to be followed when advancing hose lines to a fire; observable results that a fire stream has been properly applied; dangerous building conditions created by fire; principles of exposure protection; potential longterm consequences of exposure to products of combustion; physical states of matter in which fuels are found; common types of accidents or injuries and their causes; and the application of each size and type of attack line, the role of the backup team in fire attack situations, attack and control techniques for grade level and above and below grade levels, and exposing hidden fires.</p> <p><b>(B) Requisite Skills.</b> The ability to prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow and patterns; apply water using direct, indirect, and combination attacks; advance charged and uncharged 1½ in. (38 mm) diameter or larger hose lines up ladders and up and down interior and exterior stairways; extend hose lines; replace burst hose sections; operate charged hose lines of 1½ in. (38 mm) diameter or larger while secured to a ground ladder; couple and uncouple various handline connections; carry hose; attack fires at grade level and above and below grade levels; and locate and suppress interior wall and subfloor fires.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Interior Operations – Firefighter	Competency Met
<p><b>5.3.19*</b> Combat a ground cover fire operating as a member of a team, given protective clothing, SCBA (if needed), hose lines, extinguishers or hand tools, and an assignment, so that threats to property are reported, threats to personal safety are recognized, retreat is quickly accomplished when warranted, and the assignment is completed.</p> <p><b>(A) Requisite Knowledge.</b> Types of ground cover fires, parts of ground cover fires, methods to contain or suppress, and safety principles and practices.</p> <p><b>(B) Requisite Skills.</b> The ability to determine exposure threats based on fire spread potential, protect exposures, construct a fire line or extinguish with hand tools, maintain integrity of established fire lines, and suppress ground cover fires using water.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Full Service Operations – Firefighter	Competency Met
All of NFPA 1001 – FF2 Competencies (except Hazmat and Medical Response) and with the addition of:	Yes <input type="checkbox"/> No <input type="checkbox"/>
Live Fire Exterior and Interior	Yes <input type="checkbox"/> No <input type="checkbox"/>
Hazmat Operations ( <i>NFPA core competencies plus 6.6.1.1.2</i> )	Yes <input type="checkbox"/> No <input type="checkbox"/>
<u>6.6.1.1.2</u> The operations level responder assigned to perform product control at hazardous materials/ WMD incidents shall be trained to meet all competencies at the awareness level ( <i>see Chapter 4</i> ), all core competencies at the operations level ( <i>see Chapter 5</i> ), all mission-specific competencies for personal protective equipment ( <i>see Section 6.2</i> ), and all competencies in this section.	Yes <input type="checkbox"/> No <input type="checkbox"/>

<b>Team Leader</b> <b>Exterior &amp; Interior</b>	<b>Competency Met</b>
<ul style="list-style-type: none"> <li>Can utilize any training provider, including internal, that meets the competencies of NFPA 1021 – Fire Officer Professional Qualifications [Playbook: Page 16, note 3]</li> </ul> <p><b>Completion of the Operational Firefighter requirements for <u>either</u> the Exterior or Interior Service Level <u>PLUS</u> the following Competencies from NFPA 1021:</b></p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Incident Command and Fire Attack</b></p> <p>NFPA 1021 4.1.1, 4.2.1, 4.2.2, 4.2.3</p>	
<p><b>4.1.1* General Prerequisite Knowledge.</b> The organizational structure of the department; geographical configuration and characteristics of response districts; departmental operating procedures for administration, emergency operations, incident management system and safety; fundamentals of leadership; departmental budget process; information management and recordkeeping; the fire prevention and building safety codes and ordinances applicable to the jurisdiction; current trends, technologies, and socioeconomic and political factors that affect the fire service; cultural diversity; methods used by supervisors to obtain cooperation within a group of subordinates; the rights of management and members; agreements in force between the organization and members; generally accepted ethical practices, including a professional code of ethics; and policies and procedures regarding the operation of the department as they involve supervisors and members.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.2.1</b> Assign tasks or responsibilities to unit members, given an assignment at an emergency incident, so that the instructions are complete, clear, and concise; safety considerations are addressed; and the desired outcomes are conveyed.</p> <p><b>(A) Requisite Knowledge.</b> Verbal communications during emergency incidents, techniques used to make assignments under stressful situations, and methods of confirming understanding.</p> <p><b>(B) Requisite Skills.</b> The ability to condense instructions for frequently assigned unit tasks based on training and standard operating procedures.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

<b>Team Leader</b> <b>Exterior &amp; Interior</b>	<b>Competency Met</b>
<p><b>4.2.2</b> Assign tasks or responsibilities to unit members, given an assignment under nonemergency conditions at a station or other work location, so that the instructions are complete, clear, and concise; safety considerations are addressed; and the desired outcomes are conveyed.</p> <p><b>(A) Requisite Knowledge.</b> Verbal communications under nonemergency situations, techniques used to make assignments under routine situations, and methods of confirming understanding.</p> <p><b>(B) Requisite Skills.</b> The ability to issue instructions for frequently assigned unit tasks based on department policy.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.2.3</b> Direct unit members during a training evolution, given a company training evolution and training policies and procedures, so that the evolution is performed in accordance with safety plans, efficiently, and as directed.</p> <p><b>(A) Requisite Knowledge.</b> Verbal communication techniques to facilitate learning.</p> <p><b>(B) Requisite Skills.</b> The ability to distribute issue-guided directions to unit members during training evolutions.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Pre-Incident Planning, Size-up and Incident Action Planning</b></p> <p>NFPA 1021 4.5.2, 4.5.3, 4.6, 4.6.1, 4.6.2</p>	

<b>Team Leader</b> <b>Exterior &amp; Interior</b>	<b>Competency Met</b>
<p><b>4.5.2</b> Identify construction, alarm, detection, and suppression features that contribute to or prevent the spread of fire, heat, and smoke throughout the building or from one building to another, given an occupancy, and the policies and forms of the AHJ so that a pre-incident plan for any of the following occupancies is developed:</p> <p>(1) Public assembly</p> <p>(2) Educational</p> <p>(3) Institutional</p> <p>(4) Residential</p> <p>(5) Business</p> <p>(6) Industrial</p> <p>(7) Manufacturing</p> <p>(8) Storage</p> <p>(9) Mercantile</p> <p>(10) Special properties</p> <p><b>(A) Requisite Knowledge.</b> Fire behavior; building construction; inspection and incident reports; detection, alarm, and suppression systems; and applicable codes, ordinances, and standards.</p> <p><b>(B) Requisite Skills.</b> The ability to use evaluative methods and to communicate orally and in writing.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.5.3</b> Secure an incident scene, given rope or barrier tape, so that unauthorized persons can recognize the perimeters of the scene and are kept from restricted areas, and all evidence or potential evidence is protected from damage or destruction.</p> <p><b>(A) Requisite Knowledge.</b> Types of evidence, the importance of fire scene security, and evidence preservation.</p> <p><b>(B) Requisite Skills.</b> The ability to establish perimeters at an incident scene.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.6* Emergency Service Delivery.</b> This duty involves supervising emergency operations, conducting pre-incident planning, and deploying assigned resources in accordance with the local emergency plan and according to the following job performance requirements.</p>	

<b>Team Leader</b> <b>Exterior &amp; Interior</b>	<b>Competency Met</b>
<p><b>4.6.1</b> Develop an initial action plan, given size-up information for an incident and assigned emergency response resources, so that resources are deployed to control the emergency.</p> <p><b>(A)* Requisite Knowledge.</b> Elements of a size-up, standard operating procedures for emergency operations, and fire behavior.</p> <p><b>(B)* Requisite Skills.</b> The ability to analyze emergency scene conditions; to activate the local emergency plan, including localized evacuation procedures; to allocate resources; and to communicate orally.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.6.2*</b> Implement an action plan at an emergency operation, given assigned resources, type of incident, and a preliminary plan, so that resources are deployed to mitigate the situation.</p> <p><b>(A) Requisite Knowledge.</b> Standard operating procedures, resources available for the mitigation of fire and other emergency incidents, an incident management system, scene safety, and a personnel accountability system.</p> <p><b>(B) Requisite Skills.</b> The ability to implement an incident management system, to communicate orally, to manage scene safety, and to supervise and account for assigned personnel under emergency conditions.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Fire Ground Accountability</b></p> <p>NFPA 1021 4.6.1, 4.6.2</p>	
<p><b>4.6.1</b> Develop an initial action plan, given size-up information for an incident and assigned emergency response resources, so that resources are deployed to control the emergency.</p> <p><b>(A)* Requisite Knowledge.</b> Elements of a size-up, standard operating procedures for emergency operations, and fire behavior.</p> <p><b>(B)* Requisite Skills.</b> The ability to analyze emergency scene conditions; to activate the local emergency plan, including localized evacuation procedures; to allocate resources; and to communicate orally.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.6.2*</b> Implement an action plan at an emergency operation, given assigned resources, type of incident, and a preliminary plan, so that resources are deployed to mitigate the situation.</p> <p><b>(A) Requisite Knowledge.</b> Standard operating procedures, resources available for the mitigation of fire and other emergency incidents, an incident management system, scene safety, and a personnel accountability system.</p> <p><b>(B) Requisite Skills.</b> The ability to implement an incident management system, to communicate orally, to manage scene safety, and to supervise and account for assigned personnel under emergency conditions.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

<p style="text-align: center;"><b>Team Leader</b></p> <p style="text-align: center;"><b>Exterior &amp; Interior</b></p>	<p style="text-align: center;"><b>Competency Met</b></p>
<p><b>Live Fire – Exterior</b> <i>(Recommended for Exterior Operations)</i></p> <p>NFPA 1001 5.3.7, 5.3.8, 5.3.10</p>	
<p><b>5.3.7*</b> Attack a passenger vehicle fire operating as a member of a team, given personal protective equipment, attack line, and hand tools, so that hazards are avoided, leaking flammable liquids are identified and controlled, protection from flash fires is maintained, all vehicle compartments are overhauled, and the fire is extinguished.</p> <p><b>(A) Requisite Knowledge.</b> Principles of fire streams as they relate to fighting automobile fires; precautions to be followed when advancing hose lines toward an automobile; observable results that a fire stream has been properly applied; identifying alternative fuels and the hazards associated with them; dangerous conditions created during an automobile fire; common types of accidents or injuries related to fighting automobile fires and how to avoid them; how to access locked passenger, trunk, and engine compartments; and methods for overhauling an automobile.</p> <p><b>(B) Requisite Skills.</b> The ability to identify automobile fuel type; assess and control fuel leaks; open, close, and adjust the flow and pattern on nozzles; apply water for maximum effectiveness while maintaining flash fire protection; advance 1½ in. (38 mm) or larger diameter attack lines; and expose hidden fires by opening all automobile compartments.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>5.3.8*</b> Extinguish fires in exterior Class A materials, given fires in stacked or piled and small unattached structures or storage containers that can be fought from the exterior, attack lines, hand tools and master stream devices, and an assignment, so that exposures are protected, the spread of fire is stopped, collapse hazards are avoided, water application is effective, the fire is extinguished, and signs of the origin area(s) and arson are preserved.</p> <p><b>(A) Requisite Knowledge.</b> Types of attack lines and water streams appropriate for attacking stacked, piled materials and outdoor fires; dangers — such as collapse — associated with stacked and piled materials; various extinguishing agents and their effect on different material configurations; tools and methods to use in breaking up various types of materials; the difficulties related to complete extinguishment of stacked and piled materials; water application methods for exposure protection and fire extinguishment; dangers such as exposure to toxic or hazardous materials associated with storage building and container fires; obvious signs of origin and cause; and techniques for the preservation of fire cause evidence.</p> <p><b>(B) Requisite Skills.</b> The ability to recognize inherent hazards related to the material's configuration, operate handlines or master streams, break up material using hand tools and water streams, evaluate for complete extinguishment, operate hose lines and other water application devices, evaluate and modify water application for maximum penetration, search for and expose hidden fires, assess patterns for origin determination, and evaluate for complete extinguishment.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

<b>Team Leader</b> <b>Exterior &amp; Interior</b>	<b>Competency Met</b>
<p><b>5.3.10*</b> Attack an interior structure fire operating as a member of a team, given an attack line, ladders when needed, personal protective equipment, tools, and an assignment, so that team integrity is maintained, the attack line is deployed for advancement, ladders are correctly placed when used, access is gained into the fire area, effective water application practices are used, the fire is approached correctly, attack techniques facilitate suppression given the level of the fire, hidden fires are located and controlled, the correct body posture is maintained, hazards are recognized and managed, and the fire is brought under control.</p> <p><b>(A) Requisite Knowledge.</b> Principles of fire streams; types, design, operation, nozzle pressure effects, and flow capabilities of nozzles; precautions to be followed when advancing hose lines to a fire; observable results that a fire stream has been properly applied; dangerous building conditions created by fire; principles of exposure protection; potential longterm consequences of exposure to products of combustion; physical states of matter in which fuels are found; common types of accidents or injuries and their causes; and the application of each size and type of attack line, the role of the backup team in fire attack situations, attack and control techniques for grade level and above and below grade levels, and exposing hidden fires.</p> <p><b>(B) Requisite Skills.</b> The ability to prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow and patterns; apply water using direct, indirect, and combination attacks; advance charged and uncharged 1½ in. (38 mm) diameter or larger hose lines up ladders and up and down interior and exterior stairways; extend hose lines; replace burst hose sections; operate charged hose lines of 1½ in. (38 mm) diameter or larger while secured to a ground ladder; couple and uncouple various handline connections; carry hose; attack fires at grade level and above and below grade levels; and locate and suppress interior wall and subfloor fires.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>Live Fire – Exterior &amp; Interior</b> <i>(Recommended for Interior Operations)</i></p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Risk Management Officer	Competency Met
<p><b>Completion of the Team Leader requirements for the Exterior Operations level PLUS the following courses (1 from each area):</b></p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p style="text-align: center;"><b>EITHER</b></p> <p><b>Incident Action Planning</b></p> <p>NFPA 1021 4.6.1, 4.6.2</p> <ul style="list-style-type: none"> <li>Requires a training program with subject matter covering areas such as strategies and tactics, fire ground command and emergency scene management [Playbook: Page 16, note 5]</li> </ul>	
<p><b>4.6.1</b> Develop an initial action plan, given size-up information for an incident and assigned emergency response resources, so that resources are deployed to control the emergency.</p> <p><b>(A)* Requisite Knowledge.</b> Elements of a size-up, standard operating procedures for emergency operations, and fire behavior.</p> <p><b>(B)* Requisite Skills.</b> The ability to analyze emergency scene conditions; to activate the local emergency plan, including localized evacuation procedures; to allocate resources; and to communicate orally.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.6.2*</b> Implement an action plan at an emergency operation, given assigned resources, type of incident, and a preliminary plan, so that resources are deployed to mitigate the situation.</p> <p><b>(A) Requisite Knowledge.</b> Standard operating procedures, resources available for the mitigation of fire and other emergency incidents, an incident management system, scene safety, and a personnel accountability system.</p> <p><b>(B) Requisite Skills.</b> The ability to implement an incident management system, to communicate orally, to manage scene safety, and to supervise and account for assigned personnel under emergency conditions.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p style="text-align: center;"><b>OR</b></p> <p><b>Incident Safety Officer</b></p> <p>NFPA 1521 6.1 – 6.7.2 (operational)</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>6.1 General Functions of the Incident Safety Officer.</b></p> <p><b>6.1.1*</b> The incident safety officer (ISO) shall be integrated with the incident management system (IMS) as a command staff member, as specified in NFPA 1561, <i>Standard on Emergency Services Incident Management System</i>.</p> <p><b>6.1.2*</b> Standard operating procedures (SOPs) shall define criteria for the response of a predesignated incident safety officer.</p>	

Risk Management Officer	Competency Met
<p><b>6.1.2.1</b> If the incident safety officer is designated by the incident commander, the fire department shall establish criteria for appointment based upon 6.1.1.</p> <p><b>6.1.3*</b> The incident safety officer and assistant incident safety officer(s) shall be readily identifiable at the incident scene.</p> <p><b>6.1.4*</b> Upon arrival or assignment as the incident safety officer at an incident, he or she shall obtain a situation-status briefing from the incident commander, that includes the incident action plan.</p> <p><b>6.1.5</b> The incident safety officer shall monitor the incident action plan, conditions, activities, and operations to determine whether they fall within the criteria as defined in the fire department's risk management plan.</p> <p><b>6.1.6</b> When the perceived risk(s) is not within the fire department's risk management criteria, the incident safety officer shall take action as outlined in Section 4.6.</p> <p><b>6.1.7</b> The incident safety officer shall monitor the incident scene and report to the incident commander the status of conditions, hazards, and risks.</p> <p><b>6.1.8</b> The incident safety officer shall ensure that the fire department's personnel accountability system is being utilized.</p> <p><b>6.1.9*</b> The incident safety officer shall offer judgment to the incident commander on establishing control zones and no entry zones and ensure that established zones are communicated to all members present on the scene.</p> <p><b>6.1.10</b> The incident safety officer shall evaluate motor vehicle incident scene traffic hazards and apparatus placement and take appropriate actions to mitigate hazards as described in Section 8.7 of NFPA 1500, <i>Standard on Fire Department Occupational Safety and Health Program</i>.</p> <p><b>6.1.11</b> The incident safety officer shall monitor radio transmissions and stay alert to transmission barriers that could result in missed, unclear, or incomplete communication.</p> <p><b>6.1.12*</b> The incident safety officer shall ensure that the incident commander establishes an incident scene rehabilitation tactical level management component during emergency operations.</p> <p><b>6.1.13*</b> The incident safety officer shall communicate to the incident commander the need for assistant incident safety officers and/or technical specialists due to the need, size, complexity, or duration of the incident.</p> <p><b>6.1.14</b> The incident safety officer or assistant incident safety officer shall survey and evaluate the hazards associated with the designation of a landing zone and interface with helicopters.</p> <p><b>6.1.15*</b> The incident safety officer shall recognize the potential need for critical incident stress interventions and notify the incident commander of this possibility.</p> <p><b>6.1.16</b> If the incident safety officer or an assistant safety officer needs to enter a hot zone or an environment that is immediately dangerous to life or health (IDLH), the incident safety officer or assistant safety officer shall be paired up with another member and check in with the entry control officer.</p>	
<p><b>6.2 Fire Suppression.</b></p> <p><b>6.2.1</b> The incident safety officer shall meet the provisions of Section 6.2 during fire suppression operations.</p>	

Risk Management Officer	Competency Met
<p><b>6.2.2*</b> The incident safety officer shall ensure that a rapid intervention team meeting the criteria in Chapter 8 of NFPA 1500, is available and ready for deployment.</p> <p><b>6.2.3</b> Where fire has involved a building(s) the incident safety officer shall advise the incident commander of hazards, collapse potential, and any fire extension in such building(s).</p> <p><b>6.2.4</b> The incident safety officer shall evaluate visible smoke and fire conditions and advise the incident commander, tactical level management component's (TLMC) officers, and company officers on the potential for flashover, backdraft, blow-up, or other events that could pose a threat to operating teams.</p> <p><b>6.2.5</b> The incident safety officer shall monitor the accessibility of entry and egress of structures and its effect on the safety of members conducting interior operations.</p>	
<p><b>6.3 Emergency Medical Service Operations.</b></p> <p><b>6.3.1</b> The incident safety officer shall meet the provisions of Section 6.3 during emergency medical service (EMS) operations.</p> <p><b>6.3.2</b> The incident safety officer shall ensure compliance with the department's infection control plan and NFPA 1581, <i>Standard on Fire Department Infection Control Program</i>, during emergency medical service operations.</p> <p><b>6.3.3</b> The incident safety officer shall ensure that incident scene rehabilitation and critical incident stress management are established as needed at emergency medical service operations, especially mass casualty incidents (MCIs).</p>	
<p><b>6.4 Technical Rescue.</b></p> <p><b>6.4.1</b> The incident safety officer shall meet the provisions of Section 6.4 during technical rescue operations.</p> <p><b>6.4.2*</b> In cases where a designated incident safety officer does not meet the technician-level requirements of NFPA 1006, <i>Standard for Rescue Technician Professional Qualifications</i>, the incident commander shall appoint an assistant incident safety officer or a technical specialist who meets the technician-level requirements of NFPA 1006 to assist with incident safety officer functions.</p> <p><b>6.4.3</b> The incident safety officer shall attend strategic and tactical planning sessions and provide input on risk assessment and member safety.</p> <p><b>6.4.4*</b> The incident safety officer shall ensure that a safety briefing is conducted and that an incident action plan and an incident safety plan are developed and made available to all members on the scene.</p>	
<p><b>6.5 Hazardous Materials Operations.</b></p> <p><b>6.5.1</b> The incident safety officer shall meet the provisions of Section 6.5 during hazardous materials operations.</p> <p><b>6.5.2*</b> In cases where a designated incident safety officer does not meet the technician-level requirements of NFPA 472, <i>Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents</i>, the incident commander shall appoint an assistant incident safety officer or a technical specialist who meets the technician-level requirements of NFPA 472 to assist with incident safety officer functions.</p> <p><b>6.5.3</b> The incident safety officer shall attend strategic and tactical planning sessions and provide input on risk assessment and member safety.</p>	

Risk Management Officer	Competency Met
<p><b>6.5.4*</b> The incident safety officer shall ensure that a safety briefing is conducted and that an incident action plan and an incident safety plan are developed and made available to all members on the scene.</p> <p><b>6.5.5</b> The incident safety officer shall ensure that control zones are clearly marked and communicated to all members.</p>	
<p><b>6.6 Accident Investigation and Review.</b></p> <p><b>6.6.1</b> Upon notification of a member injury, illness, or exposure, the incident safety officer shall immediately communicate this information to the incident commander to ensure that emergency medical care is provided.</p> <p><b>6.6.2</b> The incident safety officer shall initiate the accident investigation procedures as required by the fire department.</p> <p><b>6.6.3*</b> In the event of a serious injury, fatality, or other potentially harmful occurrence to a member, the incident safety officer shall request assistance from the health and safety officer.</p>	
<p><b>6.7 Post-Incident Analysis.</b></p> <p><b>6.7.1*</b> The incident safety officer shall prepare a written report for the post-incident analysis that includes pertinent information about the incident relating to health and safety issues.</p> <p><b>6.7.2*</b> The incident safety officer shall participate in the post incident analysis.</p>	
<p style="text-align: center;"><b>EITHER</b></p> <p>FCABC/LGMA: Effective Fire Service Administration</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p style="text-align: center;"><b>OR</b></p> <p>Beyond Hoses and Helmets, or equivalent (<i>administrative</i>)</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Company Fire Officer	Competency Met
Fire Officer 1 (NFPA 1021 in its entirety)	Yes <input type="checkbox"/> No <input type="checkbox"/>
Incident Command 200	Yes <input type="checkbox"/> No <input type="checkbox"/>
Fire Service Instructor 1 (NFPA 1041 Chapter 4)	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>4.1 General.</b>  <b>4.1.1</b> The Fire Service Instructor I shall meet the JPRs defined in Sections 4.2 through 4.5 of this standard.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.2 Program Management.</b>  <b>4.2.1 Definition of Duty.</b> The management of basic resources and the records and reports essential to the instructional process.	
<b>4.2.2</b> Assemble course materials, given a specific topic, so that the lesson plan and all materials, resources, and equipment needed to deliver the lesson are obtained.  <b>(A) Requisite Knowledge.</b> Components of a lesson plan, policies and procedures for the procurement of materials and equipment, and resource availability.  <b>(B) Requisite Skills.</b> None required.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.2.3</b> Prepare requests for resources, given training goals and current resources, so that the resources required to meet training goals are identified and documented.  <b>(A) Requisite Knowledge.</b> Resource management, sources of instructional resources and equipment.  <b>(B) Requisite Skills.</b> Oral and written communication, forms completion.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.2.4</b> Schedule single instructional sessions, given a training assignment, department scheduling procedures, instructional resources, facilities and timeline for delivery, so that the specified sessions are delivered according to department procedure.  <b>(A) Requisite Knowledge.</b> Departmental scheduling procedures and resource management.  <b>(B) Requisite Skills.</b> Training schedule completion.	Yes <input type="checkbox"/>  No <input type="checkbox"/>

Company Fire Officer	Competency Met
<p><b>4.2.5</b> Complete training records and report forms, given policies and procedures and forms, so that required reports are accurate and submitted in accordance with the procedures.</p> <p><b>(A) Requisite Knowledge.</b> Types of records and reports required, and policies and procedures for processing records and reports.</p> <p><b>(B) Requisite Skills.</b> Basic report writing and record completion.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.3 Instructional Development.</b></p> <p><b>4.3.1* Definition of Duty.</b> The review and adaptation of prepared instructional materials.</p>	
<p><b>4.3.2*</b> Review instructional materials, given the materials for a specific topic, target audience, and learning environment, so that elements of the lesson plan, learning environment, and resources that need adaptation are identified.</p> <p><b>(A) Requisite Knowledge.</b> Recognition of student limitations and cultural diversity, methods of instruction, types of resource materials, organization of the learning environment, and policies and procedures.</p> <p><b>(B) Requisite Skills.</b> Analysis of resources, facilities, and materials.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.3.3*</b> Adapt a prepared lesson plan, given course materials and an assignment, so that the needs of the student and the objectives of the lesson plan are achieved.</p> <p><b>(A)* Requisite Knowledge.</b> Elements of a lesson plan, selection of instructional aids and methods, and organization of the learning environment.</p> <p><b>(B) Requisite Skills.</b> Instructor preparation and organizational skills.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.4 Instructional Delivery.</b></p> <p><b>4.4.1 Definition of Duty.</b> The delivery of instructional sessions utilizing prepared course materials.</p>	
<p><b>4.4.2</b> Organize the classroom, laboratory, or outdoor learning environment, given a facility and an assignment, so that lighting, distractions, climate control or weather, noise control, seating, audiovisual equipment, teaching aids, and safety are considered.</p> <p><b>(A) Requisite Knowledge.</b> Classroom management and safety, advantages and limitations of audiovisual equipment and teaching aids, classroom arrangement, and methods and techniques of instruction.</p> <p><b>(B) Requisite Skills.</b> Use of instructional media and teaching aids</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Company Fire Officer	Competency Met
<p><b>4.4.3</b> Present prepared lessons, given a prepared lesson plan that specifies the presentation method(s), so that the method (s) indicated in the plan are used and the stated objectives or learning outcomes are achieved, applicable safety standards and practices are followed, and risks are addressed.</p> <p><b>(A)* Requisite Knowledge.</b> The laws and principles of learning, methods and techniques of instruction, lesson plan components and elements of the communication process, and lesson plan terminology and definitions; the impact of cultural differences on instructional delivery; safety rules, regulations, and practices; identification of training hazards; elements and limitations of distance learning; distance learning delivery methods; and the instructor's role in distance learning.</p> <p><b>(B) Requisite Skills.</b> Oral communication techniques, methods and techniques of instruction, and utilization of lesson plans in an instructional setting.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.4.4*</b> Adjust presentation, given a lesson plan and changing circumstances in the class environment, so that class continuity and the objectives or learning outcomes are achieved.</p> <p><b>(A) Requisite Knowledge.</b> Methods of dealing with changing circumstances.</p> <p><b>(B) Requisite Skills.</b> None required.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.4.5*</b> Adjust to differences in learning styles, abilities, cultures, and behaviors, given the instructional environment, so that lesson objectives are accomplished, disruptive behavior is addressed, and a safe and positive learning environment is maintained.</p> <p><b>(A)* Requisite Knowledge.</b> Motivation techniques, learning styles, types of learning disabilities and methods for dealing with them, and methods of dealing with disruptive and unsafe behavior.</p> <p><b>(B) Requisite Skills.</b> Basic coaching and motivational techniques, correction of disruptive behaviors, and adaptation of lesson plans or materials to specific instructional situations.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.4.6</b> Operate audiovisual equipment and demonstration devices, given a learning environment and equipment, so that the equipment functions properly.</p> <p><b>(A) Requisite Knowledge.</b> Components of audiovisual equipment.</p> <p><b>(B) Requisite Skills.</b> Use of audiovisual equipment, cleaning, and field level maintenance.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.4.7</b> Utilize audiovisual materials, given prepared topical media and equipment, so that the intended objectives are clearly presented, transitions between media and other parts of the presentation are smooth, and media are returned to storage.</p> <p><b>(A) Requisite Knowledge.</b> Media types, limitations, and selection criteria.</p> <p><b>(B) Requisite Skills.</b> Transition techniques within and between media.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

Company Fire Officer	Competency Met
<b>4.5 Evaluation and Testing.</b>  <b>4.5.1* Definition of Duty.</b> The administration and grading of student evaluation instruments.	
<b>4.5.2</b> Administer oral, written, and performance tests, given the lesson plan, evaluation instruments, and evaluation procedures of the agency, so that bias or discrimination is eliminated, the testing is conducted according to procedures, and the security of the materials is maintained.  <b>(A) Requisite Knowledge.</b> Test administration, agency policies, laws and policies pertaining to discrimination during training and testing, methods for eliminating testing bias, laws affecting records and disclosure of training information, purposes of evaluation and testing, and performance skills evaluation.  <b>(B) Requisite Skills.</b> Use of skills checklists and oral questioning techniques.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.5.3</b> Grade student oral, written, or performance tests, given class answer sheets or skills checklists and appropriate answer keys, so the examinations are accurately graded and properly secured.  <b>(A) Requisite Knowledge.</b> Grading methods, methods for eliminating bias during grading, and maintaining confidentiality of scores.  <b>(B) Requisite Skills.</b> None required.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.5.4</b> Report test results, given a set of test answer sheets or skills checklists, a report form, and policies and procedures for reporting, so that the results are accurately recorded, the forms are forwarded according to procedure, and unusual circumstances are reported.  <b>(A) Requisite Knowledge.</b> Reporting procedures and the interpretation of test results.  <b>(B) Requisite Skills.</b> Communication skills and basic coaching.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>4.5.5*</b> Provide evaluation feedback to students, given evaluation data, so that the feedback is timely; specific enough for the student to make efforts to modify behavior; and objective, clear, and relevant; also include suggestions based on the data.  <b>(A) Requisite Knowledge.</b> Reporting procedures and the interpretation of test results.  <b>(B) Requisite Skills.</b> Communication skills and basic coaching.	Yes <input type="checkbox"/>  No <input type="checkbox"/>
<b>Emergency Scene Management</b> (4.6.1, 4.6.2)	

Company Fire Officer	Competency Met
<p><b>4.6.1</b> Develop an initial action plan, given size-up information for an incident and assigned emergency response resources, so that resources are deployed to control the emergency.</p> <p><b>(A)* Requisite Knowledge.</b> Elements of a size-up, standard operating procedures for emergency operations, and fire behavior.</p> <p><b>(B)* Requisite Skills.</b> The ability to analyze emergency scene conditions; to activate the local emergency plan, including localized evacuation procedures; to allocate resources; and to communicate orally.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p><b>4.6.2*</b> Implement an action plan at an emergency operation, given assigned resources, type of incident, and a preliminary plan, so that resources are deployed to mitigate the situation.</p> <p><b>(A) Requisite Knowledge.</b> Standard operating procedures, resources available for the mitigation of fire and other emergency incidents, an incident management system, scene safety, and a personnel accountability system.</p> <p><b>(B) Requisite Skills.</b> The ability to implement an incident management system, to communicate orally, to manage scene safety, and to supervise and account for assigned personnel under emergency conditions.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>



# REPORT

To: Chair and Directors

Date: April 3, 2019

From: Deborah Jones-Middleton, Protective Services Manger

Subject: **Expansion of the Charlie Lake Fire Department**

## RECOMMENDATION #1:

That the Electoral Area Directors Committee recommend to the Regional Board that a public meeting be held for the properties in the Highway 29 North – Under 13 Km, Sawyer Road, Wolsey Sub and Old Hope Road area to determine their interest in being included into the Charlie Lake Fire Protection Service Area.

## BACKGROUND/RATIONALE:

At the February 16, 2017 Rural Budgets Administration Committee the following motion was carried:

“That the Rural Budgets Administration Committee commit from the Fair Share Feasibility funds, \$20,000, with \$10,000 from Electoral Area ‘B’ and \$10,000 from Electoral Area ‘C’ to conduct a feasibility study to examine expanding the Charlie Lake Rural Fire Protection Area.”

Dave Mitchell and Associates was hired to perform the feasibility study and provide recommendations. The feasibility study was presented to EADC on March 15, 2018. At that meeting the following resolution was carried:

“That the Electoral Area Directors’ Committee recommend to the Regional Board that staff report back to the Electoral Area Directors’ Committee regarding the areas that could be included in the Charlie Lake Fire Protection Area using the existing infrastructure, equipment and personnel. “

At the April 16, 2018 meeting staff provided a report to EADC providing feedback from the discussions with Director Sperling and Director Goodings to consider the areas that could be included in the Charlie Lake Fire Protection Area. The following resolutions were carried:

“That the Electoral Area Directors’ Committee recommend to the Regional Board that staff be directed to:

- a) work with the Electoral Area B and Electoral Area C directors to prepare for and organize a public meeting to discuss the potential expansion of the Charlie Lake Fire Protection Area;
- b) enter into discussions with the City of Fort St. John and the District of Taylor regarding the impact on mutual aid of expanding the Charlie Lake Fire Protection Area; and
- c) report back to the Electoral Area Directors Committee regarding the outcome of the public meetings, discussions with Fort St. John and Taylor, and options to move forward to a public approval process for expanding the Charlie Lake Fire Protection Area.”

Staff Initials:

Dept. Head:

CAO:

Page 1 of 4

At the August 16, 2018 meeting staff provided a report to the Electoral Area Directors' Committee outlining the following options for expansion of the Charlie Lake Fire Department Service Area:

### Option 1

Incorporate the nine new areas into the existing Charlie Lake Fire Protection Service Area as a boundary expansion and all properties pay the same rate(s). If the CLFD budget remains generally stable with typical 2% annual increases, then existing property owners will realize a savings of \$0.054/\$1,000.

### Option 2

Create a separate fire protection service area for the new properties that are further out and are less likely to receive a discount on their home insurance. In this case the Regional District could charge out the service at a reduced rate. For example 50% of the annual tax rate charged to the current Fire Protection Service Area.

### Option 3

Create two new separate fire protection service areas - one for properties within 13 km of the fire hall and one for properties further than 13 km from the fire hall. There is a better opportunity for residents within 13 km of the fire hall to negotiate a lower insurance cost than for residents that live further than 13km from the fire hall (see Map 2 attached for distance from the fire hall).

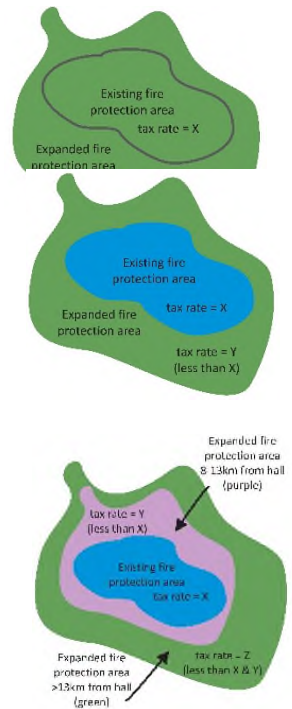
The following resolutions were carried:

"That the Electoral Area Directors' Committee recommend that the Board direct staff to:

- enter into discussions with Brant Tractor to determine access to their water cistern for firefighting response once the Charlie Lake Fire Department is staffed with a Chief and Deputy;
- enter into discussions with the City of Fort St. John regarding a Comprehensive Development Plan that would include not only zoning and land use matters but also the provision of services outside City boundaries, including but not limited to fire protection and water services as requested in their letter of June 28, 2018; and
- enter into discussions with the District of Taylor regarding the extension of Mutual Aid into the additional expansion areas once the Charlie Lake Fire Department is staffed with a Chief and Deputy; and report back to the Electoral Area Directors' Committee with the results of the discussions."

Staff met with Brant Tractor, who have advised that they are not in a position at this time to confirm Charlie Lake Fire Departments access to the water on site, however, once they have completed the building and have final approval they are willing to discuss the options further.

The District of Taylor staff have indicated that they would be willing to extend the Mutual Aid Agreement to include an expanded Charlie Lake Fire Department Service Area.



The City of Fort St. John has responded to the request for discussion of expanding the service area for Mutual Aid and improving the provision of water as follows:

“That, Council agree to enter into discussions with the Peace River Regional District regarding a **Comprehensive Development Plan** that would include not only zoning and land use matters but also the provision of services outside of City boundaries, including but not limited to fire protection and water services.”

## WATER

The most significant concern for Charlie Lake Fire Department is resourcing water in an efficient and timely manner. The current water hydrant at the Charlie Lake Fire Hall and the Charlie Lake School do not provide water a suitable flow rate, which delays the turnaround time for apparatus to return with water to continue the fire response.

Staff recommends that as areas are added to the Charlie Lake Fire Protection Service Area that funding be put into reserve to install water resources. The options are as follows:

- **Dry Hydrants on Charlie Lake:** Charlie Lake is very weedy and shallow, however, there may be a location or two on the lake that would allow for an efficient dry hydrant to be installed. The Regional District would have to obtain access either via a lease from the province or an easement on a resident’s property. The shallowness of the lake could mean that there are times of the year that water would not be accessible. The dry hydrants could be placed in strategic locations on both sides of the lake and they would support responses on properties in those areas.
- **Below Ground Water Tank:** The Regional District would have to obtain access to land either via a lease from the province or an easement on a resident’s property. The below ground water tanks are dug down below the frost line and require room above ground for apparatus access, the access must be maintained year round. The below ground water tanks can be placed strategically to ensure quick access in all areas.
- **CNRL Water Station:** CNRL has a water station with heated pump house on the east side of Charlie Lake just north of the existing boundary. CNRL is willing to meet with staff to determine their ability to provide access to the Charlie Lake Fire Department through agreement with the Regional District. This would be an excellent choice for water provision for fire response on the east side of Charlie Lake.

## EXPANSION OF THE CHARLIE LAKE FIRE PROTECTION SERVICES AREA

In determining the inclusion of an area and the rate to be charged the Electoral Area Directors may want to consider some principles such as:

- **Contiguous service:** It is important that there are no gaps in service area as they become confusing for homeowners, fire dispatchers and firefighters to navigate. To accomplish the goal of having contiguous service it is recommended to provide petitions to the areas directly adjacent to the existing fire protection area first. If those areas join the service area then the Regional District could provide petitions to the areas adjacent to the new fire protection area and so on.

Priority Order	Map ID #	Area
1	7	Highway 29 North – Under 13 Km
1	1	Sawyer Road
1	2	Wolsey Sub
1	8	Old Hope Road
2	7	Highway 29 North – Over 13 Km
2	3	250 Road
2	4	Welch Sub
3	5	Coffee Creek Sub
4	5	Coffee Creek Sub
5	6	Red Creek Sub

- **Availability of water:** Water is a very significant resource in the provision of fire protection services. Is the area close to a water source or can a water source be affordably installed to support response in the area.
- **Insurance discount:** Is it likely the property owner will be able to negotiate an insurance discount, the higher the potential discount for the area the higher the % of tax rate should be charged.
- **Distance of travel:** The further the distance from the fire hall the longer a response will take to initiate.
- **Affordability:** Is the cost of the service affordable.
- **Public interest:** Have the residents of the area indicated they are interested in receiving the service.

### ALTERNATIVE OPTIONS:

That the Electoral Area Directors Committee provide further direction.

### STRATEGIC PLAN RELEVANCE:

### FINANCIAL CONSIDERATION(S):

There will be costs to expanding the Charlie Lake Fire Protection Service Area such as:

- Installing water in strategic location to ensure timely and efficient delivery of water to the response.
  - dry hydrants: up to \$30,000 per installation;
  - below ground water tanks: between \$50,000 and \$100,000 per installation;
  - negotiated agreements with Brant Tractor and/or CNRL - costs unknown at this time.
- Hosting and advertising a public meeting approximately \$300 - \$1,000

### COMMUNICATIONS CONSIDERATION(S):

Delivery of post card invitations to the residents in the Highway 29 North – Under 13 Km, Sawyer Road, Wolsey Sub and Old Hope Road.

### OTHER CONSIDERATION(S):

Attachments:

1. Map indicating the proposed areas for inclusion in the Charlie Lake Fire Protection Service Area.
2. Proposed Expansion of the Charlie Lake Rural Fire Protection Area – April 5, 2018 Report
3. Charlie Lake Fire Department Update – August 7, 2018



# Charlie Lake Rural Fire Protection Potential Area -Recommendations

R-2

CHLK\_Potential\_Hydrant\_Locations

Type, Comment



Cistern



Brant's Tractors Location



Community



Electoral Area

Existing Fire Protection Area

Charlie Lake Fire Protection

Fort St John Rural Fire Protection

Taylor Rural Fire Protection

Roads

Hard Surface

Gravel

Seasonal

Other

Municipal Boundary

Parcels

Crown

Private



Study Area

FPA - Areas of Interest

1 - Sawyer Rd

2 - Wolsey Sub

3 - 250 Rd

4 - Welch Sub

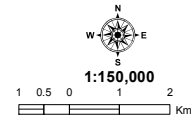
5 - Coffee Creek Sub

6 - Red Creek Sub

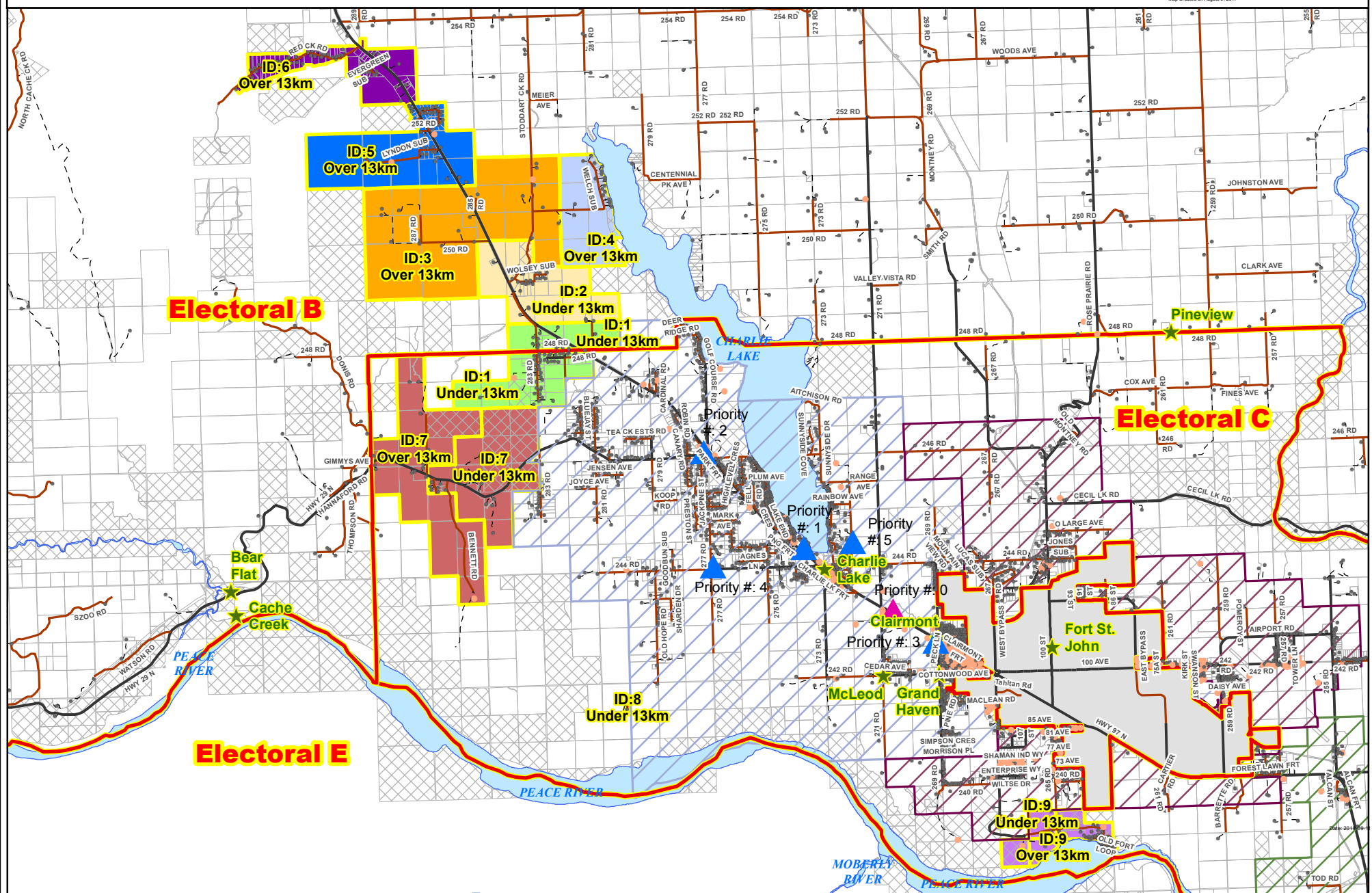
7 - Hwy 20 N

8 - Old Hope Rd

9 - Old Fort



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Map Created on August 9, 2017





# REPORT

To: Electoral Area Directors Committee

Date: April 5, 2018

From: Deborah Jones-Middleton, Protective Services Manager

**Subject: Proposed Expansion of the Charlie Lake Rural Fire Protection Area**

## RECOMMENDATION(S):

That the Electoral Area Directors Committee recommends to the Regional Board that staff be directed to:

1. Work with the Electoral Area B and Electoral Area C Directors to prepare for and organize a public meeting to discuss the potential expansion of the Charlie Lake Fire Protection Area;
2. Enter into discussions with the City of Fort St. John and the District of Taylor regarding the impact on mutual aid of expanding the Charlie Lake Fire Protection Area; and
3. Report back to the Electoral Area Directors Committee regarding the outcome of the public meetings, discussions with Fort St. John and Taylor, and options to move forward to a public approval process for expanding the Charlie Lake Fire Protection Area

## BACKGROUND/RATIONALE:

At the February 16, 2017 Rural Budgets Administration Committee the following motion was carried:

“That the Rural Budgets Administration Committee commit from the Fair Share Feasibility funds, \$20,000, with \$10,000 from Electoral Area ‘B’ and \$10,000 from Electoral Area ‘C’ to conduct a feasibility study to examine expanding the Charlie Lake Rural Fire Protection Area.”

Dave Mitchell & Associates was hired to perform the feasibility study and they have provided recommendations that were presented to the Electoral Area Directors Committee on March 15, 2018. At that meeting the following resolution was carried:

“That the Electoral Area Directors’ Committee recommend to the Regional Board that staff report back to the Electoral Area Directors’ Committee regarding the areas that could be included in the Charlie Lake Fire Protection Area using the existing infrastructure, equipment and personnel. ”

Staff met with Director Sperling and Director Goodings to consider the areas that could be included in the Charlie Lake Fire Protection Area using the existing infrastructure, equipment and personnel. The following areas were identified:

- |                          |                          |
|--------------------------|--------------------------|
| ➤ ID: 1 Sawyer Road      | ➤ ID: 6 Red Creek Sub    |
| ➤ ID: 2 Wolsey Sub       | ➤ ID: 7 Highway 29 North |
| ➤ ID: 3 250 Road         | ➤ ID: 8 Old Hope Road    |
| ➤ ID: 4 Welch Sub        | ➤ ID: 9 Old Fort         |
| ➤ ID: 5 Coffee Creek Sub |                          |

**April 16, 2018**

Staff Initials:

Dept. Head:

CAO:

Page 1 of 3

**Work Plan**

- Prepare information regarding the cost to taxpayers for fire protection services to residents based on the 2018 rate for Charlie Lake Fire Protection Area (service area) is \$0.618/\$1000 of converted land and improvement assessment. The highest rate over the last five years for the service area was \$0.875/\$1,000 of converted land and improvement assessment in 2013. The maximum taxation rate for service area is \$1.57/\$1,000 of converted land and improvement assessment.

The assessed value that could be added to the service area for each area is as follows:

Taxation is on Land & Improvements (Converted Hospital Assessment)									
Converted Assessments									
Area		Class 1	Class 2	Class 6	Class 9	Class 8	TOTAL	New Rate	Reduction
1	Sawyer Road	2,173,170	-	-	1,514	-	2,174,684	0.607930	0.010982
2	Wolsey Sub	982,570	-	-	2,422	-	984,992	0.613889	0.005023
3	250 Road	588,708	-	-	7,379	-	596,086	0.615862	0.003050
4	Welch Sub	426,828	-	-	5,018	-	431,845	0.616700	0.002212
5	Coffee Creek Sub	1,424,248	-	59,780	7,140	-	1,491,167	0.611339	0.007573
6	Red Creek Sub	2,001,740	56,910	-	633	-	2,059,283	0.608503	0.010409
7	Highway 29 North	818,410	-	-	7,941	-	826,351	0.614692	0.004220
8	Old Hope Road	64,500	-	-	-	-	64,500	0.618581	0.000331
9	Old Fort	2,927,830	-	-	-	-	2,927,830	0.604217	0.014695
Total		11,408,003	56,910	59,780	32,046	-	11,556,738	0.564700	0.054212

If all of the above areas were added in 2018 this would have reduced the current rate of \$0.618/\$1,000 of converted land and improvement assessment to \$0.5647 or provide \$18,432 more in funding to the Service Area.

- Organize a public meeting date and time at the Charlie Lake Community Hall.
- Enter into discussions with the City of Fort St. John and the District of Taylor regarding the impact of expanding the Charlie Lake Fire Protection Area.

**OPTIONS:**

That the Electoral Area Directors Committee provide other direction to staff.

**STRATEGIC PLAN RELEVANCE:**

- ☐ Ensure that the Solid Waste Management Plan is operating on a fiscally defensible basis.
- ☒ Ensure effective execution of Public Safety and Emergency Services initiatives.
- ☐ Foster Collaboration on services with municipalities and electoral areas.
- ☐ Establish a strategy for coordinated advocacy on identified issues.
- ☐ Manage parks and trails in the region.
- ☐ Support cultural industry within the regional district.
- ☐ Not Applicable to Strategic Plan.

---

**FINANCIAL CONSIDERATION(S):**

The cost of accomplishing the recommendation would be up to \$5,000 plus staff time to research the information and report back to the Electoral Area Directors Committee. The cost of the public engagement will come from the Charlie Lake Fire advertising and promotion budget.

**COMMUNICATIONS CONSIDERATION(S):**

A public engagement plan will be developed and will include:

- One to two mailouts to residents in the proposed expansion area describing the opportunity, potential costs and key considerations
- Public meeting

**OTHER CONSIDERATION(S):**

None

Attachments: Map identifying the proposed areas

**April 16, 2018**

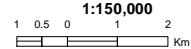
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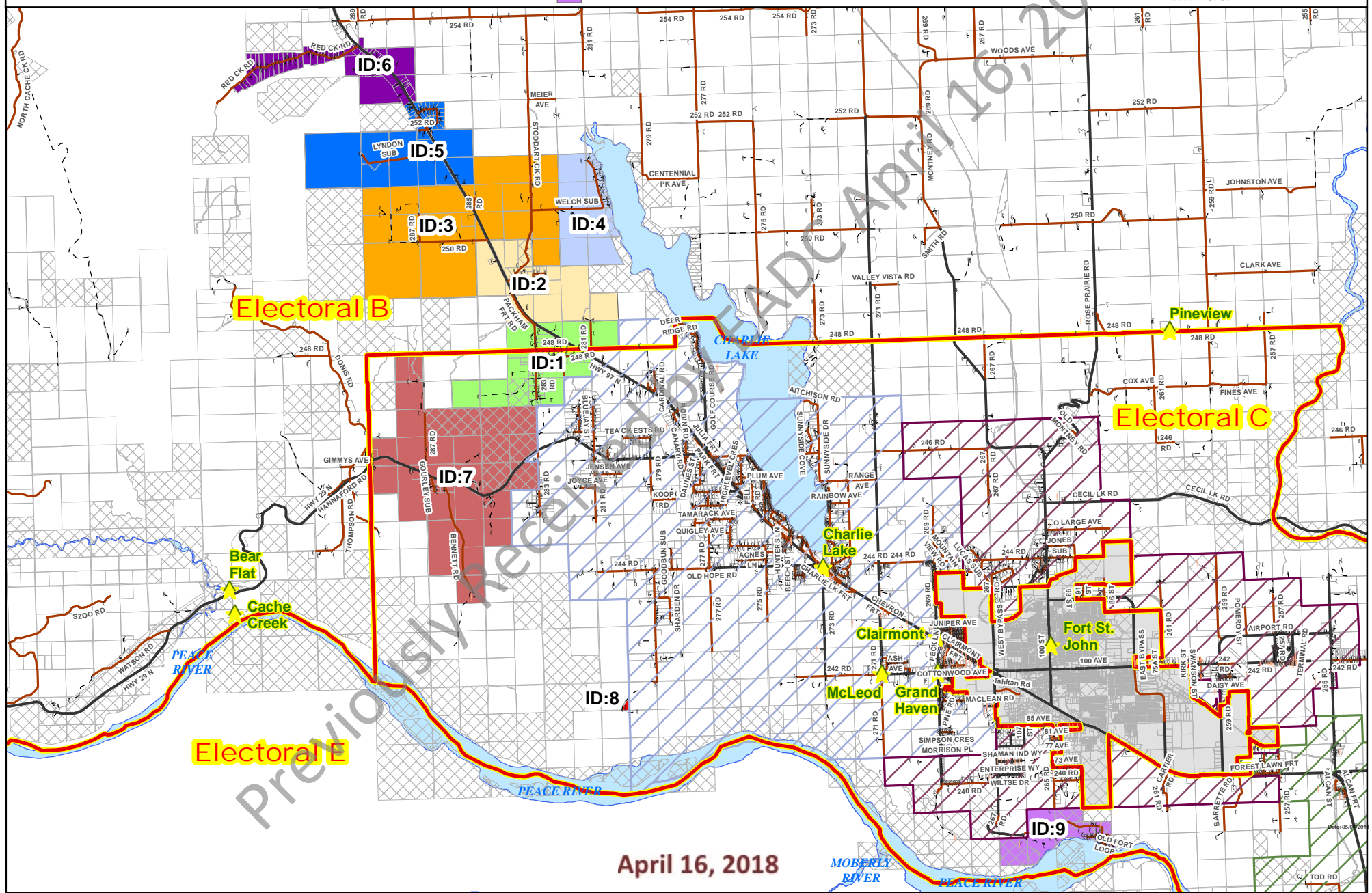
# Charlie Lake Rural Fire Protection Potential Area -Recommendations

R-2

- |   |                                    |   |   |  |  |
|---|------------------------------------|---|---|--|--|
| <b>Civic Address</b><br>Resident<br>Business<br>Community | <b>Parcels</b><br>Crown<br>Private | <b>Electoral Area</b><br>Municipal Boundary | <b>Roads</b><br>Hard Surface<br>Gravel<br>Seasonal<br>Other | <b>Existing Fire Protection Area</b><br>Charlie Lake Fire Protection<br>Fort St John Rural Fire Protection<br>Taylor Rural Fire Protection | <b>FPA - Areas of Interest</b><br>1 - Sawyer Rd<br>2 - Wolsey Sub<br>3 - 250 Rd<br>4 - Welch Sub<br>5 - Coffee Creek Sub<br>6 - Red Creek Sub<br>7 - Hwy 29 N<br>8 - Old Hope Rd<br>9 - Old Fort |
|---|------------------------------------|---|---|--|--|



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Map Created on August 9, 2017



April 16, 2018

April 9, 2019



# REPORT

To: Chair and Directors

Date: August 7, 2018

From: Deborah Jones-Middleton, Protective Services Manager

Subject: **Charlie Lake Fire Department Update**

## RECOMMENDATION #1:

1. That the Electoral Area Directors' Committee recommend that the Board direct staff to:
  - a. enter into discussions with Brant Tractor to determine access to the water cistern for fire fighting response once the Charlie Lake Fire Department is staffed with a Chief and Deputy;
  - b. enter into discussions with the City of Fort St. John regarding a Comprehensive Development Plan that would include not only zoning and land use matters but also the provision of services outside of City boundaries, including but not limited to fire protection and water services as requested in their letter of June 28, 2018;
  - c. enter into discussions with the District of Taylor regarding the extension of Mutual Aid into the additional expansion areas once the Charlie Lake Fire Department is staffed with a Chief and Deputy; and report back to the Electoral Area Directors' Committee with the results of the discussions.

## BACKGROUND/RATIONALE:

### Charlie Lake Fire Protection Review:

Staff presented the Dave Mitchell & Associates report titled "Charlie Lake Volunteer Fire Department Fire Protection Area Review" at the March 15, 2018 Electoral Area Directors' Committee (EADC) meeting. The EADC made the following recommendations:

### **EADC Recommendation 1 – Expansion of the Fire Protection Area**

*"That the Electoral Area Directors' Committee recommend to the Regional Board that staff report back to the Electoral Area Directors' Committee regarding the areas that could be included in the Charlie Lake Fire Protection Area using the existing infrastructure, equipment and personnel."*

### **Discussion**

Staff met with Director Sperling and Director Goodings to review the areas that could be included in the Charlie Lake Fire Protection Area using the existing infrastructure, equipment and personnel. The following nine areas were identified as potential expansion areas (see Map 1 attached):

- |                |                     |                     |
|----------------|---------------------|---------------------|
| 1. Sawyer Road | 4. Welch Sub        | 7. Highway 29 North |
| 2. Wolsey Sub  | 5. Coffee Creek Sub | 8. Old Hope Road    |
| 3. 250 Road    | 6. Red Creek Sub    | 9. Old Fort         |

Staff Initials:

Dept. Head:

CAO:

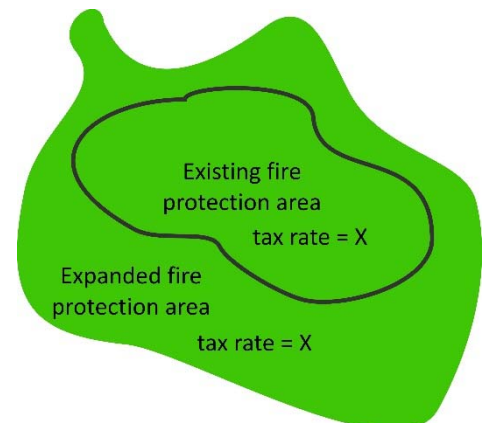
Page 1 of 7

The table shows the addition of all listed properties would result in an increase of \$11,556,738 in converted assessment for land and improvements. In 2018 this would have resulted in a decrease of \$0.054/\$1,000 or would have raised a further \$71,526 at the tax rate of \$0.62/\$1,000 in the 2018 budget.

Taxation is on Land & Improvements (Converted Hospital Assessment)				
Area		TOTAL Assessment	New Rate /\$1,000 Assessment	Reduction /\$1,000 Assessment
1	Sawyer Road	2,174,684	0.607930	0.010982
2	Wolsey Sub	984,992	0.613889	0.005023
3	250 Road	596,086	0.615862	0.003050
4	Welch Sub	431,845	0.616700	0.002212
5	Coffee Creek Sub	1,491,167	0.611339	0.007573
6	Red Creek Sub	2,059,283	0.608503	0.010409
7	Highway 29 North	826,351	0.614692	0.004220
8	Old Hope Road	64,500	0.618581	0.000331
9	Old Fort	2,927,830	0.604217	0.014695
<b>Total</b>		<b>11,556,738</b>	<b>0.564700</b>	<b>0.054212</b>
<b>2018 Budget</b>				
CLFD Converted Assessment is				120,380,605
CLFD 2018 Tax Requisition				745,050
CLFD Tax Rate per \$1,000 Assessment				0.618912
<b>Based on 2018 Budget</b>				
New Converted Tax Assessment				<b>131,937,343</b>
To raise the same requisition of \$745,050 the rate would have reduced to				<b>0.564700</b>
OR maintain the tax rate of \$0.618912 and raise				<b>816,576</b>

### Option 1

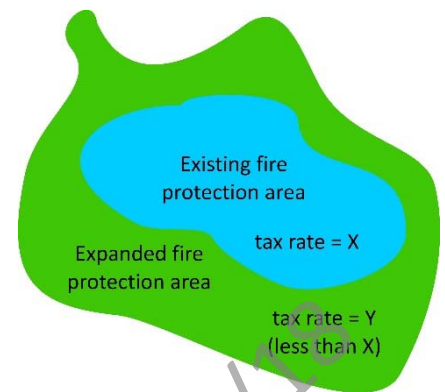
Incorporate the nine new areas into the existing Charlie Lake Fire Protection Service Area as a boundary expansion and all properties pay the same rate(s). If the CLFD budget remains generally stable with typical 2% annual increases, then existing property owners will realize a savings of \$0.054/\$1,000.



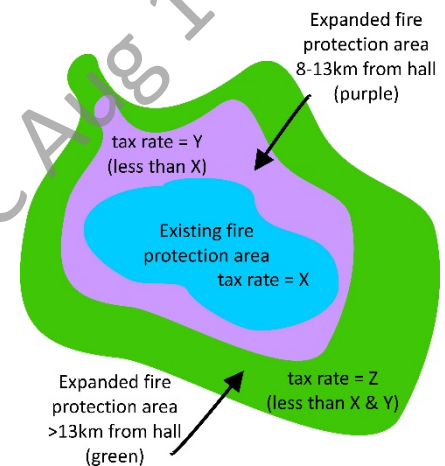
**Option 2**

Create a separate fire protection service area for the new properties that are further out and are less likely to receive a discount on their home insurance. In this case the Regional District could charge out the service at a reduced percentage rate of the annual rate paid by the existing service area. For example 50% of the annual tax rate charged to the current Fire Protection Service Area.

Note that only some of the properties in the “green” would receive a reduction on their insurance as a result of being served by a fire department.

**Option 3**

Create two new separate fire protection service areas - one for properties within 13 km of the fire hall and one for properties further than 13 km from the fire hall. There is a better opportunity for residents within 13 km of the fire hall to negotiate a lower insurance cost than for residents that live further than 13km from the fire hall (see Map 2 attached for distance from the fire hall).

**EADC Recommendation 2 – Water Supply**

*“That the Electoral Area Directors’ Committee recommend to the Regional Board that staff be directed to:*

1. *research the cost and locations of installing water sources in strategic locations within the current Charlie Lake Rural Fire Protection Area;*
2. *research the cost of implementing a Superior Tanker Shuttle Service for the Charlie Lake Rural Fire Protection Area; and*
3. *initiate discussions with the City of Fort St. John regarding the options and costs to utilize, improve and expand the fire hydrant system in the Charlie Lake Rural Fire Protection Area.”*

At the April 12, 2018 Board meeting the above resolutions were passed by the Board.

**Discussion****Cost and Locations of Potential Water Sources**

To address the issue of providing water efficiently the Fire Chief recommended installing a minimum of five dry hydrant cisterns with a minimum capacity of 24,000 gallons of water throughout the Fire Protection Area, over a five year period (see the blue triangles on the attached Map 1).

The Fire Chief recommended installing the first cistern at the Charlie Lake Fire Hall there are two options for this installation:

- 1 drilling a well that would provide consistent raw water supply to that cistern;
- 2 tapping into the existing water main that feeds the Charlie Lake Fire Hall to have the cistern continuously filled with potable water, this option will require entering into discussions with the City of Fort St. John.

The Charlie Fire Department land is owned by the Province, therefore, a decision to install a cistern on the property ~~would~~ be approved by the land owner.

The other four cisterns would be filled via water trucking companies when required. The cisterns are buried below the freezing level and provide a sealed space, therefore, water evaporation and freezing is very low to non-existent. Installation in the other four areas would require negotiating an easement with property owners.

Brant Tractor is currently installing a large well fed cistern (see pink triangle on attached Map 1). In preliminary discussions between the Fire Chief and Brant Tractor there was an indication they may grant access to Charlie Lake Fire Department to use the water for firefighting purposes upon completion of the building project, this would require further formal negotiations to confirm.

The capital and operating costs for installing the water sources is estimated as follows:

Project	Approximate Cost
<b>Capital Projects</b>	
Purchase 5 - 24,000 gallon cisterns	\$250,000
Install 5 cisterns	50,000
Drill well (20-50,000) depending on depth required	50,000
Tap into existing water main depending on location of water main	20,000
<b>Capital Investment over 5 years</b>	<b>\$320,000 to \$350,000</b>
<b>Annual Operating Costs</b>	
4 easements per annum <sup>1</sup>	10,000
Filling 4 cisterns per annum <sup>2</sup>	8,000
<b>Additional operating expense</b>	<b>\$18,000</b>

<sup>1</sup> based on what the PRRD pays for the North Pine TV Tower

<sup>2</sup> based on filling four 24,000 gallon tanks per annum

### Implementing a Superior Tanker Shuttle Service (STSS)

The Charlie Lake Fire Department now has three operational tenders:

- Tender 1 – 2014 Freightliner/Rosenbauer;
- Tender 2 – 1987 Ford 5000/Superior; and
- Tender 3 – 1996 International.

With three tenders to move water, the Charlie Lake Fire Department will be able to train for and execute the STSS, however, until all the tenders are under 20 years of age the Fire Underwriters Survey (FUS) will not accredit the department as a STSS service. Having the STSS accreditation may provide a further

discount on insurance premiums for residents in the Fire Protections Area, however, being able to provide the service with the apparatus already owned is a benefit in providing water efficiently. Further investigation will need to take place once the Department is fully staffed so that appropriate training and research can take place to determine the costs (such as purchasing more water tankers under the age of 20 years) and benefits of whether pursuing STSS accreditation is worthwhile.

### **Discussion with Fort St. John**

Staff phoned the City of Fort St. John on April 6, 2018 requesting a meeting to discuss the:

- current water supply to the Charlie Lake Fire Department;
- possibility of expanding the water supply further along the highway between Charlie Lake Fire Department and the City of Fort St. John;
- the impact of expanding the Charlie Lake Fire Protection Area on the existing Mutual Aid Agreement; and
- impact of expanding the services provided by Charlie Lake Fire Department to include road rescue within the Charlie Lake Fire Protection Area.

The following week the City of Fort St. John staff requested a letter outlining our request that they would take to their council.

On June 11, 2018 staff sent a letter to the City of Fort St. John formally requesting the meeting.

On June 28, 2018 The City of Fort St. John responded with a resolution from Council as follows:

"THAT, Council agree to enter into discussions with the Peace River Regional District regarding a Comprehensive Development Plan that would include not only zoning and land use matters but also the provision of services outside of City boundaries, including but not limited to fire protection and water services."

The letter expanding on the resolution is attached for your information. Please note that work on this project will require staff time and coordination from multiple departments – Community Services (fire, recreation, parks, etc.), Development Services and Environmental Services.

### **Impact to Mutual Aid**

The PRRD has existing mutual aid agreements with the City of Fort St. John and the District of Taylor, however, both of these agreements require that any changes to the portion of the Charlie Lake Protection Service Area shown on Schedule 'B' of the agreements requires the consent, in writing, of the City of Fort St. John and/or the District of Taylor to be considered included in the service area, and that if consent is not given in writing, primary mutual aid will not apply to the additional area and emergency resources will not be provided. The PRRD also has a mutual aid agreement with the District of Hudson's Hope, this agreement does not have the same provision.

During the wildfire events of April and May 2016 the Charlie Lake Fire Department, Taylor Fire Department and Hudson's Hope Fire Department were all deployed responding to wildfires within their fire protection areas. The City of Fort St John was the only department in the North Peace that was available to provide mutual aid and thus provides it to both Charlie Lake and Taylor. Staff is concerned that expanding the

existing fire protection area without having mutual aid resources to assist the Department may result in Charlie Lake not being able to provide the required service within the expanded fire protection area.

### **Further Updates**

#### **1) Feasibility Study**

The PRRD has engaged Dave Mitchell & Associates to do a feasibility study on all of Electoral Area 'C' and a portion of Electoral Area 'D'. The consultants travelled through the region with staff during the week of July 23<sup>rd</sup> and plan to have the report ready by mid-September. This study may offer further information on options for providing fire protection to the areas within Electoral Area 'C'.

#### **2) Staffing**

With both the Chief and Deputy Chief moving onto new positions, a number of projects have been put on hold at the hall. The following is a timeline associated with hiring new staff to date.

- April 26, 2018: Fire Chief submitted his resignation effective May 4<sup>th</sup>.
- May 4, 2018: Staff posted the position of Fire Chief that closed on June 8<sup>th</sup>. Staff interviewed three candidates.
- June 19, 2018: The Fire Chief position was awarded to Deputy Chief and staff posted the position of Deputy Fire Chief that closed on July 19<sup>th</sup>.
- July 16, 2018: New Fire Chief submitted his resignation effective August 3<sup>rd</sup>.
- July 17, 2018: Staff posted the position of Interim Fire Chief on the BC and Alberta Fire Chief's websites.
- July 20, 2018: Staff posted the position of Fire Chief that will close on August 13<sup>th</sup>.
- July 23, 2018: Interim Patrick McPhillips agreed to start on August 1<sup>st</sup>.
- August 7, 2018: Staff have conducted interviews and are currently assessing the candidates for Deputy Fire Chief position.
- August 13, 2018: Fire Chief position closes. Interviews will be arranged as soon as possible.

Start dates for both the Chief and Deputy will be dependent on the ability of the candidates to wrap up their current positions and move if required. As such a firm start date cannot yet be determined until candidates have been offered positions and they have accepted.

#### **3) Fire Apparatus**

In 2018 the Charlie Lake Fire Department budgeted \$700,000 to purchase a new engine and a new water tanker. Once the budget was approved staff started the process of drafting the specifications for the two apparatus in April. During this process it became clear that the budget would not allow the purchase of both apparatus. The increase in cost of steel and aluminum, due to the US trade issues, has decreased the PRRD's purchasing power for the apparatus.

Chief Widsten has developed a rough draft of specifications for a new engine. Tendering fire apparatus can have increased complexity and as such staff decided to hold off on the tendering process until the new Procurement Officer was hired to assist with the RFP process, which happen on July 23<sup>rd</sup>.

Now that Chief Widsten has resigned staff are waiting for the new Fire Chief and Deputy to start to review the specifications drafted by Chief Widsten to ensure they meet the needs of the department – that it is not overbuilt or underbuilt, can handle the rural terrain, etc. Staff hope to have the project posted for tender by year end.

**ALTERNATIVE OPTIONS:**

- 1) That the EADC provide further direction to staff.

**STRATEGIC PLAN RELEVANCE:**

- ☐ Ensure that the Solid Waste Management Plan is operating on a fiscally defensible basis.
- ☒ Ensure effective execution of Public Safety and Emergency Services initiatives.
- ☒ Foster Collaboration on services with municipalities and electoral areas.
- ☐ Establish a strategy for coordinated advocacy on identified issues.
- ☐ Manage parks and trails in the region.
  - ☐ Support the agricultural industry within the regional district.
- ☐ Not Applicable to Strategic Plan.

**FINANCIAL CONSIDERATION(S):**

Please see the above.

**COMMUNICATIONS CONSIDERATION(S):**

None at this time.

**OTHER CONSIDERATION(S):**

Attachments:

1. Letter from Fort St. John dated June 28, 2018
2. Charlie Lake Rural Fire Protection Potential Area – Recommendations – Map 1
3. Charlie Lake Rural Fire Protection Potential Area – Recommendations – Map 2



City of Fort St. John  
10631 100 Street | Fort St. John, BC | V1J 3Z5  
(250) 787 8150 City Hall  
(250) 787 8181 Facsimile

Peace River Regional District  
1981 Alaska Avenue  
Dawson Creek, BC  
V1G 4N4

June 28, 2018

Via email: [deborah.jones-middleton@prrd.bc.ca](mailto:deborah.jones-middleton@prrd.bc.ca)

Re: Discussions regarding the water supply to the Charlie Lake Fire Department and a portion of the Charlie Lake Fire Department and the City of Fort St. John/Peace River Regional District (Charlie Lake Fire Department) Mutual Aid Agreement

Dear Ms. Jones-Middleton,

Thank you for your letter dated June 11, 2018. Administration at the City discussed the PRRD request in a closed Council meeting on June 25<sup>th</sup>. Council passed the following resolution:

RESOLUTION NO. 39/18

"THAT, Council agree to enter into discussions with the Peace River Regional District regarding a **Comprehensive Development Plan** that would include not only zoning and land use matters but also the provision of services outside of City boundaries, including but not limited to fire protection and water services."

To provide you with more context, during Administration's discussions with Council, the four topics of discussion the PRRD had identified were acknowledged. However, it was felt that if we were to discuss and negotiate these four items it might be best and appropriate to enter into a broader discussion of a Regional Service Model. The PRRD's four items would then be discussed in the context of a Comprehensive Development Plan. In this way, both parties can come to a consensus on a full range of issues from hard infrastructure to fire services.

We will look forward to this opportunity to revisit and redevelop such a plan.

Sincerely,

Dianne Hunter  
City Manager



# Charlie Lake Rural Fire Protection Potential Area -Recommendations

R-2

CHLK\_Potential\_Hydrant\_Locations

Type of Hydrant  
# Claim  
# Brand Tractor Location

## Attachment 2

Existing Fire Protection Areas

Resident  
Business

Existing Fire Protection Areas

Charlie Lake Fire Protection  
Flat 5 Local Fire Protection  
Taylor Lake Fire Protection

Roads

Hard Surface  
Gravel  
Seasonal  
Other

Permits

Crown  
Private  
Municipal/secondary

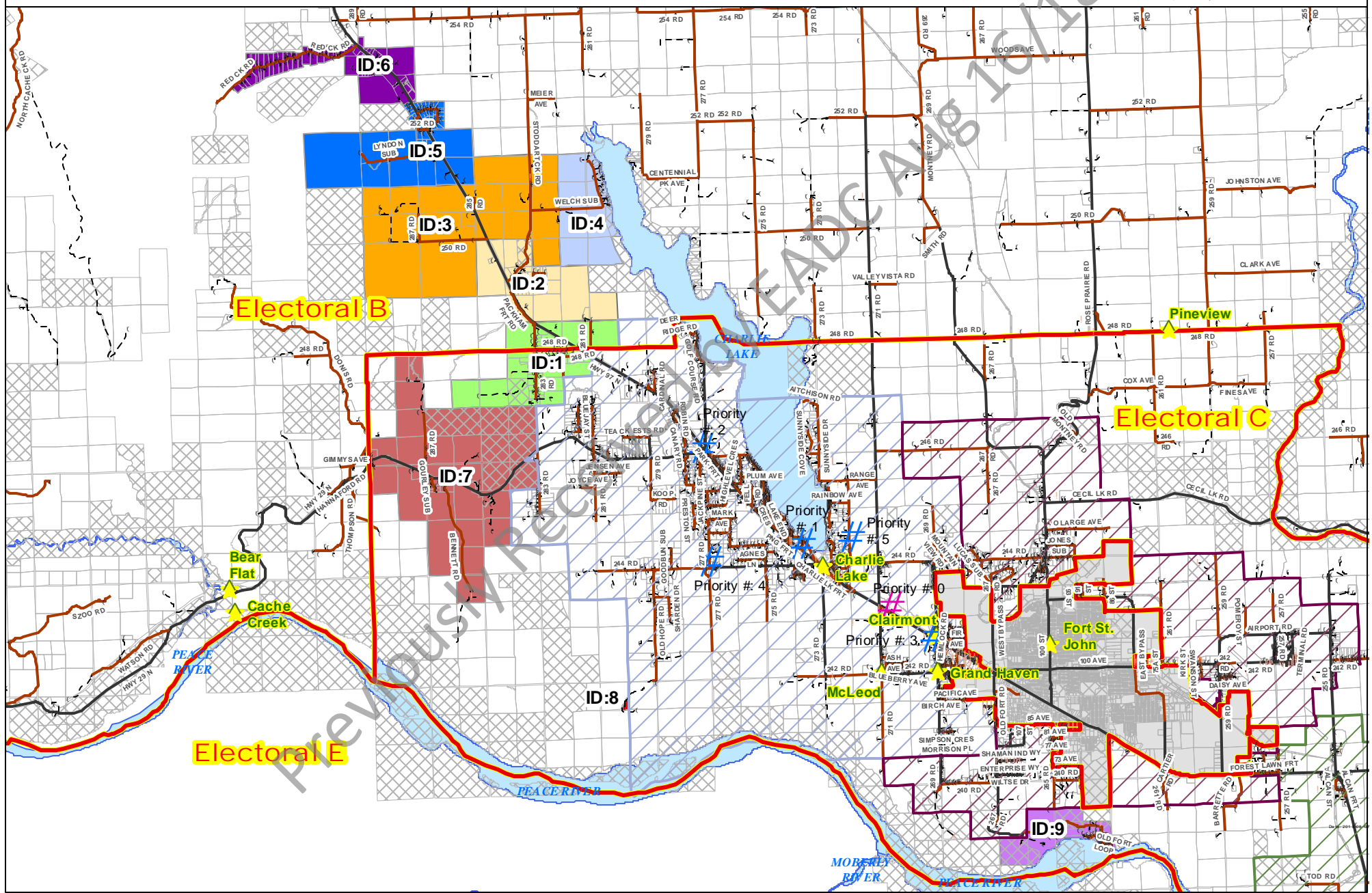
PPA - Areas of Interest

1-5 larger R/d  
2-Water Sub  
3-250 Rd  
4-Welch Sub  
5-Cache Creek Sub  
6-Rad Creek Sub  
7-Hwy 25N  
8-Oldhope Rd  
9-Oldfort

MAP 1

1:150,000  
0 0.5 1 2 Km

Prepared and produced by the Peace River Regional District (PRRD). Data used: 2016, 2017. Any inquiries may be directed to the PRRD.  
Jurisdiction of the maintenance and naming of roads belongs to the B.C. Ministry of Transportation and Infrastructure (MOTI).  
Disclaimer: All except roads and buildings are from Terrain Resource Information Management (TRIM) of the B.C. Ministry of Environment, Lands and Parks (MELP).  
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Map Created on August 9, 2017

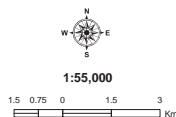


Attachment 3

# Charlie Lake Rural Fire Protection Potential Area -Recommendations

## MAP 2

- |  |  |  |   |   |
|--|--|--|---|---|
| <ul style="list-style-type: none"> <li>Community</li> <li>Civic Address                     <ul style="list-style-type: none"> <li>Resident</li> <li>Business</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Roads                     <ul style="list-style-type: none"> <li>Hard Surface</li> <li>Gravel</li> <li>Seasonal</li> <li>Other</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Municipal Boundary</li> <li>Parcels                     <ul style="list-style-type: none"> <li>Crown</li> <li>Private</li> </ul> </li> <li>Electional Area</li> </ul> | <ul style="list-style-type: none"> <li>Existing Fire Protection Area                     <ul style="list-style-type: none"> <li>Charlie Lake Fire Protection</li> <li>Fort St John Rural Fire Protection</li> <li>Taylor Rural Fire Protection</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Recommendations                     <ul style="list-style-type: none"> <li>Recommended</li> <li>Recommended 13K</li> <li>Recommended 15K</li> <li>Not Recommended</li> </ul> </li> </ul> |
|--|--|--|---|---|



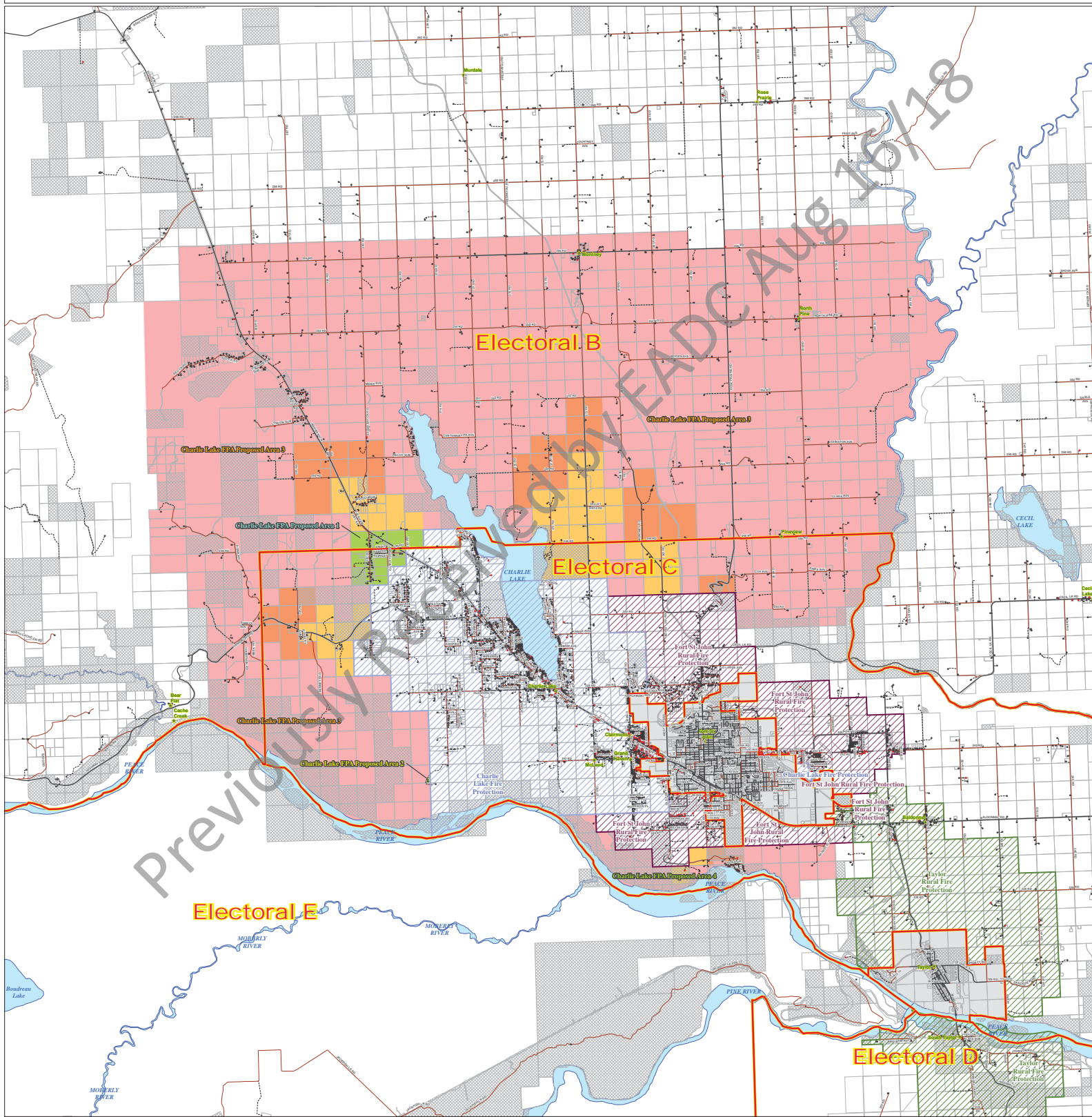
Prepared and produced by the Peace River Regional District (PRRD), Greater Peace R.C. Any inquiries may be directed to the PRRD.

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Boundaries show except roads and buildings are from Terrestrial Resource Information Management (TRIM 4) of the BC Ministry of Environment, Land and Parks (MELP).

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Map Created on August 9, 2017





# REPORT

To: Chair and Directors

Date: April 5, 2019

From: Deborah Jones-Middleton, Protective Services Manager

**Subject: Peace River Regional District Flood Risk Assessment Report**

## RECOMMENDATION #1:

That the Electoral Area Directors Committee receive the report titled 'Peace River Regional District Flood Risk Assessment Report' for discussion.

## BACKGROUND/RATIONALE:

The Peace River Regional District received funding from the Government of Canada and British Columbia National Disaster Mitigation Program' – Stream 1 – Risk Assessment projects, to complete flood risk assessments in Chetwynd Fringe, Pouce Coupe – Tomslake, and Moberly Lake.

DWB Consulting was hired to complete the Flood Risk Assessment for the three areas. The projects were completed in January 2019 and the final report was provided to the Emergency Executive Committee at the February 7, 2019 meeting.

At the February 7, 2019 Emergency Executive Committee the following resolution was carried:

"That the Emergency Executive Committee recommends to the Regional Board that the 2019 Flood Risk Assessment Report, dated January 23, 2019, prepared by DWB Consulting Services, be forwarded to the Electoral Area Directors' Committee for consideration of the report recommendations."

A full copy of the report is attached for your reference. The following is an excerpt from the Peace River Regional District Flood Risk Assessment Report provided by DWB Consulting.

## 7.0 CONCLUSION

The areas surrounding the Chetwynd Fringe, Moberly Lake, and Pouce Coupe/Tomslake within the Peace River Regional District (PRRD) have experienced several severe flooding events. Most recently, the 2011 and 2016 flood events caused significant damage to private, corporate and public infrastructure in the area. Highway 97 and Highway 27 were both affected by the events and at some points were shut down due to damage from flooding. These flood events not only directly affect the health and safety of the local residences, they affect property, businesses, and infrastructure. Significant monies has been spent in the region as part of flood relief, repair and mitigation works.

Currently, there is no floodplain mapping or mitigation planning done in the study area. Due to the severity of the events that the PRRD has seen in the past it is crucial to create thorough floodplain mapping and develop mitigation plans to ensure the health and safety of residents and protect properties and infrastructure from possible damage in potential future flood events. The UBCM CEPF funding is intended to assist government bodies to develop flood maps that address flood risks identified in the flood risk assessment. Creating these flood maps may include the acquisition of elevation data and mapping, plotting of historical flood data and inundation mapping, hydrologic and

Staff Initials:

Dept. Head:

CAO:

Page 1 of 3

hydraulic information to calculate flood elevations for selected flood events, geospatial mapping and modelling activities, and identifying locations of structures, people and assets that might be affected by flooding.

Through an extensive review of historical data and a thorough field reconnaissance DWB was able to complete a flood risk assessment on the area in order to submit a funding application through UBCM CEPF for further flood mapping and mitigation planning. As part of the field reconnaissance UAV survey was performed on potential flood risk areas (as defined in section 6.5 of this report). The UAV survey data was used to create preliminary maps and further assess potential hazards areas. The survey data can be used to create 3D images of the area including all elevation data and can be used to assist in further flood mapping efforts. DWB worked identifying and reviewing the potential flood hazards, defining a risk event used as the basis of assessment for future flooding, reviewing responders of the previous events, and defining the characteristics of the area by flooding and meteorological and seasonal conditions. DWB completed a NDMP Risk Assessment Information Template (RAIT), and created preliminary maps. This flood risk assessment can be used to assist in developing planning and mapping tools to help mitigate future flood events. Public consultation with the local residents is invaluable to determining the areas of potential flood risk and understanding the extent of damages that have occurred in the past. This information is vital for moving forward with floodplain mapping, and mitigation planning to ensure the health and safety of the residents and the infrastructure in the area is protected.

There multiple potential flood risk areas in the region and more study needs to be done to understand the details including population assets. The Union of BC Municipalities – Community Emergency Preparedness Fund(UBCM CEPF) has funding available for flood mapping, and mitigation planning, tools that can be used to reduce the impact of future flood events. DWB has written an application for funding through the UBCM CEPF as part of the works with the PRRD including a work plan and cost estimate, PRRD Flood Mapping Development – Work Plan (DWB, 2019).

## **8.0 RECOMMENDATIONS AND NEXT STEPS**

The following list provides the recommendations that are considered essential for the region and include but are not limited to:

- PRRD should have regulations to limit or control development in the floodplains.
- Develop flood risk and community plans including make changes to the response plans to ensure they account for the results.
- Watershed study to examine the debris effects.
- Land use regulations especially Chetwynd corridor and upper reaches of the creeks.
- Development of acceptable adaptation tools and models for prediction and standards that should be followed in the region and adopted for the purposes of planning and design.
- Determination of appropriate flood frequency for design and development –Q100or Q200or whatever is deemed appropriate.
- Recovery planning for residents by PRRD should be formulated. Policy should be developed for what can be done to help post flooding and post event with better warning systems for flood risk including evacuation order.
- More hydrometric stations including policy or agreements with MoTI or MFLNRORD.
- The funding will be used to address the flood risk as identified by a flood risk assessment. This will include:

- Acquisition of elevation data and mapping,
- Hydrologic and hydraulic information to calculate flood elevation for selected flood events,
- Geospatial, mapping and modelling activities,
- Identifying locations of structures, people, and assets that might be affected by flooding.
- First Nations consultation will be a major part of the next phases of the project, around Moberly Lake the two First Nations groups that will be involved with the consultation are Moberly Lake First Nations and the Sauteau First Nations Band.
- Continued Public Consultation.
- Floodplain Mapping.
- Mitigation Planning.

#### **ALTERNATIVE OPTIONS:**

That the Electoral Area Directors Committee provide direction.

#### **STRATEGIC PLAN RELEVANCE:**

#### **FINANCIAL CONSIDERATION(S):**

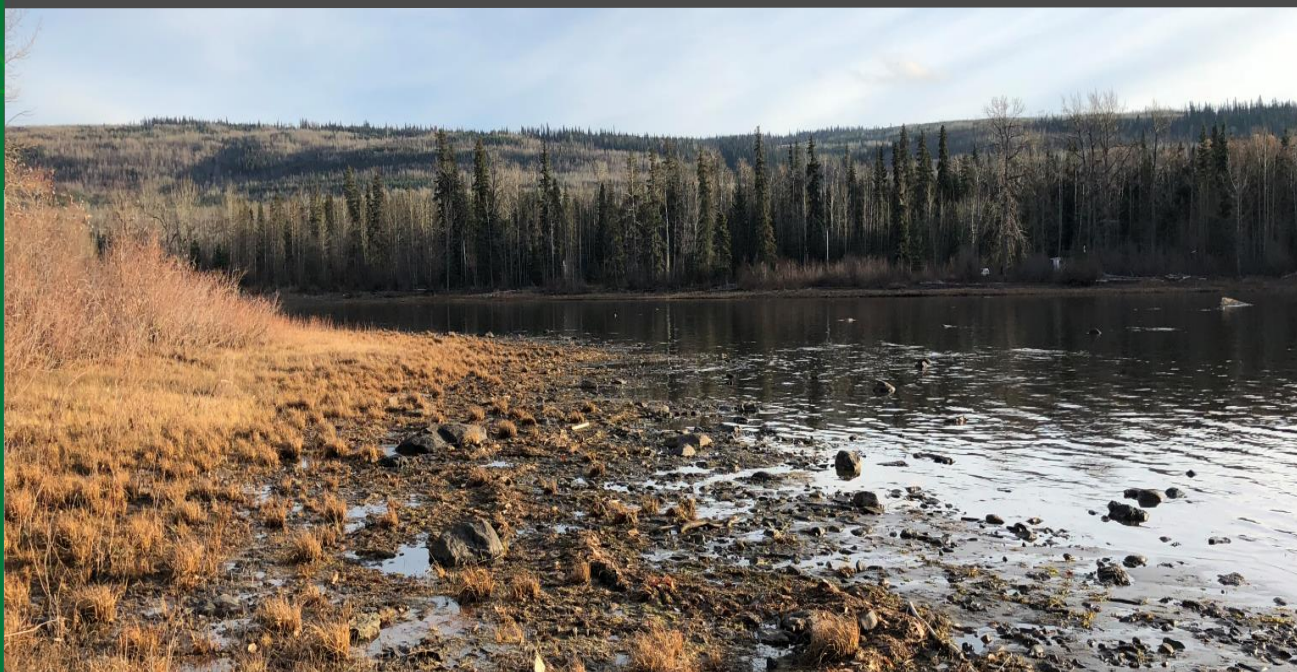
#### **COMMUNICATIONS CONSIDERATION(S):**

#### **OTHER CONSIDERATION(S):**



DWB Consulting Services Ltd.

# Peace River Regional District Flood Risk Assessment



Prepared for: Peace River Regional District  
Attn: Deborah Jones-Middleton



PEACE RIVER REGIONAL DISTRICT

Prepared by: DWB Consulting Services Ltd.  
Prince George Division  
1579 – 9th Avenue, Prince George, BC, V2L 3R8  
250.562.5541 | [www.dwbconsulting.ca](http://www.dwbconsulting.ca)

Date: January 23<sup>rd</sup> 2019 | DWB file: 18347-324 | Revisions: A



OQM | Organizational Quality  
Management Program

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We do not represent, warrant, undertake or guarantee:

- That all project information has been received.
- That regulations and standards of practices shall remain constant through the duration of the project.
- That the use of guidance in the report will lead to any particular outcome or result; or, in particular,
- That by using the guidance in the report, the client will be approved by the contract holder for the applied works.

# Signature Page

DWB Consulting Services Ltd. is pleased to submit this report for your review. This report has been prepared using sound technical and professional judgement, based on our knowledge and experience, applicable regulatory framework, industry best management practices, and current understanding of project conditions, design, and project setting.

Report Title: Peace River Regional District Flood Risk Assessment

Prepared For: Peace River Regional District

Revision: A

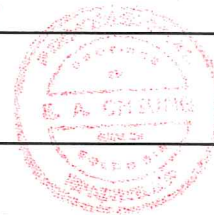
Written By:

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Reviewed By:

Emily Cheung, MASC, P.Eng, FEC



REVISION HISTORY			
Date	Version	Review Type <sup>1</sup>	Reviewed by (Name, Company)
21/12/18	DRAFT	Professional	Emily Cheung, DWB Consulting Services Ltd. (DWB)

<sup>1</sup> Editorial Review: Reviewed for formatting, grammar, spelling, etc.

Professional Review: Reviewed for content and professional signoff

Client Review: Reviewed by client

Regulatory Review: Reviewed by regulatory agency (i.e. DFO) if necessary

Peer Review: Reviewed for content and errors by peer

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## 1.0 INTRODUCTION

The Peace River Regional District (PRRD) has retained DWB Consulting Services Ltd. (DWB) to prepare a Flood Risk Assessment Report and Union of BC Municipalities - Community Emergency Preparedness Fund (UBCM CEPF) Application for funding the Flood Mapping proposed works in and around the Chetwynd, Moberly Lake, and Pouce Coupe/ Tomslake areas of the PRRD. In this report, the study areas are presented in geographical order, approximately west to east and not by degree of importance. The study area covers the Chetwynd Fringe (along Highway 97 west of Chetwynd to Willow Flats), Moberly Lake, and Pouce Coupe/Tomslake areas of the PRRD.

### 1.1 PROJECT OVERVIEW

In the past, areas within the PRRD surrounding Chetwynd, Moberly Lake, and Pouce Coupe have experienced several severe flooding events that resulted in substantial damage to infrastructure including highways, access roads, railways, a school, residences, and businesses. Most recently, the 2011 and 2016 floods caused significant damage in the PRRD requiring extensive repairs and continuing work to mitigate future flood risks. Flooding in the region is mainly caused by heavy rainfall during the freshet period. Debris and sedimentation issues continue to plague all of the areas within the project scope.

Currently, federal and provincial governments have taken initiatives and encouraged municipalities to identify the main causes of flooding, and develop or modernize flood maps to accurately determine their vulnerabilities in relation to flood risks identified by a flood risk assessment. In return, the provincial government provides some support to the municipalities for the development of the flood maps.

### 1.2 PROJECT OBJECTIVE

The objective of this project is to identify the primary causes of flooding in the Chetwynd, Moberly Lake, and Pouce Coupe areas within the PRRD and to develop a basis for flood mapping to address the flood risk identified by the flood risk assessment. As part of the project DWB was asked to:

- Provide a summary of historical flooding including historical events, flood risk, impact, and recovery.
- Provide a preliminary map showing areas that have historically been effected by flooding in the area and may be effected by future flooding (based on the available information from 2011 and 2016 floods).
- Assist in the development of a funding application to UBCM CEPF for future flood mapping.

As part of the flood risk assessment DWB was asked to:

- Identify flood hazards, compounding hazards, potential flooding areas, and characteristics of the areas.
- Perform a likelihood assessment including meteorological and seasonal conditions, climate change impacts.
- Provide maps of potential future flood risk area.
- Identify vulnerabilities and the social, economic and environmental impacts that potential future flood events could have on the communities within the study area.
- Identify the community resilience in the study area.

## 1.3 PROJECT LIMITATIONS

The works completed were limited by the scope of the project set out in the contribution agreement. The project limitations included:

- Flood Risk assessment primarily based on review of historical events, desk top study and field reconnaissance.
- No floodplain mapping, modelling, detailed quantitative analysis has been completed. This is a preliminary flood risk assessment aiming to apply for funding to prepare detailed floodplain mapping.
- Detailed assets, population, land use of the potential impact areas are preliminary estimates as floodplain analysis and mapping has not been completed.
- Impact from debris obstructing the channel is not included and may increase the size of the potential impacted areas.
- Site reconnaissance did not include flood assessments or a full flood risk evaluation.

## 2.0 METHODOLOGY

### 2.1 REVIEW OF EXISTING INFORMATION

To complete the project tasks and to understand the works carried out in the project areas, substantial effort was spent on the review of historical information. PRRD provided relevant information that was reviewed and considered for the flood risk assessment. Federal, provincial and municipal legislations and the guidelines were also reviewed. Events before 2011 as found in D. Septer's Flooding and Landslide Events in Northern British Columbia 1820-2006, the 2011, and the 2016 flood events were reviewed extensively. Similarly, rainfall and discharge data sets observed at different climate stations and Water Survey of Canada (WSC) gauging stations in the area were reviewed. Rainfall data for the 2011 and 2016 flood events is presented in Appendix B of the report and reviewed in the respective flood events sections. The WSC stream flow gauge annual maximum and minimum daily discharge show a clear spike in the data for 2011 that is 8-9 times the average for the Pouce Coupe River below Henderson Lake, and the Moberly River near Fort St. John had a daily discharge spike that is 2-3 times the average in 2011. The annual maximum and minimum daily discharge data for the Pine River at East Pine shows a spike in the data in 2016 that is approximately 2 times the average and shows multiple historical events with spikes ranging from 2-3 times the average. A summary of the review efforts can be found in Section 3.0 of this report.

### 2.2 UTILITIES AND INFRASTRUCTURE

Flooding poses a large threat to utilities and infrastructure in the study area. Many utilities run through the Highway 97 corridor including transmission lines as well as oil and gas pipelines. It is vital to the communities to protect utilities in a flood event to ensure resident safety and reduce the environmental impact of flood events. All utilities that run through the Highway 97 corridor run across the drainages within the study area and should be taken into consideration during the next phases of works.

Moving forward, bridges and culverts should be a main concern with flood mapping and mitigation planning. Recently, 7 bridges have been installed in the Chetwynd fringe to replace culverts; the bridges were designed to meet the changing hydraulic requirements of the drainages in the area and allow large woody debris (LWD) and other debris to pass in a rain event. Along with vehicle bridges, the rail line runs downstream and parallel to Highway 97 creating significant corridor challenges. Residents have expressed their concerns about the rail lines, noting that culverts are often undersized or non-existent posing a significant threat of flooding during high intensity rainfall events.

Residents in the Tomslake area expressed their concerns that during flood events all the bridges in the area become plugged with LWD and compound the flooding issues. The bridges in the Tomslake and Swan Lake areas are potentially undersized for the predicted size of future rainfall and spring runoff events. The trestle rail bridge near Pouce Coupe could be at risk in the event of a significant flood event and should be closely looked at in further studies.

## 2.3 FIELD RECONNAISSANCE

As part of the flood risk assessment, field reconnaissance was conducted in October 2018 to visit residences and infrastructures that may be impacted by potential future flooding events and not previously worked on in the 2016 mitigation works. The field reconnaissance areas were determined by reviewing the documents that recorded the flooding extents located within the project scope areas during the 2011 and 2016 floods. DWB also reviewed the satellite imagery and Google Earth elevation information to include infrastructure where no reports were available but may be within the potential future flood risk area.

Field reconnaissance included UAV survey and ground site visits. The purpose of UAV survey was to produce an up-to-date aerial imagery of potential future flood risk areas, where the impact of flooding may be significant (i.e. multiple structures are within the flood risk area) and to better understand the zones of flood risk. The aerial imagery produced from the UAV surveys can be found in Appendix E. Ground site visits were conducted at other areas where potential future flood risk could not easily be determined from the use of satellite imagery only, or where potential future flood risk was present for a single infrastructure.

## 3.0 REVIEW OF HISTORICAL EVENTS

### 3.1 EVENTS BEFORE 2011

A summary of the historical information on weather events and their impacts, for the period from 1820-2006 is presented in the article, *Flooding and Landslide Events Northern British Columbia 1820-2006* by D. Septer. The record included information of 29 flood events in the PRRD and nearby areas. A summary of some flooding events and the list of recorded dates are presented in Appendix A. Preliminary floodplain mapping was completed for the Peace River by the Ministry of Environment outside of the study area in 1985 but no other mapping reports were identified.

### 3.2 2011 FLOOD

In mid - May of 2011, a late spring freshet caused the Moberly Lake water level to rise. The damage included the foreshore, yards, boat houses, and summer use properties. Spencer Tuck Park experienced some water above its banks. Heavy rainfall events occurred in the southern Peace Region in 3 different periods of June and July of 2011, which caused significant flooding on the Pine River, several of its tributaries, and nearby areas. A total of 128.5mm of rainfall was observed at Chetwynd from June 22 – 25, 2011 and higher records were shown in other stations too. The rainfall data observed at the Chetwynd and Dawson Creek stations of Environment Canada and the Hudson Hope and Lemoray stations of the BCFS are given in Appendix B. On June 24, 2011 Chetwynd received 72.0mm of rain in a 24 hour period, this is only 3.7mm less than the Canadian Climate Normals monthly average of 75.7mm for June. That same rain event delivered 79.6mm to Hudson Hope and 125.0mm to Lemoray within 24 hours, far exceeding the monthly average for the area.

On June 30, 2011, personnel from Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRD) and PRRD conducted helicopter tours for carrying out assessment of watercourses and the impact of the rainfall. Watercourses assessed included:

- Wildmare Creek,
- Bissette Creek,
- Boulder Creek,
- Widmark Creek,
- Windrem Creek,
- Pine River,
- Moberly Lake,
- Peace River – Peace Island Park,
- Pingel Creek near Taylor,
- Saskatoon Creek northwest of Dawson Creek,
- Fur Thief Creek,
- Dawson Creek,
- Centurion Creek,
- Pouce Coupe River,
- Klukas Creek at Tomslake,
- Tupper River,
- Swan Lake, and
- Kelly Lake were assessed.

The region experienced flooding, log jams, landslides, debris flows, and bed-load deposits which resulted in damages including:

- damage to residences, businesses and other infrastructure,
- ponding,
- washing away of the railway intersection,
- severe erosion of the creek banks,
- erosion of open faced cut-banks,
- channel braiding,
- scattered wood debris,
- channel avulsion,
- trees mowed over by the mud debris and flood flow,
- washing away of driveway accesses and culverts,
- derailment of locomotives,
- washing away of railway tracks,
- power failure,
- damage to the crops,
- exceeding capacity of the sewer treatment facility,
- surcharging manholes,
- catastrophic debris torrent,
- landslides,
- water and debris overtopping the road,
- significant flooding of farm land,
- rivers changing the course,
- inundating low lying properties, and
- rising of the lake levels above natural boundaries.

Roads in the Peace Region were damaged in over 150 locations and Highway 97 (Pine Pass) was closed due to multiple impacts on June 24, 2011.

After the June 24 weather event the public was encouraged to report their damages. 81 residences called in their damages to the PRRD. Emergency response was conducted mostly by community partners and stakeholders. Between July 7 and July 9 another weather system delivered heavy rains with upwards of 80 to 100mm of rain over mostly the South Peace along the Alberta border. Damage due to this event was limited mainly to areas surrounding waterbodies and there were no significant impacts to transportation routes. Representatives from the Disaster Financial Assistance Program (DFA) briefed with 230 residents from the Chetwynd, Moberly Lake, Hasler Flats, and Willow Flats areas for outlining the eligibility requirements for residents and small businesses and the process to apply for funding under the DFA program. The representatives also explained the Resilience Centre and the services it provides.

Rural residents were reminded that their water and sewer systems may not be working properly and water may be contaminated. Recommendations from Northern Health prompted the PRRD to recommend that all residents use bottled water for drinking and cooking until they could get their water systems tested.

The PRRD Emergency Operations Centre (EOC) conducted in-stream works on Fur Thief Creek to realign the creek, remove debris and to assist in protecting Highway 97 from further damage. The repair works were going on and alternative routes through Alberta to the Peace had to be established due to the closure of the Pine Pass for nearly 2 weeks. As of December 2011, 85% of the repairs were complete and it was planned to continue over the winter and be completed in the summer of 2012. As a result of the damage and the severity, the June 24, 2011 flood was assessed at generally a 1:100 year flood event. Over \$1.3 million in claims had been paid out to the private sector, home and farm owners. Estimated local government claims are in the range of \$2 million. Conference calls and meetings were also held on an as needed basis with stakeholders- MOT, BC Hydro, Telus, engineering consultants, River forecast consultant, Red Cross, disaster relief committee and Northern Health. The Red Cross Joint Resiliency Centre was organized by the Chetwynd Emergency Program Coordinator and the PRRD Community Services Coordinator. Operated by Red Cross volunteers, the Centre provided information, relief and recovery services and support to affected families. As of July 27, 2011 the Red Cross reported that 64 people registered at the Joint Resiliency Centre of which many identified a need for psychosocial/emotional support, clean up assistance, and rebuilding/construction assistance. A Disaster Response Committee was formed that included representatives from PEP, PRRD, Chetwynd, Mennonite Disaster Services, the local and provincial Salvation Army, Christian Reformed World Relief Committee, Samaritan's Purse, Northern Health, and Indian and Northern Affairs Canada.

### 3.3 2016 FLOOD

In June of 2016, additional flooding events impacted the Pine Pass / Peace Regions including the following three areas:

- Chetwynd Fringe, south and west along the Highway 97 corridor,
- Moberly Lake, and
- Pouce Coupe and surrounding area.

The rainfall data observed at the Chetwynd and Dawson Creek stations of Environment Canada and the Hudson Hope and Lemoray stations of the BCFS are given in Appendix B. On June 15, 2016 Chetwynd received 86.8mm of rain in a 24 hour period, exceeding the Canadian Climate Normal of 75.7mm total precipitation for the month of June. In the same 24 hour period on June 15, 2016, Dawson Creek received 89.8mm of rain far exceeding the total monthly average of 67.4mm calculated by Canadian Climate Normal.

DWB carried out assessments to gather information and make recommendations for rehabilitation of the stream channels, the residences impacted by the events, and access routes except Highway 97 right of way following the events. The scope of work included making recommendations for remediation works to reduce flooding risks to residences only as directed by the PRRD and included impacts on and surrounding eleven creeks.

DWB's site visit along with information available from different sources revealed that the creeks had insufficient capacity to handle the flood volumes that contributed to stream destabilization. Heavy bedload and large woody debris (LWD) constituted the majority of the flood risks and the highway structures did not have sufficient conveyance capacity especially with bedload and debris sources upstream. Severe erosion of the banks of the creeks and massive deposition of sediment from the creeks on the floodplains also occurred. The streams are expected to show morphological changes including widening and lateral movement, creation of new channels, and changes in deposition and erosion zones. Many residences, roads, access roads, highways, parks and recreation areas, infrastructure and one school were impacted by the 2016 flood events within the study area.

Some prescriptions to provide stability, reduce risks to public safety and infrastructure, and reduce downstream impacts through removal of debris, widening channels and recontouring banks, bedload removal, and bank and crossing protection were recommended. Due to the massive and virtually endless supply of LWD, bedload gravels and boulders, these problems can neither be controlled nor eliminated but risk may be reduced to some extent. Based on the recommendations of DWB, PRRD received funding from the BC government and again retained DWB to propose a work plan in consultation with the Ministry of Transportation and Infrastructure (MOTI) and landowners. Construction / rehabilitation works in all eleven creeks in Chetwynd, Moberly Lake, and Pouce Coupe areas started in December 2016 and completed in March 2017.

## 4.0 FIELD RECONNAISSANCE

As part of the flood risk assessment, DWB completed a thorough desktop study that was backed up with a field reconnaissance. The field reconnaissance included ground assessments, completed both in 2017 and 2018, and drone surveys completed both in 2017 and 2018. The ground assessments were performed to better understand which areas were affected the most and the drone survey was used to capture images of those areas that were considered potential flood risk areas after the desktop study and ground assessment was completed.

First Nations land falls within the study area around Moberly Lake. Both the Moberly Lake First Nations Band and the Sauteau First Nations Band will be consulted with and involved in further stages of the project including further floodplain mapping, data collection, and mitigation planning.

### 4.1 GROUND ASSESSMENT

Ground assessments were continued in 2018 after an overview assessment was completed in the office to determine areas that required further assessment. These areas included those not covered by works in 2017 along with additional sites identified outside of the 2017 area scope with potential flood risk. The site visits were conducted in person and a summary of the work is included in Appendix D. The shaded entries in the Master Damages list provided in Appendix D are in areas outside the scope of the assessment, the names have been removed from all entries for privacy purposes. The summary tables include the observations and information gained by the site visits.

### 4.2 DRONE SURVEY

In 2018, a plan was developed including formulating a list of areas with identified potential flood risk. The list of risk areas were assessed in the office using available imagery. Those areas accessible for UAV imagery capture were visited and flown by our qualified UAV pilot. Images were taken with a DJI Phantom 4 PRO and were Geolocated using the onboard GPS. All images were processed and combined into orthomosaic images using PIX4D Mapper PRO. 3D models of the surveyed areas are possible but were not produced for this exercise. As a follow up from the works in 2016/2017, some areas where works were completed, aerial surveys were done in 2017 to gather data to submit to agencies. The drone surveys completed in 2017 were done on areas that were deemed high importance, requiring immediate works. The areas were flown after construction works were completed.

The following areas were flown in June of 2017:

Areas Flown June 2017		
Latitude	Longitude	Area

55° 42' 36"	-120° 07' 31"	Bissette Creek
55° 36' 43"	-121° 57' 51"	Boulder Creek
55° 36' 49"	-121° 53' 04"	Commotion Creek
55° 38' 49"	-122° 10' 29"	Fur Thief Creek
55° 50' 02"	-121° 48' 45"	La Bleu Creek
55° 50' 06"	-121° 42' 59"	Medicine Woman Creek
55° 42' 47"	-120° 07' 18"	Pouce Coupe River
55° 48' 44"	-121° 45' 01"	Pys Creek
55° 37' 05"	-121° 49' 38"	Stone Creek
55° 40' 05"	-121° 43' 30"	Wildmare Creek

The following areas were flown in 2018 as part of the 2018 Flood risk assessment and UBCM CEPF funding application:

Areas Flown June 2017		
Latitude	Longitude	Area
55° 48' 42"	-121° 47' 05"	S Moberly 10Km
55° 48' 43"	-121° 46' 21"	S Moberly 9.5km
55° 49' 03"	-121° 44' 50"	S Moberly (Yips Subdivision)
55° 48' 44"	-121° 43' 20"	S Moberly (Benson Creek)
55° 48' 38"	-121° 42' 36"	S Moberly(west of Park)
55° 49' 52"	-121° 43' 13"	N Moberly (Medicine Woman)
55° 48' 36"	-121° 41' 08"	S Moberly (East of Park)
55° 49' 55"	-121° 44' 52"	N Moberly (Caroline St)
55° 49' 53"	-121° 45' 49"	N Moberly (Holiday Beach)
55° 49' 34"	-121° 49' 31"	N Moberly (Cove Lane)
55° 40' 06"	-121° 43' 58"	Wildmare 01
55° 40' 02"	-121° 42' 35"	Wildmare 02
55° 40' 02"	-121° 42' 07"	Wildmare 03
55° 36' 30"	-121° 58' 11"	Bolder Creek(Hassler)
55° 49' 44"	-121° 47' 58"	N Moberly (Le Bleu)
55° 49' 55"	-121° 45' 13"	N Moberly (Caroline St)

55° 50' 00"	-121° 43' 40"	N Moberly (Centennial West)
55° 42' 36"	-120° 08' 46"	Upper Bissette above trestle (Pouce)
55° 42' 37"	-120° 08' 33"	Upper Bissette below trestle (Pouce)
55° 31' 06"	-120° 01' 37"	Swan Lake Sub
55° 30' 46"	-120° 01' 33"	Tupper Village Way
55° 30' 36"	-120° 01' 36"	Tupper Village Sub
55° 30' 30"	-120° 01' 40"	RC Campground Rd

## 5.0 PUBLIC MEETING INFORMATION

Public information meetings were held in Chetwynd on January 16<sup>th</sup>, 2019, and in Tomslake on January 17<sup>th</sup>, 2019. These meetings were held to help inform the public of process that the PRRD has undertaken to submit an application for funding through the UBCM CEPF with the help of DWB. Discussions with all attendees took place for several hours where the preliminary maps were discussed and attendees concerns and comments were noted.

Feedback forms were given out at each of the meetings to allow the public to express their concerns and have greater input on the project. The response to the public meetings was positive overall. Some of the public comments and concerns include but are not limited to the comments summarized below;

- The 2011 and 2016 flood events were the worst events that the areas within the study had ever seen.

The public indicated that concern should be given to the following;

- Implementation of mitigation plans put in place that could include but are not limited to
  - Plans to remove large woody debris from the watersheds,
  - Alternate route plans,
  - Beaver management plans, and
  - Plans to widen bridges in the affected areas.
- Implementation of legislation and regulations to control the construction of structures in potential flood risk areas.
- Implementation of legislation to allow residents to control the weir at the outlet to Swan Lake.
- Protection and update of rail lines and utilities in the area.
- Using local equipment during clean-up efforts of future flood damages rather than bringing in equipment from elsewhere.

## 6.0 FLOOD RISK ASSESSMENT

### 6.1 FLOOD HAZARD IDENTIFICATION

As part of the project the potential flood hazards in the areas of concern were identified. These flood hazards were identified based on the findings of the historical flood event review, and field

reconnaissance. The flood hazards summary within the study area include but may not be limited to those listed below.

- Type of flood hazard – riverine flooding including high water and erosion by overland flooding due to high intensity rainfall and/or snow melt.
- Type of flood hazard – Lake flooding including high water on floodplains due to increased volume of water entering lakes from high intensity rainfall and/or snow melt.
- Landslide may develop due to heavy rainfall saturating the soil. Also, saturated soil on banks may be more vulnerable to erosion.
- Raised groundwater table may force springs to the surface and cause flooding (as seen on Campbell Rd properties in Chetwynd).
- Watershed assessment conducted by DWB in 2016 for 11 creeks in the assessment area found the upper reaches of the creeks contained abundant source of debris and bedload that could be mobilized by flood water and obstruct the channel.
- Driveway, road, and highway crossings that are located on floodplains or have the potential to constrict or cause backflow that may increase the flood impacts.

## 6.2 EVENT FOR BASIS OF FLOOD RISK ASSESSMENT

The 2011 and 2016 flood events that caused significant damage to the study area were used as a basis for the flood risk assessment. Based on the 2011 and 2016 events along with historical data, the flood risk event used for the flood risk assessment is a 1-in-100 year return period flood. From a 1-in-100 year risk event the following conclusions can be made:

- **The event used as a basis of the assessment** is a 1-in-100-year return period flood. The event is based on the 2011 and 2016 floods which were both considered in the range of 100-year floods. The risk event is likely to occur between April to July during the freshet. The magnitude of the risk event is a 1-in-100-year return period flood. However, 1-in-100-year flood events have occurred in 1987, 2001, 2011, and 2016; the number of years between these events were 14, 10, and 5. Therefore the time period for this risk event to occur may be approximately 10 years.
- **The area impacted** by the risk event included the Chetwynd Fringe (valley along BC Highway 97 west to Willow Flats and East to Chetwynd) not including the Town of Chetwynd, Moberly Lake, and Pouce Coupe / Tomslake. Municipalities affected were the Village of Pouce Coupe and District of Chetwynd. Additional rural communities in the affected area were: Hasler Flats, Tomslake, and Swan Lake.
- **Flooding in the defined geographic areas** were caused by heavy rains with addition of snow pack melting. Residences along the lake shore and multiple creeks were directly affected. Transportation was disrupted with highways, roadways, and private access roads washed out. There are several camp grounds that were inundated and one significantly destroyed at Bissett Creek at the confluence of the Pouce Coupe River. Two other parks are within the geographic area including Moberly Lake Provincial Park and Swan Lake Provincial Park.
- **The cause of the risk events** involves several mechanisms and includes but not limited to the following:
  - High stream flow in the creeks that occurs during freshet in May and June when temperature rises and the snow pack melts. The 2011 and 2016 flood events occurred at this time when the freshet flow from snow pack melting was combined with a 1-in-100-year rainfall event.

- In May 2017, freshet flows caused the Windrem Creek to wash out a road in the District of Chetwynd. The BC River Forecast Centre issued a Flood Watch in the South Peace Region as a prolonged rain event was forecasted in the area.
- In April 2018, snow pack melting caused flooding in Dawson Creek (outside but approximate to the study area). Highway 97 between Dawson Creek and Chetwynd was reduced to single lane traffic due to pooling water. In July 2018, a Flood Warning was issued for Pouce Coupe River due to a flood, which was rated between a 100 and 200 year return period observed after localized storms.
- **Climate change impacts** to the region are considerable and continue to increase flood risk as noted in the increased frequency of the events and discussed in section 6.4.

### 6.3 REVIEW OF RESPONDERS TO A FLOOD EVENT

Local authorities including PRRD, District of Chetwynd, and Village of Pouce Coupe provide emergency response to local residences. The general response from public meetings indicated that residents were happy with the emergency response efforts from local authorities. Residents commended the local emergency response team, stating that they had a more prompt response to the 2016 flood event than the 2011 event. This suggests that the local authorities are learning from previous floods and looking to better their response to potential future flood events.

Multiple provincial government authorities provide assistance to the local authorities. The Emergency Management BC (EMBC) will coordinate response activities between the provincial authorities and local authorities. The Ministry of Transportation and Infrastructure will respond to provincial highways and roadways that are disrupted by flood. The Ministry of Forests, Lands, Natural Resource Operations & Rural Development oversees the flood hazard investigation during flooding response. The Ministry of Environment will respond if any spill of contaminants is discovered.

### 6.4 LIKELIHOOD ASSESSMENT AND CLIMATE CHANGE

Meteorological and seasonal conditions that have impacted the region are described in Section 6.2. Of greatest concern in recent years is the climate change impacts that are being realized in the region. From the Pacific Climate Impact Consortium and the Plan2Adapt model, it is projected that climate change in the next 30 years for this Peace region include increased annual precipitation in the range of 25% along with up to 20% increase in snowfall into 2080. Shorter time frame projections are lower but similar in magnitude.

Along with the increase in the potential amount of rain and snow expected to fall on the region in the future, pine beetle infestation has caused an abundance of large woody debris (LWD) and an increased amount of deforestation in the area. The increased amount of LWD in streams poses a potential flood risk for blocking culverts and preventing water from running off in future flood events. Large areas of deforestation causes water to runoff the catchment areas at a higher rate, reaching the streams faster and causing higher peaks in the volume of water running in the streams. This increases the likelihood of flooding in the area.

### 6.5 MAPPING (PRELIMINARY)

Limited mapping has been completed, only identifying potential areas of potential flood risk. Mapping is preliminary as no modelling or floodplain mapping was completed. Mapping was based on historical information, site reconnaissance, and public meeting input.

## 6.6 VULNERABILITY AND CHARACTERISTICS OF AFFECTED AREAS

The defined geographic area includes three main areas located within the South Peace Region of the Peace River Regional District in northeastern British Columbia. The three main areas are: Chetwynd Fringe (valley along BC Highway 97 west to Willow Flats and East to Chetwynd), Moberly Lake, and Pouce Coupe / Tomslake. Village of Pouce Coupe, District of Chetwynd, and multiple rural communities are located within the area. Moberly Lake Provincial Park and Swan Lake Provincial Park are within the defined geographic area.

According to the 2016 Census, the population of Peace River Electoral Area D and E that included the defined geographic area was 5920 and 2949 respectively. The municipalities' populations were 2503 for Chetwynd and 792 for Pouce Coupe. The total population in the defined geographic area was 12164. There are no significant population variances. The majority of the population lives in the defined areas of Chetwynd and Pouce Coupe and includes the highest population densities.

Main economic areas of interest: agriculture, retail, tourism, forestry, and oil and gas.

Residences living along the creeks and lakes with flooding risk within the assessment area were mostly located on potential floodplains where the creek slope is flat and bedload deposition occurs. These residences are identified as vulnerable populations. Compared to the rest of the assessment area, Chetwynd and Pouce Coupe have a relatively high degree of urbanization with higher population density as well as proximity to emergency service. Some areas west of Chetwynd on Highway 97 are not covered in cellphone service range. Many rural communities rely on one road/highway for access and evacuation.

Flooding causes significant economic loss by impacting the main industries in the area including agriculture, oil and gas, mining. Washouts of highways and roads disrupt normal operation of the main industries. The access highway through these communities provides the only corridor for the movement of goods and workers from the central interior regions of Fraser- Fort George Regional District to the northern regions through BC. Several pipeline routes already exist through these regions.

## 6.7 COMMUNITY RESILIENCE

The residents in and around Chetwynd including the Highway 97 corridor, Moberly Lake, and Pouce Coupe, Tomslake and Swan Lake have shown a great deal of resiliency in the past and continue to demonstrate their ability to recover, rebuild, and learn after the devastating effects of the floods.

New residents at Moberly Lake have been consulting with neighbours and residents that have been there through the floods to ensure that new homes are built above the previous floods high water marks. Existing residents in Chetwynd and Moberly Lake are concerned about alternative routes in and out of Chetwynd during flood events and have proposed routes through to Tumbler Ridge.

At Swan lake, residents are monitoring the outlet weir to the lake on their own time. When the weir is not frozen over the residents monitor it weekly and during freshet they monitor it daily. At their own cost residents have retained Environmental Dynamics Inc. (EDI) to perform an assessment of Swan Lake to determine the condition/state of the lake. During the 2016 flood events, which many residents stated was the worst ever, equipment was relocated by the volunteer fire department to both ends of the lake at the onset of the flood, before it was too late. The relocated equipment played a vital role in protecting the residents around the lake. Residents reported that the lake rose 6 feet on the night of June 16-17, 2016.

Residents throughout the Peace River Regional District are being proactive, looking for ways to mitigate the flood effects and better prepare for potential flood events in the future. Residents want to see debris mitigation plans put into place, alternative access routes planned and maintained in the event of washouts, bridge structures widened in areas where the amount of debris is high and where the expected volume of water exceeds current capacities, and any other mitigation actions that may protect the area.

## 7.0 CONCLUSION

The areas surrounding the Chetwynd Fringe, Moberly Lake, and Pouce Coupe/Tomslake within the Peace River Regional District have experienced several severe flooding events. Most recently, the 2011 and 2016 flood events caused significant damage to private, corporate and public infrastructure in the area. Highway 97 and Highway 27 were both affected by the events and at some points were shut down due to damage from flooding. These flood events not only directly affect the health and safety of the local residences, they affect property, businesses, and infrastructure. Significant monies has been spent in the region as part of flood relief, repair and mitigation works.

Currently, there is no floodplain mapping or mitigation planning done in the study area. Due to the severity of the events that the Peace River Regional District has seen in the past it is crucial to create thorough floodplain mapping and develop mitigation plans to ensure the health and safety of residents and protect properties and infrastructure from possible damage in potential future flood events. The UBCM CEPF funding is intended to assist government bodies to develop flood maps that address flood risks identified in the flood risk assessment. Creating these flood maps may include the acquisition of elevation data and mapping, plotting of historical flood data and inundation mapping, hydrologic and hydraulic information to calculate flood elevations for selected flood events, geospatial mapping and modelling activities, and identifying locations of structures, people and assets that might be affected by flooding.

Through an extensive review of historical data and a thorough field reconnaissance DWB was able to complete a flood risk assessment on the area in order to submit a funding application through UBCM CEPF for further flood mapping and mitigation planning. As part of the field reconnaissance UAV survey was performed on potential flood risk areas (as defined in section 6.5 of this report). The UAV survey data was used to create preliminary maps and further assess potential hazards areas. The survey data can be used to create 3D images of the area including all elevation data and can be used to assist in further flood mapping efforts. DWB worked identifying and reviewing the potential flood hazards, defining a risk event used as the basis of assessment for future flooding, reviewing responders of the previous events, and defining the characteristics of the area by flooding and meteorological and seasonal conditions. DWB completed a NDMP Risk Assessment Information Template (RAIT), and created preliminary maps. This flood risk assessment can be used to assist in developing planning and mapping tools to help mitigate future flood events. Public consultation with the local residents is invaluable to determining the areas of potential flood risk and understanding the extent of damages that have occurred in the past. This information is vital for moving forward with floodplain mapping, and mitigation planning to ensure the health and safety of the residents and the infrastructure in the area is protected.

There multiple potential flood risk areas in the region and more study needs to be done to understand the details including population assets. The Union of BC Municipalities - Community Emergency Preparedness Fund (UBCM CEPF) has funding available for flood mapping, and mitigation planning, tools that can be used to reduce the impact of future flood events. DWB has written an application for funding through the UBCM CEPF as part of the works with the PRRD including a work plan and cost estimate, Peace River Regional District Flood Mapping Development – Work Plan (DWB, 2019).

## 8.0 RECOMMENDATIONS AND NEXT STEPS

The following list provides the recommendations that are considered essential for the region and include but are not limited to:

- PRRD should have regulations to limit or control development in the floodplains.
- Develop flood risk and community plans including make changes to the response plans to ensure they account for the results.
- Watershed study to examine the debris effects.
- Land use regulations especially Chetwynd corridor and upper reaches of the creeks.
- Development of acceptable adaptation tools and models for prediction and standards that should be followed in the region and adopted for the purposes of planning and design.
- Determination of appropriate flood frequency for design and development –  $Q_{100}$  or  $Q_{200}$  or whatever is deemed appropriate.
- Recovery planning for residents by PRRD should be formulated. Policy should be developed for what can be done to help post flooding and post event with better warning systems for flood risk including evacuation order.
- More hydrometric stations including policy or agreements with MoTI or MFLNRORD.
- The funding will be used to address the flood risk as identified by a flood risk assessment. This will include:
  - Acquisition of elevation data and mapping,
  - Hydrologic and hydraulic information to calculate flood elevation for selected flood events,
  - Geospatial, mapping and modelling activities,
  - Identifying locations of structures, people, and assets that might be affected by flooding.
- First Nations consultation will be a major part of the next phases of the project, around Moberly Lake the two First Nations groups that will be involved with the consultation are Moberly Lake First Nations and the Sauteau First Nations Band.
- Continued Public Consultation.
- Floodplain Mapping.
- Mitigation Planning.

## 9.0 REFERENCES

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# Appendix A - Historical Review (D. Septer)

## Appendix A – Historical Review (from D. Septer)

No.	Date	Event type	Precipitation	Descriptions
1	May-June 1894	Spring runoff flooding	Not applicable	<p>The spring of 1894 was cold and wet. Towards the end of May the weather turned hot and sultry. Rapid snowmelt caused province-wide flooding. The “Great Flood of 1894” in the Northwest continued for 57 days (The Daily Alaska Empire, May 29, 1948).</p> <p>In a letter to the Omineca Herald and Terrace News, long-time Terrace resident called the “Great Flood of 1894” being less than the 1936 flood. However, according to another resident, the 1894 flood was much bigger than the flood of 1936: “Our high-water of 1936 was a baby in comparison. There has never been a high- water to equal it since.”</p>
2	March 25, 1939	Ice jam flooding	Not applicable	<p>At the end of March, extreme mild weather throughout the central Interior caused a sudden breakup. The Fraser River opened up about 10 days earlier than usual. Warm temperatures and heavy rain in the mountains caused river ice to break up and ice jams to form. Quesnel recorded temperatures ranging above 60° F (15.6° C). High water conditions prevailed due to ice jams. Some loss of mining equipment was reported.</p> <p>Early on March 25 following several days of rain and chinook winds, ice jams caused the Murray River to suddenly overflow its banks at East Pine, 27 mi. (43.2 km) west of Dawson Creek. Residents of the flooded area were bewildered with the speed with which the flood occurred. Survivors described the flood as, “a great wall of ice that suddenly swept on the houses.”</p> <p>Floodwaters swept away a house with eight occupants asleep. An estimated 25 people escaped and one family was marooned on the far side of the Murray River. On March 26, floodwaters covered 20-30 mi. (32-48 km) of low-lying land along the banks of the Pine and Murray rivers threatening the community of East Pine. Ice jams in the river were reported to be 60 to 70 ft. (18 to 21m) high. On March 27, floodwaters receded after taking a total of nine lives.</p>
3	Winter 1942-1943	Icejam flooding?	Not applicable.	During the winter, ice took out part of the temporary bridge over the Peace River at Taylor Flats just south of Fort St. John (Cohen 1992).
4	May 25-June 10 1948	Spring runoff flooding	Not applicable	<p>The 1948 spring runoff due to hot weather caused severe flood conditions in British Columbia, Washington, Oregon, Montana, Idaho, and elsewhere. On May 31, Premier Byron Johnson declared a state of emergency. Military authorities were given the power to conscript citizens and requisition transport. By June 2, some 9,000 people in British Columbia were homeless as a result of flooding. Four thousand Canadian soldiers were involved in the rescue operations. The Fraser River inundated parts of Quesnel and Prince George. The Skeena and Bulkley rivers caused the “worst flood since ’36.” (The Interior News, May 27, 1948).</p> <p>A late spring and the previous week’s heat wave caused the “highest water ever recorded” on the Peace River. Herbie Taylor, “first white man on Taylor Flat and the oldest old-timer in Peace River” in his entire experience had not seen high water on the Peace like this year’s.</p> <p>The Peace River rose 2 ft. (60 cm) in 24 hours flowing 4-5 ft. (1.2-1.5 m) over the cofferdam. Floodwaters caused the loss of livestock. A dozen or more families were flooded out. Down from the bridge on the other side, a family was forced to leave their home. A washout occurred on Hudson’s Hope road at the Halfway Bridge. Maximum temperatures recorded at Fort St James on May 20, 21, 24, 29 and 30, respectively, were 81.8° F (27.7° C), 84° F (28.9° C), 82.2° F (27.9° C), 83.2° F (28.4° C) and 84.5° F (29.2° C).</p>
5	July 12-14, 1956	Flooding	Not available	<p>On July 12-13, sudden floods caused washouts of culverts and bridges along a 300-mi (480 km) stretch of the Alaska Highway. The washouts left at least 20 crews from oil companies stranded in the Peace River area.</p> <p>On July 14, about 500 tourists were stranded in Dawson Creek. Additional flood damage reported along the Alaska Highway would delay reopening of the highway till July 17.</p>
6	May 18-20, 1957	Spring runoff flooding	Not available	Around May 19, a 200-ft. (60 m) stretch of newly built rail line toppled into the Peace River near Taylor. Apparently undermined by high water, a 100 ac. (40 ha) area of land collapsed, destroying a section of grade and blocking the road for a distance of 1,000 ft. (300 m). According to construction officials, the line could not be fully restored until the ground would have settled.
7	October 16, 1957	Severe scour	Not applicable	On October 16, the north end of the Peace River bridge at Taylor Flats just south of Fort St. John collapsed. The northern span of the multi-million dollar bridge tore from its moorings and crashed into the river. The centre portion of the collapsed span was

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				badly warped out of shape. A sag in the 930-ft. centre span of the two-lane bridge aroused fears that it also could drop into the Peace River. Possible causes were given as a shift in the shale bed of the river or due to the intensive industrial traffic. The oil industry was one of those most acutely affected by the bridge's collapse. Earlier in 1957, a water line, which was strung underneath the structure, ruptured sending high-pressure water into the river. This scoured out gravel once again from beneath the north abutment.
8	June 8-15, 1964	Spring runoff flooding	Not applicable	According to BC Hydro's co-chairman, the 1964 flood on the Peace River was the "worst in history" and was causing concern for construction of the Portage Mountain hydro dam at Hudson's Hope. The river had reached 295,000 cfs (8,354 m <sup>3</sup> /s) well above the previous record of 267,000 cfs (7,561 m <sup>3</sup> /s) in 1922. On June 11, the water level at the cofferdam that held back the Peace River from the dry riverbed where the dam was being constructed rose 1.5 ft. (45 cm). There was still 8.5 ft. (2.55 m) to go before the water would reach the top of the cofferdam. If it would become necessary, another 5 ft. (1.5 m) could quickly be added. Three tunnels diverted the river from the construction area. The capacity of the tunnels was 320,000 cfs (9,062 m <sup>3</sup> /s).
9	February 3, 1970	Icejam flooding	Not applicable	On February 3, warm weather, coupled with an icejam caused a sharp increase in the level of the Peace River at Taylor. An icejam below Clayburst caused the Peace River to back up for 22 mi. (35.2 km). Residents of South Taylor, 40 mi. (64 km) northwest of Dawson Creek, reported an 18-ft. (5.4 m) rise in the Peace River. According to the district superintendent for the ministry of highways at Fort St. John, the real rise had been closer to only 5 ft. (1.5 m). Overnight February 3-4, the river dropped 2 ft. (60 cm) from its crest but not before it had damaged Peace Island Park in this unorganised territory on the south bank of the Peace. The drop reduced the flood threat to the community. A South Taylor hotel operator and president of the Taylor Chamber of Commerce, stated that a rise of another 5 ft. (1.5 m) would flood the flatland area. Concerned were 150 residents and 110 pupils in an elementary school 250 yd. (225 m) from the riverbank. According to the school principal, the river appeared to have risen 14 ft. (4.2 m) in his area and on February 3 was about 2.5 ft. (75 cm) from overflowing. The sudden rise was attributed to a massive icejam stretching 20 mi. (32 km) downstream to the Alberta border. On February 4, snowdrifts 3-4 ft. (0.9-1.2 m) high blocked many roads, trapping local residents. The hardest hit districts were Fellers Heights, Rolla, Progress and Kilkerran. Winds were blowing at 30 mph (48 km/h) with gusts to 50 mph (80 km/h).
10	July 11-12, 1971	Flooding	Not available	On July 11, heavy rain in the Peace River country caused a section of track on the PGE line near Chetwynd to wash out. The line was blocked for approximately 30 hours. On the morning of July 12, Dawson Creek rose to a high level. Both ends of the rotary bridge from the parking lot to the artificial lake flooded.
11	June 12-16, 1972	Spring runoff flooding	Not applicable	On June 13 north of Prince George, Highway 97 closed after the Pine River washed out the road near Pine Pass. On June 14, after crews built a detour around the washout the highway reopened. At Peace River, the Peace River crested on June 14 at 6 p.m. after having forced 60 families out of their homes. One business firm was also evacuated.
12	May 26, 1973	Clay slump	Not available	On May 26 west of Fort St. John, a clay slump dammed the Peace River some 20 mi. (32 km) upstream from Fort St. John for about 12 hours. On May 27, a lake began to form after the embankment collapsed and blocked the Peace River. The water rose 30-40 ft. (9-12 m) creating a lake 20 mi. (32 km) long before starting to make channels through the slide on the afternoon of May 27. No houses were endangered in the sparsely populated region. At one point on May 27, a family-owned 10,000-ac. (4,000 ha) ranch, on the north bank of the Peace River with the ranch house directly across the river from the slide, was threatened. The rancher said he was concerned about 200 ac. (80 ha.) of bottomland and considered asking officials to "turn off" the Peace River's safety valve at the W.A.C. Bennett Dam, 35 mi. (56 km) upstream from the slide. By nightfall, it was estimated that 50% of the water was getting through. The danger of the dam bursting and flooding areas downstream passed at that time. A combination of factors probably averted a more serious disaster. The heavy, deep clay soil of

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				the region, ideal for grain, contains few rocks. After ending up in the middle of the Peace River, it quickly turned into mud allowing to quickly forming new channels. Also, before the completion of the W.A.C. Bennett Dam, the flow of the Peace River at runoff time would have been much higher. Now with BC Hydro's generators in operation, allows for an even, lower flow. The Attachie Slide involved over 24 million m <sup>3</sup> of sediment. According to an RCMP officer at nearby Hudson's Hope, the slide "looked a lot like the Hope Slide (on the Hope-Princeton highway)." He said it took away a 2,000-ft. (600 m) slice of the riverbank at the junction of the Peace and Halfway rivers. The force of the slide hurled trees across the river, a distance of about 500 yd. (450 m).
13	June 13-25, 1974	Spring runoff flooding	Not applicable	<p>On June 13, about 1,500 ft. (450 m) of rail grade slipped downhill 12 mi. (19.2 km) south of Fort St. John. The landslide also dragged along a 125-ton \$450,000 locomotive. The massive landslide came down about 0.5 mi. (800 m) east of the bridge across the Peace River. The four-man crew on the engine-and-caboose switching train escaped injury in the derailment. Debris from the hillside spilled into the river.</p> <p>The rail link to the northern Peace River region was expected to be closed for two weeks but by nightfall the gap kept widening. Railway officials later noted that it might take 2.5 months to rebuild the track along Peace River Hill some 400 ft. (120 m) above the river level. The problem facing the railway was how and where to relocate the line, which made a long switchback curve to the top of the hill 800 ft. (240 m) above the gorge. According to businessmen in Fort St. John, the cut in the line would cripple lumber and sulphur shipments to the south.</p>
14	July 15-18, 1974	Spring runoff flooding	Dease Lake (34.5 mm/1 day), July 16, 1974	<p>In the middle of July, torrential rain and late melting snow caused floods and washouts in northwest and northern British Columbia. There had been exceptionally heavy snowfalls the previous winter. The following summer was cool, and mountain snowmelt slow. Warm weather arrived in early July, to be followed by exceptionally heavy rainfall starting on July 15. The Alaska Highway experienced some of the worst flooding in its history. Within a matter of hours, dozens of miles of the highway had been rendered impassable. The storm continued, interrupting telecommunications and stranding hundreds of travellers. Of the people stranded in the washed-out sections, 50 were at Summit Lake, 50 at Toad River Lodge, others at isolated sites, and the largest group, 175 trapped at Muncho Lake. The Provincial Emergency Planning Group, assisted by the Royal Canadian Mounted Police, flew food and other supplies (as well as a social worker and a public health nurse to the group at Muncho Lake) to the stranded travellers.</p> <p>The Muncho Lake area was turned into an island, as the raging water cut off the highway at both ends and brought the level of the lake to unheard of levels. Miles of the highway simply disappeared; at Muncho Lake, Trout River, and elsewhere in the district. In total, 130 miles of the highway were rendered impassable. The Racing River bridge, its foundations eaten away by the raging waters, lost one of its approach spans. To complicate matters further, the Stewart- Cassiar Road, an alternate road access to the outside, washed out in the same storm, stranding the entire Northwest and adding to the urgent need to reopen the Alaska Highway.</p> <p>On July 18, the provincial government chartered a plane to fly about 2,600 lbs. (1,180 kg) of food into Muncho Lake. Here at a lodge, 150 mi. (240 km) northwest of Nelson, about 150 tourists were stuck. Some food was flown by helicopter to some 50 other tourists stranded at lodges and campsites between Muncho Lake-Racing River, about 40 mi. (64 km) south. Here, a 40-ft. (12 m) span bridge was cut by floodwaters. There were also six quarter-mile (400 m) washouts on a 30-mi. (48 km) stretch north of Muncho Lake. At Mile 479, about 1,000 yd. (900 m) of the Alaska Highway washed out. An estimated 340 telephone poles went down along the highway north of Fort Nelson.</p>
15	July 26-27, 1975	Flooding and mudslide	Not available	<p>On July 26 and 27, washouts forced the closure of the Rocky Mountain section of the Alaska Highway. Following heavy rain on July 26-27, a section of the Alaska Highway closed after it washed out in about 14 places and three bridges were knocked out. Climatically, it was a replay of the previous year, another summer of exceptionally heavy rain, when a series of washouts stranded hundreds of travellers in the same area. The rapidity and severity of the runoff, this year, caused greatest damage to</p>

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				<p>bridges and proportionally less to the road surface<sup>1</sup>. For at least six days, the Stewart-Cassiar highway was the only road link between British Columbia and the Yukon.</p> <p>At Mile 32 between Dawson Creek-Fort St. John, travel was also restricted to one-lane after a mudslide covered the road. About 800 people were stranded in Fort Nelson and 80 were trapped between downed bridges along the 355-mi. (568 km) stretch of highway between Watson Lake-Fort Nelson. By July 3, there was still the possibility that some people might be trapped between Mile 410-437, including the stretch where the Racing River bridge was still out.</p> <p>The bridge repairs took the longest. Bridges at MacDonald Creek, Racing River, and Toad River were severely damaged, ensuring travel delays and considerable cost in bringing the highway back into service. Work started on the Racing River bridge on July 5 but was not finished until July 14. Still the washouts did not have the same crippling effect as the previous year's. Most travellers were able to return to Watson Lake or Fort Nelson, where they waited for work to be completed. As well, the Stewart-Cassiar Road remained open, providing travellers with a viable route in and out of the territory.</p> <p>By July 3, the highway reopened from Mile 410 south to Fort Nelson and was open between Mile 437 to Watson Lake "on emergency basis". Emergency repairs were still being made to portions of the highway. When the Alaska Highway reopened, initially to cars and small trucks, on July 8, the convoy south from Watson Lake comprised of only 40 vehicles. The expedition from Fort Nelson, escorted by RCMP cruisers, included 310 cars and vans, 303 campers, 120 towed trailers, 93 motor homes, and a few other vehicles. Repair work was not completed by winter freeze-up, and some of the bridgework continued through the winter. By May 1976, the highway was back to its pre-flood condition.</p>
16	August 25, 1976	Mudslide	Not applicable	<p>On August 21, a 0.25-mi. (400 m) long mudslide along 95-Mile Road blocked a dead-end road at the Halfway River, 13 mi. (20.8 km) west of the Alaska Highway and 45 mi. (72 km) northwest of Fort St. John. Rainfall totaling more than 40 mm during the previous week loosened over 1 million yd. (764,600 m<sup>3</sup>) of mud. A total of 75 people, including 25 families on the Halfway Indian Reserve and two ranch families, were isolated. The highways department repaired an abandoned oil drilling road to by-pass the slide. The continuous rain played havoc with local transportation in the Peace River area with its many dirt roads.</p>
17	December 1976	Slide potential	Not applicable	<p>On December 3, the BC Hydro chairman reported that an enormous slide, 80 % bigger than the Downie slide on the Columbia River, was creeping into the reservoir behind the W.A.C. Bennett Dam. BC Hydro engineers noted that "safety cannot be guaranteed." According to a spokesman for the Peace Valley Environmental Association from Fort St. John and speaking for concerned Peace River farmers, the Brantham Ridge slide, located above a failure zone 20 mi. (32 km) upstream from the dam, contains an estimated 1.8 billion cubic yards (1.38 billion m<sup>3</sup>) of material<sup>2</sup>.</p> <p>He said that the situation was particularly critical in view of BC Hydro's intention to divert the McGregor River from the Fraser drainage system to flow north into 410,000-ac. (164,000 ha) Williston Lake. The McGregor diversion would put 20% more water in the reservoir and add to the pressure on the slide area<sup>3</sup>.</p> <p>A report by the hydro-electric design division, dated July, 1974, said that the monitoring of the unstable Brantham Ridge area showed the slide, which extends for 4 mi. (6.4 km) along the shore of Williston Lake, had moved 2 ft. (60 cm) closer to the reservoir since 1968.</p>
18	July 13-14, 1982	Flash flood	Prince George (29.2 mm/24	<p>On July 13-14, freak storms dumped about 30 cm of rain in 36 hours in the Chetwynd area. According to the weatherman, the rain was caused by a typical summer storm with thunderclaps layered in heavy cloud, accompanied by lightning and heavy rain.</p>

<sup>1</sup> The 1975 flooding proved to be expensive: more than \$2 million. (Coates 1992).

<sup>2</sup> The Downie slide, the toe of which would be in the reservoir of a new dam approved for construction above Revelstoke, contains an estimated 1 billion yd.<sup>3</sup> (0.76 billion m<sup>3</sup>), about 60 times the 1965 Hope slide (The Vancouver Sun, December 4, 1976).

<sup>3</sup> Extensive studies were done on three large slides that fringe the reservoir on the Mica Dam on the Columbia River. The Downie slide was the major concern in considering the new dam to be built between the Mica Dam-Revelstoke (The Vancouver Sun, December 4, 1976)

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			hours), July 13-14, 1982	<p>The torrential rains washed out culverts and damaged bridges, forcing rail line and highway closures. The extremely heavy rains cut trenches 5 m deep and up to 50 m long. Near Chetwynd, Falling Creek went on a rampage. Stan Glapysz, highways manager in Dawson Creek, put the damage figure at \$200,000.</p> <p>The Heritage Highway to Tumbler Ridge was expected to reopen on July 21. Work on the Heritage Highway and the Sukunka Highway from Chetwynd to the coalfield was returning to normal. On July 14, the heavy rain caused a washout along East Austin Road near Dawson Road. About 100 m of roadside ditch were washed out to a depth of about 3 m. City Public Works crews were expecting to have the ditch filled later on July 15.</p> <p>The BC Rail line between Chetwynd-Lemoray was shut down till July 18. The damage was estimated at several hundred thousand dollars.</p>
19	July 31-August 2, 1982	Flooding	Dawson Creek (85.6 mm/3 days), July 31-August 2, 1982.	<p>Between July 31-August 2, Dawson Creek received a record rainfall of 85.6 mm in three days. This amount by far surpassed the total precipitation for the entire months of July and August 1981.</p> <p>A number of washouts occurred on the Chetwynd-Tumbler Ridge and Dawson Creek-Tumbler Ridge highways. Though narrowed somewhat in certain sections, both highways remained open. The Boundary-Tumbler Ridge link closed due to a minor culvert washout at mile 42. This was expected to be repaired by 3 p.m. on August 3.</p> <p>The rains were so severe that some of the better grain crops in the South Peace “lodged” or went down said the Field Crops Specialist of the provincial Ministry of Agriculture and Food. Particularly hard hit was the hay crop. The rain delayed the fescue harvest. After the previous year’s drought, this hay was already in short supply. The rain also leached nutrients out of the hay, resulting in substantially lower quality feed.</p>
20	March 1985	Landslide potential	Not applicable	In March, Dinosaur Lake on the Peace River was closed to the public until further notice for all recreation and sport fishing. This followed a study on the movement of a landslide, which developed on the north-shore of the reservoir near the town of Hudson’s Hope. The slide had moved 5 m in the last four years. It was feared that if it would move rapidly into the water it could create waves in excess of 4 m. Depending on how fast the slide would move, the lake could be closed for up to five years.
21	May 26-29, 1986	Mudslide and flash flood	Not applicable	Centurion Creek, located within the boundaries of Chetwynd flooded its banks. It appeared that a very sudden and large volume came downstream. This surge of water flushed the creek channel taking out everything in its path. There was evidence of much overland flow, especially downstream from the Legion. Besides erosion, a resident lost their water supply and had their basement flooded. There is some speculation and evidence to suggest that the plugging up of the two 8-ft. (2.4 m) culverts under the BCR line may have aggravated the situation on this creek. The BCR later replaced these two culverts with an identical pair.
22	July 26-August 3, 1987	Flooding	Chetwynd (197.6 mm/month of July); (51.0 mm/12 hours), July 26, 1987; (30.0 mm), subsequent July precipitation; (63.6 mm/24 hours),	<p>Between July 31-August 1, following weeks of unseasonably heavy and prolonged wet weather in northeastern British Columbia, intense rainfall resulted in extensive flood damage to watercourses and property. On July 26, Chetwynd recorded 51 mm of rain in a 12-hour period. It was followed by a light continuous rain, which added another 30 mm. Then on August 1, 63.6 mm fell in a 24-hour period on saturated soils and creeks with higher than normal levels. On the evening of July 28, Dokie and the Wildmare area were hit by heavy rain and marble-size hailstones. The hailstones accumulated in some ditches nearly 1 ft. (30 cm) deep.</p> <p>Corn crops, wheat fields and greenhouses were ruined throughout the area. Many berry bushes and trees were totally stripped of their just ripening fruit and leaves. Leaves were torn off trees and shrubs. This summer hailstorm ruined corn crops, wheat fields, gardens and greenhouses. Many berry bushes were totally stripped of their just ripening fruit. Property owners in Dokie were hit by the flooding of two creeks. Numerous residences suffered damages and at least one house lost its foundations and tipped over.</p>

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			August 1, 1987	<p>Between early August 1-4, Chetwynd recorded more than 2 in. (50 mm) of rain. More than 6 in. (150 mm) of rain fell during a weeklong period. On July 31-August 1, Chetwynd was hit by flooding causing an estimated \$500,000 damage<sup>4</sup>. Hardest hit was the area around the post office. Damages in the Chetwynd district were estimated at \$680,000<sup>5</sup>. Several businesses flooded, roads washed out, bridges collapsed and many residences suffered minor to severe damage.</p> <p>Commotion Creek overflowed its banks, affecting three culverts and stalling traffic on Highway 97, 15 mi. (24 km) west of Chetwynd. Most damage occurred in the vicinity of the District of Chetwynd but also in areas as far east as Pouce Coupe and as far north as the Fontas River. Initial restoration cost was estimated at \$733,000. (Province of British Columbia, File P87-7).</p> <p>Flooding problems occurred in the Chetwynd-Moberly Lake area (including creeks crossing Highway 97 further east); near the Villages of Pouce Coupe and Taylor; at the Halfway River Indian Band Lands and at the Indian communities of Kahntah and Fontas and along the Fontas River southeast of Fort Nelson.</p> <p>Preliminary indications were that most of the damage was sustained as a result of wood and gravel debris blockages of culverts and stream channels, and not because these facilities were otherwise inadequate.</p> <p>Numerous Dokie residences suffered damage from two flooding creeks. At least one house lost its foundations and tipped over. Following the announcement that Highway 97 would reopen on August 1 at 4 p.m., a mile-long traffic jam occurred at Dokie.</p> <p>Flooding streams re-routed themselves, washing out fences and driveways. A washed out culvert at Hillview Access Road, 1 mi. (1.6 km) west of Chetwynd left several families cut off.</p> <p>Starting about 9 a.m. on August 1, Commotion Creek overflowed its banks and eventually stalled traffic on Highway 97, 15 mi. (24 km) west of Chetwynd. The highway was finally closed after the bridge at Dokie, about 6 mi. (9.6 km) west of Chetwynd washed out on the afternoon of August 1. Other flooding streams closed Highway 29 north towards Hudson's Hope and south towards Tumbler Ridge.</p> <p>On the night of August 1 and the morning of August 2, heavy rain caused flooding and an estimated \$680,000 of damage in Chetwynd. Not since the early 1970s had the town of 2,500 been hit so hard by rain and subsequent flooding. Runoff water severely affected culvert and bridges. Gravel washed out from the bases of several, including Windrem and Centurion Creek bridges. Large trees and other floating debris plugged near the Post Office, destroying the road pavement. When the creek re-routed severe flooding occurred to several buildings on the South Access Road.</p> <p>Hardest hit was the area near the Post Office, where a culvert in Windrem Creek was too small to handle the volume of water, and the Kal Tire/Red Rooster area where the BC Rail tracks prevented the water from escaping. The Northern Lights College and the BC Rail line also flooded.</p> <p>On the access boulevard and around the Red Rooster store small lakes formed. The Legion Subdivision was nearly flooded when Centurion Creek flooded and destroyed the footbridge. When the creek found a new route, severe flooding occurred to several buildings on the South Access Road. The sanitation sewer trunk line with aerial pipes crossing Centurion Creek washed out. It was replaced by an inverted siphon system with pipes placed under the creek.</p> <p>Near Northern Metallic and Kal Tire, floodwaters severely damaged the pavement. At the old Windrem Creek dam near the Chetwynd Public Campground waterfalls were formed. Some families at Hillview Road were isolated after floodwaters washed</p>

<sup>4</sup> According to Mayor Charlie Lasser, an increase in the number of settling ponds along the creek which passes through Chetwynd would remedy the problem of accumulated gravel during the flood (Chetwynd Echo, August 11, 1987).

<sup>5</sup> The provincial government approved \$6 million in assistance for victims of the July flooding in Chetwynd, Dawson Creek, Fort St. John, Fort Nelson and Tumbler Ridge. The money was to compensate residents and businesses and cover repair to roads, bridges and creeks (The Vancouver Sun, September 14, 1987). On September 10, 1988, Order in Council 1797 was approved in response to the extensive damage that occurred in the northeast of British Columbia, ordered relief to an amount not to exceed \$6 million under the Flood Relief Act.

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No.	Date	Event type	Precipitation	Descriptions
				<p>out the culvert. The sanitation sewer trunk line, with aerial pipes crossing Centurion Creek, washed out. It was replaced with an inverted siphon system, where the pipes are placed under the creek.</p> <p>The cages along the bridge by Dixied Lee, and the industrial subdivision where the culvert was also too small to handle the extreme flow, would have to be replaced by larger ones. A beaver dam backed up water into one of the town's trailer parks, but once the dam broke, the water went down in 40 minutes.</p> <p>At about 9 a.m. on August 2, serious highway flooding started at the Commotion Creek turnoff on Highway 97.</p> <p>Bisset bridge, west of Chetwynd on Highway 97 washed away and the road was closed briefly. On August 3, Dokie bridge washed out, causing traffic to line up for miles before a temporary bridge could be put in. On August 1, the 36-in.culvert at Fernando Creek was partially submerged and there was evidence that it was plugged with debris.</p> <p>Watercourses impacted included: Boulder Creek; Commotion Creek; Stone Creek; Bissett Creek; Wildmare Creek; Fernando Creek; Unnamed Creek; Windrem Creek; Widmark Creek; Centurion Creek; Medicine Woman Creek; Le Bleu Creek; Pingel Creek; 8-Mile Creek; Halfway River; Townsend Creek; Prespatou Creek and Rolla Creek, Tremblay Creek and Meikle Creek.</p> <p>Deposition of Boulder Creek bedload in the Pine River, at their confluence immediately upstream from a secondary road crossing plugged the channel of the Pine River to an average depth of about 3.5 m. Being plugged from the left bank to mid channel, the flow was diverted towards the eroding right bank. It endangered a cabin, the highway bridge and to a lesser extent, a nearby house. Estimated cost to remove 4,500 m of gravel was \$22,000.</p> <p>At Commotion Creek, significant damage was confined to the vicinity of three Highway 97 culverts. At Stone Creek, a contractor completed the clean-up work, including the restoration of a private driveway to a mobile home. Bissett Creek suffered very severe damage at a direct consequence of log jam formation throughout an approximately 700-m reach upstream from the Highway 97 crossing. Here, properties on both banks were directly endangered; those on the left bank, including a small subdivision or mobile home park, from erosion and the one on the right bank from overbank flow, surface scour and deposition. A small house was balanced precariously on the left bank and was uninhabitable. Downstream from the highway, much of the creek is bound by Provincial Park Reserve where restoration is not believed to be necessary. Estimated cost to burn logs or restore channel upstream was \$18,000.</p> <p>On the right bank of Wildmare Creek upstream from Highway 97, rapid erosion posed a potential threat to a home and, further upstream, massive log jams resulted in channel relocation and posed a direct threat to both the home and to a mobile home, contractor's yard and storage building. Estimated cost to restore channel and riprap at the home was \$40,000. Downstream from Highway 97, the channel of Wildmare Creek infilling occurred adjacent to another home, resulting in extensive right overbank flow and bedload deposition. Estimated cost for channel restoration \$5,000. Unnamed Creek west of Chetwynd, a small creek culvert under Campbell Road, infilled both sides of the road culvert and downstream of a house. In the Chetwynd District, Windrem Creek caused the majority of the flood-related problems within the Municipality. Upstream of the Ski Lodge/Rod and Gun Club, significant erosion of the channel's right bank took place in the cleared land used for shooting ranges. Estimated cost for 650 m riprap was \$16,000; Adjacent to the lodge, right bank erosion area adjacent to the main buildings and from which, as a precautionary measure, a mobile home was removed, required 330 m riprap estimated at \$8,000. The access road to the lodge and gun club washed out partially after the creek slightly changed channels. At the Municipal Campsite immediately downstream from the old Windrem Creek dam the left bank eroded. Estimated cost on the North Access Road Crossing, repairs to the bridge support structure, gabion basket approach and downstream wingwalls, replacement of two footbridges and minor channel restorations was \$60,000. 50 Street crossing and BC Railway crossing washed out.</p> <p>Restoration cost of Widmark Creek was \$45,000. An 11.5-m high culvert on Centurion crossing the BC Railway line Dawson Creek failed. A 96-in. multi-plate culvert and two 48-in. dia. culverts replaced the previous three 48-in.dia. culverts. Downstream, at the Highway 97 crossing, two footbridges were swept away and a sewer crossing was destroyed, while, further downstream, evacuations were necessary. The estimated cost of restoration was \$67,000;</p>

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No.	Date	Event type	Precipitation	Descriptions
				<p>In the Moberly Lake area north of Chetwynd: Medicine Woman Creek: extensive damage to private properties resulted when the Highway 29 pipe-arch culvert plugged with debris, diverting floodwater east along the highway before it passed through local drainage culverts under the highway. Camp Sagatawa was but one of the nine or more downstream properties to suffer damage. Le Bleu Creek: problems in this area resulted from extremely high runoff rather than debris blockages. Overbank flow caused damage at a residence's property. Further upstream, another property suffered extensive flood damage from overbank flow. In the Pouce Coupe area: estimated cost bedload deposition leading to left bank erosion was \$18,000 at a local property. Regional District Park right bank erosion protection totally destroyed throughout its former 110-m length downstream from the Highway 2 bridge crossing. Estimated riprap replacement cost \$30,000.</p> <p>Near Taylor, Pingle Creek was the most seriously damaged of all the areas visited. Upstream from the Highway 97 bridge, much of the original channel throughout the first 1,300 m upstream from the highway was completely infilled with silty-sand, balls of clay and massive quantities of wood debris. Estimated cost to re-excavate the channel and riprap left bank for 150 m was \$44,000. 8-Mile (Tower) Creek: overbank flow was reported to have caused crop damage. Flooding at the confluence of the Kahntah and Fontas rivers resulted in some property damage. A huge log jam at the BC Railway crossing is believed to have been responsible for upstream flooding which damaged two houses in the Fontas Indian Community-Fort Nelson I.B. In case of the old house, floodwater was 2+ m above the floor level and in the new house it was 1.2 m deep. Band members reported additional logjams further downstream. They attributed them to material moved from upstream of the bridge by BC Railway. Halfway River: Indian and Northern Affairs reported a total loss of riprap protecting the community water intake, and a change in the main channel which is directing the flow at the intake. Rain and high water were both reportedly continuous through to at least August 13; Townsend Creek (tributary to Halfway River): the timber bridge crossing to this Christian Community washed away, which was not an infrequent occurrence. On Prespatou Creek a problem was reported, possibly a debris jam. Rolla Creek: crop damage was reported as a result of a creek blockage.</p> <p>All BC Rail traffic halted after floodwaters covered the tracks with debris. In several locations, foundations washed out up to 10 ft. (3 m) under the track. Floodwaters washed out the bridge over Bissett Creek, making Highway 97 impassable. Bissett Creek suffered very severe damage due to the formation of a logjam throughout an approximately 700-m reach upstream from the Highway 97 crossing. Properties on both banks were directly endangered. Those on the left bank, including a small subdivision or mobile home park, from erosion and the one on the right bank from overbank flow, surface scour and deposition. After the bridge at Dokie, about 6 mi. (9.6 km) west of Chetwynd washed out on the afternoon of August 1, the highway was later closed to all traffic. Other flooding creeks caused the closure of Highway 29 North toward Hudson's Hope and Highway 29 South to Tumbler Ridge. The road closures affected hundreds of southbound vehicles. A number of stranded motorists were evacuated by helicopter from isolated areas.</p> <p>On the morning of August 1, just before the lakeside road washed out, the Moberly Lake provincial campground at was evacuated. When flooding rivers caused Moberly Lake to rise rapidly, 50 people were evacuated from Camp Sagatawa and five camping units. Waves up to 3 ft. (90 cm) high were forced over its shore. Five people were evacuated by boat from the south side of the lake. Camp Sagatawa was inundated by a 3-ft. (90 cm) stream, which became 30 ft. (9 m) wide. Near Camp Sagatawa, Highway 97 was threatened. Near Sagatawa, an 8-ft. (2.4 m) culvert at Medicine Woman Creek became plugged. Near Moberly, Le Bleu Creek washed out the approach to the bridge by Ken's Place.</p> <p>The gravel road between Highway 29 and the park washed out in four places, including the Martin Creek bridge, and was not expected to be repaired within two or three weeks. After both approaches to the Martin Creek bridge washed out, about 20 Sukunka River campers were cut off from Highway 29. On August 2, 19 people were evacuated by helicopter: 14 campers staying at the Sukunka Falls Provincial Park and five hikers at Kinuseo Falls. A local resident rescued a two-year old child from a camper hung up on the edge of a collapsed bridge.</p>

## Appendix A – Historical Review (from D. Septer)

No.	Date	Event type	Precipitation	Descriptions
23	May 31-June 7, 1990	Spring runoff flooding		During the early part of June, four large areas (Okanagan, Kelowna and Kamloops areas, Prince George, including Williams Lake and Dawson Creek) experienced flooding. Flood conditions hampered the area's logging and tree planting operations. Forest Service roads (FSR) in the Anzak and Carp Lake areas were closed. North Fraser FSR was closed at 17 km and 57 km; Bowron FSR at 12 km; McGregor-Sande FSR at 9 km; McGregor-Logan FSR at 57 km; Carp FSR at 13.78 km; (The Carp Provincial Park Road remained open); McGregor-Gleason FSR at 3.5 km and the Chuchinka-Colbourne FSR at 51 km.
24	June 9-12, 1990	Spring runoff flooding and debris slide	Prince George (45.2 mm), midnight on June 9-June 12, 1990; Dawson Creek A (106 mm), evening of June 10 to about 5 p.m. on June 12, 1990	The heavy rainfall caused flash flooding and erosion damage in the Dawson Creek area. (East Pine bridge-north to the Peace River and south to Tumbler Ridge). Around June 12, parts of downtown Dawson Creek experienced "thigh-high" water. On June 13, floodwaters subsided. The Dawson Creek area flooding was caused by heavy rain whereas the other areas experienced damage due to a combination of snowmelt and rain. The total cost of channel restoration, log clearing and repair work was estimated to be \$2,575,980. A further \$883,080 was needed for enhancement work. (O.I.C. 919 Task No. 910077) Dates of flooding occurred between May 28-June 30.
25	June 14, 1996	Sinkholes	Not applicable	During the summer, two sinkholes were found in the W.A.C. Bennett Dam <sup>6</sup> . On June 14, a tourist noticed the first one, about 40 m deep, in a road across the bridge. Drilling tests showed the sinkhole was caused by a 110-m long pipe about 15 cm in diameter that had been left in the dam when the construction was completed in 1967. In September, a smaller sinkhole was discovered surrounding a second survey pipe embedded in the dam. The discovery of the two holes in June and September caused alarm. It was feared that the dam might breach and spill the contents of the 1,120-mi. <sup>2</sup> (2,900 km <sup>2</sup> ) Williston Lake Reservoir, the largest in North America. Hand compaction of material around the benchmark pipes during the construction of the dam was believed to be the cause of the two sinkholes. According to BC Hydro spokesman, also the 30-ft. (9 m) areas around the sinkholes were not firm as could be and silt in the core of the dam had been moving. The sinkholes were refilled and the road across the dam rebuilt. To stiffen up the core of the dam the holes were filled by compaction grouting. Work for each hole was expected to cost about \$7 million (Peace River Block Daily News, January 15, 1997). In May, the level of Williston Lake behind the dam dropped significantly, causing dust storms in some shoreline areas. By June, the reservoir started to refill. B.C. Hydro officials expected the lake to reach its normal level in September.
26	January 27-29, 1997	Ice jam flooding	Not applicable	Late on January 27, ice build up in the Peace River about 5 km downstream from Taylor caused the level of the Peace River to rise behind it. To alleviate the potential flooding of properties along the river in South Taylor, BC Hydro cut back the outflow from the W.A.C. Bennett Dam about 5,000 cfs (141.6 m <sup>3</sup> /s). BC Hydro spokesman noted, "I don't think it will get any worse than it did last year."

<sup>6</sup> The huge earth dam in northeastern British Columbia contains 57 Million m<sup>3</sup> of fill, mostly compacted till. Across-section of the dam resembles a giant triangle, 800 m at the base, 12 m across the top and 185 m high. The dam, completed in 1967, is 13 m above the level of Williston Lake, which stretches about 100 km west behind it. It provides about one third of British Columbia's hydroelectric needs (Canadian Press, June 6, 1997). The sinkholes are columns of loose material 8 ft. (2.4 m) across and about 100-120 ft. (30-36 m) deep. It is basically a round elevator shaft that is not at the specified density (Peace River Block Daily News, January 15, 1997).

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No.	Date	Event type	Precipitation	Descriptions
				As of the morning of January 29, there were no reports of shoreline homes in danger of flooding. In response to warm weather patterns the ice jam south of Taylor and potential flooding receded. The ice front slowly made its way down the Peace River. By January 30, it was situated at the Taylor Bridge. The ice jam later receded 2.5 km downstream of Highway 97 bridge. The water level at South Taylor dropped 1.5 m.
27	June 10-13, 2001	Flooding	Not available	<p>During the second week of June, extreme precipitation caused many rivers in the Peace River area to overflow their banks. Flooding caused significant damage to at least three roads in the area: Cypress Road, 65 km northwest of Fort St. John; Farrell Creek and Upper Halfway Road between Fort St John-Hudson's Hope.</p> <p>Two major washouts of about 200-300 m in length, one at each bridge, made Cypress Road impassable<sup>7</sup>. At the Cypress Creek bridge, the end fills were completely gone. Repairs were estimated at \$250-300,000. According to one local resident, this was the "worst flooding to have occurred here since 1965."</p> <p>On the Upper Halfway Road, another substantial washout of 500-1,000 m in length obliterated the road and its right-of-way. Water flows at the Halfway River bridge were high and the approaches appeared to be holding. Repairs were estimated at \$500-600,000. Repairs to a major culvert failure on Farrell Creek Road were estimated at \$400-600,000.</p> <p>On Highway 29, ten downpipes were demolished. Repairs were estimated at \$200,000. There were two new slides on Highway 29 at the Halfway and three more at Cache Creek hill with an estimated repair cost of \$1 million. Many other significant washouts occurred along this route. As the water table changed, more slides were anticipated over the coming weeks. Significant damage was done to private roads, driveways, oil and gas facilities and roads.</p> <p>Around June 13 near Smithers, two or three blocked culverts caused substantial flooding on the last 2 km on Driftwood Road. A piece of road washed out around 3 km from the gate.</p>
28	January 18-24, 2005	Flooding, icejam flooding and mudslide	Not available	On the morning of January 24, highway and rail connections in the Pine Pass were disrupted by a mudflow and flooding. A mudflow in the Pine Pass area about 20 km north of the MacKenzie junction temporarily closed Highway 97. Soon after the highway reopened to single lane alternating traffic, it was closed again just before noon when Rollston Creek jumped its banks. The area had recently experienced higher than normal temperatures and heavy rain and snowmelt.
29	June 13, 2005	Landslip	Not available	On the night of June 13, a 200-300-m section of Highway 29 between Chetwynd-Tumbler Ridge collapsed. Prior to the collapse, a "significant amount of rain" fell in the area. The highway closure forced traffic to make a 150- km detour.

<sup>7</sup> The Cypress Creek Road is 44 km long, with three bridges and has a number of short side roads attached to it. While the first 22 km and the first bridge remained intact, about 12 families were left isolated beyond this point. (Ministry of Transportation). There are no alternate routes for Cypress, Upper Halfway or Farrell Creek roads.

## Appendix B - Summary of Rainfall Data (2011, 2016)

## Appendix B - 2011 and 2016 Rainfall Data for PRRD Areas

<b>Summary of Rainfall Data at different Stations 2011</b>				
DATE	ENV. Canada	BCFS Sta.	BCFS Sta.	ENV. Canada
	Chetwynd	Hudson Hope	Lemoray	Dawson Creek
	(mm)	(mm)	(mm)	(mm)
22/06/2011	3.2	0.0	0.0	0.3
23/06/2011	27.5	0.4	6.0	19.2
24/06/2011	72.0	79.6	39.2	54.4
25/06/2011	25.8	45.2	125.0	8.8
26/06/2011	0.0	7.6	10.4	0
<b>Total Rainfall (mm)</b>	<b>128.5</b>	<b>132.8</b>	<b>180.6</b>	<b>82.7</b>
DATE	ENV. Canada	BCFS Sta.	BCFS Sta.	ENV. Canada
	Chetwynd	Hudson Hope	Lemoray	Dawson Creek
	(mm)	(mm)	(mm)	(mm)
07/07/2011	17.9	0.0	0.2	0.0
08/07/2011	43.6	26.6	26.8	50.3
09/07/2011	10.3	11.8	12.4	29.1
10/07/2011	5.6	6.0	12.4	2.3
11/07/2011	5.2	18.4	5.6	7.1
<b>Total Rainfall (mm)</b>	<b>82.6</b>	<b>62.8</b>	<b>57.4</b>	<b>88.8</b>
DATE	ENV. Canada	BCFS Sta.	BCFS Sta.	ENV. Canada
	Chetwynd	Hudson Hope	Lemoray	Dawson Creek
	(mm)	(mm)	(mm)	(mm)
14/07/2011	15.2	1.0	4.0	N/A
15/07/2011	11.4	0.0	3.8	N/A
16/07/2011	2.8	28.0	0.8	6.8
17/07/2011		12.6	11.8	3
<b>Total Rainfall (mm)</b>	<b>29.4</b>	<b>41.6</b>	<b>20.4</b>	<b>9.8</b>

<b>Summary of Rainfall Data at different Stations 2016</b>				
DATE	ENV. Canada	BCFS Sta.	BCFS Sta.	ENV. Canada
	Chetwynd	Hudson Hope	Lemoray	Dawson Creek
	(mm)	(mm)	(mm)	(mm)
13/06/2016	0.0	0.0	0.2	0.0
14/06/2016	48.0	1.6	18.8	8.8
15/06/2016	86.8	41.2	92.2	89.8
16/06/2016	0.6	1.4	6.0	12.0
17/06/2016	0.0	0.0	0.0	N/A
<b>Total Rainfall (mm)</b>	<b>135.4</b>	<b>44.2</b>	<b>117.2</b>	<b>110.6</b>

## Appendix C - Desktop assessment maps

# Appendix D - Master Damages List

Appendix D - Master Damages PRRD Flood Risk Assessment			
Date	911 Address	Description	General Location
23-Jun-16	208 Road	2 culverts washed out in 2 driveways on property, lives in Kamloops will be in Dawson Creek tomorrow.	Arras
29-Jun-16	Riley Crossing	Property flooded due to Pouce River; property borders directly beside the Pouce River - some property loss; HD equipment; 54' tractor trailer fully loaded, boat, 3 trucks all submerged underwater; river took out entire fence of lower field approx 2-3 acres damaged; haven't done anything yet; has some insurance - adv to speak with them; DFA.	Briar
04-Jul-11	235 Road, Cecil Lake	Dirt walled beasement caved in, pushing on furnance and hot water tank.	Cecil Lake
29-Jun-11	Hwy 97 S	No main road access (quad trail only way out). Primary residence. Has had major land erosion. Lost fence & one older shed, but only concerned with future prevention of erosion and is interested in information on water management plans.	Chetwynd
16-Jun-16	Dokie School Road	Flooded yard, creek broke banks, sent to Chetwynd to wait for directions.	Chetwynd
18-Jun-16	Hwy 97 S	Flooded basement, ground/property damage.	Chetwynd
27-Jun-11	Hasler Road	Boulder Creek has destroyed their property, massive amounts of debris in yard and no driveway access to main road.	Chetwynd
27-Jun-11	Hasler Sub	Devastation of neighbours, including destroyed homes and farmers' fields - she will advise them to call the PRRD. Main concern is for neighbour, who lives on Hasler Rd. but is away. His home & shop have been totally flooded. Only damage is to her well. She is not looking for compensation as they can fix it themselves.	Chetwynd
29-Jun-11	Old Hasler Road	2 people have called on behalf of a neighbour who was away & has now had to take his wife with alzheimers to a sisters in Terrace because he couldn't bring her home to a mess. Advised that the house is a permanent residence - there is at least 4 inches of water in the house - yard and outbuildings destroyed - well full of silt.	Chetwynd
29-Jun-11		Home was submerged in 3.5 feet of water & he had to walk out at 3:00am. This happened 3 weeks ago and was the first incident of flooding at Hasler. His property was shown on the front page of the Chetwynd paper at that time. He lost his truck, tools, 2 skidoos, BBQ, Camper, & furniture. His main concern is the roadway - he can't get in to get any remaining items that may be left. Is staying at contact phone number & is looking for a new place to live.	Chetwynd

30-Jun-11	Hasler	No access to house - Boulder Creek diverted went through driveway, can't get in or out with a vehicle - deep ravine - not sure about septic tank, it seems to be working. Power shed has water damage and is surrounded by water, outbuildings and fencing all damaged, field, whatever equipment was outside, chain saws, everything in shop, well damaged, lost bridge on property, firepits, landslides, looks like a war zone, vehicles and campers imbedded in rock.	Chetwynd
16-Jun-16	Hasler Road	Lost her house, shop, everything.	Chetwynd
18-Jun-16	Hwy 97	Boulder Creek is etching out the foundation of his home and he is wondering who might be able to help him; Cabin is falling into river, has supplies coming.	Chetwynd
18-Jun-16	Old Hasler Road	Property Flooded.	Chetwynd
July 5, 2016	Hwy 97 S	Concerned about further erosion to land causing house to fall into Boulder Creek; 12 ft cliff about 3 ft from back door; house is situated on property backing onto creek; some cracks in foundation; afraid they are going to lose house if it's left too long without any work done to it as land is sloughing; will not allow kids to stay at house as its not safe.	Chetwynd
27-Jun-11	McDonough Rd	Lost bridge deck on a 16' x 55' bridge on property, pump house for livestock waterers is lost, lost fencing, water was 35ft deep.	Chetwynd
28-Jun-11	Hwy 97S	Commotion Creek isolated their home, removed their septic field and potentially have no suitable access.	Chetwynd
28-Jun-11	Tricker Rd	Driveway is washed out -culvert washed away - water in basement caused damage - has a loader that he made a trail to get to town.	Chetwynd
20-Jun-16	Tricker Rd	Road into residence is totally washed out - made a goat trail so can get in and out - rerouted creek back into culvert.	Chetwynd
29-Jun-11	Fernando Sub	Has a 2' ditch across his garden that is washed away, he lost a tent and his wooden shed is water damaged. Back in 2011 MoT replaced the culvert but didn't remove the debris in the creek, consequently this flood backed up over people's property. The whole creek needs to be cleaned out.	Chetwynd
30-Jun-11	Moreland Sub	4 ft wall around the bottom of the house that is on a hillside had water coming over the wall & the wall cracked & water was coming through until yesterday (June 28th). He stayed on top of the water pouring into his basement with the shop vac (just barely kept up). Main concern is damage to wall.	Chetwynd
27-Jun-11	West Hayward Rd	Driveway culvert damaged.	Chetwynd
28-Jun-11	Houde Road	Well flooded, driveway access impacted, water in basement, fencing lost, hay fields on 70 acres, possible equipment damage.	Chetwynd

28-Jun-11	Ganson Rd	Took out well - still have water from cistern that can use - don't know the extent of silt in wells - pressure tank broke off - the pump is broken - have 5 children living in residence.	Chetwynd
28-Jun-11	Hasler Rd	Field and pasture under water(500 acres), fences flattened, lost a dozen skidoos in power shed. Lots of items not located like motors - 2 hay barns under water, balers, cutters, etc. - don't really know extent of all the damage or loss.	Chetwynd
30-Jun-11	Wildmare Rd	Lost some of the river frontage and the roadway to cabin - wells are flooded and full of silt.	Chetwynd
30-Jun-11	Fernando Road	Private roads on farm have been washed out.	Chetwynd
27-Jun-11	Hwy 97 S	No power due to flood, driveway damage.	Chetwynd
18-Jun-16	Stone Ck Sub	Property damage - ground/electrical.	Chetwynd
18-Jun-16	Stone Creek Sub	2 cars swept away, 500 meters of timber destroyed, 20 acres of juvenile timber taken out, 3 days of work with loader restoring creek putting back into boundaries, creek crossing got taken out (2 big culverts).	Chetwynd
18-Jun-16	Campbell Sub	Water came in along through the garage, the driveway is a mud hole - they dug trenches to try to get the water away from the house, water came into the dining room, -the bottom half of the window & wall down in dining room has damage, the floor is damaged - water dripped down the stairs - water came in the basement filled the heat ducts & damaged flooring and carpet.	Chetwynd
18-Jun-16	Hwy 97 S	Primary residence - driveway is mush, basement flooded, sewer backed up, furnace, 2 hot water tanks, iron remover, pressure tank damaged. Yard is a "sponge" and house is sinking in one corner. Ten acre hay field is underwater.	Chetwynd
29-Jun-11	Willow Flats	Whole backyard flooded - yard full of gravel - well is wrecked full of silt - car full of gravel - creek running in yard - lawn mower covered in gravel - silt & gravel everywhere - water in house next door.	Chetwynd
18-Jun-16	Campbell Sub	Basement flooded, drywall and insulation damaged, lagoon starting to flow over, worried about landslides in subdivision.	Chetwynd
27-Jun-11	Hwy 97 S	Lots of property damage.	Chetwynd
29-Jun-11	Hwy 97 S	Property damage.	Chetwynd
29-Jun-11	Hwy 97 S	Property damage.	Chetwynd
28-Jun-11	Hwy 97 S	Property damage.	Chetwynd
30-Jun-11	Hwy 97 S	Property damage - ground/electrical.	Chetwynd
16-Jun-16	Hwy 97 S	Has hay (40 acres) and pasture land that is under 10 feet of water & has lost fences. He is concerned about wet land habitats & the location of a culvert being installed by CN Rail were their tracks have washed out at CN Track no. 646.11. If Minisy of Environment notices the location of his 6 missing cows (2 cows, 2 calves, 2 steer) during there fly over he would appreciate a call to direct him to their location.	Chetwynd
16-Jun-16	Hwy 97 S	Lots of property damage	Chetwynd

18-Jun-16	Waters Sub	Damage to outside property and outbuildings, creek has redirected itself through his yard about 2 ft from house.	Chetwynd
29-Jun-16	Wildmare Rd	Flooding in basement - carpet destroyed.	Chetwynd
29-Jun-11	Wildmare Rd	Driveway & culvert completely washed out. No road access in/out. Gap in roadway is 25' wide by 10 - 12' deep. Has minor damage to gardens and greenhouse. Wildmare creek used to pass roughly 200 metres south of the house-it now seems to be about 50 metres to the north!!	Chetwynd
18-Jun-16	Wildmare Rd	Log jam causing pooling on property, well shed gone, no water, fencing destroyed.	Chetwynd
30-Jun-11	Wildmare Rd	Lagoon damaged, driveway damaged, MOT working to fix culvert which will help with driveway.	Chetwynd
27-Jun-11	Wildmare Rd	Is not home, husband is home and stranded, he is choosing to stay to try to save house and keep generator going with sump pump; He is stranded but stated he is safe (self-assessed).	Chetwynd
28-Jun-11	Wildmare Rd	House has river running through it and 10 acres of property are under water. House is uninhabitable, severe ground or slope failure, proximity risks.	Chetwynd
28-Jun-11	Wildmare Rd	Self evacuating from Wildmare - house is completely flooded, water running through, excavator in creek is tipped over. Asking for assistance.	Chetwynd
30-Jun-11	Waters Sub	Major damage to basement electrical system due to flooding.	Chetwynd
28-Jun-11	Wildmare Rd	Flooding in large storage; property damage at corner of property 2/3 away across land @ 5 acres, creek just ripped land area apart, uprooted tree, great deal of silt, well water damaged, at least a foot or two deep of debris.	Chetwynd
30-Jun-11	West Fraser Rd	Lost culverts throughout the property. 9 ft culvert, two large culverts, two smaller culverts washed away. He is unable to get across the river to see if further culverts are gone - cattle pen is completely filled with mud - rocks & debris everywhere.	Chetwynd
04-Jul-11	Willow Ck FSR	Old farm, access washed out	Chetwynd
27-Jun-11	Cypress Creek	Lost driveway, fences, road washed out.	Cypress Creek
28-Jun-11	Charlie Lake Cres	Water ran down hill and ripped through yard damaging all the landscaping - took out culvert - overflowed creek - took out 1/2 the driveway which was freshly gravelled.	Fort St John
04-Jul-11		Flooding in basement.	Fort St John
21-Jun-16	Rose Prairie	Basement flooded - carpets ruined.	Fort St John
28-Jun-11	257 Road, Airport Sub	Wall in basement and floor in basement damaged from water.	Fort St John
18-Jun-16	Upper Halfway Road	10 acres of land lost, lost fencing, farming is primary income.	Halfway River
27-Jun-11	FSR 69	Driveway is washed out.	Halfway River
27-Jun-11	Coulson rd HH	Basement flooded.	Hudson's Hope

27-Jun-11	Nichols Dr. Jackfish Lake	The access road has been destroyed - the only way in or out is via a quad trail at the back of the property (are able to get their 4X4 truck through it) home-based business (hair dresser) is suffering as her clients can't access. Her home is ok but her yard and field is a disaster (gravel, mud, debris).	Jackfish Lake
27-Jun-11	Nichols Sub, Jackfish	Shop destroyed by mudslide, tools lost, boat damaged.	Jackfish Lake
28-Jun-11	Nichols Rd	Yard and road washed out damage under trailer.	Jackfish Lake
28-Jun-11	217 Road	50 acres of field that was totally under water and he may have lost his canola crop located north of the creek on 219 Road.	Kilkerran
28-Jun-11		Power is out - cannot get there - will lose everything in deep freezer - had halibut.	Lemoray
29-Jun-11	Cowie Ck Road	Water through roof; leaking through roof on top floor through to main floor. No drywall - ceiling is wood; water came in through slats; house has resettled off overhang; pillars are off foundation (slab on ground). Well water is brown b/c it is a spring-fed well.	Lone Prairie
29-Jun-11	17.5 km past S. Moberly Road, past Dokie Creek	No access to house.	Moberly Lake
29-Jun-11	Cottonwood Place	2.5" water on floor, drywall, debris, possibly water & sewer.	Moberly Lake
29-Jun-11	Cottonwood Place	2.5" water on floor, drywall, debris, possibly water & sewer.	Moberly Lake
29-Jun-11	Cottonwood Place	Flooded, creek damage.	Moberly Lake
29-Jun-11	Centennial Rd West	Various	Moberly Lake
29-Jun-11	Hwy 29	Horse pasture along the creek & all fencing destroyed. Garden destroyed including 80 lbs of potatoes that were planted.	Moberly Lake
29-Jun-11	Lakeshore Dr	Driveway eroded, guest cabin has 1 1/2 ft water in it, water system to primary home may be damaged.	Moberly Lake
30-Jun-11	Centennial Rd W	Water running through yard has affected water system, crawl space is flooded and driveway lost	Moberly Lake
June 30 2011	Yips Sub Moberly	Primary residence - basement flooded via sump pump hole (basement 1/2 finished) drywall, flooring, furniture ruined. Also lost shed that contained 2 outboard motors, 2 chain saws, gas pump, woodworking saws, meat saw). Holiday trailer had water up to windows and was flipped on its side. In morning water was within 30 feet of house and couldn't get out as the bridge was washed out.	Moberly Lake
30-Jun-11	Pioneer Rd	Water flooded crawl space and first floor of house - floor ruined - up 4 inches on walls - will be wet insulation - possibly damage to bottom of cupboards - 3 portable cabinets damaged - pump house with pressure system all ruined - some flooding in outbuildings - stucco possible damaged on house - shop built on beams - up to floor joists - skirting was soaked.	Moberly Lake

30-Jun-11	Moberly Lake Rd	Renting house - 1 1/2 feet of water in house on main floor and 5 feet in basement - cannot live in house - staying at the neighbours - damage to all furniture - septic and well flooded too.	Moberly Lake
27-Jun-11	West Centennial Access Rd	Cabin engulfed in water - foundation and floor underneath damaged and eroding - not sure about water pump - deck work is floating - water system in cabin for the house - so have cut power to it - front of cabin tipping into lake - house - crawlspace had 6 inches of water - have been able to pump - not sure if hot water tanks have been damaged - H-Vac system not sure if it's functional - yard is floating all under water - garden gone - gazebo engulfed in water - have no water and not using sewer system - power is ok at this point at house.	Moberly Lake
27-Jun-11	Yip	Wet insulation - not a permanent residence.	Moberly Lake
27-Jun-11	Yips Sub	Primary residence completely surrounded in water. Garden under water. -Footing of the large deck is tilted & deck is starting to pop off. Debris is floating and damaging skirting & siding. Unable to look under skirting to assess damage. Lots of items stored under there are still submerged. All gravel that was banked around the house is washing away. Concerned sewer may be damaged & her well may be contaminated. Most of the driveway has been eaten out. Previously had 70 loads of gravel to beach area & will have to wait until water receded to assess damage there. Luckily she had her company bull dozer on the property and used it to divert water for 3 neighbours as well as herself to help save a lot of property. Dock ripped apart & mostly floated away. Also lost picnic table & treated wood horse-shoe pits.	Moberly Lake
27-Jun-11	W Centennial (Mob Lk)	Seasonal property on Moberly Lake -can't get to the property, but can see it is under about 3 feet of water. They have a fully furnished 3 bedroom cabin, (with 3 beds, couches chairs, rugs, etc. -lots of items including telescope, 3 fridges, deep freeze) A 4 bedroom bunkhouse with 2 queen & 4 single beds and a guest house with 2 single beds and a tool shed, & water shed. \$1500 BBQ with oven & ice box is submerged. Patio furniture is floating away along with the deck. The dock is gone. Will take pictures of damage once they can get to the property.	Moberly Lake
27-Jun-11	S. Moberly Rd	Seasonal cabin on Moberly lake. Can't currently get to the cabin because the water is too deep. Will be able to assess damage to cabin and two outbuildings once water recedes.	Moberly Lake
28-Jun-11	Holiday Beach Rd	Primary residence - over 42 inches of water in basement - damage to water pump, tank, water softener, pressure tank, hot water tank, sewing room, workshop, deep freeze, lots of storage items & gyprock.	Moberly Lake
28-Jun-11	Holiday Beach Rd	Seasonal Residence but is primary from May to Sep each year. - Water up around cabin & is still submerged. Haven't been able to get to it yet to assess damage.	Moberly Lake

28-Jun-11	Yip Road	Property damage - fallen trees, concerned about a log jam on 3rd bridge.	Moberly Lake
28-Jun-11	Holiday Beach Rd	Boat house totally flooded - under cabin is flooded.	Moberly Lake
04-Jul-11	Park Rd Yips Sub	Basement flooded, outbuildings flooded. Equipment wrecked, holiday trailer damaged, cut swath through yard, yard full of debris,.	Moberly Lake
04-Jul-11	Cottonwood Place Moberly	Cabin totally flooded (5 feet of water) everything wrecked - outhouses flooded everything going into the lake.	Moberly Lake
	Lakeshore Drive	2 structures with 4ft water inside.	Moberly Lake
	Cottonwood Place	Under 6ft of water, boat house is submerged.	Moberly Lake
	Cottonwood Place	Under 6ft of water, boat house is submerged.	Moberly Lake
	Yips Sub	Foundation damage, flooding & drywall, furniture, debris and silt in yard, driveway under water.	Moberly Lake
19-Jun-16	Holiday Beach Rd	Water surrounded house, flooding damaged, drywall, permanent residences.	Moberly Lake
19-Jun-16	Yip Sub	Water 36" in crawl space, 7" water on main floor, flooring damage, in-floor heating, electrical damage, debris in yard, power shed damaged, some furniture.	Moberly Lake
19-Jun-16	Yip Sub	Driveway washed out, yard destroyed, 2' water in crawl space.	Moberly Lake
19-Jun-16	W Centennial Rd Moberly	Property damage, ground water backed up into house damaging hot water tank and heating system.	Moberly Lake
19-Jun-16	Cottonwood Place	Water 5 ft around house-3ft in house.	Moberly Lake
19-Jun-16	Lake shore drive	Land and structures flooded.	Moberly Lake
19-Jun-16	Lake shore drive	Land and structures flooded.	Moberly Lake
19-Jun-16	Lakeshore drive	Land and structures flooded.	Moberly Lake
19-Jun-16	Lakeshore drive	Land and structures flooded.	Moberly Lake
19-Jun-16	Cove Ln	Beach erosion.	Moberly Lake
19-Jun-16	Cove Ln	Beach erosion.	Moberly Lake
19-Jun-16	Cove Road	Minimal damage.	Moberly Lake
19-Jun-16	Cove Ln	Dock damage.	Moberly Lake
04-Jul-11	Pioneer Road	Bank washed out, damage is pretty bad, bank is sloughing really bad.	Moberly Lake
04-Jul-11	S Moberly Lake Road	Dock damage.	Moberly Lake
18-Jun-16	Yips Sub	House is locked but appears to have damage.	Moberly Lake
27-Jun-16	Yips Sub	Flooding to boat house and power shed.	Moberly Lake
06-Jul-16	Yips Sub	Crawl space flooded, minimal damage.	Moberly Lake
19-Jun-16	Yips Sub	Issue from creek.	Moberly Lake
19-Jun-16	Yips Sub	Septic damage in crawl space.	Moberly Lake
07-Jul-16	Yips Sub	Creek washed through.	Moberly Lake
	254 Rd	Fields washed away 12ft wide ruts 1 ft deep left behind.	North Pine
	Cypress rd Pink Mountain	Land damage and debris on land.	Pink Mountain
	211 Road	Culvert damaged; driveways washed out; CRS will not take responsibility for culverts; would like CRS to get funding to fix the driveways and culverts.	Pouce Coupe

	Radar Laker Road	West Bissette Cat Bridge on South Loop; East Bissette cat bridge; Log Cabin Footbridge (2 span) West Bridge approach and downstream end of culvert and wash south side of hill; Culver near Wolf footbridge (below Radar Lake); Kiwanis trail culvert North end Kiwanis Trail; culvert near Bissette single span footbridge and two span footbridge; culvert on Martin Trail (2nd culvert below Radar Lake).	South Dawson
	Agricultural Land	Agricultural property, farmland leased out; person who is leasing land to farm cannot access field. MOTI Road allowance that flooded happened in 2011; large culvert washed causing hole in road.	South Dawson
	Independent Road	2 cabins under water, RV under water, woodshed fallen over.	Tomslake
	Tate Creek Road 17	Major lagoon clean up needed due to flooding of Tate Creek and Kluskas creek (creeks join on property) which brought in debris - trees, rocks, beaver dam sticks; debris prevents lagoon from working properly; cannot currently get to lagoon to assess due to excessive silt on land and dampness - causes vehicle/tractors to sink; has had 1 contractor come out but stated be sometime before silt dries enough to work on; corrals are also damage, but 1st priority is lagoon; owners farm land.	Tomslake
	Independent Rd	Water flooding into field.	Tomslake
	Tumbler Ridge Hwy S	Lost land, creek that goes through course is now a river, lost culverts, need to replace gravel.	Tumbler Ridge
Jan-19	209 Road	2016 highest they have seen by 4-5 feet	Pouce Coupe
Jan-19		Kluskas Lake - flooded driveways moved 215 and SW of 202, pickups moved by the water down Tate Creek towards and joining Bissette Creek	Tomslake
Jan-19		Concerned about the debris in and around the creeks. Beavers fell trees that are taken in the floods and end up plugging up bridges.	Tomslake
Jan-19	Old Edmonton Hwy	Erosion has changed the flow of the river in some areas which changes the floodplain.	Tomslake
Jan-19	Hwy 97 North of Chetwynd	Railway culverts are too small or non existant. No Road detour routes in case of washouts. Debris diversions in the creeks.	Chetwynd
Jan-19	Houde Road	2013 - MOTI burned 6 buildings and farm equipment during the 2011 flood cleanup, no investigation allowed by the Ministry of Transportation or the Ministry of Environment. There was a 1 meter cube oil spill that has yet to be cleaned up. 2013 MOTI on flood clean up blast pickup sized rocks from submarine pit for enbridge pipeline to Vancouver. This resulted in 500 loads of rock put on ALR which has not been cleaned up yet. MOTI diverted Commotion Creek into Strand Lake with approx. 50 railway ties and pavement. PCB's and creosote in the asphalt and ties has likely polluted the fish bearing lake. These need to be removed ASAP (from the 2016 Flood). Fur Thief Creek needs to be cleaned up. Build road through Monkman Pass.	Chetwynd

Jan-19	Moberly Lake	Consider Access routes from Chetwynd to Tumbler ridge in the event of washouts.	Moberly Lake
Jan-19	Moberly Lake	Widen the bridge at the outlet of Moberly Lake, it plugs with debris and can not handle the volume of water during flood events.	Moberly Lake
Jan-19	Tomslake	Residents are concerned that all the bridges in the area are undersized and do not allow enough water to flow underneath them. The bridge get plugged with large woody debris and other debris found in the watersheds.	Tomslake
Jan-19	Swan Lake	Residents manage the weir at the outlet of the lake. The weir is not large enough to handle the volume of water during flood events. The residents want legislation allowing them to control the amount of water flowing over the weir.	Swan Lake

LEGEND	Residents that fall outside the study area.	
	Concerns brought up at Public Meetings by residents.	

# Appendix E - Flight Overview – Aerial Images

# Appendix F - Detailed Flight Images

## Appendix G - Identified Potential Risk Areas