Detailed Comment on CN Draft PMP Confirmation #: CN-18/23-BCW Sept 2018- Dec 2023 (PMP)

Submitted for T. Buck Suzuki Environmental Foundation (TBSEF) and United Fishermen and Allied Workers' Union –UNIFOR (UFAWU)

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Attachments

A) EXPANSION ON Glyphosate fate and toxicity to salmon and steelhead populations in the lower Skeena River watershed with special reference to environmental and biological parameters that may modify fate and effects - Dr. Chris Kennedy August 14th, 2018
   1) Glyphosate report modulators submitted Aug 14 final 2018.pdf
   2) CVKennedy2014-1.pdf

B) Comment on: Exceptional Character of the location of the Prince Rupert to Terrace section of the CN rail in regards to the proposed CN Pest Management Plan (BC West)-Allen S. Gottesfeld Ph.D., P.Geo., August 14, 2018
   1) Aug 14 2018 Gottesfeld comment on CN PMP final.pdf
   2) Gottesfelds cv .pdf

C) Field Assessment Report and Background Review CN 2017 Herbicide Application in the Skeena Sub, Terrace to Prince Rupert, BC -Amanita Helena Coosemans, B.Sc. (hon.), M.Ed., R.P.Bio. March 7, 2018
   1) CN Herbicide Assessment Report_Final.pdf,
   2) CoosemansreportPhotoDocument_Part1.pdf,
   3) CoosemansreportPhoto Document_Part2.pdf,
   4) CoosemansreportCARO Results Report.pdf and
   5) Coosemansreport Chain of Custody_CARO.pdf

D) Lab results for July 10 2018 and October 2017 samples
   1) Lab results 2018 for S4 Oct 2017 and S8 July 10 2018 samples.pdf

E) Letter dated September 4, 2018 Angela McCue, Barrister & Solicitor
   1) 09.04.18 McCue CN PMP legal letter (with attachments).pdf

Executive Summary

Rationale and recommended changes to the PMP

1) The CN Skeena subdivision has exceptional characteristics related to increased risk to salmon populations from pesticide use as described by experts

a) "*This report* [prepared for this comment- Attachment A] *provides information showing that factors unique to this river system may increase the transport of glyphosate-based herbicides into salmon habitat, result in more glyphosate being bioavailable, and be more toxic to salmonids than in other areas. This information supports previous conclusions that glyphosate use as proposed may cause adverse effects to Pacific salmonid populations."*
"...High water solubility, low binding capacity in the rail area, high water table, seasonally-saturated soils, and high precipitation rates all may result in significant amounts entering the river either subsurface or overland."
"...the persistence of glyphosate in the environment may be prolonged in the Skeena area..."
"...sublethal effects occur at much lower concentrations and include a variety of effects that should be considered significant and may pose a risk to fish in general, and spawning Pacific salmon in areas adjacent to application of the herbicide."
- Dr. Chris Kennedy Professor SFU, B.Sc., Biological Sciences and Ph.D., Environmental Toxicology

b) "*I recommend that pesticides not be used in this exceptional location due to the exceptionally high risk of pesticide contamination of high value aquatic ecosystems and that mechanical/manual techniques be relied on for vegetation clearing of CN's rail right of ways and ballast in the Prince Rupert to Terrace section."*
-Dr. Allen Gottesfeld Ph.D., P. Geo. Head Scientist for the Gitxsan Watershed Authorities and the Skeena Fisheries Commission 1999-2012

c) Applicators' decisions would be based on general levels of toxicity and adverse effects that may be appropriate for other parts of Canada whereas the PMP needs to address expert advice about risk levels arising from local conditions:

- Second largest salmon producing river in Canada
- Lowest average afternoon temperature in June, July and August (Prince Rupert 15.67 °C)
- 2,470 mm (2.5 meters) average rainfall in Prince Rupert
- Indication that low temperature and cloud cover resulted in toxic chemical persistence; A twig sample (S8) taken at the edge of the CN RoW within 5 meters of the Skeena estuary on July 10, 2018, about 300 days after the suspected 2017 application, contained 3,680 ppb of glyphosate.
- Coarse textured mineral soils/substrates low in organic matter which drain heavy rainfall events quickly into nearby fish bearing and other waterways [Scroll down to Photo Section]
- Closeness of the rail line to aquatic ecosystems with it being extremely closely tied to floodplain habitat and in some cases the salmon swim right through the underlying riprap.
- High water table and seasonally saturated soils

RECOMMENDATION:

The Skeena subdivision's exceptional risk factors be specifically addressed in the CN PMP with special measures to keep pesticide application to an absolute minimum (see ballast recommendation under Rationale 3)

2) It is feasible and practical to clear the CN rail right of way "RoW" without broadcast spray. The safety issues in the RoW are significantly different from the issues relating to the ballast. The main concern with the RoW is sight lines rather than track stability.

a) Adjacent highway uses non chemical only methods to address sight line objectives- if BC highways can do it so can CN
b) Expert recommendation for mechanical clearing of vegetation in the Skeena Sub was given by Amanita Coosemans, B.Sc. (hon.), M.Ed., R.P.Bio. whose expertize includes local vegetation ecology and pesticide use
c) In the case of the Skeena subdivision, proper mapping and adherence to the myriad of Pesticide Free Zones (PFZs) required would disclose that broadcast spray of chemicals is impractical. BC law protects fish habitat and wetlands by requiring 10 m PFZs for most toxic chemicals as a result of which the extensive PFZs significantly overlap leaving only limited areas where pesticide can be applied (also discussed in 4 (b) with examples in photo section).
d) While BC hydro arguably has somewhat different RoW vegetation clearing objectives than CN and the highway they do however provide yet another example of clearing without recourse to broadcast spray
e) CN cleared the RoW without recourse to broadcast spray for many years
f) The expense of mechanical clearing may arguably be higher than average in the Skeena subdivision where growth rates may be higher than the average for the CN network as a whole, however this area represents less than 1% (.007) of CN's route-kilometers of track in Canada and the risk of higher adverse impacts from pesticide (as described under 1) justifies the expense
g) CN has formally and publicly agreed in the past (as recorded in the 2012 Comprehensive Study Report) to clear the RoW mechanically in the long stretch in the Skeena subdivision (from Ridley Island to past Fairview Terminal in Rupert). This section of rail was included in the assessment of the Fairview expansion project. This suggests that manual clearing is a feasible option in the Skeena subdivision area.
h) In Nova Scotia in 2017 CN agreed "not to spray the brush and vegetation that is encroaching on the nearly 120 kilometres of track from Bedford to Brookfield" which we understand was a stretch of track close to a salmon bearing river – although this was a river with significantly lower fisheries values than the Skeena.

RECOMMENDATION:

For all **RoWs** within the CN PMP including the Skeena subdivision:

> RoWs be cleared mechanically/manually without recourse to broadcast chemical spray. Spot treatment using handpump application may be permitted: except on berry bushes and except in Pesticide Free Zones (PFZs).

3) It is feasible and practical, considering the risk, to clear the CN rail ballast ("ballast") without resorting to power spray in areas of exceptional concern; in the Skeena subdivision (which is exceptional for its

fish habitat concern) and within cities, towns and villages (which are exceptional for public concerns for human health)

a) these areas of exceptional concern represent a very small percentage of CN's route
b) partially successful treatments exist (e.g. CN admits steam works for all but deep rooted plants) and in order to address safety concerns we are recommending these methods may be augmented by handpump application of pesticide to achieve effective weed control
c) continued efforts are required to develop effective alternatives to pesticides
d) allowing selective, non power, but not broadcast, spray to supplement non chemical alternatives like steam in the ballast will allow CN to meet safety concerns while limiting the amount of toxin risk and incentivizing CN to continue developing nonchemical alternatives

RECOMMENDATION:

For **Ballast** within the CN PMP, excepting: PFZs, the entire Skeena subdivision, cities, towns and villages

> Ballast be cleared with methods which include recourse to low shrouded broadcast chemical spray where necessary

For **Ballast** within the Skeena subdivision, PFZs, cities, towns or villages

> Ballast be cleared using combination of nonchemical methods (ie weed pulling, steam, ballast cleaning, etc.) with resort to chemical methods limited to selective treatment using handpump application where necessary

4) BC law, including adherence to IPM principles and PFZs, must be complied with (see Attachment E1, letter dated September 4, 2018 Angela McCue, Barrister & Solicitor)

a) BC law requires that CN employ Integrated Pest Management (IPM). While acknowledging the importance of vegetation clearing in ROW and the safety issues regarding vegetation in the ballast, at the same time CN's PMP must address the need to:

- reduce pesticide use as a general rule where practical,
- limit pesticide to the absolute minimum in the Skeena subdivision area where characteristics of the site include parameters which increase the adverse negative environmental impacts from pesticides; and
- limit pesticide use to the absolute minimum in cities, towns and villages where there is public concern for risk to human health

b) Mapping, verification, monitoring and security bond are required to ensure compliance with the CN PMP and PFZ regulations generally.

- It is impossible to maintain the required pesticide free zones around sensitive features if those features are not known. See photos below for watercourses hidden under brush, culverts and other sensitive waters draining invisibly into the Skeena.
- In their previous PMP CN referred to their mapping which showed sensitive features requiring PFZs.
- CN has refused us access to their mapping arguing applicators will decide PFZs on location at the time of pesticide application; without mapping showing fishbearing

waters and waters flowing into them, many would be missed for example it is impossible to see many flowing water channels which are covered with brush. (see photos below)

- Local people including FN have important knowledge with which to verify mapping.
- Our experts' comments on the Skeena subdivision's exceptional risk factors justifies special measures to keep pesticide application to an absolute minimum regardless of what took place in 2017. However there are strong indications that PFZs were not adhered to in 2017 to such a large extent that a significant impact on salmon populations may have occurred (photos below, Kennedy report and Coosemans report). Any future spraying would magnify the risk arising from the 2017 non-permitted spraying and apparent excessive overspray. Mapping, verification, local monitoring and a security bond are required.

RECOMMENDATION:

The PMP specify CN will adhere to IPM principles and comply with PFZ and all other BC statutes and regulations

CN provide mapping showing sensitive features and minimum PFZs to local FN and other interested parties for verification, input and correction (as required).

RECOMMENDATION:

CN provide an independent monitor, approved by local FN and interested parties to attend during chemical applications and report noncompliance to FN and other interested parties including the BC Ministry of Environment.

CN provide a security bond to insure compliance and for needed mitigation or remediation

Workers for mechanical/manual clearing be hired locally to ensure CN has people on the ground in the RoWs who have a connection to and value the local environment.

RECOMMENDATIONS:

1) For all RoWs within the CN PMP including the Skeena subdivision:
   a. RoWs be cleared mechanically/manually without recourse to broadcast chemical spray. Spot treatment using handpump application may be permitted: except on berry bushes and except in Pesticide Free Zones (PFZs).

2) Ballast
   a. For Ballast within the CN PMP, excepting: PFZs, the entire Skeena subdivision, cities, towns and villages
      Ballast be cleared with methods which include recourse to low shrouded broadcast chemical spray where necessary
   b. For Ballast within the Skeena subdivision, PFZs, cities, towns or villages
      Ballast be cleared using combination of nonchemical methods (ie weed pulling, steam, ballast cleaning, etc.) with resort to chemical methods limited to selective treatment using handpump application where necessary

3) Compliance
   a. The PMP specify CN will adhere to IPM principles and comply with PFZ and all other BC statutes and regulations
   b. CN provide mapping showing sensitive features and minimum PFZs to local FN and other interested parties for verification, input and correction (as required).
   c. CN provide an independent monitor, approved by local FN and interested parties to attend during chemical applications and report noncompliance to FN and other interested parties including the BC Ministry of Environment.
   d. CN provide a security bond to insure compliance and for needed mitigation or remediation
   e. Workers for mechanical/manual clearing be hired locally to ensure CN has people on the ground in the RoWs who have a connection to and value the local environment.

RATIONALE FOR RECOMMENDATIONS

1) Expert comment on exceptional characteristics of Skeena subdivision related to increased risk to salmon populations

1 (a) Dr. Chris Kennedy

Dr. Chris Kennedy prepared a report for TBSEF dated August 14 2018 (provided to CN August 17th 2018) entitled:
Expansion on Glyphosate fate and toxicity to salmon and steelhead populations in the lower Skeena River watershed with special reference to environmental and biological parameters that may modify fate and effects

The substance of his opinion [emphasis added] can be summed up in the following selected quotes; for the complete report and Dr. Kennedy's CV see attachment A.

"Glyphosate leaching can occur in uniform and very coarse-textured soil materials as is found under railway embankments. In the spray area [Skeena subdivision], the soil is categorized as a ferro-humic podzol and glyphosate sorption may be reduced in top soil layers due to the eluviation of sesquioxides from upper layers and the formation of a cementing layer that may prevent water containing glyphosate from penetrating to lower soil levels where binding would occur. In addition, sorption rates decrease at lower temperatures and may increase transport in water. High water solubility, low binding capacity in the rail area, high water table, seasonally-saturated soils, and high precipitation rates all may result in significant amounts entering the river either subsurface or overland.

In addition to the above potential increases in surface water concentrations, the coastal areas of BC have climatic conditions including low temperatures that may increase the t1/2 of glyphosate in soil and water. Microbial degradation in cool temperate areas may be slower than areas of warmer climate. Seasonal fluctuations in temperature and concomitant with fluctuations in soil microbial activity will also reduce glyphosate degradation. These factors suggest that the persistence of glyphosate in the environment may be prolonged in the Skeena area under such conditions.

...

Although the acute lethal toxicity concentrations of glyphosate-based herbicide formulations are considered to be of moderate toxicity and may be unlikely to cause mortality in fish in the Skeena River itself, concentrations in smaller spawning reaches may under some circumstances reach levels that could cause mortality. There exists a knowledge gap regarding many aspects of the application, environmental conditions, and properties of the receiving environments to make firm conclusions in this regard. However, sublethal effects occur at much lower concentrations and include a variety of effects that should be considered significant and may pose a risk to fish in general, and spawning Pacific salmon in areas adjacent to application of the herbicide.

In the lower Skeena river area, there are a number of climatic, hydrological, geographical, and biological conditions that may alter the risk of salmonid populations to the use of glyphosate on railways near the Skeena river. This information warrants an examination and reevaluation of its use in this regard. This

report provides information showing that factors unique to this river system may increase the transport of glyphosate-based herbicides into salmon habitat, result in more glyphosate being bioavailable, and be more toxic to salmonids than in other areas. This information supports previous conclusions that glyphosate use as proposed may cause adverse effects to Pacific salmonid populations.

Dr. Kennedy is a professor in the Department of Biological Sciences, Simon Fraser University, and has a B.Sc., Biological Sciences and Ph.D., Environmental Toxicology.[1]

1 (b) Dr. Allen Gottesfeld

"I was asked by T. Buck Suzuki Environmental Foundation to comment, as a professional geoscientist and expert in fisheries biology, stock assessment and salmonid habitat in the Skeena Valley, on the various factors set out in Dr. Kennedy's report, described above in the context of the Prince Rupert to Terrace section of the CN rail corridor.

I can confirm that the location of the Prince Rupert to Terrace section of the rail line is indeed exceptional in regards to:

1. *high precipitation*
2. *cool temperatures*
3. *high water table*
4. *seasonally saturated soils*
5. *coarse textured mineral soils/substrates low in organic matter*
6. *closeness to aquatic ecosystems, the rail line is extremely closely tied to floodplain habitat west of Terrace in some cases the salmon swim right through the underlying riprap (whereas eastward of Terrace the rail bed is usually higher up from the rivers on gravel terraces) and*
7. *the value of nearby aquatic ecosystems as salmon habitat (which value is extremely high).*

The coarse textured mineral soil, low in organic matter tends to drain heavy rainfall events quickly into nearby fish bearing and other waterways.

I recommend that pesticides not be used in this exceptional location due to the exceptionally high risk of pesticide contamination of high value aquatic ecosystems and that mechanical/manual techniques be relied on for vegetation clearing of CN's rail right of ways and ballast in the Prince Rupert to Terrace section."

-August 14, 2018 Allen S. Gottesfeld Ph.D., P.Geo.[2]

[1] Dr. Kennedy PROFESSIONAL SOCIETIES AND ASSOCIATIONS: Physiology Section-American Fisheries Society, Canadian Aquatic Resources Section-American Fisheries Society, Society of Environmental Toxicology and Chemistry and Canadian Society of Zoologists. HONORS AND FELLOWSHIPS: National Institutes of Health, Individual National Research Service Award, 1990, Legion of Honor, Physiology Section, American Fisheries Society, 2002, President, Physiology Section, American Fisheries Society, 2002-2004. RESEARCH INTERESTS: Aquatic Toxicology, Ecotoxicology and Fish Physiology; Physiology of xenobiotic defense mechanisms in teleosts; Biology and bioenergetics of contaminant exposure; Environmental and life history modulators of xenobiotic toxicity; Development of sublethal and in vitro tests and water quality guidelines.

[2] From 1999 to 2012 Dr. Gottesfeld was the Head Scientist for the Gitxsan Watershed Authorities and the Skeena Fisheries Commission. During this period, he supervised approximately 100 projects in the Skeena Valley, in fisheries biology, stock assessment and salmonid habitat. He is a member of the Northern Boundary Technical

1 (c) Applicators' decisions would be based on general levels of toxicity and adverse effects that may be appropriate for other parts of Canada whereas the PMP needs to address expert advice about risk levels arising from local conditions

Canadian and BC policy relying on the risk from pesticides, glyphosate for example, is influenced by the notion they are short-lived in the environment. TBSEF first became concerned that local conditions may exacerbate pesticide toxicity when we discovered residual glyphosate in foliage collected approximately one and a half months after the suspected 2017 CN Skeena subdivision pesticide application[3]. We sampled again on July 10, 2018, about 300 days after the suspected application and found that this fresh sample (S8) contained: 3680 ppb of Glyphosate and 164 ppb AMPA. See Attachment Lab Results July 10 2018 Sample

This recent result highlights one of the concerns raised by Drs. Kennedy and Gottesfeld; that very exceptional conditions in the Skeena subdivision will exacerbate adverse effects from pesticides. Compared to the rest of Canada and North America this area has exceptionally cool temperatures and cloudy skies in summer which may be keeping toxins from breaking down. Heavy rainfall, again exceptional, increases leaching into fish bearing waters. Rocky porous substrate underlying the rail which is closely tied to and in many instances directly connected with fish bearing waters exists for large sections of the Skeena subdivision corridor unlike other areas.

The area has extremely high salmon habitat values. The Skeena is the second largest producing salmon river in Canada. The number of vulnerable coho fry in the lower reaches is characterized by Dr. Gottesfeld as extraordinary and that is just one of the species the area is exceptional for. See attached Field Assessment Report and Background Review CN 2017 for more detail on fish species in the area.

Considering the above, especially Dr. Kennedy's and Dr. Gottesfeld's expert opinions, it is our position that the PMP should not allow reliance on the applicator's usual criteria but instead specify no broadcast spraying in the Skeena subdivision with only some spot application where needed to meet safety concerns with the ballast (in conjunction with steam and other alternatives). Simply put the applicators lack the education or qualifications to assess the types of risks assessed by Drs. Kennedy and Gottesfeld.

2) Evidence that it is practical to meet sight line requirements in the RoW using mechanical/manual methods without resorting to any broadcast spray.

The safety issues in the RoW are significantly different from the issues relating to the ballast. The main concern with the RoW is sight lines rather than track stability.

It is our position that mechanical/manual methods are practical and should be used in all the RoWs covered by the PMP without resorting to any broadcast spray. We are recommending that selective

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Committee of the Pacific Salmon Commission and the salmon section of the Fisheries and Oceans Canada Pacific Scientific Advice Review Committee. See full comment and CV attachment B

[3] CN Herbicide Assessment Report- Coosemans

herbicide method of wiping the surface of stem with herbicide after mechanical cut to prevent re-sprouting of shrubs and trees (but not berry bushes) may be used if necessary and selective handpump application of herbicide for control of noxious/invasive weeds may also be used if necessary.

2 (a) The BC Ministry of Transportation and Infrastructure uses only non-chemical methods for vegetation clearing of the highway RoW in the relevant area.

The BC Ministry of Transportation has adopted an even more restrictive policy than we are recommending for CN. The highway runs directly beside CN rail in the Skeena subdivision and the BC Ministry of Transportation has similar safety objectives for the RoW (if not the ballast). If BC highways can do it so can CN.

> *"The Ministry of Transportation and Infrastructure, or our Maintenance Contractors, do not use herbicide for vegetation control along the highways. Any applications to invasive plants are done by the Northwest Invasive Plant Council and their contractors".* – July 27th 2018 Nathan Voogd, BSc. Area Manager, Roads, Ministry of Transportation and Infrastructure, Skeena District

2 (b) Recommendation for mechanical clearing of vegetation in the Skeena Sub by local vegetation ecology and pesticide use professional

Amanita Coosemans:
"The Skeena Sub has a unique set of conditions that make safe, effective use of herbicide problematic: 1) The climatic conditions in the Skeena Sub are frequently wet and windy, which interfere with safe herbicide spray applications in this area. 2) Fisheries values are very high in the Skeena Sub, and herbicide applications have potential to negatively affect stocks from the entire Skeena watershed. 3) Much of CN's Skeena Sub lies directly adjacent to fish-bearing streams and waterways (e.g. ditchlines) that enter fish-bearing streams, thus legally requiring that CN use alternate methods in these areas for the safety of aquatic life under both the federal Fisheries Act and BC's Integrated Pest Management Act & Regulation.

In light of these conditions, in my opinion it is reasonable to request a significant use of mechanical clearing of vegetation in the Skeena Sub. Particularly beyond the ballast area, I expect that regular maintenance using mechanical cutting would ensure that vegetation does not unsafely encroach on the railway right-of-way: I would recommend that herbicide use in this area be limited to spot treatments to control invasive plant species, and spot treatment to prevent re-sprouting of cut stems (shrub or tree species)—for example by wiping the cut surfaces of stems with herbicide following a mechanical cut.

The rail industry argues that there is really no alternative to use of chemicals on the ballast. It would be my recommendation that the industry continue experimentation with developing new methods or integrated plans, in order to reduce their dependence on pesticide use, particularly around the sensitive habitat of this important watershed."

--August 16 2018 Amanita Coosemans, who is a professional biologist, registered since 1998 with the Association of Professional Biologists of British Columbia, and with the College of Applied Biology in BC since that organization's inception in 2003. Her educational and professional background includes vegetation ecology, plant physiology, specific pesticide training (Pesticide Applicator's Certificate with Forestry Supplement, June 2000), wildlife ecology, and aquatic/fish and fish habitat assessment and restoration. She has worked with herbicides as an environmental monitor during their application, and has undertaken both pre-/post- herbicide environmental assessments for forestry.

See attached Field Assessment Report and Background Review CN 2017 Herbicide Application in the Skeena Sub, Terrace to Prince Rupert, BC -Amanita Helena Coosemans, B.Sc. (hon.), M.Ed., R.P.Bio. March 7, 2018 for more detail about the Skeena subdivision including fish species and life stage expected to be present in periods when spray applications have taken place.

2 (c) In the case of the Skeena subdivision, proper mapping and adherence to the myriad of PFZs required would disclose that broadcast spray of chemicals is impractical

Due to the proximity of the rail to the Skeena itself and the extremely large number of streams, ditchlines, rivulets and other watercourses draining into the Skeena in the CN Skeena subdivision area the number and extent of PFZs required there is so great, that if properly applied, broadcast spray of the RoW is extremely impractical. BC law protects fish habitat and wetlands by requiring 10 m PFZs for most toxic chemicals, as a result the sensitive water features when properly investigated and accounted for through verified mapping and with PFZs properly applied would result in most of this exceptional subdivision covered by overlapping areas which must be maintained pesticide free. For further discussion see 4 (b) and for examples of the exceptional character of the area see the photo section at the end of this comment.

Note: In their previous PMP CN referred to their mapping showing sensitive features requiring PFZs. This mapping has been requested from CN beginning well in advance of their advertisement regarding the proposed PMP but so far we have been denied access. This mapping, if subjected to verification to include all sensitive features (like these rivulets draining directly into the fish bearing waters), would show how impractical broadcast spraying is in the Skeena subdivision, even for the ballast.

2 (d) While BC hydro has somewhat different RoW vegetation clearing objectives than CN and the BC Ministry of Transportation (highways) they do however provide yet another example of clearing without recourse to broadcast spray

> "*In checking our maintenance records, BC Hydro did not use herbicides on power line corridors in the Kalum LRMP over the entire five year term (2010-2015) of our last Integrated Vegetation Management Plan and historically the use of herbicide in the Skeena area has been low. There are no plans to use herbicides in controlling vegetation in the Kalum LRM area in 2016."* – excerpt from BC Hydro response for an inquiry concerning the Kalum Land Resource

Management Plan after review of their historical use of herbicides in BC Hydro's Skeena management area back in May 2016 during the consultative phase of their current IVMP .

2(e) CN cleared the RoW without recourse to broadcast spray for many years

Concerns in the mid-eighties and 1990[4] led to appeals of CN's management plans, meetings with local First Nations, the Fishermen's union, ENGOs and individuals and an understanding that CN would clear the RoW using mechanical methods supplemented with selective pesticide methods like "hack and squirt".

From local enquiries we understand that CN has cleared the RoWs for many years in the period from 1985 to 2016 without resorting to broadcast spray- locals do recall seeing low boom shrouded broadcast spray of the ballast only.

- "I have been working at Tyee every summer and I have never seen broadcast spraying of the RoW until 2017; only a low shrouded sprayer for the ballast- Richard Kristmanson, Tyee Test Fishery
- "I thought CN was not allowed to spray herbicide along the rail- I think there was a ruling in the eighties or nineties and we won" – personal comments Carol Brown president Prince Rupert Environmental Society
- "the buffers around sensitive waters are so numerous and extensive along the Skeena they basically overlap and make it impossible to spray" – anonymous

In 1985 First Nations and local groups and individuals appealed broadcast spraying of pesticides in the CN RoW and won agreement from CN according to Rob Brown who was involved with the appeal. ("There was an appeal in 1985, I believe, which required that CN meet with representatives from Nisga'a, Kitsumkalum, Kitwanga and others. As a result of that meeting CN agreed to manage the RoW without broadcast spray"- personal comment Rob Brown Terrace reporter/author) ("There was an appeal of CN spray in the mid-eighties and we won" – personal comment Dr. Gottesfeld)

An appeal in 1990 involving the Fishermen's union succeeded in having Spike 5G and Simmaprim 80W removed from the chemicals approved for usage on ballast and those involved in the appeal recall being assured that there would only be selective application of chemicals, "hack and squirt", in the RoW, if necessary. ("CN has not been allowed to broadcast spray for decades—only selective application was allowed; hack and squirt- personal comment"- Joy Thorkelson president UFAWU) (We did not have a complete victory with our 1990 appeal but at least CN said they would only use point and squirt"- Arnie Nagy part of 1990 UFAWU appeal)

In addition to the fact that it has been possible in the past to avoid broadcast spraying in the RoW, it must also be borne in mind that amendments to the relevant legislation since the appeals referred to above were made to implement Integrated Pest Management principles with a view to reducing overall pesticide use. CN is attempting to go in the other direction thereby flying in the face of the clear intent of the current legislative scheme.

[4] http://www.eab.gov.bc.ca/pest/89_43.pdf ENVIRONMENTAL APPEAL BOARD Province of British Columbia APPEAL NO. 89/43 PES

2 (f) Response to concerns about high growth rate in the Skeena subdivision

The expense of mechanical clearing may arguably be higher than average in the Skeena subdivision where growth rates are high, however this area represents less than 1% (.007) of CN's route-kilometers of track in Canada so a general policy of no broadcast spray, which is generally practical (see highway policy) can certainly be extended to include this area.

The exceptional growth rate of unwanted vegetation in this area comes with exceptional productivity and consequentially extraordinary high habitat values. This added to the risk of higher adverse impacts from pesticide in this particular area justifies the expense.

2 (g) CN agreed (in the 2012 Fairview Expansion CSR) to clear the RoWs in the stretch from Ridley Island to Rupert mechanically

The Fairview Expansion project required an environmental assessment for changes to the rail line corridor. When the Fairview expansion project was being assessed CN agreed to mechanical clearing of the RoWs for the Fairview expansion project which included a new rail line in the Skeena subdivision from Ridley Island to Fairview Terminal in Prince Rupert. This mitigation commitment is documented in the Comprehensive Study Report: "Vegetation in the line of sight or in the right-of-way will be mechanically maintained where necessary".[5] Therefore we conclude manual clearing is a feasible option in the Skeena subdivision area.

2 (h) In Nova Scotia in 2017 CN agreed "not to spray the brush and vegetation that is encroaching on the nearly 120 kilometres of track from Bedford to Brookfield"

In Nova Scotia CN agreed "*not to spray* [pesticides on] *the brush and vegetation that is encroaching on the nearly 120 kilometres of track from Bedford to Brookfield"* which route goes through Waverly-Salmon River wilderness area. *"There will be no spraying in this location this year," said Jonathan Abecassis, a regional CN spokesman. "Vegetation along the right of way will be cut by hand and machine for this year."*- August 22, 2017 http://thechronicleherald.ca/novascotia/1496909-cn-abandons-herbicide-spray-plan-after-public-concern

It was decided not to spray last year in this sensitive, important habitat area of Nova Scotia and there are even greater reasons not to spray in the Skeena subdivision area; extraordinarily high salmon habitat

[5] Table 6-4 Summary of Mitigation Measures to Address Potential Project Effects on Vegetation Resources, Comprehensive Study Report Pursuant to the Canadian Environmental Assessment Act
For the Proposed: Fairview Terminal Phase II Expansion Project in Prince Rupert, British Columbia
Proposed by: Prince Rupert Port Authority and Canadian National Railway Company
Prepared by: Fisheries and Oceans Canada, Environment Canada and Canadian Transportation Agency, September 2012 CEAssessment Registry Reference Number 08-03-37956

value, second largest salmon river in Canada as well as other parameters which increase adverse pesticide impacts described elsewhere in this comment especially in the Dr. Kennedy appendix.

If manual clearing makes sense for 120 km of track in Nova Scotia for fisheries protection then it makes even more sense along the Skeena.

3) It is feasible, and practical considering the risk, to clear the ballast without resorting to power spray chemical application in areas of exceptional concern; Skeena subdivision, cities, towns and villages

3 (a) These areas of exceptional concern represent a small percentage of CN's route.

These exceptional areas represent a small percentage of CN's route; approximately 1% of CN's approximately 33,000 route-kilometers of track in Canada (the whole Skeena subdivision, where the distance from Terrace to Prince Rupert is approximately 150 km, is about 0.007 or less).

3 (b) Partially successful treatments exist (e.g. steam for all but deep rooted plants) and in order to address safety concerns we are recommending these methods may be augmented by handpump application of pesticide to achieve effective weed control

Some alternative methods are: ballast cleaning, hand weeding and steam. Steam was successful except for deep rooted plants according to CN's previous PMP:

> *"3.5.3 Alternative Technologies*
> *Steam and Boiling Water Application*
> *Between 1988 and 1997 Canadian Pacific Railway (CP) developed and tested a track-mounted prototype that applied steam to vegetation growing within the ballast. CP later tested a boiling water application extensively. The primary limitation with steam and boiling water applications was the inability to injure the roots of deep-rooted plants."*

Therefore, we conclude that spot treatments of herbicide used on deep rooted plants coupled with non chemical means like steam, boiling water, ballast cleaning, hand weeding, etc. would be effective alternatives to broadcast pesticide use on the ballast in sensitive areas.

3 (c) Given the risk, continued efforts are required to develop non- chemical methods for the ballast in the Skeena subdivision location, areas in PFZs, and in cities, towns and villages.

While it is practical to meet safety concerns using mechanical/manual methods for the ROW, and while effective alternatives exist to broadcast spraying in the ballast area and it is a longstanding legal

requirement that non chemical methods be used in PFZs, vegetation in the ballast presents special safety concerns which may make it impractical to eliminate all pesticide use in the ballast area at this time. In the special case of the Skeena subdivision location, where exceptional parameters exacerbate the adverse effects of pesticide use as mentioned above, special efforts need to be made when clearing the ballast in order to limit the adverse effects on salmon and the environment generally, to a reasonable level . In addition, public health concerns in residential areas also require special efforts be made by CN to develop and improve non-chemical methods.

3 (d) Selective non-power spray where needed to supplement alternative treatments will allow for meeting safety concerns while at the same time offering an incentive to continue efforts towards non chemical alternatives

We understand the technical difficulties and safety concerns relating to the ballast area and wish to be reasonable. We have developed comments designed to encourage minimization of pesticide use where practical while allowing CN to come up with the most efficient and hopefully innovative solutions. In the special case of the Skeena subdivision and cities, towns and villages we concluded, based upon our investigations and expert input, that the limitation of pesticide application to hand pump or wiping is the best way to encourage the need to minimize.

For reasons of practicality we recommend the allowance for spot treatments of ballasts for deep rooted plants while encouraging CN to move forward with pilot projects as anticipated by the BC Integrated Pest Management Act.

4) BC law including adherence to IPM principles and PFZs must be complied with (see Attachment E1 letter dated September 4, 2018 Angela McCue, Barrister & Solicitor)

4 (a) BC law requires that CN employ Integrated Pest Management (IPM):

- "*an approach that ensures pesticides are used efficiently and only when necessary*"[6]
- "*to ensure that pesticides are only used once all options have been considered.*"[7]
- which includes the internationally accepted principle "*non-chemical methods must be preferred to chemical methods if they provide satisfactory pest control*"[8]
- and which requires "*a licensee may use a pesticide only after undertaking all of the following actions in accordance with integrated pest management principles*:
  -- [including] *that pest treatment methods be selected based on:*
  - consideration of practical alternatives to pesticide use, and

[6] INTEGRATED PEST MANAGEMENT ACT 2003 Legislative Session: 4th Session, 37th Parliament, Wednesday October 8, 2003 Hansard
[7] INTEGRATED PEST MANAGEMENT ACT
2003 Legislative Session: 4th Session, 37th Parliament, Tuesday May 13, 2003 Hansard
[8] https://iapps2010.me/2016/01/19/european-unions-eight-principles-of-integrated-pest-management-ipm/

- protection of human health and the environment[9]

CN concedes that the selection of method(s) used will depend on certain criteria which include:

- Aboriginal and public concerns;
- Short and long-term impacts of the method(s) being considered;
- Expected efficacy of the method(s) being considered;
- Cost effectiveness of each method;
- Environmental considerations (proximity to water sources, bodies of water, food growing or planted for human consumption, riparian areas, wildlife and fish habitat); and,
- Characteristics of the site, including the proximity of water bodies, water sources and environmentally sensitive features;
- The possibility of adverse impacts to wildlife, fish, surrounding land, workers and bystanders;
- Existing soil types, weed species present, reasons for control, and how they relate to the suitability of the particular method(s) being considered;

We acknowledge the importance of vegetation clearing in ROW and the safety issues regarding vegetation in the ballast. At the same time CN's PMP must address the need to:

- reduce pesticide use as a general rule where practical and
- limit pesticide to the absolute minimum in the Skeena subdivision area where characteristics of the site include parameters which increase the adverse negative environmental impacts from pesticides
- limit pesticide use to the absolute minimum in cities, towns and villages where there is public concern for risk to human health

When the selection criteria and IPM principles are considered in light of the expert advice regarding those special characteristics of the Skeena subdivision site contributing to the possibility of adverse effects to Pacific salmonid populations, it is apparent that broadcast spraying of pesticide should be prohibited and only limited use of pesticide using handpump targeted methods should be permitted. Similarly given public concern and feasibility of alternatives those IPM principles determine that broadcast spray in RoWs cannot be justified anywhere within the area covered by the PMP. In the special case of cities, towns and villages broadcast spraying cannot be justified for treatment of the ballast either and should be prohibited and only limited use of pesticide using handpump targeted methods should be permitted.

4 (b) Mapping, verification, monitoring and security bond are required to ensure compliance with the CN PMP and PFZ regulations generally.

- It is impossible to maintain the required pesticide free zones around sensitive features if those features are not known. See photos below for watercourses hidden under brush, culverts and other sensitive waters draining invisibly into the Skeena, etc.
- In their previous PMP CN referred to their mapping which showed sensitive features requiring PFZs.

[9] Section 3.8 What are the standards for use of Integrated Pest Management MOE 2016 Integrated Pest Management Act and Regulation – Landscape/Structural Sector Review Paper

- Despite repeated requests, CN has refused us access to their mapping arguing applicators will decide PFZs on location at the time of pesticide application without relying on mapping—this is ludicrous – applicators need accurate mapping as a starting point to determine PFZs. Applicators cannot determine whether or not waters are fishbearing simply by looking, it is impossible to even see many flowing water channels covered with brush, etc. (see photos below)
- Local people including FN have important knowledge with which to verify mapping.
- There are strong indications that PFZs were not adhered to in 2017 to such a large extent that significant impact on salmon populations may have occurred (photos below, Kennedy report and Coosemans report). Future pesticide application would be expected to amplify this risk in a manner that cannot be justified. We cannot afford to risk this again so mapping, verification, local monitoring and a security bond are required.
- Verification and monitoring can be achieved if an independent agreed monitor as well as local CN staff be assigned to be present during spraying and, if locals have expressed a need for it, prior to spraying these staff and the monitor will meet with a representative of local FN and interested groups including those listed below in detailed comment for section 3.5. The purpose would be to insure there is an understanding of what the minimum PFZs are. The meeting costs (including fee for the representative if needed) would be covered by CN.
- The verified maps will be used in the field prior to treatment to establish and stake NTZs.

Below we have recommended detailed changes to CN's draft PMP by section which are intended to ensure environmental protection from impacts of pesticides in balance with the safe and practical operation of the railway.

Recommended Changes by Draft PMP Section Number

Section: 2.1 Purpose

This Section should be changed to read as follows:

> 2.1 Purpose
>
> **CN** is in the relatively unique situation of having a legal obligation, pursuant to the Rules Respecting Track Safety (the "Rules"), adopted under the RSA, to ensure that vegetation which is on or immediately adjacent to the railway roadbed is controlled. In particular, the Rules require federal railways to ensure that track is free of vegetation that could create fire hazards, affect track integrity and obstruct visibility of operations and inspections. Separate regulations also require removal of vegetation to ensure every grade crossing meets sightline requirements. **CN also has an obligation to address these vegetation control issues by implementing a vegetation management plan that complies with the British Columbia Integrated Pest Management Act and Regulations and accords with the principles of Integrated Pest Management (IPM), "an approach that ensures pesticides are used efficiently and only when necessary"[10].** Accordingly, and complying with **CN's legal responsibilities**, vegetation management activities are performed to ensure safe and **practical** railway operations **using an array of management techniques with chemical approaches being used only as a last resort.**
>
> As a result, the purpose for managing vegetation on lands owned or operated by **CN** is to maintain the safe functioning of train operations and to protect the public, employees and the environment from potential hazards that are associated with vegetation around railway operations **and from potential hazards associated with vegetation management**. Specifically:

The following should be included as a bullet after the bullet -Certain amounts and varieties of vegetation in railway yards, station grounds, around buildings and signal infrastructure:

- **In the course of managing each of these above specific vegetation hazards, to achieve the goal of BC's Integrated Pest Management Act: "*Our goal with the legislation and with the requirement of integrated pest management is a reduction in the amount of pesticides we use as a province.*"[11] And for CN to adhere to those principles of Integrated Pest Management designed to minimize pesticide use[12]:**
  - **Non-chemical Methods Principle: Sustainable biological, physical and other non-chemical methods must be preferred to chemical methods if they provide satisfactory pest control.**
  - **Reduced Pesticide Use Principle: The professional user should keep the use of pesticides and other forms of intervention to levels that are necessary**

[10] INTEGRATED PEST MANAGEMENT ACT 2003 Legislative Session: 4th Session, 37th Parliament, Wednesday October 8, 2003 Hansard

[11] INTEGRATED PEST MANAGEMENT ACT 2003 Legislative Session: 4th Session, 37th Parliament, Tuesday May 13, 2003 Hansard

[12] https://iapps2010.me/2016/01/19/european-unions-eight-principles-of-integrated-pest-management-ipm/

Section: 2.2 Objectives
The first paragraph of this section should be changed as follows:

> The objectives are to ensure effective vegetation management for railway safety purposes, while considering and incorporating environmental and human health values **in accordance with accepted principles of Integrated Pest Management including minimization of pesticide use. CN** is committed to ensuring worker and public safety and **ensuring** environmental protection **from impacts of pesticides and herbicides** in balance with the safe and **practical** operation of a railway.
>
> The objectives of the CN program are to:

Change the first objective to:

- Maintain **a sufficiently** vegetation-free track ballast section **to ensure railway safety in a manner that minimizes pesticide use and minimizes risks to the environment and human health;**

Add the objective:

- **Minimize use of pesticide where practical.**

Section 2.3 Reasons For Vegetation Management

Between Sections 2.3 **(a)** Reasons For Vegetation Management and 2.4 Management of the Right of Way a section **2.3 (b) Reasons for Minimizing Pesticide Use** should be added:

2.3 (b) Reasons for Minimizing Pesticide Use

> *"General Hazards of pesticides":*[13]

"Direct impact on humans

- *serious health implications to man and his environment. There is now overwhelming evidence that some of these chemicals do pose a potential risk to humans and other life forms and unwanted side effects to the environment*
- *The high risk groups exposed to pesticides include production workers, formulators, sprayers, mixers, loaders*

Impact on environment

- *Pesticides can contaminate soil, water, turf, and other vegetation. In addition to killing insects or weeds, pesticides can be toxic to a host of other organisms including birds, fish,*

[13] The General Hazards of pesticides below are all excerpted from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2984095/ Impact of pesticides use in agriculture: their benefits and hazards 2009, Md. Wasim Aktar, et al.

beneficial insects, and non-target plants. Insecticides are generally the most acutely toxic class of pesticides, but herbicides can also pose risks to non-target organisms.

Surface water contamination

- *Pesticides can reach surface water through runoff from treated plants and soil. Contamination of water by pesticides is widespread. The results of a comprehensive set of studies done by the U.S. Geological Survey (USGS) on major river basins across the country in the early to mid- 90s yielded startling results. More than 90 percent of water and fish samples from all streams contained one, or more often, several pesticides (Kole et al; 2001)*
- *The insecticide diazinon, and the weed-killers dichlobenil, diuron, triclopyr, and glyphosate were detected also in Puget Sound basin streams. Both diazinon and diuron were found at levels exceeding concentrations recommended by the National Academy of Sciences for the protection of aquatic life (Bortleson and Davis, 1987–1995)."*[14]

Specific Example of Risk from Pesticide Use[15]

- "Although the acute lethal toxicity concentrations of glyphosate-based herbicide formulations are considered to be of moderate toxicity and may be unlikely to cause mortality in fish in the Skeena River itself, concentrations in smaller spawning reaches may under some circumstances reach levels that could cause mortality. There exists a knowledge gap regarding many aspects of the application, environmental conditions, and properties of the receiving environments to make firm conclusions in this regard. However, **sublethal effects occur at much lower concentrations and include a variety of effects that should be considered significant and may pose a risk to fish in general, and spawning Pacific salmon in areas adjacent to application of the herbicide."**

Section 2.4.1 Sight Line Requirements

The sentence CN is committed to maintaining these sight line requirements through its vegetation management program should be removed and replaced with a paragraph:

It is practical to meet sight line requirements using mechanical/manual methods. CN is committed to maintaining these sight line requirements through its integrated vegetation management program, in a manner that minimizes risks to the environment and human health without resorting to any broadcast spray. Selective herbicide method of wiping the surface of stem with herbicide after mechanical cut to prevent re-sprouting of shrubs and trees (but not berry bushes) may be used if necessary.

Section 2.4.2 Noxious Weeds and Invasive Plants

[14] Excerpts from The General Hazards of pesticides https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2984095/ Impact of pesticides use in agriculture: their benefits and hazards 2009, Md. Wasim Aktar, et al.

[15] EXPANSION ON Glyphosate fate and toxicity to salmon and steelhead populations in the lower Skeena River watershed with special reference to environmental and biological parameters that may modify fate and effects - Dr. Chris Kennedy August 14th, 2018

Various methods of control, other than broadcast spray of pesticides, will be employed, along with backpack hand-pump pesticide spray use for spot treatments where necessary.CN will perform trials and work to develop pesticide free approaches especially in the Skeena subdivision where extra precaution is required. The particulars and parameters as well as the results of these trials will be provided to BC MOE and stakeholders annually.

Section 3.0 The CN Pest Management Program

Change this section to read:
For the purpose of this plan, CN's PMP incorporates integrated pest management (IPM) and the program will use the principles of IPM.

Add these further elements to: The elements of **IPM** included in CN's PMP are:

- Minimize reliance on pesticides
- Pesticides are used efficiently and only when necessary
- Achieve a reduction in the amount of pesticides we use and report annual pesticide use statistics to the public

Section 3.2 Identification of Targeted Pests

3.2.1 Herbaceous Broadleaves and Grasses
Herbaceous broadleaves and grasses are commonly found in the RoW and ballast section.....
As will be shown in Section 3.4 of this PMP, the tolerance for herbaceous broadleaves and grasses growing in these areas is very low, and often results in control measures being implemented.

This should be added:

In order to reduce pesticide use to an absolute minimum in especially sensitive areas, like PFZs, in villages, towns and cities and the Skeena subdivision generally, efforts will be made to identify deep rooted plants in the ballast for spot treatment where steam or other alternative methods are not effective

Section 3.2.2 Woody Vegetation
Woody vegetation within the RoW comes in two forms, evergreen and deciduous. Evergreen trees are generally controlled by non-chemical methods (brush saw or chain saw).

Should be changed to:

Woody vegetation within the RoW comes in two forms, evergreen and deciduous. Evergreen and deciduous trees will generally be controlled by non-chemical methods (brush saw or chain saw).

And the last paragraph should be changed to:

In order to reduce the need for future control of woody vegetation, we will sometimes employ the manual application of a pesticide to the cut surfaces immediately after cutting has occurred.

Section 3.4.3 Decision Making

The decision to undertake vegetation management and the treatment method used will depend primarily on whether or not the injury/treatment threshold has been met for that particular area.

This should be changed by deleting and the treatment method used from the opening sentence to read:

The decision to undertake vegetation management will depend primarily on whether or not the injury/treatment threshold has been met for that particular area.

Section: 3.5 Treatment Options and Selection Criteria

Once a decision has been made that vegetation management is required for an area, the selection of method(s) used will depend on the following criteria:

The following criteria should be added:

- **that under no circumstances will broadcast spray of pesticide be used in ROWs**
- **that under no circumstances will broadcast spray of pesticide occur in the Skeena subdivision for ballast treatment**
- **that under no circumstances will broadcast spray of pesticide be used within villages, towns and cities (ROW, Ballast or other CN property)**
- **backpack hand-pump pesticide spray may be used for spot treatments for invasive weeds and for spot treatments of the ballast where necessary where alternative treatment has not been sufficient in the Skeena subdivision or in villages, towns and cities (with proper notice to residents)**
- **selective herbicide method of wiping the surface of stem with herbicide after mechanical cut to prevent re-sprouting of shrubs and trees (but not berry bushes) may be used if necessary**
- **generally non-chemical methods will be considered first and pesticides/herbicides resorted to only where non-chemical methods have been proven to be impractical and in those cases, where practical, hand pump will be chosen over broadcast spray.**

Following the listed treatment options and selection criteria, is the following paragraph:

Prior to treatment, areas where unwanted vegetation is growing will be documented. Locations of environmentally sensitive features such as proximity to water bodies and water sources will be identified in the field prior to treatment.

This paragraph should be highlighted, expanded and changed as follows:

Mapping and Sensitive Features

Prior to treatment, areas where unwanted vegetation is growing will be documented.

Locations of environmentally sensitive features such as proximity to water bodies and water sources will be identified and mapping showing these features will be shared with local interest groups as T. Buck Suzuki Environmental Foundation, Prince Rupert Environmental Society, United Fishermen and Allied Workers 'Union-UNIFOR UFAWU, Skeena Wild Conservation Trust, Friends of Wild Salmon, Friends of Morice-Bulkley, Council of Canadians Terrace Chapter and First Nations for verification prior to treatment.

Verified maps will be used to locate areas where PFZs are required and an independent agreed monitor as well as local CN staff will be assigned to be present during spraying. These staff will meet with a representative of local FN and interest groups if locals have expressed a need for this. The purpose would be to insure that all waterbodies that require a PFZ have been identified and mapped and that CN staff are aware of them. The meeting costs (including fee for the representative if needed) would be covered by CN.
The verified maps will be used in the field prior to treatment to establish and stake NTZs.

The final item in the list of techniques proposed which follows in this section should be changed from Chemical control (pesticide applications) to:

- Chemical control (pesticide applications in the limited circumstances outlined above)

Section 3.5.3 Chemical Control (Pesticides)

Should be changed to read as follows:

Pesticides are important as a tool in railway vegetation management but only as a tool of last resort. Pesticides may be considered with a view to minimizing adverse effects where non-chemical methods are not practical; and (a) cannot be employed; (b) are not sufficiently effective; or (c) are in areas such as track ballast where alternative control methods may not be sufficient.

In the exceptional case of the Skeena subdivision, a location of exceptionally high vegetation growth rates, the cost of non-chemical methods may be higher on a per kilometer basis than other areas. However, the exceptional growth rate of unwanted vegetation in this area comes with exceptional productivity and consequentially extraordinary high habitat values. Non-chemical methods in this area are determined to be practical when that high habitat value is taken into account as well as other factors which also increase the likelihood of adverse effects from pesticide use. The extra cost for alternatives is practical in the Skeena subdivision as a means to avoid broadcast spray of pesticide. The Skeena subdivision represents less than 1% (.007) of CN's route-kilometers of track in Canada (about 200/30,000 km). The relatively small area and potentially significant impacts in this area are to be taken into account when weighing whether or not pesticides use can be justified even manually.

Section 3.5.3.1 Pesticide Identification

The following paragraph should be added at the end of the section:

Note that even glyphosate, which has a "toxicity to fish" classification of "slight", could, in some situations and formulations have an adverse population impact on salmon in the Skeena corridor according to Dr. Kennedy's August 2018 report (see attachment A. Most of the chemicals listed have even worse classifications than glyphosate regarding toxicity to fish, for

example fluroxypyr (Oct Tain) is listed as very highly toxic to aquatic organisms. There is the added concern regarding these listed chemicals' toxicity to aquatic plant life and other parts of the ecosystem.

Given the terrestrial environmental risk as well as the above mentioned aquatic environmental risk from these pesticides:

- **no broadcast spraying will take place in ROWs,**
- **no broadcast spray will be used in the Skeena subdivision**
- **extreme care will be taken to meet the PFZ and NTZ requirements where broadcast spray is used for ballast outside the Skeena subdivision area and**
- **applicators will exercise extreme care to choose the best chemical to meet the pest control requirements while minimizing risks.**

Section 3.5.3.2 Adjuvant Identification

Should be amended to include reference to harmful impacts as well:

Surfactants increase the penetration, effectiveness, coverage overall and harmful adverse effects of almost any pesticide.

Section 3.5.3.3 Criteria of Pesticide Treatment for Specific Area and Purpose

Table 4 summarizes the reasons for possible use of pesticides for the management of unwanted vegetation within specific areas or for specific purposes:

Table 4 needs to be changed to reflect the extra precaution necessary as a result of the expert finding that pesticide in the Skeena subdivision poses greater risk.

- The first row second column needs to be amended as follows:
  Ballast section treatment includes all tracks within the PMP area except the Skeena sub-division. As noted earlier, there are not as yet any fully effective stand-alone non-chemical controls for ballast vegetation management.
  A final sentence should be added:
  In the Skeena subdivision and in cities, towns and villages alternative methods will be used supplemented with handpump backpack pesticide application as necessary (no broadcast spray).
- In the second row second column the second sentence should be changed to read:
  However, in instances where noxious weeds or invasive plants are present, spot treatments using backpack handpumps may be used. Where tall growing vegetation is impeding sight line requirements or compromising access to buildings, signals, communication and electrical infrastructure, treatment with one of the listed pesticide active ingredients may be done using backpack handpumps. Treatment with appropriate pesticide active ingredient(s) listed in Table 2 may, in some cases, be required for the right-of-way however they will not be applied by broadcast spraying and pesticide use will be considered only after alternatives have been assessed.
- The third row second column second and third sentences should be changed to read:
  The listed pesticide active ingredients may be foliar applied (by backpack handpump), applied to cut stumps, to the basal bark areas of individual deciduous trees following mechanical cutting or mowing to stop re-sprouting, or in areas where mechanical methods are not

feasible or practical. Treatment with appropriate pesticide active ingredient(s) listed in Table 2 may be required for maintenance of the sight line but not by broadcast spray.

- The last Row (Noxious Weeds) sentence should be changed to read:
  Where noxious weeds and invasive plants have been identified, treatment with appropriate pesticide active ingredient(s) listed in Table 2 may be required using selective handpump backpack spray.

Section 3.5.3.4.3 Handgun (Power Hose and Nozzle)

Should be amended to read as follows:

A handgun (power hose and nozzle) is a hand-held spray gun and hose attached to a portable tank filled with pesticide solution, usually with a power driven pump to provide pressure to the pesticide solution in the hose. The power driven pump presents the potential for abuse resulting in excessive application of pesticide and excessive drift with elevated or disproportionate risks to human health and the environment including critical fisheries. **Handguns will not be used**

Section 3.5.3.4.6 Radiarc Sprayer

Should be amended to read as follows:

A precision, boomless application device is used for the application of pesticides and plant growth regulators in a uniform pattern while providing drift control when applied in low spray volumes. The sprayer can be mounted on the side of a hi-rail spray vehicle or spray train for application of weed and brush control pesticides. This device presents the potential for abuse resulting in excessive application of pesticide and excessive drift with elevated or disproportionate risks to human health and the environment including critical fisheries. **Radiarc Sprayers will not be used.**

Section 3.5 Treatment Options and Selection Criteria, should include another category of options:

Section 3.5.4 Alternative Methods

Efforts will be made to find improved non chemical methods, especially for the ballast in sensitive areas where chemical methods pose unacceptable risk to the environment. Trials will be undertaken to try new methods. Trials will be undertaken to refine and improve on alternative methods which have been found to have partial success (like steam) by combining them with other methods or developing other refinements. Evaluations of trials will be made available upon request.

Section **3.6 Post Treatment Evaluations**

The following sentence should be added to this section:

Post treatment evaluations, when completed, will be made available, upon request, to the interested parties listed previously.

Section 3.7 Monitoring and Security Bond and Local Hiring

Given the issues in 2017 in the Skeena subdivision an independent monitor who is acceptable to local interested parties will be contracted to monitor compliance with this PMP and report yearly in a publically available report.

A security bond guaranteeing compliance will be provided by CN to increase public confidence and provide funds for any required mitigation measures.

Workers for mechanical/manual clearing will be hired locally to ensure CN has people on the ground in the RoWs who have a connection to and value the local environment.

Section 4.1 Qualifications and Responsibilities for Applying Pesticides
The words British Columbia should be added:

All pesticide applications will be conducted or supervised by a person who holds a **British Columbia** Pesticide Applicator Certificate endorsed for the class of pesticide and the pesticide use required for pesticide applications under this PMP.

Section 5.0 Environmental Protection Strategies and Procedures

Before the paragraph On the day of application the following should be added:

Mapping and Sensitive Features

Prior to treatment, areas where unwanted vegetation is growing will be documented.

Locations of environmentally sensitive features such as proximity to water bodies and water sources will be identified and mapping showing these features will be shared with local interest groups including T. Buck Suzuki Environmental Foundation, Prince Rupert Environmental Society, United Fishermen and Allied Workers 'Union-UNIFOR UFAWU, Skeena Wild Conservation Trust, Friends of Wild Salmon, Friends of Morice-Bulkley, Council of Canadians Terrace Chapter and First Nations for verification prior to treatment.

Verified maps will be used to locate areas where PFZs are required and an agreed upon monitor as well as local CN staff will be assigned to be present during spraying. If locals have expressed a need, the CN staff will meet with a representative of local FN and groups, perhaps the monitor. The purpose would be to insure there is an understanding of what the minimum PFZs are (the meeting costs including fee for the representative if needed, would be covered by CN).

The verified maps will be used in the field by the applicator prior to treatment to establish (and stake if necessary or appropriate) NTZs taking into account current conditions. They will also be used in the field to inform CN staff and the monitor.

Section 5.1 Strategies to Protect Domestic and Agricultural Water Sources and Bodies of Water

The paragraph introducing Table 6 uses the phrase consistent with whereas the previous PMP used the phrase complies with in the same context. The law must be complied with. Use of the term consistent

with introduces an inappropriate level of vagueness that could undermine the laws created by the elected legislature.

This paragraph should be amended to read:

> Table 6 describes the minimum measures that shall be implemented to protect domestic and agricultural water sources, and bodies of water. The pesticide-free zones (PFZs) and no treatment zones (NTZs) in this table **comply** with the standards as specified in the IPMR.

Section 5.2 Strategies to Protect Fish, Wildlife, Riparian Areas and Habitat

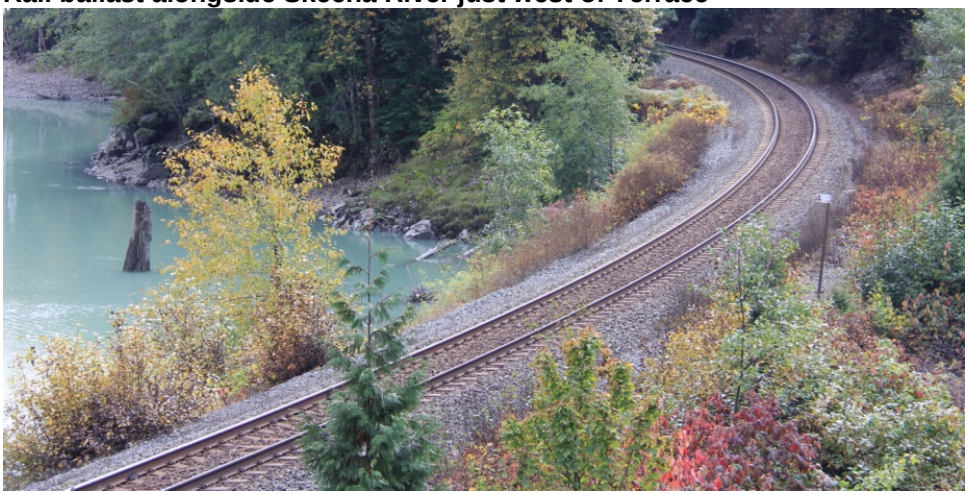
The fourth bullet in the list of protective strategies prior to control measures being implemented should be changed and an additional bullet should be added as follows:

- If pesticide use is proposed, local FN, ENGOs and/or stakeholders will be provided with mapping identifying the above water bodies and minimum PFZs and given the opportunity (with reasonable funding to be provided by CN) to verify the mapping.
- Provide an opportunity for the CN flagging employee and an independent monitor familiar with the area who will travel in a hi-rail vehicle ahead of the spray vehicle, to meet with a representative of the local interested parties mentioned above to insure s/he is familiar with the risks of adverse environmental impacts.

Photos of Skeena Subdivision

PESTICIDE ON RoW OR BALLAST MAY ENTER FISH HABITAT
through underlying coarse rock/riprap

Rail ballast alongside Skeena River just west of Terrace



Swath of dead vegetation follows curve of rail along Skeena
by CN mile 4

– Roth photo
Sept 25 2017

Shames Creek- damaged vegetation and ballast over rocky substrate

Rocky substrate aids toxin leaching
Cool temperatures slow toxin breakdown

Shames River at CN Mile ~15.5

"Red-osier dogwood sample collected. Positive laboratory result for glyphosate"

-Coosemans Report
14&15 Oct. 2017

Approx. 45 days after suspected application residual toxin level was:
2660 ppb Glyphosate
<100 ppb AMPA

-see CARO Attachment C4

Long stretch of dead vegetation beside rail with riprap ballast directly over Skeena River

Skeena River
17.5 to 18 Mile

"Rip-rap ballust directly over Skeena River (estimated distance of 7m from track edge to river, directly over permeable materials)."

-Coosemans Report
Table 1 Site field notes

Esker Overpass view of ballast near extraordinary coho habitat
(reports of fry swimming through rip rap)

Esker Overpass Mile ~20.5

"Spray appears to be within 5m of water's edge, but could not be confirmed."

-Coosemans Report
26 Sept.2017

"*Downstream view of high-value rearing area in off-channel habitat of the Skeena River."*

- Coosemans
Photo Document Part 1.

54 Mile Area

"*Steep area adjacent track (north side) with evidence of continuous use of high spray across numerous small streams. Photo depicts stream... apparently sprayed within 1m. These streams ....drain directly (i.e. within 50m) into the Skeena River"*– Coosemans Report.

54 Mile Area.
15 October 2017

"High spray evident for extensive eastbound segment; note that many ephemeral watercourses occur along these slopes, entering fish-bearing waters (Skeena River) to photo right."

-Coosemans
Photo Document Part 1

Large stretches of the Skeena subdivision, as above, have mountains on one side draining down along the rail and directly into the Skeena.

The rail and road follow the Skeena for most of the route.

Numerous streams and rivulets drain through the underlying riprap and rocky substrate even where there are no culverts.

Roth photo

Running water in one of numerous rivulets draining out of riprap into the Skeena on a sunny day.

The road and rail riprap runs adjacent to the river (with some sections originally built in the river) for long sections in the CN Skeena subdivision area.

Roth photo

Kwinitsa, one of many Skeena subdivision rail crossings over fish bearing streams, near their confluence with the Skeena River

"Upstream view to left bank; note damage to Sitka spruce shrubs and other vegetation at top of bank (both upstream and downstream sides of bridge), and apparent proximity of upstream channel and wetland habitat"

Coosemans Photo Document Part 1.

Ditched channels along rail run through culverts and riprap to Skeena

Some streams disappear through riprap under rail line to Skeena others go through culverts or under them.

Mapping of all sensitive waters draining directly into Skeena and adhering to required PFZs would rule out broadcast spray in Skeena subdivision.

Ditched Channel and Inverness Passage portion of Skeena River estuary
where RoW or Ballast pesticide application may drain into fish bearing waters

Port Edward Cannery Museum, Mile ~81.9.

"Westbound view, showing damaged vegetation on right (over ditched watercourse beyond lawn) and on left (adjacent Inverness Passage, Skeena River)."

-Coosemans
14 October 2017
Photo Document Part 2

Note: Large flowing watercourse in the ditched channel is hidden by dead (apparently sprayed) vegetation. Mapping is required to enable applicators to apply PFZs.

Port Edward Cannery Museum Mile ~81.9.

"View of ditched channel with heavily damaged vegetation, bank to bank."

-Coosemans
Photo Document Part 2

Inverness Channel by Lelu Island

CN mile 84
Inverness Channel by Lelu Island

July 10 2018 dead twigs and needles were sampled at this location.
~300days after suspected application the residual level of toxin was:
164 ppb AMPA
3680 ppb Glyphosate
1055 ppb Imazapyr
-AL lab report Attachment D

Note:

- Photo was taken at low tide
- beach shows course where water drains under ballast through riprap into estuary--therefore pesticide on ballast would likely drain into estuary
- Samples were from a tree on the slope up from the beach within 3m of high water
- **3,680 ppb residual glyphosate after 300 days is an indication that toxins actually do persist much longer than usual in the Skeena subdivision area.**

Port Edward beach at low tide showing ballast and damaged vegetation over rocky substrate which would leach toxins directly into this part of the Skeena estuary

Port Edward Boat Launch
Mile ~86.
14 October 2017

"Damaged vegetation adjacent to Inverness Passage (Skeena River estuary)."

-Coosemans
Photo Document Part 2

Porpoise Harbour Skeena estuary looking south from fish plant parking near boat launch crossing. Rocky substrate would drain toxin leaching from ballast and RoW.

Swath of dead and deformed vegetation adjacent to estuary at low tide.

Rocky porous substrate shown above continues along the harbour here.

Pedestrian walkway within Prince Rupert city limits

Well used pedestrian walkway to ferry terminal and small craft dock within Prince Rupert city limits, apparently sprayed with herbicide at the CN rail crossing.

September 23 2017 photo Roth

RECOMMENDATION:

No broadcast spray of pesticides on RoW or ballast in the Skeena subdivision, cities, towns or villages

Selective application may be used with handpump only