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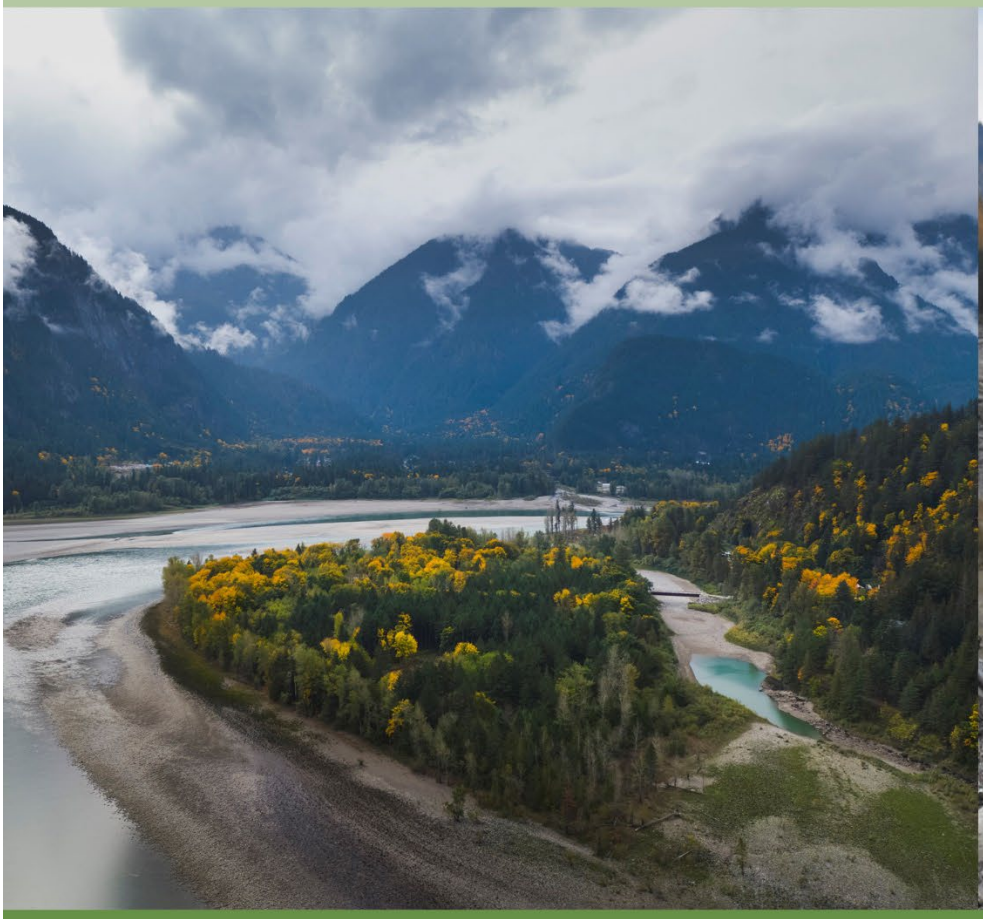

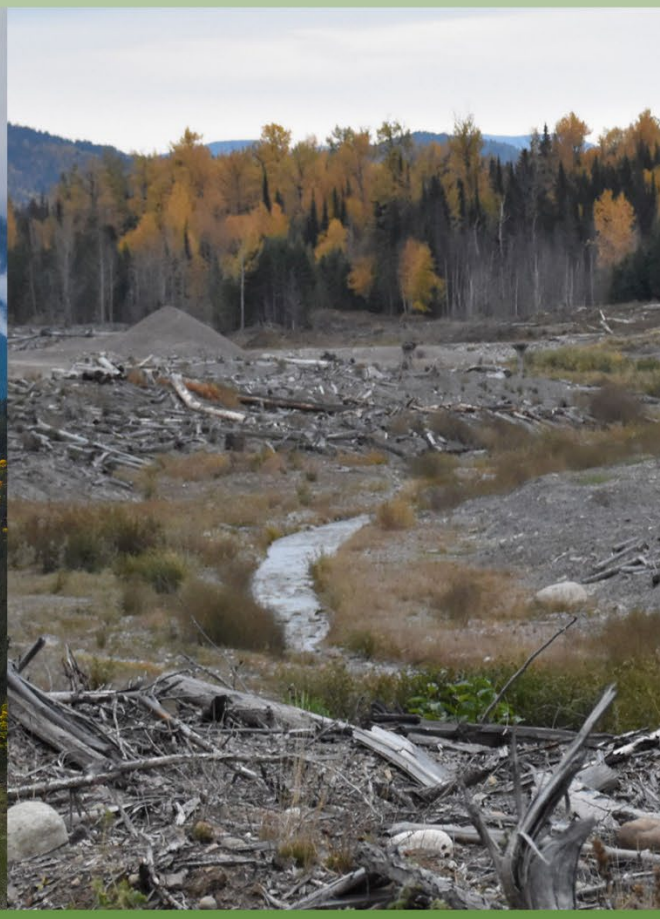

FRASER RIVER PROTECTION

An Initial Assessment of the Legal Failure for Cumulative Impacts

NOVEMBER 2024

Fraser River Protection:
An Initial Assessment of the Legal Failure for Cumulative Impacts

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November 2024

ACKNOWLEDGEMENT

Environmental Law Centre students and lawyer completed this Initial Assessment at the request of Bev Sellars, member and former chief of the Xatśūll Nation. Bev Sellars initiated this work as part of a larger Indigenous-led initiative to protect the Fraser River. See the first report supporting this work, *Whole-of-River Protection for the Fraser River: A Scan of Legal Protections*. See also the documentary *The Spirit Who Swims*, co-written and directed by Bev Sellars and Garry Tutte, about the importance of Salmon to Indigenous peoples along the Fraser River.

This Initial Assessment is the work of several legal researchers and lawyers with expertise in different disciplines. It began with students in the Environmental Law Clinic Intensive in the winter 2024 semester, and benefitted from the expertise of Chad Wilkinson, Articling Student (formerly a Clinic student) who is also registered professional biologist. While the information available on effluent discharges into the Fraser River varied significantly, each ELC student categorized their research roughly into the categories of introduction, methodology and results, and attempted to quantify total permitted effluent discharge into the Fraser River.

Caveat

This publication is a preliminary investigation intended to generate discussion, and as a resource for Indigenous governing organizations, First Nations organizations and individuals considering the cumulative impact of permitted effluent discharge into the Fraser River.

We examine and describe regulated effluent from regulatory permit conditions acquired from public databases. It is based on legally approved discharges sourced from relevant government agencies. Values reported here are unverified by regulators and may not represent actual volumes discharged operationally by permittees; therefore, these results are preliminary in scope. As such, this report should not be relied upon as a full and accurate representation of effluent being released into the Fraser River and its tributaries. This publication is not a complete and definitive inventory of total pollution load or impacts. The purpose is to demonstrate the geographic and temporal scale of effluent discharges and begin to identify the limitations of current permitting approaches.

This publication is not authoritative and may contain inadvertent errors and omissions. While it provides legal information, it is not legal advice and should not be relied upon as such. We encourage Indigenous governing organization, First Nations and anyone who reads it to contact legal counsel before taking any actions.

Ultimately, every Indigenous community is different and has an inherent right to choose how best to protect and preserve their relationship with rivers based on their own laws and culture.

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1. INTRODUCTION

As the iconic river in the province of British Columbia (BC), it is both remarkable and shocking that there is no cumulative effects monitoring on the Fraser River. This absence is even more egregious considering how the Fraser River watershed sustains dozens of Indigenous communities and includes much of the land base of BC. The Provincial Government (the Province) continues to permit effluent discharge without aggregated cumulative effects reporting despite several catastrophic disasters that have changed the shape and quality of the River. These disasters include the 2014 Mount Polley tailings pond collapse that released approximately 17 million cubic metres (17 billion litres) of tailings water and 8 million cubic metres (8 billion litres) of tailings material into the watershed.[1] The 2019 blockage from more than 110,000 cubic metres of rock and debris that sheared off and crashed into the River near Big Bar prevented salmon from migrating upstream into the upper 63% of the drainage basin[2], which supported a return of an estimated 2.9 million salmon in 2022.[3] The 2024 landslide on the Chilcotin River near Farwell Canyon resulted in a massive debris surge along the length of the River that blocked an area comprising approximately 8% of the entire Fraser River drainage basin.[4]

The Impact Assessment Agency of Canada defines cumulative effects as "changes to the environment, health, social and economic conditions as a result of a project's residual effects combined with the existence of other past, present and reasonably foreseeable physical activities."[5] Consideration of cumulative effects means that the Province would have to consider the effects of climate change, population growth, and economic development on the environmental impact of a permitted project in the already affected in the Fraser River watershed. Given the importance of the Fraser River, and the environmental disasters listed above and their effects, it is time to implement cumulative effects monitoring and analysis to understand, restore and safeguard the health of the River into the future.

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[1] BC Government, "Mount Polley Mine Tailings Dam Breach" (last modified 28 July 2023), online: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/spills-environmental-emergencies/spill-incidents/past-spill-incidents/mt-polley>.

[2] The Water Survey of Canada hydrometric gauging station at Big Bar Creek has a gross drainage area of 146,000 km^2 which comprises the majority of the upper Fraser River basin. Government of Canada, "Daily Discharge Graph for FRASER RIVER AT BIG BAR CREEK (08MD013) [BC]" (last modified 28 June 2024), online: <https://wateroffice.ec.gc.ca/report/historical_e.html?stn=08MD013>.

[3] Fisheries and Oceans Canada, "Big Bar Landslide remediation" (last modified 25 June 2024), online:<https://www.pac.dfo-mpo.gc.ca/pacific-smon-pacifique/big-bar-landslide-eboulement/index-eng.html>.

[4] This estimate is based on hydrometric data provided by the Water Survey of Canada gauging station located several kilometres below the landslide near Farwell Canyon. Government of Canada, "Daily Discharge Graph for CHILCOTIN RIVER BELOW BIG CREEK (08MB005) [BC]" (last modified 28 June 2024), online: <https://wateroffice.ec.gc.ca/report/historical_e.html?stn=08MB008&dataType=Daily&parameterType=Flow&first_year=1987&last_year=1989&mode=Graph>.

[5] Government of Canada, "About cumulative effects" (last modified 19 February 2024), online: <https://www.canada.ca/en/services/environment/cumulative-effect/about.html>.

The purpose of this report is to assist Indigenous Nations and organizations to work with the provincial and federal governments to adopt a cumulative effects monitoring regime and incorporate the risks posed to the aquatic ecosystems and corresponding species known to frequent them into permitting decisions.

This report is a preliminary attempt to compile and summarize permitted effluent discharges in the watershed. To make this quantification, this report provides a non-exhaustive survey of the effluent discharges permitted by the Province. This preliminary review can establish a foundation from which a more detailed cumulative effects analysis can occur leading to better protection of the River.

Part 1 of this report identifies the importance of monitoring cumulative impacts on the Fraser River for reasons relating both to environmental health and duties owed by the Province of BC and Government of Canada to Indigenous Nations. Part 2 addresses the impacts of municipal wastewater, stormwater, and urban runoff on the Fraser, with a focus on Metro Vancouver. Part 3 reports on the approved effluent discharge from major mines along the River, with Part 4 addressing pulp and paper effluent discharge. Part 5 identifies permitted and unpermitted non-point sources of effluent discharge to provide insight into what other types of effluent are authorized to be discharged into the Fraser River. Part 6 summarizes the findings in this report.

1.1 A NOTE ABOUT THE RELATIONSHIP BETWEEN WATER FLOW AND EFFLUENT CONCENTRATION

The Fraser Basin, which is the catchment area for the River, is the largest watershed by area and volume entirely contained within BC.[6] The Water Survey of Canada's hydrometric gauging station Fraser River at Port Mann Pumping Station (08MH126) has an historical record of 60 years (1965-1992) comprising a gross drainage area of 232,000 square kilometres.[7] Total flow volume of the Fraser River recorded at this Station, as a mean daily discharge, ranges between 621 cubic metres per second (cms) or approximately 53.7 billion litres per day (lpd), as recorded on February 6, 1985 and 13,700 cms (~1.18 trillion lpd) recorded on June 22, 1967.[8] The most complete set of historical hydrometric data (i.e., 1912-current) comes from the Fraser River at Hope (08MF005) gauging station comprising a gross drainage area of 217,000 square kilometres. Daily discharges range from the lowest recorded at 340 cms (~29.4 billion lpd) on January 8, 1916, to a peak of 15,200 cms

[6] Fraser Basin Council, "About the Basin" (last visited 28 August 2024), online: <https://www.fraserbasin.bc.ca/about_fraser_basin.html#:~:text=Fraser%20Basin%20Watersheds&text=The%20Fraser%20Basin%20is%20BC's,a%20quarter%20of%20the%20province)>.

[7] Government of Canada, "Daily Discharge Graph for FRASER RIVER AT PORT MANN PUMPING STATION (08MH126) [BC]" (last modified 28 June 2024), online: <https://wateroffice.ec.gc.ca/report/historical_e.html?stn=08MH126&dataType=Daily&parameterType=Flow&first_year=1965&last_year=1992&mode=Graph>.

[8] *Ibid.*

(~1.31 trillion lpd) on May 31, 1948 over the 113-year period of record.[9] On average, a base flow of 827 cms (~71.5 billion lpd) occurs on March 7, with a peak daily discharge of 7,190 cms on June 15 (~621 billion lpd), then steadily declining to 993 cms (~85.8 billion lpd) by December 31.[10]

The Water Survey of Canada hydrometric data for the Fraser River indicates strong seasonality (fluctuating flow volumes) dominated by snowpack.[11] This seasonality drives several ecosystem services, such as the life cycles of various species of migrating Pacific salmon. Given the value of salmon, not only as a keystone species to functioning ecosystems,[12] but also to Indigenous communities that depend on it, seasonal variability in flows should factor prominently in permitting conditions for municipalities, businesses, and industries that discharge effluent under current statutory regimes. Fluctuations in discharge and water availability imply a need to consider current water availability when assessing cumulative impacts to the Fraser River that relate to pollution and water quality, especially because of recent alarming trends in the seasonal hydrograph that are directly tied to climate change.

Flow model projections for the Fraser River between 2070-2099 predict a 5% (150 m^3/s) increase in average flow, but a much more substantial decrease in the average peak flow of about 18% (1600 m^3/s) with peak flows occurring, on average, 24 days earlier in the year.[13] To account for these changes, the discharge of effluent must decrease to account for the decrease in water volume projected in the coming decades, particularly in times of drought.

Water availability already represents a potential cumulative risk, especially in recent years. Environmental flows are approaching near historic lows on the Fraser River and the observed lack of water in the mainstem channel has been somewhat alarming with respect to its effect on Pacific salmon spawning migrations.[14] Snowpack in the Fraser Basin equated with the provincial average at 38% of normal conditions by June 15, 2024.[15] Compare this to the same day for historical peak

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[9] Government of Canada, "Daily Discharge Graph for FRASER RIVER AT HOPE (08MF005) [BC]" (last modified 28 June 2024), online: <https://wateroffice.ec.gc.ca/report/historical_e.html?stn=08MF005&dataType=Daily&parameterType=Flow&first_year=1912&last_year=2023&mode=Graph&mean1=1&scale=normal>.

[10] Government of Canada, "Daily Discharge Graph for FRASER RIVER AT HOPE (08MF005) [BC]" (last modified 28 June 2024), online: <https://wateroffice.ec.gc.ca/report/historical_e.html?start_year=1850&end_year=2024&mean1=1&scale=normal&mode=Graph&stn=08MF005&dataType=Daily&parameterType=Flow&first_year=2023&last_year=2023>.

[11] See John Morrison *et al*, "Climate change in the Fraser River watershed: flow and temperature projections" (2001) 263 J Hydrology 1–4 at 232 [Morrison et al].

[12] The term "keystone species" describes animals that contribute disproportionately to control the integrity and stability of their communities. See James Helfield and Robert Naiman, "Keystone Interactions: Salmon and Bear in Riparian Forests of Alaska" (2006), 9 Ecosystems <https://doi.org/10.1007/s10021-004-0063-5> at 167.

[13] Morrison et al, *supra* note 11 at 230.

[14] B Charlebois, The Canadian Press, "Low water levels affecting salmon migration in B.C. streams: DFO" (17 August 2024), online: <https://www.cbc.ca/news/canada/british-columbia/bc-salmon-migration-drought-1.7297577>.

[15] Government of BC, "Snow Survey and Water Supply Bulletin" (15 June 2024) online as pdf: <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/river-forecast/2024_june15.pdf>. See also Government of BC, "Provincial Freshet and Flood Status: Final Spring 2024 Freshet Bulletin" (20 June 2024), online as

daily average discharge for the Fraser River.[16] This year, the River experienced a peak daily discharge of 4,510 cms on June 15, 2024, later cresting to 5,110 cms by July 1 (as provisionally reported by the Water Survey of Canada).[17] These values are well below (i.e., 60.5% and 71.3%, respectively) the historical peak for mean daily discharge of 7,190 cms observed at gauging station 08MF005 (Fraser River at Hope).

Seasonal variation in water availability further affects effluent exposure to downstream aquatic ecosystems. As this report documents, several effluent discharge permits for locations near Prince George allow large-scale bleached kraft pulp mills, a paper mill, a petrochemical refinery, and sanitary lagoons to collectively release a maximum daily volume of over 471 million lpd at several discharge points along the Fraser and Nechako Rivers.[18] The Water Survey of Canada operates the Fraser River at South Fort George gauging station 08KE018 located downstream from these permitted discharge points. Complete flow information for the upper Fraser River is only available for 1984 and ranges from a minimum flow of 258 cms (~22.3 billion lpd) on December 6 to a maximum of 3,200 cms (~276 billion lpd) on July 1.[19] If the existing permitted discharge volumes were in place at the time of the hydrograph, effluent exposure would have amounted to a maximum of ~2.11% of the total volume of the Fraser River during base flow from a minimum of ~0.17% during peak runoff. This range varies by more than an order of magnitude in terms of seasonal variability in effluent exposure.

In 2023, the flows at Prince George were extremely low. Although complete flow information is only available for 1984, there is a good historical record for stream level data measured at station 08KE018. The data show that daily stream level fell below 2.8 m on November 9, 2023 for the first time since December 2, 1979 and December 3, 1980 over the entire 56-year period of record from 1968 to 2023.[20] Real-time hydrometric data for 2024 are still provisional at this stage, but the base mean daily level measured at station 08KE018 once again fell below 2.8 m to 2.78 m on January

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pdf: <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/river-forecast/provincial_freshet_update_2024_jun_20.pdf>.

[16] Government of Canada, *supra* note 9.

[17] Provisional discharge is obtained from most recent rating curve with adjustments made as required and subject to review and possible changes prior to final publication. Government of Canada, "Real-Time Hydrometric Data Graph for FRASER RIVER AT HOPE (08MF005) [BC]" (), online: <https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=08MF005&mode=Graph&startDate=2024-05-01&endDate=2024-07-30&prm1=46&y1Max=&y1Min=&prm2=47&y2Max=&y2Min=&max2=1&min2=1&mean2=1&median2=1>.

[18] Part 4 provides a detailed analysis of all permitted facilities in Table 4 for the pulp and paper sector.

[19] Government of Canada, "Daily Discharge Graph for FRASER RIVER AT SOUTH FORT GEORGE (08KE018) [BC]" (last modified 28 June 2024), online: <https://wateroffice.ec.gc.ca/report/historical_e.html?start_year=1850&end_year=2024&y1Max=1&y1Min=1&scale=normal&mode=Graph&stn=08KE018&dataType=Daily&parameterType=Flow&first_year=1984&last_year=1984>.

[20] Government of Canada, Daily Water Level Graph for FRASER RIVER AT SOUTH FORT GEORGE (08KE018) [BC]" (last modified 28 June 2024), online: <https://wateroffice.ec.gc.ca/report/historical_e.html?stn=08KE018&dataType=Daily&parameterType=Level&first_year=1968&last_year=2023&mode=Graph&scale=normal>.

12, 2024.[21] If licence holders are permitted to continue to discharging at the maximum allowable rates into streams with record low volumes the percentage of effluent in the total volume River water increases. State plainly, lower water volume can require less effluent discharge to maintain a healthy River.

This example points to the water flow-dependent nature of effluent permitting and the need for real-time monitoring and adjustment of effluent discharges when water flows fluctuate. Given the range of commercial and industrial sectors operating simultaneously throughout the Fraser Basin, this kind of policy response can only be achieved through a properly instituted framework for cumulative effects monitoring.

1.2 FINDINGS SUMMARY

Our research reveals the total effluent permitted to be discharged into the Fraser River watershed from all activities is unknown. This is due, in part, to a lack of complete synthesis by the various permitting agencies of the Province. Lack of coordination and sharing of information between provincial and federal jurisdictions is also a factor, such as for effluent and water quality data collected and reporting on effluent effects for the mining and pulp and paper sectors.[22] It is also partly due to permit conditions that allow for "unspecified" yet continuous discharges from various point and non-point sources.

In summary, an initial assessment of provincial authorizations reveals that daily permitted effluent discharged into the Fraser River watershed includes at least:

- Up to 2 billion litres of treated municipal wastewater comprised of residential, commercial, and industrial wastewater collected via sewer and stormwater pipes,[23] but excluding an approximated additional 164 million litres of episodic combined sewer overflows in Metro Vancouver alone;[24]

[21] Government of Canada, "Real-Time Hydrometric Data Graph for FRASER RIVER AT SOUTH FORT GEORGE (08KE018) [BC]" (last modified 28 June 2024), online: <https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=08KE018&mode=Graph&startDate=2019-10-17&endDate=2024-10-17&prm1=46&y1Max=&y1Min=&mean1=1&prm2=3&y2Max=&y2Min=>.

[22] Specifically, this is related to regulatory requirements for environmental effects monitoring under the federal *Fisheries Act,* RSC 1985, c. F-14. Environmental Protection Operations Directorate of Environment and Climate Change Canada (Pacific and Yukon Region), personal communication (as an email, 15 October 2024 6:52 pm) [EPOD].

[23] Metro Vancouver, "Liquid Waste Management Plan" (2024), online: <https://metrovancouver.org/services/liquid-waste/integrated-liquid-waste-management-plan> [Liquid Waste Management Plan].

[24] Notably, annual estimates of discharge into the Fraser River are from 2020. City of Vancouver, "Update on the Development of a Sewage and Rainwater Management Plan for Vancouver" (12 January2023), online as pdf: <https://council.vancouver.ca/20230201/documents/cfsc1.pdf>, appendix B.

- Approximately 452 million litres of urban runoff during rain events estimated for the Fraser Basin below Kanaka Creek;[25]
- Approximately 141 million litres of direct discharge from mines, with another approximately 1.2 billion litres discharged to tailings ponds or the ground;
- Approximately 846 million litres of pulp and paper effluent; and
- An incalculable mix of permitted and unpermitted volumes of effluent discharge into the River from non-point commercial and industrial sources.

Few of these permits require changes to discharge volume depending on the season or volume of water in the River. Importantly, the research did not reveal any analysis of the cumulative impacts of these discharges on the River ecosystem and its ecological communities.

1.3 THE IMPORTANCE OF MONITORING CUMULATIVE IMPACTS ON THE FRASER RIVER

The Fraser River is a globally significant watershed – both in size and ecological importance – that empties into the Salish Sea (Strait of Georgia). The Fraser River is BC's longest river, measuring 1,375 km,[26] is "one of the most extensive and productive biological systems in Canada,"[27] and is home to important fish and wildlife populations that include over 300 species of birds.[28] It also provides the most significant salmon habitat of any river in Canada.[29] The Fraser River Basin alone contains 31 species of fish, 10 of which are considered at risk.[30]

Despite its environmental and cultural significance, the Fraser River currently has no comprehensive monitoring regime or analysis that examines the impact of cumulative effects. Until recently, provincial and federal environmental impact assessment processes did not require consideration of cumulative impacts.[31] In addition, the Province requires activities within the

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[25] This estimate would exclude major urban centres in the upper basin, such as the City of Kamloops in the Thompson subdrainage and the City of Prince George at the Nechako River confluence. Canada (Environment Canada) & British Columbia (Ministry of Environment, Lands and Parks), "A state of the environment synopsis: the lower Fraser River Basin" (Ottawa: Environment Canada, 1992), online as pdf: <https://publications.gc.ca/collections/collection_2022/eccc/En1-11-92-1-1-eng.pdf> at 4 [State of the Fraser].

[26] Stephanie Kristensen, Bram F. Noble & Robert J. Patrick, "Capacity for Watershed Cumulative Effects Assessment and Management: Lessons from the Lower Fraser River Basin, Canada" (2013) 52 Environmental Management 360 at 361.

[27] State of the Fraser River, *supra* note 25 at 1.

[28] *Ibid* at 6-7.

[29] Michael Healey, "The Cumulative Impacts of Climate Change on Fraser River Sockeye Salmon (Oncorhynchus nerka) and Implications for Management" (2011) 68 Can J Fish Aquat Sci 718 at 719.

[30] Government of Canada, *Cumulative Effects of Threats on At-Risk Species Habitat in the Fraser Valley, British Columbia* (Cultus Lake: Fisheries and Oceans Canada, 2022) at 1 [*Cumulative Effects of Threats on At-Risk Species Habitat*].

[31] Maya Gislason & Holly Anderson, "The Interacting Axes of Environmental, Health, and Social Justice Cumulative Impacts: A Case Study of the Blueberry River First Nations" (2016) 4:78 Healthcare 1 at 4.

watershed to achieve a defined scale – such as a mine or pulp and paper mill – before being required to undergo an environmental impact assessment.[32] Subjecting only a small number of projects to comprehensive reviews as a project-based, rather than place-based (i.e., regional or watershed) approach, cannot meaningfully address risks from cumulative impacts.[33]

Most activities discharging waste into the Fraser River are regulated by the BC Ministry of Environment and Climate Change Strategy ("ENV") under the provincial *Environmental Management Act* ("EMA").[34] The Province requires projects seeking to discharge effluent into the Fraser River to meet specific numerical standards under activity-specific regulations. These numerical standards assume that "dilution is the solution to pollution" and the permits issued under these regulations are typically not specific to seasonal and annual differences in water flow.[35] There is no aggregated cumulative impacts analysis of effluent from permitted projects and their physical and operational activities. Ultimately, the environmental assessment system and facility-by-facility permitting regime to date have been incapable of fully comprehending the cumulative environmental and social impacts of development in the Fraser River watershed.

The last meaningful assessment of the "State of the Fraser River" was conducted over 30 years ago.[36] As outlined in the 2011 report, the *Cohen Commission of Inquiry into the Decline of Sockeye Salmon,* there has been "no comprehensive assessment of aquatic environmental quality on the Fraser River."[37] Much has changed over the subsequent three decades of development, mining, climate change, and human occupation. The original "State of the Fraser" report found a "decline in the abundance of natural resources and quality of the environment since historical times, that is, approximately the last 100 years" and that the Basin in particular was "experiencing declining environmental quality and increasing stress on the environment."[38] That study identified the dominant sources of pollution in the Lower Fraser River Basin to be "domestic discharges, industrial effluent, and urban and agricultural runoff" with "contaminated groundwater flows, accidental spills, leachates from landfills and wood wastes, discharges from floating homes and liveaboard boats, and other miscellaneous sources" also contributing.[39] The Fraser's water quality has declined as agricultural practices and urbanization continue to advance throughout the

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[32] Thresholds for requiring a provincial environmental assessment certificate are established in Table 4 for Forest Products Industries and Table 6 for Mine Projects. *Reviewable Projects Regulation*, BC Reg 187/2023, ss 8, 10; thresholds also exist for mines and metal mills under the federal *Impact Assessment Act,* SC 2019, c 28, ss 109, 188. *Physical Activities Regulations*, SOR/2019-285, s 2, paras 18-23.

[33] Martin Olszynski, "Environmental impact reviews should take a more regional perspective" (Policy Options, 25 June 2024), online: <https://policyoptions.irpp.org/magazines/june-2024/regional-environmental-impact/>.

[34] SBC 2003, c 35 [EMA].

[35] Parts 3 and 4 of this report identify only a small subset of all sector-specific EMA discharge permits that include conditions for variable discharges that correspond with annual freshets (i.e., May and June). For example, see Government of British Columbia, "BC Mine Information: Bonanza Ledge" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e3f34635c865df00c519/authorizations>, s 1.1.1 [Bonanza Ledge Mine permit].

[36] State of the Fraser River, *supra* note 25.

[37] *Ibid* at 306.

[38] *Ibid* at 8.

[39] *Ibid* at 2.

Basin.[40] Given the additional 30 years of exposure to pollutants since the original report, there is an urgent need for a modern assessment of the cumulative environmental effects on the Fraser River and a public data portal for continuous monitoring.

1.4 CUMULATIVE IMPACTS AND RECONCILIATION

Since the original "State of the Fraser" report, both the provincial and federal governments have recognized the inherent authority and rights of Indigenous Nations to govern and safeguard their societies, which includes protecting the Fraser River for those Nations in the watershed. Both state governments have committed to implementing the *United Nations Declaration on the Rights of Indigenous Peoples* ("UNDRIP"),[41] which substantively articulates the following rights and duties relating to cumulative effects:

- Right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources (Article 29(1)), such that states hold a duty to:
    - (2) ensure no disposal of hazardous materials shall take place in the lands or territories of indigenous peoples without their free, prior and informed consent, and,
    - (3) take effective measures to ensure programmes for monitoring, maintaining and restoring the health of indigenous peoples, as developed and implemented by the peoples affected by such materials, are duly implemented;
- Right to determine and develop priorities and strategies for development or use of their lands or territories and other resources (Article 32(1)), such that states hold a duty to:
    - (2) Consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources, and
    - (3) Provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact;

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[40] *Cumulative Effects of Threats on At-Risk Species Habitat*, *supra* note 24 at 1.

[41] *United Nations Declaration on the Rights of Indigenous Peoples*, UNDRIP, UN Doc 61/295 (2007) [UNDRIP]; Government of BC, "Declaration on the Rights of Indigenous Peoples Act" (last modified 12 August 2024), online:<https://www2.gov.bc.ca/gov/content/governments/indigenous-people/new-relationship/united-nations-declaration-on-the-rights-of-indigenous-peoples> ; Government of Canada, "Backgrounder: *United Nations Declaration on the Rights of Indigenous Peoples* Act" (last modified 10 December 2021), online: <https://www.justice.gc.ca/eng/declaration/about-apropos.html>.

- Duty to cooperate with Indigenous peoples to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them (Article 19);
- Duty to maintain and strengthen the distinctive spiritual relationship with traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources and to uphold their responsibilities to future generations in this regard (Article 25); and
- Duty to provide redress, by means that can include restitution or, when this is not possible, just, fair and equitable compensation, for the lands, territories and resources which they have traditionally owned or otherwise occupied or used, and which have been used or damaged without their free, prior and informed consent (Article 28(1)).[42]

To uphold these rights and achieve their corresponding duties, Indigenous Nations require data and an informed understanding of cumulative impacts on the Fraser River. This information could help First Nations assess further development in the watershed and any project's impact on their Aboriginal and treaty rights. Without data to inform their understanding of the cumulative effects of administrative measures – such as permits – on their rights, Indigenous people are unable to truly give informed consent In addition, BC's *Declaration on the Rights of Indigenous Peoples Act*[43] acknowledges UNDRIP in provincial law and obligates the Province of BC to make its laws, such as the EMA, consistent with UNDRIP.[44] For example, activities that cause pollution could better recognize a right of participation by affected Indigenous Nations in the decisions made by the Province to issue and amend discharge permits..

In a recent court decision, the BC Supreme Court found that the Province has a legal responsibility to measure cumulative impacts within an Indigenous Nation's territory.[45] In the *Yahey* decision, the British Columbia Supreme Court held that the cumulative effects of development unjustifiably infringed the Blueberry River First Nation's Treaty rights. It also found that the Province of BC's failure to assess cumulative effects breached the honour of the Crown. One scholar suggests that this decision may indicate a willingness from courts "to hold decision-makers accountable for their procedural inadequacies as well as the consequences of their failure to adequately and substantively protect the cultural sustainability of Indigenous peoples."[46]

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[42] UNDRIP, *ibid*.
[43] SBC 2019, c 44.
[44] *Ibid*, s 3.
[45] 2021 BCSC 1287.
[46] Bruce Muir, "Consequences and Implications of British Columbia's Failed Cumulative Effects Assessment and Management Framework for Indigenous Peoples" (2022) 95 Environmental Impact Assessment Review 1 at 8.

1.5 METHODOLOGY

Each part of this paper addresses a different form of regulated effluent being discharged into the Fraser River. We have canvassed primary and secondary sources to identify each form of regulated effluent referred to in this report. Sources include permit conditions, provincial and federal regulatory regimes, and reporting obligations. Information has been taken from public sources, including discharge permits and relevant government databases where the authors used their best efforts to accurately depict the current state of the Fraser River. Values reported here have not been verified with the respective Ministry representatives. Although authorized by their respective permits, the values do not represent actual volumes discharged operationally by permit holders. Therefore, the findings are preliminary in scope and should not be relied upon as a full and accurate representation of all effluent discharges to the Fraser River and its tributaries.

While this report does not comprehensively address all sources of effluent, the volumes of authorized discharges are remarkable, have not been assembled in such a public way since the original "State of the Fraser" report, and begin to shed light on cumulative effects on the Fraser River.

The specific methodology used to assess the volume of each effluent is addressed in each of the following parts.

2. MUNICIPAL WASTEWATER, STORMWATER AND URBAN RUNOFF

2.1 INTRODUCTION

The focus of this part is on wastewater treatment in Metro Vancouver for three reasons. First, Metro Vancouver is the largest urban area in BC and reports indicate that it is expected to be home to over three million residents by July 1, 2024.[47] Approximately half of all BC residents live in Metro Vancouver.[48] Second, wastewater effluent from Metro Vancouver is discharged either directly into the Fraser River, Burrard Inlet, or Salish Sea (Strait of Georgia).[49] Discharge into the mouth of the Fraser River may be particularly harmful as migratory species like salmon must travel through Metro Vancouver waters to reach their natal spawning habitats farther inland. Salmon may be immediately affected at the mouth of the Fraser, potentially predisposing them to further harms.[50] The tidal conditions in the Lower Fraser River accentuate this effect by retaining the effluent at the mouth of the River and potentially exposing millions of juvenile salmon to pollutants during periods of migration.[51] Third, Metro Vancouver has the most robust monitoring and reporting of all the wastewater treatment plants of any local governments along the Fraser River.[52]

Part 2 of this report outlines Metro Vancouver's wastewater systems alongside provincial and federal regulatory frameworks pertaining to wastewater, including liquid waste management plans. It also addresses the potential impacts of municipal wastewater, stormwater, and urban runoff into the Fraser River, which includes noting the absolute volumes of effluent discharge.

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[47] John Mackie, "Metro Vancouver projected to hit three million residents this year" (20 January, 2024), online: <https://vancouversun.com/news/metro-vancouver-projected-to-hit-three-million-residents-this-year>.

[48] Reportedly, BC's population is projected to reach 7.9 million by 1946, which is up by 44% as compared to 5.5 million in 2023. BC Gov News, "BC Stats report confirms growing population" (30 January 2024), online: <https://news.gov.bc.ca/releases/2024MUNI0001-000109>.

[49] Metro Vancouver, "Liquid Waste Management Plan" (2024), online: <https://metrovancouver.org/services/liquid-waste/integrated-liquid-waste-management-plan> [Liquid Waste Management Plan].

[50] Margaret Morales & Gunilla Oberg, *The Idea of Sewage as a Resource: An Introductory Study of Knowledge and Decision Making in Liquid Waste Management in Metro Vancouver, BC. Canada.* (Vancouver: UBC Institute for Resources, Environment and Sustainability, 2012) at 11 [Morales & Oberg].

[51] State of the Fraser River, *supra* note 25 at 3.

[52] The Integrated Liquid Waste and Resource Management Plan commits Metro Vancouver to monitor, assess, and forecast the impacts of liquid waste discharges from the region's wastewater treatment plants, combined sewer overflows, and sanitary sewer overflows on receiving water bodies. Metro Vancouver, "Fraser River Environmental Monitoring Programs Comprehensive Review 2014-2019 Summary Report" (2020), online as pdf: <https://metrovancouver.org/services/liquid-waste/Documents/fraser-river-environmental-monitoring-programs-comprehensive-review-summary-report-2014-2019-SummaryReport.pdf> at 7.

2.2 METHODOLOGY

Research in this part was synthesized from a diversity of primary sources of law and secondary sources of specialist information and criticism. The research began with a search for municipal documents pertaining to wastewater discharge along the Fraser River to determine roughly the scope of the issue, followed by an appraisal of applicable provincial and federal statutes and regulations. Finally, these methods evaluate secondary research and criticism of wastewater effluent and its environmental effects to provide context for the issue.

2.3 RESULTS

2.3.1 WASTEWATER TREATMENT IN METRO VANCOUVER

Metro Vancouver's first wastewater treatment plant, Lion's Gate, was built in West Vancouver in 1961.[53] Its second, Iona Island wastewater treatment plant, was built along the North Arm of the Fraser River just two years later, in 1963.[54] By 1976, Metro Vancouver had constructed the remaining three wastewater treatment plants that still operate today: Lulu Island, Annacis Island, and Northwest Langley.[55] Metro Vancouver (then Greater Vancouver) began to complete stages of their Liquid Waste Management Plan pursuant to the former BC *Waste Management Act.*[56] The first stage of that plan was completed in 1989, with the upgrade for the Annacis Island and Lulu Island wastewater treatment plants to secondary treatment completed in 1997 and 1998, respectively.[57] Of note, four out of the five wastewater treatment plants in Metro Vancouver are on the Fraser River.

Metro Vancouver treats 440 billion litres of wastewater annually, a significant majority of which is treated at the Annacis Island and Iona Island wastewater treatment plants (between 1-2 billion lpd).[58] This water originates from three main sources: (1) residential, commercial, and industrial wastewater collected via sewer pipes; (2) storm water runoff from rain and snow melt; and (3) inflow or groundwater infiltration into leaky sewage pipes.[59]

In 1992, the three primary wastewater treatment plants in Metro Vancouver – Annacis Island, Iona Island, and Lulu Island – accounted for around 90% of all domestic effluent in the Lower Fraser

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[53] Morales & Oberg, *supra* note 51 at 11.
[54] *Ibid.*
[55] *Ibid.*
[56] RSBC 1996, c 482 (repealed by the EMA), *Ibid.*
[57] *Ibid.*
[58] Liquid Waste Management Plan, *supra* note 50.
[59] Morales & Oberg, *supra* note 51 at 13.

Basin.[60] Reports from 1985 indicated that effluent from at least Annacis Island and Lulu Island wastewater treatment plants exceeded BC toxicity levels 50% and 66.7% of the time, respectively.[61] While these two wastewater treatment plants have since been upgraded to secondary treatment, multiple reports on wastewater pollution[62] and the filing of private prosecutions because of the pollution drew attention to the issue in the late 1990's and early 2000's.[63] As of April 2024, two of Metro Vancouvers wastewater treatment plants still use only primary treatment – Iona Island and Lion's Gate. The remaining three – Lulu Island, Annacis Island, and Northwest Langley – employ both primary and secondary treatment.[64]

The magnitude of groundwater inflow and infiltration into the liquid waste system is substantial. There are no official estimates of the outflow (i.e., sewage that, in turn, leaks from the sewer pipes into the ground).[65] Approximately 40% of all liquid waste in Metro Vancouver is attributable to groundwater infiltration – and of that an estimated 30-80% is attributable to leaky private sewer pipes.[66]

2.3.2 PRIMARY AND SECONDARY TREATMENT

The first stage of primary treatment aims to remove a significant proportion of suspended solids and floating materials in wastewater by sedimentation.[67] Floating materials (like oil, grease, rags) are skimmed off the surface of the water in the tank, while other solids suspended in the wastewater settle at the bottom of the tank.[68] Wastewater then goes to the secondary treatment phase where wastewater passes through a biological reactor housing microorganisms which break down organic matter over a period that may be as short as a few hours or as long as weeks.[69]

It is important to note that secondary treatment does not remove all contaminants from treated effluent. A study on a "major secondary wastewater treatment plant near Vancouver" found that

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[60] State of the Fraser River, *supra* note 25 at 3.
[61] *Ibid.*
[62] Sierra Legal Defence Fund, The National Sewage Report Card: Rating the treatment methods and discharges of 20 Canadian cities, (Vancouver: Save Georgia Strait Alliance, 1994); Sierra Legal Defence Fund, The National Sewage Report Card (Number Two): Rating the Treatment Methods and Discharges of 21 Canadian Cities (Vancouver: United Fishermen and Allied Workers' Union, Local 24 and Georgia Strait Alliance, August 1999).
[63] Representing the Georgia Strait Alliance, T. Buck Suzuki Environmental Foundation and the United Fishermen and Allied Workers Union – CAW, Sierra Legal Defence Fund laid charges against the GVRD and the Province at the North Vancouver Provincial Court. Georgia Strait Alliance, "Charge laid against BC and Greater Vancouver" (3 June 2007), online: <https://georgiastrait.org/press/charge-laid-against-bc-and-greater-vancouver/>.
[64] Metro Vancouver, "Wastewater Treatment Plants and Processes" (last visited 29 August 2024), online: <https://metrovancouver.org/services/liquid-waste/wastewater-treatment-plants-and-processes>.
[65] State of the Fraser River, *supra* note 25 at 14.
[66] *Ibid.*
[67] Rumana Riffat & Taqsim Husnain, *Fundamentals of Wastewater Treatment and Engineering* (London: CRC Press, 2022) at 117.
[68] *Ibid.*
[69] *Ibid* at 141.

although microplastic content in effluent was reduced by 97% to 99% in secondary treatment, an estimated 30 billion microplastics were released into the discharge area annually.[70] Another study of the fish near Metro Vancouver observed English sole found in proximity to wastewater treatment plant discharge areas exhibited health impacts including disruptions in liver gene expression, thyroid function, lipid metabolism, and reproductive capabilities.[71] The researchers attribute these effects broadly to pharmaceuticals discharged in wastewater treatment plant effluents, particularly estrogenic compounds and statins/fibrates.[72] It has been proposed that the impacts of chemicals that escape wastewater treatment extend beyond aquatic life to terrestrial fauna living near wastewater treatment plants (like tree swallows).[73] The inability of secondary treatment to neutralize antibiotic resistant bacteria and pharmaceuticals like antidepressants has also led some experts to conclude that advanced treatment strategies – such as tertiary treatment – are the prudent next step.[74]

Given the historic toxic levels found in wastewater as set out above, without comprehensive new studies on both primary and secondary treatment, accurate evaluation of cumulative impacts on the Fraser River is not possible. This is particularly important when considering that Metro Vancouver's largest wastewater treatment plant still employs only primary treatment.

2.3.3 LIQUID WASTE MANAGEMENT PLANS

Local governments are authorized by ENV under the EMA to develop liquid waste management plans, but, except for some larger urban centre, the Act and Province by order does not require local governments to make such plans.[75] If local governments do elect to make them, the Province recognizes that liquid waste management plans can assist local governments to better protect public health and the environment, and to ensure public accountability.[76] Plans also reinforce the principle that careful planning of water, sewage, and stormwater infrastructure can benefit local

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[70] The study also observes that as "zooplankton in the NE Pacific Ocean are readily ingesting [microplastics] … [there is the] potential for serious impacts at the bottom of the food chain." EA Gies *et al*, "Retention of microplastics in a major secondary wastewater treatment plant in Vancouver, Canada" (2018) 133 Marine Pollution Bulletin at 554 and 560 [Gies et al].

[71] Pharmaceuticals in effluents have been designed to target various processes in humans that are conserved across vertebrates and may be toxic to aquatic wildlife at low concentrations. K Parekh & VL Marlatt, "Using Hepatic Gene Expression Assays in English Sole (*Parophrys vetulus*) to Investigate the Effects of Metro Vancouver Wastewater Effluents" (2023) 11 Toxics 657.

[72] *Ibid.*

[73] PL Dods *et al*, "Reproductive success and contaminants in tree swallows (*Tachycineta bicolor*) breeding at a wastewater treatment plant" (2009) 24:12 Environmental Toxicology and Chemistry 3106.

[74] A Lajeunesse *et al*, "Distribution of antidepressant residues in wastewater and biosolids following different treatment processes by municipal wastewater treatment plants in Canada" (2012) 46:17 Water Research 5600.

[75] EMA, s 24(1).

[76] Government of BC, "Interim Guidelines for Preparing Liquid Waste Management Plans" (July 2011), online as pdf: <https://www2.gov.bc.ca/assets/download/9D3A9727A8F647808DF1A1E2D62C862B> at 4.

governments in the long run through the minimization of environmental impacts, reduced costs, and increased flexibility for expansion or upgrades.[77]

Metro Vancouver first developed a liquid waste management plan decades ago. It also appears to be the only large local government along the Fraser River to have implemented such a plan. However, recently many municipalities and regional districts on Vancouver Island and elsewhere on the BC mainland have created or are in the process of developing liquid waste management plans.[78]

Other large wastewater treatment facilities in the lower Fraser include the JAMES wastewater treatment plant jointly operated by the City of Abbotsford and the District of Mission, the third-largest secondary treatment plant in BC.[79] The City of Chilliwack also owns and operates a secondary wastewater treatment plant.[80] Other local governments, such as the City of Quesnel, partner with a private party to deal with its wastewater. The Cariboo Pulp Mill treats 1.3 billion litres of wastewater and sewage generated by the City per year.[81] Part 4 of this report discusses the pulp and paper sector in more detail.

2.3.4 MONITORING

2.3.4.1 Federal

Canadian wastewater treatment plants are governed federally under the *Wastewater Systems Effluent Regulations*[82] pursuant to the *Fisheries Act.*[83] The purpose of the *Wastewater Systems Effluent Regulations* is to reduce the threats to fish and their habitat by decreasing the level of deleterious substances from wastewater effluent into waters frequented by fish,[84] and is intended to achieve this objective by setting national effluent quality standards for wastewater systems that discharge 100,000 litres or more of effluent per day.[85] For large wastewater systems, such as local government wastewater treatment plants, the *Wastewater Systems Effluent Regulations* set a

[77] *Ibid* at 6.
[78] See e.g., CRD, RDN, Port Alberni, CVRD, CSRD, Whistler, District of Squamish, Nelson, District of Sooke, Kamloops, Vernon.
[79] Boost Environmental Systems, "James Wastewater Treatment Plant" (2024), online: <https://boostenviro.com/projects/james-wwtp/>.
[80] City of Chilliwack, "Wastewater Treatment Plant" (2024), online: <https://www.chilliwack.com/main/page.cfm?id=3101>.
[81] City of Quesnel, Municipal Services – "Sewer" (2024), online: <https://www.quesnel.ca/municipal-services/water-sewer/sewer>; George Henderson, "City of Quesnel has a new sewage deal with Cariboo Pulp" (20 December 2019), online:<https://www.mycariboonow.com/57715/news/city-of-quesnel-has-new-sewage-deal-with-cariboo-pulp/>.
[82] SOR/2012-139.
[83] RSC 1985, c F-14 [*Fisheries Act*].
[84] *Ibid.*
[85] *Ibid.*

statutory obligation to sample effluent discharge at least three days per week in general,[86] and once per month for acute lethality testing.[87]

Information received between 2013 and 2022 by Environment and Climate Change Canada ("ECCC") under the regulations are publicly available. The Effluent Regulatory Reporting Information System ("ERRIS") nationally collates results from reported "concentrations of carbonaceous biochemical oxygen demanding matter and suspended solids, acute lethality test results, and volumes of effluent discharged from the final discharge point and from combined sewer overflow points."[88] According to the Wastewater Section of the Industrial Sectors and Chemicals Directorate of ECCC, data are available once compiled with other jurisdictions per equivalency agreements, and following quality assurance and quality control procedures, which take approximately one year. Data from 2023 had not been posted to ERRIS at the time of this report.[89]

2.3.4.2 Provincial

Wastewater treatment plants in BC are regulated provincially under the *Municipal Wastewater Regulation* pursuant to the EMA. The *Municipal Wastewater Regulation* includes requirements for environmental impact studies during the construction and operation of wastewater treatment plants.[90] Environmental impact studies are required to: (1) Establish effluent quality requirements necessary to protect public health and the receiving environment;[91] (2) Demonstrate that the proposed disposal and treatment system and relevant discharges will not adversely affect public health or the receiving environment;[92] (3) Address impacts on the receiving environment both when quality requirements are met and when they are unmet;[93] and (4) "Consider the potential cumulative effects of the discharge on the receiving environment."[94]

2.3.5 STORMWATER AND URBAN RUNOFF

Stormwater often passes through combined sewer/stormwater systems to wastewater treatment plants in municipalities and regional districts in the Lower Fraser River Basin,.[95] During periods of

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[86] *Ibid*, s 10.
[87] *Ibid*, s 11.
[88] Government of Canada, "Wastewater Systems Effluent Regulations Reported Data" (Ottawa: ECCC, last visited 29 August 2024), online: <https://data-donnees.az.ec.gc.ca/data/substances/planinfrastruture/wastewater-systems-effluent-regulations-reported-data?lang=en>.
[89] Wastewater Section of the Industrial Sectors and Chemicals Directorate, ECCC, personal communication (Email, 3 October 2024 10:39 am)
[90] BC Reg 76/2022, s 19(1).
[91] *Ibid*, s 19(2)(b).
[92] *Ibid*, s 19(2)(d).
[93] *Ibid*, s 19(2)(e).
[94] *Ibid*, s 19(2)(a).
[95] State of the Fraser River, *supra* note 25 at 4.

heavy rainfall, combined sewer overflows can occur as pipes and wastewater treatment plants lack the capacity to manage all the additional rainwater.[96] During combined sewer overflow events, combined sewers direct excess contents into receiving waterbodies around Metro Vancouver without treatment (including the Fraser River, Burrard Inlet, and False Creek).[97] The runoff consists not only of rainwater, but also untreated sewage. Although the City of Vancouver acknowledges that this combined sewer overflow, as an anti-flooding mechanism, "can impact ecosystem health", it asserts that the impacts of the raw sewage are "usually highly diluted" by rainwater.[98] Approximately 32 billion litres of combined sewer overflows were discharged into Burrard Inlet and 6 billion litres of combined sewer overflows were discharged into the Fraser River in 2020.[99] There are at least seven sewer overflow locations in Metro Vancouver along the Fraser River.[100]

Urban runoff is a catch-all term for the accumulation of contaminants from sources like air pollution, fossil fuel combustion, household pollutants and roads that enter waterways via urban drainage systems.[101] Metals (including heavy metals like copper, zinc, and lead),[102] carbon compounds (like polycyclic aromatic hydrocarbons), and fecal coliform bacteria form a significant part of pollutants in urban runoff.[103] The annual urban runoff in 1987 in the Fraser River downstream of Kanaka Creek was estimated at 165 billion litres per year (~452 million lpd), accounting for approximately 18% of all wastewaters entering the River.[104] By comparison, in 1987 industrial wastewater flows accounted for just over 90 billion litres per year (~247 million lpd).[105]

Microplastics in wastewater often originate as non-point source contamination in urban stormwater.[106] as stormwater outfalls themselves provide minimal to no treatment of pollutants prior to discharge.[107]

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[96] City of Vancouver, "Combined sewer overflows (CSOs)" (2024), online: <https://vancouver.ca/home-property-development/combined-sewer-overflows.aspx>.
[97] *Ibid.*
[98] *Ibid.*
[99] City of Vancouver, "Update on the Development of a Sewage and Rainwater Management Plan for Vancouver" (12 January2023), online as pdf: <https://council.vancouver.ca/20230201/documents/cfsc1.pdf>, appendix B at 6.
[100] Metro Vancouver, "Sewerage and Drainage Services" (last visited 30 August 2024), online: <https://gis.metrovancouver.org/mvmaps/sewer>.
[101] Environment Canada, "Fraser River Access Plan: Aquatic Issues", online: <14711E (publications.gc.ca)>, s 2.1 [Fraser River Access Plan].
[102] State of the Fraser River, *supra* note 25 at 4.
[103] Fraser River Access Plan, *supra* note 96, s 2.1.
[104] State of the Fraser River, *supra* note 25 at 4.
[105] *Ibid.*
[106] Gies et al, *supra* note 71.
[107] City of Vancouver, "Foundations for Healthy Waters Plan: Summary of Phase 1 Work and Next Steps" (August 2023), online as pdf: <https://vancouver.ca/files/cov/csa-foundations-summary-report.pdf>, ss 4-8 [Foundations for Healthy Waters Plan].

2.3.6 WASTEWATER IN METRO VANCOUVER INTO THE FUTURE – THE HEALTHY WATERS PLAN

Vancouver City Council directed staff to begin developing a Healthy Waters Plan in 2020. The Plan is designed to improve the City's sewage and drainage services and align with Vancouver's pending liquid waste management plan update.[108] The City of Vancouver's commitment to implementing UNDRIP also has implications for sewage and rainwater management,[109] particularly with respect to impacts on aquatic life, wildlife and cultural practices along the Fraser River.[110]

2.4 CONCLUSION

Impacts of the disposal of wastewater in the Fraser River do not seem to have been systematically assessed by the federal or provincial governments since the "State of Fraser" report in 1992. Publicly accessible monitoring schedules, testing results, and a aggregated dataset for local government wastewater management will be a central pillar of cumulative impacts analysis on the Fraser River.

[108] Vancouver updated their liquid waste management plan in 2011 and planned to submit their latest liquid waste management plan to the province for review in late 2023. *Ibid* note 62, ss 1-2.
[109] *Ibid*, ss 3-4.
[110] *Ibid*, ss 3-6.

3. MINE EFFLUENT

3.1 INTRODUCTION

Mine effluent[111] discharged into the Fraser River watershed risks the health of fish and aquatic ecosystems,[112] as well as risks infringement of Indigenous rights.[113] This part of the report focuses on the permitted effluent discharge from the major metal mines located within the Fraser River watershed to highlight the significant volume of waste already permitted by the Province. Effluent volumes in this part include from metal mines, both actively operating and either closed or under care and maintenance, contained in storage facilities for mine tailings and submerged in wastewater ponds.

There are approximately 1,887 "past producing" mine sites in BC without valid *Mines Act* or EMA permits.[114] They are considered "historic" and 1,171 are identified as having potential for acid generation and/or metal leaching.[115] For the Fraser Basin, they are densely concentrated in the Cariboo region east of Quesnel and associated with the 1860's gold rush, although a significant number of these mine sites are located in the lower Fraser Valley, further up into the Fraser canyon and extending into the Bridge River and Thompson River subdrainages.[116] The legacy effect of these historic mine sites is an important component of overall Fraser River mine pollution that has not been considered in this report due to a lack of available data.

Finally, the Fraser Basin does not have a significant coal mining presence as found in other BC watersheds. While aggregate mining (e.g., sand and gravel pits and construction aggregate

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[111] Effluent has been defined as "a water-based byproduct from a mining process which may contain chemicals of potential concern" as cited in *Tsilhqot'in National Government v. Director, Environmental Management Act*, 2023 BCEAB 37 at para 1 [*Tsilhqot'in*].

[112] Mining Operations, stating that "Some mines are point sources of effluents which may contain a wide range of contaminants including suspended sediments, dissolved and particulate metals, and contaminants introduced via chemicals used for processing. These contaminants may affect fish directly through their toxicity, or indirectly by altering physical parameters of their environment (i.e. pH, alkalinity, oxygen saturation levels, sedimentation)." Fisheries and Oceans Canada, "Fraser River Basin Strategic Water Quality Plan – Lower Fraser River: Fraser Delta, Pitt-Stave, Chilliwack and Harrison-Lillooet Habitat Management Areas" (last visited 30 August 2024), online as pdf: <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/222078.pdf> at 2-22.

[113] Environmental Law Centre (Kyra Graham *et al*, UVic ELC Intensive 2023 Law Students), University of Victoria, "Whole-of-River Protection for the Fraser River: A Scan of Legal Protections" (June 2023), online as pdf: <https://elc.uvic.ca/wordpress/wp-content/uploads/2024/01/2023-01-12-Fraser-River-Legal-Scan_10July2023.pdf>.

[114] Government of BC, Historic Mine Sites in British Columbia (Victoria: Ministry of Energy and Mines, Mining Division, 2003) at 3, 9 [Historic Mine Sites in BC]

[115] *Ibid* at 3, 9.

[116] *Ibid* at 10.

quarries) has a significant presence in the Fraser Basin, it has been excluded from this review since these activities do not generally require discharge authorizations from ENV.[117]

3.2 METHODOLOGY

The review of the mine wastewater issues in the Fraser River watershed includes an examination of the provincial permitting regime and considers regulatory responsibilities for monitoring and reporting on discharge. Various sources from the Environmental Law Centre, First Nations, Province of BC, environmental organizations, Fisheries and Oceans Canada ("DFO"), case law, and other resources are further relied upon to examine mining effluent contamination and cumulative effects potential on the Fraser River. The review of relevant legislation and regulations focuses primarily on the EMA,[118] which governs effluent discharge permits issued by ENV for mining, as well as other types of waste discharges, in BC.

A province-wide assessment of the mining industry assisted to identify mines operating within the Fraser River watershed, which are predominantly metal mines. Following mine identification, a review of the public "BC Mine Information" website revealed individual EMA authorizations.[119] This approach helped identify active (operating) mines in addition to closed mines within the Fraser River watershed and allowed a characterization of various effluent discharge authorizations and some general trends within the permits. A thorough search of existing waste discharge authorizations confirms which closed mines continue to hold an effluent discharge permit and actively discharge effluent after mine operations have ceased.[120] All values specified in permits throughout this mining-related part of the report have been converted to litres per day for consistency.

3.3 RESULTS

Permits issued by ENV for mining effluent discharge under the EMA include 11 mines (six active and five closed) across three of the six regions encompassing subdrainages of the Fraser River watershed. It represents all the mines in the Fraser Basin holding provincial discharge permits.[121]

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[117] Government of British Columbia, Aggregate Mine Application Guide, Version 1.0 (Victoria: Ministry of Energy, Mines and Low Carbon Initiatives, June 2024) at 12.

[118] EMA, Part 2, s 14.

[119] Government of British Columbia, "BC Mine Information - Major Mines in British Columbia" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/projects>.

[120] Government of BC, "Environmental Management - E-Licensing Public System" (last modified 26 March 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PosseMenuName=MM_Main>.

[121] The Cariboo-Chilcotin and Thompson Regions both have several active and closed major mines, and the Nechako has two closed mines under discharge permit; the Fraser Headwaters, Canyon and Lower Fraser Regions do not have major

Only two active mines – Gibraltar and Mount Polley, both of which are in the Cariboo Region – are permitted to discharge large volumes of effluent directly into the Fraser River watershed. All operating mines are permitted to discharge effluent to tailings storage facilities, with limited amounts of unspecified releases to the ground or otherwise to the aquatic receiving environment. Certain closed mines retain permits to discharge mine effluent into (and from) tailings storage facilities, subject to various forms of treatment. Placer mining may also pose significant risk of cumulative effects from sedimentation, riparian impacts to fish, and mercury release.[122]

The following summary highlights key findings within the categories of direct discharge, discharge to tailings impoundment and seepage/runoff, as well as legacy/closed mines and mines under care and maintenance that still actively discharge effluent. This section also provided a brief and limited discussion of monitoring and reporting requirements as well as new mines and placer mining. While the intent of this section is to highlight some key areas of concern related to cumulative effects upon aquatic ecosystems and Indigenous rights, it does not provide a detailed, comprehensive description of the overall mining sector.

3.3.1 DIRECT DISCHARGE

The Gibraltar and Mount Polley mines are the only metal mines with effluent permits that allow substantial discharges directly into rivers of the Fraser Basin. The combined effluent discharge volume from these mines is both significant and noteworthy.

3.3.1.1 Gibraltar Mine

Gibraltar Mines Limited operates Gibraltar Mine, a molybdenum and copper mine owned by Taseko Mines Limited (Taseko) and located near McLeese Lake in the Cariboo Region. In 2019, ENV authorized an amendment to Gibraltar's effluent discharge permit to increase the amount of effluent discharge into the Fraser River equivalent to approximately 14.8 million lpd over a period of three years.[123] Tsilhqot'in National Government appealed the permit on the basis of it being a

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mines. See Rivershed Society of British Columbia, "Connect – Map Exploration" (2024), online: <https://watershedcpr.canadiangeographic.ca/salmon/connect/map-exploration/#:~:text=The%20Fraser%20River%20Watershed%20can,wildlife%2C%20communities%2C%20and%20industries>.

[122] See Fair Mining Collaborative, "B.C. Placer Mining – High Environmental Impacts vs. Low Economic Return", (2017), online: <https://wildsight.ca/wp-content/uploads/2017/04/BCPlacer_Environment_Economic.pdf>; see also Judith Lavoie (The Narwhal), (April 17, 2018), 'It's an Environmental Law-Free Zone': B.C. Auditor General Asked to Investigate Unregulated Placer Mining", online: <https://thenarwhal.ca/it-s-environmental-law-free-zone-b-c-auditor-general-asked-investigate-unregulated-placer-mining/#:~:text=Placer%20mining%20can%20kill%20fish,of%20placer%2Dmined%20streams.%E2%80%9D> [Lavoie].

[123] *Tsilhqot'in, supra* note 111 at 14.

50% increase in mine wastewater discharge of tailings supernatant into the Fraser River.[124] The BC Environmental Appeal Board upheld the permit in *Tsilhqot'in National Government v. Director, Environmental Management Act*, finding the discharge authorized under the Amendment was sufficiently protective of the environment.[125]

Today, Gibraltar holds EMA permit 416 (last amended November 30, 2023), which authorizes daily discharge of approximately 15.03 million litres from an Active Water Treatment Plant to the Fraser River.[126] Additionally the permit authorizes the release of approximately 16.42 million lpd from the tailings impoundment and/or tailings impoundment seepage ponds to the Fraser River.[127] Both discharge are continuous with specified releases from the tailings impoundment that invoke seasonal timing windows and temperature levels intended for the protection of fish.[128]

3.3.1.2 Mount Polley Mine

Mount Polley operates a gold and copper mine owned by Imperial Metals Corporation (Imperial) near the Town of Likely in the Cariboo Region. Mount Polley Mining Corporation holds EMA permit 11678 (last amended December 1, 2022), which authorizes discharge of treated effluent directly into Quesnel Lake "from the site runoff and seepage water collection and management systems" to a maximum rate of 52 million litres per day and an average rate of 29 million litres per day.[129] Permit 11678 also authorizes seepage water discharge from "Springer Pit to Ground" and requires water levels at the pit to be monitored to limit seepage towards Bootjack Lake.[130] The 2014 breach of the tailings dam led to authorized a maximum daily discharge of 52 million lpd of mine effluent directly into Quesnel Lake and is set to continue until at least June 30, 2025.[131]

As a major tributary of the Fraser River, Quesnel Lake continues to experience effects from the devastating Mount Polley tailings breach in 2014. At its peak, 25 billion litres (25 million cubic metres) of tailings spilled into Quesnel Lake and surrounding waterbodies.[132] Some reports have claimed that the contamination cleared within one year, while other studies have shown seasonal

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[124] *Ibid* at 330. See also Troy Baptiste and Francis Laceese, in *The Province* (op-ed), "B.C.'s 'road map' to social license for mining starts with Gibraltar" (April 25, 2021), online: <https://theprovince.com/opinion/troy-baptiste-and-francis-laceese-provinces-roadmap-to-improved-social-licence-for-mining-should-start-with-gibraltar-mine>.

[125] *Tsilhqot'in, supra* note 111.

[126] The most recent amendment to EMA permit 416 (20 November 2023) indicated the Active Water Treatment Plant is a new facility since s 1.1.1 of the permit states it should be in operation by September of 2024. Government of British Columbia, "BC Mine Information: Gibraltar" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e4094635c865df00caab/overview>, ss 1.1.2 [Gibraltar].

[127] *Ibid*, s 1.2.1.

[128] *Ibid.*

[129] Government of British Columbia, "BC Mine Information: Mount Polley Mine" (last visited 30 Augusts 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e41f4635c865df00d1b7/authorizations>, ss 1.2.1, 1.2.2 [Mount Polley].

[130] *Ibid*, s 1.3.

[131] *Ibid,* ss 1.2.2–1.2.3.

[132] West Coast Environmental Law, "Challenging Mount Polley's wastewater permit in Quesnel Lake" (August 18, 2020), online: <https://www.wcel.org/blog/challenging-mount-polleys-wastewater-permit-quesnel-lake> [Challenging Mount Polley].

turnover of Quesnel Lake that led to copper-sediment pollution entering Quesnel River at the Lake outlet.[133] Questions arise in this context about the safety of tailings impoundments to store mine waste and seepage from tailings storage facilities via groundwater into rivers and creeks, even under "normal" circumstances, which have not been exacerbated by climate change induced flooding and other irregular events.[134]

Notably, neither BC nor Canada took legal action against Mount Polley Mining Corporation or Imperial, nor did they issue penalties, charges, or fines for the tailings breach, which contravened permits and associated regulations.[135] First Nations, individuals and the Concerned Citizens of Quesnel Lake considered mounting litigation to stop mine effluent discharge into Quesnel Lake during the 2022 permit amendment application; however, no further evidence of challenge to the permits was found.[136]

3.3.2 OPERATING MINES

All five operating mines in the Fraser Basin discharge to tailings storage facilities and/or tailings impoundments. This represents the most substantial volume and location of ongoing mine waste generation and water management within the Fraser Basin. All operational mines are authorized to discharge effluent to tailings storage facilities and their "seepage ponds". Surface and groundwater sampling for water quality include analyses must comply with environmental monitoring requirements included in the discharge authorization permit prescribed under the *Waste Discharge Regulation* of the EMA.[137] However, the Cohen Commission final report found

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[133] See for example, University of Northern British Columbia, "Seasonal turnover sends pulses of metal-rich sediment from Mount Polley tailings pond breach down Quesnel River" (12 October 2022), online: <https://www2.unbc.ca/newsroom/unbc-stories/seasonal-turnover-sends-pulses-metal-rich-sediment-mount-polley-tailings-pond-breach-down-quesnel-river>; see also Andrew K. Hamilton et al, "Seasonal Turbidity Linked to Physical Dynamics in a Deep Lake Following the Catastrophic 2014 Mount Poley Mine Tailings Spill" (2020), 56:8 J Water Resources Research 1, online: <https://doi.org/10.1029/2019WR025790>.

[134] See e.g. the letter from Woodward and Company (Matthew Boulton) on behalf of Kamloops Area Preservation Association regarding the expert hydrogeologist Dr. Morin's 2019 report of groundwater / aquifer contamination into Peterson Creek from the historic Ajax Mine, (1 October 2020), online as pdf: <https://miningwatch.ca/sites/default/files/2020-10_-_minewaterpollutionkamloops_-_legal_letter_sent_to_bc_minister_of_environment_0.pdf> [Woodward]. See also Dr. Kevin Morin, "Peterson Creek and Aquifer – Review of Ajax Mine Permit 3904 for Reliably Characterizing and Preventing Water Contamination by Existing Mine Wastes" (April 15, 2020), online as pdf: <https://miningwatch.ca/sites/default/files/2020-05_-_minewaterpollutionkamloops_-_expert_report_-_dr.morin-mdag_0.pdf>; this report found elevated levels of molybdenum beyond Canadian safe drinking water guidelines.

[135] BC Mining Law Reform, "New Map Shows Dozens of Mine Pollution Threats in B.C." (19 January 2021), online: <https://reformbcmining.ca/news/2021/01/new-map-shows-dozens-of-mine-pollution-threats-in-bc/>.

[136] Challenging Mount Polley, *supra* note 126. See also Concerned Citizens of Quesnel Lake, "Mt Polley Gets Approval for Another 3 Years Using Quesnel Lake to Dilute Mine Wastewater!" (2023), online: <https://www.ccql.ca/single-post/mt-polley-gets-approval-for-another-3-years-using-quesnel-lake-to-dilute-mine-waste-water>.

[137] BC Reg 51/2024, s 2.

that the Province often issued permits without monitoring requirements or any cumulative effects analysis.[138]

The presence of large volumes of stored and submerged tailings beyond the operational lifespan of each mine represents a legacy contamination issue. Waste rock and tailings storage can result in chronic pollution and present public safety risks that persist beyond mine closure and well into the foreseeable future.[139] Considering the storage volumes of tailings impoundments, the combined discharge of all authorizations for currently operating mines in the Thompson, Cariboo, and Nechako Regions amounts to a cumulative permitted discharge of over 624 million litres per day into tailings impoundments or permitted via seepage ponds. This excludes otherwise permitted amounts that are unspecified and uncharacterized and discharge to the receiving environment.

The following summary of authorizations within the major subdrainages of the Fraser Basin includes operating mines in the Thompson, Quesnel, Nechako, and Upper Fraser watersheds. Notably, a significant amount of authorized mine effluent from the Nechako Region empties into the Nechako Reservoir above the Kenney Dam. Thus, this effluent only partially enters the Fraser River, while the remaining runoff drains into the Pacific Ocean west of the Coast Mountains.

3.3.2.1 Thompson River

Craigmont Mine is operated by Huldra Properties Incorporated and located west of Merritt in the Thompson Region. The amended EMA permit 11478 from 2020 authorizes a maximum rate of effluent discharge of 150,000 lpd from silver/lead ore concentrator tailings to a lined tailings impoundment.[140]

Highland Valley Copper is a copper molybdenum mine located west of Logan Lake in the Thompson Region and operated by Teck Resources Limited. The amended EMA permit 376 (27 February 2023) authorizes a discharge of 800 million lpd to tailings impoundments. This consists of a maximum of 582,000 of effluent from copper-molybdenum ore dressing plant tailings and an average of 282 million litres per day into a tailings impoundment.[141] The permit also authorizes a

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[138] Honourable Bruce I. Cohen, Commissioner, "The Uncertain Future of Fraser River Sockeye – Volume 1: The Sockeye Fishery – Final Report" (October 2012), *Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River*, online as pdf: <https://publications.gc.ca/collections/collection_2012/bcp-pco/CP32-93-2012-1-eng.pdf> at 322 [Cohen Commission].

[139] Waste rock pollution issue is well understood for coal mines in the Elk Valley in southeast BC. For additional public safety risks related to tailings dam failures, see D Komljenovic *et al*, "A resilience-based approach in managing the closure and abandonment of large mine tailing ponds" (2019) 30 Int J Min Sci Tech at 737; see also D Kossof *et al,* "Mine tailings dams: Characteristics, failure, environmental impacts, and remediation" (2014) 51 Applied Geochemistry at 235.

[140] Notably, the previous permit (2012) included an average rate of discharge of 2.5 million lpd from a magnetite recovery mill into a tailings impoundment. The current amount is based on a maximum rate of discharge of 150 cubic metres per day according to EMA permit 11478. Government of British Columbia, "BC Mine Information: Craigmont Mine" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e3fe4635c865df00c7a8/authorizations> s 1.1.1.

[141] Government of British Columbia, "BC Mine Information: Highland Valley Copper Mine" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e40f4635c865df00cd2a/authorizations>, s 1.1.1.

wastewater treatment plant to release effluent to either the ground (i.e., direct to the receiving environment), "the tailings line, the emergency tailings pond, or the sewage storage ponds" at an average of 200,000 lpd.[142]

Separately Highland Valley's tailings seepage sulphate reducing bacteria ponds S5 and S8 (outfalls) are authorized to discharge directly to the environment. The S5 outfall releases into Dupuis Creek at a maximum of 1.5 million lpd for a maximum of seven days during the annual freshet, and at 288,000 lpd for the remainder of the year.[143] The S8 outfall permits a maximum discharge rate of 112,000 lpd to Witches Brook.[144] Additional non-point source discharges are authorized over a continuous period with the average rate and effluent characteristics unspecified.[145] The permit also applies to unspecified non-point source discharges of "seepage from the Bethlehem Tailings Pond to Bose Lake via subsurface drainage."[146]

New Afton is the third mine (copper-gold) located in the Thompson Region near Kamloops. Operated by New Gold Inc., the EMA permit 100224 authorizes the discharge of a combined average of 84 million litres per day continuously to either of three tailings storage facilities in addition to 45,000 litres of treated domestic sewage per day.[147] As for surface discharges from non-point sources (i.e., mine contact water from waste rock storage areas, tailings facilities, and pits), effluent characteristics and authorized rates of discharges are unspecified.[148]

3.3.2.2 Middle Fraser River

Gibraltar Mine operates along the Fraser River south of Quesnel in the Cariboo-Chilcotin Region. In addition to the direct discharges to the Fraser River (discussed above), the current EMA permit 416 also authorizes an average of 200 million lpd of copper-molybdenum tailings slurry to a tailings impoundment.[149] Seepage, drainage, and domestic sewage may be discharged to the Gibraltar East Pit to a maximum elevation of 3,200 feet above mean sea level[150] and Granite Pit to a maximum elevation of 3,800 feet above mean sea level.[151] Non-point source continuous discharges are authorized from mine contact water from waste rock storage areas, tailings facilities, and pits with unspecified rates and characteristics.[152]

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[142] *Ibid*, s 1.2.1.
[143] *Ibid,* s 1.3.1.
[144] *Ibid,* s 1.4.1.
[145] *Ibid,* s 1.5.1.
[146] *Ibid*, s 1.6.1.
[147] EMA permit 100224 was amended as recently as June 30, 2021. Government of British Columbia, "BC Mine Information: New Afton Mine" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e4234635c865df00d2e4/authorizations>, ss 1.1.1, 1.2.1, 1.3.1, 1.5.1.
[148] *Ibid,* s 1.4.
[149] Gibraltar, *supra* note 127, s 1.3.1.
[150] *Ibid,* s 1.4.1.
[151] *Ibid,* s 1.5.1.
[152] *Ibid,* s 1.6.

3.3.2.3 Quesnel River

Mount Polley is a gold/copper mine in the Cariboo Region near Quesnel Lake. In addition to the direct discharge to the Quesnel River via Quesnel Lake (discussed above), the current EMA permit 11678 authorizes a continuous average rate of discharge of 55.5 million lpd of tailings slurry to the tailings storage facility.[153]

3.3.2.4 Upper Fraser River

Mosquito Creek is a gold mine operated by Osisko Development Corporation (Osisko). Its amended Permit 5553 authorizes discharge of effluent from several underground mine portals into Mosquito Creek, which is a small tributary of the Willow River, at an unspecified volume, with characteristics of discharge "equivalent to or better than typical underground gold mine workings water."[154] Another authorization in the permit allows 11,000 lpd of discharge from the "tailings supernatant overflow pond."[155]

3.3.3 CLOSED OR SUSPENDED MINES

Several major mines that historically operated within the Fraser River watershed have now either closed or have paused production and operate under care and maintenance while ENV continues to authorize effluent discharge. Some provisions in the permits place no specified limits on volume or quality of discharge. The cumulative discharge rate authorized for closed mines in major tributaries extending into the Fraser Basin is approximately 287 million lpd into tailings impoundments and via seepage/drainage.

3.3.3.1 Thompson River

Studies have demonstrated the contamination impacts on waterbodies from legacy tailings impoundments. In the case of the historic Ajax Mine near Kamloops, in an October 2020 letter to ENV, counsel on behalf of its client, Kamloops Area Preservation Association, raised concerns about Effluent Permit 3904 and the related monitoring and contamination of creeks in the area.[156] Along with this letter, a technical brief was prepared that identified "Arsenic, selenium, uranium, molybdenum, copper, sulphates, and nitrates pollution in Peterson Creek/Thompson River" from

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[153] Mount Polley, *supra* note 130, s 1.1.1.
[154] Government of British Columbia, "BC Mine Information: Mosquito Creek Mine" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e41c4635c865df00d0f2/authorizations>, s 1.1.1.
[155] *Ibid,* s 1.2.
[156] Mining Watch Canada, "New Report Finds Worsening Water Pollution from Mining in Kamloops, BC" (October 5, 2020), online: <https://miningwatch.ca/news/2020/10/5/new-report-finds-worsening-water-pollution-mining-kamloops-bc>.

the Ajax Mine.[157] The letter requests that the Minister utilize their powers to amend permits under section 16 of the EMA to strengthen environmental monitoring conditions in the permit.[158]

Afton Ajax is jointly owned, 80% by KGHM Polska Miedź S.A. (KGHM) and 20% by Abacus Mining & Exploration Inc. (Abacus), who currently consider it to be "under development."[159] Permit 3904 was last amended in 2022 and authorizes seepage and runoff effluent discharge from the closed Ajax Pit Area for an average discharge rate of 25,000 lpd to an unspecified area.[160]

3.3.3.2 Quesnel River

The Quesnel River (QR) mine is owned by Osisko Development. Local operations are closed, but the mine continues to process ore transported from its nearby mines in the upper Willow River. Permit 12601 authorizes daily effluent discharge of 1.8 million litres to the tailings storage facility and Main Zone Pit.[161] The Main Zone Pit also is authorized to discharge an unspecified amount from it to an unnamed tributary of the Quesnel River, based on a requirement that it "not exceed the natural overflow rate resulting from precipitation, run-off and groundwater."[162] Several other authorizations for discharge of effluent to creeks, wetlands and the ground associated with this permit, with this same "natural limit."[163]

3.3.3.3 Nechako River

Huckleberry Mine is a gold, silver, and copper mine that operated near Ootsa Lake in the Nechako Reservoir above the Kenney dam. Amended permit 14483 (dated 2012, yet still appears valid) authorizes a continuous maximum daily discharge of 48.6 million litres of slurry tailings to tailings management facilities.[164] The continuous daily discharge of up 13.7 million litres into Tahtsa Reach has a maximum rate of 20 million lpd of "mine runoff, pit water, groundwater from dewatering wells, treated sewage effluent and mill process water."[165] The permit contains additional authorizations for seepage and runoff discharge from mine facilities (tailings storage, dam face

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[157] BC Mining Law Reform, "Dilution is Not the Solution – Mining Pollution, Compliance and Recognizing Indigenous Laws to Protect Watersheds" (6 May 2021), online: <https://reformbcmining.ca/news/2021/05/dilution-is-not-the-solution-mining-pollution-compliance-and-recognizing-indigenous-laws-to-protect-watersheds/>.
[158] Woodward, *supra* note 135.
[159] KGHM, "Ajax" (last visited 29 August 2024), online: <https://kghm.com/en/our-business/projects-under-development/ajax>.
[160] This includes "seepage and runoff generated by North Waste Rock Dump, South Waste Rock Dump, and Overburden Stockpile." Government of British Columbia, "BC Mines Information: Afton-Ajax Mine" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e3ec4635c865df00c420/authorizations>, s 1.1,
[161] Government of British Columbia, "BC Mine Information: QR Mine" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e4284635c865df00d401/authorizations>, s.1.1.1.
[162] *Ibid,* s 1.3.1.
[163] *Ibid,* ss 1.5.1, 1.6.1, 1.7.1.
[164] Government of British Columbia, BC Mine Information: "Huckleberry Mine" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e4104635c865df00cdac/authorizations>, ss 1.1.1, 1.1.3.
[165] *Ibid,* s 1.2.2.

and various mine sites) into four sediment control ponds, which drain into creeks and total 6.08 million litres per day.[166] Treated domestic sewage in the amount of approximately 130 thousand litres to the tailings impoundment and to Mill Creek is also authorized.[167]

Endako mine is a molybdenum mine near Fraser Lake located in the Nechako Region. Since closing, the amended EMA permit 1307 authorizes several seepage discharges from tailings ponds to creeks that lead to Francois Lake or the Endako River, a tributary of the Nechako below the Kenney Dam. Maximum combined permitted daily discharge totals 21 million litres and an additional 3.17 million lpd of seepage from waste rock dump(s), for a total of 24.17 million lpd of allowable discharge into the Fraser River watershed.[168]

3.3.3.4 Upper Fraser River

Bonanza Ledge Mine is a gold mine operated in the Cariboo Region by Osisko Development Corporation. It is currently closed and under care and maintenance with amended EMA permit 17876 issued June 29, 2022. It authorizes discharge of mine contact water into the sediment control pond at a maximum rate of 1.68 million lpd.[169] Treated and untreated effluent is released from Lowhee Creek into the Willow River, a tributary of the upper Fraser River. Maximum continuous discharge from the sediment control pond is ~1. 58 million lpd[170] alongside effluent from a water treatment plant released at a maximum rate of ~4.73 million lpd,[171] with unspecified non-point source effluent discharged to ground.[172]

3.3.4 COMBINED DISCHARGES

This review of operating and closed mines in the Thompson, Quesnel, Nechako, and Upper Fraser Basin considers direct and indirect mine permitted effluent discharges into containment areas that include underground workings (e.g., mine portals), tailings storage facilities and sediment control ponds. This amounts to nearly 1.2 billion lpd excluding unspecified discharge volumes (Table 1) with 1 billion lpd coming from just two mine operations: Highland Valley Copper and Gibraltar. Other sources of effluent are being discharged to the ground or into creeks, rivers, and lakes. Where these discharge volumes have been specified in the EMA permits, it represents an additional cumulative daily discharge of approximately 140 million litres released daily into the aquatic receiving environment of the Fraser River watershed (Table 2).

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[166] *Ibid,* s 1.3.
[167] *Ibid,* ss 1.4, 1.5.
[168] Government of British Columbia, BC Mine Information: "Endako Mine" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/p/5fa1e4034635c865df00c966/authorizations>, s 1.1.1–1.6.1.
[169] Bonanza Ledge Mine permit, *supra* note 36, s 1.5.2
[170] *Ibid*, s 1.1.
[171] *Ibid,* ss 1.2, 1.3.
[172] *Ibid,* s 1.4.

Table 1: Mine Effluent Permitted for Release into Containment Areas.

River	Permittee	Operation	Permit	Litres/day	Location
Upper Fraser	Osisko	Bonanza Ledge	17876	1,680,000 Unspecified	Wells-Barkerville
		Mosquito Creek	5553	Unspecified	
Nechako	Imperial*	Huckleberry	3900	48,730,000	Ootsa Lake
	Centerra	Endako	1307	Unspecified	Fraser Lake
Quesnel	Imperial	Mount Polley	11678	55,500,000	Likely
	Osisko	Quesnel River	12601	1,800,000	
Middle Fraser	Taseko	Gibraltar	416	200,000,000	McLeese Lake
Thompson	Huldra Properties	Craigmont	11478	1,500,000	Merritt
	Teck	Highland Valley Copper	376	800,000,000	Logan Lake
	New Gold Inc.	New Afton	100224	84,000,000 45,000	Kamloops
Cumulative daily discharge (in litres)				1,193,255,000	

*Note: only partial discharge due to effluent being released in the Nechako reservoir.

Table 2: Mine Effluent Permitted for Direct Release into the Receiving Environment.

River	Permittee	Operation	Permit	Litres/day	Location
Upper Fraser	Osisko	Bonanza Ledge	17876	1,576,800 4,730,400 Unspecified	Wells-Barkerville
		Mosquito Creek	5553	11,000 Unspecified	
Nechako	Imperial*	Huckleberry	3900	26,080,000	Ootsa Lake
	Centerra	Endako	1307	24,170,000	Fraser Lake
Quesnel	Imperial	Mount Polley	11678	52,000,000	Likely
	Osisko	Quesnel River	12601	Unspecified	
Middle Fraser	Taseko	Gibraltar	416	15,033,600 16,416,000	McLeese Lake
Thompson	Huldra Properties	Craigmont	11478	Unspecified	Merritt
	Teck	Highland Valley Copper	376	623,243 Unspecified	Logan Lake
	New Gold Inc.	New Afton	100224	Unspecified	Kamloops
	KGHM/Abacus	Ajax	3904	25,000	Kamloops
Cumulative daily discharge (in litres)				140,666,043	

*Note: only partial discharge due to effluent being released in the Nechako reservoir.

3.3.5 MONITORING

3.3.5.1 Federal

Federal regulatory oversight of the mining industry to address effects to the aquatic receiving environment includes monitoring effluent pursuant to the *Metal and Diamond Mining Effluent Regulations*[173] of the federal *Fisheries Act.* Operators must report all data to ECCC under Schedule 5 of the regulations. Monitoring studies consist of effluent characterization, sublethal toxicity testing and water quality monitoring.[174] Biological monitoring studies include science-based assessments of effects on fish tissue, fish population, and benthic invertebrate community.[175] Regular reports of monitoring data go to the Mine Effluent Reporting System ("MERS").[176] Data submitted to MERS for individual mine operations are publicly available from ECCC.

3.3.5.2 Provincial

Individual discharge permits prescribe mine-specific monitoring and reporting requirements under the EMA. Permits require some degree of continuous and/or periodic (e.g., daily, weekly, monthly, quarterly, annually, and/or biannually) monitoring of water quality and some degree of aquatic effects monitoring. Reports prepared by qualified environmental professionals are submitted to ENV along with results from laboratory analyses uploaded to provincial databases. Water quality and other environmental monitoring information for specific mines can be found in reports made available on the BC Mine Information website.[177]

3.3.6 NEW MINES

Two proposed mines located in the Fraser River watershed are in the exploration phase and do not hold effluent discharge permits. However, they remain noteworthy for future impacts they may add as cumulative effects in the watershed. The temporal and spatial scale of these developments should be accounted for in any future analyses.

The proposed Cariboo Gold Mine in the Cariboo Region near Wells is likely the most significant new mining project, having received an Environmental Assessment Certificate in October of 2023 and now in its permitting phase. The proposed Blackwater Gold Mine in the Nechako Region is

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[173] SOR/2002-222.
[174] *Ibid,* sched 5, s 3.
[175] *Ibid,* sched 5, s 9.
[176] Government of Canada, "Online Reporting for Metal and Diamond Mines" (last modified 12 July 2024): online: <https://www.canada.ca/en/environment-climate-change/services/managing-pollution/sources-industry/mining-effluent/metal-diamond-mining-effluent/mine-effluent-reporting-system.html>.
[177] Government of BC, "BC Mine Information: Water Quality" (last visited 30 August 2024), online: <https://mines.nrs.gov.bc.ca/water-quality>.

located south of Vanderhoof. It is also a significant new mining proposal located below the Kenney Dam, so all effluent from this mine will remain in the Fraser Basin.

Taseko's New Prosperity Mine is no longer on the BC Government's Major Mines website. In 2020 the Supreme Court of Canada dismissed Taseko's appeal of the 2019 Federal Court of Appeal judgements,[178] and the subsequent decision not to renew the New Prosperity Mine environmental assessment certificate. For a cumulative impact perspective, the Federal Court of Appeal decisions upholding the original 2013 finding of "significant adverse environmental effects" by the federal Minister of Environment is relevant to future mine developers in the Fraser River watershed.[179]

3.3.7 PLACER MINING

Fisheries and Oceans Canada estimated that 65% to 75% of BC placer mining activity occurs in the Fraser Basin.[180] Exemptions in the Placer Mining Waste Control Regulation of the EMA exempt most placer mining operators from obtaining an effluent discharge permit.[181] Modern placer mining regulations normally require miners to "divert 'process' water into a settling pond and allow the water to seep into the ground, or reuse it, rather than releasing it directly into the stream", but some BC waterways are exempt from this settling process.[182] It is also known that "the risk of modern placer activities mobilizing historic mercury is rising as placer mining activity grows."[183] The Environmental Law Centre and other organizations have documented the failure of current BC regulations to prevent or mitigate harm caused by unregulated placer miners.[184] Questions also necessarily arise in this context regarding the strength of monitoring and enforcement regimes for placer mining in BC.

It is unknown how many placer mines are not exempt and therefore operate under an effluent discharge permit. This information is not publicly available on BC mines authorization websites. Therefore, it is impossible to assess the volume and type of effluent discharge from placer mining activities, both those regulated and unregulated. One example of placer mining under regulation is

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[178] See *Taseko Mines Limited v Canada (Environment)*, 2019 FCA 319 and 2019 FCA 320.

[179] Carol Linnitt, "A timeline from birth to death of Taseko's embattled embattled New Prosperity mine in B.C." (14 May 2020), online: <https://thenarwhal.ca/timeline-birth-to-death-tasekos-embattled-new-prosperity-mine-bc/>.

[180] Fisheries and Oceans Canada, "Fraser River Basin Strategic Water Quality Plan – Lower Fraser River: Fraser Delta, Pitt-Stave, Chilliwack and Harrison-Lillooet Habitat Management Areas" (last visited 30 August 2024), online as pdf: <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/222078.pdf>, s 2.6 - Mining Operations.

[181] BC Reg 131/2021. See also Government of British Columbia, Ministry of Energy, Mines and Petroleum Resources, "BC Placer Mining Best Management Practices – Technical Guide" (November 2019), online as pdf: <https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/mineral-exploration-mining/documents/exploration/bmps_technical_guide_2019.pdf>.

[182] Environmental Law Centre, University of Victoria, Letter to Auditor General of British Columbia (Carol Bellringer), "RE: Request for an audit and examination of the Government of British Columbia's failure to adequately regulate placer mining" (30 March 2018), online as pdf: <https://elc.uvic.ca/wordpress/wp-content/uploads/2018/04/2017-03-02-Placer-Mining-AG-Submission.pdf> at 6-7.

[183] *Ibid* at 6.

[184] Lavoie, *supra* note 123.

the Wingdam underground placer mine located east of Quesnel in the Cariboo Region that holds an effluent discharge permit.[185]

3.4 CONCLUSION

In conclusion, this review found the amount of mining effluent discharge permitted to be discharged within the Fraser River watershed amounts to over 1 billion litres per day[186] and is equivalent to over 415 billion litres of effluent per year. While the amount of effluent being discharged directly into the Fraser River watershed is over 142 million litres per day, various seepage, runoff, spillage and non-point source amounts are "unspecified" and not accounted for accurately within the existing EMA discharge permits administered by ENV.

While the characteristics of mine effluent may vary depending upon treatment and remain bound by the maximum concentrations of toxic metals, nutrients, dissolved oxygen and other parameters prescribed in each permit, the Province lacks clear standards for permitting effluent and consistent measures to monitor ongoing discharge into the Fraser River. Thus, it appears that the Province is not taking into consideration cumulative impact of mining effluent discharged daily throughout the Fraser River.

[185] 49 North Resources Inc, "49 North's Investee Company, Omineca Mining and Metals, Reports the Filing of Permit Amendment for Production at Wingdam Gold Project" (23 October 2014), online: <https://fnr.ca/news/news-releases/49-north-s-investee-company-omineca-mining-and-metals-reports-the-filing-of-permit-amendment-for-production-at-wingdam-gold-project>.

[186] The combined calculation from all operating and closed mines reviewed amounted to an average approximation of 1,139,000,000 lpd of effluent.

4. PULP AND PAPER EFFLUENT

4.1 INTRODUCTION

For well over a century, logging forests for lumber, wood, and fibre contributed to and established a pulp and paper sector in BC, which has come to represent the dominant source of permitted effluent discharge into the Fraser River for the forest industry. Although not exhaustive, this part of the report examines effluent discharge permits that are given to various industries, ranging from logging camps and sawmills to industrial-scale manufacturing of wood and fibre products, including large-scale bleached kraft pulp mills, unbleached pulp mills, plywood, fibreboard, cardboard, paper, and tissue.

The approach to assessing cumulative effects addresses contributing factors that combine to affect both water quality and water availability, given the state of aquatic and riparian ecosystems within the Fraser Basin. Cumulative interactions involve both temporal and spatial dimensions and consider unforeseeable or unpredictable events compounded by permitted effluent release from defined points of discharge. No additional consideration has been made in this part for non-point-source discharges, including any unregulated discharge or prohibited deposition of deleterious substances.[187] Additional forestry-related activities that contribute to non-point sources, such as the application of pesticides, are not discussed, but the regulation of pesticides as it applies to the agriculture sector is discussed in Part 5.

Apart from effluent discharge, other factors of influence include the seasonal timing and extent to which unplanned releases occur in either a controlled (i.e., human-caused) or uncontrolled manner (i.e., subject to natural processes). This is briefly discussed to provide context around cumulative risk factors attributable to climate change.

4.2 METHODOLOGY

The scope of this review is similar to the section on mining in that it provides background context for the overall presence of forestry-related effluent discharge in the Fraser River watershed. The primary source of information includes effluent discharge permits authorized under section 14 of the EMA for the Fraser River as far north as Ootsa Lake and extending southwest to the Fraser River estuary. Provincial and federal laws and regulations allow for controlled discharge of effluent. The description of how water quality may be affected by effluent discharge and aquatic effects monitoring regimes accompanies additional considerations for cumulative impacts.

[187] *Fisheries Act*, s 34.

4.3 RESULTS

The pulp and paper industry began in the early 20th century on the west coast of BC and Vancouver Island and was closely tied to a nascent hydropower industry.[188] Later developments along the Fraser River came between 1965 to 1975 with the development of bleached kraft mills for pulp and paper in Kamloops, Quesnel, and Prince George. Canfor was among the first to invest in mills in the interior of BC and still operates today,[189] along with West Fraser Mills Ltd., Millar Western Forest Products, and Kruger Inc.

Wood mills in the Fraser River watershed produce lumber and engineered products. They use considerably less water compared to the high volume of water required for pulp and paper facilities.[190] Much of the wood fibre supply for the facilities has come through pulpwood agreements[191] and operating sawmills.[192] Facilities operate under conditional water licences to extract and use water from the Fraser River and tributaries, much of which is treated as effluent released under discharge permits.

4.3.1 FACILITIES

This review revealed 10 discharge permits for controlled effluent discharge into the Fraser River or its tributaries, generally expressed as lpd. The bleached kraft pulp mills are the primary source of effluent with additional effluent from several paper mills, sanitary lagoons, a petrochemical refinery, sawmills, wood residue landfills, and plywood and fibreboard plants.

Total combined maximum permitted effluent amounts to over 846 million lpd with four bleached kraft pulp mills accounting for nearly 80% of that amount and located in Prince George (3) and Kamloops (1). Table 3 summarizes the location and volume of permitted effluent discharged.

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[188] Pulp and Paper Canada, "Looking West: Historical Overview of the Industry in BC" (1 January 2004), online: <https://www.pulpandpapercanada.com/looking-west-historical-overview-of-the-industry-in-bc-1000141957/>.

[189] *Ibid.*

[190] West Fraser Mills, "Water" (2024), online: <https://www.westfraser.com/sustainability/sustainability-report/caring-earth/water>.

[191] Division 7 of Part 3 of the *Forest Act,* RSBC 1996, c 157 provided for four area-based pulpwood agreements in the Fraser watershed. They represent a conditional licence to "pulp quality timber" issued as a timber tenure for up to 25 years but are no longer being issued. Province of BC, "Pulpwood Agreements" (11 January 2021), online: <https://www2.gov.bc.ca/gov/content/industry/forestry/forest-tenures/timber-harvesting-rights/pulpwood-agreements>.

[192] Pulp and Paper Canada, "Kruger completes acquisition of Domtar's Kamloops Pulp Mill; strengthens its position in BC" (2 June 2022), online: <https://www.pulpandpapercanada.com/kruger-completes-acquisition-of-domtars-kamloops-pulp-mill-strengthens-its-position-in-b-c>.

Moving upstream above the Fraser River Canyon, additional inputs from industrial facilities are located on or near confluences with key tributaries including the Thompson, Quesnel, and Nechako rivers.

Table 3: Pulp and Paper Effluent Discharge Permitted into the Receiving Environment.

River	Permittee	Operation	Permit	Litres/day)	Location
Nechako	West Fraser Mills	Logging camp*	3172	23,000	Ootsa Lake
		Fraser Lake Sawmills	105026	Unspecified	Fraser Lake
	Canfor Pulp	Prince George and Intercontinental bleach kraft pulp mills (2), one paper mill, and petrochemical refinery	3900	240,000,000 12,000,000	Prince George
		Sanitary lagoons	76	432,000	
Upper Fraser		Northwood bleached kraft pulp mill	157	190,000,000 28,000,000 800,000	
Middle Fraser	Millar Western Forest Products	Quesnel River Pulp	5803	34,000,000	Quesnel
	West Fraser Mills	Quesnel Plywood	1720	23,000 1,660,000 440,000 684,000	
Quesnel	West Fraser Mills and Mercer	Cariboo Pulp & Paper mill, plywood plant, sawmill complex, sewage system	1152	125,000,000 31,000,000	
Thompson	Kruger Inc.	Bleached kraft pulp mill.	1199	182,000,000	Kamloops
Cumulative daily discharge (in litres)				846,062,000	

*Note: only partial discharge due to effluent being released in the Nechako reservoir.

4.3.1.1 Thompson River

The Province of BC permitted the establishment of a pulp sector above the Fraser River Canyon with the construction of Kruger's facility in Kamloops. Production under EMA permit 1199 (amended June 30, 2023) authorizes discharge of effluent to the Thompson River. This includes a maximum continuous daily discharge of 182 million litres from the bleached kraft pulp mill.[193]

[193] BC Government, "Authorization Management System: Authorization Number = 1199" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, ss 1.1.

4.3.1.2 Quesnel River

Several facilities operate in Quesnel and the Cariboo Regional District. Permit 1152 (amended March 13, 2024) authorizes the Cariboo Pulp & Paper Company to discharge effluent to the Fraser and Quesnel rivers from a pulp mill, pulp mill lined landfill, plywood plant, sawmill, and sanitary sewage collection systems. The permit authorizes a maximum of 125 million litres of effluent from an effluent treatment facility along with 31 million litres of effluent from a water treatment plant.[194]

West Fraser Mills recently sold the Quesnel River Pulp mill to Atlas Holdings and it is being operated by Millar Western Forest Products.[195] The pulp mill is permitted under EMA permit 5803 (amended November 23, 2023) to discharge effluent from "a market thermomechanical / bleached chemi-thermomechanical pulp mill and a medium density fibreboard plant and leachate from wood residue landfills" at a continuous daily rate of 34,000,000 litres.[196]

4.3.1.3 Middle Fraser River

West Fraser Mills is authorized by EMA under permit 1720 (amended April 21, 2020) to discharge effluent to the Fraser River from a plywood plant and associated uses located near Quesnel. Authorized daily discharges include a maximum of 23,000 litres from the sewage treatment plant, 1.66 million litres from the drainage system "that ties into the sewage plant discharge and related appurtenances," 440,000 litres of effluent from a "freshwater pumphouse," and 684,000 litres from a "fire protection loop."[197]

4.3.1.4 Upper Fraser River

Canfor's Northwood bleached kraft pulp mill is located north of Prince George on the upper Fraser River using fibre sourced from forestry operations in the region. Permit 157 (amended April 16, 2007) authorizes a maximum daily discharge of 190 million litres into the Fraser River via a submerged outfall and diffuser as well as an additional maximum daily discharge of "non mill-process effluent" consisting of steam stripper condenser cooling water (28 million litres per day) and water treatment sludge to the exfiltration lagoon (800,000 litres per day).[198]

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[194] BC Government, "Authorization Management System: Authorization Number = 1152" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, ss 1.1, 1.2.
[195] Pulp and Paper Canada, "West Fraser Announces Sale of Two Pulp Mills in Western Canada to Atlas Holdings" (22 September 2023), online: <https://www.pulpandpapercanada.com/west-fraser-announces-sale-of-two-pulp-mills-in-western-canada-to-atlas-holdings/>.
[196] BC Government, "Authorization Management System: Authorization Number = 5083" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, s 1.1.
[197] BC Government, "Authorization Management System: Authorization Number = 1720" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, ss 1.1, 1.2, 1.3, 1.4.
[198] BC Government, "Authorization Management System: Authorization Number = 105026" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, ss 1.1, 1.2, 1.3.

4.3.1.5 Nechako River

Canfor has facilities in Prince George at the confluence of the Nechako and Fraser Rivers, which include the Intercontinental and Prince George facilities that draw water from the Nechako River under EMA permit 3900 (amended February 19, 2020).[199] The permit authorizes a combined continuous discharge at an average of 215 million and a maximum of 240 million litres per day into the Fraser River, along with an average of 5.5 million and a maximum of 12 million litres per day of effluent from a water treatment plant to an exfiltration pond.[200] Permit 76 (amended November 24, 2020), separately authorizes continuous daily discharge of 432,000 litres effluent to surface water from two sanitary lagoons serving its bleach kraft pulp mills, one paper mill and chemical plant.[201]

Further upstream West Fraser's sawmill operations EMA discharge permit 3172 (revised April 10, 2019) authorizes 23,000 litres per day from two facultative lagoons via an outfall into Ootsa Lake, which is part of the Nechako Reservoir above the Kenney dam, from a logging camp.[202] A second EMA permit 105026 (amended March 8, 2017) discharges treated effluent into Fraser lake as a combined discharge released at a continuous and indeterminate rate from a log yard and sawmill runoff treatment systems.[203] The permit also authorizes an indeterminate and continuous amounts of effluent from a planer mill oil/grit separator and spray irrigation from the Fraser Lake Sawmill.[204]

4.3.2 EFFLUENT CHARACTERISTICS

Environment and Climate Change Canada regulates effluent pursuant to the *Pulp and Paper Effluent Regulations*[205] under the *Fisheries Act.* Section 2 of that regulation defines effluent as:

> (b) wastewater from a mill, other than wastewater from the treatment of intake water, including process water, gas scrubbing water, boiler blow-down water, wash-down water, cooling water, leachate from any site at the mill where solid residues generated by any mill

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[199] Pulp and Paper Canada, "Sluiceways to sustainability: Operations at Canfor's cutting-edge water treatment plant" (27 September 2022), online: <https://www.pulpandpapercanada.com/sluiceways-to-sustainability-operations-at-canfors-cutting-edge-water-treatment-plant/>.

[200] BC Government, "Authorization Management System: Authorization Number = 3900" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, ss 1.1, 1.2.

[201] BC Government, "Authorization Management System: Authorization Number = 76" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, s 1.1,

[202] BC Government, "Authorization Management System: Authorization Number = 3172" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, s 1.1.1.

[203] BC Government, "Authorization Management System: Authorization Number = 105026" (last visited 3 September 2024), online: <https://j200.gov.bc.ca/pub/ams/Default.aspx?PossePresentation=DocumentSearch>, s 1.1.

[204] *Ibid,* ss 1.2, 1.3.

[205] SOR/92-269 [*Pulp and Paper Effluent Regulations*]

are treated or disposed of, and leachate from any site at the mill where wood chips or hogfuel are stored.

4.3.3 TREATMENT

The combination of waste generated by the pulp and paper sector includes effluent from multiple processes that must be treated prior to release using primary and secondary treatment.[206] Primary treatment removes suspended solids using clarifiers in combination with settling ponds. Secondary treatment involves microbial processes to digest biodegradable material and toxic elements, thereby reducing biochemical oxygen demand and levels of total suspended solids that are considered damaging to downstream fish habitat.[207]

4.3.4 MONITORING

4.3.4.1 Federal

As with the mining sector, ECCC requires environmental effects monitoring using science-based performance measures to assess whether pulp and paper effluent is protective of fish, fish habitat, and use of fish for human consumption.[208] Effluent monitoring and monthly reporting by operators is required under Schedule II of the *Pulp and Paper Effluent Regulations.*[209] Monitoring considers the presence of acutely lethal effluent and any effect on aquatic test organisms (e.g., *Daphnia magna* and *Oncorhynchus mykiss*), biochemical oxygen demand, quantity of suspended solids, volume, pH, and electrical conductivity.[210] Science-based sublethal toxicity and biological monitoring with reporting must occur every 3 years under more general environmental effects monitoring.[211]

Reporting of effluent deposit into water under the *Pulp and Paper Effluent Regulations* establishes maximum quantities under prescribed conditions. The regulations prohibit the deposit of effluent deemed acutely lethal to fish.[212] Key indicators used to evaluate the quality of water discharged

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[206] This includes debarking, pulp washing, bleaching, and regeneration of cooking chemicals. Environment and Climate Change Canada, "Canadian Environmental Sustainability Indicators: Pulp and Paper Effluent Quality" (2022), online as pdf: <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/pulp-paper-effluent-quality.html>.

[207] *Ibid.*

[208] Government of Canada, "Environmental effects monitoring" (last modified 16 June 2023), online: <https://www.canada.ca/en/environment-climate-change/services/managing-pollution/environmental-effects-monitoring.html> [Environmental Effects Monitoring].

[209] *Pulp and Paper Effluent Regulations*, s 7(1)(b).

[210] *Ibid*, schedule II, s 1(1).

[211] *Ibid*, schedule IV.1, ss 2(1), 2(2), 3.

[212] *Ibid*, s 6(5).

are biochemical oxygen demand and suspended solids.[213] The Environmental Effects Monitoring Electronic Reporting (EEMER) system must be used to input information required in Schedule IV.1 of the *Pulp and Paper Effluent Regulations*.[214]

4.3.4.2 Provincial

The EMA enables the *Pulp and Paper Liquid Effluent Control Regulation*.[215] Prohibitions are in place for bleached kraft pulp mills, which cannot exceed a monthly average of 0.6 kg of halogenated organic compounds per air dry tonne of pulp produced.[216] The regulation also requires frequent effluent sampling for compliance determination. Sampling frequency ranges from toxicity (monthly), biochemical oxygen demand (3 times per week), total suspended solids (5 times per week) and halogenated organic compounds (weekly). Effluent quality must be equal to or better than requirements in Schedule 2 for biochemical oxygen demand, total suspended solids, and acute toxicity.[217]

4.3.5 REGULATORY REFORM

The Government of Canada is seeking to modernize the *Pulp and Paper Effluent Regulations* since reporting that environmental effects monitoring programs show effluent from 70% of the pulp and paper mills to be impacting fish and/or fish habitat while 55% of mills also pose potentially higher risk to the environment.[218] It is unclear as to the extent to which climate change factors into these effects, but it is plausible that seasonality is a factor and associated trends of decreasing water availability.

4.3.6 CUMULATIVE RISK POTENTIAL

Water availability represents a potential cumulative risk, especially in recent years as environmental flows approach near historic lows on the Fraser River. If not adjusted to account for such a trend, a relative daily permitted discharge of pulp and paper effluent in industrial areas, especially around Kamloops and Prince George, could signal undue risk to the ecological integrity Fraser River. Such a risk considers the combined lack of available water licensed for withdrawal

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[213] *Ibid,* s 6(1).
[214] Environmental Effects Monitoring, *supra* note 209.
[215] BC Reg 470/90.
[216] For facilities using chlorine or chlorine compounds. *Ibid*, s 2(1).
[217] *Ibid*, s 5(1), schedule 2.
[218] Government of Canada, "Modernization of the Pulp and Paper Effluent Regulations" (January 2024), online: <https://www.canada.ca/en/environment-climate-change/services/managing-pollution/sources-industry/pulp-paper-effluent.html>.

combined with a relatively high proportion of discharged effluent contained in the total river volume supporting fishes such as Fraser River salmon, along with other aquatic life.

4.4 CONCLUSION

The total combined permitted pulp and paper effluent, as measured from the 10 final discharge points permitted for the controlled release of effluent into the Fraser River or its tributaries, is 846,062,000 litres per day. Cumulatively, and taken with other sources of effluent discussed in previous parts of this report, the potential exists for serious impacts to the health of the Fraser River. According ECCC's Environmental Protection Operations Directorate, communication between provincial and federal regulators is largely limited to whatever information is being shared publicly, including any trends and summary reports. Both federal and provincial regulators substantially rely on reporting from the individual facility operators and there is no collated reporting from all jurisdictions or across industries for reported industrial effluent discharges, observed and reported water quality and biological characteristics, or observed and reported aquatic impacts.[219] In short, neither jurisdiction is set up to take meaningful steps to systematically understand and actively manage cumulative impacts if there are signals present in the environmental monitoring data.

[219] EPOD, *supra* note 22.

5. NON-POINT SOURCES OF EFFLUENT (PERMITTED & UN-PERMITTED)

5.1 INTRODUCTION

Apart from the point-source effluent examined in the previous parts, Part 5 addresses the range of other regulatory approvals allowing effluent to enter the Fraser River. The Government of Canada regulates ecosystem-disrupting contaminants defined as deleterious substances primarily through *the Fisheries Act* (section 36); defined as toxic substances through the *Canadian Environmental Protection Act*, (section 44 and Part 5); and defined as waste the *Canada Water Act* (section 9).[220]

In addition to effluent from local government wastewater, mining, and pulp and paper, several other pollutants are known to be deposited in the Fraser River. As addressed by the *Cohen Commission,* municipal wastewater, mining, and forestry, are point source contaminants, meaning that they come from a single place and are more easily identified.[221] Many non-point source contaminants that enter the Fraser River can have deleterious effects on ecosystems but remain difficult to identify and effectively measure.[222] The Province of BC has permitted effluent discharge from multiple non-point sources adjacent to the Fraser River, as can be found in its Authorization Management System.[223] However, few studies exist on the total amount of effluent flowing into the Fraser River from permitted sources. Additionally, many sources of non-permitted effluent enter the Fraser River. Dr. Peter Ross, research scientist for the Marine Environmental Quality Section, Institute of Ocean Sciences, testified for the *Cohen Commission*, stating that "Canada needs to better understand non–point sources as they relate to Fraser River sockeye salmon."[224]

This part addresses non-point source contaminants entering the Fraser River, including contaminants from agriculture, cement and concrete plants, fish processing, shipping and bulk storage, and greywater. This part sets out the types of chemicals each source may release and provides any available information on the provincial permitting using data gathered from a preliminary survey of the Waste Discharge Authorization Management System. These findings further demonstrate the undetermined scope and volume of unregulated pollution entering the

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[220] Cohen Commission, *supra* note 139.
[221] *Ibid* at 305.
[222] *Ibid* at 305.
[223] Government of BC, "Find authorization information: Search the Authorization Management System (AMS)" (last modified 7 August 2024), online: <https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/find-authorization> [AMS].
[224] Cohen Commission, *supra* note 139 at 307.

Fraser River and highlight the lack of interjurisdictional coordination to address cumulative impacts on ecosystems within the Fraser River watershed.

5.2 METHODOLOGY

Limited information exists on the amount of effluent flowing into the Fraser River from non-point sources, such as agriculture, cement and concrete plants, fish processing and canneries, shipping and bulk storage, and greywater. For each of these sources, information has been collected from the *Cohen Commission* reports, Environment Canada's *Fraser River Action Plan*, and other online sources, with limited permitting examples identified in the Province of BC's Waste Discharge Authorization Management System. No sources have been located regarding total permitted amounts of effluent per non-point source discussed.

5.3 RESULTS

The following subsections introduce some of the types of non-point source effluent discharging into the Fraser River.

5.3.1 AGRICULTURE AND PESTICIDES

While runoff from agriculture is present along much of the Fraser River and is particularly prevalent in the Fraser Valley,[225] there is a lack of publicly available data on the amount of discharge permitted from agricultural lands, along with the types of agricultural chemical products and the volumes of chemicals used. Runoff from agricultural sources is generally known to contribute to elevated nutrient levels in waterways, hypoxia, and increased concentrations of zinc and copper.[226] Fertilizer use, erosion of contaminated soils, contaminated groundwater, and runoff from pesticides, are all known pollutants to surface waters in the Fraser River.[227]

Multiple studies conducted in the 1990s found that agricultural wastes from livestock and poultry effluent, as well as fertilizer use on crops, were causing elevated ammonia, oxygen depletion and eutrophication levels in streams that flow into the lower Fraser Valley.[228] These studies also found

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[225] Fraser River Access Plan, *supra* note 96 at 22.
[226] *Ibid* at 13.
[227] Cohen Commission, *supra* note 139 at 311.
[228] The Management of Agricultural Wastes in the Lower Fraser Valley Program Steering Committee, "MANAGEMENT OF AGRICULTURAL WASTES IN THE LOWER FRASER VALLEY SUMMARY REPORT - A WORKING DOCUMENT" (March 1997), online: <https://publications.gc.ca/collections/collection_2015/ec/En83-6-1996-30-eng.pdf>.

that groundwater adjacent to the Fraser River was contaminated with excessive nitrate levels.[229] The studies determined that the contamination was a result of excessive application of fertilizer for agriculture, and the use of imported feeds to maintain large quantities of livestock and poultry.[230]

The EMA *Code of Practice for Agricultural Environmental Management* ("the Agriculture Code") regulates agricultural activities in BC. Storage and application of nutrients, concentrations of livestock and poultry all have setback requirements from drinking water sources, other watercourses and property boundaries.[231] A director may increase a setback or impose one where not otherwise required if there is reason to believe contaminated runoff, leachate or solids may be entering a drinking water source or watercourse, or crossing a property boundary.[232] However, increased setbacks are not in place for lands adjacent to the Fraser River.

To ensure compliance against contamination from leachate or wastewater, the Director can request the conduct of assessments, tests, analysis or monitoring of for agricultural activities by a qualified professional with results provided as a report.[233] Testing soils, nitrates, and phosphorus[234] in accordance with a nutrient management plan is required if a nitrate test for a field is 100 kg N/ha or more, the field is in an agricultural operation with an agricultural land base of 5 hectares or more, and is located within a vulnerable aquifer recharge area identified in Schedule B.[235] Schedule B of the Code lists vulnerable aquifers in the Fraser Basin that include Abbotsford, Langley, Chilliwack in the Fraser Valley; Sicamous, Sunnybrae, Tappen in the Thompson; and Williams Lake in the Cariboo-Chilcotin regions.[236]

Agricultural practices along the Fraser River can potentially lead to contamination from pesticide use. Widespread application of pesticides on crops and lawns "results in non–point source pollution in the form of runoff, which can have lethal and sublethal effects on Fraser River sockeye."[237] In the Fraser Valley, where pesticides are applied heavily to crops adjacent to the River, aquatic ecosystems face potential adverse effects due to its proximity to agricultural operations.[238] Section 33.1 of the *Integrated Pest Management Act Regulation* ("IPM Regulation") referentially incorporates the meaning of "agricultural operations", "contaminated runoff",

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[229] *Ibid.*
[230] M Landos, "From Pristine to Polluted: How Chemicals and Pollutants Drive Fishery Declines and Ecosystem Collapse. Fraser (Stó:lō) River, British Columbia, Canada," International Pollutants Elimination Network (2024) at 45 [Landos].
[231] BC Reg 8/2019, s 17 [Agriculture Code].
[232] *Ibid,* s 19(1).
[233] *Ibid,* s 80(2)(d).
[234] *Ibid,* ss 53-55.
[235] *Ibid,* s 56
[236] *Ibid,* sched B, s 1.
[237] Cohen Commission, *supra* note 139 at 311.
[238] *Ibid*. See also *Integrated Pest Management Regulation*, BC Reg 604/2004, ss 5–6 [IPM Regulation]. See also Agriculture Code, *supra* note 232, s 1.

"groundwater", "property boundary", and "watercourse" from the EMA Agriculture Code.[239] These provisions establish corresponding codified practices and require detailed record keeping about pesticide use.[240]

Unless pesticide use is provided from a licensed service user,[241] neither the *Integrated Pest Management Act* ("IPMA")[242] nor the IPM Regulation expressly require agriculture operations on private land to obtain a licence as a pesticide "non-service" user.[243] According to the IPM Regulation, a landowner that "uses a pesticide only on goods brought to the land by the owner" – which arguably includes commercial ranchers and farmers – is exempt for requiring a licence.[244] Furthermore, aerial applications of pesticides on private land for agriculture do not require a permit (i.e., authorization to use a prescribed pesticide, class of pesticides, or pesticide for a prescribed use under Section 6 of the IPMA).[245]

Additional provision in the IPMA and IPM Regulation further indicate that pesticide use on residential properties and agricultural lands are less stringently regulated compared to "prescribed" applications.[246] Unless the application falls specifically into "a permit- or confirmation-requiring category," Section 6(1) of the IPM Regulation exempts the owner of private land – such as a residential property – from requiring a licence or certificate to use a pesticide from the list set out in Schedule 5 and classified as "DOMESTIC".[247] Similarly, a person having a "possessory interest in agricultural land" that includes a surface lease or other right of entry, such as a pipeline or oil or gas facility requiring pesticides to control vegetation on the right-of-way or facility under contract with the holder of the lease or other right of entry is also exempt from requiring a licence.[248] Finally, Schedule 6 lists "Essential Service Locations" that include the following relevant "agriculture and food" categories:

- Item 14 – places where land is used for agriculture;

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[239] They have the same meaning as in the Code of Practice for Agricultural Environmental Management. The provision similarly requires the use of best practices to prevent spray drift and any contaminated runoff from entering a watercourse or groundwater along with detailed record keeping. BC Reg 8/2019 of the EMA. IPM Regulation, *supra* note 239 at div 6.1, s 33.1.

[240] *Ibid,* ss 33.1(2–3).

[241] A "service" in relation to a pesticide means the use of the pesticide by a person or their employee or contractor under a service contract between the person and landowner or land manager where pesticide is to be used. *Ibid,* s 4.

[242] SBC 2003, c 58 [IPMA].

[243] Non-service means that you apply pesticides only to your own land or land that you manage. Government of BC, Ministry of Environment and Climate Change Strategy Pesticide Licence Application Form Reference Code: EPO-IPM-05.3; IPM Regulation*,* ss 44(1), 44(4).

[244] *Ibid,* s 6(1)(c).

[245] *Ibid*, s 18(4)(a).

[246] Prescribed uses require a pest management plan, a pesticide use notice, and confirmation of the receipt of that notice by an administrator. *Ibid,* s 7.

[247] IPM Regulation*,* s 6(1)(a.1).

[248] *Ibid,* s 6(1)(e).

- Item 16 – facilities for food production, processing, storage and transportation.[249]

Notably, Schedule 6 categories are not tied into any specific provisions or their associated restrictions or prescribed uses in the IPM Regulation. Provisions set out in the IPM Regulation indicate the Province requires comprehensive records on the types or amount of reported pesticides used in agriculture, whether licensed or otherwise.[250] According to ENV's Integrated Pest Management Program, pesticide use by the agricultural sector on private property does not require an authorization under the IPMR.[251]

With respect to licenses and permits used in agriculture or other sectors, individual permitting information on pesticide use may be publicly available; however, this preliminary review did not determine whether those permits directly correspond with non-point source effluent. The report did not conclude whether effluent permits exist and therefore cannot comment on the number of authorizations in place within the Fraser River watershed, whether for agriculture operations, pesticide use, or both.

5.3.2 CEMENT AND CONCRETE PLANTS

Cement and concrete plants also discharge effluent into the Fraser River. As of 2011, there were 17 cement and concrete plants operating in the Fraser River watershed, mostly on the lower Fraser River.[252] The water quality parameters of greatest concern from these plants included "pH, total suspended solids, sodium, potassium, chlorine, sulphates, oil and grease, and metals such as aluminum, arsenic, copper, chromium, lead and zinc."[253]

Lafarge owns several cement plants operating along the Fraser River, including a cement plant that operated in Richmond for 40 years prior to modernization in 1999.[254] The Authorization Management System provides permits for many of these cement and concrete plants to discharge effluent. According to one permit, Lafarge has a cement plant close to the Fraser River in Abbotsford BC that allows for 20,000 litres of waste to be discharged as effluent each day,[255] which is an indication of what comparable plants could be authorized to discharge.[256]

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[249] *Ibid,* sched 6.
[250] *Ibid*, s 31.1(3).
[251] Government of BC, Ministry of Environment and Climate Change Strategy Integrated Pest Management Program, personal communication (as an email, 17 October 2024 3:05 pm).
[252] Landos, *supra* note 231 at 32.
[253] *Ibid.*
[254] *Ibid.*
[255] *Transfer and Amendment of Permit PEO4589 for Effluent Discharges from a Ready-Mix Concrete Batch Plant at 31601 Walmsley Rd., Abbotsford BC* (2009), online: <https://j200.gov.bc.ca/pub/ams/download.aspx?PosseObjectId=40699674> at 4.
[256] AMS, *supra* note 224.

5.3.3 FISH PROCESSING AND CANNERIES

At the time of the *Cohen Commission* in 2011, at least 10 seafood processing facilities had permits to discharge effluent into the lower Fraser River. Contaminants of concern from these processing facilities included "temperature, pH, total suspended solids, residual chlorine, oil and grease, and nutrients such as nitrate, nitrite and ammonia."[257] However, research on the permitting of effluent from such processing facilities has not been fruitful.

In addition, for much of the 20th century, canneries operated along the lower Fraser River. As of 1954, only 20 fish canneries remained operating in British Columbia due to reductions in salmon supply and weakening demand for canned products.[258] In 1996 the last cannery closed, leaving many abandoned canneries, which continuously leach "legacy pollutants like discarded oil barrels, asbestos, steel, paint, plastic and creosote-soaked pilings into the Fraser River."[259]

5.3.4 SHIPPING AND BULK STORAGE

Shipping and bulk storage along the Fraser River also contribute large amounts of effluent, much of which is unregulated. There are currently 24 shipping and bulk storage facilities in the Fraser River watershed, mainly in the lower Fraser River. The number of shipping and bulk storage facilities has grown significantly since the start of the 21st century with container terminals located at "Vancouver Port (Centerm, Vanterm, Deltaport), Fraser River Port and North Fraser Port."[260] The North Fraser Port is particularly impactful as it is a major transportation link for logs moving along the BC coast and contributing to over $1 billion in GDP annually.[261] As a result of a considerable amount of freight volume travelling through the area, shipping and bulk storage can release contaminants such as petroleum hydrocarbons, antifoulants and metals into the Fraser River.[262] In addition, freight volumes moving to and from ports on roads and railways contribute additional run-off into the Fraser River.[263] Little information is available about the amount of effluent entering the Fraser River from these sources.

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[257] Landos, *supra* note 231 at 39.
[258] *Ibid* at 38.
[259] *Ibid.*
[260] *Ibid* at 39.
[261] *Ibid.*
[262] *Ibid.*
[263] *Ibid.*

5.3.5 GREYWATER

Lastly, the *Cohen Commission* has classified greywater as a non-point source contaminant of concern within the Fraser River.[264] Greywater includes wastewater "originating from showers, baths, bathroom sinks, kitchen sinks, pools, spas, and laundry."[265] While greywater enters the environment as permitted effluent from municipal wastewater systems, it also enters through non-point sources such as septic systems, and through discharge from vessels.[266]

Greywater often contains multiple contaminants which are harmful to ecosystems including, "nutrients, bacteria, viruses, and multiple chemicals, including endocrine disruptors associated with detergents and personal care products."[267] According to the Province, cumulative effects stemming from the discharge of greywater from multiple vessels along the Fraser "may result in the long-term disruption of nutrient levels and subsequent impacts on the aquatic ecosystem."[268]

The Federal Government does not regulate greywater under the *Canada Shipping Act* or *Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals*, as long as it does not contain a pollutant prescribed in those regulations.[269] Effectively this means that greywater is not considered to be garbage or sewage by the federal government.[270] At the provincial level, greywater discharges are regulated by ENV under the authority of the EMA. Section 13 of the EMA prohibits individuals from discharging greywater, as defined in "domestic sewage" or "waste from trailers, campers, transportable housing units, boats, or houseboats onto land or into any reservoir, lake, pond, stream, or other natural water body except in compliance with a permit, approval, order, waste management plan, or EMA regulation, or if disposal facilities are provided."[271] Little research has been conducted on the amount of either regulated or unregulated greywater effluent along the Fraser River.

5.4 CONCLUSION

Part 5 of this report has addressed a range of non-point sources of contamination within the Fraser River, including discharge from agriculture, cement and concrete plants, fish processing, shipping and bulk storage, and greywater. While the Province has provided copies of waste discharge permits related to some of these activities via their Authorization Management System,

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[264] Cohen Commission, *supra* note 139 at 312.
[265] *Ibid.*
[266] *Ibid.*
[267] *Ibid.*
[268] *Ibid.*
[269] *Ibid.*
[270] *Ibid.*
[271] EMA, s 13.

it seems there are few external studies on the total amount of effluent flowing from these sources. The *Cohen Commission* accepted evidence from both "Environment Canada and DFO witnesses who testified that there were gaps in non–point source contaminant research and monitoring with respect to Fraser River sockeye salmon."[272] These results reveal the extent of unregulated pollution infiltrating the River, underscoring the lack of coordinated jurisdictional efforts in addressing the cumulative impacts on ecosystems within the Fraser River.

[272] Cohen Commission, *supra* note 139 at 322.

6. CONCLUSION

Significant volumes of effluents are discharged into the Fraser River watershed from wastewater, stormwater and urban runoff, authorized mining effluent, pulp and paper effluent and non-point sources of effluent.

Local governments, in particular Metro Vancouver, discharge pollutants into the Fraser River through wastewater, stormwater, and urban runoff. There has been no systematic assessment of the impacts to the Fraser since 1992. Metro Vancouver currently appears to be the only large local government on the Fraser to have developed a liquid waste management plan, although all have wastewater treatment plants in operation.

Mining effluent discharge amounts to over 1.3 billion litres a day into the Fraser River watershed, excluding unspecified volumes released to the receiving environment under individual permits. Gibraltar and Mount Polley mines alone directly discharge an estimated combined amount of 60 to 83 million litres of effluent per day into waterbodies. Operating and closed mines are authorized to discharge nearly 1.2 billion litres per day into tailings impoundments. Up to 139 million litres – 11.6% of the total specified amount – is otherwise discharged to receiving environment daily, including creeks and rivers via seepage/drainage. Two new proposed mines, Cariboo Gold Mine and Blackwater Gold Mine, will contribute additionally to the cumulative impact from mining in the Fraser River watershed.

Pulp and paper effluent is the forest industry's dominate source of permitted effluent discharge into the Fraser River and is regulated both provincially and federally. The total combined permitted effluent from 10 discharge permits for controlled effluent discharge into the Fraser River or its tributaries is 846,062,000 litres per day. The industry is water intensive and requires regular withdrawal of licenced water that is directly tied to production. It also has relatively limited capacity to store effluent prior to treatment compared to vast tailings impoundments of mines. This makes it susceptible to cumulative impacts tied to seasonal water availability that is increasingly influenced by climate change. This has important implications, especially on the future state of Pacific salmon in the Fraser River and its tributaries.

Several permitted and non-permitted non-point sources of effluent are also polluting the Fraser. Agricultural waste has been found to have contaminated the Fraser through excessive nitrate levels, from fertilizer and imported feed, and pesticides being used on crops and lawns. Seventeen cement and concrete plants discharge effluent into the Fraser, with one Lafarge cement plant alone authorized to discharge 20 cubic meters (20,000 litres) of waste a day. Fish processing and canneries leech effluent into the river. Twenty-four shipping and bulk storage contribute large amounts of unregulated effluent, including petroleum hydrocarbons, antifoulants and metals. Greywater also enters the river through municipal wastewater systems, septic systems and discharge from vessels.

This initial assessment of the range and volume of permitted and non-permitted effluent being discharged into the Fraser River watershed provides insight into the extent of cumulative discharges and their concentration in certain areas, particularly in the lower Fraser River where salmon begin their journey up the River. This, combined with more extreme variability in seasonal flows linked to climate change, highlights the importance of implementing a coordinated monitoring and cumulative impacts assessment procedures to protect the health of the Fraser River and its ecosystems.

The Fraser River is integral to the dozens of Indigenous societies located throughout the watershed. The fish, particularly salmon, were key to the personal, economic and cultural health of those communities. A core commitment of the *Declaration on the Rights of Indigenous Peoples' Act* is to make provincial law consistent with the UNDRIP. This consistency, coupled with the mandate for cumulative effects assessment from the *Yahey* decision make it clear that a better understanding of impacts and amendments to anti-pollution laws are required. A starting point is a comprehensive monitoring and public data program for the Fraser River from which cumulative effects assessment and permit amendments can begin.