metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMITTEE

REGULAR MEETING

Friday, July 16, 2021
1:00 p.m.
28th Floor Boardroom, 4730 Kingsway, Burnaby, British Columbia

A G E N D A[1]

1. ADOPTION OF THE AGENDA

1.1 July 16, 2021 Regular Meeting Agenda
That the Climate Action Committee adopt the agenda for its regular meeting scheduled for July 16, 2021 as circulated.

2. ADOPTION OF THE MINUTES

2.1 June 11, 2021 Regular Meeting Minutes *pg. 4*
That the Climate Action Committee adopt the minutes of its regular meeting held June 11, 2021 as circulated.

3. DELEGATIONS

4. INVITED PRESENTATIONS

5. REPORTS FROM COMMITTEE OR STAFF

5.1 Metro Vancouver's Achievement of Carbon Neutrality in 2020 *pg. 11*
That the MVRD Board receive for information the report titled "Metro Vancouver's Achievement of Carbon Neutrality in 2020", dated June 22, 2021.

5.2 Modelling a Carbon Neutral Region: Project Report *pg. 32*
That the Climate Action Committee receive for information the report dated June 24, 2021, titled "Modelling a Carbon Neutral Region: Project Report".

5.3 Highlights from Engagement on Draft *Clean Air Plan* *pg. 36*
That the Climate Action Committee receive for information the report dated June 24, 2021, titled "Highlights from Engagement on Draft *Clean Air Plan*".

[1] *Note: Recommendation is shown under each item, where applicable.*

5.4 2021 Update on Regional District Sustainability Innovation Fund Projects

That the Climate Action Committee receive for information the report dated May 31, 2021, titled "2021 Update on Regional District Sustainability Innovation Fund Projects."

5.5 Proposed Updates to the Sustainability Innovation Fund Policies

That the MVRD Board approve the proposed updates to the Regional District Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

That the GVS&DD Board approve the proposed updates to the Liquid Waste Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

That the GVWD Board approve the proposed updates to the Water Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

5.6 Next Phase of Engagement on a Cannabis Production and Processing Emission Regulation

That the MVRD Board authorize staff to proceed with the next phase of engagement on the proposed approach to regulating air emissions from cannabis production and processing using the draft discussion paper attached to the report titled "Next Phase of Engagement on a Cannabis Production and Processing Emission Regulation", dated June 22, 2021.

5.7 Lower Fraser Valley Ambient Air Quality Monitoring Network Review 2021

That the Climate Action Committee receive for information the report dated June 22, 2021, titled "Lower Fraser Valley Ambient Air Quality Monitoring Network Review 2021".

5.8 Old Growth in the Metro Vancouver Region

That the Climate Action Committee receive for information the report dated June 29, 2021, titled "Old Growth in the Metro Vancouver Region".

5.9 Board Appointment of Enforcement Officers

That the MVRD Board:

a) pursuant to the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008* and the *Environmental Management Act*:
   i. appoint Metro Vancouver employees Eugene Lee and Rei Van as officers; and
b) pursuant to section 28 of the *Offence Act*:
   i. appoint Metro Vancouver employees Eugene Lee and Rei Van for the purpose of serving summons under section 28 of the *Offence Act* for alleged violations under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*.

5.10 Manager's Report

That the Climate Action Committee receive for information the report dated July 5, 2021, titled "Manager's Report".

6. INFORMATION ITEMS

6.1 Correspondence dated June 7, 2021 addressed to Sav Dhaliwal, Metro Vancouver Board, from Bruce Ralston, Minister of Energy, Mines and Low Carbon Innovation, Josie Osborne, Minister of Municipal Affairs and George Heyman, Minister of Environment and Climate Change Strategy re Help Cities Lead Campaign.

6.2 Report from Edward Nichol, Regional Planner, Regional Planning and Housing Services re Metro Vancouver Tree Regulations Toolkit dated May 14, 2021.

7. OTHER BUSINESS

8. BUSINESS ARISING FROM DELEGATIONS

9. RESOLUTION TO CLOSE MEETING

Note: The Committee must state by resolution the basis under section 90 of the Community Charter on which the meeting is being closed. If a member wishes to add an item, the basis must be included below.

10. ADJOURNMENT/CONCLUSION

That the Climate Action Committee adjourn/conclude its regular meeting of July 16, 2021.

Membership:

Carr, Adriane (C) - Vancouver
Dhaliwal, Sav (VC) - Burnaby
Arnason, Petrina - Langley Township
Baird, Ken - Tsawwassen First Nation
Dupont, Laura - Port Coquitlam
Hocking, David - Bowen Island
Kruger, Dylan - Delta
McCutcheon, Jen - Electoral Area A
McIlroy, Jessica - North Vancouver City
McLaughlin, Ron - Lions Bay
Patton, Allison - Surrey
Royer, Zoe - Port Moody
Steves, Harold - Richmond
Yousef, Ahmed - Maple Ridge

METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMITTEE

Minutes of the Regular Meeting of the Metro Vancouver Regional District (MVRD) Climate Action Committee held at 1:01 p.m. on Friday, June 11, 2021 in the 28th Floor Boardroom, 4730 Kingsway, Burnaby, British Columbia.

MEMBERS PRESENT:
Chair, Councillor Adriane Carr, Vancouver
Vice Chair, Councillor Sav Dhaliwal*, Burnaby (arrived at 1:03 p.m.)
Councillor Petrina Arnason*, Langley Township
Chief Ken Baird*, Tsawwassen
Councillor David Hocking*, Bowen Island
Councillor Dylan Kruger*, Delta (arrived at 1:03 p.m.)
Director Jen McCutcheon*, Electoral Area A
Councillor Jessica McIlroy*, North Vancouver City
Mayor Ron McLaughlin*, Lions Bay
Councillor Allison Patton*, Surrey
Councillor Zoe Royer*, Port Moody (arrived at 1:03 p.m. and departed at 3:38 p.m.)
Councillor Harold Steves*, Richmond
Councillor Ahmed Yousef*, Maple Ridge

MEMBERS ABSENT:
Councillor Laura Dupont, Port Coquitlam

STAFF PRESENT:
Roger Quan, Director, Air Quality and Climate Change, Parks and Environment
Jerry W. Dobrovolny, Chief Administrative Officer
Amelia White, Legislative Services Coordinator, Board and Information Services

1. ADOPTION OF THE AGENDA

1.1 June 11, 2021 Regular Meeting Agenda

It was MOVED and SECONDED
That the Climate Action Committee:
a) amend the agenda for its regular meeting scheduled for June 11, 2021 by adding Old Growth Logging at Fairy Creek under Item 7 – Other Business; and
b) adopt the agenda as amended.

CARRIED

*denotes electronic meeting participation as authorized by Section 3.6.2 of the *Procedure Bylaw*

2. ADOPTION OF THE MINUTES

2.1 April 16, 2021 Regular Meeting Minutes

It was MOVED and SECONDED
That the Climate Action Committee adopt the minutes of its regular meeting held April 16, 2021 as circulated.

CARRIED

1:03 p.m. Vice Chair Dhaliwal, Councillor Kruger and Councillor Royer arrived at the meeting.

3. DELEGATIONS

No items presented.

4. INVITED PRESENTATIONS

No items presented.

5. REPORTS FROM COMMITTEE OR STAFF

5.1 Cancellation of Provincial Climate Action Revenue Incentive Program (CARIP)

Report dated May 27, 2021, from Conor Reynolds, Division Manager, Air Quality and Climate Change Policy and Jason Emmert, Program Manager, Climate Policy, Parks and Environment Department, seeking the Climate Action Committee's feedback and direction on the specifics of a replacement program that provides funding for local government climate action programs.

Members were provided a presentation on the cancellation of CARIP, the impact to Metro Vancouver's climate action plans and the recommendations for a replacement program.

Discussion ensued regarding potential replacement options, reporting requirements, the province wide approach to data collection, and the need for on-going funding.

Presentation material titled "Climate Action Revenue Incentive Program (CARIP): Replacement Program Needed to Support Local Government Climate Action" is retained with the June 11, 2021 Climate Action Committee agenda.

It was MOVED and SECONDED

That the MVRD Board authorize the Board Chair to write a letter to the Provincial Minister of Municipal Affairs, Minister of Environment and Climate Change Strategy, and Minister of Finance, regarding the cancellation of the Climate Action Revenue Incentive Program, providing details on key elements to be retained in a replacement program and suggested improvements, based on the analysis in the report dated May 27, 2021, titled "Cancellation of Provincial Climate Action Revenue Incentive Program (CARIP)".

CARRIED

5.2 Next Phase of Engagement on an Open-Air Burning Emission Regulation

Report dated May 18, 2021, from Amy Thai, Senior Policy Analyst, and Julie Saxton, Air Quality Planner, Parks and Environment Department, summarizing the engagement to date on a potential emission regulation for open-air burning of vegetative debris in Metro Vancouver and seeking MVRD Board approval to carry out the next phase of engagement.

Members were provided a presentation on the bylaw development consultation including the scope of proposals for emission regulation, and the proposed regulation and authorization process.

Presentation material titled "Proposals to Manage Emissions from Open-Air Burning: Bylaw Development Consultation" is retained with the June 11, 2021 Climate Action Committee agenda.

It was MOVED and SECONDED

That the MVRD Board:

a) receive for information a summary of the initial engagement on a potential emission regulation for open-air burning of vegetative debris in Metro Vancouver, as described in the report titled "Next Phase of Engagement on an Open-Air Burning Emission Regulation", dated May 18, 2021; and

b) authorize staff to proceed with additional engagement on a potential emission regulation for open-air burning of vegetative debris in Metro Vancouver, based on the draft discussion paper and updated engagement plan presented in the report titled "Next Phase of Engagement on an Open-Air Burning Emission Regulation", dated May 18, 2021.

CARRIED

5.3 Alternatives to Agricultural Open-Air Burning in Metro Vancouver

Report dated May 17, 2021, from Amy Thai, Senior Policy Analyst and Julie Saxton, Air Quality Planner, Parks and Environment Department, providing information about the results of a Sustainability Innovation Fund study of alternative practices for managing agricultural vegetative debris, in order to identify opportunities to avoid open-air burning in the Metro Vancouver region.

It was MOVED and SECONDED
That the Climate Action Committee receive for information the report titled "Alternatives to Agricultural Open-Air Burning in Metro Vancouver", dated May 17, 2021.

CARRIED

5.4 2021 Update on Liquid Waste Sustainability Innovation Fund Projects
Report dated May 19, 2021, from Paul Kadota, Program Manager, Utility Research and Innovation, Policy, Planning and Analysis, Liquid Waste Services, providing an update on projects funded under the Liquid Waste Sustainability Innovation Fund.

Members were provided a presentation on the status of Liquid Waste Sustainability Innovation Fund Projects.

Presentation material titled "2021 Update on Sustainability Innovation Fund Projects: Liquid Waste Services" is retained with the June 11, 2021 Liquid Waste Committee agenda. Members were provided a video presentation on a Metro Moment, which is not retained with the agenda.

It was MOVED and SECONDED
That the Climate Action Committee receive for information the report dated May 19, 2021, titled "2021 Update on Liquid Waste Sustainability Innovation Fund Projects."

CARRIED

5.5 Air Quality and Climate Action Initiatives in *Caring for the Air* 2021
Report dated May 10, 2021, from Amy Thai, Senior Policy Analyst, Parks and Environment Department, presenting the 2021 edition of the annual *Caring for the Air* publication and providing information about outreach conducted for the 2020 edition to raise awareness about climate change and air quality initiatives in the Lower Fraser Valley airshed.

Members were provided a video presentation on *Caring for the Air* 2021, which is not retained with the agenda.

It was MOVED and SECONDED
That the MVRD Board receive for information the report dated May 10, 2021, titled "Air Quality and Climate Action Initiatives in *Caring for the Air* 2021".

CARRIED

5.6 Sectoral GHG Reduction Targets Update and Comparison
Report dated May 25, 2021, from Morgan Braglewicz, Senior Policy and Planning Analyst, Parks and Environment Department, providing an update on recent changes to provincial and federal climate targets, and a comparison to Metro Vancouver's proposed regional targets.

It was MOVED and SECONDED

That the Climate Action Committee receive for information the report dated May 25, 2021, titled "Sectoral GHG Reduction Targets Update and Comparison".

CARRIED

5.7 Manager's Report

Report dated May 25, 2021, from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment Department, updating the Climate Action Committee on the Climate Action Committee 2021 Work Plan, the BC Building Electrification Road Map, the *Clean Air Plan*, *Climate 2050*, the Proposed Amendments to Air Quality Permit and Regulatory Fees, the Residential Indoor Wood Burning Bylaw and the Metro Vancouver appointee to the Zero Emissions Innovation Centre.

It was MOVED and SECONDED

That the Climate Action Committee receive for information the report dated May 25, 2021, titled "Manager's Report".

CARRIED

6. INFORMATION ITEMS

6.1 Correspondence dated June 1, 2021, from the Mayor's Office, Corporation of the District of Saanich, to BC Elected Officials and BC Chief Administrative Officers regarding British Columbia Climate Action Revenue Incentive Program Ending

6.2 Report from Gregory Freeman, Senior Economist and Megan Gerryts, Senior Advisor, Regional Economic Prosperity Service re Clean Transportation Sector Profile dated May 7, 2021

7. OTHER BUSINESS

7.1 Old Growth Logging at Fairy Creek

The Committee discussed logging activity at Fairy Creek on Vancouver Island, and the resolution that was passed at the March 23, 2021 City of Port Moody Regular Council meeting, advocating for the protection of old growth forests.

Main Motion

It was moved and seconded

That the Climate Action Committee direct staff to analyze and review the logging activity in old growth forests in British Columbia, specifically at Fairy Creek, and report back to the Climate Action Committee with options to oppose the logging activity.

Discussion ensued as to whether or not the above recommendation was within the scope of the Climate Action Committee.

Amendment to the Main Motion
It was moved and seconded
That the Climate Action Committee amend the Main Motion, by striking the phrase "specifically at Fairy Creek" following the "old growth forests in British Columbia".

CARRIED
Councillor Steves voted in the negative.

3:38 p.m. Councillor Royer departed the meeting.

Question on the Main Motion as Amended
Question was then called on the Main Motion as amended and it was

CARRIED
Mayor McLaughlin and Councillor Yousef voted in the negative.

The Main Motion as amended now reads as follows:
That the Climate Action Committee direct staff to analyze and review the logging activity in old growth forests in British Columbia, and report back to the Climate Action Committee with options to oppose the logging activity.

Request of Staff
Staff were requested to identify how much land in the Metro Vancouver region is occupied by old growth forests and report back with the findings to the Climate Action Committee.

8. BUSINESS ARISING FROM DELEGATIONS
No items presented.

9. RESOLUTION TO CLOSE MEETING

It was MOVED and SECONDED
That the Climate Action Committee close its regular meeting scheduled for June 11, 2021 pursuant to the *Community Charter* provisions, Section 90 (1) (k) as follows:

"90 (1) A part of the meeting may be closed to the public if the subject matter being considered relates to or is one or more of the following:

(k) negotiations and related discussions respecting the proposed provision of a regional district service that are at their preliminary stages and that, in the view of the board or committee, could reasonably be expected to harm the interests of the regional district if they were held in public."

CARRIED

10. ADJOURNMENT/CONCLUSION

It was MOVED and SECONDED
That the Climate Action Committee adjourn its regular meeting of June 11, 2021.

CARRIED
(Time: 3:52 p.m.)

_____ _____

Amelia White,
Legislative Services Coordinator

Adriane Carr, Chair

46042821 FINAL

To: Climate Action Committee

From: Nav Hundle, Policy Analyst, Parks and Environment Department

Date: June 22, 2021 Meeting Date: July 16, 2021

Subject: **Metro Vancouver's Achievement of Carbon Neutrality in 2020**

RECOMMENDATION

That the MVRD Board receive for information the report titled "Metro Vancouver's Achievement of Carbon Neutrality in 2020", dated June 22, 2021.

EXECUTIVE SUMMARY

As a signatory to the BC Climate Action Charter, Metro Vancouver has been reporting its climate actions and carbon neutrality status for the past ten years since the beginning of the Climate Action Revenue Incentive Program (CARIP). In May 2021, the Province announced the cancellation of CARIP with the 2020 reporting requirements marking the last year of the program. Although CARIP reporting is not a requirement for 2020, Metro Vancouver has completed a report on a voluntary basis. Metro Vancouver has achieved corporate carbon neutrality for 2020, which is the second year in a row, building on its carbon neutral status in 2019. Carbon neutrality is assessed in accordance with the Charter and the associated Provincial Carbon Neutral Local Government Framework. The report highlights Metro Vancouver's actions to adapt to the changing climate as well as to reduce greenhouse gas (GHG) emissions, and quantifies Metro Vancouver's net corporate carbon footprint. This report demonstrates leadership on climate action and a call for additional action that is needed to extend carbon neutrality from the corporation to the region as a whole by 2050, as set out in the *Climate 2050 Roadmaps*.

PURPOSE

To inform the Climate Action Committee of Metro Vancouver's achievement of carbon neutrality as an organization in 2020, as well as implications for meeting the goal of a carbon neutral region by 2050.

BACKGROUND

As a signatory to the B.C. Climate Action Charter and participant in the Climate Action Revenue Incentive Program (CARIP) since its launch, Metro Vancouver prepares an annual climate action report to the Province. The Province announced the end of the CARIP program in May 2021 (Reference 1), and confirmed that the only reporting requirement for participating local governments for the 2020 reporting year is the carbon tax rebate form, which is due on August 6, 2021. However, Metro Vancouver has prepared its annual climate action report for the 2020 reporting year on a voluntary basis using the Carbon Neutral Local Government Framework to ensure a continuation of annual public reporting.

The Climate Action Committee 2021 Work Plan identifies reporting on Metro Vancouver's climate action and carbon neutral progress as a priority for 2021.

METRO VANCOUVER'S ACHIEVEMENT OF CARBON NEUTRALITY

In 2020, Metro Vancouver achieved carbon neutrality for the third time since beginning carbon neutral reporting (prior carbon neutral years were 2015 and 2019), and the 2020 reporting year marks the second consecutive year that carbon neutrality has been achieved. Metro Vancouver seeks to:

1) take action to reduce the GHG emissions from its buildings, vehicles, and other sources to the extent possible; and
2) balance the remaining emissions, which for 2020 was 15,437 tonnes of carbon dioxide equivalents (tCO_2e), with carbon credits from projects that reduce or avoid GHG emissions.

Corporate Climate Leadership

Metro Vancouver's corporate carbon neutrality is an important performance indicator as it demonstrates leadership on climate action and serves as a 'call to action' for other organizations, businesses and residents to work towards making the entire region carbon neutral by 2050. However, an expansion and acceleration of climate action is needed for Metro Vancouver to maintain its corporate carbon neutral status, and to reduce region-wide emissions to achieve this target. These actions will be the focus of the *Climate 2050 Roadmaps*, as well as the *Clean Air Plan* currently under development. While these planning processes are underway, Metro Vancouver continues to develop and implement critical and time-sensitive actions to reduce corporate and regional emissions.

Metro Vancouver has quantified its corporate GHG emissions for 2020 using the methodology provided under the Provincial Carbon Neutral Local Government Framework. Reportable emissions include those from "traditional services", such as drinking water and wastewater operations, but excludes emissions from services or facilities that are not typically operated or maintained by most local governments, such as landfills, the waste to energy facility, or buildings used for housing. These additional emissions, while outside of the scope of the provincial framework, are tracked by Metro Vancouver and are reported separately (Reference 2).

Metro Vancouver's net corporate carbon footprint consists of core emissions from direct fuel use and emissions from contracted services, balanced by projects that reduce or avoid GHG emissions. In 2020, Metro Vancouver's core emissions had decreased when compared to 2019 emissions (6,661 tCO_2e in 2019 and 5,366 tCO_2e in 2020), with some of the emission reductions likely a result of the COVID-19 pandemic and changes to corporate operations, such as decreased fleet and building use. Emissions from contracted services remained relatively unchanged with a total of 9,984 tCO_2e in 2019 compared to 10,071 tCO2e in 2020.

Carbon Neutrality in 2020

Metro Vancouver achieved carbon neutrality in 2020 because its total reportable emissions of 15,437 tCO_2e were entirely balanced by carbon credits from projects that helped to avoid the release of GHGs or reduce carbon in the atmosphere via sequestration. These projects were led by teams from across the organization and include avoided forest conversion projects, the ecological restoration of Burns Bog (a joint effort with the City of Delta), and the Coquitlam Landfill Gas Capture project. A significant amount of carbon credits that were claimed in the 2020 reporting year were due to the Burns Bog restoration project, which had excess credits in 2019 that were available to carry forward to the 2020 climate action reporting year.

A variety of GHG reduction and credit projects have contributed to carbon neutrality, and it will be necessary to maintain a varied portfolio of carbon neutral projects. Metro Vancouver faces the dual challenge of providing services to a growing population, and increased energy consumption associated with increased levels of service and utility treatment. However, Metro Vancouver is in a unique position to develop a varied portfolio of carbon credit projects, due to park land acquisition, protection of green space, and ongoing development of low-carbon energy generation from liquid waste and solid waste management.

Corporate policy development will continue to play an important role in supporting Metro Vancouver's corporate emissions reductions, such as the *Corporate Carbon Price Policy* and the *Fleet Planning and Acquisition Policy.*

Metro Vancouver's Climate Reporting

The *Metro Vancouver Climate Actions 2020* report is provided as Attachment 1. This report includes a high-level summary of climate actions, and highlights a few key projects, including:

- Net Zero Welcher Avenue Redevelopment (Housing project),
- Park Land Acquisitions (Kanaka Regional Park & Crippen Regional Park),
- Carbon Neutral Protective Coating for Sewers,
- Alternative Fuel and Recyclables Recovery Project,
- Regional Greenways 2050 Plan,
- Regional Growth Strategy: Applying a Climate Lens for the Metro 2050 Policy Review,
- Planning for our Future Water Supply in Metro Vancouver,
- We Love Water Campaign, and
- Liquid Waste Services – Environmental Risk Analysis and Prioritization.

The report was prepared using the 2019 CARIP survey format, and aligns with the provincial Carbon Neutral Framework. Moving forward with reporting for future years, staff will evaluate the format and scope of the annual reporting of corporate GHG emissions, with consideration of emissions from sources that are out of scope for CARIP but in line with global best practices, which include data that to date has been separately reported in Metro Vancouver's Annual Corporate Energy and GHG Emissions Management Report: 2014 to 2018 (Reference 2). As reported to the Committee at its June meeting, staff will be communicating with the Province regarding a potential replacement program for CARIP, and any requirements for reporting that it might include. In addition, a key component of the Climate 2050 Strategic Framework is an annual report on the development and implementation of the *Climate 2050 Roadmaps*, that tracks progress towards established climate targets, and provides updates on climate action projects.

Local Carbon Registry for Local Governments

In order to ensure transparency of tracking and reporting of local government GHG reduction projects, Metro Vancouver has also registered its past and current carbon credit projects with a public registry of local government carbon credits (Reference 3). The Local Carbon Registry is an integrated platform service that can be utilized by local governments to set up their GHG inventory, and register their carbon offset projects and emission reduction progress. The platform allows local governments to share lessons learned, and disclose achievements and progress for GHG reductions in a transparent

manner. The unique nature of the online platform is the accommodation of carbon credit projects established under the Provincial Local Government Carbon Neutral Framework. The Local Carbon Registry has been established in an effort to increase transparency on Metro Vancouver's corporate climate action and GHG emission reduction and sequestration projects.

ALTERNATIVES
This is an information report. No alternatives are presented.

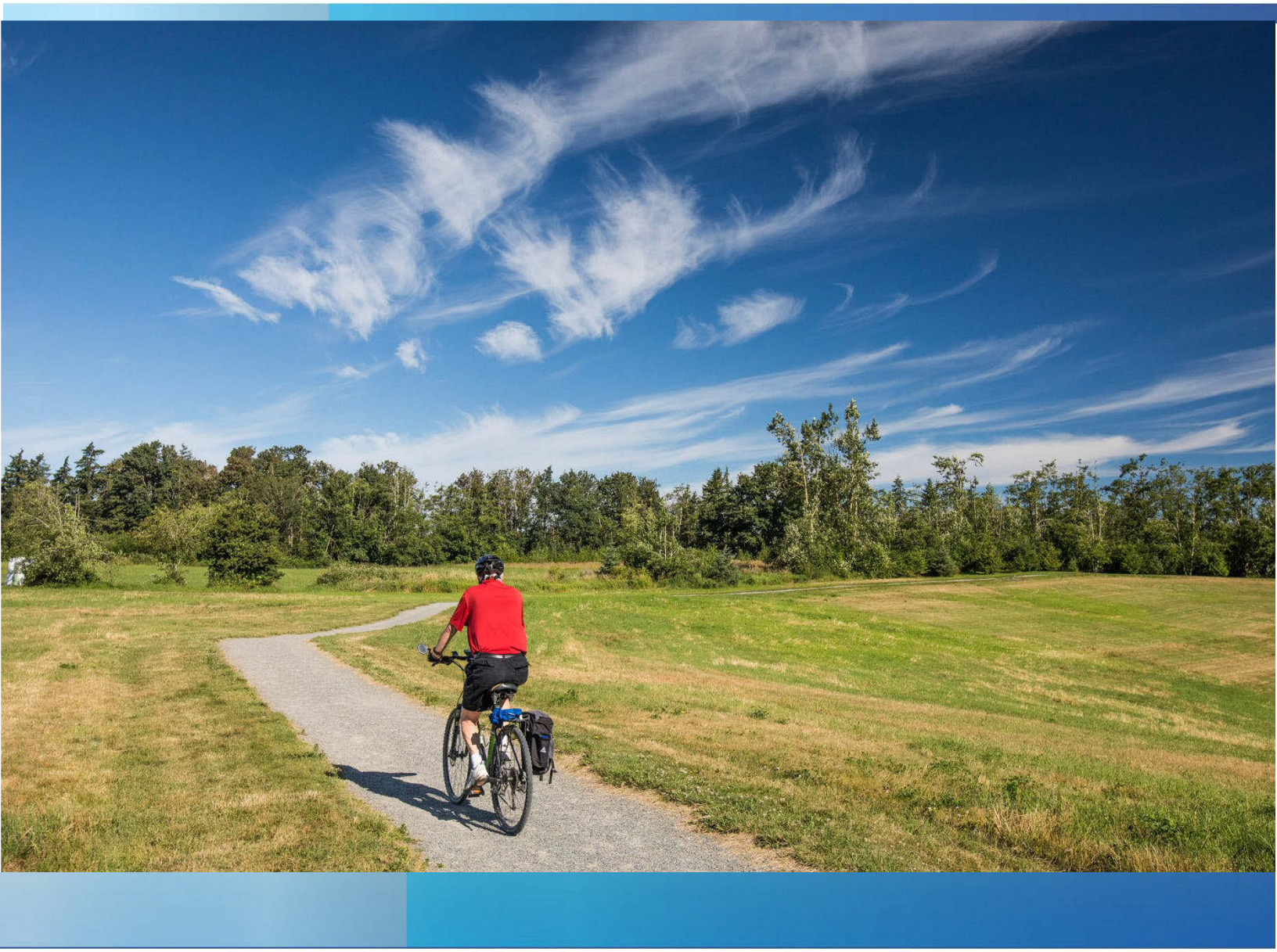
FINANCIAL IMPLICATIONS
The provincial government has announced that 2021 will be the final year of the CARIP program, and as such it is the last year that Metro Vancouver and its member jurisdictions are eligible for a rebate of all carbon taxes paid directly in the prior year. The annual carbon tax rebate received by Metro Vancouver has been used to directly support Metro Vancouver's corporate and regional climate action projects and programs. The cancellation of CARIP has a significant impact on subsequent year budgets for climate action programming at Metro Vancouver, and staff are working with provincial government staff on a replacement program in hopes of avoiding a funding gap in 2022.

CONCLUSION
Metro Vancouver achieved corporate carbon neutrality in 2020 through reduction of its GHG emissions and by balancing the remainder with carbon credit projects that reduce or avoid GHG emissions. Corporate carbon neutrality is an important indicator of climate action performance and serves as a call to action towards a carbon neutral region by 2050. Metro Vancouver will continue to demonstrate climate leadership by accelerating actions to meet its emissions targets, noting that a sufficiently funded local government climate action program will be critical to achieve both the Provincial and local government climate action targets and plans. Metro Vancouver will continue to track and report corporate energy and emissions annually, as well as carbon credits projects and corporate carbon neutral status. Progress on regional emissions and climate actions will be tracked, and reported through *Climate 2050* annual reporting, intended to begin in 2021.

Attachments
1. "Metro Vancouver Climate Actions 2020: Climate Action Public Report" *(45991203)*

References
1. Climate Action Committee Report, "Cancellation of Provincial Climate Action Revenue Incentive Program (CARIP)", dated May 27, 2021 *(*45693543*)*
2. Climate Action Committee Report, "Managing Metro Vancouver's Corporate Energy and Greenhouse Gas Emissions (2014 to 2018)", dated August 14, 2020 (39720037)
3. local carbon registry

46212896



Metro Vancouver Climate Actions 2020

Climate Action Public Report

June 30, 2021

General Information

Regional District: Metro Vancouver (Metro Vancouver Regional District)
Population: **2,749,059** (2020)
Regional Growth Strategy: "Metro Vancouver 2040 – Shaping our Future" (adopted July 2011)

Report Preparation and Contact Information

As a signatory to the BC Climate Action Charter, and in accordance with requirements of the Climate Action Revenue Incentive Program (CARIP), Metro Vancouver has completed annual climate action reports since 2011. Although a public report is not a requirement for Provincial reporting in 2020, Metro Vancouver has voluntarily published its annual corporate greenhouse gas emissions and its corporate and regional climate actions for 2020. This public report is available to stakeholders and residents to promote awareness of the range of climate actions Metro Vancouver is undertaking.

Recognizing the magnitude of the climate challenge, the urgency for action, and the evolving science and data, Metro Vancouver has developed *Climate 2050*, Metro Vancouver's regional climate action strategy. *Climate 2050* applies a "climate lens" to Metro Vancouver's policies and initiatives both corporately and throughout the region. The Metro Vancouver Board has adopted the *Climate 2050 Strategic Framework*, the first component of *Climate 2050.* The *Climate 2050 Strategic Framework* sets out the vision and guiding principles for the strategy, and identifies ten issue areas that will each require its own implementation approach. In 2019, the Metro Vancouver Board adopted new greenhouse gas reduction targets as part of a revised *Strategic Framework*, which committed Metro Vancouver to becoming a carbon neutral region by 2050 and an interim target of 45% reduction from 2010 levels by 2030.

Over 2019-2022, Metro Vancouver is developing a series of *Climate 2050 Roadmaps* which will describe the goals, strategies, and actions within each issue area that are necessary to transition the region to a carbon neutral, resilient future while improving the health, well-being, and prosperity of Metro Vancouver residents. Since 2019, eight discussion papers have been developed for *Climate 2050* Issue Areas (i.e., Buildings, Industry, Transportation, Nature & Ecosystems, Waste, Agriculture, Energy, and Water & Wastewater Infrastructure). To date, there are currently two draft *Climate 2050 Roadmaps* published and undergoing engagement for the key issue areas of Transportation and Buildings. The first iterations of both of these *Roadmaps* are intended to be published by the end of 2021. With progress on the *Roadmaps* underway, Metro Vancouver continues to undertake a range of climate actions. In addition, *Climate 2050* is also intended to include an annual report on progress, and will also serve as a key reporting mechanism to track progress towards the *Climate 2050* vision and goals.

In parallel to the implementation of *Climate 2050*, Metro Vancouver is developing its fourth regional air quality and greenhouse gas management plan, the *Clean Air Plan*. The Plan will set Metro Vancouver's direction for air quality and GHG management for the next ten years, and support achieving the interim regional greenhouse gas reduction target for 2030. The draft *Clean Air Plan* was published online in April 2021 and is undergoing engagement, with the final *Clean Air Plan* to be presented to the Metro Vancouver Board for endorsement later in 2021.

This report was prepared by the staff of the Air Quality and Climate Change Division of Metro Vancouver, with input from across the organization. Questions on the report should be directed to AQInfo@metrovancouver.org or the Metro Vancouver Information Centre at 604-432-6200.

Reported by:
Roger Quan
Director, Air Quality and Climate Change
Parks and Environment Department

Contact us:
Metro Vancouver
4730 Kingsway, Burnaby, BC V5H 0C6
604-432-6200
www.metrovancouver.org

Table of Contents

2020 Corporate Climate Action

The section provides an overview of Metro Vancouver's corporate climate actions, following the CARIP qualitative survey format. Actions are summarized in broad categories for each of the areas listed below. Three key actions demonstrating Metro Vancouver's corporate climate action are highlighted in more detail in this section.

In 2020, Metro Vancouver undertook actions in the following areas:

☑ Building and Lighting Actions
☑ Energy Generation Actions
☑ Greenspace Actions
☑ Planning Actions
☑ Solid Waste Actions
☑ Transportation Actions
☑ Water and Wastewater Actions
☑ Other Climate Actions: Battery operated parks equipment for operations and maintenance.

The following sections outline the actions taken by Metro Vancouver in more detail.

Building and Lighting

In 2020, Metro Vancouver undertook actions in the following categories:

☑ New or upgraded energy-efficient lighting systems
☑ New or upgraded energy-efficient heating systems
☑ New or upgraded building envelope initiatives
☑Upgrades to amenities in recreation facilities
☑ Studies related to building and/or lighting energy efficiency
☑ Other: Net Zero Energy Study for Housing Development

Energy Generation

In 2020, Metro Vancouver undertook actions in the following categories:

☐ Solar power projects
☑ Heat recovery or heat reclamation projects
☑ Biomass or bio-gas projects
☐ Geo-exchange or geothermal projects
☑ Studies related to energy generation

Greenspace

In 2020, Metro Vancouver undertook actions in the following categories:

☑ Tree planting
☑ Greenspace acquisition

☑ New or upgraded amenities in parks
☑ Invasive species management
☑ Plans or strategies related to greenspace

Planning

In 2020, Metro Vancouver undertook actions in the following categories:

☑ Energy/Emissions Management Plan (New or Updated)
☑ Asset Management Plan (New or Updated)
☐ Corporate Climate Action Plan (New or Updated)
☑ Strategic Plan (New or Updated)
☑ Other: Planning underway for renewable natural gas fueling infrastructure for fleet, and procurement of EV charging stations.

Solid Waste

In 2020, Metro Vancouver undertook actions in the following categories:

☑ Introduction, expansion or improvement of recycling initiatives at corporate facilities
☐ Introduction, expansion or improvement of composting initiatives at corporate facilities
☐ Communication or education for staff related to corporate solid waste initiatives
☑ Studies or research related to corporate solid waste initiatives
☑ Plans or strategies related to corporate solid waste initiatives
☑ Other: Calculation of GHG reduction credits associated with organics diversion activities by Metro Vancouver's member municipalities.

Transportation

In 2020, Metro Vancouver undertook actions in the following categories:

☑ Fleet replacement or upgrades
☑ New or improved electric vehicle initiatives
☐ New or improved active transportation infrastructure for staff
☑Communication or outreach for staff related to corporate transportation initiatives
☐ New or improved public transportation initiatives for staff

Water and Wastewater

In 2019, Metro Vancouver undertook actions in the following categories:

☑ New or improved water or wastewater infrastructure
☑ Studies or research related to water conservation
☑ Plans or strategies related to water or wastewater
☑ Water reduction initiative(s)
☑ Plans or strategies related to water or wastewater

Corporate Climate Action Highlights

This section highlights three of Metro Vancouver's key actions that demonstrate leadership and innovative approaches to reduce corporate greenhouse gas emissions.

Welcher Avenue Redevelopment Net Zero Study

In 2020, Metro Vancouver Housing Corporation (MVHC) submitted a development application to the City of Port Coquitlam for a Welcher Avenue redevelopment project. The proposed five-story building will include 63 homes, with a sustainable and energy-efficient design. The rental housing project has been designed to meet the BC Energy Step Code 4 ('Net Zero ready'), with the development designed to consider both affordability and climate action. To date, a net zero feasibility has been completed for the project and the building will be designed to accept an on-site renewable energy generation system (photovoltaic) that will further reduce net energy consumption.

This design standard will reduce greenhouse gas emissions and energy consumption to help meet MVHC's 10-Year Plan targets as well as Metro Vancouver's regional climate targets in Climate 2050.

Park Land Acquisitions

In 2020, Metro Vancouver completed the purchase of a parcel totaling 2.3 hectares at the Kanaka Creek Regional Park in the City of Maple Ridge. The new addition to the park is located on the north arm of Kanaka Creek and near the Bell Irving Fish Hatchery. The property includes largely treed creek ravine.

An additional land acquisition was completed in 2020 at the Crippen Regional Park in Bowen Island, which expanded the park by 1.21 hectares (3 acres), following Metro Vancouver's purchase of a prominent waterfront landmark near Snug Cove. The landmark, known as Dorman Point, consists of a rocky bluff landscape that is rare in the regional parks system. It features a small pebble beach and outcrops covered with mosses, ferns and wildflowers, interspersed with wind-shaped Douglas fir, Shore pine and Arbutus trees.

Through the conservation efforts of Park Land Acquisitions, the protected greenspaces help to store carbon and advance climate action goals at Metro Vancouver.

Carbon Neutral Protective Coating for Sewers

In collaboration with the University of British Columbia (UBC), Ocean Pipe and Metro Testing & Engineering, Metro Vancouver is field testing and validating the performance of a new protective coating material developed at UBC and referred to as Multiphase Composite Coating (MCC) for use in concrete sewer pipes. MCC is an example of circular economy and innovation, since the product is a carbon neutral coating that is formulated using industrial waste.

The MCC formula has the potential to protect both new and existing concrete sewer pipes from corrosion and in turn result in significant reductions in repair and replacement costs for Metro Vancouver sewer networks. The product is currently being piloted in a sewer chamber located in Delta, and is a great example of innovation to push forward our region's climate action goals.

2020 Community-Wide Climate Actions

This section provides an overview of Metro Vancouver's community-wide climate actions, following the qualitative CARIP survey format. Actions are summarized in broad categories for each of the areas listed below. Three key actions demonstrating Metro Vancouver's community climate actions are highlighted in more detail in this section.

In 2020, Metro Vancouver undertook actions in the following areas:

☑ Building and Lighting Actions
☑ Energy Generation Actions
☑ Greenspace Actions
☑ Planning Actions
☑ Solid Waste Actions
☑ Transportation Actions
☑ Water and Wastewater Actions
☑ Other Climate Actions: Caring for the Air report; Undertook modeling work for a Carbon Neutral Scenario, and development of the *Clean Air Plan* (air quality and greenhouse gas management Plan)

Building and Lighting

In 2020, Metro Vancouver undertook actions in the following categories:

☐ New or upgraded energy-efficient lighting systems
☐ New or upgraded energy-efficient heating systems
☑ BC Energy Step Code related projects
☐ Incentives/rebate programs related to energy-efficient building or lighting
☐ Outreach, education or communication related to energy-efficient building or lighting
☑ Other: Development of the draft *Climate 2050* Buildings Roadmap.

Energy Generation

In 2020, Metro Vancouver undertook actions in the following categories:

☐ Solar Power Projects
☑ Heat recovery or heat reclamation projects
☑ Landfill gas capture/utilization projects
☐ Micro-hydro projects
☑ Studies or research related to energy generation

Greenspace

In 2020, Metro Vancouver undertook actions in the following categories:

☑ Tree planting
☑ Greenspace restoration or maintenance
☑ Greenspace acquisition

☑ Invasive species management
☑ Plans or strategies related to greenspace
☑ Other: Research and monitoring of species and ecosystems in Metro Vancouver Parks such trials of habitat protection methods, water and soil testing, and Greenhouse gas flux measurements in peatlands undergoing restoration.

Planning

In 2020, Metro Vancouver undertook actions in the following categories:

☐ Official Community Plan (New or Updated)
☑ Climate Action Plan (New or Updated)
☑ Regional Growth Strategy (New or Updated)
☐ New or updated bylaw(s) or zoning addressing climate issues

Solid Waste

In 2020, Metro Vancouver undertook actions in the following categories:

☑ Introduction, expansion or improvement of recycling initiatives
☐ Introduction, expansion or improvement of composting initiatives
☑ Community clean-up initiatives
☑ General waste reduction initiative (including landfill diversion strategies)
☑ Outreach, education or communication related to solid waste
☑ Other: Solid Waste reports and studies such as calculation of GHG reduction credits associated with organics diversion activities by Metro Vancouver's member municipalities; and Alternative Waste Management Practices for Agricultural Vegetative Debris study.

Transportation

In 2020, Metro Vancouver undertook actions in the following categories:

☐ New or improved active transportation infrastructure
☑ New or improved public transportation initiatives (i.e. weekend shuttle bus for Park users)
☑ New or improved electric vehicle initiatives
☑ Outreach, education or communication related to transportation
☑ Plans or strategies related to transportation
☑ Other: Completion of an Access Inventory as a part of Alternative Transportation Study to identify the availability of cycling and transit infrastructure for visiting Regional Parks without a personal car.

Water and Wastewater

In 2020, Metro Vancouver undertook actions in the following categories:

☑ Water restrictions
☐ Incentives/rebate programs related to water or wastewater
☑ Outreach, education or communication related to water or wastewater
☑ Studies or research related to water or wastewater

☑ Plans or strategies related to water or wastewater

Community-Wide Climate Action Highlights

This section highlights three of Metro Vancouver's key actions that demonstrate leadership and innovative approaches to reduce community-wide greenhouse gas emissions.

Alternative Fuel and Recyclables Recovery Project

In 2020, Metro Vancouver initiated a feasibility study and business case for an Alternative Fuel and Recyclables Recovery Project. Metro Vancouver is looking to reduce regional greenhouse gas emissions by recovering material currently destined for disposal to create an alternative fuel product. The target material is small load waste, which is typically self-hauled by residents and primarily contains wood and other building materials. Small load waste is very similar in composition to construction and demolition waste, which is currently processed at licensed private facilities to extract recyclables and create an alternative fuel product from the remainder.

Following the opening of two new recycling and waste centres in early 2022, Metro Vancouver plans to redirect approximately 60,000 tonnes per year of this material from our facilities to existing private sector construction and demolition facilities for processing. Assuming 25,000 tonnes of alternative fuel could be recovered from the small load waste and used in place of fossil fuels such as coal and natural gas, this project could result in up to 20,000 tonnes CO_2 equivalent per year reduction in regional greenhouse gas emissions.

Regional Greenways 2050 Plan

The Regional Greenways 2050 plan describes the region's shared vision for a network of recreational multi-use paths for cycling and walking that connects residents to large parks, protected natural areas and communities to support regional livability. The plan was developed in consultation with local jurisdictions, agencies, First Nations and key stakeholders, and focuses on regional-scale recreational greenways. This network is complementary to TransLink's Major Bikeway Network. Together the two networks contribute to active transportation infrastructure in the region.

The plan identifies current challenges and benefits, provides an updated vision for a gap-free system of regional greenways and an implementation framework that focuses on actions that can be undertaken in the next five years that will enable measurable progress toward this long term vision.

Implementation of Regional Greenways 2050 supports the goals of the region's *Clean Air Plan* and *Climate 2050* strategy, by providing access to safe and comfortable routes for active transportation to promote a reduction in the number of trips taken by driving and the associated greenhouse gas emissions.

Regional Growth Strategy: Applying a Climate Lens for the Metro 2050 Policy Review

Metro Vancouver is updating Metro Vancouver 2040: Shaping our Future (*Metro 2040*), the regional growth strategy. Though many of the goals, actions, and tools that are working well in *Metro 2040* will remain unchanged, updates will extend the strategy to the year 2050 and allow the region to better respond to critical and emerging issues such as climate change, social equity, resilience, and housing affordability. Updates will also align the strategy with *Transport 2050* (TransLink's new regional

transportation strategy) and implement policy improvements in a number of areas. The updated strategy, anticipated to be completed in 2022, will be called *Metro 2050*.

Content for *Metro 2050* is informed by a series of Policy Reviews scoped to address specific policy themes, including Climate Change and Natural Hazards. Each Policy Review involved looking at the current policies in *Metro 2040* related to a policy theme, identifying gaps and opportunities, considering best practices, engaging with stakeholders and others, and developing policy recommendations to be integrated into *Metro 2050.*

The purpose of the Climate Change and Natural Hazards Policy Review was to identify ways to strengthen the regional growth strategy's climate change and natural hazard policies. The recommendations that emerged from the Policy Review focused on:

- applying a climate lens to all goal areas of *Metro 2050*, with an emphasis on integrating the content with *Climate 2050* – the regional climate action strategy;
- ensuring member jurisdictions specify how they will meet the region's GHG emissions reduction targets;
- identifying and mapping regional-scale natural hazards, risks and vulnerabilities; and
- encouraging regional growth patterns that incorporate emergency management, utility planning, and climate change adaptation considerations.

Climate Preparedness and Adaptation Action

This section describes the climate impacts Metro Vancouver is experiencing, and how they are being addressed.

Metro Vancouver has identified the following potential climate impacts:

☑ Increased temperatures increasing wildfire activity
☑ Extreme weather events contributing to urban and overland flooding
☑ Changes to temperature and precipitation causing seasonal drought
☑ Warmer winter temperatures reducing snowpack
☑ Sea level rise and storms causing coastal flooding and/or erosion
☑ Other: Invasive species

In 2020, Metro Vancouver undertook actions in the following categories in an effort to consider or address the impacts of climate change:

☑ Emergency response planning
☑ Asset management
☑ Infrastructure upgrades
☑ Public education and awareness
☑ Strategic and financial planning
☑ Risk and vulnerability assessments

☑ Risk reduction strategies
☐ Official Community Plan policy changes
☑ Other: Metro 2050 Regional Growth Strategy: Climate Change and Natural Hazards Review

In 2020, Metro Vancouver partnered with the following organizations to prepare for and adapt to climate change:

☑ Adaptation to Climate Change Team (SFU)
☐ Columbia Basin Trust
☐ Community Emergency Preparedness Fund (UBCM)
☑Federation of Canadian Municipalities
☑ Fraser Basin Council
☑ Pacific Institute for Climate Solutions (UVIC)
☑ Other: Integrated Partnership for Regional Emergency Management, Translink, West Coast Environmental Law, BC Housing & Pembina Institute

Adaptation Action Highlights

This section highlights three of Metro Vancouver's key actions that demonstrate leadership and innovative approaches to adapting to a changing climate.

Planning for our Future Water Supply in Metro Vancouver

The long-term water supply planning study, Water Supply Outlook 2120, presents key findings and actions in the Metro Vancouver region to ensure the continued delivery of clean, safe drinking water to the region over the next 100 years. The study assesses the water system's resiliency to various challenges, such as population growth and impacts of climate change, and confirms that the region is on the right track by planning for the Coquitlam Lake Water Supply Project to be in place by the late 2030s.

We Love Water Campaign

The We Love Water campaign continues to encourage residents to 'use a little less, care a little more' through a range of advertising and updated creative materials that explored connections between the regional water system and residents' own water use. All promotions continued to lead to welovewater.ca. Metro Vancouver shares all campaign materials and coordinates outreach with members. This outreach campaign is an initiative that contributes to reducing the overall demand for drinking water in the region, and is an initiative that address the climate impacts related to the region's water supply.

Liquid Waste Services- Environmental Risk Analysis and Prioritization

In 2020 Metro Vancouver conducted an Environmental Risk Analysis and Prioritization of environmental risks associated with the operation of the liquid waste utility, including those with climate impacts. A review of the Liquid Waste Services activities identified fifty environmental risks which were evaluated systematically for environmental significance considering environmental impact, regulatory compliance, and public concern. The environmental impact was based on a calculated score of potency, time period, geographic scale, and frequency. Potential impacts from environmental risks range from contamination of water, soil and air, to far-reaching cumulative effects such as climate change, loss of biodiversity and

bio-accumulation of toxins in the environment with potential impacts to public health and terrestrial and aquatic life.

The analysis and prioritization methodology determined that rigorous management systems are in place for the majority of wastewater related risks, however a number of risk areas were identified for strengthened risk mitigation including those with climate impacts such as wastewater process GHGs, vehicle emissions, and refrigerant management. These were among the risks prioritized for ongoing consideration, setting objectives, defining strategy to inform capital planning and/or developing enhanced operational environmental programs.

2020 Carbon Neutral Reporting

2020 Carbon Emissions

Did you measure your local government's corporate GHG emissions in 2020?	Yes
Corporate GHG emissions (in tonnes of carbon dioxide equivalent) from services delivered directly by your local government:	5,366
Corporate GHG emissions (in tonnes of carbon dioxide equivalent) from contracted services:	10,071
TOTAL A: CORPORATE GHG EMISSIONS FOR 2020	**15,437 tCO_2e**

2020 Carbon Reductions

To be carbon neutral, a local government must balance their TOTAL corporate GHG emissions generated in 2020 by one or a combination of the following actions:

- Undertake Green Communities Committee-supported Option 1 Project(s)
- Undertake Green Communities Committee-supported Option 2 Project(s)
- Purchase carbon offsets from a credible offset provider

For more information about options to balance or offset corporate GHG emissions please refer to Becoming Carbon Neutral: A Guidebook for Local Governments in British Columbia.

If applicable, please report the 2020 GHG emissions reductions (in tonnes of carbon dioxide equivalent (tCO_2e)) being claimed from Option 1 GHG Reduction Projects:

OPTION 1 PROJECTS	REDUCTIONS
1E Avoided Forest Conversion	
Thompson Mountain	404

Minnekhada Quarry Road (Minnekhada Regional Park)	72
Grant Hill (Kanaka Creek Regional Park)	203
Lane Property (Kanaka Creek Regional Park)	64
TOTAL B: REDUCTIONS FROM OPTION 1 PROJECTS FOR 2020	**743 tCO_2e**

If applicable, please report the names and 2020 GHG emissions reductions (in tonnes of carbon dioxide equivalent (tCO2e)) being claimed from Option 2 GHG Reduction Projects:

OPTION 2 PROJECT NAME	REDUCTIONS
Ecosystem Restoration of the Burns Bog Ecological Conservancy Area	27,341
TOTAL C: REDUCTIONS FROM OPTION 2 PROJECTS FOR 2020	**27,341 tCO_2e**

2020 Carbon Offsets

If applicable, please report the number of offsets purchased (in tonnes of carbon dioxide equivalent (tCO2e)) from an offset provider for the 2019 reporting year:

OFFSET PROVIDER	REDUCTIONS
Not applicable	N/A
TOTAL D: OFFSETS PURCHASED FOR 2019	**0 tCO_2e**

TOTAL REDUCTION AND OFFSETS FOR 2019 (Total B+C+D) = 28,084 tCO_2e

Corporate GHG Emissions Balance for 2020

Your local government's Corporate GHG Emissions Balance is the difference between total corporate GHG emissions (direct + contracted emissions) and the GHG emissions reduced through GCC Option 1 and Option 2 projects and/or the purchase of offsets.

CORPORATE GHG EMISSIONS BALANCE FOR 2020 = (A – (B+C+D)) = -12,647 tCO_2e

If your local government was carbon neutral in 2020, please record any emissions reductions you will be carrying over for future years and the source of the reductions, including the year they were earned (e.g. organics diversion, 2020 100 tCO2e):

Source of Carryover Emission Reduction	Year Earned	GHG Emissions Reductions

1.	Ecosystem Restoration of the Burns Bog Ecological Conservancy Area	2012-2016	12,647
TOTAL E - BALANCE OF REDUCTIONS ELIGIBLE FOR CARRY OVER TO NEXT YEAR			**12,647 tCO_2e**

APPENDIX 1: Contracted Emissions Report for Metro Vancouver

Reporting Metro Vancouver's Contracted Emissions

Metro Vancouver's corporate GHG emissions from contracted services are primarily related to hauling of solid waste, biosolids, and residual material from corporate facilities to final disposal or use sites, such as landfills, beneficial use sites, or biofuel facilities.

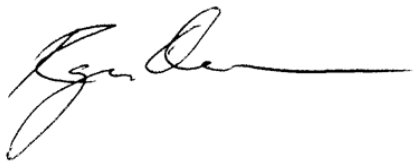
Metro Vancouver reports its contracted emissions in accordance with reporting guidance provided by the joint Provincial-UBCM Green Communities Committee's Workbooks and Guidebook. The "*Guidance on Including Contracted Emissions in Local Government Corporate Inventories*" describes what contracts should be included in corporate inventories, what emissions data needs to be collected, and the steps that a local government can undertake to achieve this. It directs local governments to report emissions from new contracts and upon renewal of existing contracts.

Metro Vancouver's waste management approach is to reduce the generation of waste, and to pursue opportunities for resource recovery and the beneficial reuse of waste. Programs supported or implemented by Metro Vancouver and its partners to reduce, reuse, and recycle waste (including organics diversion from households and businesses) marks a shift from thinking about the waste as an end product toward seeing waste as a potential resource. Metro Vancouver will continue to pursue approaches and technologies to reduce GHG emissions and promote opportunities for the replacement of fossil fuels.

Contracted Emissions Reporting Form for Metro Vancouver

Reporting Year: 2020

Local Government Information			
Name of Local Government	Metro Vancouver		
Designate Appointed to Sign Off on Estimation Template	Name: Roger Quan Title: Director, Air Quality and Climate Change Phone: 604-436-6770 Email: roger.quan@metrovancouver.org		
Estimation Methodology Information			
Rationale for Applying an Estimation Methodology	For contracts in the 2020 reporting year, fuel use was reported directly from contractors ("Estimation Option 1"). Contract name = activity.		
Contracted Emissions			
Drinking, Storm and Wastewater	CONTRACT NAME	ESTIMATION OPTION USED	ESTIMATED ANNUAL GHGS (t CO2e)
	Biosolids/Residuals Hauling	1	3,386
	SUBTOTAL ANNUAL CONTRACTED EMISSIONS FOR TRADITIONAL		3,386
Solid Waste Collection, Transportation and Diversion	CONTRACT NAME	ESTIMATION OPTION USED	ESTIMATED ANNUAL GHGS (t CO2e)
	Solid Waste Hauling	1	4, 593
	SUBTOTAL ANNUAL CONTRACTED EMISSIONS FOR TRADTIONAL SERVICE		4,593
Misc	CONTRACT NAME	ESTIMATION OPTION USED	ESTIMATED ANNUAL GHGS (t CO2e)
	Other Off-Road Equipment	1	1,370.5
	Other Mobile Sources	1	722
	SUBTOTAL ANNUAL CONTRACTED EMISSIONS FOR TRADITIONAL		*2092.5*
TOTAL ESTIMATED CONTRACTED EMISSIONS FOR 2020 (tonnes CO2e)			**10,071**

Estimated Contracted Emissions: Authorization and Sign Off
The information provided in this Contracted Emissions Reporting Form for the 2020 reporting year is to the best of my knowledge correct and complete. *Designate Signature:*    Roger Quan, Director, Air Quality and Climate Change Date: June 30, 2021


metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Morgan Braglewicz, Senior Policy and Planning Analyst
Parks and Environment Department

Date: June 24, 2021 Meeting Date: July 16, 2021

Subject: **Modelling a Carbon Neutral Region: Project Report**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated June 24, 2021, titled "Modelling a Carbon Neutral Region: Project Report".

EXECUTIVE SUMMARY

Metro Vancouver has committed to becoming a carbon neutral region by 2050. As a first step towards understanding the potential impact of policies on greenhouse gas emissions reductions, staff undertook a modelling project that compares a business as planned scenario with a carbon neutral scenario. This information was considered by staff as the actions and strategies included in the *Climate 2050 Roadmaps* and *Clean Air Plan* were developed, and were used as an initial estimate of the potential impact of policies in those documents. The results show that while it is possible to achieve significant emissions reductions through the implementation of a set of aggressive but achievable policies, at this time, this scenario did not meet Metro Vancouver's climate targets for 2030 or 2050. The results reaffirm the urgent need for climate action, and the need for a dynamic iterative process in continuing to add new actions as part of the *Climate 2050 Roadmaps*. The modelling was intended to focus on emission reductions, and additional analysis will likely be needed to support additional engagement and detailed implementation of many of these actions.

PURPOSE

This report conveys the final report from the Modelling a Carbon Neutral Region Project.

BACKGROUND

The project 'Modelling a Carbon Neutral Region' was part of the Climate Action Committee's work plan for 2020. In November 2020, the Committee received a verbal update on the interim results from the project. Since that update, the project team has been using the modelling data to inform engagement on the draft *Clean Air Plan* and the *Climate 2050 Roadmaps*. The project is now complete and the consultant has produced a project report summarizing the method, data, assumptions, and results from the modelling work. This report follows up on the presentation of the interim results in November 2020 with the final project report.

PROJECT SUMMARY

This project used a model to evaluate the potential impact of a package of policies on all emissions sectors within the region. The model takes into account vehicle stock, buildings, industrial boilers, and other energy-using equipment, and determines greenhouse gas and air contaminant emissions as well as projected energy demand for 2020, 2030, 2040, and 2050. The model focuses on GHG

emission reductions and does not take into account price, costs, or other economic factors related to the policies, nor other social or behavioural factors. The estimated emissions are compared to Metro Vancouver's climate targets to reduce GHG emissions 45% by 2030, relative to 2010, and to reach regional carbon neutrality by 2050. The project compares a business as planned scenario with a carbon neutral scenario to assess the impact of a package of aggressive and achievable policies.

Scenario Descriptions and Assumptions

The Business as Planned Scenario represents the region's current emissions trajectory, based on policies and actions that currently exist or are very well developed. This includes policy at all orders of government – local, provincial, and federal. The Carbon Neutral Scenario is an aggressive and achievable package of policies and actions designed to drastically reduce emissions across all sectors. As with the business as planned scenario, this includes policies at all orders of government. While most of the policies modelled in the Carbon Neutral Scenario are ambitious, they are rooted in what is technologically feasible, though they may be challenging to implement. Many of the policies are based on similar policies being implemented by leading jurisdictions around the world.

Underpinning both the business as planned and carbon neutral scenarios are a series of assumptions about energy supply and land use that align with the scenario assumptions. Each scenario models a policy package, with the carbon neutral scenario incorporating about 40 policies across all sectors. These policies are detailed in the final project report (Reference 1), developed with the intent of providing transparency on model assumptions.

Results Summary

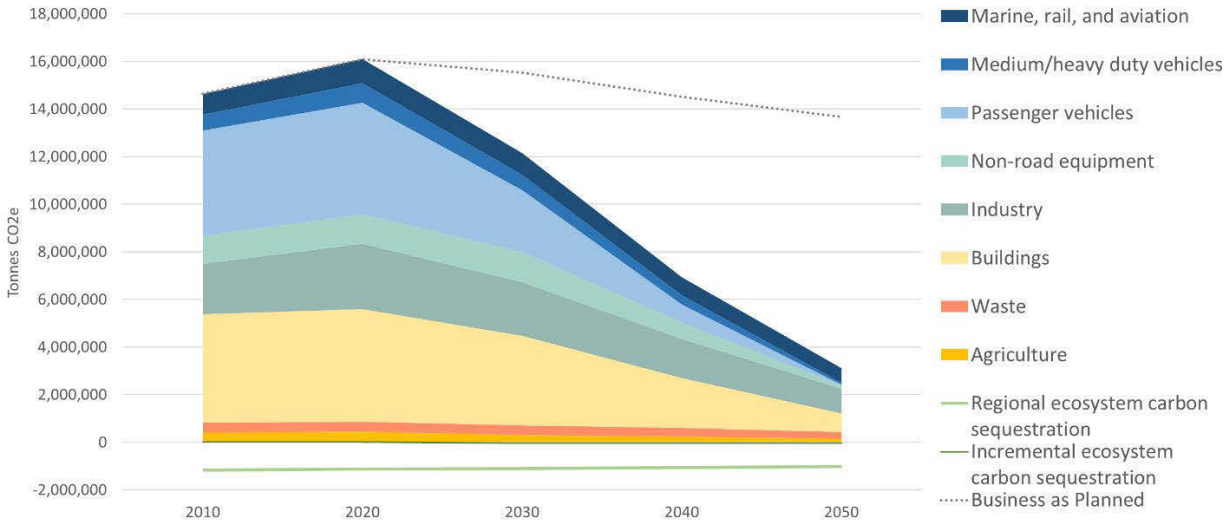
Under the Business as Planned scenario, overall projected GHG emissions decline slightly between 2020 and 2050 (6% reduction relative to 2010). Buildings emissions remain stable as existing regulations for new buildings, such as the BC Step Code, balance out regional population growth. Emissions from light duty vehicles have been declining under the Business as Planned Scenario, and this trend will increase, particularly after 2030, largely due to the *BC Zero-Emissions Vehicle Act* regulations which have already come in to force. However, emissions from other sectors – notably industry, non-road equipment and other transportation sectors (medium/heavy duty vehicles, air, marine, and rail) – increase.

Under the Carbon Neutral Scenario, overall projected GHG emissions for 2030 decrease by over 15% from 2010 and by almost 80% in 2050 (Figure 1). About 3.1 million tonnes of emissions remain in 2050. This is driven by significant switching from fossil fuels to renewable energy sources, notably electricity use in light duty vehicles and buildings. Other renewable energy sources such as renewable natural gas displace emissions in industry and, to a lesser extent, large complex buildings. In this scenario energy efficiency is improved, resulting in less energy demand overall.

Preliminary estimates show that about 1 million tonnes of CO_2 equivalents are sequestered annually in regional ecosystems, but this is projected to decline between 2020 and 2050 due to continued development in the region. While some decreases in regional sequestration over time are offset by policies modelled in the Carbon Neutral Scenario, annual carbon sequestration is not sufficient to balance the remaining GHG emissions in 2050. These results indicate that the scenario modelled would not reach Metro Vancouver's target of a 45% reduction in 2030; while the model did not

produce data points between 2030 and 2040, interpolating the results suggest that a 45% reduction in emissions would be achieved sometime in the mid-2030s. In addition, the results indicate that the current set of policies modelled will not result in the region achieving carbon neutrality by 2050.

Figure 1: Carbon Neutral Scenario Results



It should be emphasized that these are initial modelling results, intended to illustrate the challenge in meeting the targets, prioritize the key actions, and inform a pathway for development of additional actions through an ongoing process of strengthening the *Climate 2050 Roadmaps*.

Key Findings

The results of this project suggest that it is possible to achieve significant emissions reductions if aggressive actions are implemented now, but that additional actions and commitments will be necessary to achieve regional carbon neutrality by 2050 and reduce emissions by 45% by 2030. They also reaffirm the urgency of the situation – the longer policy makers wait, the more difficult it will be to push emissions down closer to the 2030 target. While the region has a strong baseline store of ecosystem carbon that may contribute to carbon neutrality, it is difficult to increase that store, and increasing climate threats may compromise existing natural carbon sequestration. Actions to directly reduce emissions by reducing overall energy use and switching to clean, renewable energy will be the key to reaching carbon neutrality, complemented by robust regional ecosystems that provide numerous benefits in addition to carbon sequestration. And, once emissions have been reduced to the full extent possible, there will be an emergent role for technological carbon capture, utilization, and storage, which also needs to be researched and developed now.

Project Scope and Limitations

This project covered all emissions sectors using a broad range of data sources and model inputs. As a result, this analysis provides an understanding of region-wide greenhouse gas and other air contaminant emissions in business as planned and aggressive climate action futures. The results have helped inform the potential impact of actions under consideration in the *Clean Air Plan* and *Climate 2050 Roadmaps*. However, due to the broad scope of the project, modelling assumptions and

methods were correspondingly broad. As the actions in the *Clean Air Plan* and *Climate 2050 Roadmaps* are implemented, additional work at the individual policy or sector level will likely be needed for key actions to understand detailed policy considerations and impacts, including financial implications. This analysis could also help understand how to implement policies in order to deepen emissions reductions to get closer to regional climate targets for 2030 and 2050.

Additionally, key project outputs are focused on greenhouse gas and air contaminant emissions and reductions, as well as projected energy demand. While the project does take into account other factors such as technology readiness and policy in leading jurisdictions, there are numerous benefits, costs, barriers, and opportunities not fully explored through this project. Follow up work that looks at the costs and benefits associated with an aggressive climate policy scenario will complement the results from this project. Additionally, as actions in the *Clean Air Plan* and *Climate 2050 Roadmaps* are implemented, specific sector or policy level analysis may be needed to explore these factors in more detail. As noted in Report 5.3 in the Climate Action Committee July 2021 agenda package, these are key considerations which have been raised during engagement on the draft *Clean Air Plan*.

ALTERNATIVES
This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS
The contract value for this project was initially set at $132,602, but over the course of the project, the contract was amended to reflect changes to the project scope, bringing the final project contract amount to $172,523. Project funding came from the operating budgets for the Air Quality function ($135,023), and Regional Planning function ($20,000). Partner funding was contributed from the City of Vancouver ($10,000), and City of North Vancouver ($7,500). The contract is now complete.

CONCLUSION
The results from this project demonstrate that significant decreases in regional greenhouse gas emissions are possible with the implementation of a suite of aggressive yet achievable policies. However, the results also suggest that in order to reach regional climate targets for 2030 and 2050, additional actions and commitments are needed beyond what was analyzed in this modelling project. Through the *Climate 2050 Roadmaps* and *Clean Air Plan*, staff have identified evidence-informed strategies and actions that work towards meeting regional climate targets. Additional analysis will likely be needed to support the implementation of these actions to fully understand the emissions impact, energy requirements, and costs and benefits. Recognizing that this is the initial set of modelling to support Climate 2050 and the Clean Air Plan, ongoing development of the Climate 2050 Roadmaps will be dynamic and iterative, in order to identify opportunities and implement actions to deepen emissions reductions.

References
Carbon Neutral 2050 - Policy and Modelling Report, consultant's report dated July 2021

46277614

To: Climate Action Committee

From: Lucy Duso, Policy Coordinator, External Relations Department
Laura Taylor, Public Engagement Coordinator, Parks and Environment Department

Date: June 24, 2021 Meeting Date: July 16, 2021

Subject: **Highlights from Engagement on Draft *Clean Air Plan***

RECOMMENDATION

That the Climate Action Committee receive for information the report dated June 24, 2021, titled "Highlights from Engagement on Draft *Clean Air Plan*".

EXECUTIVE SUMMARY

Metro Vancouver's draft *Clean Air Plan* was released for comments April 1 to June 15, 2021. The aim of the engagement program was to seek comments from stakeholders and the public related to the goals, targets, and actions in addition to equity, implementation, and collaboration. The stakeholder engagement activities sought comments on actions related to buildings, industry, transportation, and agriculture from businesses, agencies and others involved in these sectors. For the public, the focus was on outreach to youth and residents who have indicated an interest in climate action and air quality issues with a deliberate effort to expand the audience involved. There was also dialogue with other governments, including First Nations, member jurisdictions, provincial staff and related agencies. Engagement activities attracted about 1,000 public participants and generated over 50 feedback forms and 35 direct emails. This report summarizes some of the prevalent themes from the engagement, and reflects the expected tension between audiences who want to see more action now, and those who feel it is too aggressive. The key issues identified were costs, duplication with other governments initiatives, collaboration, and ability of small businesses to adjust.

PURPOSE

This report provides highlights of the engagement on the draft *Clean Air Plan*, and summarizes the feedback received. Staff are in the process of assessing this feedback to inform revisions to the plan, and expect to present a final version of the *Clean Air Plan* for the Board's consideration in fall 2021.

BACKGROUND

At its March 2021 meeting the Board authorized staff to proceed with engagement on the draft *Clean Air Plan*, based on the report dated February 10, 2021, titled "*Draft Clean Air Plan*". Attachments to that report included a draft *Clean Air Plan* and proposed engagement plan.

Prior to developing the draft *Clean Air Plan* in 2021, a *Clean Air Plan Backgrounder* was released as a resource for early discussion and comments on the plan's direction and scope. Feedback received from this early engagement was provided to the Board in the report dated October 19, 2020, titled, "*Update on Engagement for Clean Air Plan and Related Climate 2050 Roadmap Development*" and considered in developing the draft *Clean Air Plan*. In addition, in conjunction with the *Clean Air Plan*, staff developed and sought comments on draft *Climate 2050 Roadmaps* for buildings and

transportation, and discussion papers on agriculture and industry. Staff will consider feedback and revise all documents in parallel, as there is direct alignment of actions to address both health harming air contaminants as well as greenhouse gas emissions in both the *Clean Air Plan* and these roadmaps.

PUBLIC AND STAKEHOLDER ENGAGEMENT PLAN

The objectives in the engagement plan were three-fold:

- Share information with the public on the purpose and benefits of the *Clean Air Plan*.
- Provide a range of opportunities for the public to provide feedback.
- Have meaningful conversations with specific sectors and organizations (e.g., those impacted by the proposed actions, responsible for implementation, aligned sectors, experience with equity assessment) about their level of support, specific concerns of the impacts or intent, and thoughts on collaboration and implementation.

Sharing information is identified as a key objective in engagement because even as public demands for more climate action grow, the public is largely unaware of the progress on climate action from local governments or what the most effective actions are. Information about the draft plan and engagement was shared through social media promotions with some emphasis on youth-favoured platforms, corporate newsletters, and paid promotions. This outreach was amplified by community partners, including member jurisdictions and other agencies. The intent was to direct the audience to the *Clean Air Plan* site on the Metro Vancouver website. On the website, a concise, plain language summary of the draft *Clean Air Plan* was available along with a two-minute introductory video. During the engagement period there were over 8,000 page visits and 5,000 views of the introductory video.

Public Engagement

Prior to the formal comment period, Metro Vancouver hosted a public climate webinar series from January to March 2021, where the final webinar featured the draft *Clean Air Plan*. That series attracted about 1,000 public participants. The engagement plan promoted a range of opportunities for public feedback that included: two public forums with in-program polling and over 30 minutes in each allocated to public questions; an on-line feedback form; and an email offering the public direct access to the team. To drive the public to the website and on-line feedback form, an invitation for comment was sent to the 4,000+ residents and stakeholder contacts in Metro Vancouver's Air Quality and Climate Change mailing list. The *Clean Air Plan* public forums in April and May attracted about 120 participants, and over 50 feedback forms and over 40 direct emails from were received. Highlights of the reach of this campaign are found in Attachment 1 'Engagement reach infographic for the draft *Clean Air Plan*' and Attachment 2 'Social media to promote the draft *Clean Air Plan'*.

There were two youth-driven leadership discussions featuring the *Clean Air Plan*. Appendix 3 '*Youth engagement on the draft Clean Air Plan'* includes perspective shared from the youth audience.

Stakeholder Engagement

Alongside ensuring opportunity for public feedback, staff pursued meaningful conversations with stakeholders from specific sectors (e.g. industry, transportation, buildings), organizations (e.g. BC Trucking Association, Business Council of BC), and other governments (member jurisdictions, Province, in-region First Nations, health authorities, neighbouring regional districts). Attachments 4 and 5, respectively '*List of audiences connected with in the Clean Air Plan engagement'*, and

'*Stakeholder meetings where Clean Air Plan was a substantial portion of the conversations'* reflect the reach and participation for these conversations. Themes from this feedback are described below. Appendix 6 '*Sample extracts from feedback forms, correspondence, meeting notes'* includes some of the hundreds of comments and recommendations received.

FEEDBACK RECEIVED

Feedback Themes

Feedback was requested against a consistent set of questions through the feedback form and forum agendas. The themes of the questions explored:

- Awareness of Metro Vancouver's commitments and actions related to air quality and climate action in this region;
- Support or concern for any of the targets, goals, strategies or actions in the draft plan;
- Probe for details on why there was support or concerns;
- Any additional considerations or ideas that could be incorporated into the draft plan; and
- In the stakeholder forums, participants were asked to comment on implementation of the plan, potential collaborations, alignment with other initiatives, and equity considerations.

Awareness of Metro Vancouver's commitments and actions varies with audience

Earlier public opinion research, conducted in 2018, to inform the strategy for developing the *Climate 2050 Strategic Framework* indicated that the region's residents have low recognition of local government climate action. However, those motivated to participate in the public forums generally were more aware, ranking about 3.5 on a scale of 1 to 5 for awareness, while awareness was slightly higher in the stakeholder forums. This was why promoting the development of the draft *Clean Air Plan*, including the scope, targets and benefits, was an objective of the engagement plan.

Support or concern for any targets, goals, strategies or actions in the draft plan

The majority of feedback addressed this question. Among targets, goals, strategies or actions, feedback largely addressed specific actions though there were comments on others as noted below.

Targets

The regional targets for GHG emissions reductions, improved air quality and improved visual air quality were generally supported. Some responses recognized the challenge in meeting the GHG targets while others urged Metro Vancouver to move more aggressively. For example, forum participants suggested through a participant poll that support for a 45% reduction in GHG emissions by 2030 was polarized, with respondents feeling it was either too aggressive or not aggressive enough. Further dialogue indicated general support for emissions targets, but concerns emerged about the timeline due to, for example, technological readiness and cost. Other respondents asked for more aggressive targets, including one comment from a youth engagement session suggesting that from a global perspective, wealthier countries have means and responsibility to aim higher.

Goals

Most agencies and organizations identified alignment with or support for the long term goals for each sector. For example, the Vancouver International Airport Authority identified an aligned carbon neutral goal for 2050, while feedback from TransLink identified that the Mayors' Council was

exploring a proposed 65% reduction of greenhouse gas emissions from 2010 levels by 2030 from personal transportation (light duty vehicles) in alignment with the draft *Clean Air Plan.*

Concerns about goals included the terminology used. For example, for some the term (and intention) of 'zero emission' technologies caused concern and they suggested that 'lower emission' technologies are more achievable. Industry feedback noted that the pathways to carbon neutrality for industrial facilities were not clear. There were also suggestions to include demand management as a goal, for instance the value of active transportation including cycling. Some agriculture sector respondents indicated they are struggling with the goal of carbon neutrality. Another suggestion is to go beyond carbon neutrality for agriculture, and set a goal that is carbon negative from this sector.

Actions

The bulk of the feedback was expressed as support or concerns for specific actions, though there were suggestions for additional actions or proposed revisions to the scope of actions. For example, the Fraser Valley Regional District indicated interest in applying certain actions across district boundaries while noting a concern for spill-over emissions from Metro Vancouver to the FVRD. More examples are included in Attachment 6. Some themes are:

- Acknowledgement of the cost of capital investment required in some emission reduction actions (e.g. space heating, large trucks, rail infrastructure);
- Given the scope and range of actions in the draft *Clean Air Plan*, there should be a stronger indication of priorities. One suggestion was to use the RACE approach (realistic, achievable, cost effective and equitable) in identifying priorities. Another suggestion was to present priorities in a hierarchy by applying energy conservation principles with conservation first, then efficiency, followed by a switch to renewable energy;
- Potential for duplication, overlap or lack of a harmonized or aligned approach among government regulators (e.g. the draft plan includes an action to advocate for lower carbon fuel standards which one respondent noted were lowered recently by the Province);
- Interest and support from many respondents to participate in a collaborative approach (e.g., a round table, working group, pilot project) in implementing the plan; and
- Need to consider tailored support for small operations and businesses (e.g. a small agriculture operator, a trucking firm with 1 to 3 vehicles) and consider scale of investment, opportunities for coordinated investments etc.

In committing the region to becoming carbon neutral by 2050, Metro Vancouver will continue to work with industry stakeholders to find the most cost effective solutions to reducing greenhouse gas emissions in this sector and leveraging innovation and collaboration initiatives that will create new economic opportunities for leaders in carbon neutrality and zero emission solutions. Staff will also investigate connections to the Regional Economic Prosperity Service, as well as partnership opportunities that tap into the Sustainability Innovation Fund.

Equity

An approach to considering equity in the plan development and implementation was introduced. There is feedback on equity from many audiences, and it is worth noting that the characterization of equity itself shifts for different audiences. In general, youth considered equity as intergenerational and also at a global scale. Some industry responses considered equity in terms of the distribution of

costs and benefits. Others considered equity in terms of health impacts on individuals, or cumulative impacts on specific communities. A selection of comments on equity are included in Attachment 6.

Additional considerations

Some examples of additional considerations raised that are not directly addressed in the plan include:

- Downloading impacts of climate actions onto rural communities (e.g., increased mining to generate battery metals);
- The need to address methane leaks;
- Use of low-carbon fuels as a pathway to compliance;
- Suggestion to identify a role for business and industry associations;
- Need for economic modelling in addition to emission modelling (e.g., changes in employment) or business cases that assess costs and benefits.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

There are no financial implications stemming from this report. All costs incurred in engagement on the draft *Clean Air Plan* are within the approved 2021 budget.

CONCLUSION

Metro Vancouver concluded an engagement program for the draft *Clean Air Plan* on June 15, 2021. The program was designed to raise awareness of the draft plan, provide accessible information and tools to provide feedback and pursue meaningful conversations with those more likely to be impacted by implementation of the plan. Promotions for the engagement reached over 200,000 residents and staff engaged with over 40 stakeholder agencies, businesses and associations. About 100 individual responses were received through direct correspondence, feedback forms and captured in meeting notes. This report shares highlights of that feedback.

Staff are assessing the feedback for the purpose of revising the draft plan, and presenting a proposed final *Clean Air Plan* to the Board in fall 2021.

Attachments

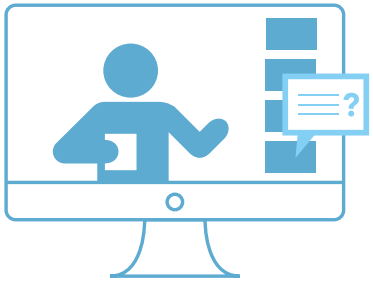
1. Engagement reach infographic for the draft *Clean Air Plan* *(46292427)*
2. Social media to promote the draft *Clean Air Plan* *(46361878)*
3. Youth engagement on the *Clean Air Plan* *(46326046)*
4. List of audiences connected with in the *Clean Air Plan* engagement *(46284423)*
5. Stakeholder meetings where *Clean Air Plan* was a substantial portion of the conversations *(46266796*)
6. Sample extracts from feedback forms, correspondence, meeting notes *(46299666)*

References

1. Clean Air Plan introductory video
2. Clean Air Plan web resource
3. Clean Air Plan online feedback form

46294458

Clean Air Plan Engagment
Participation Highlights



Public forums and webinars

300 participants

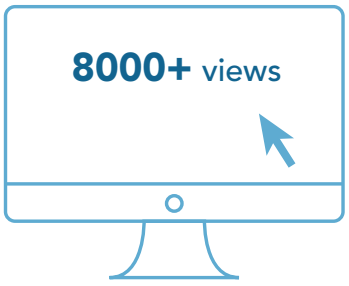
Stakeholder forums

Buildings | Industry | Transportation

80 participants

50+ detailed online feedback forms

Web resource visitors



Discussions with stakeholders

15+ invited presentations and Q&A

Social Media reach

200K+ saw the information

Social interaction

6500+ clicked, shared, commented and liked

Project team emails

70+ composed written feedback

Introductory video views

5000+ watched the video

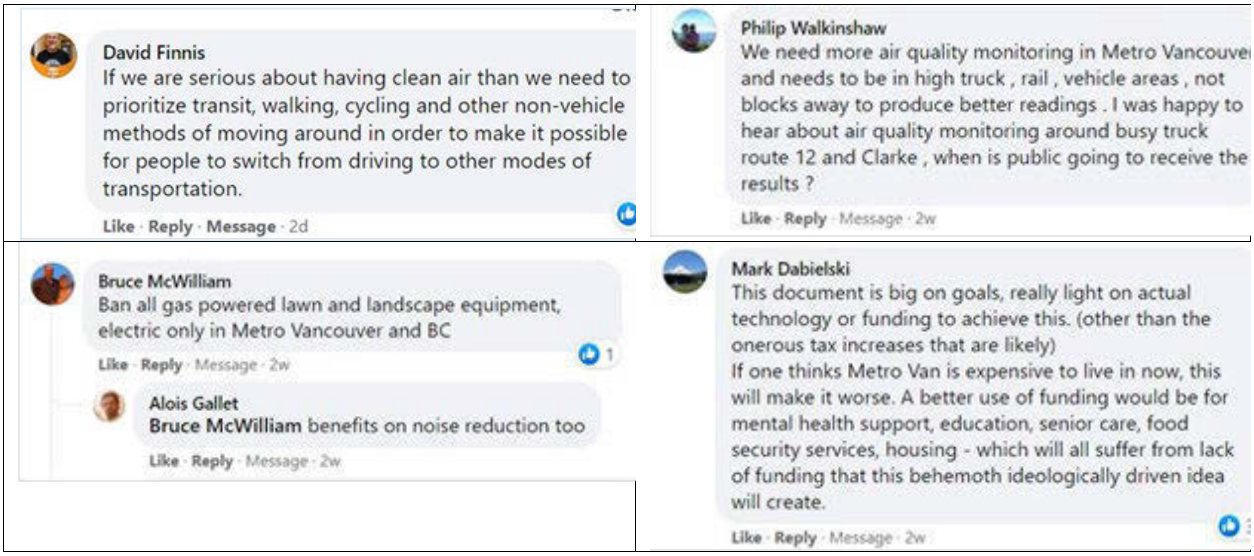
ATTACHMENT 2

Social media to promote the draft *Clean Air Plan*

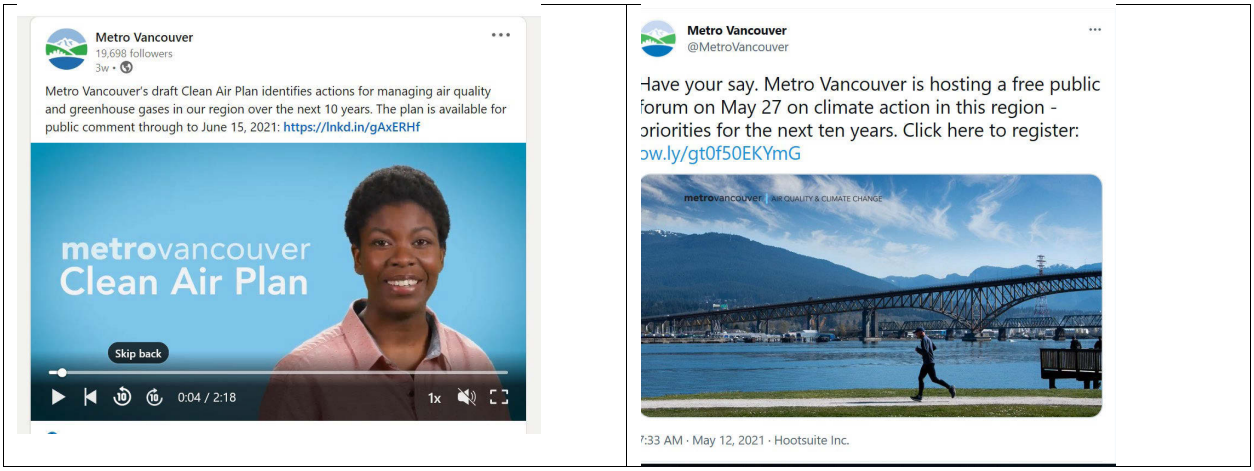
Social media was used to meet the engagement plan objective of raising the awareness of the plan purpose and benefits and to drive readers to the web resource for information or to register for events.

Staff posted regularly to corporate channels (LinkedIn, Facebook, Twitter, Instagram). The plan included a media buy, which increased presence on youth-focused platforms (i.e. Instagram) using engaging images and polling, and expanded reach to a less typical audience using community platforms (i.e. TriCityNews.com, VancouverisAwesome.com, Curiocity etc.). In addition, community partners amplified the reach of the social media to their own networks.

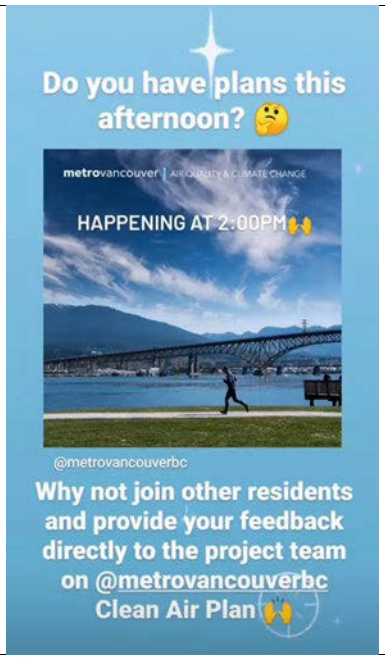
Examples of social media comments.



Examples of social media posts




Tweet
Metro Vancouver
@MetroVancouver
We are seeking public input on a draft Clean Air Plan that will aim to reduce GHGs by 45% of 2010 levels by 2030. Learn more about the plan and share your feedback: ow.ly/LhTY50EXW7W
#climateaction #climate2050 #airquality
metrovancouver
Clean Air Plan
353 views
0:00 / 2:19


Do you have plans this afternoon?
metrovancouver | AIR QUALITY & CLIMATE CHANGE
HAPPENING AT 2:00PM
@metrovancouverbc
Why not join other residents and provide your feedback directly to the project team on @metrovancouverbc
Clean Air Plan


City of Vancouver - Greenest City @greenestcity · Apr 25
Are you interested in air quality and climate change in our region? Check out Metro Vancouver's draft Clean Air Plan and share your thoughts: ow.ly/v6Es50EnHfp
#airquality #climateaction #climate2050
2
8
12


CityHive @cityhivevan · May 4
Have your say in a part of #MetroVancouver's climate future!
Metro Vancouver @MetroVancouver · Apr 27
Check out Metro Vancouver's draft Clean Air Plan, the proposed plan for managing air quality and GHGs over the next 10 years. The draft plan is available for public comment through to June 15: ow.ly/v6Es50EnHfp
#airquality #climateaction #climate2050
metrovancouver AIR QUALITY & CLIMATE CHANGE

46361878

ATTACHMENT 3

Youth Engagement on the *Clean Air Plan*

The engagement plan included a focus on youth audiences, including K-12, college and early career. Social media outreach included an emphasis on youth-preferred platforms and a young host was chosen to host the introductory video on the draft *Clean Air Plan*. Metro Vancouver's Youth4Action team provided opportunities to hear from students across the region.

Metro Vancouver holds many conversations with youth exploring the crossroads between youth leadership and sustainability. The *Clean Air Plan* team joined some of Metro Vancouver's Youth4Action sessions, where staff introduced the *Clean Air Plan* and co-hosted dialogue sessions along with youth leaders.

The Youth4Action team provided these comments to summarize the input from youth education and engagement activities. The team noted the following bullets reflect typical perspectives shared through participation in Youth4Action programs. They are non-exhaustive and are adapted from dialogue facilitated by the Youth4Action team at events from March through June 2021.

- Youth leaders are incredibly passionate about climate action, and see the issue as an emergency. They are eager to take action at school and in the community and to educate their unique networks on sustainability topics with the goal of creating *systemic* change. Often, school-based green teams are informed by a feeling of urgency.
- Youth leaders appreciate the opportunity to engage with complex local sustainability issues, and have expressed that they feel more equipped to contribute meaningfully to discussions around

climate solutions, policies, and programs when they have been supported to enhance their understanding.

- Youth leaders typically have an advanced and nuanced understanding of the relationships between justice, equity, diversity, inclusion and action on climate change. They often regard First Nations inclusion as an indispensable aspect of progressive climate solutions.
- Youth leaders often don't feel their concerns are heard or valued by adults. They are often frustrated by not being included in decision-making processes and can be skeptical that governments and officials will follow through on commitments made to address climate change.
- When conversations about climate action have been facilitated between Metro Vancouver staff and students, youth consistently express gratitude for having their perspectives heard and valued, and that they wish this was the norm in other areas of their lives.

In addition to these dialogue sessions, youth were engaged through social media platforms and encouraged to send in feedback (see quote from young resident in Attachment 6 to the report 'Highlights from Engagement on Draft *Clean Air Plan*', dated June 24, 2021).

46326046

ATTACHMENT 4

List of Audiences Connected with in the *Clean Air Plan* Engagement

This attachment includes examples (and is not comprehensive) to demonstrate the range of organizations and individuals encouraged to review the draft plan, attend presentations and submit feedback on the draft *Clean Air Plan*.

Public
Clean Air Plan subscribers list (1,400), Metro Vancouver Sustainable Region subscribers list (5,000), Youth4Action, reach through social media

Other Governments
Member Jurisdictions (and Electoral Area A), First Nations, BC Ministry of Energy, Mines and Low Carbon Innovation, Ministry of Finance - Economic Forecasting and Analysis, BC Ministry of Agriculture, Food and Fisheries, Agricultural Land Commission, BC Ministry of Environment and Climate Change Strategy, BC Climate Action Secretariat, BC Ministry of Transportation and Infrastructure, Fraser Valley Regional District, Transport Canada, BC Ministry of Jobs, Economic Development and Competitiveness, Natural Resources Canada, Health Canada

Non-Profit Organizations
David Suzuki Foundation, HUB Cycling, Zero Waste Canada/Zero Waste BC, Vancouver Native Housing Society, Vancouver Aboriginal Friendship Centre Society, BC Non-Profit Housing Association, Victoria Transport Policy Institute, Fraser Basin Council, Urban Development Institute, Canadian Centre for Policy Alternatives, Pembina Institute, Eco Justice, BC Lung Association, Foresight

Committees (advisory and similar)
Metro Vancouver Agricultural Advisory Committee, Regional Engineers Advisory Committee, Township of Langley Agriculture Advisory and Economic Enhancement Committee

Partner Agencies or Organizations with statutory responsibilities in air quality, health, or related areas
Vancouver International Airport Authority, Fraser Health Authority, Vancouver Coastal Health Authority, First Nations Health Authority, Vancouver Fraser Port Authority, TransLink

Energy Utilities
FortisBC, BC Hydro

Industry and Business Associations
Business Council of British Columbia, Railway Association of Canada, Vancouver Economic Commission, British Columbia Trucking Association, New Car Dealers Association of British Columbia, Canadian Fuels Association, BC Greenhouse Growers Association, Electric Mobility Canada, Urban Design Institute, BC Council of Forest Industries, Cement Association of Canada, BC Construction Association, Building Owners and Managers Association, British Columbia Automobile Association, Home Performance Stakeholder Council

Businesses
Parkland Refining, Zen Clean Energy Solutions, Perkins & Will, Modo (Car Share), NEXT FMS, MBS Equipment Company Canada, West Coast Reduction, Lehigh Hanson, Lafarge Canada, Suncor Energy, Purolator

Academic Institutions
British Columbia Institute of Technology, Langara College, UBC Clean Energy Research Centre, Pacific Institute for Climate Solutions (UVIC), Clean Energy Canada (SFU), SFU Renewable Cities Program

46284423

ATTACHMENT 5

Stakeholder Meetings where *Clean Air Plan* was a Substantial Portion of the Conversations (non-exhaustive)

Audience	Engagement Activity	Timing
Metro Vancouver Agricultural Advisory Committee	Presentation with Q&A session	April 22, 2021
Public	Public Forum	April 27, 2021
Buildings Sector	Stakeholder forum	April 28, 2021
Transportation Sector	Stakeholder forum	May 5, 2021
Regional Engineers Advisory Committee (REAC)	Presentation with Q&A session	May 7, 2021
Province of BC	Presentation with Q&A session	May 12, 2021
Industry Sector	Stakeholder forum	May 19, 2021
Metro Vancouver Youth4Action	Leadership Clinic	May 19, 2021
Public	Public Forum	May 20, 2021
Township of Langley Agriculture Advisory and Economic Enhancement Committee	Presentation with Q&A session	May 26, 2021
Clean Energy Canada	Presentation with Q&A session	May 27, 2021
BC Trucking Association	Presentation with Q&A session	June 1, 2021
Metro Vancouver Youth4Action	Leadership Clinic	June 2, 2021
Home Performance Stakeholder Council	Presentation with Q&A session	June 7, 2021
Energy, Environment and Climate Committee of Business Council of British Columbia	Presentation with Q&A session	June 8, 2021
Foresight	Presentation with Q&A session	June 8, 2021
Mechanical Contractors Association of BC	Presentation with Q&A session	June 15, 2021
InnovateBC	Presentation with Q&A session	June 23, 2021

Pre-engagement conducted in-between Phase 1 and Phase 2 (January 2021 – March 2021)

Audience	Engagement Activity	Timing
Public	Agriculture webinar	February 2, 2021
Public	*Clean Air Plan* webinar	March 9, 2021
BC Ministry of Environment Annual Interagency Workshop	Presentation with Q&A session	March 9, 2021
Lower Fraser Valley Air Quality Coordinating Committee	Presentation with Q&A session	March 11, 2021
REAC-Climate Protection Subcommittee	Presentation with Q&A session	March 17, 2021

46266796

ATTACHMENT 6

Draft Clean Air Plan engagement - sample extracts from feedback forms, correspondence, meeting notes

I'm rather doubtful we can meet the first target, as long as we keep thinking that if we just change the technology, we can continue consuming at ridiculously high levels (collectively, I mean -- obviously there are many poor people who consume little). LED Christmas lights initially cut our energy usage -- but we quickly made up for it by purchasing and using far more lights! Houses where I live used to be allowed walkout basements only; now they have deep in-ground basements that require more concrete, more HVAC and the use of pumps to keep them dry. Where old houses had 3 or 4 outdoor lights, now it's often 20 or 30. Even if those are LEDs, still, we're missing an opportunity to really make a dent in our carbon emissions. I could go on and on: larger vehicles, more electronic devices, more possessions. We need an attitude shift!

- Resident

Metro Vancouver is to be commended for the Goals and Actions in the draft 2021 Clean Air Plan. We recommend minor wording changes that could potentially lead to broader and more effective action in this region, specifically in outreach and motivation. Recommendations include [edited for length]:

- Metro Vancouver commit to collaborate with non-profit groups that have the capacity and expertise to communicate and motivate broadly.
- Expand 'scope' of outreach and awareness beyond residents, and include large organizations/ employers.

- Non-profit organization

Transitioning to clean electricity should be prioritized over other forms of renewable energy such as wood waste, biofuels and renewable natural gas to ensure that we will also improve regional air quality and the health of residents while reducing greenhouse gas emissions. This significant transition of our energy sector provides an unprecedented opportunity to protect the health of the population and associated societal costs from air pollution, if done well.

- Vancouver Coastal Health's Health Protection Program.

I would've preferred a more aggressive GHG emissions reduction target considering that higher-income countries should take on more responsibility. A 50% minimum requirement with a 60% target would've been preferable.

- Youth involved with the Sustainabiliteens movement

BCTA supports the notion of mandating the BC Zero Emissions Vehicle Act to extend zero emission vehicle sales requirements to medium and heavy-duty on-road vehicles, in recognition of market availability, access and vehicle reliability. […] This is a significant challenge given there are limited options currently available, and even as equipment comes to markets, the lead times to develop fleet penetration are long. We are hopeful we will see the first heavy-duty fully electric zero emission vehicle in BC in 2021, but it is critically important to recognize that the state of commercial zero emission vehicles is nearly 1.5 decades behind that of passenger vehicles.

- BC Trucking Association

Metro Vancouver's Clean Air Plan 2021 sets ambitious goals towards improvements in local air quality that will benefit not only Metro Vancouver's residents, but also your neighbors, including the FVRD.

The FVRD is currently working on our own Air Quality Management Plan (AQMP), to be finalized in September 2021, and it is encouraging to see a significant number of shared goals and opportunities for further collaboration emerge.

- Fraser Valley Regional District, staff

Tsleil-Waututh Nation is in agreement with this statement and supportive of bold action to reduce GHG emissions in the region. We need to accelerate our regional climate actions to avoid dangerous levels of climate change. The Clean Air Plan is the action plan that will directly address greenhouse gas emissions form sources in this region, supporting the vision of Climate 2050.

Beyond providing services to their communities, TWN and other Coast Salish First Nations have a stewardship obligation to protect the lands, waters and wildlife within their traditional and unceded territorities. TWN's snəẇəyəɬ, or ancestral law, provides TWN with legal principles that inform our stewardship responsibilities and obligations to our lands, waters, and səlilwətaɬ (Tsleil-Waututh people) including past, present, and future generations. [Comment in regards to Clean Air Plan content on Roles and Responsibilities]

- Tsleil-Waututh Nation

Metro Vancouver should undertake a thorough cost-benefit analysis that provides a transparent representation of the proposed strategies and actions so that the stated Clean Air Plan principle of equitable distribution of benefits and costs can be clearly reviewed and understood by all stakeholders.

The recent shift by Metro Vancouver as a regional authority to propose regulating industrial greenhouse gases (GHG) in addition to MV's current role of regulating industry's conventional air contaminants (CACs) is concerning. Given the significant initiatives already in effect and under development in both provincial and federal jurisdictions, Canadian Fuels Association recommends that Metro Vancouver not duplicate efforts on GHG emissions.

- Canadian Fuels Association

Comments related to equity (as referenced in the Committee Report)

FortisBC indicated support for Metro Vancouver's Climate 2050 and Clean Air Plan commitment to seek fair, equitable solutions that address affordability, as individual customers will reduce their energy consumption and their energy bills.

Tsleil-Waututh Nation commented 'pleased to see consideration of social equity in the context of climate change impacts and actions. First Nations communities are also disproportionately impacted

by climate change. Policies and programs that reduce emissions should support an equitable distribution of benefits and costs – How will this be implemented and monitored?'

CityHive, through a guest presentation in the public forums, noted 'The Clean Air Plan resonated with things CityHive hears from youth, especially with regards to the equity implications of decisions.'

Participants in the stakeholder forum on buildings asked that any incentive programs consider equity and that there should be common approaches to equity in the region.

Participants in the stakeholder forum on transportation asked that equity be specifically considered in any preparation for mobility pricing.

Participants in the stakeholder forum on industry noted that:

- From a human health perspective, there are huge discrepancies in the population from a health outcome perspective. Those living closer to large emitters, roadways, areas vulnerable to climate impacts (e.g. flooding, wildfire smoke) – more likely to end up on hospitals, more likely to feel climate impacts. These are often people that have faced racism and other systemic issues in society. Impacts can be seen in hospitals. Those that will be impacted the most will be those that don't have the resources to mitigate some of these impacts.
- Affordability is a big issue in this region. The type of industries that provide high paying jobs goes to the carbon leakage issue as well. Maybe an issue if industries leave the region as a result of emissions policies; those high paying jobs may be lost. Affordability lens should be considered. [And this] intersects with the discussion on marginal abatement costs.
- One of Vancouver's assets is the environment, the quality of the air. This attracts other high paying industries to the region as well.

Feedback forms reflected considerations for equity in comments about wood smoke and strata incentives, for example: 'You have a rebate program on single houses when they upgrade their windows and walls. Why don't you have the same program for Strata buildings? I believe it's a more targeted project and bigger impact than single houses. I don't think it's right NOT to give the same support to Strata buildings as you do to single houses. Why (do) you omit Strata buildings?'

Business Council of BC members raised considerations around equity and noted failing to attract businesses and jobs would be a missing part of the evaluation.

In the public forums there were requests to better consider equity, and queries on how this will be accomplished.

46299666

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Roger Quan, Director, Air Quality and Climate Change
Megan Gerryts, Senior Advisor, Regional Economic Prosperity Service

Date: May 31, 2021 Meeting Date: July 16, 2021

Subject: **2021 Update on Regional District Sustainability Innovation Fund Projects**

RECOMMENDATION
That the Climate Action Committee receive for information the report dated May 31, 2021, titled "2021 Update on Regional District Sustainability Innovation Fund Projects."

EXECUTIVE SUMMARY
This report provides an update on 14 projects that were approved for funding in 2017 through to 2020 under the Sustainability Innovation Fund. Of the projects, two are reporting as complete, one is discontinued, and the remainder are in progress. Progress on many of the projects was slowed due to the COVID-19 pandemic.

PURPOSE
This report provides an update on projects funded under the Regional District Sustainability Innovation Fund.

BACKGROUND
The Regional District Sustainability Innovation Fund (Fund) was created by the Board in 2004 to provide financial support to Regional District projects that contribute to the region's sustainability. The MVRD Board adopted the *Regional District Sustainability Innovation Fund Policy* on June 27, 2014, with further amendments in 2016, to guide the use and management of the Fund. The policy requires that the Climate Action Committee be updated on an annual basis on the deliverables, outcomes and measurable benefits of the projects receiving funding.

This report presents an update on projects that have not yet been reported as complete to the Climate Action Committee, including status, amount spent, and project outcomes.

STATUS OF SUSTAINABILITY INNOVATION PROJECTS (APPROVAL YEARS: 2017 – 2020)

The table below provides information on the status of each project. Additional details are provided in the attachment. Updates on a number of the projects have been provided to the Climate Action Committee on an individual basis in previous meetings.

Project	Approval Year	Amount Approved	Status
DC Fast Charger at Metro Tower III	2017	$150,000	Complete
LumiAir: Lighting your path to Clean Air	2018	$140,000	In progress
Air Aware: Air Quality and Citizen Science	2018	$95,000	In progress

Climate Literacy Modules	2019	$160,000	In progress
Sustainable Infrastructure and Buildings Policy: Design Guide	2019	$150,000	Complete
Transit-Oriented Affordable Housing Implementation Calculator	2019	$100,000	Discontinued
Targeted Invasive Plant Grazing in Metro Vancouver	2020	$150,000	In progress
Using eDNA Sampling Technology in Regional Parks	2020	$68,000	In progress
Preventing Smoke Emissions from Agricultural Waste Management	2020	$140,000	In progress
Clean Air for Students and Schools (CLASS)	2020	$200,000	In progress
Mobile Monitoring of Fugitive and Other Industrial Air Emissions with "Flying Labs"	2020	$100,000	In progress
Building Resilience: Exploring the Potential of Renewable Energy Building Infrastructure	2020	$200,000	In progress
Net-Zero Feasibility Study for Welcher Affordable Housing Development	2020	$160,000	In progress
Step Code Implementation Impacts for Building Envelope Rehabilitation of Existing Buildings	2020	$90,000	In progress

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

The projects summarized in this report had funding approved by the MVRD Board from 2017-2020. The disbursals of funds were made in accordance with the applicable *Sustainability Innovation Fund Policy* that governs the use and management of the Funds.

The table below outlines the funding approved and the amount spent to date for each project. Any unspent funds for completed projects remain in the Sustainability Innovation Fund reserve.

Project	Total Amount of Funding Approved	Amount Spent (as of May 31, 2021)
2017 Approval Year		
DC Fast Charger at Metro Tower III	$150,000	$118,417
2018 Approval Year		
LumiAir: Lighting your path to Clean Air	$140,000	$96,554
Air Aware: Air Quality and Citizen Science	$95,000	$70,000
2019 Approval Year		
Climate Literacy Modules	$160,000	$27,664
Sustainable Infrastructure and Buildings Policy: Design Guide	$150,000	$149,510
Transit-Oriented Affordable Housing Implementation Calculator	$100,000	$0
2020 Approval Year		
Targeted Invasive Plant Grazing in Metro Vancouver	$150,000	$27,000
Using eDNA Sampling Technology in Regional Parks	$68,000	$32,555

Project	Total Amount of Funding Approved	Amount Spent (as of May 31, 2021)
Preventing Smoke Emissions from Agricultural Waste Management	$140,000	$72,400
Clean Air for Students and Schools (CLASS)	$200,000	$0
Mobile Monitoring of Fugitive and Other Industrial Air Emissions with "Flying Labs"	$100,000	$0
Building Resilience: Exploring the Potential of Renewable Energy Building Infrastructure	$200,000	$0
Net-Zero Feasibility Study for Welcher Affordable Housing Development	$160,000	$160,000
Step Code Implementation Impacts for Building Envelope Rehabilitation of Existing Buildings	$90,000	$0

The balance in the Regional District Sustainability Innovation Fund at December 31, 2020 was $11.45 million.

OTHER IMPLICATIONS

At the February 2021 meeting, the Climate Action Committee directed staff to review the Sustainability Innovation Fund policies and provide recommendations for amendments for Board consideration. Report 5.5 in the Committee's July 2021 agenda package responds to that direction.

CONCLUSION

This report has presented an update on fourteen projects funded under the Regional District Sustainability Innovation Fund. The Sustainability Innovation Funds were created by the Board in 2004 to provide financial support to utility or Regional District projects that contribute to the region's sustainability.

Attachment

Update on Regional District Sustainability Innovation Fund Projects

45909632

ATTACHMENT

UPDATE ON REGIONAL DISTRICT SUSTAINABILITY INNOVATION FUND PROJECTS

DC Fast Charger at Metro Tower III: Complete

Accelerated electric vehicle (EV) adoption is a key greenhouse gas (GHG) reduction opportunity in the transportation sector, which is reflected in the *Climate 2050 Transportation Roadmap*. To better understand EV charging needs and challenges, Metro Vancouver installed a Direct Current (DC) Fast Charger at Metrotower III with the objectives of filling a gap in the regional network of charging stations and testing an innovative two-tiered pricing system. The installation is meant to support EV charging for a wide range of user groups, including the public, Metro Vancouver's fleet and staff vehicles, and Metrotower III tenants.

The charging station was commissioned in September 2019 for public use, and implemented a two-tiered, time based pricing system, designed to incentivize users to unplug and make the station available for the next user. Users are initially charged $0.30 per minute, and after the first 30 minutes of charging, a higher tiered price of $0.50 per minute is initiated.

Staff have monitored station usage since installation and noted the following key outcomes:

- Over two thirds of charge events are under 30 minutes
- About 50% of charge events are under 20 minutes
- Only 7% of charge events are over 1 hour

These outcomes suggest that the pricing structure is having the intended effect of incentivizing shorter charge times to ensure vehicle turnover at the charging station. However, assessment of the pricing structure was impacted by the COVID-19 pandemic, which saw limited public access and equipment downtime as public health restrictions resulted in much lower use for the final 6 months of the pilot. Additionally, the charging data and user feedback captured during this DC Fast Charging demonstration project has shown that higher pricing can be a deterrent for EV users. These findings suggest that a regional pricing approach for EV charging may be a better approach while still ensuring user turnover and respectful charging etiquette.

LumiAir: Lighting your path to Clean Air: In Progress

The LumiAIR project aims to engage and educate the public through a thought-provoking and accessible visual display of air quality that allows the public to associate the data collected at Metro Vancouver air quality monitoring stations with air quality in their community. The first phase of the project is complete whereby preliminary designs were developed, focus groups were conducted, and a final design was selected. The final design incorporates public feedback from the focus groups.

Staff have initiated the final phase to build and configure the display, which includes a touchscreen interface, kiosk display, computer, and Metro Vancouver branding. The display will show real-time, current air quality data and allow comparisons to scenarios that represent community exposure to a wildfire smoke day, hot summer elevated ground-level ozone day and air quality decades ago.

Key outcomes to date:

- Conducted two public focus groups,
- Prepared three preliminary designs and selected a final design,

- Designed the user interface and kiosk to house the screen,
- Procured the display components and hardware, and
- Programmed the display to retrieve real-time data and produce a graphical representation.

Air Aware: Air Quality and Citizen Science: In Progress

Air Aware aims to understand the strengths and limitations of small, low-cost, air quality sensors; support the public in the appropriate use of these sensors; and examine the sensors' potential to augment Metro Vancouver's air monitoring network. Phase 1 is complete: staff co-located sensors at Metro Vancouver's air quality monitoring stations to compare their performance to standard instruments used in Metro Vancouver's air quality monitoring network and then lent sensors to a number of volunteer residents to learn about their experience with them. Phase 2 is underway: staff created and published a website to provide guidance to anyone interested in using small air sensors. In parallel with the website, staff drafted a technical report to summarize Metro Vancouver's research and evaluation of selected small sensors. The report is undergoing final review and will be published on the Air Aware website when completed.

Key outcomes to date:

- Deployed air sensors with 12 volunteers and gathered feedback on their experience;
- Completed first and second co-location of air sensors at Metro Vancouver's air monitoring stations;
- Completed draft of technical report, including all data analysis; and
- Published Air Aware webpages: http://www.metrovancouver.org/services/air-quality/action/air-aware/Pages/default.aspx

Climate Literacy Modules: In Progress

Climate Literacy Modules are intended as a learning tool to encourage audiences that are less familiar with climate change science and effective climate action in this region to explore and learn some of the concepts, ideas, and terminology used in climate action conversations. The outcome is that a learner will feel more confident in participating in conversations about climate solutions. The tool is designed in a series of online modules, where the learner can work through them linearly or in their chosen order and pace.

Staff have developed content for the learning modules, with input from external advisors including a K-12 curriculum development specialist, an Indigenous knowledge advisor, and a climate scientist.

The project team is in the process of moving this content into the learning module platform with interactive components including characters, white board video, knowledge testers and other tools designed to engage the learner. There are features for accessibility.

The project was put on hold in spring 2020 as project staff shifted workloads to manage changes stemming from the pandemic. The building of the learning modules is now moving quickly.

Next steps will include completing the learning modules, testing and revising the learner experience, and promotion. The audience is intentionally inclusive and this is designed as a publically accessible tool. The audiences considered includes as examples; teachers and learners, municipal staff (e.g. in

professions not currently focused on climate action), residents broadly, and similar. There is ongoing interest from other governments as the modules develop.

Sustainable Infrastructure and Buildings Policy: Design Guide: Complete

In October 2018 the Metro Vancouver Board adopted the *Sustainable Infrastructure and Buildings Policy*. This policy aims to ensure that the wide range of projects undertaken by Metro Vancouver are consistent in their approach to sustainable design and construction. Design teams are compelled to incorporate performance-based considerations for energy efficiency and GHG emissions, sustainable and efficient use of resources, and ecological health. The policy targets Leadership in Energy and Environmental Design (LEED) Gold and BC Energy Step Code Level 3 as minimum standards for occupied buildings and Envision Gold for infrastructure.

In 2019, with support from the SIF, work began to develop a *Sustainable Infrastructure and Buildings Policy Design Guide* to facilitate and support the successful application of the policy to new infrastructure and building projects as well as significant retrofits to existing infrastructure and buildings. The Design Guide was completed in March 2021, and provides detailed technical guidelines to be used by Metro Vancouver staff and consulting teams to assist delivering high performance, sustainable infrastructure and building projects.

Development of the Design Guide was led by staff in Air Quality and Climate Change with support from the CAO's office, complemented by a technical advisory group and steering committee comprising staff from each service area. Staff are now working to develop a rollout plan with training and support, and intend to bring a report in Fall 2021 to introduce the Board to the Design Guide.

Transit-Oriented Affordable Housing Implementation Calculator: Discontinued

The Transit-Oriented Affordable Housing Implementation Calculator was originally intended to communicate the development cost analysis of the Transit-Oriented Affordable Housing (TOAH) Study interactively, allowing users to "learn by doing". In the Summer of 2020, after conducting an information interview with the developer of inclusionary housing web tools, it was determined that: the potential audience for the TOAH Calculator was more limited than anticipated; user uptake would be a challenge; and the overall benefits would likely not justify the expenditure. The project team now recommends that the project not be completed.

Regional Planning and Housing staff continue to explore transit-oriented affordable housing through other projects and studies, such as a forthcoming update to the 2013 Housing and Transportation Cost Burden Study.

Targeted Invasive Plant Grazing in Metro Vancouver: In Progress

In mid-2020 Metro Vancouver initiated Phase 1 of the "Targeted Invasive Plant Grazing" project by retaining a consultant to assess the feasibility of grazing as an herbicide-free invasive plant control option. Informed by a literature review and interviews with fourteen practitioners from across Western Canada and the US, the consultant concluded that goats are the most suitable livestock species (compared to sheep, pigs, and cattle), and that targeted grazing:

- may be an effective control method for Himalayan blackberry, giant hogweed, English and Irish ivies, Himalayan balsam, Himalayan blackberry, purple loosestrife, Scotch broom, and wild chervil;
- control efficacy is likely similar to hand pulling or mowing, with repeated treatments required for long term control; and
- is logistically complex, 2-4 times costlier, and 2-5 times more carbon-intensive in Metro Vancouver at this time, due a lack of local trained herds and the need to transport herds from other areas of BC or Alberta.

During its meeting on April 16, 2021, the Climate Action Committee received a staff report and presentation summarizing these study results. Regional Parks staff are further exploring whether: a) a suitable trained local herd can be found, and b) the complex logistical requirements can be met prior to conducting a pilot project at Aldergrove Regional Park.

Using eDNA Sampling Technology in Regional Parks: In Progress

Environmental DNA (eDNA) sampling is a relatively new survey technique that relies on the detection of genetic materials collected from habitats and analyzed in a laboratory. This emerging method uses less effort than traditional sampling, is more cost-effective, and is far less invasive to sensitive fish and wildlife species. This project aims to help Metro Vancouver better understand the presence and distribution of key aquatic species to inform park management decisions and support the maintenance of ecosystem resilience in parks.

In the first year of the project staff were trained in both field sample collection and laboratory processing techniques, equipment was sourced and procured, and 5 parks were sampled for 8 species:

- Kanaka Creek, Derby Reach, Colony Farm, Minnekhada, Grouse Mountain
- Species sampled: coastal cutthroat trout, coho salmon, red-legged frog, Pacific water shrew, coastal tailed frog, western toad, rainbow trout, Oregon spotted frog
- All samples were sent to the Helbing Lab at the University of Victoria (UVIC).

The development of new primers for two local species of interest were initiated. Specimens were collected by consulting biologists and sent to the UVIC lab where they isolate the DNA. The DNA is then sequenced by an external agency and then sent back to create the new primers. Finally, these are tested against many conspecifics to ensure correct results. The Salish Sucker Technical Bulletin is complete but not yet published, and that primer is now available for public use. The Oregon Fairy Shrimp primer is still in progress.

It was helpful to learn red-legged frogs (a species at risk in BC) had moved into two of the restored wetlands that were tested in east area. Many results came back negative for species that were tested for, and that is also helpful for management. Results to date have been shared with partner groups who volunteered by helping out with the field surveys, as well as in the Regional Parks newsletter and Facebook posts. The 2020 results were also shared with the Metro Vancouver Watersheds Environmental Management team.

Preventing Smoke Emissions from Agricultural Waste Management: In Progress

Open-air burning of vegetative debris is a source of fine particulate matter and other air contaminants, including greenhouse gases, in the region. These air contaminants are harmful to public health and the environment. In 2020, the first part of this project was initiated in the form of a study to investigate the benefits and barriers to using alternatives to open-air burning for managing agricultural vegetative debris in the Metro Vancouver region. The findings of the study indicated that alternative waste management methods produce fewer emissions of both particulate matter and greenhouse gases compared to open-air burning. However, there are barriers to using alternative methods for farmers in the region, which include cost, complexity, practical feasibility, biosecurity considerations, and equipment availability. This phase of the project was completed in early 2021 and was the subject of an information report to the June 11, 2021 Climate Action Committee meeting (Reference: Climate Action Committee Agenda June 11, 2021 (metrovancouver.org)).

Work has begun on procurement of consulting services for the second phase of the project to develop a multi-language best practices guide to support the use of low-emission alternatives to open-air burning of agricultural vegetative debris. The guide will provide information for farmers about alternative waste management options for vegetative debris that avoid open-air burning, such as recycling and reusing, or methods that reduce emissions from burning. Development of the best practices guide will draw upon the findings of the first part of the project. To ensure that the guide is tailored to the Metro Vancouver region, the local agriculture sector, including farmers and representatives of farming associations, educational institutions, and BC Ministry of Agriculture, Food and Fisheries will be involved in the development of the guide. The project will also gather input from organizations and businesses that have information about local markets and specifications for the products of alternative waste management practices. This project is currently expected to be completed by the end of 2021.

Clean Air for Students and Schools (CLASS): In Progress

Clean Air for Students and Schools (CLASS) will pilot actions to reduce exposure to traffic-related air pollution in and around schools. The project will involve teachers, students, and parents so they can learn more about their exposure to air pollution and how to measure it. The project has 3 parts:

1. Partnering with schools in the Metro Vancouver region to assess the different areas for sources of traffic-related air pollution and identify ways to reduce exposure to them.
2. Piloting actions to reduce exposure to traffic-related air pollution and involving teachers, students, and parents in measuring air quality using small, low-cost air sensors, before and after implementation of mitigation actions.
3. Creating a report and teaching tools for other schools on potential ways to reduce exposure to traffic-related air pollution.

Due to the COVID-19 pandemic response, limited access to schools, and teachers' increased workload during this time, this project was put on hold in 2020 and 2021. While CLASS was on hold, staff researched other programs involving air quality at schools, such as TransLink's Youth Travel Strategy and Sonoma Technology's Kids Making Sense program, to learn about potential partnerships and existing programs' successes and challenges.

Mobile Monitoring of Fugitive and Other Industrial Air Emissions with "Flying Labs": In Progress
The aim of this project is to assess whether drone-mounted small sensor air monitoring equipment can be used to measure air contaminants effectively and accurately from emissions that are scattered, difficult to access from the ground, or not contained within a facility's site boundaries. The project is planned to be conducted in two parts. The first part involves contracting a licensed drone operator to fly a commercial drone capable of carrying small sensors to determine the feasibility of this sampling platform for investigating sources of air emissions in the Metro Vancouver region. The second part of the project is expected to focus on using the drone-mounted air monitoring equipment to more fully characterize emissions from key sources where existing monitoring and sampling techniques.

Due to the COVID-19 situation, securing the services of a licensed drone operator and a commercial drone was delayed in 2020. Ground-based mobile measurement tests were conducted using Metro Vancouver's existing small sensor equipment. In addition, progress was made in 2020 on assessing the suitability of small sensor equipment and the constraints on flying drones. Specific findings include:

- The identification of the only currently commercially available monitoring equipment that is designed to be mounted on a drone and measure a variety of air contaminants using small sensor technology;
- Limitations of currently available sensor technologies for air contaminants other than particulate matter;
- The limits on the weight of loads that can be carried by various drones;
- Location and environmental limitations on drone flights in the Metro Vancouver region; and
- The availability and required qualifications of contractors to conduct flights.

Procurement is underway to secure a contractor to conduct the first part of this project in the early summer of 2021.

Building Resilience: Exploring the Potential of Renewable Energy Building Infrastructure: In Progress
The purpose of this project is to target low emission renewable energy technology to build resiliency within affordable housing. Evaluating the feasibility of incorporating renewable energy in to building infrastructure is the first step towards understanding the role it could play in a climate resilient and low carbon region. By taking the first step, Metro Vancouver can demonstrate the feasibility of this approach within the region and lead the region in building low carbon resilience.

The project is still in early planning stages and delayed due to the COVID-19 situation requiring additional staff time and attention to stabilize operations and processes as well as support tenants through additional financial hardship. As stability returns to operational functions the project will be picked up and progressed through late 2021 and into 2022. Information gathered from the *Net-Zero Feasibility Study for Welcher Affordable Housing Development* project will support future actions.

Net-Zero Feasibility Study for Welcher Affordable Housing Development: In Progress
The purpose of this project is to study the feasibility of designing and constructing MVHC's Welcher Avenue multi-family residential affordable rental redevelopment project to a Netzero Energy (NZE)

or Netzero Energy Ready (NZER) standard. The NZE/NZER standard characterizes a building with dramatically reduced operational energy consumption compared with standard base building code designs, with the possibility of offsetting building energy consumption with on-site renewable energy generation.

This study is being completed in partnership with the Federation of Canadian Municipalities' Green Municipal Fund (FCM-GMF). If achieving NZE or NZER is determined to be feasible for the Welcher project, the construction phase may become eligible for capital grant funding through the FCM-GMF program. The FCM-GMF has specified a Total Energy Usage Intensity (TEUI) target of 80 kWh/m^2/yr. Preliminary energy modelling results from the study has shown that through innovative energy reduction strategies and design features, the building's predicted TEUI value is approximately 60 kWh/m^2/yr. Comparing this value to a BC Energy Step Code Level 4 TEUI requirement of 100 kWh/m^2/yr, the energy conservation measures proposed for the Welcher development represent a dramatic reduction in both operational energy use and greenhouse gas emissions over the life of the building even when compared to a high-performance Step Code 4 building.

Furthermore, work on this study has created another possible grant funding opportunity with the Province of British Columbia's CleanBC program, which offers cash incentives for greenhouse gas emissions and electrification of natural gas building systems. The pursuit of energy reduction strategies during the NZE/NZER study led to substituting the building's natural gas systems (heating, ventilation, air conditioning and domestic hot water) to high efficiency electric air-source heat pumps, which further supports climate policy objectives of Metro Vancouver, as well as those of the provincial and federal governments.

The NZE/NZER feasibility study will conclude in July 2021, at which time Metro Vancouver Housing (MVH) intends to submit an application for capital grant funding through the FCM-GMF program for the Welcher Affordable Housing Redevelopment project. Construction of the Welcher Affordable Housing Redevelopment project is expected to begin in the fourth quarter of 2021.

Step Code Implementation Impacts for Building Envelope Rehabilitation of Existing Buildings:
In Progress

The purpose of this project is to better understand the levels of the BC Building Code Step Code and its cost and performance implications for major renewals of MVHC's existing housing stock. The current BC Building Code is written for implementation with new building construction, but does not strictly apply to existing building renewals. A large portion of MVHC's existing housing projects were constructed approximately 40 years ago and many major building components (roofing, windows, cladding, etc.) are reaching the end of their service lives. The near future requirement of major capital investment into the existing housing stock creates the opportunity for performance upgrades to align with Metro Vancouver's strategies, plans and policies and the current building Step Code. An in-depth understanding of the economic and performance implications of the step code is of great interest as an affordable housing provider in the region.

This study will:

- create a guide for making informed decisions when designing and constructing upcoming major building renewals.
- provide insight on performance metrics (energy consumption, greenhouse gas emission).

- Provide insight on marginal and long-term maintenance costs.

Housing's Capital Maintenance team have been working with Pembina on a related project, Reframed (deep retrofits). Pembina have been working with RDH and have produced a draft report that contains information that will overlap well with the SIF Step Code Implementation Impacts for Building Envelope Rehabilitation of Existing Buildings research and report. Now that the Pembina report is completed in draft, Metro Vancouver Housing are working with RDH Consultants to obtain a proposal to build on the Pembina report and conduct additional research to develop the specific requirements and cost implications to achieve the various Step Code levels in existing buildings. Additionally, a change to the BC Building Code is coming with respect to rehabilitation of existing buildings. Metro Vancouver Housing are making efforts to collaborate with the team working on the Code upgrade to ensure information and work efforts are being shared to enhance both projects.

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Megan Gerryts, Senior Advisor, Regional Economic Prosperity Service
Roger Quan, Director, Air Quality and Climate Change, Parks and Environment

Date: June 25, 2021 Meeting Date: July 16, 2021

Subject: **Proposed Updates to the Sustainability Innovation Fund Policies**

RECOMMENDATION

That the MVRD Board approve the proposed updates to the Regional District Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

That the GVS&DD Board approve the proposed updates to the Liquid Waste Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

That the GVWD Board approve the proposed updates to the Water Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

EXECUTIVE SUMMARY

The Sustainability Innovation Fund (SIF) program allows the Metro Vancouver organization to address critical climate challenges, meet strategic objectives and pilot innovative ideas. SIF projects touch on areas such as the circular economy, resource recovery, emissions reduction and environmental protection.

Following direction from the Climate Action Committee, staff are bringing forward proposed updates to the Sustainability Innovation Fund policies to strengthen and amplify the positive outcomes of the program. To address the stagnant annual contribution to the fund, Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects.

Starting in 2024, staff are proposing that Financial Services gradually phase in an increase in the contribution amount to each of the Sustainability Innovation Fund reserves. Annual contributions will not exceed 1% of the respective legal entity's operating budget and a maximum amount in the fund will be set at $25 million, indexed to inflation.

PURPOSE

To seek Board approval for the proposed updates to the three Sustainability Innovation Fund (SIF) policies.

BACKGROUND

At its meeting held February 12, 2021, the Climate Action Committee directed to staff to review the Sustainability Innovation Fund policies. Key issues discussed included how current annual contributions to each of the three funds are based on the GST rebate amount from 2005, and the $100,000 limitation on annual funding for projects under the Regional District SIF. Staff have conducted a review of the Sustainability Innovation Fund program and are recommending policy changes to address the stagnant annual contribution and funding cap for Regional District projects, as well as additional changes focused on enabling projects that can improve sustainability through innovation or continuous improvement, create positive economic benefits for the region, and further sustainability goals in response to the climate emergency. To ensure the fund can support innovative projects going forward, staff are recommending linking the annual funding amount to the annual operating budget and phasing in an increase over time starting in 2024.

VALUE OF INNOVATION

In order to be able to address the climate emergency and meet our corporate objectives, innovation is required. For a large organization such as Metro Vancouver, there is a need to invest in innovation and this will involve: research and development, the adoption of new products, improved processes and production practices, technologies and business strategies.

The SIF program is unique as it allows staff to bring forward their innovative ideas and partner with those outside the organization to put ideas into action. Successful partnerships may lead to significant benefits for the organization, and region, in terms of efficiency gains in utility processes, delaying or reducing the need for costly infrastructure upgrades or providing significant environmental benefits. These will help to keep services affordable for the region and improve the resilience of Metro Vancouver systems.

As an example, the Hydrothermal Processing Biofuel Demonstration project will evaluate the conversion of wastewater biomass to low carbon transportation fuels. If this SIF project is successful, it can lead to full-scale implementation of the technology at the Iona Island Wastewater Treatment Plant for an estimated net present value savings of more than $60 million compared to the business as usual scenario. Further, a full-scale facility at Iona Island can reduce GHG emissions by 16,000 tonnes CO_2e/yr, which has attracted the attention of the advanced biofuel industry and petroleum producers seeking to decarbonize liquid transportation fuels. Expressed interest from organizations such as International Energy Agency – Bioenergy, the U.S. Department of Energy, the Commercial Aviation Alternatives Fuels Initiative, and the Water Research Foundation provided incentive for private-sector and provincial investments of $5 million towards the Hydrothermal Processing Biofuel Demonstration project.

The SIF program is able to bridge the gap between research and commercialization, which is often the hardest type of funding to secure. Being able to invest in technological innovation in the region also yields great economic-development returns, driving entrepreneurship, an export-oriented economy and greater prosperity for the region. Additionally, these funds can often be leveraged as they allow researchers to acquire matching funding from other sources.

With this policy update there is an opportunity to increase partnerships centered on technological innovation that will create these economic benefits and meet corporate objectives. These types of projects may generate returns on SIF project investments through Intellectual Property royalties. A review of comparable governmental organizations that focus on innovation revealed that these organizations typically spend 0.5%-2% of their budget on innovation.

PROPOSED POLICY AMENDMENTS

The three amended SIF Policies attached to this report (Attachments 1-3) show proposed amendments that have been made in response to Committee direction and identified program issues. Attachments 4-6 show the red line versions of the policies. The amendments are designed to enable a wider variety of projects that will reduce emissions, protect the environment or advance regional resilience. The amended policy language explicitly encourages partnerships that will lead to innovative solutions to Metro Vancouver's challenges.

Policy Changes	Existing	Proposed
Funding amounts	Annual contributions: LW: $1,127,000 RD: $347,000 WS: $723,000	Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects. Annually, an amount no greater than 1% of the legal entity's annual operating budget will be transferred to the fund. The fund balance will be set at a maximum amount of $25 million indexed to inflation.
Project funding limits	Regional District limited to $100k per year per project.	Remove Regional District funding limit.
Eligible proposals must include sustainability principles	Definition of sustainability from the defunct Sustainability Framework.	Sustainability refers to reducing emissions, protecting the environment and/or advancing regional resilience.
Eligible proposals must forward innovation or provide continuous improvement	Innovation not defined. Beyond 'business as usual' requirement creates challenges with respect to interpretation.	Proposals may cover the spectrum of projects involving true innovation to continuous improvement.
Partnerships	Projects must consider partnerships. Support given to projects that involve members.	Additional emphasis on partnerships, particularly ones that will lead to innovative solutions to Metro Vancouver's challenges, such as through applied and/or translational research within the region's academic institutions. Solutions may be generated through a crowd-sourcing ideation process.
Accountability	Reporting on project outcomes to Committee and in e-Library	Improved project reporting through project close out template (including KPI reporting)

Accountability

Staff are also intending to improve the accountability of SIF-funded projects by implementing measures to improve reporting on project outcomes, such as Key Performance Indicator (KPI) reporting. KPIs are currently identified by project proponents as part of the SIF application process, and new procedures will be put in place to facilitate consistent reporting during projects and at project completion. Closer attention will also be paid in the evaluation of potential projects with respect to qualitative and quantitative data on each of the projects.

Annual Contribution

The current policy language sets the annual contribution amount for each of the three funds based on the GST rebate amount set in 2005. This annual funding amount is problematic as it is a stagnant amount that does not take into account the value of money over time. In response to this issue, staff are proposing that the annual contribution to the fund be determined by Financial Services, up to a maximum of 1% of the legal entity's operating budget. This increase in funding will be phased in gradually over time with increases starting in 2024.

The broadening of definitions in the policy, as well as removal of the funding cap, will likely create pressure on the remaining balances. In response to this, staff are proposing an increased contribution. Without an increased contribution, the enhancements to the policy language may drive the fund to depletion. Conversely, in order to protect against any of the three fund balances getting too large, the proposed policy mandates that the maximum amount in the fund cannot exceed $25 million, indexed to inflation. This amount was determined as being sufficient to support innovative projects going forward.

Table 1: Schedule of fund contributions based on current 5-Year Financial Plan *(subject to budgetary processes and review)*

	2022	**2023**	**2024**	**2025**	**2026**
WS Annual Contribution	$723,000	$723,000	$ 1,861,500	$ 2,484,600	$3,500,000
% of operating budget	0.22%	0.21%	0.5%	0.6%	0.7%
LW Annual Contribution	$1,127,000	$1,127,000	$2,351,500	$3,259,200	$5,250,000
% of operating budget	0.3%	0.27%	0.5%	0.6%	0.7%
RD Annual Contribution	$347,000	$347,000	$554,500	$684,000	$840,000
% of operating budget	0.4%	0.4%	0.5%	0.6%	0.7%

Staff believe that coupling the funding amount to the operating budget is expected to create a stable proxy to base annual contributions on. Allowing Financial Services to set the annual contribution schedule, up to the maximum amount of 1% of the operating budget, phased in over time, gives the organization the flexibility to ensure the fund is able to support innovative projects going forward while safeguarding against the fund getting too large. Fund contributions will be subject to budgetary processes and review.

The proposed maximum of 1% of the operating budget is consistent with similar utility organizations that invest in innovation. In the scan of similar governmental organizations, innovation investments ranged from 0.5%-2% of the overall budget amount. These investments can add corporate value in

the form of economic, environmental and social benefits. Additionally, intangible benefits include valuable partnerships with other organizations, corporate integrity and public trust.

ALTERNATIVES

1. That the MVRD Board approve the proposed updates to the Regional District Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

   That the GVS&DD Board approve the proposed updates to the Liquid Waste Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

   That the GVWD Board approve the proposed updates to the Water Sustainability Innovation Fund as presented in the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies".

2. That the Climate Action Committee receive for information the report dated June 25, 2021, titled "Proposed Updates to the Sustainability Innovation Fund Policies" and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

If the Board approves Alternative 1, Financial Services will gradually phase in an increase in the contribution amount to each of the SIF reserves starting in 2024. Table 1 shows the planned schedule for contribution increases. Annual contributions will not exceed 1% of the legal entity's operating budget and a maximum amount in the fund is set at $25 million, indexed to inflation.

CONCLUSION

Following direction from the Climate Action Committee, staff are bringing forward proposed updates to the Sustainability Innovation Fund policies to strengthen and amplify the positive outcomes of the program. To address the stagnant annual contribution to the fund, Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects. Starting in 2024, staff are proposing that Financial Services gradually phase in an increase in the contribution amount to each of the Sustainability Innovation Fund reserves. Annual contributions will not exceed 1% of the respective legal entity's operating budget and a maximum amount in the fund will be set at $25 million, indexed to inflation.

Attachments

1. Liquid Waste Sustainability Innovation Fund Policy
2. Regional District Sustainability Innovation Fund Policy
3. Water Services Sustainability Innovation Fund Policy
4. Liquid Waste Sustainability Innovation Fund Policy Red Line Version
5. Regional District Sustainability Innovation Fund Policy Red Line Version
6. Water Services Sustainability Innovation Fund Policy Red Line Version

46409721

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

BOARD POLICY

LIQUID WASTE SUSTAINABILITY INNOVATION FUND

Effective Date: June 24, 2014 (revised month day, year)

Approved By: GVS&DD Board

Policy No. FN-003

PURPOSE

The Policy is designed to ensure that the Liquid Waste Sustainability Innovation Fund (Fund) is used to support projects of the liquid waste utility that contribute to the region's sustainability and that the Fund is managed in an effective, transparent, and accountable manner.

POLICY

The Liquid Waste Sustainability Innovation has been in place since October 29, 2004, when the GVS&DD Board approved the creation of a Fund that would be "dedicated to funding projects based on the principles of sustainability." Projects must contribute to the region's sustainability by reducing emissions, protecting the environment and/or advancing regional resilience.

The fund is designed to support projects that demonstrate an innovative approach that is considered less proven or beyond the level of risk tolerated through the budget process. Projects may also adopt a continuous improvement approach that would not be feasible through the regular budget process due to funding or risk tolerance constraints.

Projects are encouraged to consider partnerships that will lead to innovative solutions to Metro Vancouver's challenges, particularly through applied and/or translational research within the region's academic institutions. These solutions may be generated through a crowd-sourcing ideation process.

Projects supported by the Fund must:

- be overseen by the GVSⅅ
- be consistent with the authority and responsibility of the GVSⅅ
- be consistent with the objectives of the *Integrated Liquid Waste and Resource Management Plan* and/or the *Board Strategic Plan*;
- consider partnerships including, but not limited to, member jurisdictions, academic institutions, non-governmental organizations, and community groups;
- result in a positive contribution, in the form of tangible results and/or measurable benefits, to the sustainability of the region;
- demonstrate innovation or a continuous improvement approach.

Fund Management

- Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects.

- Annually, an amount no greater than 1% of GVS&DD's annual operating budget will be transferred to the fund.
- The fund will be set at a maximum amount of $25 million indexed to inflation.
- Any revenues generated from projects derived from SIF investments will be taken into consideration with respect to annual contribution amounts.
- The total amount disbursed from the Fund in any year is at the discretion of the GVS&DD Board and will depend on the merit of the proposals submitted.
- Reporting on the balance of the Liquid Waste Sustainability Innovation Fund will be carried out through the Status of Reserves report.

Annual Evaluation and Decision-Making Process

- Project proposals will be evaluated by the Sustainability Innovation Fund Inter-Departmental Steering Committee according to the criteria outlined in the Application Package
- Staff will provide the designated Standing Committee with a report on recommendations on the proposals considered for funding and implications of these recommendations on the Fund's balance.
- The designated Standing Committee will provide its recommendations to the GVS&DD Board which will make the final decision on projects to be funded.

Reporting on the Fund's Contributions to Regional Sustainability

- On an annual basis, the designated Standing Committee will receive a report on the projects supported by the Fund including the deliverables, outcomes, and the measurable benefits of these projects to the region's sustainability.
- Project reports will be housed in an "e-Library" for easy access by member jurisdictions, regions and others who are interested in learning from the experiences, and who wish to assess the transferability of certain projects to other jurisdictions.

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

BOARD POLICY

REGIONAL DISTRICT SUSTAINABILITY INNOVATION FUND

Effective Date: October 24, 2014 (revised month day, year)

Approved By: GVRD Board

Policy No. FN-007

PURPOSE

The Policy is designed to ensure that the Regional District Sustainability Innovation Fund (Fund) is used to support projects that will contribute to the region's sustainability and that the Fund is managed in an effective, transparent and accountable manner.

POLICY

The Regional District Sustainability Innovation Fund has been in place since October 29, 2004, when the GVRD Board approved the creation of a Fund that would be "dedicated to funding Regional District projects that are based on the principles of sustainability". Projects must contribute to the region's sustainability by reducing emissions, protecting the environment and/or advancing regional resilience.

The fund is designed to support projects that demonstrate an innovative approach that is considered less proven or beyond the level of risk tolerated through the budget process. Projects may also adopt a continuous improvement approach that would not be feasible through the regular budget process due to funding or risk tolerance constraints.

Projects are encouraged to consider partnerships that will lead to innovative solutions to Metro Vancouver's challenges, particularly through applied and/or translational research within the region's academic institutions. These solutions may be generated through a crowd-sourcing ideation process.

Projects supported by the Fund must:

- be overseen by the MVRD;
- be consistent with the authority and responsibility of the MVRD;
- be consistent with the objectives of the *Board Strategic Plan* or other regional district plans as applicable;
- consider partnerships including, but not limited to, member jurisdictions, academic institutions, non-governmental organizations, and community groups;
- result in a positive contribution, in the form of tangible results and/or measurable benefits, to the sustainability of the region;
- demonstrate innovation or a continuous improvement approach.

Support will be given in the evaluation process to regional district projects that involve one or more member jurisdictions, particularly if such involvement can be used to leverage additional funding

from a municipality or another source. In order to promote equity in the involvement of members, efforts will be made to involve a variety of different members in different projects.

Fund Management

- Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects.
- Annually, an amount no greater than 1% of MVRD's annual operating budget will be transferred to the fund.
- The fund will be set at a maximum amount of $25 million indexed to inflation.
- Any revenues generated from projects derived from SIF investments will be taken into consideration with respect to annual contribution amounts.
- The total amount disbursed from the Fund in any given year is at the discretion of the MVRD Board and will depend on the merit of the proposals submitted.
- Reporting on the balance of the Regional District Sustainability Innovation Fund will be carried out through the Status of Reserves report.

Annual Evaluation and Decision-Making Process

- Project proposals will be evaluated by the Sustainability Innovation Fund Inter-Departmental Steering Committee according to the criteria outlined in the Application Package.
- Staff will provide the designated Standing Committee with a report on recommendations on the proposals considered for funding and implications of these recommendations on the Fund's balance.
- The designated Standing Committee will provide its recommendations to the MVRD Board which will make the final decision on received applications.

Reporting on the Fund's Contributions to Regional Sustainability

- On an annual basis, the designated Standing Committee will receive a report on the projects supported by the Fund including deliverables, outcomes, and the measurable benefits of these projects to the region's sustainability.
- Project reports will be housed in an "e-Library" for easy access by member jurisdictions, regions and other who are interested in learning from the experiences, and who wish to assess the transferability of certain projects to other jurisdictions.

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

BOARD POLICY

WATER SUSTAINABILITY INNOVATION FUND

Effective Date: June 27, 2014 (revised July month day, year)

Approved By: GVWD Board

Policy No. FN-005

PURPOSE

The Policy is designed to ensure that the Water Sustainability Innovation Fund (Fund) is used to support projects of the water utility that contribute to the region's sustainability and that the Fund is managed in an effective, transparent, and accountable manner.

POLICY

The Water Sustainability Innovation Fund has been in place since October 29, 2004, when the GVWD Board approved the creation of a Fund that would be "dedicated to funding projects based on the principles of sustainability." Projects must contribute to the region's sustainability by reducing emissions, protecting the environment and/or advancing regional resilience.

The fund is designed to support projects that demonstrate an innovative approach that is considered less proven or beyond the level of risk tolerated through the budget process. Projects may also adopt a continuous improvement approach that would not be feasible through the regular budget process due to funding or risk tolerance constraints.

Projects are encouraged to consider partnerships that will lead to innovative solutions to Metro Vancouver's challenges, particularly through applied and/or translational research within the region's academic institutions. These solutions may be generated through a crowd-sourcing ideation process.

Projects supported by the Fund must:

- be overseen by the GVWD;
- be consistent with the authority and responsibility of the GVWD;
- be consistent with the objectives of the *Drinking Water Management Plan* and/or the B*oard Strategic Plan*;
- consider partnerships including, but not limited to, member jurisdictions, academic institutions, non-governmental organizations, and community groups;
- result in a positive contribution, in the form of tangible results and/or measurable benefits, to the sustainability of the region;
- demonstrate innovation or a continuous improvement approach.

Fund Management

- Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects.

- Annually, an amount no greater than 1% of GVWD's annual operating budget will be transferred to the fund.
- The fund will be set at a maximum amount of $25 million indexed to inflation.
- Any revenues generated from projects derived from SIF investments will be taken into consideration with respect to annual contribution amounts.
- The total amount disbursed from the Fund in any year is at the discretion of the GVWD Board and will depend on the merit of the proposals submitted.
- Reporting on the balance of the Water Sustainability Innovation Fund will be carried out through the Status of Reserves report.

Annual Evaluation and Decision-Making Process

- Project proposals will be evaluated by the Sustainability Innovation Fund Inter-Departmental Steering Committee according to the criteria outlined in the Application Package.
- Staff will provide the designated Standing Committee with a report on recommendations on the proposals considered for funding and implications of these recommendations on the Fund's balance.
- The designated Standing Committee will provide its recommendations to the GVWD Board which will make the final decision on projects to be funded.

Reporting on the Fund's Contributions to Regional Sustainability

- On an annual basis, the designated Standing Committee will receive a report on the projects supported by the Fund including the deliverables, outcomes, and the measurable benefits of these projects to the region's sustainability.
- Project reports will be housed in an "e-Library" for easy access by municipalities, regions and others who are interested in learning from the experiences, and who wish to assess the transferability of certain projects to other jurisdictions.

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

BOARD POLICY

LIQUID WASTE SUSTAINABILITY INNOVATION FUND

Effective Date: June 24, 2014 (revised October 28, 2016)

Approved By: GVS&DD Board

Policy No. FN-003

PURPOSE

The Policy is designed to ensure that the Liquid Waste Sustainability Innovation Fund (Fund) is used to support projects of the liquid waste utility that contribute to the region's sustainability and that the Fund is managed in an effective, transparent, and accountable manner.

~~**DEFINITIONS**~~

~~**Sustainability**~~

~~Adapting the concept of sustainability as defined by Metro Vancouver's Sustainability Framework for the purposes of this Fund, a sustainability project would need to:~~

- ~~Have regard for both local and global consequences and long term impacts~~
- ~~Recognize and reflect the interconnectedness and interdependence of systems~~
- ~~Be collaborative~~

~~In addition, sustainability projects will make a contribution to:~~

- ~~Protecting and enhancing the natural environment~~
- ~~Providing for ongoing prosperity~~
- ~~Building community capacity and social cohesion.~~

POLICY

The Liquid Waste Sustainability Innovation has been in place since October 29, 2004, when the GVS&DD Board approved the creation of a Fund that would be "dedicated to funding projects based on the principles of sustainability." Projects must contribute to the region's sustainability by reducing emissions, protecting the environment and/or advancing regional resilience.

The fund is designed to support projects that demonstrate an innovative approach that is considered less proven or beyond the level of risk tolerated through the budget process. Projects may also adopt a continuous improvement approach that would not be feasible through the regular budget process due to funding or risk tolerance constraints.

Projects are encouraged to consider partnerships that will lead to innovative solutions to Metro Vancouver's challenges, particularly through applied and/or translational research within the region's academic institutions. These solutions may be generated through a crowd-sourcing ideation process.

~~Annually, an amount equal to the GST rebate for the liquid waste utility in 2005 ($1,127,000) is contributed to the Fund.~~

~~The Fund is not designed to support "business as usual" projects that a department would undertake as part of its normal operations, nor is it in place to support projects that would normally be funded through a department's capital plan. The Fund can be used, however, to pursue "opportunity projects" in the capital planning process, innovative projects that are outside the liquid waste core functions that address cross-cutting organizational objectives, and public engagement and education programs designed to change behaviour.~~

Projects supported by the Fund must:

- be overseen by the GVSⅅ
- be consistent with the authority and responsibility of the GVSⅅ
- be consistent with the objectives of the *Integrated Liquid Waste and Resource Management Plan* and/or the *Board Strategic Plan*;
- consider partnerships including, but not limited to, member jurisdictions, academic institutions, non-governmental organizations, and community groups;
- result in a positive contribution, in the form of tangible results and/or measurable benefits, to the sustainability of the region;
- demonstrate innovation or a continuous improvement approach ~~and facilitate action~~.

Fund Management

- Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects.
- Annually, an amount no greater than 1% of GVS&DD's annual operating budget will be transferred to the fund.
- The fund will be set at a maximum amount of $25 million indexed to inflation.
- Any revenues generated from projects derived from SIF investments will be taken into consideration with respect to annual contribution amounts.
- ~~Annually, an amount equal to the GST rebate for the liquid waste utility in 2005 ($1,127,000) is contributed to the Fund.~~
- The total amount disbursed from the Fund in any year is at the discretion of the GVS&DD Board and will depend on the merit of the proposals submitted.
- Reporting on the balance of the Liquid Waste Sustainability Innovation Fund will be carried out through the Status of Reserves report.

Annual Evaluation and Decision-Making Process

- ~~In accordance with the Sustainability Innovation Fund Process, departments will identify potential projects relevant to the objectives of the Fund during the internal budget planning process.~~

- ~~Projects proposed may come from staff led planning processes or from any Board Committee who can direct staff to evaluate a project or initiative and to prepare a proposal for consideration.~~
- ~~To be considered, project proponents will need to complete the Sustainability Innovation Fund Application, which includes a description of the alignment with the goals of the *Integrated Liquid Waste and Resource Management Plan* and the *Board Strategic Plan* and a triple bottom line analysis. Proposals should specify the anticipated measurable contributions to the region's sustainability (e.g., reductions in greenhouse gas emissions, conversion to renewable energy sources, cleaner air or water, or improvements in ecosystem health) in addition to other benefits.~~
- Project proposals will be evaluated by the Sustainability Innovation Fund Inter-Departmental Steering Committee according to the criteria outlined in the Application Package
- Staff will provide the designated Standing Committee with a report on recommendations on the proposals considered for funding and implications of these recommendations on the Fund's balance.
- The designated Standing Committee will provide its recommendations to the GVS&DD Board which will make the final decision on projects to be funded.

Reporting on the Fund's Contributions to Regional Sustainability

- On an annual basis, the designated Standing Committee will receive a report on the projects supported by the Fund including the deliverables, outcomes, and the measurable benefits of these projects to the region's sustainability.
- Project reports will be housed in an "e-Library" for easy access by member jurisdictions, regions and others who are interested in learning from the experiences, and who wish to assess the transferability of certain projects to other jurisdictions.

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

BOARD POLICY

REGIONAL DISTRICT SUSTAINABILITY INNOVATION FUND

Effective Date: October 24, 2014 (revised October 28, 2016)

Approved By: GVRD Board

Policy No. FN-007

PURPOSE

The Policy is designed to ensure that the Regional District Sustainability Innovation Fund (Fund) is used to support projects that will contribute to the region's sustainability and that the Fund is managed in an effective, transparent and accountable manner.

~~**DEFINITIONS**~~

~~**Sustainability**~~

~~Adapting the concept of sustainability as defined in Metro Vancouver's *Sustainability Framework* for the purposes of this Fund, a sustainability project would need to:~~

- ~~Have regard for both local and global consequences and long term impacts~~
- ~~Recognize and reflect the interconnectedness and interdependence of systems~~
- ~~Be collaborative~~

~~In addition, sustainability projects will make a contribution to:~~

- ~~Protecting and enhancing the natural environment~~
- ~~Providing for ongoing prosperity~~
- ~~Building community capacity and social cohesion~~

POLICY

The Regional District Sustainability Innovation Fund has been in place since October 29, 2004, when the GVRD Board approved the creation of a Fund that would be "dedicated to funding Regional District projects that are based on the principles of sustainability". Projects must contribute to the region's sustainability by reducing emissions, protecting the environment and/or advancing regional resilience.

The fund is designed to support projects that demonstrate an innovative approach that is considered less proven or beyond the level of risk tolerated through the budget process. Projects may also adopt a continuous improvement approach that would not be feasible through the regular budget process due to funding or risk tolerance constraints.

Projects are encouraged to consider partnerships that will lead to innovative solutions to Metro Vancouver's challenges, particularly through applied and/or translational research within the region's academic institutions. These solutions may be generated through a crowd-sourcing ideation process.

~~Annually, an amount equal to the GST rebate for the GVRD in 2005 ($347,000) is contributed to the Fund.~~

~~The Fund is not designed to support "business as usual" projects that a department would undertake as part of its normal operations, nor is it in place to support projects that would normally be funded through a department's capital plan. The Fund can be used, however, to include features to a project that improve or supplement the sustainability elements of a project.~~

Projects supported by the Fund must:

- be overseen by the MVRD;
- be consistent with the authority and responsibility of the MVRD~~, which includes air quality management, regional parks, housing, growth management, and inter-municipal initiatives such as ecological health and climate change mitigation and adaptation~~;
- be consistent with the objectives of the *Board Strategic Plan* or other regional district plans as applicable;
- consider partnerships including, but not limited to, member jurisdictions, academic institutions, non-governmental organizations, and community groups;
- result in a positive contribution, in the form of tangible results and/or measurable benefits, to the sustainability of the region;
- demonstrate innovation or a continuous improvement approach ~~and facilitate action~~.

Support will be given in the evaluation process to regional district projects that involve one or more member jurisdictions, particularly if such involvement can be used to leverage additional funding from a municipality or another source. In order to promote equity in the involvement of members, efforts will be made to involve a variety of different members in different projects.

Fund Management

- Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects.
- Annually, an amount no greater than 1% of MVRD's annual operating budget will be transferred to the fund.
- The fund will be set at a maximum amount of $25 million indexed to inflation.
- Any revenues generated from projects derived from SIF investments will be taken into consideration with respect to annual contribution amounts.
- ~~Annually, an amount equal to the GST rebate for the GVRD in 2005 ($347,000) will be transferred to the Fund.~~
- ~~The maximum amount awarded to any one project in an individual year will be $100,000.~~
- The total amount disbursed from the Fund in any given year is at the discretion of the MVRD Board and will depend on the merit of the proposals submitted.
- Reporting on the balance of the Regional District Sustainability Innovation Fund will be carried out through the Status of Reserves report.

Annual Evaluation and Decision-Making Process

- ~~In accordance with the Sustainability Innovation Fund Process, departments will identify potential projects relevant to the objectives of the Fund during the internal budget planning process.~~
- ~~Projects proposed may come from staff led planning processes or from Committees directly related to regional district functions who can direct staff to evaluate a project or initiative and to prepare a proposal for consideration.~~
- ~~To be considered, project proponents will need to complete the Sustainability Innovation Fund Application, which includes a description of the alignment with the goals of a regional management plan (if relevant) and the *Board Strategic Plan* and a triple-bottom line analysis. Proposals should specify the anticipated measurable contributions to the region's sustainability (e.g., reductions in greenhouse gas emissions, conversion to renewable energy sources, cleaner air or water, or improvements in ecosystem health) in addition to other benefits.~~
- Project proposals will be evaluated by the Sustainability Innovation Fund Inter-Departmental Steering Committee according to the criteria outlined in the Application Package.
- Staff will provide the designated Standing Committee with a report on recommendations on the proposals considered for funding and implications of these recommendations on the Fund's balance.
- The designated Standing Committee will provide its recommendations to the MVRD Board which will make the final decision on received applications.

Reporting on the Fund's Contributions to Regional Sustainability

- On an annual basis, the designated Standing Committee will receive a report on the projects supported by the Fund including deliverables, outcomes, and the measurable benefits of these projects to the region's sustainability.
- Project reports will be housed in an "e-Library" for easy access by member jurisdictions, regions and others who are interested in learning from the experiences, and who wish to assess the transferability of certain projects to other jurisdictions.

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

BOARD POLICY

WATER SUSTAINABILITY INNOVATION FUND

Effective Date: June 27, 2014 (revised October 28, 2016)

Approved By: GVWD Board

Policy No. FN-005

PURPOSE

The Policy is designed to ensure that the Water Sustainability Innovation Fund (Fund) is used to support projects of the water utility that contribute to the region's sustainability and that the Fund is managed in an effective, transparent, and accountable manner.

~~**DEFINITIONS**~~

~~**Sustainability**~~

~~Adapting the concept of sustainability as defined by Metro Vancouver's Sustainability Framework for the purposes of this Fund, a sustainability project would need to:~~

- ~~Have regard for both local and global consequences and long term impacts~~
- ~~Recognize and reflect the interconnectedness and interdependence of systems~~
- ~~Be collaborative~~

~~In addition, sustainability projects will make a contribution to:~~

- ~~Protecting and enhancing the natural environment~~
- ~~Providing for ongoing prosperity~~
- ~~Building community capacity and social cohesion~~

POLICY

The Water Sustainability Innovation Fund has been in place since October 29, 2004, when the GVWD Board approved the creation of a Fund that would be "dedicated to funding projects based on the principles of sustainability." Projects must contribute to the region's sustainability by reducing emissions, protecting the environment and/or advancing regional resilience.

The fund is designed to support projects that demonstrate an innovative approach that is considered less proven or beyond the level of risk tolerated through the budget process. Projects may also adopt a continuous improvement approach that would not be feasible through the regular budget process due to funding or risk tolerance constraints.

Projects are encouraged to consider partnerships that will lead to innovative solutions to Metro Vancouver's challenges, particularly through applied and/or translational research within the region's academic institutions. These solutions may be generated through a crowd-sourcing ideation process.

~~Annually, an amount equal to the GST rebate for the water utility in 2005 ($723,000) is contributed to the Fund.~~

~~The Fund is not designed to support "business as usual" projects that a department would undertake as part of its normal operations, nor is it in place to support projects that would normally be funded through a department's capital plan. The Fund can be used, however, to pursue "opportunity projects" in the capital planning process, innovative projects that are outside the drinking water core functions that address cross-cutting organizational objectives, and public engagement and education programs designed to change behaviour.~~

Projects supported by the Fund must:

- be overseen by the GVWD;
- be consistent with the authority and responsibility of the GVWD;
- be consistent with the objectives of the *Drinking Water Management Plan* and/or the B*oard Strategic Plan*;
- consider partnerships including, but not limited to, member jurisdictions, academic institutions, non-governmental organizations, and community groups;
- result in a positive contribution, in the form of tangible results and/or measurable benefits, to the sustainability of the region;
- demonstrate innovation or a continuous improvement approach ~~and facilitate action~~.

Fund Management

- Financial Services will develop and annually update a contribution schedule to ensure the fund is able to support future projects.
- Annually, an amount no greater than 1% of GVWD's annual operating budget will be transferred to the fund.
- The fund will be set at a maximum amount of $25 million indexed to inflation.
- Any revenues generated from projects derived from SIF investments will be taken into consideration with respect to annual contribution amounts.
- ~~Annually, an amount equal to the GST rebate for the water utility in 2005 ($723,000) is contributed to the Fund.~~
- The total amount disbursed from the Fund in any year is at the discretion of the GVWD Board and will depend on the merit of the proposals submitted.
- Reporting on the balance of the Water Sustainability Innovation Fund will be carried out through the Status of Reserves report.

Annual Evaluation and Decision-Making Process

- ~~In accordance with the Sustainability Innovation Fund Process, departments will identify potential projects relevant to the objectives of the Fund during the internal budget planning process.~~

- ~~Projects proposed may come from staff led planning processes or from any Board Committee who can direct staff to evaluate a project or initiative and to prepare a proposal for consideration.~~
- ~~To be considered, project proponents will need to complete the Sustainability Innovation Fund Application, which includes a description of the alignment with the goals of the *Drinking Water Management Plan* and the *Board Strategic Plan* and a triple-bottom line analysis. Proposals should specify the anticipated measurable contributions to the region's sustainability (e.g., reductions in greenhouse gas emissions, conversion to renewable energy sources, cleaner air or water, or improvements in ecosystem health) in addition to other benefits.~~
- Project proposals will be evaluated by the Sustainability Innovation Fund Inter-Departmental Steering Committee according to the criteria outlined in the Application Package.
- Staff will provide the designated Standing Committee with a report on recommendations on the proposals considered for funding and implications of these recommendations on the Fund's balance.
- The designated Standing Committee will provide its recommendations to the GVWD Board which will make the final decision on projects to be funded.

Reporting on the Fund's Contributions to Regional Sustainability

- On an annual basis, the designated Standing Committee will receive a report on the projects supported by the Fund including the deliverables, outcomes, and the measurable benefits of these projects to the region's sustainability.
- Project reports will be housed in an "e-Library" for easy access by member jurisdictions, regions and others who are interested in learning from the experiences, and who wish to assess the transferability of certain projects to other jurisdictions.

To: Climate Action Committee

From: Arvind Saraswat, Senior Project Engineer
Esther Bérubé, Division Manager, Air Quality Bylaw and Regulation Development
Laura Taylor, Public Engagement Coordinator
Parks and Environment Department

Date: June 22, 2021 Meeting Date: July 16, 2021

Subject: **Next Phase of Engagement on a Cannabis Production and Processing Emission Regulation**

RECOMMENDATION

That the MVRD Board authorize staff to proceed with the next phase of engagement on the proposed approach to regulating air emissions from cannabis production and processing using the draft discussion paper attached to the report titled "Next Phase of Engagement on a Cannabis Production and Processing Emission Regulation", dated June 22, 2021.

EXECUTIVE SUMMARY

During 2019, Metro Vancouver staff initiated consultation with stakeholders on regulatory proposals to manage emissions of volatile organic compounds (VOC) from cannabis production and processing facilities. This was followed by additional engagement with key stakeholders, from November 2020 through March 2021, to facilitate development of a common understanding of key issues and potential solutions. Cannabis production and processing is potentially a significant additional source of VOC emissions in the airshed, which warrant similar levels of control to other regulated sources, to ensure that ground level ozone issues are not exacerbated. Based on stakeholder feedback, the regulatory proposals have been adjusted and would include requirements related to an emission management plan, emission control requirements, a complaints and officer observation response plan, records and reporting, and a minimum distance between new cannabis production and processing facilities and hospitals, schools, and other sensitive receptors. This report seeks approval from the MVRD Board to conduct the next phase of engagement.

PURPOSE

This report presents feedback received during additional engagement and seeks Board approval to carry out the next phase of formal engagement on adjusted proposals to regulate air emissions from cannabis production, processing and extraction operations.

BACKGROUND

The legalization of recreational cannabis in October 2018 resulted in the rapid expansion of licensed cannabis production and processing facilities in the Metro Vancouver region. On May 24, 2019, the MVRD Board directed staff to proceed with the first phase of engagement on proposals to regulate air emissions from cannabis production and processing operations. At the Climate Action Committee meeting on October 16, 2020, staff reported on feedback from the first phase of engagement that occurred between June and November 2019, and a framework for additional engagement.

This report presents the feedback received during the additional engagement phase, and regulatory proposals adjusted in response to feedback received to date.

POTENTIAL IMPACTS OF EMISSIONS FROM CANNABIS PRODUCTION IN METRO VANCOUVER

Emissions from cannabis production include VOC that have the potential to exacerbate regional issues with the formation of harmful ground-level ozone and secondary fine particulate matter, if insufficiently controlled. Based on scientific literature, Metro Vancouver estimated that potential uncontrolled VOC emissions from licensed cultivation in the region could range from 330 to 2080 tonnes per year, similar to other regulated VOC sources in the region and equivalent to about one to five percent of total regional VOC emissions (Reference 1). The *Regional Ground-level Ozone Strategy for the Canadian Lower Fraser Valley*, adopted by the Board in 2014, identifies VOC reduction as a strategic direction to guide the reduction of ground-level ozone.

The VOC emissions from cannabis production tend to be odorous. Metro Vancouver and member municipalities have received many complaints about odorous emissions from cannabis production.

SUMMARY OF ADDITIONAL ENGAGEMENT

Discussions with other orders of government as well as local cannabis producers took place from November 2020 through March 2021, to help identify effective and realistic emission management solutions that would result in a proposed regulation acceptable to all parties. Staff met with representatives from Health Canada, the Agricultural Land Commission, the Ministry of Environment and Climate Change Strategy, the Ministry of Agriculture, Food and Fisheries, and local cannabis producers. Two public webinars were held in January and February 2021.

Feedback received is summarized in Attachment 1; key highlights are listed below:

- Feedback from the public indicates that odorous emissions continue to be an important concern for residents who live near cannabis production and processing facilities.
- Feedback from the majority of cannabis producers indicates that activated carbon filters are a widely used control technology for the sector that meets Health Canada requirements.
- Cannabis producers in the region expressed concerns about additional costs incurred due to a new regulation but also indicated their interest in doing their part to protect the environment.
- The Ministry of Agriculture, Food and Fisheries seeks to ensure that the potential regulatory requirements would not impose an excessive burden on licensed producers in the region.
- Most cannabis producers and provincial government staff questioned the projected VOC emissions from cannabis production and their relative contribution to regional VOC levels.
- In general, cannabis producers active in the region, government agencies and members of the public indicated a willingness to continue working with Metro Vancouver on this issue.

PROPOSED REGULATORY APPROACH

Federal, provincial, regional, and municipal governments have a role in regulating cannabis production in the Metro Vancouver region. The *Environmental Management Act* delegates authority to Metro Vancouver for air pollution control and air quality management within the Metro Vancouver region, including on industrial and agricultural land. Metro Vancouver regulates emissions through site-specific permits that authorize emissions from individual facilities, and emission regulations that

apply to a group of similar facilities or activities. An emission regulation for cannabis production and processing facilities would provide an efficient mechanism to manage emissions from this sector and protect the environment and public health, while reducing odour impacts.

A potential emission regulation for cannabis production and processing could include the following requirements, which have been adjusted based on feedback received to date and are presented in more detail in the draft discussion paper in Attachment 2.

- Each facility with an indoor growing area greater than 200 m^2 would be required to have an **emission management plan** prepared by a qualified professional, to meet emission control requirements. Micro-producers (facilities smaller than 200 m^2) expressed concerns about the cost burden of retaining a qualified professional.
- **Emission control requirements** would require facilities to use and maintain activated carbon filters for VOC emission control in structures used for cultivation, processing, and extraction. Quantitative targets for VOC control efficiency based on industry best practices would guide the design of control works in new and existing facilities, with requirements for further improvement in VOC control efficiency in existing facilities within ten years. Facilities using control technologies other than activated carbon would seek authorization through a site-specific permit.
- **Complaints and officer observation response plan** would address requirements to notify Metro Vancouver of complaints, investigate potential causes, and take remedial measures to ensure compliance with the emission management plan. Feedback from control technology providers and affected residents indicates that the odorous properties of VOC emissions from cannabis can be detected at low concentrations. Rapid response to complaints can facilitate checking that VOC emissions are being controlled as required, which is expected to mitigate odour issues.
- **Required records and annual reporting** related to cannabis production and emission controls will enable ongoing confirmation that the emission management plan is well implemented.
- **Minimum distance requirements** would ensure that new facilities would be located no closer than 200 metres from sensitive receptors.
- **Registration fees and variable annual fees based on VOC emissions discharged** would recover costs of application reviews and inspections, and encourage emission reductions. The proposed fees for photoreactive VOC would match what is being considered as part of changes to air quality regulatory fees (Reference 2). No feedback on proposed fees has been received to date.

Based on feedback from stakeholders, outdoor cannabis cultivation and cultivation of industrial hemp under the federal *Industrial Hemp Regulations* will not be covered under the potential regulation.

CONSULTATION PROCESS AND TIMELINES

Staff propose to engage in consultation on the potential emission regulation between August and November 2021 with a targeted audience of the local cannabis industry, affected members of the public, and government and health agencies. The objective of the consultation would be to inform and obtain feedback from stakeholders and the public about the proposed emission regulation. The details of the potential regulation, adjusted based on engagement to date, is provided in the draft discussion paper titled, "A Potential Emission Regulation for Cannabis Production and Processing in Metro Vancouver, Draft Discussion Paper with Adjusted Proposals, July 2021" (Attachment 2). The attached draft will be updated based on feedback from the Committee and Board, formatted to be consistent with Metro Vancouver's engagement documents, and used as the basis for consultation.

The consultation process would be conducted in accordance with the Board policy on public engagement. The updated engagement plan (Attachment 3) provides details about the process for the next phase of engagement. Proposed methods include:

- Meetings with licensed cannabis producers and operators of extraction facilities operating in the Metro Vancouver region;
- Meetings with staff from member jurisdictions and other orders of government;
- Virtual or in-person discussions with relevant professional and industry associations;
- Webinars to gather feedback on the potential regulation from the public.

The project website would be updated to include new information, and social media and other means of distribution of material will be relied on as COVID-19 restrictions are relaxed.

ALTERNATIVES

1. That the MVRD Board authorize staff to proceed with the next phase of engagement on the proposed approach to regulating air emissions from cannabis production and processing using the draft discussion paper attached to the report titled "Next Phase of Engagement on a Cannabis Production and Processing Emission Regulation", dated June 22, 2021.

2. That the Climate Action Committee receive for information the report titled "Next Phase of Engagement on a Cannabis Production and Processing Emission Regulation", dated June 22, 2021 and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

Under Alternative 1, staff will proceed with the next phase of engagement on a potential bylaw to regulate emissions from cannabis production and processing. The resources needed, including staff time and other costs associated with the consultation program and subsequent development of a potential regulation, have been approved within program budgets for 2021.

Under Alternative 2, the Committee may wish to provide alternate direction to staff on how to address emissions from cannabis production, processing and extraction.

CONCLUSION

The legalization of recreational cannabis in October 2018 resulted in the rapid expansion of licensed cannabis production and processing facilities in the Metro Vancouver region. Uncontrolled VOC emissions from this sector have the potential to increase levels of harmful ground-level ozone and fine particulate matter. According to Metro Vancouver's estimates using information from scientific literature, the magnitude of potential VOC emissions from licensed cultivation is expected to be similar to other regulated sources of VOC in the region. Both Metro Vancouver and member jurisdictions have received complaints about odorous emissions from cannabis production operations. An emission regulation for cannabis production and processing operations is expected to provide a streamlined mechanism to manage emissions from this sector and protect the environment and public health, while reducing odour impacts.

Staff recommend Alternative 1, to proceed with the next phase of engagement on the proposed approach to regulating air emissions from cannabis production as described in the attached discussion paper titled, "A Potential Emission Regulation for Cannabis Production and Processing in Metro Vancouver, Draft Discussion Paper with Adjusted Proposals, July 2021." Consultation with the public, businesses, member jurisdictions, other orders of government and other stakeholders is intended to provide any person who may be affected by a potential emission regulation with sufficient opportunity to learn about the proposals and provide feedback.

Attachments

1. Summary of Additional Engagement, Cannabis Production and Processing, June 18, 2021 *(45403687)*
2. A Potential Emission Regulation for Cannabis Production and Processing in Metro Vancouver, Draft Discussion Paper with Adjusted Proposals, July 2021 *(40179882)*
3. Updated Engagement Plan for the Next Phase of Engagement on a Potential Emission Regulation for Cannabis Production and Processing Operations *(45275721)*

References

1. Exploring Options to Manage Emissions from Cannabis Production and Processing Operations in Metro Vancouver, Cannabis Cultivation Emissions Estimate Methodology and Sensitivity Analysis, November 13, 2019.
2. Proposed Amendments to Air Quality Permit and Regulatory Fees in Metro Vancouver, Discussion Paper, November 2020.

45857420

metrovancouver

Summary of Additional Engagement Cannabis Production and Processing

June 18, 2021

Table of Contents

List of Tables

1.0 ADDITIONAL ENGAGEMENT OVERVIEW

1.1. Introduction

Metro Vancouver Regional District (MVRD, operating as Metro Vancouver) is responsible for managing and regulating air quality in the region under authority delegated from the provincial government in the *BC Environmental Management Act* (EMA). Metro Vancouver protects public health and the environment through a tiered approach to managing the discharge of air contaminants that applies the use of site-specific permits, sectoral emission regulations, and provisions in the *Greater Vancouver Regional District (GVRD) Air Quality Management Bylaw No. 1082, 2008* (Bylaw 1082). Permits are required for activities and complex facilities with significant levels of emissions that may potentially impact the environment and public health. Regulations apply air emissions control requirements to a group of facilities or activities that share similar characteristics. Bylaw 1082 prohibits any person from discharging air contaminants so as to cause pollution.

The legalization of recreational cannabis in October 2018 resulted in rapid expansion of licensed cannabis production and processing facilities in the Metro Vancouver region. Based on an analysis of the local cannabis sector, published scientific literature, and Health Canada data, Metro Vancouver has projected that these facilities have the potential to emit air contaminants such as volatile organic compounds (VOC) that are precursors to ground-level ozone at a level comparable to other regulated sources in the region. Ground-level ozone is harmful to human health and the environment. Uncontrolled potential emissions of VOC from cannabis production have been projected by Metro Vancouver to be about 800 tonnes per year. This amount represents approximately 2% of the VOC emitted in the region in 2015 (Metro Vancouver, 2019).

During the summer and fall of 2019, Metro Vancouver consulted with a wide spectrum of stakeholders on initial regulatory proposals to control emissions from cannabis production and processing. A report titled “Summary of Feedback on Proposals to Regulate Emissions from Cannabis Production and Processing”, dated September 21, 2020, was presented to the Climate Action Committee on October 16, 2020 including a framework for additional engagement. Based on the broad range of feedback received during Phase 1 consultation activities, an additional period of engagement with key stakeholders was proposed to allow for deeper and focused discussion about the need to control emissions of VOC from cannabis production and processing, and potential measures to do so. Additional engagement with key stakeholders took place from November 2020 through March 2021. All feedback received was used to develop detailed proposals for regulatory measures for a second formal phase of consultation.

1.2. Objectives of Additional Engagement

As with the first phase of engagement, for this additional period of engagement, Metro Vancouver committed to the “involve” level of participation as defined in the Board policy on *Public Engagement*. The purpose of additional engagement was to help identify effective and realistic emissions management solutions that would allow a potential regulation to work for all parties.

1.3. List of Key Stakeholders

The following key stakeholders were consulted during additional engagement:
General public

- Health Canada (Regulatory Operations and Enforcement Branch)
- Agricultural Land Commission
- Ministry of Environment and Climate Change Strategy
- Ministry of Agriculture, Food and Fisheries (MAFF)
- Cannabis producers:
  - Pure Sunfarms
  - Rubicon Organics
  - Tantalus Labs
  - Canopy Growth (did not participate in meetings, resubmitted their October 2019 letter)
  - Zenabis (did not respond to Metro Vancouver's invitation)
  - Aurora (did not respond to Metro Vancouver's invitation)
  - Benchmark Botanics (did not respond to Metro Vancouver's invitation)
  - BC Micro License Association (did not respond to Metro Vancouver's invitation)

1.4. Additional Engagement Activities

In-depth discussions were held, in the form of staff-to-staff meetings, with key stakeholders on four specific engagement questions listed below.

1. What would be effective ways to manage/regulate emissions from this sector in order to reduce impacts?
2. What would be suitable performance standards and how should we verify that emissions are being controlled effectively?
3. What needs to be done to address odour issues?
4. How can we make the regulatory requirements work for all stakeholders, not just the regulated parties or the regulator?

The staff-to-staff meetings held between Metro Vancouver and other governments and producers are listed below. Two public webinars were also held, on January 13, 2021 and February 17, 2021, to share information regarding additional engagement and receive feedback from the general public.

AUDIENCE	DATE	PARTICIPANTS
Agricultural Land Commission	January 18, 2021	2
Health Canada	January 25, 2021	13
Ministry of Environment and Climate Change Strategy (ENV); and Ministry of Agriculture, Food and Fisheries (MAFF)	January 19, 2021	5
Pure Sunfarms	February 8, 2021	2
Rubicon Organics and Ministry of Agriculture, Food and Fisheries	February 16, 2021	4
Tantalus Labs and Ministry of Agriculture, Food and Fisheries	March 3, 2021	3
Metro Vancouver Agricultural Advisory Committee	November 20, 2020	16

Table 1: List of meetings and presentations

Staff from the Ministry of Agriculture, Food and Fisheries (MAFF) attended two of the additional engagement meetings between Metro Vancouver staff and producers. Metro Vancouver staff appreciate MAFF staff's support and contributions to these discussions.

AUDIENCE	DATE	PARTICIPANTS
Public	January 13, 2021	37
Public	February 17, 2021	29

Table 2: List of webinars

2.0 ADDITIONAL ENGAGEMENT FEEDBACK

2.1 Summary of Feedback

Feedback gathered through consultation activities included a broad range of comments and concerns raised by participants during public webinars and focused feedback from industry professionals and government agencies.

Comments and questions raised by participants generally fell into four broad categories:

- Odour experienced by the public: Feedback from the public indicates that odour from this sector continues to be an important concern for residents who are close to cannabis production and processing facilities.

- Support for activated carbon filters as suitable control technology: Feedback from majority of producers indicates that activated carbon filters are a suitable control technology for the sector and are widely used. Some producers may choose to use a different control technology and apply for a permit instead of registering under the potential regulation.
- Concern about costs to producers: Producers that met with Metro Vancouver staff expressed concerns about additional costs that they may be required to incur due to a new regulation. They also indicated they would like to do their part to protect the environment.
- All producers that are active in the region, government agencies and members of the public expressed that they would like to continue working with Metro Vancouver on this issue.

2.2 Detailed Feedback

Feedback received during additional engagement is summarized below. A compilation of all issues raised along with responses from Metro Vancouver staff is presented in the Issue-Response Table in Appendix A. Correspondence containing feedback on the proposals is presented in Appendix B. Appendices A and B are available on Metro Vancouver's website (Reference 1).

2.2.1 Control of emissions

The following feedback was received in response to this question: What would be effective ways to manage/regulate emissions from this sector in order to reduce impacts?

- Discussions with producers indicate that activated carbon filters are being successfully used by a majority of cannabis production and processing facilities to control VOC emissions. However, the degree of control being achieved is not well documented. Also, there is at least one facility in the Metro Vancouver region that controls emissions using a biofilter (a biological control system that uses microorganisms on a moist solid matrix to break down contaminants in an airstream). That facility has also installed some activated carbon filtration to control emissions.
- Staff also received questions regarding validity of estimated VOC emissions from this sector. Metro Vancouver had published Cannabis Cultivation Emissions Estimate Methodology and Sensitivity Analysis in November 2019 (Reference 2) containing projections for VOC emissions from all licensed growing area in the region and those estimates continue to guide Metro Vancouver's work.
- Some members of the public expressed concerns that the proposed requirements may conflict with or may be less stringent compared to Health Canada's requirement to be equipped with a system that filters air to prevent escape of odours from facilities. Health Canada requires odour control and filtration at facilities. However, Health Canada does not prescribe a specific technology for control of odours. Health Canada's requirements are limited to control of odours and are not meant to deal with regional air quality impacts of VOC emissions.

2.2.2 Verification of emission control

The following feedback was received in response to this question: What would be suitable performance standards and how should we verify that emissions are being controlled effectively?

- All three producers that Metro Vancouver staff met with and that are active in the region have protocols or standard operating procedures to ascertain that control devices are operated and maintained properly. Health Canada requires maintenance logs to be kept at the site. Some producers have also conducted limited air sampling as well.
- Producers, Health Canada staff and provincial government staff have emphasized that odour complaints are not a good way to verify control of VOC since some VOC have very low odour thresholds, i.e. they can be detected by humans at very low concentrations.
- There was general agreement that for large facilities an independent qualified professional needs to determine the number of carbon filters, flow rates, replacement frequency for carbon and other site specific control requirements for VOC.
- Producers and provincial government staff would like to ensure that greenhouses and fully enclosed facilities are treated differently, as greenhouses need to vent and the cost to redesign would be too high.
- Feedback from a producer also confirmed that higher VOC capture efficiency is achievable for trimming and drying rooms in greenhouses compared to growing areas in greenhouses. Additionally, all emissions emanating from processing rooms can be routed through activated carbon filters. This is useful with respect to design of control works as VOC concentrations are reported to be significantly higher in processing rooms.
- Two members of the public resubmitted their November 2020 letter with comments related to use of qualified professionals in design of control systems, tracking and investigations of odour complaints, provisions for security deposits, fines and minimum distance between facilities and sensitive receptors.

2.2.3 Addressing odour issues

The following feedback was received in response to this question: What needs to be done to address odour issues?

- A number of concerned citizens conveyed their frustration with respect to odours from cannabis facilities and odour continues to be an important issue. Members of the public affected by cannabis production odours, generally due to proximity to their residence, would like to see an end to these odour issues.
- All three producers active in the region have some measures in place to follow up on odour complaints. Producers, Health Canada and provincial government staff also noted that some complaints may be due to illicit or personal use growers in proximity of licensed producers.
- Producers would like to get complaints information expeditiously so that they can act on it quickly. Additionally, they would like to know if complaints are new or repeat complaints (without any identifying information).

- One producer noted that they saw a substantial decrease in the number of complaints once the processing facility was fully enclosed and processing facility emissions were routed through activated carbon filters.
- Health Canada has a dedicated email for cannabis complaints (cannabis@canada.ca). Health Canada manages odour emissions on a complaints basis and considers odours a nuisance issue. Health Canada also encourages communication between producers and complainants. Health Canada communicates with licence holders, compiles complaints and inspects as needed.

2.2.4 Balanced requirements

Following feedback was received in response to this question: How can we make the regulatory requirements work for all stakeholders, not just the regulated parties or the regulator?

All stakeholders appreciated the opportunity to provide feedback. Producers, provincial government staff and Health Canada staff confirmed that they would like to continue working closely with Metro Vancouver on this issue.

2.2.5 Other feedback

Metro Vancouver staff also received feedback from BC Greenhouse Grower's Association (BCGGA) about various air quality and climate change initiatives. The BCGGA conveyed concerns regarding proposals to regulate emissions from plants. They are concerned about impacts that a potential regulation may have on the broader agricultural sector and food security.

Canopy Growth resubmitted their October 2019 letter to reiterate their concerns related to the magnitude of VOC emissions from the cannabis sector, Metro Vancouver's jurisdiction and using VOC monitoring and detection to address odour complaints from the public. They also confirmed that they were using activated carbon filters, implementing odour management plans and had rapidly closing and double-entry doors when they were operating in the region.

2.3 Feedback on Engagement Approach

Feedback from Metro Vancouver Agricultural Advisory Committee (November 20, 2020) was supportive of the engagement approach presented by staff.

Staff from Agricultural Land Commission did not express any concerns regarding Metro Vancouver's approach.

References

1. Issue-Response Table and Incoming Correspondence from Additional Engagement on a Cannabis Production and Processing Emissions Regulation (November 2020 – March 2021)
2. Metro Vancouver (2019). *Exploring Options to Manage Emissions from Cannabis Production and Processing Operations in Metro Vancouver, Cannabis Cultivation Emissions Estimate Methodology and Sensitivity Analysis.*

A Potential Emission Regulation for Cannabis Production and Processing Operations in Metro Vancouver

Draft Discussion Paper with Adjusted Proposals

July 2021

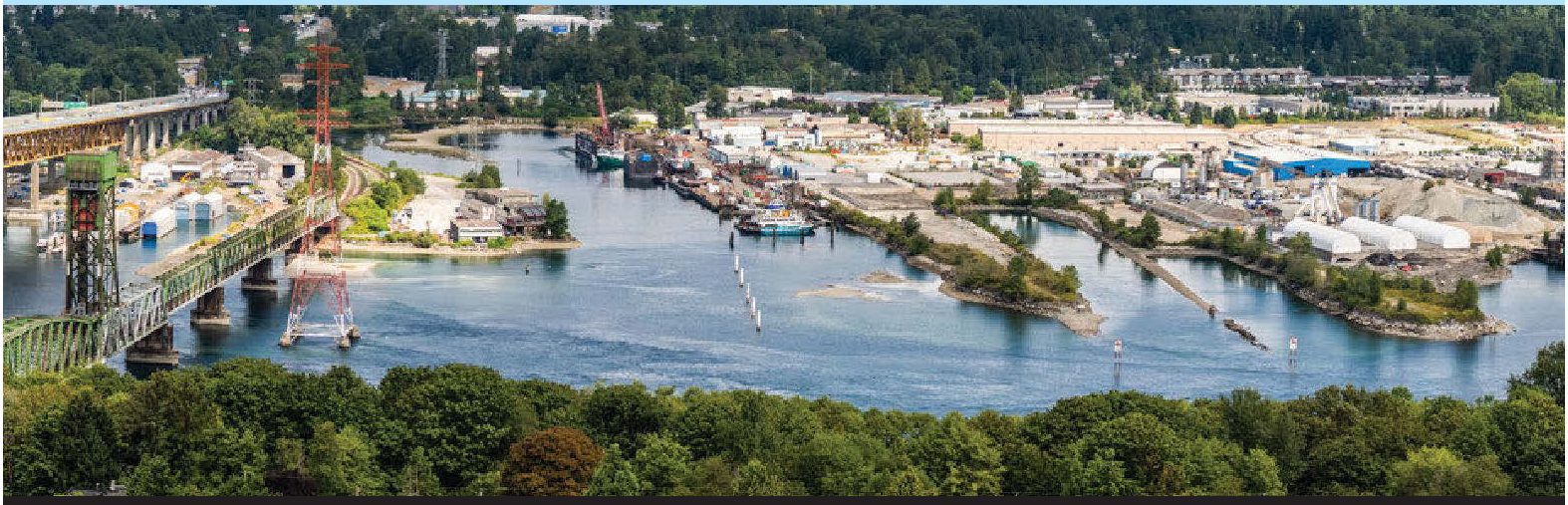


Table of Contents

List of Figures

INTRODUCTION

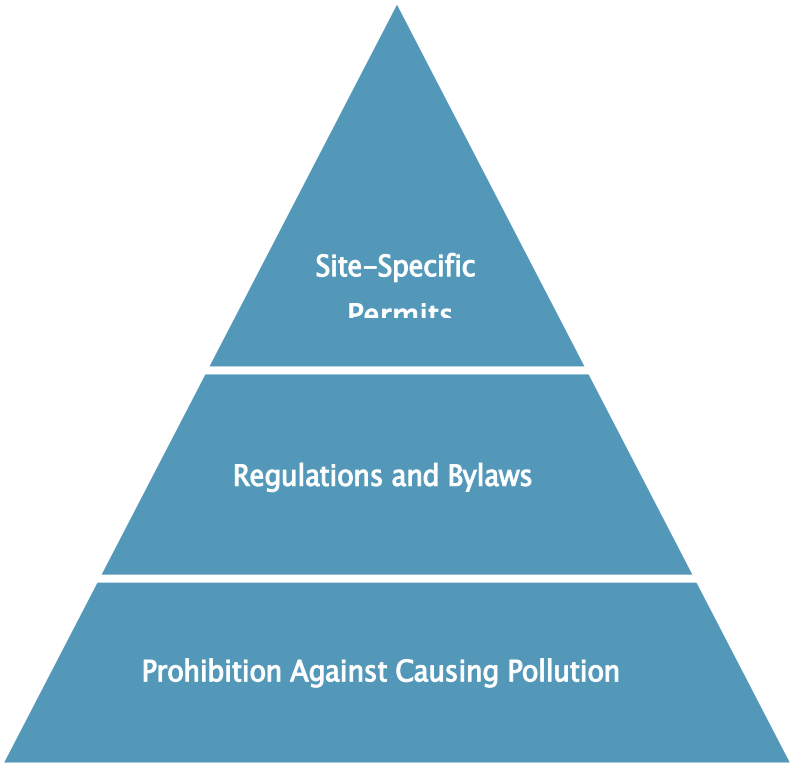
Metro Vancouver Regional District (MVRD, operating as Metro Vancouver) is responsible for managing and regulating air quality in the region under authority delegated from the provincial government in the *BC Environmental Management Act*. Metro Vancouver protects public health and the environment through a tiered approach (Figure 1) to managing the discharge of air contaminants that applies the use of site-specific permits, sectoral emission regulations, and provisions in the *Greater Vancouver Regional District (GVRD) Air Quality Management Bylaw No. 1082, 2008* (Bylaw 1082). Permits are required for activities and complex facilities with significant levels of emissions that may have the potential for high impacts on the environment and public health. Regulations apply air emissions control requirements to a group of facilities or activities that share similar characteristics. Facilities can choose to seek authorization of their emissions under an emission regulation, if they meet all the requirements, or under a permit. Bylaw 1082 prohibits any person from discharging air contaminants so as to cause pollution.

The legalization of recreational cannabis in October 2018 resulted in rapid expansion of licensed cannabis production and processing facilities in the Metro Vancouver region. In May 2019, the MVRD Board directed staff to proceed with Phase 1 consultation on proposals to regulate air emissions from cannabis production and processing operations.

During the summer and fall of 2019, Metro Vancouver consulted with a broad spectrum of stakeholders on regulatory proposals to control emissions from cannabis production and processing. A report titled "Summary of Feedback on Proposals to Regulate Emissions from Cannabis Production and Processing", dated September 21, 2020, was presented to Metro Vancouver's Climate Action Committee on October 16, 2020 including a framework for additional engagement. Based on the broad range of feedback received during Phase 1 consultation activities, additional engagement with key stakeholders took place from November 2020 through March 2021. The additional engagement allowed for focused discussions about the need to control volatile organic compound (VOC) emissions from cannabis production and processing, and optimal measures to do so, prior to detailed proposals for regulatory measures being developed for a second phase of consultation.

This discussion paper includes adjusted proposals for a potential emission regulation based on feedback from stakeholders received to date. An emission regulation for cannabis production and processing operations is expected to provide a streamlined mechanism to manage emissions from this sector and protect the environment and public health, while reducing odour impacts.

Figure 1: Tiered Approach to Regulating Air Contaminants in Metro Vancouver

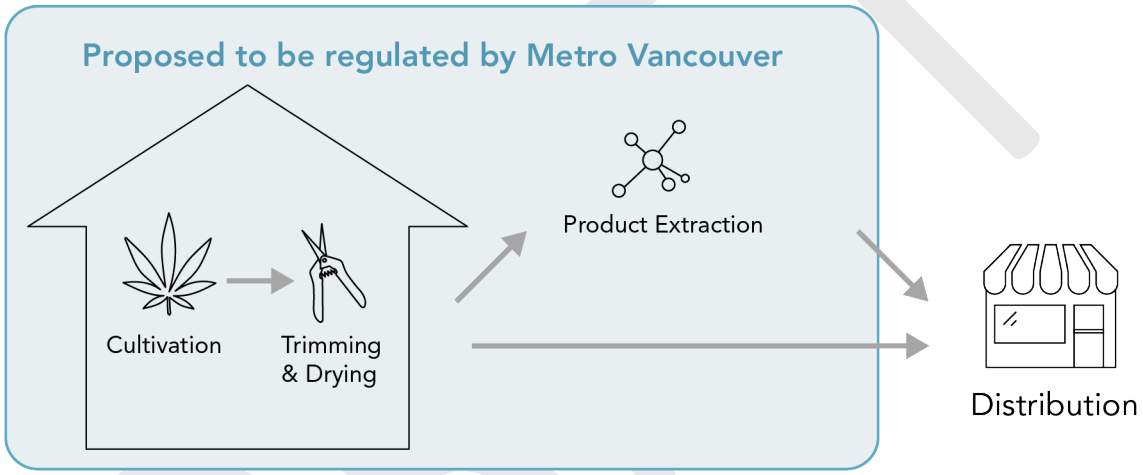


The following sections outline adjusted regulatory proposals to control air emissions from cannabis production and processing operations.

PURPOSE

This discussion paper describes the adjusted proposals to regulate the discharge of air contaminants from the cultivation, harvesting and handling of cannabis plants and from extraction facilities. Facilities that would be subject to the potential emission regulation include operations conducting indoor cultivation, cultivation by several individuals in cooperatives, cannabis processing operations such as drying, trimming and harvesting of cannabis plant material and cannabis oil and active ingredient extraction facilities. Outdoor cultivation, personal growing of cannabis plants under the BC *Cannabis Control and Licensing Act* and the federal *Cannabis Act*, and cultivation under the federal *Industrial Hemp Regulations* will not be covered under the proposed regulation.

Figure 2: Scope of Potential Regulation



This discussion paper may be of interest to:

- Businesses that produce and process cannabis, extraction facilities, as well as associations representing these parties;
- Consultants, manufacturers, and suppliers that provide services such as air emission control;
- Businesses involved in the design and construction of cannabis production, processing or extraction operations;
- Holders of a Health Canada licence to produce or process cannabis in the Metro Vancouver region;
- Metro Vancouver's member jurisdictions;
- Agricultural industry;
- Public health experts;
- Members of the public affected by emissions from cannabis production, processing or extraction operations; and
- Other interested parties affected by potential regulatory proposals related to cannabis production, processing and extraction operations or by air quality in the Metro Vancouver region.

The proposed consultation program will allow Metro Vancouver to inform interested parties and the public of the adjusted proposals for regulating emissions from facilities that produce and process

cannabis, and to receive feedback. Representatives of interested parties and the public will be invited to provide feedback until November 30, 2021.

DEFINING THE PROBLEM

The legalization of recreational use of cannabis in October 2018 led to the rapid expansion of indoor commercial cannabis production in the Metro Vancouver region and caused concerns about the potential resulting impacts to the environment and public health. In the Metro Vancouver region, a number of greenhouses formerly used for vegetable production have been retrofitted for cannabis production, yet were not designed or constructed to collect and treat air contaminants. Metro Vancouver as well as member municipalities have received complaints about odorous emissions from cannabis production operations.

Information from other jurisdictions in which cannabis is produced suggests that cannabis production has the potential to cause negative air quality impacts if the following emissions are not adequately controlled:

- Air contaminants emitted during cannabis production, processing and extraction include volatile organic compounds (VOC) that may contribute to the formation of harmful ground-level ozone and fine particulate matter through reactions with other substances and sunlight in the lower atmosphere. Emissions most notably occur during the flowering, harvesting, drying and trimming phases, during which high levels of a group of VOC called terpenes can be produced. Terpenes are known for their strong odour and involvement in the production of ground-level ozone and fine particulate matter.
- The power production equipment needed to meet the requirements for heating, lighting and suitable growing environment for the indoor production of cannabis generates emissions of nitrogen oxides and may emit particulate matter, depending on the fuel.

A number of technologies are available to control VOC but these may not all be suitable for cannabis production operations in the Metro Vancouver region. This discussion paper focuses on regulatory proposals for managing VOC emissions from the cannabis production and processing sector through a potential emission regulation, whereas emissions from power production equipment are managed through site-specific permits or other existing emission regulations.

GUIDING PRINCIPLES

A regulation to address emissions from cannabis production operations in Metro Vancouver would aim to:

- Emphasize prevention and control of emissions through best management practices and continuous improvement;
- Set efficient and effective requirements that will protect the public and enable the operation of environmentally responsible facilities;
- Follow a 'discharger pay' principle;
- Minimize emissions of volatile organic compounds which can contribute to the formation of ground- level ozone and fine particulate matter, and lead to odour impacts;
- Address concerns expressed by members of the public about impacts from emissions of cannabis production operations, although impacts associated with odorous emissions may not be entirely eliminated; and
- Align with the management plans and strategies adopted by the Metro Vancouver Regional District Board including:
  - the Integrated Air Quality and Greenhouse Gas Management Plan,
  - the Regional Ground-Level Ozone Strategy, and
  - the Odour Management Policy Development Plan.

WORKING WITHIN THE LEGISLATION

With the adoption of Bill C-45 (the *Cannabis Act*), recreational marijuana became legal in Canada on October 17, 2018. Federal, provincial and local governments, including Metro Vancouver and its member jurisdictions, have roles in the regulation of legal cannabis production and processing.

The federal government is responsible for establishing and maintaining the national framework for regulating the production of cannabis, which includes setting standards for health and safety, and for licensing production and processing facilities. Regulations under the *Cannabis Act* allow cannabis production in enclosed indoor facilities, in greenhouses, and outdoors, provided that security requirements can be met. The new regulations brought into force in 2018 state that if produced in a building, "the building must be equipped with a system that filters air to prevent the escape of odours". All processing activities must be conducted indoors.

Provinces and territories are responsible for determining how cannabis is distributed and sold within their jurisdictions, and can restrict consumption and possession. The *BC Cannabis Control and Licensing Act* describes requirements and restrictions developed to support public safety, including limits on production for personal use. In addition, the provincial government amended the *BC Agricultural Land Reserve Use, Subdivision and Procedure Regulation* on July 13, 2018. The amendment clarified that the lawful production of cannabis cannot be prohibited in the Agricultural Land Reserve (ALR) if cultivation takes place in an open field, a structure with a soil base, or an existing structure or structure under construction by July 13, 2018 for the purpose of growing crops. Since cannabis production in the ALR is designated as "farm use", the BC Farm Industry Review Board may hear complaints from persons aggrieved by odour, noise, dust or other disturbances arising from cannabis production in the ALR, under the *Farm Practices Protection (Right to Farm) Act*.

Under Section 31 of the *BC Environmental Management Act* (EMA), Metro Vancouver has delegated authority for air pollution control and air quality management within the Metro Vancouver region, including industrial and agricultural lands. EMA states that the Metro Vancouver Board "may, by bylaw, prohibit, regulate and otherwise control and prevent the discharge of air contaminants". EMA defines air contaminants, which are generally substances in the air that are capable of impacting health, environment, property, and in some cases, the normal conduct of business. Under *GVRD Air Quality Management Bylaw No. 1082, 2008* (Bylaw 1082), Metro Vancouver exercises its air quality regulatory authority with a system of permits that apply to individual facilities, and emission regulations that apply to types of operations and activities with similar characteristics. For example, Metro Vancouver regulates air emissions from agricultural sources within the region through permits and regulations such as the *GVRD Agricultural Boilers Emission Regulation Bylaw No. 1098, 2008*.

Bylaw 1082 prohibits the discharge of air contaminants by an industry, trade or business unless the discharge is conducted in accordance with a Metro Vancouver emission regulation or permit. The release of air contaminants, including VOC, has the potential to cause air pollution if present in a way that substantially alters or impairs the usefulness of the environment. Bylaw 1082 prohibits any person from discharging, or allowing or causing the discharge of any air contaminant so as to cause pollution. Metro Vancouver can set emission regulations for emissions of air contaminants in the region that are more stringent compared to other parts of the province.

Metro Vancouver's member jurisdictions are responsible for land-use zoning and business licensing, which can impose conditions on the location and conduct of cannabis production and processing to the extent allowed under provincial legislation such as the *Community Charter* and the *BC Agricultural Land Reserve Use, Subdivision and Procedure Regulation*.

PROPOSED REGULATORY APPROACH

The objective of introducing an emission regulation for cannabis production and processing operations is to set efficient and effective requirements that will protect the public and enable the operation of environmentally responsible facilities. Facilities can choose to seek authorization of their emissions under an emission regulation, if they meet all the requirements, or under a permit.

Proposed Requirements in an Emission Regulation

Proposed regulatory requirements to manage VOC emissions from cannabis production and processing facilities fall under five categories:

1. Emission Management Plan
2. Emission Control Requirements
3. Complaints Response Plan
4. Required Records and Reporting
5. Minimum Distance Requirements

1. Emission Management Plan

All facilities must prepare and implement an emission management plan that meets the following requirements:

a. The emission management plan must include a description of all sources of VOC emissions and controls;
b. The emission management plan must enable the facility to meet the emission control requirements in the regulation;
c. For facilities with growing area greater than 200 m^2, emission management plan must be prepared by a qualified professional (QP) and submitted to the Metro Vancouver District Director for approval;
d. The emission management plan must specify the number of activated carbon filters, sizes, mass of activated carbon, air flow rates and replacement frequency of activated carbon. For facilities with growing area greater than 200 m^2, a QP must determine these parameters;
e. For facilities with growing area greater than 200 m^2, a QP must confirm the replacement frequency and specification of activated carbon once the facility is in operation by conducting at least three Butane Activity tests (ASTM D5742), separated by at least six weeks and analyzing a minimum of three representative activated carbon filters or samples per test; and
f. Based on relevant information, such as information included in an inspection report, the District Director may require a review of plans by a QP and/or monitoring.

2. Emission Control Requirements

VOC emissions must be controlled according to the following requirements:

a. VOC emissions must be captured and treated with activated carbon filters to the maximum extent feasible at all times, based on industry best practice assessed periodically. VOC emission controls must achieve the following control efficiencies for estimated emissions:
    i. Greater than 95% control efficiency for trim rooms and drying rooms;
    ii. For greenhouses that use natural ventilation in growing areas and were operational before March 31, 2021, greater than 70% control efficiency for growing areas until July 1, 2031, and greater than 95% control efficiency thereafter; and
    iii. Greater than 95% control efficiency for other enclosed areas/facilities, including extraction facilities and on-site waste management amenities.
b. All VOC sources must be enclosed in a structure equipped with operating emission controls;
c. Activated carbon must be replaced, at a pre-determined frequency, before a significant decline in activated carbon performance is expected. For facilities with growing area greater than 200 m^2, based on data from Butane Activity tests (ASTM 5742);

d. Activated carbon filters must be operated and maintained per manufacturer's specifications and, for facilities with growing area greater than 200 m^2, according to QP guidance;
e. All doorways in structures must be equipped with rapidly closing double-door systems that provide a barrier to the escape of air contaminants;
f. All cannabis waste management activities, including composting and waste solvent storage, must be enclosed in structures when conducted on a property where cannabis is produced or processed; and
g. Extraction facilities using solvent extraction must use a solvent recovery system consistent with industry best practices.

3. Complaints and Officer Observation Response Plan

All facilities must prepare and implement a complaints response plan that includes:

a. Contact information of person(s) responsible for receiving, recording and responding to complaints and notifying Metro Vancouver;
b. The process to record and investigate complaints and potential causes;
c. The process for identifying and implementing remedial actions to ensure compliance with the facility's Emission Management Plan and the Emission Control Requirements;
d. The process to publicize facility contact information for complaints;
e. Based on relevant information, such as information included in an inspection report, the District Director may require a review of a Complaints Response Plan; and
f. If an officer detects the presence of air contaminants that are odorous beyond the property boundary, upon notification, facility operators must:
    i. Investigate potential causes; and
    ii. Identify and implement remedial actions to ensure compliance with the facility's Emission Management Plan and the Emission Control Requirements.

4. Required Records and Reporting

All facilities must keep records and report information to the District Director as described below:

a. Keep records of the mass of activated carbon used/discarded, dates of replacement of activated carbon, complaints received and remedial actions taken, changes to control works, number of plants, strains and growing area.
b. Make records available to an officer for inspection; and
c. Annual reporting of mass of activated carbon used and discarded, dates of replacement of activated carbon, complaints, responses, and any remedial actions taken.

5. Minimum Distance Requirement

New facilities must be located more than 200 metres from land zoned for residential use, hospitals, schools, daycares, playgrounds and community care facilities.

In addition to requirements under the potential regulation to control emissions from cannabis production and processing, boilers and heaters used by a facility would need to comply with the applicable regulations. For facilities with a capacity of 50 MW or less, boilers can register under the *GVRD Agricultural Boilers Emission Regulation Bylaw No. 1098, 2008* for facilities in the Agricultural Land Reserve, or under the *GVRD Boilers and Process Heaters Emission Regulation Bylaw No. 1087, 2008*, as amended, for facilities not in the Agricultural Land Reserve.

Metro Vancouver regulates emissions from reciprocating engines through permits. Facilities using reciprocating engines as a power source, but that would otherwise meet the requirements of the potential regulation, could choose to apply for a permit authorizing emissions from the entire facility or from the reciprocating engine only.

If the facility is not able to comply with all of the emission regulation requirements, or if the facility employs unique technologies in its emission controls that are not authorized in the regulation, the facility may seek authorization for air discharges through the Metro Vancouver permitting process.

Administration of the Emission Regulation

Metro Vancouver's regulatory system includes a system of user fees which are intended to provide recovery of the costs of developing and administering permits and regulations, following a 'discharger pay' principle. The costs associated with administering the emission regulation are intended to be covered by registration and annual fees.

The proposed registration fee of $2,000 would cover the cost of the registration process, the review of application and an initial inspection. The annual fee for facilities operating under the potential regulation would be a composite comprising a fixed fee portion of $250 and an additional variable air contaminant emissions fee portion calculated using the emission fee per tonne of photoreactive VOC established in the *GVRD Air Quality Management Fees Regulation Bylaw No. 1083, 2008,* as amended. This variable fee portion could be determined using estimated facility-wide controlled emissions. Calculations of estimated emissions from growing areas of the facility must be consistent with the calculation of the midpoint estimate for VOC emissions presented in Table 3 of Metro Vancouver's Cannabis Cultivation Emissions Estimate Methodology and Sensitivity Analysis, November 13, 2019. Metro Vancouver would revise the growing area emission factor based on available scientific information on a regular basis. Emissions from processing areas can be estimated based on measured concentrations or concentrations provided by Metro Vancouver, flow rates and control efficiency. Any alternate method for estimating VOC emissions proposed by a registered facility would need to be approved by Metro Vancouver's District Director under the *Environmental Management Act*.

The potential regulation would also specify supplemental increases based on inflation that would occur on an annual or other fixed schedule to reflect increases in administration costs. The fees would come into effect upon implementation of the emission regulation.

Definitions would also be included in the emission regulation to ensure a common understanding of applicable terminology.

Providing Comments on the Potential Regulatory Initiative

Metro Vancouver is seeking input on the adjusted proposals to regulate air emissions from cannabis production and processing from stakeholders representing different perspectives, and will consider all input in the development of a potential emission regulation. The MVRD Board will receive a summary of the input received.

Metro Vancouver welcomes feedback with respect to the regulatory proposals outlined in this discussion paper. Metro Vancouver will carefully consider all feedback when considering potential proposals for managing emissions from cannabis production operations in the region.

Metro Vancouver staff and contractors will treat comments received with confidentiality; please note that comments you provide and information that identifies you as the source of those comments may be publicly available if a freedom of information (FOI) request is made under the *Freedom of Information and Protection of Privacy Act*. If you have any questions or comments regarding the consultation process, please call 604-432-6200.

Metro Vancouver invites you to provide feedback on this discussion paper by November 30, 2021 to AQBylaw@metrovancouver.org. Feedback will be considered until the MVRD Board adopts an emission regulation bylaw for managing emissions from cannabis production operations.

Thank you for taking the time to consider and provide input on adjusted regulatory proposals for cannabis production operations in Metro Vancouver.

Updated Engagement Plan for the Next Phase of Engagement on a Potential Emission Regulation for Cannabis Production and Processing Operations (as submitted to Committee and Board)

Introduction

Metro Vancouver is committed to engaging with the public, stakeholders and other governments, including First Nations, and incorporating their feedback into a potential Cannabis Production Emission Regulation.

The proposed engagement process is proposed to be conducted between August and November 2021 and will be conducted in accordance with the Metro Vancouver Board Policy on Public Engagement. This phase of engagement builds on the work completed to date to develop a potential emission regulation for cannabis production and processing operations. The engagement plan is designed to reach a broad audience to discuss the purpose and benefits of the potential regulation. Engagement will continue to focus on seeking feedback from affected sectors including cannabis growers and producers, the larger agricultural community, and other orders of government.

Due to public health measures during the COVID-19 pandemic, engagement activities will be conducted mainly using virtual and online means, and staff are planning creative and engaging materials to encourage feedback. More in-person activities may be introduced later in 2021 in accordance with public health recommendations. Feedback will be reported to the Committee, highlighting how it informed the development of an emission regulation for cannabis production and processing operations.

Engagement Objectives

- Share information with the public on the proposed measures and benefits of the potential emission regulation.
- Have meaningful conversations with specific sectors and organizations (e.g., those impacted by the proposed regulation such as cannabis producers, the BC Cannabis Legalization and Regulation Secretariat, and Health Canada).
- Provide multiple opportunities for the public and affected sectors and organizations to provide feedback.

Outcomes

- A broad audience is aware of the opportunity to provide input into a potential emission regulation for cannabis production and processing operations, and aware of a regulation's purpose and benefits.
- Specific sectors and organizations are aware, have the opportunity to speak with staff, and are requested to provide feedback.
- Feedback is received, recorded, presented to the Board, and where required, staff have responded.
- Feedback is considered in developing a regulation, and adjustments made in light of feedback are highlighted to the Board when presenting the proposed emission regulation for cannabis production and processing operations for consideration.
- A common understanding is sought between Metro Vancouver and cannabis producers on the purpose and feasibility of a potential emission regulation.

Audience

Staff expect to engage with the public and the following stakeholders and authorities on a potential emission regulation for open-air burning of vegetative debris in Metro Vancouver:

- The public;
- Member jurisdictions;
- Local Indigenous communities;
- Cannabis producers and processors;
- Agricultural producers;
- Agricultural advisory committees;
- Businesses involved in land development, construction and landscaping;
- Related industry and industry associations;
- Professional organizations;
- Provincial, federal and other government agencies;
- Neighbouring jurisdictions; and
- Health agencies.

Tactics and Timing

Tactic	**Timing**

Inform audiences that the Discussion Paper titled "*A Potential Emission Regulation for Cannabis Production and Processing in Metro Vancouver, Discussion Paper with Adjusted Proposals*" is published, purpose and benefits, and options for providing comments.
• Publish an engaging web resource to house:
  ○ Discussion Paper
  ○ Plain language summary of the Discussion Paper
  ○ Highlight purpose and benefits
  ○ Highlight major actions
  ○ Links to contextual documents
  ○ Options for providing comment
• Correspondence to stakeholder audience to include:
  ○ Link to web resource
  ○ Invitation to join a public or sector specific virtual forum
  ○ Invitation for a meeting with staff
  ○ Request and options for providing feedback
  ○ Specific mail out to agricultural audience based on previous engagement
• Promote information to broader audience via:
  ○ Social media
  ○ Relevant Newsletters
  ○ Request member outreach to residents
	Upon approval by the Metro Vancouver Board

Answer questions and clarify information
• Host five webinars to walk through the Discussion Paper and proposed requirements for managing emissions from cannabis production and answer any questions
  ○ 2 public
  ○ 2 stakeholders (focused content for producers, processors and related businesses)
	Virtual forums – Between September and November 2021
	
	Virtual meetings – schedule as requested

○ 1 Government • Offer to meet (virtually) with ○ other governments ○ specific sectors and organizations ○ other relevant audiences • Respond to email queries to project email and moderate social media	Respond to queries and moderate social media – ongoing
Ensure specific sectors and organizations are aware, have the opportunity to speak with staff, and are requested to provide feedback • Phone or email direct offers to have a virtual meeting and conversation with audiences the project team deems essential to hear from (e.g. implementation, collaboration, alignment, higher impact etc.)	Between August and November 2021
Compile feedback • Collect and review feedback • Create a table that can be filtered for theme and audience	Between December 2021 and February 2022
Analyze/ incorporate into draft Emission Regulation for Cannabis Production and Processing Operations	TBD
Draft Emission Regulation for Cannabis Production and Processing Operations to MVRD Board • Include summary of engagement and feedback and how feedback was applied	TBD

45275721

To: Climate Action Committee

From: Ken Reid, Superintendent, Environmental Sampling and Monitoring
Kyle Howe, Air Quality Analyst
Parks and Environment Department

Date: June 22, 2021 Meeting Date: July 16, 2021

Subject: **Lower Fraser Valley Ambient Air Quality Monitoring Network Review 2021**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated June 22, 2021, titled "Lower Fraser Valley Ambient Air Quality Monitoring Network Review 2021".

EXECUTIVE SUMMARY

Metro Vancouver commissioned a consultant's review of its network of air quality monitoring stations. The review found that Metro Vancouver operates one of the most comprehensive ambient air quality monitoring networks in the world. The report identified 13 recommendations to further strengthen the network so that it continues to be world-leading. These recommendations include improving spatial coverage of the permanent monitoring network (including adding a station in the Surrey/White Rock area), integrating lower cost sensors, and improvements in odour monitoring. These recommendations will be considered by staff as part of ongoing planning for network improvements. Metro Vancouver's new air quality management plan, the *Clean Air Plan*, has identified the need for the network to be reviewed every 5-10 years.

PURPOSE

To provide the Climate Action Committee with the findings of a consultant study, the *Lower Fraser Valley Ambient Air Quality Monitoring Network Review*, and future directions for the network and Metro Vancouver's air quality monitoring capabilities.

BACKGROUND

Metro Vancouver operates a comprehensive network of air quality monitoring stations, with 31 stations from Horseshoe Bay to Hope, that provide the technical foundation for the air quality management program. From time to time, Metro Vancouver commissions a third party review of the network, to ensure it is responsive to changing needs and technologies. This report conveys the findings and recommendations of a consultant's review of the network, and recommendations for continued improvements to the network and Metro Vancouver's air quality monitoring capabilities.

Metro Vancouver's draft *Clean Air Plan* outlines over 50 actions under the issue area of "Measure, Monitor and Regulate", which rely on a robust air quality monitoring network. Many other actions in the *Clean Air Plan* rely on the analysis of regional air quality trends and how air quality changes across the region. The draft *Clean Air Plan* was informed by the network review and has identified the following directions for the network:

- Enhance monitoring network with low cost and portable sensors, near-road and community monitoring, and carbon dioxide monitoring.
- Measure the changing climate and the impacts to air quality, including visual air quality.
- Develop and implement a user-friendly open data portal, so the public and researchers can more easily access and use data collected by Metro Vancouver.
- Explore options to improve rapid monitoring capabilities during air quality emergencies.
- Review monitoring network every 5-10 years to respond to regional changes, emerging issues and help protect human health and the environment.

THE LOWER FRASER VALLEY AIR QUALITY MONITORING NETWORK

Metro Vancouver operates a network of air quality monitoring stations that provide the basis for air quality planning, including determining compliance with air quality objectives and standards, tracking air quality trends, and providing information to the public. The Lower Fraser Valley Air Quality Monitoring Network comprises 31 stations that continuously monitor air contaminants throughout the airshed. Recognizing the shared nature of the airshed, six of the stations are located in the Fraser Valley Regional District (FVRD), and these stations are operated by Metro Vancouver under a service agreement with the FVRD. In addition to continuous instruments at these stations, some also include instruments being operated to collect samples that are submitted for detailed laboratory analysis of numerous air contaminants. Complementing the fixed stations of the air quality monitoring network are portable and special study instruments, including the mobile air monitoring unit (MAMU), that can be moved throughout the region to investigate local air quality issues.

The network provides the foundation for developing new air quality and climate policy and is a key component of the Measure, Monitor and Regulate issue area identified in the draft *Clean Air Plan.* The network supports both of the long term goals set in the draft *Clean Air Plan* by providing a world-leading monitoring network and providing data directly to Metro Vancouver residents about current air quality. Air quality in the region is monitored and reported in real-time, in order to respond to emerging air quality issues (e.g. wildfire smoke and air quality advisories).

REVIEW OF THE EXISTING NETWORK

Regional air quality monitoring is a balance of utilizing highly sensitive equipment, selection of monitoring locations that are representative of broad areas, and continuous maintenance and calibration to ensure data are of the highest quality. As the science of measuring air quality improves over time, the monitoring network needs to adapt to integrate emerging technology and evolve with the latest scientific and health research. In 2020 a consultant's study was commissioned to provide a review of the Lower Fraser Valley Air Quality Monitoring Network. The full report and Executive Summary (Attachment) was received in May 2021.

The *Lower Fraser Valley Air Quality Monitoring Network Review* provides a comparative analysis of the network against other jurisdictions across Canada, the United States, and globally, to understand where our network excels and identify areas where the network could improve. The consultant found that on a population basis, the network is a world-leader when compared to other large jurisdictions such as Montreal, London, UK, and the South Coast Air Quality Management District (California). In addition to having high spatial coverage, the network also monitors for a robust set of air contaminants and is in line with other major metropolitan networks across Canada and the world.

Improvements to the air quality monitoring network are guided in part by third-party consultant reviews, an understanding of best practices from around the world, and by staff working closely with senior levels of government, health agencies, researchers, member municipalities and others. *The Lower Fraser Valley Air Quality Monitoring Network Review* evaluated the status of recommendations from the previous network review and demonstrated that significant improvements have been made to the network. Of the 18 recommendations in the previous review, 11 have been completed and another 4 are either in progress or have been planned. The remaining recommendations have been re-evaluated in this current review. Highlights of network changes in the last decade include:

- Created public real-time air quality data website (airmap.ca)
- Added stations in New Westminster and Delta (Tsawwassen) to monitor a number of contaminants including fine particulate matter, ozone and nitrogen oxides
- Added stations in Mission and Agassiz to enhance monitoring of ground-level ozone, as well as fine particulate matter and nitrogen oxides
- Replaced continuous fine particulate monitoring instruments at all stations with new technology capable of measuring portions of fine particulate that could not be measured previously
- Performed near-road special study and established a permanent near-road monitoring station
- Established a core set of permanent more heavily instrumented “Super Sites” distributed across the length of the Lower Fraser Valley
- Added monitoring related to diesel particulate matter
- Expanded portable monitoring capabilities, including a new mobile air monitoring unit (MAMU)
- Added more visual air quality monitoring sites
- Performed neighbourhood-scale special studies
- Reduced carbon monoxide monitoring
- Developed in-house capabilities for comprehensive data analyses, and
- Upgraded the air quality data acquisition system.

RECOMMENDATIONS FOR FUTURE DIRECTION OF THE NETWORK

In recent years, consumer grade sensor technology has expanded in popularity as it provides low-cost options for measuring air quality. As reported to the Committee in November 2020, staff recently completed the Air Aware project, which conducted an analysis of existing consumer grade sensor technology. In addition to the emergence of consumer grade sensors, there has also been an increase in mid-tier (or professional grade) sensors, which do not have the same accuracy as the regulatory instruments used in the network, but provide more reliable data than the consumer grade sensors.

Embracing both the consumer grade and mid-tier sensor technologies is critical for the network to continue to evolve. Numerous studies have demonstrated that these consumer and mid-tier sensors provide valuable supplementary data as part of a larger, high quality network. These types of sensors could also be used to enhance the specialized air quality studies conducted by Metro Vancouver, including high resolution community monitoring, both by being more affordable and requiring a significantly smaller footprint to install and operate. Integration of these types of sensors will require further development of data analytics and data processing tools.

The full list of the 13 recommendations from the consultant's report is as follows:

Improve Spatial Coverage of the Permanent Monitoring Network – Increasing population density south of the Fraser River should be considered as a factor for investigating the installation of a new permanent monitoring station. Based on projected population growth for the region and the current spatial distribution of the network, the consultant has recommended an additional monitoring station be developed in the Surrey/White Rock area. In addition to improving spatial coverage in dense areas, the report also suggests monitoring in more rural and wilderness areas within the region, some of which could be done with emerging sensor technologies.

Integrate Lower Tier Sensors into the Network – Professional and consumer grade air quality sensors present an opportunity to supplement the regulatory monitoring network, increase spatial coverage and increase community engagement. Care must be taken when interpreting the data from these sensors as they may have limitations when compared to the high quality data collected in the regulatory network.

Improve Odour Monitoring – Consider implementing a complementary yet less formal system than the current air quality complaint system to allow for easier reporting of odours across the region.

Add Carbon Dioxide Measurements – Explore how local monitoring of CO_2 could provide information on the effectiveness of policy measures and to aid in determining emission factors.

Audit Air Quality Monitoring Stations - Review permanent monitoring station locations every one to three years to ensure the site continues to meet original siting criteria and that measurements are suitable for their intended purpose.

Expand Documentation – Develop and provide information regarding standard operating procedures, quality assurance and quality control activities, instrument audit procedures and calibrations, and station-specific metadata.

Provide Air Quality Health Index (AQHI) for each Monitoring Station – Currently the Lower Fraser Valley has six AQHI zones, while the network has 19 stations which provide sufficient data for calculating a station-specific AQHI.

Add Second Near-Road Station – The *Metro Vancouver Near-Road Air Quality Monitoring Study* completed in 2020 recommended that additional near-road monitoring is conducted in the region.

Re-Establish Remote Monitoring Station – In partnership with Environment and Climate Change Canada and BC Ministry of Environment and Climate Change Strategy, Metro Vancouver contributed to the operation of a Canadian west coast background monitoring station in Ucluelet from 2010-2017.

Expand Ancillary Information – Expansion of data not directly related to the network but which supports air quality programs and assessments. This could include traffic data from across the region, additional data on wildfire impacts, and increased detail of the emission inventory.

Expand the Use of Speciation Data – Improve the utilization of non-continuous speciation data (which examines the chemical composition of e.g., total fine particulate matter or total volatile organic compounds) already being collected within the network. Incorporating analysis of this data

into the air quality program would further support policy work, environmental assessments and identification of emerging air quality issues.

Reduce Carbon Monoxide Monitoring – Further reductions in carbon monoxide monitoring could be made, as data indicates concentrations are well below existing air quality objectives and standards throughout the region, with resources re-purposed to higher priority monitoring.

Continue Performing Special Studies – Specialized air quality studies were identified as important to understand neighbourhood-scale exposure to contaminants and to conduct monitoring in locations where there is no permanent monitoring stations.

The consultant's full report and the 13 recommendations will be considered by staff in planning for network improvements, and reported to the Climate Action Committee upon implementation. Continual improvement in air quality monitoring in the Lower Fraser Valley will aid in development of air quality policy and will support the goals set out in the *Clean Air Plan*. By leveraging the large amount of real-time and historical data, Metro Vancouver is well positioned to continue improving our air quality and identifying emerging air quality trends.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

The cost of the consulting review of the Lower Fraser Valley Ambient Air Quality Monitoring Network was included in the ambient air quality monitoring program budget in 2019 and 2020. The Fraser Valley Regional District contributed financially to the cost of the review and the work was done in partnership with the FVRD. Planned improvements to the network as a result of the recommendations in this report will be included in future budget requests.

CONCLUSION

The Lower Fraser Valley Ambient Air Quality Monitoring Network provides air quality monitoring services to the region and is a key part of developing policy, monitoring real time air quality and supporting air quality management. Reviews of the network are conducted periodically, and a consultant was retained to review the network and provide recommendations for future improvements. The review indicated that Metro Vancouver operates a world-class ambient air quality network but can continue to improve by considering a list of 13 key recommendations for implementation.

Attachment

Executive Summary - Lower Fraser Valley Air Quality Monitoring Network Review (RWDI, 2021)
(46558933)

References

1. Air Aware & Small Sensors
2. Metro Vancouver Near-Road Air Quality Monitoring Study

46256643

Executive Summary

Introduction

The Metro Vancouver Regional District (MVRD) has been operating an ambient air quality monitoring program within its jurisdiction since 1972. In 1998, in partnership with the Fraser Valley Regional District (FVRD) and the province of British Columbia, the MVRD integrated the air quality monitoring function for locations within the FVRD into a single air quality monitoring network (the Network) serving both regional districts located in the Lower Fraser Valley (LFV) airshed. While MVRD operates the Network, ongoing commitments to the Network operations are made by the FVRD under a service agreement with MVRD. On-going commitments to the Network are also made by federal, provincial, and other stakeholders.

The core of the existing Network consists of 31 fixed long-term air quality monitoring stations in the LFV airshed and 1 mobile air monitoring unit. Air quality sampling is conducted with continuous instruments connected to a central data acquisition system and also with non-continuous sampling technologies, where samples are collected for detailed analysis in a federal laboratory. Meteorological monitoring instruments, located at most stations, are an important component of the Network. The MVRD also participates in special studies using portable or semi-portable monitoring equipment in support of neighbourhood-level monitoring and the development of air quality improvement plans.

Objectives

RWDI was retained by the MVRD to conduct a review of the LFV ambient air quality monitoring network, specifically to assess the current state of the Network, identify emerging air quality issues that may require additional monitoring, and provide recommendations for modifications to the Network to ensure MVRD continues operating a world-class air quality monitoring network. Not part of the scope was a review of the Network objectives that were identified in the 2008 assessment. However, it is RWDI's impression that these objectives remain applicable and valuable.

Results

This report includes a review of other large air quality monitoring networks and has identified the air quality monitoring network operated by MVRD as a world-class network especially with respect to its permanent network using tier 1 regulatory grade sensors. Table 1 below summarize the reviewed networks and provide a comparison between the networks.

Table 1: Comparison of evaluated networks

	LFV	Ontario	Montreal	London	Seoul	SCAQMD	Puget Sound
*Number of Continuous Stations	31	39	15	100	65	40	23
Population (Millions)	2.8	14.6	1.9	8.9	9.7	18	4.1
Density (stations per million people)	12.5	2.7	7.9	11.2	6.7	2	5.6
Area Served (km^2)	36,303 *	1,076,000	500	1,569	605	17,000	17,820*

Coverage (km^2 per station)	1,037	27,590	33	16	9	25*	775
Station Types	Urban, Rural	Urban, Rural	Urban	Urban, Rural, Curbside, Roadside	Urban, Rural, Roadside	Urban, Rural	Urban, Rural, Roadside
Criteria Contaminants	CO, NO_2, O_3, PM_{10}, $PM_{2.5}$, SO_2, TRS	CO, NO_2, O_3, $PM_{2.5}$, SO_2	CO, NO_2, O_3, $PM_{2.5}$, SO_2	CO, NO_2, O_3, PM_{10}, $PM_{2.5}$	CO, NO_2, O_3, PM_{10}, $PM_{2.5}$, SO_2	CO, NO_2, O_3, PM_{10}, $PM_{2.5}$, SO_2, Pb	CO, NO_2, O_3, PM_{10}, $PM_{2.5}$, SO_2
Additional Parameters	Black Carbon, VOCs, PAHs, Visibility,	N/A	Black Carbon, VOC, PAH	Black Carbon, VOCs, PAHs, Visibility,	Photochemical, Deposition, VOC, heavy metals, THC, CH_4, PM_1	Photochemical, Deposition, VOC, heavy metals, THC, CH_4, PM_1	Black Carbon, VOCs, PAHs, Visibility, Carcinogens
Major Pollution Sources	Traffic, Wood Burning, Construction, Industrial sites, Punctuated events (forest fires)	Traffic	Traffic, Wood Burning, Construction	Traffic, Construction	Traffic, construction, external sources (China)	Traffic, Construction, Industry, Forest Fires	Traffic, Wood Burning, Construction, Industrial emissions, Punctuated events (forest fires)

*The PSCAA and LFV administrative areas are dominated by uninhabited wilderness and therefore, are far greater than other regions and are largely unmonitored. Despite this, impacts to uninhabited regions, such as from anthropogenic LFV/PSCAA sources contributing $PM_{2.5}$, ozone, or acid deposition as well as impacts from these uninhabited regions (such as wildfires, forest cycling, vegetative isoprene emissions, etc.) can have increasing importance in both regions with potential increasing land use intensity changing the dynamic of these areas.

Recommendations

Since the most recent assessment of the Network in 2008, changes have occurred in air quality due to factors such as:

- increasing understanding of the impacts of traffic-related air pollution on the near road environment;
- more frequent transportation of wildfire smoke into the airshed;
- increasing impacts of climate change, e.g. on photochemical smog and wildfires;
- ambient air quality trends in MVRD and the FVRD;
- regional growth and emissions patterns; and
- evolving ambient monitoring technology.

In addition, the MVRD needs to ensure that the Network continues to be properly aligned with other federal and provincial commitments and networks.

A review of the recommendations that were provided in the 2008 Network assessment showed evidence that the MVRD has completed the majority of the recommendations and partially completed or planned to complete most of the remaining recommendations. RWDI has developed a new set of recommendations, which includes some of the previous recommendations that remain relevant, outlined below.

Improve Spatial Coverage of the Permanent Monitoring Network

In response to changes such as demographics and new insights, MVRD should consider additional permanent monitoring using tier 1 regulatory grade sensors, e.g. south of the Fraser River and in rural or wilderness areas.

This report has identified the air quality monitoring network operated by MVRD as a world-class network especially with respect to its permanent network using tier 1 regulatory grade sensors. With growing and shifting populations, changes in land-use, increasing consideration of indigenous communities, and growing scientific insights, MVRD should continuously evaluate its current network and respond to newly identified spatial gaps. The following areas have been identified for the potential addition of permanent stations:

- The area south of the Fraser River, in particular Surrey / White Rock; the City of Langley, the Walnut Grove sector of Langley and adjoining portion of northeast Surrey; and the northeastern portion of Abbotsford abutting onto Sumas Mountain.
- The portion of the FVRD covered by the Agricultural Land Reserve in eastern Abbotsford and eastern Chilliwack.
- Rural and wilderness areas.

Integrate Lower Tier Sensors into the Network

Based on recent advancements, it is recommended that MVRD expand the Network by incorporating tier 2 professional grade monitors and tier 3 consumer grade sensors.

Tier 2 professional grade instruments are capable of meeting air quality monitoring data quality objectives as specified within the Monitoring and Quality Assurance/Quality Control Guidelines published by the National Air Pollution Surveillance program or BC Ministry of Environment and Climate Change Strategy (BC MOECCS) field sampling manual. These instruments meet these data quality objectives but are not listed or use different monitoring technology to that listed in the guidelines

and have not undergone the rigorous testing required of regulatory grade instruments. Depending of the kind of system, there are several potential advantages:

- low power requirements and portability;
- few temperature restrictions for operation; and
- near instantaneous results and speciation of compounds such as volatile organic compounds and semi volatile organic compounds.

Tier 3 consumer grade instruments are low-cost instruments accessible to the general public but do not meet the requirements specified under the guidelines and are typically reported as having limited stability, susceptible to interference from other criteria air contaminants. These instruments are commonly deployed for so called “citizen science” and “community science”.

Citizen science typically operates mostly exclusive of scientific oversight; commonly, instructions are provided, and the citizen manages the system mostly with limited expertise and technical abilities. This enables the scientific organization to receive a large amount of sampling information while using very little resources, but the data could potentially have limited utility.

Conversely, a community approach engages a group of individuals (such as a school, hospital, or retirement community) to carry out measurements. Participants can be trained by the scientific organization more comprehensively on measurement protocol. In this case, less data is received, and more resources are required to support measurement training, but the data are of a higher quality and value.

MVRD might consider contacting the United States South Coast Air Quality Management District for additional information on its Air Quality Sensor Performance Evaluation Center (AQ-SPEC) and its approach to blending measurements and modelling. AQ-SPEC was created to facilitate the use of low-cost sensors through validation and data quality assessments. The research conducted by the AQ-SPEC provides a database of low-cost sensors that could help MVRD determine the most appropriate sensors that suit its needs beyond regulatory monitoring. However, it is important to note that environmental conditions specific to the LFV may require modifications of the use case.

Moreover, the South Coast Air Quality Management District blends observations at these non-regulatory monitoring locations with model output, including National Oceanic and Atmospheric Administration model predictions and mathematically simulated ‘stations’ as calculated by the South Coast Air Quality Management District. The district utilizes this data to create a gridded map of 5 km x 5 km cells to inform localized air quality, including an air quality index throughout the district. Historical, current, and forecast air quality data is provided to the public through smartphone applications and is also available on their website.

Improve Odour Monitoring

It is recommended that MVRD explores potential improvements in the effectiveness and efficiency of the current odour monitoring and management system.

MVRD’s current odour monitoring system relies mainly on complaints submitted by the public (3000 to 4500 complaints per year). MVRD receives more complaints relating to odour than any other type of air emission. Upon reception of a complaint, officers perform odour surveys starting at the complainant location based on wind direction and the most likely suspect. The current system requires substantial resources and appears to be too slow to be effective in identifying compliance issues.

MVRD might want to investigate possibilities to complement the current complaint-based system with an additional layer of less formal information on odours for surveillance purposes. The University of British Columbia, for example, has launched the Smell Vancouver public web application (https://smell-vancouver.ca/), where citizens can report odours for research purposes. Similarly, the Wood Buffalo Environmental Association's COMP (Community Odour Monitoring Program) allows community members to submit information about odours they experience in the Regional Municipality of Wood Buffalo. Information is submitted to a database, where it will be compared to the ambient air data collected at the Wood Buffalo Environmental Association's air monitoring stations throughout the region. If high odour concentrations are found to coincide with high concentrations of continuously monitored criteria air contaminants, a locally valid relationship can be developed and those already measured contaminants could be used as a proxy for odours.

By giving users the ability to choose between sending a notification or a formal complaint, more data can be collected over the long-term to develop a better understanding of potential odour sources, without the need to follow up and respond to notifications. It is plausible that users might choose to notify rather than complain when given an option. There might also be instances where some citizens find an odour offensive enough to issue a complaint while others might notice the odour but only send a notification.

Add Carbon Dioxide (CO_2) Measurements

Given the increasing importance of climate change, it is recommended that MVRD adds CO_2 monitoring to existing sites representing different environments such as urban, suburban, and rural. In addition, CO_2 measurements can be used to aid in determining emissions factors and to improve emissions inventory reports.

Concentrated emissions of CO_2 in a localized area can lead to a capping effect that locally increases concentrations of O_3 and PM, thereby increasing exposure to these contaminants in urban areas. It also creates stagnation conditions that can favour secondary pollution formation. Finally, over the longer term, CO_2 records might also provide information on the effectiveness of policy measures to reduce CO_2 emissions and of the impact of population shifts and associated land-use changes.

Audit Air Quality Monitoring Sites Annually

Auditing air quality monitoring sites every one to three years ensures that the sites continue to meet original siting criteria and that measurements are suitable for their original purpose, and it increases transparency. The audits should include a full site inspection.

This recommendation was carried forward and modified from recommendation 16 in the 2008 network review. Currently, MVRD conducts instrument performance and station operation audits, but not a full audit. For transparency, audit results could possibly be published in an appendix to the annual reports as part of the recommendation to expand documentation.

Expand Documentation

Providing additional network-related information improves transparency and supports research. Examples of additional information include:

- Standard operating procedures, quality assurance and quality control activities, and station and instrument audit procedures;
- Metadata; and
- Audit and calibration results.

Provide Air Quality Health Index (AQHI) for each Monitoring Station

Currently, the Lower Fraser Valley is covered by six AQHI zones, with the AQHI for each zone being reported on Metro Vancouver's website. Nineteen LFV monitoring sites measure all three of $PM_{2.5}$, O_3, and NO_2 and would allow for calculation of the AQHI in these specific locations, in addition to the AQHI zones currently being reported. It is recommended to add a $PM_{2.5}$ monitor to the Maple Ridge site to allow for a station-specific AQHI to be reported in that location.

Add Second Near-Road Site

Based on recent and projected population data for the MVRD, the addition of a second near-road site is recommended.

The current Network meets the recommended criteria for near-road sites namely: at least one site for the MVRD with a population greater than 1 million with the following parameters measured: black carbon, CO, NO_2, O_3, $PM_{2.5}$, SO_2, ultra-fine particles and traffic counting. However, in the last few years MVRD has surpassed a population greater than 2.5 million and is predicted to continue growing to more than 3.0 and 3.5 million people in the 2030's and 2040's, respectively. A second near-road site for a population greater than 2.5 million is recommended.

It might be helpful to deploy the mobile air monitoring unit at candidate locations before deciding on a fixed location. A main arterial road with nearby residences is desirable, ideally with a different traffic mix than Clark Drive, which has a very high percentage of heavy truck traffic.

In addition to serving local needs within MVRD, an additional near-road site would contribute to nation-wide objectives. In the 'Near-Road Air Pollution Pilot Study' in 2019, Southern Ontario Centre for Atmospheric Aerosol Research recommended a national near-road monitoring network including long-term near-road monitoring stations established in Canada's largest cities. The network should promote outreach and public involvement, to proactively engage Canadians, encourage behaviour change, and build stronger societal support for new policies or regulations. The network for near-road monitoring should publicly share data from near-road stations through web sites, phone apps, and public displays (e.g., electronic signs on highways) when and where impacts are potentially arising. Such a national initiative would also directly benefit MVRD.

Re-Establish Remote Monitoring Station

It is recommended that MVRD re-establishes a remotely located permanent station to monitor air quality, specifically criteria air contaminants, in the clean, background lower troposphere relevant to air quality in the LFV.

This recommendation was originally suggested in the 2008 network review and temporarily implemented from 2010-2017 by MVRD's partnership with ECCC and BC MOECCS in the operation of the baseline air quality station in Ucluelet. A detailed site selection study was originally performed, which might contain information that is still relevant to determine an alternative remote location. In the interim, it is RWDI's understanding that attempts are being made to establish statistical relationships for the available data period from 2010-2017 between data collected at Ucluelet and other regional stations such as Cheeka Peak on the Olympic Peninsular. That information could be helpful in filling in the data gap after establishing a new background station but would not be a substitute for a new background station, because there is high uncertainty in the extrapolation of such a statistical relationships into the future.

Expand Ancillary Information

It is recommended that MVRD considers providing additional air quality related information.

While this recommendation does not directly relate to the Network itself, desirable ancillary information to the Network was identified during the review in the larger context of air quality in the LFV. Specifically, MVRD could collaborate with respective agencies to provide information such as:

1. Traffic data in standardized and systematic formats for major roadways in the LFV.
2. Additional information for protection from air quality impacts of wildfires.
3. Emission Inventory: Additional ways of aggregating individual emission sources and source types.

These three examples are further explored in the following subsections.

Traffic Data

Traffic counts, fleet composition, and other traffic-related information are important determinants of population exposure to traffic-related air pollution. In addition, traffic data is of crucial importance in the development of emission inventories for photochemical modelling.

Traffic data are typically collected by municipalities in Canada but are difficult to obtain in standardized and systematic formats for large geographic areas. Potential partners with a shared interest in traffic data, and who might already be collecting traffic data, are Translink and the BC Ministry of Transportation and Infrastructure. A standardized approach to collecting traffic data, particularly truck data, would provide valuable information to extrapolate results from near-road measurement sites across areas impacted by traffic and support traffic models. There are also potential synergies with respect to the quantification of traffic related GHG emissions. By joining forces with other interested agencies, benefits could be maximized and cost shared between agencies.

Wildfires

MVRD's advisory program is already comprehensive and collaborative with partners in the Health Authorities for education/outreach. However, given the substantial impact of wildfires on air quality in the LFV in recent years, MVRD might be able to incorporate additional resources to improve public health protection.

Major forest fire events in recent years have caused substantial increases in summer $PM_{2.5}$ and possibly also NO_2 and ozone concentrations throughout the LFV. Current research on future forest fire extent and frequency might not be conclusive because of many driving factors, including forest management practices. However, increasing summer temperatures and a likely extension of the dry period in the Pacific Northwest are factors that will exacerbate favorable forest fire conditions. Furthermore, measures to decrease forest fire risk and improve fire management will take years to decades to implement and take effect. Recent research suggests that the health impacts of $PM_{2.5}$ originating from wildfires might be greater than from non-wildfire sources (Aguilera, 2021). To improve the protection of public health, MVRD might consider utilizing additional information and prediction resources such as resources from the US EPA (https://www.epa.gov/smoke-ready-toolbox-wildfires). Opportunities might also exist to share and coordinate resources and information with other agencies such as the BC Centre for Disease Control and HealthLinkBC.

Emission Inventory

Additional ways of aggregating individual emission sources and source types could provide additional insights and would benefit the tracking and forecasting of growth sectors such as the Port.

It was noted by MVRD that work is currently under way to create a GHG emission inventory for the LFV. With respect to CAC, individual emission sources or specific source types are aggregated in different ways in MVRD's emission inventories (MVRD, 2018a) to shed light on areas of particular concern that could be targeted with emission reduction policies. MVRD might want to consider additional aggregations, for example to describe Port areas and their supply chain emissions (e.g. truck and rail) together as a major source, along with growth projections.

Expand the Use of Speciation Data

The review identified several opportunities to utilize existing data better or add measurements of particular importance.

This review highlighted the wealth of information provided by the National Air Pollution Surveillance network in the LFV, especially for speciated data. While ongoing reductions in the speciation program might run counter to its utility, they could be reconciled with improvements to increase the Network's utility.

Currently, some of the LFV sites measure high levels of some volatile organic compound (VOC) species. Characterization of VOCs is important as some are air toxics with direct human health effects and others act as precursors to photochemical smog. Because the National Air Pollution Surveillance program applied consistent methodology over time, accurate trend determination can be made for total non-methane hydrocarbons and for individual VOC species. Moreover, speciated VOC measurements can be used to infer emission contributions and validate emission inventories. The expansion of the Trans Mountain Pipeline and associated storage facilities and marine traffic may result in increased VOC emissions and impacts.

Some semi-volatile species such as polycyclic aromatic hydrocarbon (PAH) are toxins of particular concern downwind of some point sources within the LFV as well as from residential wood burning. Therefore, MVRD should consider the measurement of semi-volatiles species at some select locations.

For $PM_{2.5}$, mass alone is a very imperfect measure of potential $PM_{2.5}$ impacts. Tracking progress and developing optimum control strategies for $PM_{2.5}$ requires a detailed understanding of precursor levels and components. Data on ambient levels of ammonia and nitric acid are important for a full understanding of the atmospheric chemistry and fate of emitted nitrogen oxides especially on a regional scale. The speciated $PM_{2.5}$ measurement program also collects data on biomarkers such as levoglucosan that are useful in quantifying forest fire impacts as well as residential wood burning. The relative importance of various species and emission sources on visibility can also be derived from the speciated $PM_{2.5}$ measurements being made at network sites.

Reduce Carbon Monoxide Monitoring

MVRD might consider further reductions in conventional carbon monoxide (CO) monitoring.

Current CO levels throughout the LFV and even at the sites most impacted by transportation sources are well below existing ambient air quality objectives by MVRD. There are no Canadian ambient air quality standards for CO, and it is not used in the calculation of the AQHI. In urban areas, CO measurements can provide an index of anthropogenic emissions and, when linked with NO_X and VOC measurements, can provide important information related to emissions verification and the efficiency of emissions controls, especially as they relate to the transportation sector. Microscale and middle scale measurements are the most useful site classifications for CO monitoring sites, because most people have the potential for highest exposure on these scales. Currently, even after reduction in CO monitoring, the majority (8 out of 12) of LFV sites remain neighbourhood scale and population exposure classification. High sensitivity measurements would be the most useful for all scales of representativeness.

Continue Performing Special Studies

It is recommended that MVRD continues performing special studies.

In the previous network review (RWDI, 2008), it was recommended to perform special studies to examine neighbourhood-scale variability of pollutants in an area of mixed land-use including residents and a variety of emission sources and to examine air quality near roadways in areas with residents and high traffic congestion. MVRD implemented these recommendations by performing or participating in several special studies. The value of these studies has been noted in this review and acknowledged by MVRD.

Conclusions

A comparison with other large air quality monitoring networks showed that the MVRD is operating a world-class network. A review of the Network objectives that were identified in the previous Network assessment in 2008 was not part of this assessment, but it is RWDI's impression that these objectives remain applicable and valuable. A review of the recommendations that were provided in the 2008 Network assessment showed evidence that the MVRD has completed the majority of the recommendations and partially completed or planned to complete most of the remaining recommendations. RWDI has developed new recommendations, including previous recommendations that remain relevant. All new recommendations are in support of the Network objectives from the 2008 assessment.

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Roger Quan, Director, Air Quality and Climate Change
Neal Carley, General Manager
Parks and Environment Department

Date: June 29, 2021 Meeting Date: July 16, 2021

Subject: **Old Growth in the Metro Vancouver Region**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated June 29, 2021, titled "Old Growth in the Metro Vancouver Region".

EXECUTIVE SUMMARY

At the June 2021 meeting, the Climate Action Committee directed staff to report back on the issue of old growth within the Metro Vancouver region. From the perspective of the Committee's terms of reference, staff have analyzed the carbon storage in old growth, the amount of old growth in the region's watersheds and regional parks, and actions and initiatives to conserve forested areas, including old growth.

The current actions, and new policies under development as part of both Climate 2050 and Metro 2050 are sufficient to protect old growth in the region. Recommendations on a Board position beyond what is associated with climate action and climate benefits, are outside of the purview of the Climate Action Committee.

PURPOSE

To provide information to the Climate Action Committee on old growth forest within the Metro Vancouver region, and actions and initiatives to track and conserve old growth and associated climate benefits within the region.

BACKGROUND

At the June 13, 2021 meeting, the Climate Action Committee discussed a report to Port Moody City Council regarding the protection of remaining old growth forests in BC (Attachment 1), and a related report considered by Richmond City Council. Both reports call on the provincial government to defer logging in all at-risk old growth forests in BC until the recommendations of the Old Growth Strategic Review Panel have been implemented, with associated resolutions to be sent to the Lower Mainland Local Government Association (LMLGA) and the Union of BC Municipalities (UBCM).

The following motion was adopted:

That the Climate Action Committee direct staff to analyze and review the logging activity in old growth forests in British Columbia, and report back to the Climate Action Committee with options to oppose the logging activity.

There was also discussion about whether or not the above recommendation was within the scope of the work of the Climate Action Committee, along with concerns expressed by Committee members about staff capacity to carry out a detailed review. Accordingly, this report brings forward staff recommendations prepared from the perspective of what is within scope of the Climate Action Committee's terms of reference, specifically climate change aspects, relationship to Climate 2050, and ecological health. Issues such as funding to support economic considerations, funding support, and Indigenous reconciliation, have not been reviewed in detail by staff in preparing this report.

Carbon Storage in Old Growth Forests

Old growth forests can store approximately 1,000 tonnes of carbon per hectare. According to a 2019 report (Reference 1):

> *"Net carbon uptake in old forests does level off or decrease, but total storage increases. Old forests usually store much more carbon on site than do young post-logging forests. Depending on how they naturally function, how they are disturbed, and how they are managed, forests can therefore either mitigate or contribute to greenhouse gas emissions and climate change." (page 2)*

> *"…although all BC forests will eventually be replaced—suddenly, episodically, or gradually—currently they are carbon banks and their stored carbon has much greater **time value** now and in the crucial next three decades than anticipated, post-logging carbon storage recouped over the ensuing seven or more decades. Regardless of whether BC forests are a net source or a sink at any given moment, they continue to store megatonnes of carbon as long as they still have trees on site—even if the trees are dead." (page 3)*

In addition to carbon storage, it is important to consider the wide diversity of habitats that old growth forests provide. These habitats support many different species and have high biodiversity values.

Mature and young forests are critical for carbon sequestration (ongoing uptake of carbon as trees continue to grow) and they provide connectivity so wildlife species can move across the landscape. Protecting mature and young forests, in addition to old growth, will increase the amount of old growth in this region over the long term.

Old Growth in the Metro Vancouver Region

Old growth is defined as ecosystems that are older than 250 years. Metro Vancouver tracks old growth and other rare, fragile, or at-risk ecosystems using the Sensitive Ecosystem Inventory. Within the region, including the full extent of Metro Vancouver's watersheds that extend north of the MVRD boundary, there are 49,853 ha of old growth. Of this amount, 34,805 (70%) is on Metro Vancouver owned or managed lands: 33,011 ha (66%) within watersheds and 1,794 ha (4%) in Regional Parks.

For British Columbia as a whole, according to a May 30, 2021 CBC News article (Reference 2),

> *"The province says there are currently 13.7 million hectares of old growth in British Columbia, and 10 million of those hectares are protected or not economical to harvest. For reference, the entire province is roughly 95 million hectares in size, with approximately 57 million hectares of forested land.*

Around 20 million hectares of public forest in B.C. is available for harvesting, according to the province, of which 3.6 million hectares is old growth.

Each year, 200,000 hectares of forested lands in B.C. are logged. The province says 27 per cent of this annual harvest comes from old growth."

Current Metro Vancouver Actions to Protect Forested Areas

There are a number of actions and initiatives across Metro Vancouver service areas, that protect forested areas, including old growth.

- The *Ecological Health Framework* encapsulates Metro Vancouver's collective efforts around ecological health and provides guiding principles, goals, and strategies to help achieve the vision of 'a beautiful, healthy, and resilient environment for current and future generations'. Specifically, the *Framework* identifies Metro Vancouver's role in protecting and enhancing ecological health as it relates to its services and functions; provides a foundation for integrating ecological health into Metro Vancouver's corporate decision making; identifies how Metro Vancouver will report on ecological health-related initiatives across the organization; and supports regional efforts to protect and enhance ecological health.
- Metro Vancouver maintains the Sensitive Ecosystem Inventory (SEI), a consistent science-based GIS mapping of ecologically significant lands across the region, such as old, mature, and young forests, as well as other rare, fragile, or at-risk ecosystems. The inventory was first compiled in 2013 and updated in 2018 to document changes to mapped ecosystems and quantify the amount, rate, and type of ecosystem loss. The SEI will be updated in 2022 in line with regional data collection schedules.
- Metro Vancouver is currently seeking comment from member jurisdiction Councils on the draft of *Metro 2050*, the update to *Metro 2040*, the regional growth strategy. The draft sets aspirational regional targets to protect 50% of land for nature and increase tree canopy cover to 40% within urban areas. It also features new actions for Metro Vancouver and member jurisdictions to protect, restore, enhance, and connect ecosystems, including an advocacy action for Metro Vancouver to encourage the Province to consult and collaborate with all levels of government, including First Nations, and other stakeholders in the review of future natural resource extraction projects (e.g. forest harvesting, aggregate extraction).
- As part of *Climate 2050*, Metro Vancouver is developing a *Nature and Ecosystems Roadmap* that will identify actions to protect, restore, and connect the region's ecosystems, and enhance ecosystem and community resilience. These actions will provide a wide range of ecosystem services including storing carbon, cooling city streets, improving human health, and supporting biodiversity.
- As part of 'Modelling a Carbon Neutral Region', estimates of annual regional ecosystem carbon sequestration were developed to better understand the role that sequestration may play in reaching Metro Vancouver's goal of regional carbon neutrality by 2050.
- Metro Vancouver water supply areas include approximately 60,000 hectares of forested land that is closed to the public and protected from industrial and urban activities that fall outside utility needs. The forests are managed with a minimal intervention approach which includes intense monitoring of forest health.
- Regional Parks protect over 13,700 ha of the region's natural areas, with ongoing land acquisition to grow the system further. Park planning and management actions including stewardship and restoration, forest health monitoring, invasive species removal, and wildfire

management are conducted with the goal of conserving ecosystem health and ensuring the long-term resiliency of park ecosystems.

- Metro Vancouver's recently completed Tree Regulations Toolkit provides guidance on selecting and using regulatory tools to help preserve trees and increase tree canopy cover. The Toolkit is a resource for member jurisdiction staff, decision makers, and practitioners.

From the perspective of the Climate Action Committee and its terms of reference, staff's analysis is that there are actions in place to both track and conserve old growth within the Metro Vancouver region, and maintain the associated carbon sequestration and other benefits. Any additional position or advice to the Board on expressing opposition to old growth logging elsewhere in the province is outside of the mandate of the Climate Action Committee.

ALTERNATIVES

1. That the Climate Action Committee receive for information the report dated June 29, 2021, titled "Old Growth in the Metro Vancouver Region".

2. That the Climate Action Committee receive for information the report dated June 29, 2021, titled "Old Growth in the Metro Vancouver Region", and refer the matter to the Mayors Committee for further assessment of advocacy on the part of Metro Vancouver, and the implications of the Metro Vancouver organization taking a position of opposition to old growth logging.

FINANCIAL IMPLICATIONS

There are no financial implications associated with Alternative (1) or (2) as set out in this report.

CONCLUSION

Per direction from the Climate Action Committee, staff have reviewed carbon storage of young, mature and old growth forests, as well as the land areas in the region that are old growth. An analysis of the range of actions and initiatives both existing and planned, in various service areas across the organization, indicate that old growth areas will continue to be protected in the region, and that climate action benefits will be maintained. Accordingly, staff recommend Alternative 1, that the Climate Action Committee receive this report for information and take no further action at this time.

Attachment

"Old Growth Logging Port Moody report", report to Port Moody Council from the Office of Mayor Rob Vagramov, dated March 12, 2021 *(46522225)*

References

1. Forestry and Carbon in BC, report dated February 2019, prepared by Dr. Jim Pojar for SkeenaWild Conservation Trust, Terrace, and BCSkeena Watershed Conservation Coalition, Hazelton, BC.
2. What you need to know about old growth trees in B.C. — and the threats facing them, CBC news article posted May 30, 2021

46474091

Report to Council

From the Office of Mayor Rob Vagramov

Date: March 12, 2021
Subject: Old Growth Logging

Purpose

To advocate for the protection of the remaining old growth forests in British Columbia.

Recommendation

WHEREAS ancient high productivity (big tree) old growth ecosystems are one of the most valuable tourism, First Nations culture, wild salmon enhancing, biodiversity banking, and climate resiliency assets;

AND WHEREAS only a miniscule fraction of the planet's original, high productive, ancient forests remain in BC, the vast majority of which is slated to be eliminated through logging; including the headwaters of Fairy Creek, the last unprotected intact old-growth watershed on southern Vancouver Island; BE IT RESOLVED:

THAT the City of Port Moody formally oppose the logging of at-risk old-growth forests;

AND THAT the City of Port Moody call on the Government of British Columbia to immediately and permanently protect the Fairy Creek watershed from further logging;

AND THAT the City of Port Moody call on the Government of British Columbia to immediately defer logging in all at-risk old-growth forests, including all remaining high-productivity old-growth forests, as identified by the independent Old Growth Strategic Review Panel, until all 14 of the panel's recommendations have been implemented;

THAT the City of Port Moody call on the Government of British to allocate funding to support the economic transition of affected communities away from unsustainable old growth logging, in the full spirit of indigenous reconciliation where applicable, for the development of long-term sustainable local economies and *Indigenous Protected and Conserved Areas* where applicable;

AND THAT the following resolution be sent to the Lower Mainland LGA and the Union of BC Municipalities with this report, dated March 12 from the Office of Mayor Rob Vagramov regarding Old Growth Logging:

> **WHEREAS ancient high productivity (big tree) old growth ecosystems are one of the most valuable tourism, First Nations culture, wild salmon enhancing, biodiversity banking, and climate resiliency assets;**
>
> **AND WHEREAS only a miniscule fraction of the planet's original, high productive, ancient forests remain in BC, the vast majority of which is slated to be eliminated through logging; including the headwaters of Fairy Creek, the last unprotected intact old-growth watershed on southern Vancouver Island; BE IT RESOLVED:**
> **THAT the Government of British Columbia immediately defer logging in all at-risk old-growth forests, as identified by the independent Old Growth Strategic Review panel until all 14 of the panel's recommendations have been implemented, and support the transition of affected local communities toward more sustainable jobs.**

AND THAT the Government of British allocate funding to support the economic transition of affected communities away from unsustainable old growth logging, in the full spirit of indigenous reconciliation where applicable, for the development of long-term sustainable local economies and *Indigenous Protected and Conserved Areas* where applicable;

Background

Ever since humanity's divergence from our primate ancestors, we have generally (with the exception of some localized cultures, or indigenous peoples) upheld and very successfully implemented a *scorched earth policy* of sorts, by efficiently and systematically converting all manner of living beings – wild beasts, exotic flora, forests, and other – into useable resources for the further expansion of the Human Footprint.

Over the course of our humble takeover of the planet, this process has eliminated vast reserves of wildlife, wildlife habitat, and flora, during our relatively brief expansion from the prehistoric age, to the present day, accelerating with every advancement in technology – from the stick, to the gun, to the chainsaw, to the factory.

When considering the forested groundcover on planet Earth, it is estimated that less than 30%[1] of it has been spared from human interference. Much of this miniscule share is right here in British Columbia, and of *that*, only a few groves and parks are offered the permanent protections they deserve, as an unbelievably scarce resource possessing ineffable value.

The few forest watersheds that remain untouched show us what the rest of our Province looked like pre-harvesting: vast expanses of dense forests, trunks wider than many cars, trees older than millennia. One can understand the mindset of the settlers who first logged Port Moody: This continent is infinite, and another plentiful continent surely exists *somewhere*.

The Space Race of the 1950s and 60s, however, showed us the physical limitations of the planet we inhabit, a self-contained *pale blue dot*, with no similar oasis nearby. Unlike those first settlers, we have no excuses at our disposal when it comes to protecting rare spots of original surface.

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

Discussion

Government Says, Government Should Do

In September 2020, the BC government released the much-anticipated report [Attachment 2] of the Old Growth Strategic Review, conducted by an independent two-person panel comprised of Garry Merkel (professional forester, natural resource expert, member of the Tahltan Nation) and Al Gorley (professional forester, former chair of the Forest Practices Board). The Old-Growth Strategic Review had one of the highest ever *Engage BC* responses with 200 meetings in 45 communities, 300 written submissions, 400 published articles and papers, 9,000 emails and 18,500 completed surveys. The Review concluded that "*BC's overall system of forest management has not supported the effective implementation or achievement of the stated and legislated public objectives for old growth forests.*" The panel called for a "*paradigm shift*," recognizing that old forests have intrinsic value for all living things, and should be managed as such, rather than simply for timber supply to support ephemeral consumer goods.

Since its release, many were hopeful that the government would spare no time in implementing the recommendations, and thus, protecting some of the most incredible natural spaces left on the face of the Earth. Statements made by Premier John Horgan during the previous provincial election bolstered this sentiment. The *Prince George Citizen* captured the Premier's campaign sentiments in an October 15 2020 article:

"We're committed to implementing the report in its totality," said Horgan when asked about it during a campaign stop. [2]

Since winning the election, Premier Horgan further backed this up with his mandate letter to the current Minister of Forests, Katrine Conroy. In it, he includes a mandate to "*implement the recommendations of the Old Growth Strategic Review in collaboration with Indigenous leaders, labour, industry, and environmental groups to protect more old-growth stands*", and further comments about indigenous reconciliation and the importance of addressing climate change through forestry policy, throughout the document.

Since that time, however, a coalition of environmental organizations including the Wilderness Committee, Sierra Club BC, and Ancient Forest Alliance reviewed the government's actions, and issued a scathing report card [Attachment 1] outlining that many commitments remain un-actionned. The report card gives the current government one D grade, followed by several "F"s in relation to its commitments to old growth protection. This indicates a clear disconnect in terms of expectations set and met, between the provincial government and environmentalist/ concerned First Nations.

In a February 22 2021 meeting with Minister Conroy, the Minister stated that the government remains committed to implementing the recommendations, but noted that the implementation of the recommendations as they were presented in the independent panel's report is "*probably going to take at least a decade."* Many are concerned that we risk losing significant, if not all of, the kind of at-risk, high-productivity old growth forests that the independent panel recommended protecting in the first place.

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

March 11th, 2020 marked the six-month deadline for the provincial government to begin implementing the recommendations of the independent panel's report. Recommendation #6 recommended that "*until a new strategy is implemented, defer development in old forests where ecosystems are very high and near term risk of irreversible biodiversity loss.*"

This report does not question the Government's resolve in relation to protecting old growth assets, which has been confirmed to the public time and time again. This report also does not directly advocate for an acceleration of the Minister's implementation timeline of over 10 years (although that would be nice). Instead, one of the resolutions recommended here seeks to simply halt all logging of all at-risk old growth forest assets *until* the independent panel's recommendations are implemented in their entirety. This would provide a level of temporary protection until the government can enact the "paradigm shift" that was promised during the election, and alleviate some of the pressure from the provincial government in ensuring the panel's recommendations can be implemented properly.

First Nations / Reconciliation

This report does not seek to speak for First Nations communities, only to note that to date, First Nations have yet to be paid any semblance of fair-re-compensation for the historical wealth extracted from forests on their unceded lands.

On September 29th 2020, the The Union of B.C. Indian Chiefs passed a resolution calling on the province to implement all 14 of BC's Old Growth Strategic Review Recommendations. The Union's resolutions best summarizes what the BC Government must do to preserve the last of the high-productive ancient forest ecosystems, and make right on their public commitments to true reconciliation:

> *"**THEREFORE BE IT RESOLVED** the UBCIC Chiefs-in-Assembly fully support the First Nations and allies who are protesting the negligent logging and clear-cutting practices enabled by the BC government that have undermined First Nations Title and Rights and pushed Vancouver Island's old-growth forests to the brink of collapse;*
>
> ***THEREFORE BE IT FURTHER RESOLVED** the UBCIC Chiefs-in-Assembly fully support the Old Growth Strategic Review Panel's report and recommendations that are vital to creating a new, sustainable old growth strategy, and call upon the provincial government to take immediate and sustained action to ensure that the report's recommendations are carried out, with First Nations included and consulted every step of the way;*
>
> ***THEREFORE BE IT FURTHER RESOLVED** the UBCIC Chiefs-in-Assembly call upon the BC government to provide more details on its plan to shift logging deferrals to permanent protection, and working in partnership with impacted First Nations, to engage in discussions on expanding these deferrals to include all threatened old-growth forests, including areas like the Walbran Valley, Nahmint, Fairy Creek, Tsitika Valley, Mt. Elphinstone, Argonaut Creek.*
>
> ***THEREFORE BE IT FURTHER RESOLVED** the UBCIC Chiefs-in-Assembly direct the UBCIC Executive and staff to work with other like-minded organizations to urge the provincial and federal governments to provide dedicated funding for First Nations Indigenous Protected and Conserved Areas (IPCAs) and First Nations land use plans, as*

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

well as financial support for First Nations communities to manage and steward ICPAs, purchase and protect private lands with old-growth, and pursue conservation- based businesses and economies, including cultural and eco-tourism businesses, clean energy, and second-growth forestry;

***THEREFORE BE IT FINALLY RESOLVED** the UBCIC Chiefs-in-Assembly urge the Ministry of FLNRORD to consult and engage with First Nation communities and organizations, including the First Nations Forestry Council and the First Nations Leadership Council, to develop and implement a renewed old-growth strategy that entrenches Indigenous consent into its processes; is aligned with the principles of the UN Declaration, the Old Growth Strategic Review recommendations, and the BC First Nations Forestry Strategy; is supported by strong enforcement and compliance standards; and is intended to support sustainable old-growth cultural harvesting as an important First Nations livelihood and source of culture."*

Jobs, Jobs, Jobs

Usually, proponents of unsustainable resource extraction point to a jobs sector that would be deeply affected by any proposed regulations, or at least a negative impact to the bigger economic picture. In the case of Old Growth logging, however, the economic picture is quite simple: the trees are worth more alive.

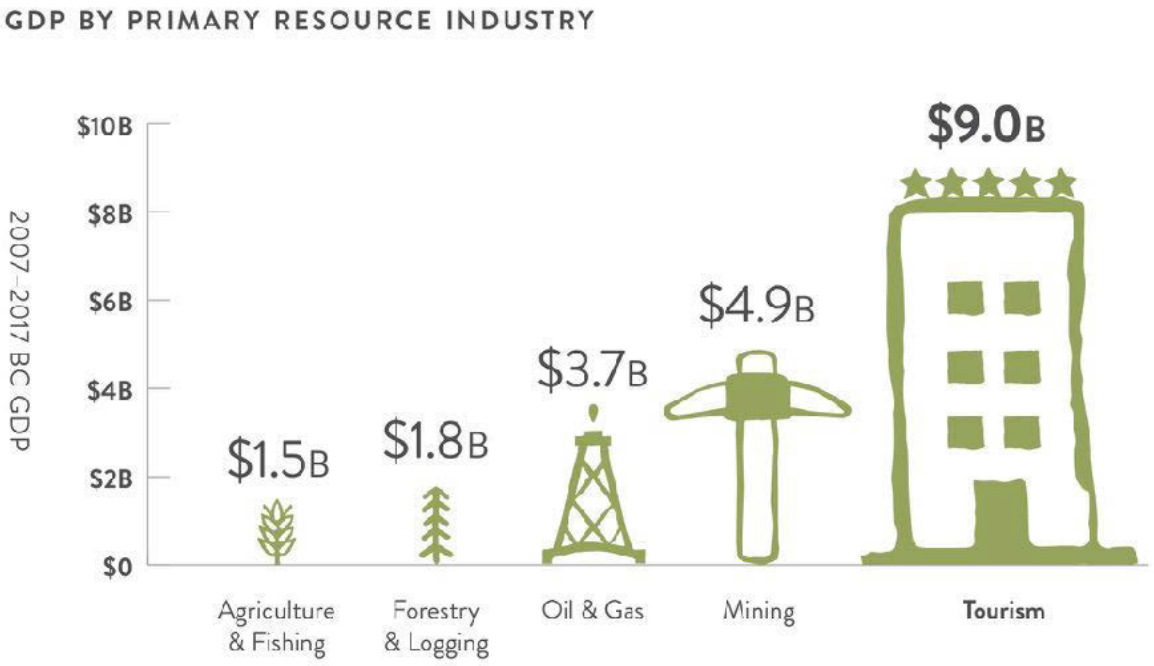
Currently, about 54,000 hectares of old-growth forests – an area about 5x the size of Vancouver – are being logged every year in BC[3]. At current logging rates, and especially with our notorious "clear-cut" approach to harvesting, BC will eventually run out of old growth forests. This means that jobs tied directly to the rude logging of these incredible giants will also come to an end, if no protective measures are taken now. In short, any jobs tied to old growth logging are fundamentally doomed, simply due to the fact that you can only clear-cut original forests once – from there on out, they are no longer original, and do not possess many of the qualities that are worth preserving, from complex mycelial networks that allow countless trees to work as one, to unparalleled tree size, to unimaginable (or, as presented in the independent panel's report, un-understandable) biodiversity, and of course, carbon capture abilities.

Old growth trees, on the other hand, possess a significantly longer economic viability profile, simply by their tourism allure alone in many cases. In their 2016 submission to the BC Chamber of Commerce, the Port Renfrew Chamber noted one anecdote from a 2012 financial analysis done by a kayaking company in the Discovery Islands:

It was determined that the value of the 60 hectares of timber was worth about $3,600,000. Since the regeneration cycle meant the area could be cut only once every 60 years, the yearly economic value of the timber was $60,000. The economic value to the kayaking company, however, was $416,000 per year, or $24,960,000 for the same 60-year period. In stark contrast to the approximately 300 person-days employment from logging the 60 hectares just once, the kayaking company provided 20,160 person-days of employment during the 60-year cycle. And this simple economic analysis didn't include the employment and earnings for the 40 other ecotourism businesses using the same area.

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

This one simple analysis uncovers the true value of these incredible old growth trees, not as pathetic roof shingles to be shipped to Florida, nor (even more disrespectfully) as fuel pellets for generating electricity in Europe. According to the Government of British Columbia, "*tourism contributed more to GDP than any other primary resource industry [in 2017]* ".[4]



The BC Chamber of Commerce carried the following resolution in 2016, renewing it in 2019:

THE CHAMBER RECOMMENDS that the Provincial Government:

1. **Support the increased protection of old-growth forests in areas of the province where they have or can likely have a greater net economic value for communities if they are left standing for the next generation and beyond.**

2. **Protect endangered old-growth forests by enacting new regulations such as an Old-Growth Management Area, Wildlife Habitat Area, or Land Use Order, with the intent to eventually legislate permanent protection for areas through provincial park or conservancies.**

The economic case for keeping these trees standing it clear, and the effects of encouraging tourism instead have already been tried and tested across North America's west coast – just imagine requesting to purchase California's Redwoods (some confirmed to be over 1,500-2,000 years old) to convert to them to "*amazing shingles that might even last 30 years*" – the very proposition would be laughable in a jurisdiction that was once as comparatively abundant in old growth assets as BC is today.

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

In many developing countries, impoverished locals commit environmental atrocities on a regular basis simply to put food on their tables. From hunting rhinos for their horns, to finning sharks, to illegally obtaining and refining crude oil (leading to perpetual spills in delicate ecosystems), these actions are pursued solely out of desperation – there simply isn't another accessible job at their disposal, and many of their traditional ways of life have been permanently disrupted by the global economy. Many international NGOs have acknowledged this reality, and have begun pouring money into conservation and eco-tourism initiatives, leading to poachers becoming conservationists or tour guides, as an example.

One of the recommendations of this report calls on Provincial funding and support for BC communities and First Nations that currently rely on unsustainable old growth logging. Folks in the environmental movement are not out to destroy the livelihood of local residents. A supported transition to more sustainable sources of income, in the spirit of indigenous reconciliation where applicable, would not only protect the ecosystems in question, but would also lead to sustainable and resilient economies that can stand the test of time.

Climate Crisis

The October 2018, International Panel on Climate Change (IPCC) special report provided a grave global warning of the need for massive emissions reduction within the next 11 years to avoid irreversible catastrophic changes to climate.

Aside from the intrinsic value of the magnificence of some of the largest organisms on the planet existing in one of the most intricate webs of ecological relationships on par with the rain forests of the amazon, these ancient ecosystems have an incredible capacity to store and sequester carbon.

High productivity old-growth forests can store over 1,000 tonnes of carbon per hectare, one of the highest rates on earth. These forests act as the planet's carbon bank, accumulating carbon in soil, trees, and organic matter over millennia. Research has increasingly shown that old trees store more carbon than young trees in proportion to their size. A single valley-bottom old growth tree can absorb far more carbon in a year than even an acre of seedlings. Almost 70% of the carbon stored in a tree is accumulated in the second half of its life.

Logging primary, mature and old forests and converting them to secondary, managed forests can reduce total carbon storage by 40-50% or more, even when off-site storage of carbon in wood products in buildings is factored in. In a climate crisis it does not make sense to cut down carbon-storing older trees when there are large expenditures of resources to reduce carbon emissions and invent carbon-capture technology.

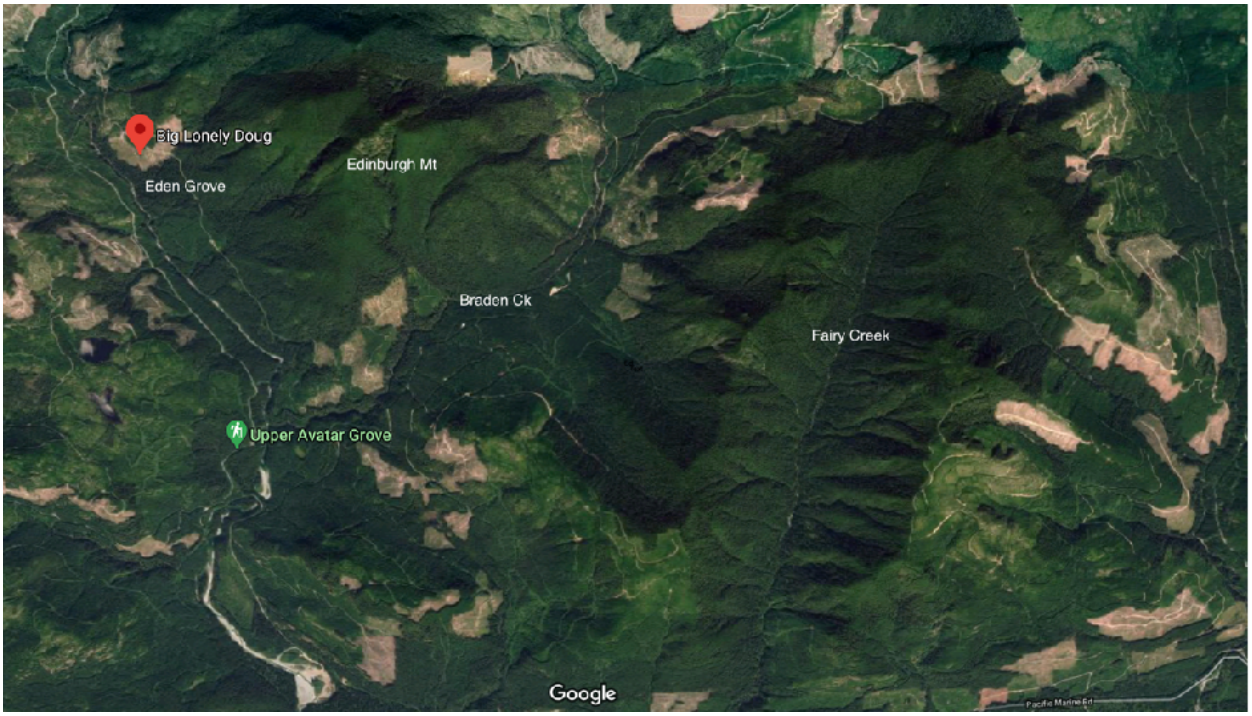
In addition to carbon storage and sequestration, the unique conditions and processes within ancient old growth ecosystems are vital to BC's ability to adapt to a changing climate. Old growth forests are critical to the conservation of biodiversity akin to "banks" of genetic material for future use and adaptation to changing climatic conditions. In addition, these forest are very resistant to fire and have an incredible ability to intercept and store water, which are critical attributes necessary to withstand the self-reinforcing cycle of increasing temperature, drying landscapes, and large forest fires.

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

When taking into account that old growth forest products are often shipped across the world, to be used in often-replaceable products such as roofing shingles, exterior cladding, paper, pulp, and pellets, the senselessness of old-growth ecosystem harvesting cannot be understated.

Have We Not Learned?

One of the current battles for Old Growth protection is currently taking place at the Fairy Creek watershed in Pacheedaht First Nation territory near Port Renfrew. Fairy Creek is known locally as the last remaining unprotected, intact watershed on southern Vancouver Island. Note the dark green colouration, no missing patches, a rare sight to behold on satellite imagery of BC:

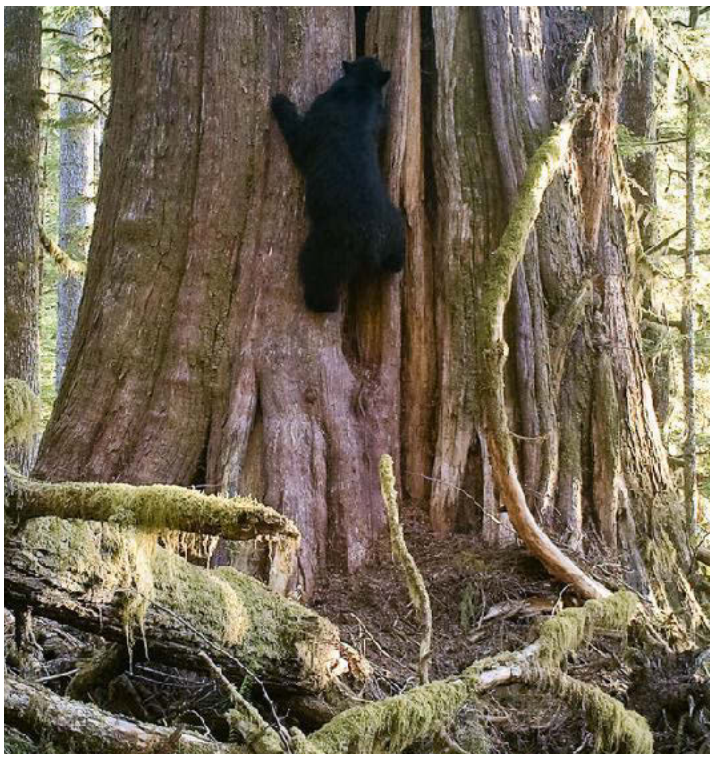


For context, one creek away stands the aptly-named “Avatar Grove” (who were you rooting for during that film?), a grove that was protected relatively recently. Further up stands *Big Lonely Doug*, pictured below, which is Canada’s second-largest Douglas-fir tree and is known as one of the most famous trees in Canada. Doug is estimated to be between 750 and 1200 years old[5], and is the last remaining member of his grove, which was logged in 2014. It is estimated that 99% of the original, old-growth Douglas firs in British Colombia have been mercilessly cut down[5].

If the image below is *after* logging, one need not use imagination to conceptualize what existed there *before*.

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

Only a few hundred meters away is Eden Grove, another section of forest slated for annihilation. Its contents are nothing short of breathtaking, offering a glimpse into what Doug's neighbourhood used to look like:



[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

Recently, logging interest in the area has rung the alarm bells loudly in local communities and across the province. In response, local environmentalists, First Nation members, and others concerned about the impending doom of Fairy Creek, Eden Grove, and surrounding high-value ecosystems have blockaded forest service roads leading to the magnificent and irreplaceable old growth Forests that are slated for destruction. These groups are joined by Bill Jones, elder from Pacheedaht First Nation, who has been calling on Premier John Horgan to protect the forests of his lands, and other forests like it. An injunction has been applied for to clear the way for logging, and hearings are set for the end of March.

Those who have followed the history of similar conflicts over unsustainable old growth logging are sure to draw parallels between this localized situation, and one that sparked the single largest act of civil disobedience in Canadian History - the *War of the Woods,* over Clayoquot Sound on Vancouver Island. Following a similar injunction granted in the 1990s, thousands flocked to protect the rainforests of Vancouver Island near Tofino. Hundreds of arrests took place before much of the area was finally protected, and in 2000, it was added to the UNESCO World Biosphere Reserve, rightfully acknowledging the area for its global environmental value.

The recommendations of this report specific to Fairy Creek seek to prevent such a large-scale conflict from taking place again, by urging the provincial government to immediately protect these last remaining lands from human interference.

Reasonable Request

The fundamental request of this report to the Provincial government is simple – to immediately protect high productivity old growth forests, which represent only 1% of the forests of British Columbia[6]. It is my conclusion that logging *only* 99% of our forests should be enough.

Financial Implications

None.

Council Strategic Plan Objectives

- Inspire environmental actions and advocacy

Attachment(s)

1. https://www.ancientforestalliance.org/b-c-is-flunking-on-old-growth-forests-environmental-report-card-says/
2. https://engage.gov.bc.ca/app/uploads/sites/563/2020/09/STRATEGIC-REVIEW-20200430.pdf
3. https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/premier-cabinet-mlas/minister-letter/conroy_mandate_2020.pdf

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf
[2] https://www.princegeorgecitizen.com/news/local-news/horgan-commits-to-paradigm-shift-in-old-growth-forest-management-1.24220819
[3] https://www.theglobeandmail.com/canada/british-columbia/article-while-government-consults-and-consults-some-more-logging-in-bcs/
[4] https://www.destinationbc.ca/content/uploads/2019/07/2017-Value-of-Tourism.pdf
[5] https://www.atlasobscura.com/places/big-lonely-doug
[6] https://www.ancientforestalliance.org/wp-content/uploads/2014/10/bcs-old-growth-forest-report-web.pdf

To: Climate Action Committee

From: Kathy Preston, Program Manager, Environmental Regulation and Enforcement
Parks and Environment Department

Date: June 18, 2021 Meeting Date: July 16, 2021

Subject: **Board Appointment of Enforcement Officers**

RECOMMENDATION

That the MVRD Board:

a) pursuant to the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008* and the *Environmental Management Act*:
   i. appoint Metro Vancouver employees Eugene Lee and Rei Van as officers; and
b) pursuant to section 28 of the *Offence Act*:
   i. appoint Metro Vancouver employees Eugene Lee and Rei Van for the purpose of serving summons under section 28 of the *Offence Act* for alleged violations under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*.

EXECUTIVE SUMMARY

Recent changes in staff have resulted in a need to update staff appointments as MVRD Board-designated officers under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*, the *Environmental Management Act* and the *Offence Act*. Staff recommend that the MVRD Board appoint staff accordingly.

PURPOSE

To appoint Metro Vancouver employees as Board-designated officers.

BACKGROUND

Employment status changes for Metro Vancouver environmental regulatory staff have resulted in a need to update staff appointments to ensure appropriate authority to advance air quality management goals. Section 31 of the *Environmental Management Act* and the *Greater Vancouver Regional District Air Quality Management Bylaw No. 1082, 2008* grant authority to Board-designated officers.

ROLE OF PERMITTING AND ENFORCEMENT OFFICERS

Metro Vancouver's Air Quality Regulatory Program supports the goals of the Integrated Air Quality and Greenhouse Gas Management Plan by promoting compliance with air quality management bylaws and regulating the discharge of air contaminants.

Officers may enter property, inspect works, and obtain records and other information to promote compliance with the *Environmental Management Act* and MVRD air quality management bylaws.

The *Offence Act* allows regional districts to appoint bylaw enforcement officers for the purpose of serving summons for bylaw violations. Officers, if appointed for that purpose, may serve a summons in respect of alleged offences under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*.

ALTERNATIVES

1. That the MVRD Board:
   a) pursuant to the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008* and the *Environmental Management Act*:
      i. appoint Metro Vancouver employees Eugene Lee and Rei Van as officers; and
   b) pursuant to section 28 of the *Offence Act*:
      i. appoint Metro Vancouver employees Eugene Lee and Rei Van for the purpose of serving summons under section 28 of the *Offence Act* for alleged violations under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*.

2. That the MVRD Board receive for information the report dated June 18, 2021, titled "Board Appointment of Enforcement Officers" and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

There are no additional financial implications for expenditures as the MVRD appointees are already on staff.

CONCLUSION

Recent changes in staff have resulted in a need to update staff appointments as MVRD Board-designated officers under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*, the *Environmental Management Act* and the *Offence Act*. Staff recommend that the MVRD Board adopt Alternative 1.

46164151

To: Climate Action Committee

From: Roger Quan, Director, Air Quality and Climate Change
Parks and Environment Department

Date: July 5, 2021 Meeting Date: July 16, 2021

Subject: **Manager's Report**

RECOMMENDATION
That the Climate Action Committee receive for information the report dated July 5, 2021, titled "Manager's Report".

CLIMATE ACTION COMMITTEE 2021 WORK PLAN
The attachment to this report sets out the Committee's Work Plan for 2021. The status of work program elements is indicated as pending, in progress, or complete. The listing is updated as needed to include new issues that arise, items requested by the Committee, and changes to the schedule.

Developing an Approach to Setting GHG Limits for Existing Large Buildings in Metro Vancouver
Metro Vancouver is exploring a regional building performance standard (BPS) as a way to drive significant reductions in building energy use and greenhouse gas (GHG) emissions at the regional scale, and to support complementary initiatives across its 21 member jurisdictions. The need to explore such a standard has been supported by Metro Vancouver's Climate Action Committee previously and has been included as a "Big Move" in the draft *Climate 2050 Buildings Roadmap* and *Clean Air Plan*. Regulating GHG emissions in the existing building stock has been identified in the "Modelling a Carbon Neutral Region" project as the most significant opportunity to reduce GHG emissions in the building sector (up to 650,000 tonnes CO_2e by 2030, up to 3.5 million tonnes CO_2e by 2050), and as a foundational action to achieve our 2030 and 2050 climate targets.

In 2020 and 2021, a consultant team was hired to explore the potential nature and scope of such a program for Metro Vancouver, with complementary work for City of Surrey focused on new construction benchmarking, and to develop a set of recommendations to help guide program components and requirements. The project received funding support from BC Hydro as this work aligns with actions in the recently released *Building Electrification Roadmap* (BERM), for which BC Hydro was a Steering Committee member. The final report reviews best practices in other jurisdictions and presents a concept for a regionally coordinated energy and GHG emissions benchmarking and performance requirement for large ("Part 3") residential, institutional, commercial and industrial buildings.

Staff are now considering the recommendations and technical information provided in the report in the design of a regional BPS. Staff are also currently working with the City of Vancouver and BC Hydro to conduct further analysis on the large building stock in the region. This analysis will inform key considerations for BPS such as the potential for GHG reductions, GHG limits in specific building types, and the costs and impacts to building owners. Staff intend to bring a regulatory discussion paper on

this subject to the Climate Action Committee and MVRD Board in late 2021 and seek authorization to begin engagement in 2022.

BC Lung Association *State of the Air 2021* Report

In June 2021, the BC Lung Association released the *State of the Air 2021* report for British Columbia (see Reference). The BC Lung Association report is similar in scope and complementary to Metro Vancouver's annual publication of *Caring for the Air*, which was received by the Climate Action Committee at its June meeting. While *Caring for the Air* focuses on the Lower Fraser Valley airshed, the BC Lung report provides information for the province as a whole.

This year's edition includes articles on:

- a recap of this year's BC Lung Air Quality and Health Workshop, "Air Quality and the COVID-19 Pandemic";
- monitoring air quality with small sensors;
- how the Air Quality Health Index helps inform residents about air quality conditions in their community and how these conditions may affect their health;
- preparing for wildfire smoke;
- reducing exposure to traffic emissions;
- mapping a "smellscape" of odours and their sources in Metro Vancouver;
- updates from partner agencies on air quality and health actions underway in BC; and
- a data snapshot of BC's air quality levels in 2020, similar to the summary provided in *Caring for the Air*.

Provincial Air Quality Objectives for Nitrogen Dioxide

In April, the B.C. Ministry of Environment and Climate Change Strategy proposed new provincial air quality objectives for nitrogen dioxide (NO_2). Similar to Metro Vancouver's ambient air quality objectives, the province uses air quality objectives as benchmarks for air quality planning, permit applications, authorizations, and air quality advisories. The proposed new objectives would be based on federal standards, specifically the 2020 Canadian Ambient Air Quality Standards (CAAQS) for NO_2, including more stringent one-hour and annual objectives.

In feedback to the province, Metro Vancouver staff indicated support for BC's proposed NO_2 objectives. The Metro Vancouver Board has already adopted the one-hour and annual 2020 CAAQS for NO_2 as ambient air quality objectives for the Metro Vancouver region in 2019. BC's proposed objectives will provide a consistent set of objectives for NO_2 and help drive air quality improvements across the province, and will also support the commitments of both BC and Metro Vancouver for continuous improvement of air quality. The proposed objectives and commitment to continuous improvement align well with Metro Vancouver's draft *Clean Air Plan*, which includes a target that 'Ambient air quality in the region meets or is better than health-based ambient air quality objectives and standards set by Metro Vancouver, the BC Government and Government of Canada.'

Ground-Level Ozone Air Quality Advisory During June Heat Wave

Metro Vancouver, British Columbia and the entire Pacific Northwest experienced an unprecedented heat wave starting on June 25, 2021 and continuing for several days. This heat wave saw record breaking high temperatures, including in the community of Lytton where the all-time Canadian record

temperature was set three days in a row, eventually reaching 49.6 degrees Celsius. In our region, the heat wave exceeded some climate projections for Metro Vancouver, including the 2050 projection for number of days with overnight temperatures above 20 degrees and the highest 1-in-20 year return period temperature for 2080. Climate projections for our region indicate extreme heat waves will become more common if global greenhouse gas emissions do not reach 45% reduction by 2030 and net zero emissions by 2050.

An air quality advisory was issued for the airshed on June 26, 2021 and remained in place until June 30, coinciding with the heat wave with maximum daytime temperatures exceeding 40 degrees Celsius in parts of the region. The advisory was issued initially due to high levels of ground-level ozone, which is not emitted directly, but rather, formed from atmospheric reactions between volatile organic compounds and nitrogen oxides in the presence of sunlight. Nitrogen oxides are emitted when fuels are burned while volatile organic compounds are emitted from a variety of sources including fossil fuels, cannabis production, agricultural activities, solvents like paint thinners and varnishes, as well as natural sources.

While the frequency and severity of ground-level ozone advisories has been reduced in the last two decades with management actions (e.g., *Regional Ground-Level Ozone Strategy)*, the extreme temperatures resulted in unprecedented ozone concentrations, reaching peak levels not seen since the late 1980s.

The advisory was initiated on June 26, for ground-level ozone in the eastern portions of Metro Vancouver and the central Fraser Valley. On June 28, nine stations exceeded the 1-hour and 8-hour ambient air quality objectives for ground-level ozone, including a 1-hour average of 151.1 parts per billion (ppb) at the Maple Ridge station (the 1-hour objective is 82 ppb). On June 29 the advisory was extended to also include the eastern Fraser Valley, and fine particulate matter ($PM_{2.5}$) was added to the advisory due to increasing levels of haziness from a buildup of local emissions and secondary formation of $PM_{2.5}$. The advisory was cancelled on June 30 with a return to more moderate temperatures and as cooler, cleaner marine air flowed into the region.

While wildfire activity was growing in concern across the province, the region was not impacted by wildfire smoke during this advisory.

Wildfire smoke advisories in recent summers, as well as the June 2021 ground-level ozone advisory, emphasize how climate change is presenting new challenges for air quality management. The recent ozone advisory indicates how extreme weather events have the potential of erasing decades of progress made on reducing the severity of ground-level ozone episodes.

Metro Vancouver's 2021 PNE activation - "Together We Make Our Region Strong"
For the first time, Metro Vancouver will participate in the Pacific National Exhibition with a significant exhibit. This year's event occurs at a significant time in history and provides an opportunity for residents to come out to enjoy one of the largest and most memorable events in BC. Metro Vancouver's activation will showcase the projects and initiatives essential for a resilient and sustainable region, introducing residents to our critical infrastructure projects, our inspiring regional parks and how we plan for growth and the stewardship of over a quarter of the region's land base. Visitors to the Metro Vancouver showcase will have the opportunity to interact with displays

that convey messaging about Metro Vancouver's mission and goals. A series of tents, infrastructure elements, games, and exhibits will let visitors experience the wide range of Metro Vancouver services in a fun and interactive way. From historical wooden pipes to modern steel tunnel liners, selfie walls that put visitors in the frame of our SuperHabits campaign, and opportunities to ask Metro Vancouver staff questions about our work, the displays will leave visitors inspired about where they live, and gain understanding of the many different activities taking place that make this one of the most livable regions in the world. For Air Quality and Climate Change, we plan to have three displays with an Air Quality and Climate Change Tent, our Mobile Air Monitoring Unit (MAMU) and Emotive, our zero emission vehicle display.

Attachment
Climate Action Committee 2021 Work Plan

Reference
British Columbia Lung Association, *State of the Air Report 2021* and *Technical Appendix*

46243398

Climate Action Committee 2021 Work Plan
Report Date: July 5, 2021

Priorities

1st Quarter	**Status**
Climate Action Committee 2021 work plan and priorities	Complete
Climate 2050 – FCM Low Carbon Cities Canada initiative	Complete
Climate 2050 – carbon neutral modelling	In progress
Climate 2050 – electric vehicle programs review and recommendations	Complete
Sustainability Innovation Fund (SIF) – 2021 proposals	Complete
2nd Quarter	
Climate 2050 – draft Roadmap: Buildings	Complete
Climate 2050 – draft Roadmap: Transportation	Complete
Climate 2050 – draft Roadmap: Industry	In progress
Climate 2050 – Energy Roadmap discussion paper	Complete
Air quality – draft Clean Air Plan	Complete
Air quality – second phase of consultation on open air burning emission regulation	Complete
Air quality – monitoring network review and upgrades	In progress
10th annual Caring for the Air report	Complete
SIF – status report on previously approved liquid waste projects	Complete
3rd Quarter	
Climate 2050 – draft roadmaps: Agriculture; Nature and Ecosystems	In progress
Climate 2050 – Land Use and Growth Management Roadmap discussion paper	Pending
Climate 2050 – Metro Vancouver's climate actions and carbon neutral progress	In progress
Climate 2050 – initiate consultation on proposed buildings regulatory initiative	Pending
Air quality – amendments to air quality permit and regulatory fees	In progress
Air quality – amendments to non-road diesel engine emission regulation	In progress
Air quality – update on regulatory initiative for cannabis processing	In progress
SIF – status report on previously approved regional district projects	In progress
SIF – status report on previously approved water projects	In progress
Ecological Health Framework – annual report	Pending
4th Quarter	
Climate 2050 – annual report and progress tracking	In progress
Climate 2050 – Human Health and Well-being Roadmap discussion paper	Pending
Climate 2050 – final roadmaps: Buildings, Industry, Transportation	Pending
Climate 2050 – managing Metro Vancouver's corporate GHG emissions and energy	Pending
Air quality – Clean Air Plan for Board approval	In progress
Air quality - initiate process to update boilers and process heaters regulation	Pending
Annual budget and 5 year financial plan	In progress

BRITISH COLUMBIA

June 7, 2021

Ref: EMLI 113902 / MUNI 265586 / ENV 375663

Sav Dhaliwal
Chair
Metro Vancouver Board

Email: chair@metrovancouver.org

Dear Chair Dhaliwal:

Thank you for writing to us about the Help Cities Lead campaign.

Local government leadership is a cornerstone of addressing climate change in British Columbia (BC) and the Ministries of Energy, Mines and Low Carbon Innovation (EMLI), Environment and Climate Change Strategy, and Municipal Affairs look forward to ongoing collaborations with local governments.

In 2018, our Government launched CleanBC, which puts BC on the path to a cleaner, better future by building a low-carbon economy with new clean-energy jobs and opportunities. This commitment to CleanBC was demonstrated in Budget 2021, with an additional $506 million allocated to reducing emissions and promoting affordability. This brings total CleanBC funding to nearly $2.2 billion over five years.

The policy areas highlighted in your letter represent priority areas for the Province.

Through our StrongerBC Economic Recovery Plan, the Province committed $2 million to support the development of a Property Assessed Clean Energy (PACE) Roadmap. The Roadmap will be completed in the coming months and used to inform the Province's review and approach to any mandate regarding PACE.

In November 2020, the Minister of Finance was given a mandate to support EMLI to require home energy labelling and disclosure at the time of sale for BC homes. EMLI is currently developing policy options to support this mandate and, before moving forward, will engage homeowners, real estate professionals, local governments and First Nations to ensure alignment with stakeholder objectives and priorities.

../2

Ministry of Energy, Mines and Low Carbon Innovation

Office of the Minister

Mailing Address:
PO Box 9060, Stn Prov Govt
Victoria, BC V8W 9E2

Telephone: 250 953-0900
Facsimile: 250 356-2965

The Attorney General and Minister responsible for Housing (AGH) is currently developing an Existing Building Renewal Strategy, which will include actions to improve energy efficiency, reduce greenhouse gas emissions, and increase resiliency to climate and seismic hazards. Technical requirements for a retrofit code are under development and will be introduced by 2024.

The AGH was also mandated to support local governments to set their own carbon pollution standards for new buildings. Together, this work will empower local governments to take bolder action to address climate change.

Thank you, again, for writing. We look forward to working together on the policy areas you have highlighted.

Sincerely,

Bruce Ralston
Minister of Energy, Mines and Low Carbon Innovation

Josie Osborne
Minister of Municipal Affairs

George Heyman
Minister of Environment and Climate Change Strategy

cc: Honourable David Eby
Attorney General and Minister responsible for Housing

Honourable Selina Robinson
Minister of Finance

To: Regional Planning Committee

From: Edward Nichol, Regional Planner, Regional Planning and Housing Services

Date: May 14, 2021 Meeting Date: June 9, 2021

Subject: **Metro Vancouver Tree Regulations Toolkit**

RECOMMENDATION

That the MVRD Board receive for information the report dated May 14, 2021, titled "Metro Vancouver Tree Regulations Toolkit".

EXECUTIVE SUMMARY

This report highlights the Metro Vancouver Tree Regulations Toolkit, which provides guidance on regulatory tools for member jurisdictions to help preserve trees and increase tree canopy cover. Metro Vancouver commissioned Diamond Head Consulting Ltd. to develop the toolkit in response to projected tree canopy cover decline within the Urban Containment Boundary over the next 20-30 years, and a lack of regionally-specific guidance related to tree regulations available to member jurisdictions. The toolkit identifies the available approaches to regulate trees in British Columbia, highlights considerations for selecting appropriate tools based on the local community context, and assesses the tools that regulate both land use (e.g. zoning bylaws and subdivision and servicing bylaws) and trees (e.g. environmental development permit areas, covenants, and tree bylaws). As a next step, Metro Vancouver will promote and share the toolkit to inform planning efforts at the local level.

PURPOSE

To provide the Regional Planning Committee and MVRD Board with the completed Metro Vancouver Tree Regulations Toolkit for information (Attachment).

BACKGROUND

Healthy trees provide communities with important ecosystem services, including shading and cooling, flood absorption, habitat, and carbon storage. Collectively, the trees within the public and private lands of a community (including the trees in parks, around buildings, along streets and in backyards) make up the urban forest. Since 2016, Metro Vancouver has supported its member jurisdictions in ensuring a healthy and resilient urban forest by providing data and resources, convening practitioners, and advocating for innovative approaches.

In October 2019, the Regional Planning Committee received the report titled "Ecological Health – Tree Canopy Cover and Impervious Surfaces" for information (Reference 1). This report conveyed the results of the Regional Tree Canopy Cover and Impervious Surfaces study (Reference 2). The study revealed that tree canopy cover within the Urban Containment Boundary is expected to decrease from 32% to 28% over the next 20-30 years due to projected urban growth and development.

Member jurisdictions are developing or updating tree bylaws or related regulations in order to help maintain (or increase) the number of trees in their local communities; however, regionally-specific best practices and guidance materials are not readily available to support this work, and several member jurisdictions have requested this information from Metro Vancouver staff. To help address this gap, Metro Vancouver commissioned Diamond Head Consulting to prepare a toolkit that provides guidance on selecting and using regulatory tools that can help preserve trees and increase tree canopy cover in the region. The toolkit has been completed and is attached to this report for information.

TOOLKIT OVERVIEW

The Metro Vancouver Tree Regulations Toolkit provides guidance on selecting and using regulatory tools that help preserve trees and increase tree canopy cover within British Columbia's current legislative framework. The Toolkit is a resource for member jurisdiction staff, decision makers, and practitioners.

No single best practices approach to regulating trees was identified, therefore, the toolkit presents guidance on multiple tools based on best practices and recommends alternatives and options for consideration based on the local community context. Deciding on the most appropriate regulatory approach will require consideration of the community's values and objectives, as well as budgetary and staff resourcing implications.

The toolkit was informed by survey input from member jurisdiction staff and consulting arborists in the region, as well as a review of scientific literature, practitioner guides, and bylaws from across Canada and the United States.

This toolkit contains an overview of:

- The available approaches to regulating trees in British Columbia;
- Considerations for selecting the appropriate tools based on the local community context;
- Higher-level plans that can support tree preservation and an increase in tree canopy cover, such as regional growth strategies and official community plans;
- Tools that regulate land use and influence the space available to retain or replace trees, such as zoning bylaws and subdivision and servicing bylaws, including key bylaw components that impact tree preservation and tree canopy cover; and
- Tools that regulate trees as their primary purpose, such as environmental development permit areas, covenants and tree bylaws, including key bylaw components and alternative options for each component based on local community contexts.

Content pertaining to tools that primarily regulate trees (e.g. tree bylaws) is emphasized; content on higher-level plans and tools that regulate land use is included as supplemental information. The Toolkit may be updated in the future to add more substantial content to the land use-focused sections (e.g. official community plans).

RELATIONSHIP TO OTHER INITIATIVES

The Metro Vancouver Tree Regulations Toolkit complements several Metro Vancouver initiatives, plans, and policies, including:

- *Metro 2050:* The current draft of *Metro 2050* includes actions for Metro Vancouver to collect and maintain tree canopy cover data, and to implement the strategies and actions that support increasing tree canopy cover from 32% to 40% within the region's Urban Containment Boundary by the year 2050. Draft actions for member jurisdictions include the adoption of local tree canopy cover targets and policies that enable the retention and expansion of urban forests, by employing tools such as tree regulations (Reference 3).
- *Climate 2050:* In the Nature and Ecosystems Discussion Paper, Big Idea 1 explores the need to accelerate and expand the restoration and protection of natural areas and urban ecosystems, including a potential 40% tree canopy cover target within the Urban Containment Boundary (Reference 4). This target, in addition to other urban forestry-related policies, will continue to be explored as the Nature and Ecosystems Roadmap is developed.
- *The Urban Forest Climate Adaptation Initiative:* Metro Vancouver developed the Urban Forest Climate Adaptation Initiative to assess the risks and predicted changes to the region's urban forest. The resources developed through this initiative provide guidance to help practitioners manage trees and urban forests in a changing climate (Reference 5).
- *The Ecological Health Framework:* The Ecological Health Framework encapsulates Metro Vancouver's collective efforts around ecological health and provides guiding principles, goals, and strategies to help achieve a vision for a beautiful, healthy, and resilient environment. Adopted by the MVRD Board in 2018, the framework highlights Metro Vancouver's roles in providing data, conducting research, convening forums, developing best practices, and continuing to support member jurisdictions to plan communities with sufficient green spaces such as parks, nature trails, and urban forests (Reference 6).

NEXT STEPS

Metro Vancouver will promote and share the toolkit broadly throughout the region as a resource to inform planning efforts at the local level. The Toolkit may be updated in the future to add more substantial content to the land use-focused sections. Metro Vancouver will continue to provide data and resources, convene practitioners, and advocate for innovative approaches to ensure a healthy and resilient regional urban forest.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

There are no financial implications to this consultant study; it was undertaken as part of Regional Planning's regular work program and Board-approved 2020 Regional Planning budget.

CONCLUSION

To help address projected tree canopy cover decline within the Urban Containment Boundary over the next 20-30 years and the lack of regionally-specific tree regulations guidance available to member jurisdictions, Metro Vancouver commissioned a consultant to develop the Metro Vancouver Tree Regulations Toolkit. The toolkit identifies the available approaches to regulate trees in British Columbia, highlights considerations for selecting appropriate tools based on the local community context, and details the higher-level plans and regulatory tools that can help to preserve trees and increase tree canopy cover.

Attachment *(45840173)*
"Metro Vancouver Tree Regulations Toolkit", dated May 2021

References

1. Ecological Health – Tree Canopy Cover and Impervious Surfaces, report dated September 21, 2019
2. Regional Tree Canopy Cover and Impervious Surfaces
3. *Metro 2050* Draft Policy Language – Goal 3: Protect the Environment and Respond to Climate Change Impacts and the Implementation Section, report dated March 26, 2021
4. *Climate 2050* Nature and Ecosystems Discussion Paper
5. Metro Vancouver Urban Forest Climate Adaptation Initiative
6. Ecological Health Framework

45612588

Metro Vancouver Tree Regulations Toolkit

May 2021

Prepared by:

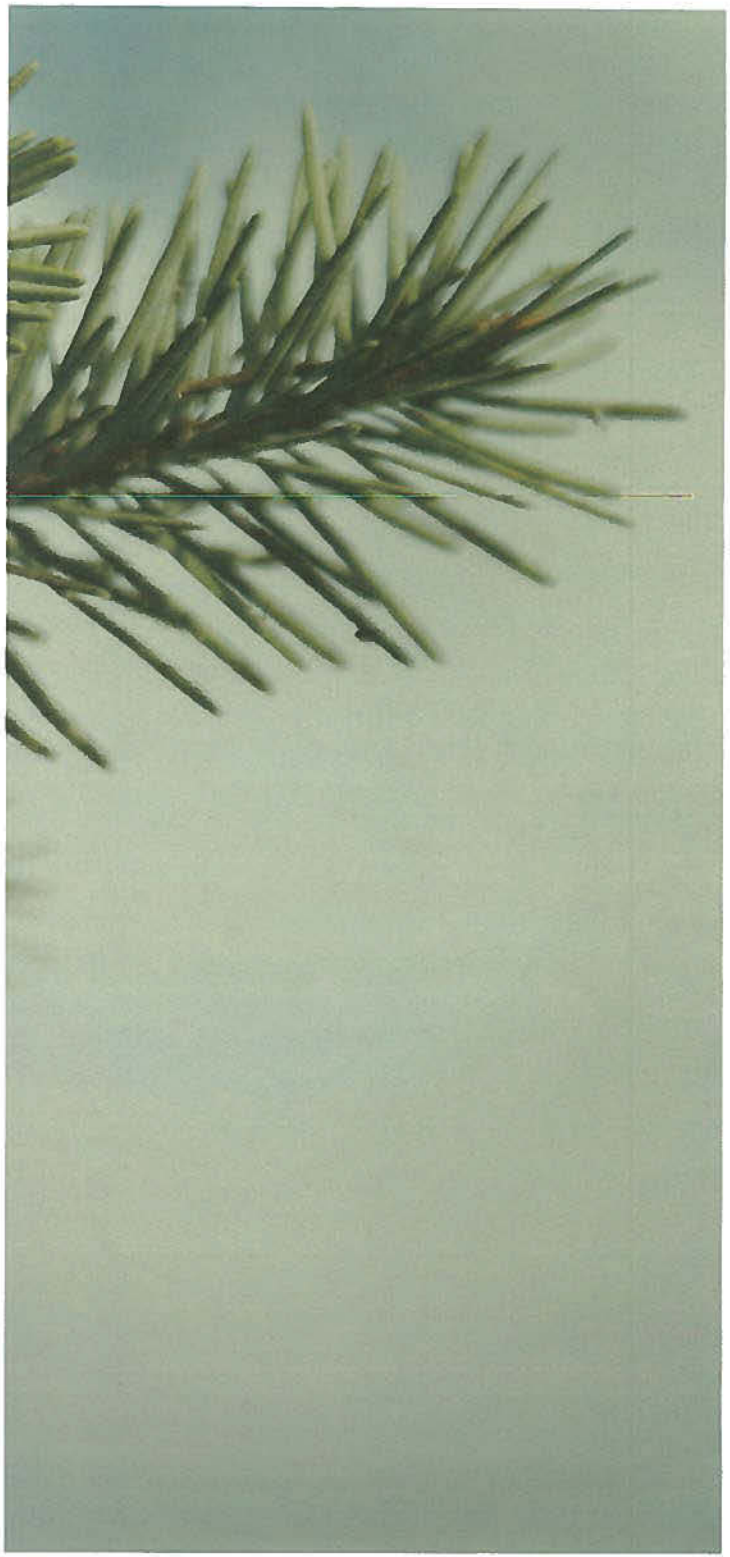
DIAMOND HEAD

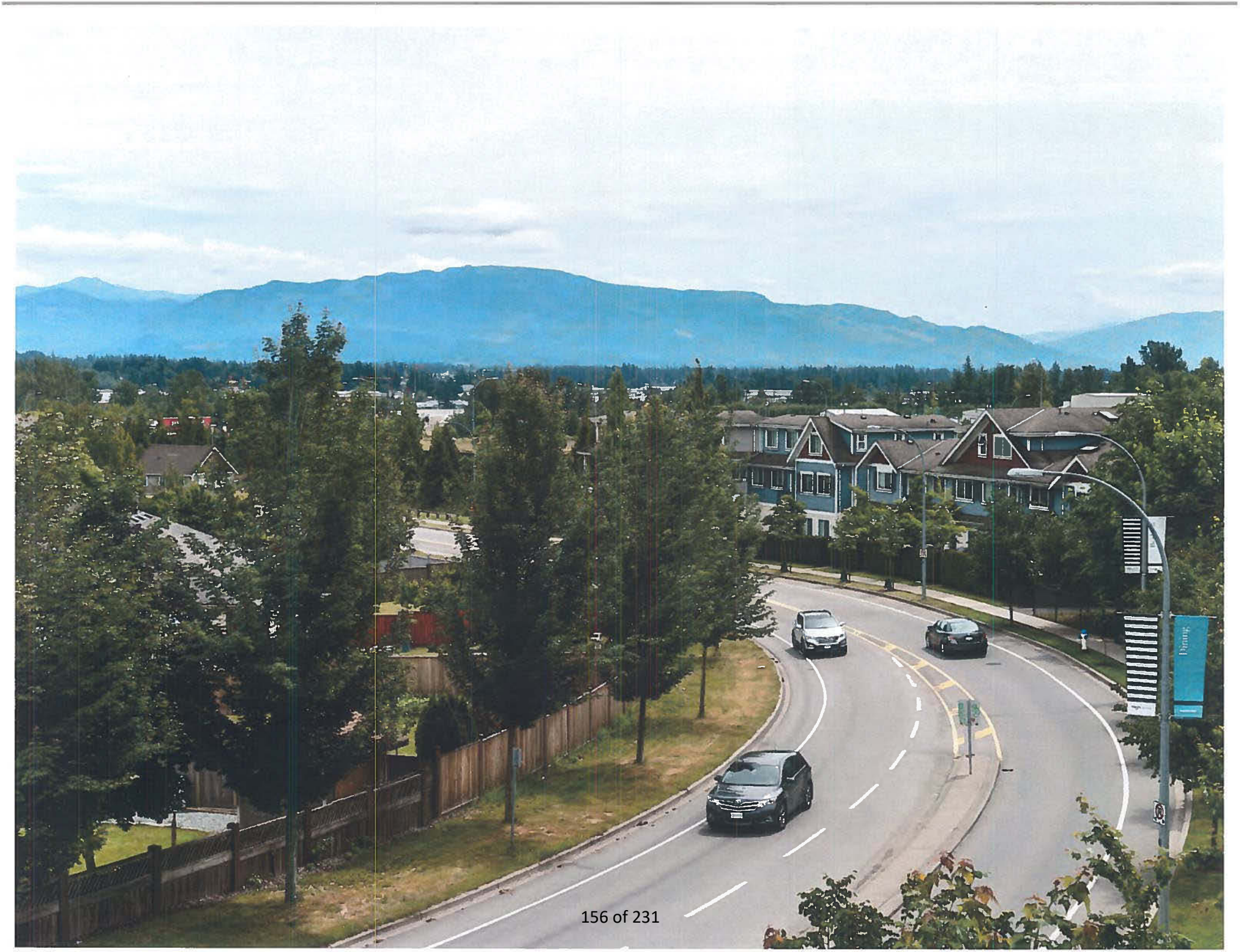
Commissioned by Metro Vancouver

metrovancouver

SERVICES AND SOLUTIONS FOR A LIVABLE REGION

Table of Contents





Acknowledgements

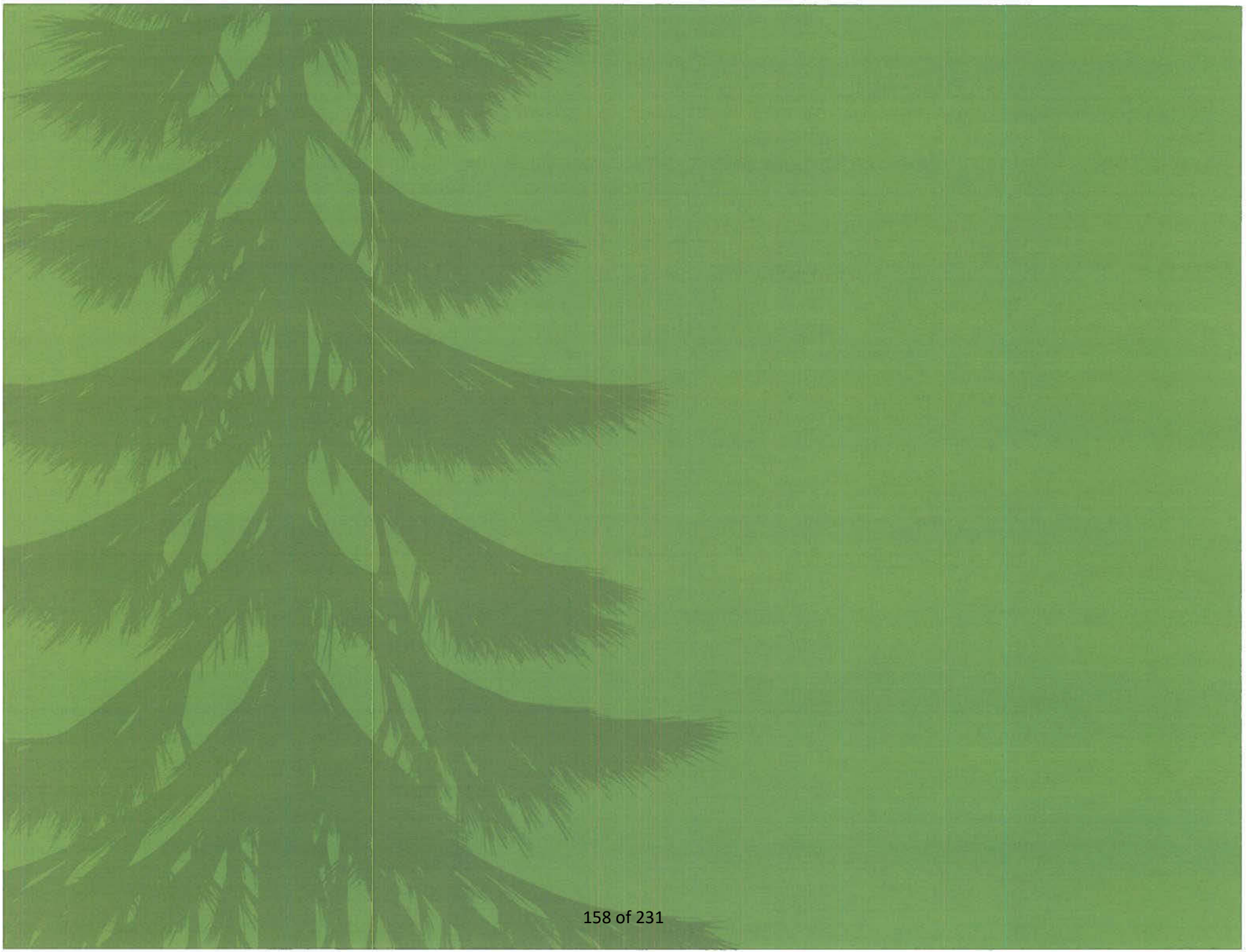
Thank you to all the municipal staff and consulting arborists who answered our surveys in the fall of 2020. Thank you also to Edward Nichol and Marcin Pachcinski of Metro Vancouver, and Dr. Julian Dunster for their thorough review and comments on this Toolkit. The *Metro Vancouver Tree Regulations Toolkit* benefited from your input, guidance, and care.

TOOLKIT AUTHORS

Amelia Needoba
Camille Lefrançois
Trevor Cox
Elliot Bellis
Mike Coulthard

RECOMMENDED CITATION

Metro Vancouver. (2021). *Tree Regulations Toolkit*. Contract report prepared by Diamond Head Consulting.



1.0 Introduction

Trees provide Metro Vancouver communities with shade and cooling, intercept stormwater, store carbon, create habitat, and make our cities beautiful. Healthy forests in both urban and natural areas are an essential component of regional livability and resilience to climate change. However, the area covered by trees in Metro Vancouver's urban areas (i.e., within the Urban Containment Boundary) is expected to decline from 32% to 28% over the next 20 to 30 years (Metro Vancouver, 2019). This canopy loss is anticipated due to development and lower density housing areas being re-developed as part of the region's planned growth. At the same time, the urban forest is vulnerable to climate change, and unexpected canopy loss could occur in the region because of heat, drought, extreme weather events or pest and disease outbreaks. As a result, approaches to preserve trees and grow canopy cover need to consider a wide range of factors, from the impact of land use on the availability of permeable land to grow trees to the future climate suitability of tree species.

The *Metro Vancouver Tree Regulations Toolkit* (Toolkit) provides guidance for Metro Vancouver member jurisdictions on how they can develop comprehensive policy and regulations to preserve trees and grow tree canopy within British Columbia's current legislative framework. Municipalities in British Columbia can use legislative tools to offset or prevent canopy loss.

This Toolkit is a resource for municipal staff, decision makers and other practitioners, including planners, arborists, biologists, engineers and landscape architects, on using regulatory tools that influence the preservation and growth of trees and tree canopy. This Toolkit provides a framework for selecting regulatory tools to help achieve municipal tree preservation or canopy growth objectives.

No single best practices approach to regulating trees was identified during this review. The Toolkit therefore presents guidance based on best practices when available and recommends alternatives and options for consideration. Deciding on the most appropriate regulatory approach will require consideration of the community's values and canopy cover objectives, as well as the budgetary implications for local governments and permit applicants.

This Toolkit is not legal advice. Users must conduct their own legal review of any bylaws, regulations, or policies developed using this Toolkit.

ADDITIONAL TOOLKITS AND GUIDANCE DOCUMENTS

There are several other useful guides and toolkits that may help readers and inform the development of a comprehensive set of bylaws to manage natural assets, including:

- The Green Bylaws Toolkit for Conserving Sensitive Ecosystems and Green Infrastructure (Stewardship Centre BC, 2016) provides guidance on tools for local governments to protect green infrastructure (natural and engineered).

- Environmental Development Permit Areas: In Practice and in Caselaw (Britton-Foster, Grant, & Curran, 2016) provides information about using Environmental Development Permit Areas to protect riparian and terrestrial ecosystems. This report provides information about key components of environmental development permit areas (DPAs) and their judicial treatment in British Columbia.

- Enhancing Climate Resilience of Subdivision and Development Servicing (SDS) Bylaws in the Columbia Basin: A Guidance Document (Nelitz, Cooke, Curran, & Glotze, 2013) provides information to guide the update of subdivision and development servicing bylaws for the purpose of increasing climate resiliency and reducing the cost of building and operating infrastructure.

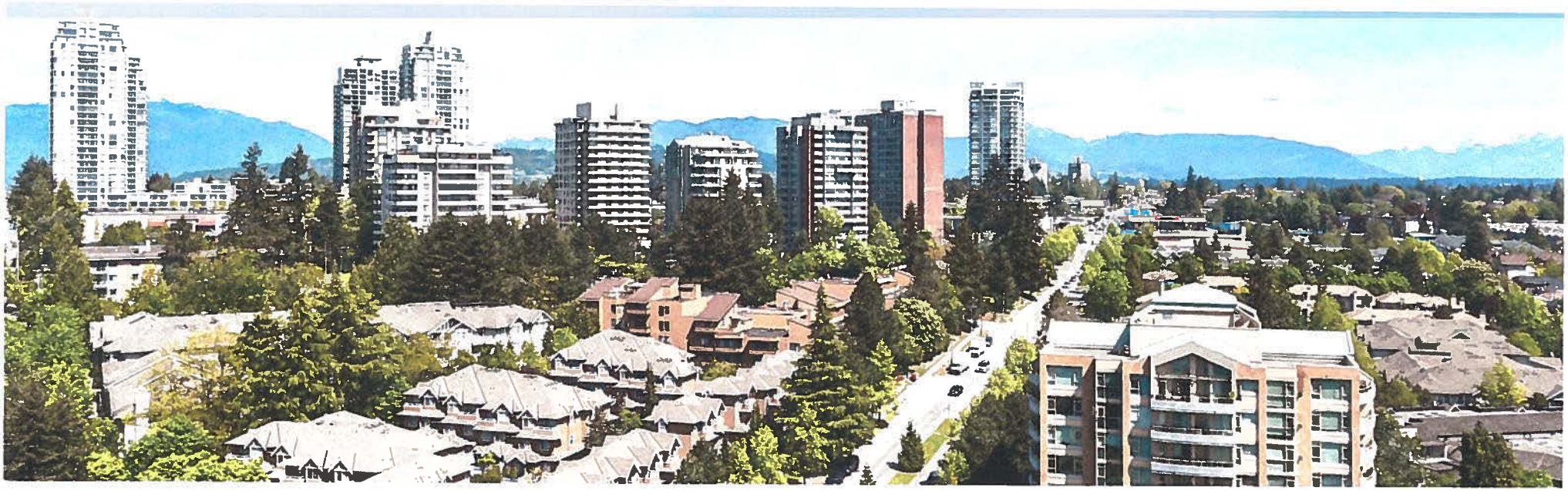
- The Topsoil Bylaws Toolkit (Curran, Dumont, Low, & Tesche, 2012) provides information and guidance for local governments to create effective topsoil policies that support rainwater management and reduce the impact of development.

1.1 STRUCTURE OF THE TOOLKIT

This Toolkit provides:

1. An overview of the available approaches to regulating trees in British Columbia
2. Considerations for selecting the right tools for your community
3. Descriptions of each tool including:
   a. **Higher-level plans** that can support tree preservation or canopy growth through their vision and policy guidance (regional growth strategies and official community plans)
   b. **Tools regulating land use** that influence the space available to retain or replace trees (zoning bylaws and subdivision and servicing bylaws)
      i. The Toolkit lists key bylaw components that impact tree preservation and growth
   c. **Tools regulating trees** as their primary purpose (environmental development permit areas, covenants, and tree bylaws)
      i. The Toolkit provides detailed information about:
         - Key components listed in typical bylaw sections
         - The purpose of each component within the bylaw
         - Options for each component, either as a recommended best practice or a list of alternatives for readers to select from based on their community context

The majority of the content in this Toolkit is focused on tools regulating trees as their primary purpose because Metro Vancouver had identified a gap in regional guidance on this topic. Information about higher-level plans and tools regulating land use has been included because they provide the foundation for long term preservation of trees and growth of tree canopy in the region. Readers seeking to preserve trees and grow canopy cover should begin with higher-level plans and tools regulating land use before selecting tools to regulate trees. Callout boxes throughout this Toolkit provide examples, external resources, and findings from the practitioner surveys conducted for the development of this Toolkit.



1.2 TOOLKIT DEVELOPMENT

The Toolkit was developed with input from a practitioner survey of municipal staff and consulting arborists in the region. In addition, the project team conducted a review of scientific literature, practitioner guides and bylaws from several regions across Canada and the United States to explore best practices for regulating trees and tree canopy.

Practitioners in Metro Vancouver were surveyed to better understand regional perceptions of the strengths and needs for improvement of tree regulations. Two practitioner surveys were sent, the first targeting municipal staff involved in tree bylaw implementation, and the second targeting consulting arborists who have experience working through the development process (listed on the International Society of Arboriculture's list of consulting arborists for municipalities in Metro Vancouver).

Fourteen staff from Metro Vancouver member jurisdictions with private tree bylaws answered the municipal survey. Twenty-nine consulting arborists (who have experience preparing arborist reports on development projects across Metro Vancouver) answered the consulting arborist survey. Appendix 1 contains the survey results.

The project team conducted a review of academic literature and practitioner guides to identify components of successful tree regulations and key considerations for governance, planning and implementation supporting effective regulations. Appendix 2 contains the literature review.

Several Canadian tree bylaws were reviewed to inform the tree bylaws section. In Canada, only some provinces have legislation that explicitly enables the regulation of trees on private property. Municipalities in Ontario, Québec and British Columbia have private tree bylaws. Although bylaws from Ontario, Québec and the US were reviewed, British Columbia bylaws were selected for comparison in the Toolkit because of their legal compatibility with legislation in the Metro Vancouver region.

2.0 British Columbia's Institutional Framework for Regulating Trees

British Columbia's institutional framework provides a range of policy and regulatory tools to preserve or grow trees in forest stands and urban areas. Figure 1 summarizes how tree and tree canopy considerations can be incorporated into British Columbia's available regulatory tools, including:

1. Higher-level plans:
   a. Regional Growth Strategy
   b. Official Community Plans and neighbourhood plans
2. Tools regulating land use and therefore the space available for tree retention and replacement:
   a. Zoning bylaws
   b. Subdivision and servicing bylaws
3. Tools primarily regulating trees:
   a. Environmental development permit areas
   b. Covenants
   c. Tree bylaws

These tools provide opportunities to regulate trees in British Columbia but may not be applicable in all instances; the relevance of each tool depends on each jurisdiction's context and the trees that are the focus of regulation. Figure 1 includes examples for how each tool can be used to regulate trees growing on private (blue headings) and public (red headings) land for two types of canopy: naturalized stands and urban areas. Each column on the figure indicates if and how a tool would typically apply to this type of public or private tree canopy. For example, Figure 1 does not list content for 'Regional Growth Strategies' under private yard trees and private trees in a development because they are not typically addressed by that tool.

In addition to the regulations represented in Figure 1, some bylaws can stand alone or have their content addressed within zoning bylaws, subdivision and servicing bylaws or development permit areas. These bylaws include:

- **Runoff control bylaws** | Runoff control bylaws can establish maximum percentage areas covered by impermeable surfaces varied by land use, zones, geography and size of paved areas

- **Screening and landscape bylaws** | These bylaws can require screening or landscaping to preserve, protect, restore and enhance the natural environment, screen or buffer land uses, and to prevent hazardous conditions (e.g., require certain types of plants in wildfire hazard areas)

- **Soil removal and deposit bylaws** | Sometimes called sediment and erosion bylaws, these bylaws regulate grading, soil removal and deposition, soil storage and erosion control guidelines

- **Watercourse protection bylaws** | Watercourse protection bylaws can regulate specific activities and development in riparian setback areas

HOW REGULATORY TOOLS CAN BE USED TO PRESERVE TREES AND GROW TREE CANOPY IN THE REGION

	PRIVATE FOREST	MUNICIPAL FOREST
REGIONAL GROWTH STRATEGIES (OCP* must be consistent with RGS*)	Encourage development patterns that avoid urban sprawl, minimize risks from natural hazards, protect environmentally sensitive areas (ESAs) and water quality.	Encourage preserving, creating and linking urban and rural open spaces including parks and recreation areas.
OFFICIAL COMMUNITY PLANS & NEIGHBOURHOOD PLANS (Other bylaws must be consistent with OCP*)	Direct development away from ESAs* and environmental hazards. Policies supporting preservation, protection, and enhancement of tree stands and wildlife trees, clustering and density bonusing in exchange for conservation covenants.	Policies supporting the preservation, protection and enhancement of tree stands and wildlife trees. Policies that support clustering and density bonusing in exchange for parkland.
ZONING BYLAWS (Or contained in related land use bylaws for runoff control, parking, landscaping etc.)	Require setbacks from riparian areas and ESAs*, enable clustering and density bonusing, set out standards for preserving, protecting, enhancing and restoring ESAs	At rezoning, parkland acquisitions can be negotiated through density bonusing.
SUBDIVISION SERVICING BYLAWS	Sets standards for drainage and onsite stormwater management that can be made low impact.	Sets standards for drainage and onsite stormwater management that can be made low impact.
DEVELOPMENT PERMIT AREAS	Establish riparian setbacks, ESA* soil and vegetation protection and restoration guidelines, environmental assessment requirements.	DPAs on private land can enhance connectivity, restoration and enhancement of natural areas adjacent to municipal forest.
COVENANTS	Protect natural areas and sensitive ecosystems on title and place maintenance or restoration requirements and restrict actions that could damage the protected features.	
TREE BYLAWS	Regulate all trees in ESAs*, on slopes and significant trees. Specify assessment, protection, replacement standards.	Regulate all municipal trees. Specify assessment, protection, compensation standards.

***Short forms:** ESA – Environmentally Sensitive Area | OCP – Official Community Plan | RGS – Regional Growth Strategy

Figure 1. The key regulatory tools in BC that can be used to protect or grow urban forest canopy types.

2 | Trees in Urban Areas

MUNICIPAL STREET & PARK TREES	PRIVATE YARD TREES	PRIVATE TREE IN A DEVELOPMENT
Develop settlement patterns that minimize the use of automobiles and encourage walking, cycling and the efficient use of public transit.		
Policies and targets supporting parkland amenity contributions, new parkland, expansion of the urban forest, treed character of streets and areas, integration with goals such as stormwater management, biodiversity, energy conservation and walkability.	Policies supporting the treed character of new landscaping in land uses and neighbourhoods.	Policies and targets supporting tree and canopy retention, protection and enhancement.
At rezoning, negotiate amenity contributions for new parkland. Require setbacks of above and below ground structures, signage and weather protection favourable for street trees.	Require lot sizes, trees per lot, impermeable/ permeable cover, off-street parking, screening | and landscaping, favourable to yard trees.	IMPORTANT: The tree bylaw may not apply to the extent necessary to allow a permitted use or density.
Set standards for boulevard trees, spacing, soil volume, planting standards, access, utilities favourable for street trees.	Set standards for access and utilities placement favourable to yard trees.	Set standards for access and utilities placement favourable to retaining private trees.
	Promote energy conservation, water conservation and reduction of greenhouse gas emissions using trees.	
		Protect trees or tree groups on developing properties, place maintenance requirements and restrict actions that could damage the protected features.
Regulate all municipal trees. Specify assessment, protection, compensation standards.	Regulate certain trees and require a minimum number of trees/canopy per lot. Specify assessment and replacement standards.	Regulate certain trees and require a minimum number of trees/canopy per lot. Specify assessment, protection, replacement standards.

Tree types: Forest stands and naturalized areas | Urban trees

Jurisdiction: Public | Private

***Short forms:** ESA – Environmentally Sensitive Area | OCP – Official Community Plan | RGS – Regional Growth Strategy

3.0 Selecting the Right Tools and Options for your Community

This Toolkit provides options for content that municipalities could include in policy and regulatory tools to preserve trees and grow tree canopy. For a municipality considering what tool(s) to select, an urban forest governance lens may be helpful to identify the decision-making factors. Urban forest governance refers to the processes, interactions, organizations, and decisions that lead to the establishment and maintenance of urban forest resources and benefits (Lawrence, De Vreese, Johnston, Konijnendijk, & Sanesi, 2013). Applying an urban forest governance lens means defining the governance approach used by a specific municipality and using that information to help inform decisions about which tool(s) are likely to be most successful.

The paper "*Urban forest governance: Towards a framework for comparing approaches*" (Lawrence, De Vreese, Johnston, Konijnendijk, & Sanesi, 2013) defines a set of variables for systematically analysing urban forest governance. This Toolkit poses a set of analysis questions related to urban forest governance; these questions can be used to help define the relevant focus, level of effort, extent of change, key actors, capacity, and processes for developing new tree regulations.

Urban forest governance analysis questions

1. **Community context:**
   - What are the urban forest canopy types that are the target of canopy preservation or growth: canopy in forest stands and naturalized areas, canopy in urban areas, or canopy in both naturalized forest stands and urban areas? Please refer to Figure 1 for the canopy types and how they might be regulated with different tools.
   - What level of administration and enforcement effort can be supported by the jurisdiction's population size and geographic area?
   - What level of regulation would align with community values?

2. **Institutional frameworks:**
   - What types of policies, plans and regulations are already in place and how could they be enhanced or complemented with updates or new regulation?
   - Will new policies or plans be required to support new regulation?
   - What urban forest canopy or tree targets exist in policies and plans, and how could new regulations be used to achieve them?

3. **Actors and coalitions:**
   - Who are the key internal and external stakeholders who need to be consulted?
   - Who needs to support the decision and who will make the final decision?

4. **Resources:**
   - Will funding and staffing need to increase to support the new regulation?
   - What new technical information will need to be provided to internal and external stakeholders?
   - Can other policies, programs or staff be used to implement the changes more effectively?

5. **Processes:**
   - What are the narratives, conflicts and framing that justify the changes being made?
   - What are the specific ways that actors and stakeholders will be consulted, engaged, involved, and empowered in decisions and implementation?
   - What are the performance targets[1] for the change? How will success be measured and reported in relation to targets?

Answering these questions will help choose the right tools and options for your community. Your answers will inform the selection and design of policy and regulatory tools that will be appropriate for the community's governance context; and help identify the engagement and resourcing required to support their effective implementation.

[1] Examples of measurable targets include metrics such as canopy cover, rate of tree removal and replacement, replacement tree survival rates, or pervious cover.

Higher-level plans are established for a regional, municipal or neighbourhood planning scale. The plans set goals, targets and policies that guide planning and development at that planning scale, making them an important driver for tools that regulate land use and trees.

4.0 Higher-level Plans

The higher-level plans described in this section include Regional Growth Strategies, Official Community Plans and Neighbourhood Plans. Regional Growth Strategies are an agreement across local governments on the future, population in the region and employment projections, actions proposed, and targets, policies and actions, for example for the reduction of greenhouse gas emissions (Local Government Act, RSBC 2015, c 1, 2015). A Regional Growth Strategy describes objectives for and ways to protect environmentally sensitive areas. Local governments are required to include a regional context statement within Official Community Plans (OCPs) to demonstrate consistency with matters in the regional growth strategy.

Official Community Plans are comprehensive plans that can include environmental protection policies. They provide the policy support for the bylaws adopted in the community. Official Community Plans can also define settlement patterns that guide development and avoid sprawl, map key areas, and designate development permit areas and guidelines for development permits responsible for tree protection and replacement (Stewardship Centre BC, 2016). Official Community Plans can establish goals and indicators related to the preservation and growth of a community's urban forest and support the implementation of community-supported bylaws and policies for that purpose.

Neighbourhood Plans can be a helpful accompanying policy tool to set out targets for canopy cover. They can also and define policy objectives and character elements of importance for the urban forest and neighbourhood character. This smaller planning scale enables more consideration to be given to the local land use and unique context of each neighbourhood within a municipality.

Zoning bylaws and subdivision and servicing bylaws create the foundation for long term protection and growth of trees. Land use regulations control where trees will exist and how much space is available for them to grow in a particular land use type as it develops.

It will be ineffective to implement a tree bylaw or an environmental development permit area to protect trees or grow tree canopy if land use regulations do not require adequate space to retain or grow trees post-development.

5.0 Tools Regulating Land Use

Land use regulations have a significant impact on tree preservation and growth because they influence the space available to retain or replace trees with development. The two land use bylaws discussed in this section include:

- **Zoning bylaws**, which influence tree retention based on the permitted use and density and the private landscape space available to replant trees

- **Subdivision and servicing bylaws**, which control the placement of street trees and soil volume provided, and construction standards

Key components for tree retention or planting have been identified in each bylaw. They are discussed with technical guidance and recommendations for the reader's consideration.

5.1 ZONING BYLAWS

Metro Vancouver's 2019 Regional Tree Canopy Cover and Impervious Surfaces report (Metro Vancouver, 2019) found that 54% of the region and 32% of the land within the Urban Containment Boundary is covered with tree canopy, and 50% of the land within the Urban Containment Boundary is impervious surfaces. The study revealed that higher density housing developments had shown a trend of increasing tree canopy and pervious cover up until the 1980s, and that it has trended downwards in recent years. In contrast, single-family housing (particularly detached) had steadily supported higher canopy and pervious cover until the 1970s but has since trended downwards with larger home sizes on smaller lots. The decline of canopy cover and pervious cover is expected to continue. Zoning influences the tree canopy and pervious cover retained or provided with development.

Several components of zoning bylaws can impact a municipality's ability to preserve trees or grow canopy cover. Firstly, zoning bylaws regulate permitted use and density on a parcel and a tree bylaw may not apply if it would prevent that use or density. Secondly, zoning bylaws impact the private landscape space available to retain or replace trees by influencing the extent of impervious cover on those sites.

Zoning bylaws include rules for lot sizes, setbacks, building coverage, and how land can be used, which can in turn affect land cover and where tree canopy (and associated environmental benefits such as urban heat mitigation and stormwater interception) is distributed (Wilson, Clay, Martin, Stuckey, & Vedder-Risch, 2003). Many studies have found that canopy cover declines significantly with median building lot coverage or housing density (Bernhardt & Swiecki, 2001; Hilbert,

LAND USE AND CANOPY COVER IN METRO VANCOUVER

Recent work by Metro Vancouver found that most of the tree canopy cover in the urban areas is in "Residential – single-family detached with no secondary unit". "Parking" and "Retail and other commercial" areas have the least canopy cover at 5% and most impervious surface cover at more than 90% (Metro Vancouver, 2019).

The study found a relationship between tree canopy cover and the time period of development. High density housing stock actually showed gains in canopy cover from the 1940s to 1980s. The increase in high density canopy cover over time was attributed to the 'skyscraper' boom in 1960s, 1970s, and 1980s, characterized by tall and slender buildings with low Floor to Area Ratio (FAR), and enough space between them to preserve view corridors (Metro Vancouver, 2019).

Low density housing canopy cover was relatively steady until the 1970s and then showed a declining trend up to 2000. This decline indicated that fewer, or smaller, trees were being retained or planted during construction of low density housing over time as lot sizes shrunk and demand for bigger homes increased, resulting in increased lot coverage and lower tree canopy (Metro Vancouver, 2019).

The Vancouverism architectural model featured residential buildings that used up little lot coverage and allowed abundant greenspace, street trees and other public space at ground-level (Metro Vancouver, 2019). However, average canopy cover has declined in both high density and low density housing stock in Metro Vancouver between 1980 and 2000.

et al., 2019). Practitioners surveyed during the development of the Toolkit also noted maximum lot coverage as being impactful for canopy preservation or growth. However, despite useful documentation about the impact of zoning on tree canopy preservation and growth, research points out this relationship is still not well enough understood to inform fine scale land use planning (Mincey, Schmitt-harsh, & Thurau, 2013).

The common denominator affecting canopy cover, as highlighted in research and by practitioners, is the permeable space that will remain on a site after development. A strong inverse relationship exists between impermeability and canopy cover, as found in the 2019 Metro Vancouver study (Metro Vancouver, 2019). In the City of Vancouver, data analysis for the urban forest strategy showed that once impermeability exceeded 50% of a city block, tree canopy was on average less than 10%. Once a city block reached 80% impermeability, there was essentially no canopy cover.

> The majority of municipal staff survey respondents indicated that they thought their zoning bylaws were not currently effective for preserving or growing canopy cover.

Given this close relationship between impervious surfaces and canopy cover, municipalities seeking to preserve or grow canopy cover should ensure that their zoning bylaw results in adequate pervious surface and soil to grow trees in the land uses where the community wants to see tree canopy.

5.1.1 Defining Minimum Pervious Cover

The minimum pervious cover required to sustain trees is related to the amount of soil volume required for trees to grow. To meet minimum soil volume requirements, at least 0.3 m^3 of soil and preferably 0.6 m^3 of soil per metre square of mature canopy area is recommended (Metro Vancouver, 2017). These soil volumes relate approximately to a surface area per tree, 8 m^2 for a small tree and 35 m^2 or more for a large tree (Table 1) assuming 1 m depth. Where trees must be installed in hardscape, soil cells or structural soil can be used to provide the soil under paved areas; however, the extent of these soils must be larger to provide the equivalent volume of soil.

If zoning bylaws explicitly consider the minimum pervious cover required to support trees on a lot, then the ability to either retain or replant trees with development will be greatly improved.

5.1.2 Bylaw Components to Achieve Minimum Pervious Cover

Many components of zoning bylaws can significantly impact pervious surfaces and canopy cover. The key components below are identified in the literature and by practitioners:

- **Site/lot coverage** | The maximum site coverage defines the proportion of a lot that can be occupied by structures. With the exception of landscaping grown on structure (discussed below), this represents an area that will not be available as pervious cover.

- **Maximum impervious cover** | Pervious cover is often further reduced by impervious surfaces additional to structures, such as walkways, parking pads or patios. Municipalities interested in retaining pervious cover should consider including a requirement for maximum impervious coverage to limit the additional impact of surfaces on site permeability.

Table 1. Surface area of soil per tree assuming 1 m depth

TREE SIZE	APPROXIMATE SURFACE AREA (M^2) OF SOIL REQUIRED PER TREE (ASSUMING 1 M SOIL DEPTH)		
	On ground	**Under hardscape – soil cells+**	**Under hardscape – structural soil++**
Small tree canopy spread is up to 6 m	8	x1.1	x5
Medium tree canopy spread is up to 10 m	20	x1.1	x5
Large tree canopy spread is greater than 10 m	35	x1.1	x5

+Soil cells are 92% soil, ++Structural soil is 20% soil.

PERVIOUS TREE ZONE

The City of Ottawa recently amended its Residential Fourth Density zones, which consist of intensive low-rise residential. As part of the amendments, applicants are now required to provide a pervious area meant for tree planting that must provide a minimum connected surface area with a minimum width that will enable tree planting. The amendment specifically requires applicants to provide ***"at least one aggregated rectangular area of at least 25m² whose width is not more than twice its length, for the purposes of tree planting."***

The area must contain sufficient soil volume and space to enable tree planting.

City of Ottawa (2020), R4 Zoning Review: Proposed Zoning Amendments.

GREEN ROOFS AND TREE PLANTING ON STRUCTURE

Green roofs may provide an opportunity to plant vegetation and small trees to offset canopy loss and can provide many benefits. However, trees growing on structure will provide less and shorted lived canopy compared to trees planted in the ground because of the soil volumes available and the need to remove trees periodically to repair membranes.

- **Setbacks** | Trees require space from buildings and paved surfaces to grow to maturity without conflict with adjacent infrastructure. As such, municipalities should consider the threshold below which the setback will prevent tree planting from happening on that side of the lot.

- **Underground structures** | Setbacks do not explicitly apply to underground structures in all zoning bylaws. It should be noted that, where underground structures are permitted to reach the property line, it will result in tree impacts both on and beyond that property. For instance, underground parkades that reach the property line may require the removal of adjacent street trees and may also hinder the potential to replace a tree on those adjacent sites. Being explicit about where zero setbacks for underground structures will be permitted would help to manage expectations about tree retention, planting and canopy cover potential in adjacent streetscapes and sites as redevelopment occurs, and enable proactive planning for alternative greening options in these future low-canopy areas.

- **Parking requirements** | On site parking requirements can increase impervious cover, or the extent of underground parkades. Numerous municipalities have implemented or investigated reducing or increasing the flexibility of parking requirements as a way to meet objectives for affordability or greenhouse gas reduction, and this flexibility would also increase the ability to retain or replace trees on a lot.

5.1.3 Additional Bylaw Components to Preserve Trees and Grow Tree Canopy

Several additional components of zoning bylaws can significantly impact the preservation of trees and growth of canopy cover, including:

- **Screening and landscaping guidelines** | Landscaping and screening guidelines can be used to require minimum numbers of trees, certain types and cover of trees either in general or in specific zoning. For example, certain species can be required in wildland urban interface zones, vegetation buffers can be required between land uses, or a minimum density of trees can be required in landscape planting. The Canadian Nursery Tree Stock Standard establishes standards for stock size and quality. Typically, a warranty period is attached to the landscaping requirement, which should be attached to a bond amount that includes the cost of stock, installation, maintenance, and inspections.

- **Density clustering** | Density clustering can be used to preserve tree stands or larger plantable areas. The overall density on the site may not be increased but the developer may benefit from smaller lots than would otherwise be permitted, or a density bonus may be provided, in exchange for conserving certain areas. Conservation covenants in favour of the municipality are often used to protect the green space for the long-term. Clustering can be accomplished through density averaging and density transfer, amenity density bonuses, bare-land strata, or comprehensive development zoning or a combination of those options.

- **Density bonusing** | Amenity density bonuses can be used to preserve tree stands in exchange for additional density or variations in lot configuration. Conservation covenants in favour of the municipality are often used to protect the green space for the long-term.

- **Comprehensive development** | Comprehensive development zones can be used to drive landscape-level planning for larger parcels of land. Communities may find it useful to achieve stand preservation goals or to enable innovative treatments on sites with particular constraints or strategic locations.

SEATTLE'S EXCEPTIONAL TREE PROTECTION ZONING

The City of Seattle defines exceptional trees as species of a certain size growing individually or in groves. The City has a defined process to adjust building setbacks and height to retain exceptional trees. The process and development requirements vary based on the zone:

- **Single-family zones:** Applicants must take advantage of front and rear yard setback departures to enable the retention of exceptional trees.

- **Lowrise zones:** Where an exceptional tree is threatened, applicants must either follow a Streamlined Design Review process to make adjustments to enable tree retention, or they must consider increases in the permitted height detailed in the Tree Protection Code to achieve the same purpose. Additional departures to increase FAR and height or reduce the number and standard of required parking spaces may also be explored with applicants to enable the retention of exceptional trees.

- **Midrise and commercial zones:** Applicants must explore options such as departures from the land use code (as approved by a Design Review) or changes to parking plans to retain exceptional trees.

Seattle Department of Construction & Inspections (2019) – Tree Protection Regulations in Seattle.

5.2 SUBDIVISION AND SERVICING BYLAWS

Subdivision and servicing bylaws influence the retention and replacement of trees in new subdivisions. These bylaws often regulate street trees by controlling the width of boulevard, street lanes and sidewalks, tree selection and spacing, required soil volume and road construction standards. The bylaw also impacts private trees on new subdivisions through the placement and width of utility connections and driveways and can include landscaping requirements for both on site and offsite areas. By regulating drainage, subdivision and servicing bylaws can also influence the extent to which grading and topography changes impact stands of trees on or adjacent to new developments.

The amount of soil volume provided for municipal street trees is one of the most significant ways these bylaws affect urban tree canopy. Table 2 provides recommended soil volume minimums for street trees (Metro Vancouver, 2017).

Table 2. Minimum recommended soil volume per tree

TREE SIZE	Minimum soil volume (m^3)	Shared or irrigated soil volume (m^3)
Small tree canopy spread is up to 6 m	8	6
Medium tree canopy spread is up to 10 m	20	15
Large tree canopy spread is greater than 10 m	35	30

Soil volume shall be calculated as:

- Soil: Surface area (Length x Width) of connected pervious x 1
- Soil under hardscape:
  - Soil: Volume of soil (Length x Width x Depth)
  - Soil cells: Volume of soil cell installation (Length x Width x Depth) x .92

If subdivision and servicing bylaws explicitly consider the minimum soil volume required to support trees in a street, then the survival and quality of street trees can be greatly improved.

When updating subdivision and servicing bylaws, municipalities that seek to preserve trees and grow canopy cover should consider the following components:

- **Boulevard width** | In general, the largest boulevard width possible should be provided for the tree planting strip. Where trees are planted in a planting strip and sharing space with utilities, a minimum width of 2 m is recommended in order to be able to provide space for the tree to grow and an adequate setback from utilities. The absolute minimum planting strip width should be 1.5 m to allow for growth of the trunk and trunk flare but additional soil volume should then be provided under the sidewalk, or via root bridges to adjacent soil volume areas.

UK TREES AND DESIGN ACTION GROUP

The Trees and Design Action Group is a not-for-profit, collaborative and cross-sector forum from the United Kingdom that promotes urban forestry throughout the country. They have published useful guides that help decision-makers integrate, plan and design for trees in their jurisdictions, notably:

Trees in Hard Landscapes: A Guide for Delivery – this guide includes detailed information from the planning stages through to technical design for tree planting spaces and species selection.

The UK Trees and Design Action Group (2014) has published many other guides that readers may find helpful to review on their website.

- **Soil volume** | Soil volume minimums are essential to ensuring that newly constructed streetscapes can accommodate trees. Soil volumes can be met either in ground where native soils have been retained, or with a combination of top-soil and soil cells or structural soil. When adequate soil volumes are not achievable via planting strips, use soil cells to increase soil volumes and connect root zones of planting under paving.

- **Landscaping requirements** | Standards for the landscape plan, plant spacing, type, stock quality, irrigation and drainage are essential to ensure that trees are planted in appropriate locations and are of a quality and size to survive and thrive. The Canadian Nursery Tree Stock Standard establishes standards for stock size and quality. Typically, a warranty period is attached to the landscaping requirement, which should be attached to a bond amount that includes the cost of stock, installation, maintenance, and inspections.

- **Utility and infrastructure setbacks** | Utility and infrastructure setbacks can result in trees being excluded from a streetscape or private yard. It is necessary to balance the potential for infrastructure conflict with the flexibility to include trees in spaces shared with utilities. Setbacks should be firm when a hazard could be created (e.g., intersection visibility, gas main connections) but allow for reasonable flexibility in other situations.

- **Streetscape component locations** | Streetscape design standards define the standard location for streetscape components such as utilities, sidewalks, road lanes, bicycle lands, boulevards, stormwater, trees and lighting in a streetscape. Standards should leave room for flexibility to adjust streetscape design when there are competing interests in the streetscape by establishing a hierarchy of preferred and alternative compliance methods for different streetscape components.

RIGHT-OF-WAY STANDARDS TO GROW TREE CANOPY

Many municipalities in North America have soil volume standards that meet or exceed the minimums recommended in this Toolkit. Deeproot maintains a database that reports minimum soil volumes for street trees in Canadian and US municipalities (Marritz & Hunter, 2020). For example, in Canada:

- Kitchener (ON) surpasses the recommended soil volumes for small, medium and large trees in the Urban Forest Appendix of their Development Manual (City of Kitchener, 2015).

- Guelph (ON) surpasses recommended the minimum soil volumes for small, medium and large trees in their Downtown Streetscape Manual (City of Guelph, 2014).

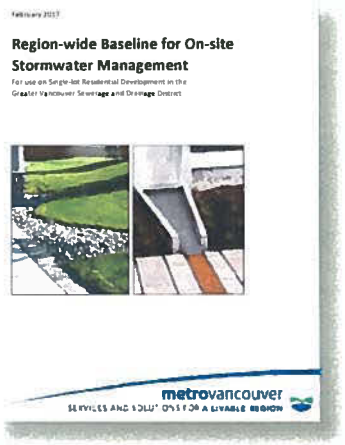
More examples can be found on Deeproot's website.

- **Tree protection requirements** | Subdivision and servicing bylaws can include tree protection requirements guiding tree retention and replacement during the subdivision permitting process. However, it is recommended that tree protection requirements only be included in a subdivision and servicing bylaw when the municipality either does not have a tree bylaw, or if approved subdivisions are exempted from the tree bylaw. Tree protection requirements included in a subdivision and servicing bylaw should meet an equivalent standard to those expected of a tree bylaw (see Section 6.2 Tree Bylaws).

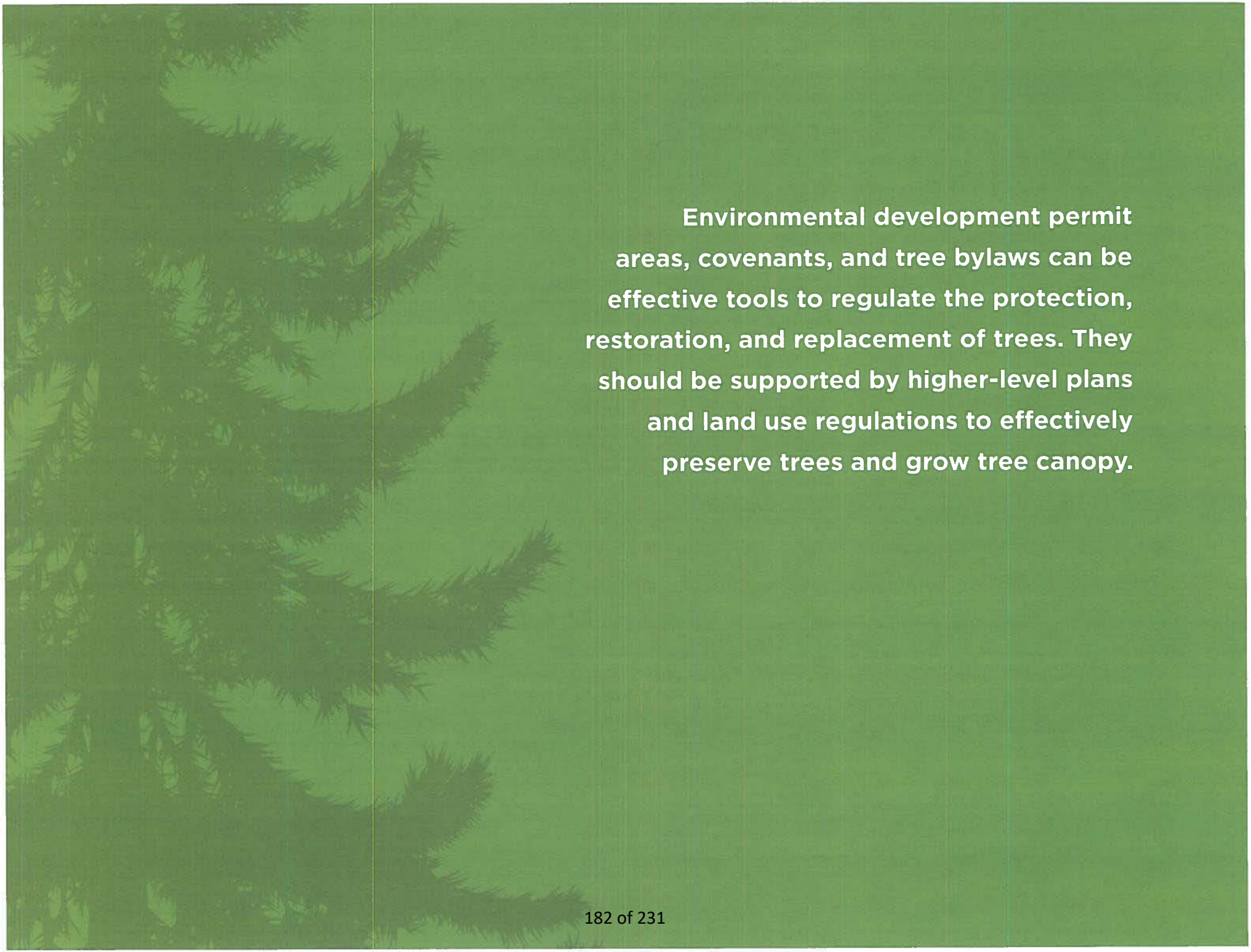
- **Drainage and on site stormwater management** | Drainage standards should incorporate protection or restoration of natural watercourses, native soil and trees whenever feasible. Stormwater management systems can incorporate on site capture and infiltration facilities. Such measures can support healthy tree canopy by enabling infiltration and soil water storage accessible to retained trees.

ALIGNING CANOPY COVER GOALS WITH STORMWATER MANAGEMENT INITIATIVES

Municipalities are increasingly seeking solutions to improve integrated stormwater management to lessen the demand on traditional grey infrastructure and reduce adverse impacts such as water pollution and erosion. Many integrated stormwater management approaches rely on pervious cover, and may therefore align with canopy cover goals by helping to preserve or restore potential planting areas.



- Metro Vancouver's Region-wide Baseline for On-Site Stormwater Management provides best management practices for drainage on single-lot residential development
- Metro Vancouver's Stormwater Source Control Design Guidelines provide guidance for absorbent landscaping, bioretention, vegetated swales, pervious paving, infiltration trenches and extensive green roofs
- Toronto's Green Streets Technical Guidelines report provides detailed guidance on the implementation of green infrastructure into streetscapes
- Seattle's Stormwater Manual (vol. 3 – Project Stormwater Control) provides guidance on how to integrate retained or newly planted trees to stormwater control projects
- San Francisco's Stormwater Management Requirements and Design Guidelines report provides guidance for post-construction stormwater runoff control with street tree implementation



Environmental development permit areas, covenants, and tree bylaws can be effective tools to regulate the protection, restoration, and replacement of trees. They should be supported by higher-level plans and land use regulations to effectively preserve trees and grow tree canopy.

6.0 Tools Primarily Regulating Trees

This Toolkit provides detailed information about regulatory tools focused on preserving trees and growing tree canopy, specifically:

- **Environmental development permit areas,** which identify locations that need special treatment for certain purposes such as the protection of the natural environment, its ecosystems and biological diversity and typically include:
  - Identification of the development permit area
  - Development permit area guidelines

- **Covenants**, which can require that an amenity be protected, preserved, conserved, maintained, enhanced, restored or kept in its natural or existing state

- **Tree Bylaws**, which regulate the protection and replacement of individual trees and typically include:
  - Bylaw definitions
  - Prohibitions
  - Permitted removal reasons
  - Permit application information requirements
  - Requirements and incentives for tree retention and replacement
  - Replacement tree planting standards
  - Actions on site
  - Securities
  - Penalties
  - Tree bylaw implementation

The following sections provide the detailed information for each key component of the two regulations, including:

- Purpose of the component
- Recommendations for each element, either as:
  - Must have – a recommended best practice or list of alternatives that should be chosen based on the community context, values, goals and impacts
  - Recommended or additional options – listed for every community's consideration, where they may help achieve specific goals or manage impacts
- Examples of where each option is found in existing regulations

6.1 ENVIRONMENTAL DEVELOPMENT PERMIT AREAS

The Local Government Act allows land to be designated under a development permit area (DPA) for the protection of the natural environment that may "require protection measures, including that vegetation or trees be planted or retained" (section 491(1) of the *Local Government Act*).

Regional and community planning processes will often identify natural values and hazards related to forest stands that overlap with but are not adequately addressed by tree bylaws. Using development permit areas (DPAs) can define land with a specific management intent to align it with strategic objectives for protection of the natural environment. For example, in British Columbia, DPAs can be used for the (LGA, 2015):

- *Protection of the natural environment, its ecosystems and biological diversity;*
- *Protection of development from hazardous conditions;*
- *Establishment of objectives to promote energy conservation;*
- *Establishment of objectives to promote water conservation; or*
- *Establishment of objectives to promote the reduction of greenhouse gas emissions.*

DPAs can complement tree bylaws by providing protection, restoration or enhancement guidelines to achieve a broader range of objectives in these areas when development occurs.

Practitioners surveyed emphasized the importance of environmentally sensitive areas, waterfront and riparian areas for protecting tree stands. Some communities have also found form and character DPAs and energy DPAs to be helpful in managing urban trees or tree stands.

Environmental DPAs are used to protect natural features from the impacts of construction or land alteration activities (Britton-Foster, Grant, & Curran, 2016). They are often used to protect environmentally sensitive areas including the marine foreshore, watercourses, wetlands and sensitive terrestrial ecosystems. Environmental DPAs can help protect trees from development activity by identifying significant forest stands and enforcing design guidelines to protect them. Environmental DPAs can be designed to require that identified forested areas be protected and, if degraded, restored or enhanced as a requirement of a development application. Environmental DPAs can be designed to work with, or independently of, a tree bylaw.

6.1.1 Identification of the Development Permit Area

PURPOSE | Identify the environmentally sensitive areas where the development permit applies and "describe the special conditions or objectives that justify the designation" (Local Government Act, 2015)

MUST HAVE: Mapping Environmentally Sensitive Areas

Environmentally sensitive areas must be defined in order to provide landowners with information on whether the development permit guidelines will apply to their development application.

EDPAs may use mapping of varying precision to designate areas where the development permit guidelines may apply. The designation of those areas is often done using external mapping data from regional or provincial sources. At a minimum, environmental DPAs should provide a principled basis for landowners to understand what falls within or does not fall within the approximate area boundary (Britton-Foster, Grant, & Curran, 2016).

Available technology and spatial information for mapping allows municipalities to provide relatively detailed locations of DPAs. The scale, precision and update frequency of mapping must be carefully considered, as environmental DPAs with precise but inaccurate mapping have been challenged.

ADDITIONAL OPTIONS | In addition to the mapping of environmentally sensitive areas, municipalities may wish to consider the mapping and protection of a network of ecosystems to preserve landscape level ecosystem connectivity. This network of ecosystems is called green infrastructure network mapping.

- **Green infrastructure network mapping**
  Green infrastructure networks seek to identify a network of interconnected natural areas that will conserve ecosystem values and functions as well as provide benefits to wildlife and people. A green infrastructure network consists of:
  - Core habitat areas that provide a home range for species
  - Natural corridors across urban areas that prevent the fragmentation of core habitat areas

  Once mapped, green infrastructure network areas can be included and protected within environmental DPAs. The mapping can also serve to inform Neighbourhood Plans and other landscape-level plans.

At the regional level, Metro Vancouver manages and updates the Sensitive Ecosystem Inventory. This inventory may be a good starting point for municipalities wishing to map environmentally sensitive areas. It would however need to be accompanied by a detailed assessment of environmentally sensitive areas to develop mapping at the municipal and neighbourhood scales.

PROTECTING TREES WITHIN DPAS

It is common for jurisdictions that have a tree bylaw and an environmental DPA to include trees within DPAs in the bylaw's definition of protected trees. The inclusion of trees within development permit areas in the tree bylaw strengthens their protection because of the enforcement mechanisms included in the tree bylaw. The tree bylaw can also ensure that, when the development permit is waived or not required, a suitable tree permitting and replacement process applies. If both an environmental development permit area and tree bylaw exist, consideration should be given to exempting applicants from a tree removal permit in cases where a development permit has been granted and ensuring that both policies are designed to have essentially the same requirements for tree protection, removal and replacement in DPAs.

In practice

The City of Surrey implements a sensitive ecosystems DPA that encompasses both a streamside protection DPA and green infrastructure network. It allows the City to protect habitat patches, to avoid the fragmentation of ecosystems, and to require habitat restoration with development.

6.1.2 Development Permit Area Guidelines

PURPOSE | Development guidelines inform landowners about what the requirements are for protecting DPAs when they develop adjacent lands.

OPTIONS

Many guidelines exist that can help preserve trees and grow tree canopy. The options highlighted in this Toolkit include tree protection within DPAs, the preservation and enhancement of forested ecosystems, restoration, and information requirements.

Tree protection within DPAs

Trees within EDPAs are usually protected unless deemed hazardous. Tree protection measures include:

- **Relocating** proposed buildings, structures, servicing or roads to prevent root impacts
- **Fencing** can be required during construction, or as a permanent fixture
- **Pruning** to carefully select branches for removal to reduce the wind load in trees (Stubbs et al., 2019)

Preservation or enhancement of forested ecosystems

Forested ecosystems can be preserved or enhanced with measures such as:

- **Tree species requirements** to maintain the composition and density of native species with replanting
- **Retention of wildlife** trees to provide habitat within forested stands
- **Preservation or enhancement of specific areas** to prevent fragmentation or maintain connectivity
- **Buffer zone planting** in the zone adjacent to the DPA. Natural landscaping may be required to provide a soft transition from the environmentally sensitive area to the development area

Restoration

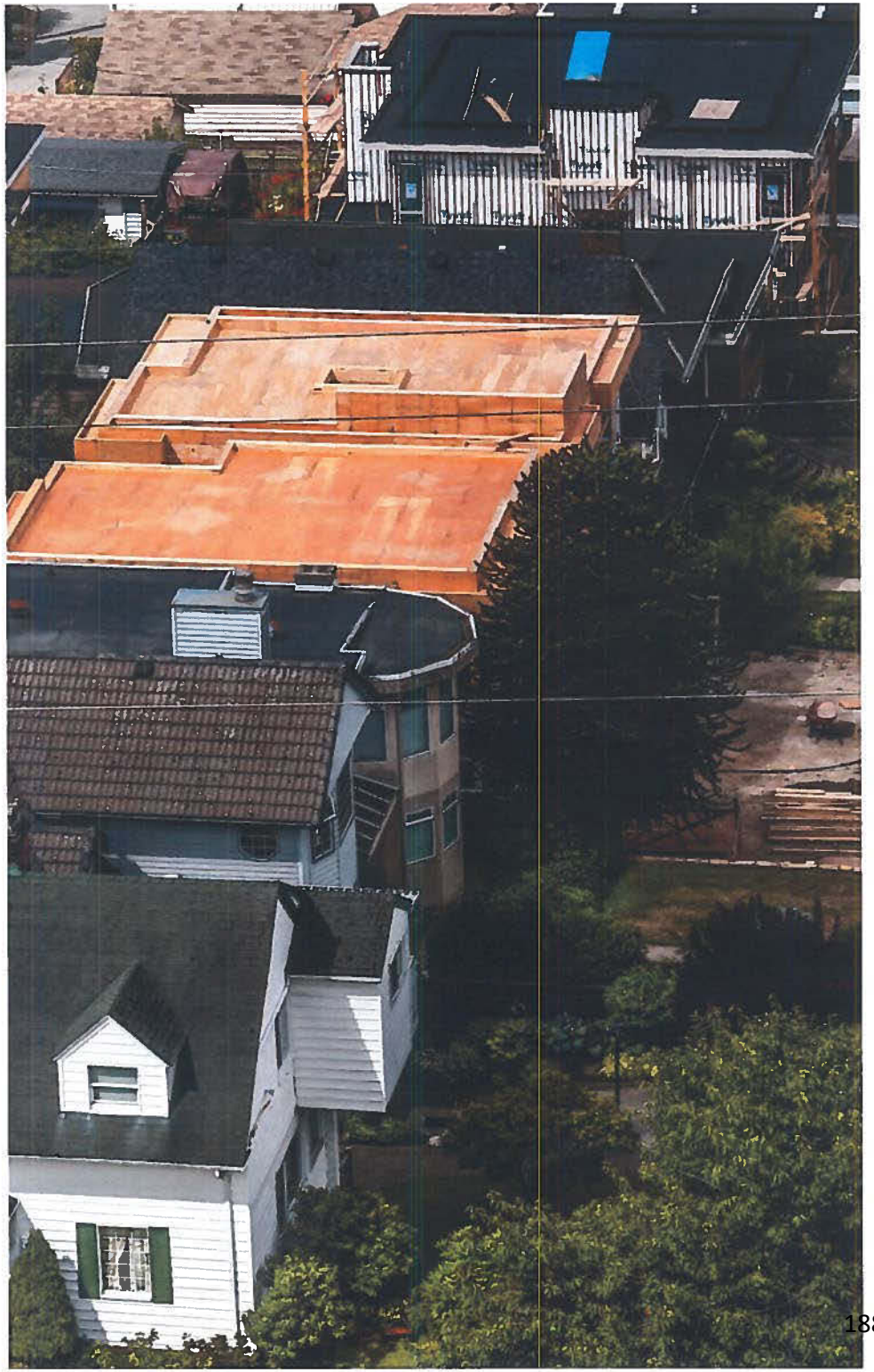
Where existing ecosystems are degraded or damaged, environmental DPAs can require measures to return the environmentally sensitive area to its natural state:

- **Planting of native trees and plants** to restore the native plant community
- **Removal of invasive species** to prevent competition with native species and spread into adjacent natural areas

Information requirements

Environmental DPA guidelines can require applicants to provide reports from qualified professionals such as:

- **Site conditions and monitoring** from a qualified environmental professional (i.e., a person in good standing with a legislated self-regulating association in British Columbia who is acting within their area of expertise, such as a professional Biologist, Agrologist, Arborist, Forester, Geoscientist, Engineer, Architect, or Landscape Architect)
- **Riparian assessment to identify the Streamside Protection and Enhancement Area** per Provincial methods defined in the Riparian Areas Regulation
- **Stand prescriptions to reduce the likelihood of windthrow** along new exposed forest edges
- **The identification of hazardous trees** by an ISA Certified Arborist who holds the Tree Risk Assessment Qualification (TRAQ)



6.1.3 Other Types of Development Permit Areas

6.1.3.1 Hazardous Condition DPAs

Tree retention is often regulated within hazard DPAs such as steep slopes DPAs to be helpful for tree retention. However, wildfire DPAs may conflict with tree preservation or replacement goals where trees pose a wildfire risk to structures. Where wildfire DPAs apply, it is important to ensure that the wildfire DPA and the tree bylaw are aligned to enable consistency with wildland urban interface management objectives. Alignment could involve permitting removals for wildfire risk reduction in the bylaw and ensuring that replacement trees and landscapes conform with FireSmart guidelines.

6.1.3.2 Energy Conservation, Water Conservation & Greenhouse Gas Emissions Reduction DPAs

Under energy conservation, water conservation and greenhouse gas emissions reduction DPAs, there are guidelines that can contribute to preserving trees and growing tree canopy while increasing carbon storage and meeting goals for climate action. These components include landscaping strategies such as planting trees for passive solar gain and cooling to reduce energy consumption (British Columbia Ministry of Community, Sport and Cultural Development, 2011). Trees should be located to serve as a windbreak and shade trees should be planted to cool impervious surfaces where possible. Tree species that require less watering should be selected to minimize irrigation needs.

6.2 COVENANTS

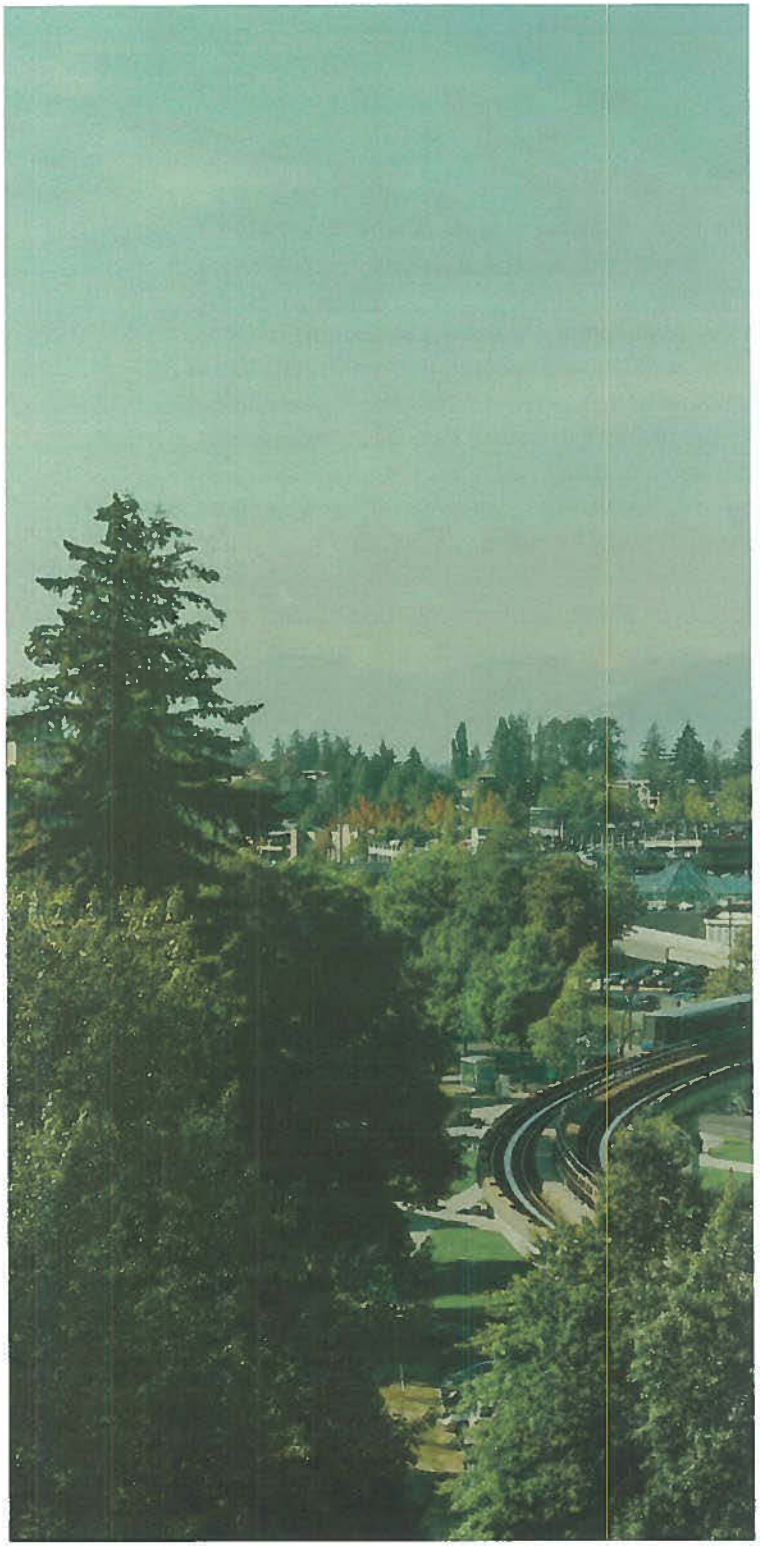
Covenants are a tool local governments use to regulate trees on individual land parcels, usually with rezoning, subdivision, or development permits. The Province of British Columbia's Land Title Act, section 219 allows covenants (sometimes also called conservation covenants) to be registered on title. This toolkit section offers a brief description of the use of covenants to preserve trees and grow tree canopy but is not a comprehensive discussion of the legal and technical requirements of covenants in British Columbia.

Covenants registered under section 219 of the Land Title Act are a voluntary agreement between a property owner and a designated organization (government body or land trust organization) registered on the property title. Section 219 covenants can be both positive (require actions) and negative (prohibit actions) in nature (WCEL, 2005; LTA of BC, 2014). They can be used to protect, conserve, maintain, enhance, restore or keep amenities such as natural, environmental, wildlife or plant value in its natural or existing state (LTA, s.219). Conservation covenants can 'run with the land', binding all future owners of the property for the full term of the agreement, which can be perpetual.

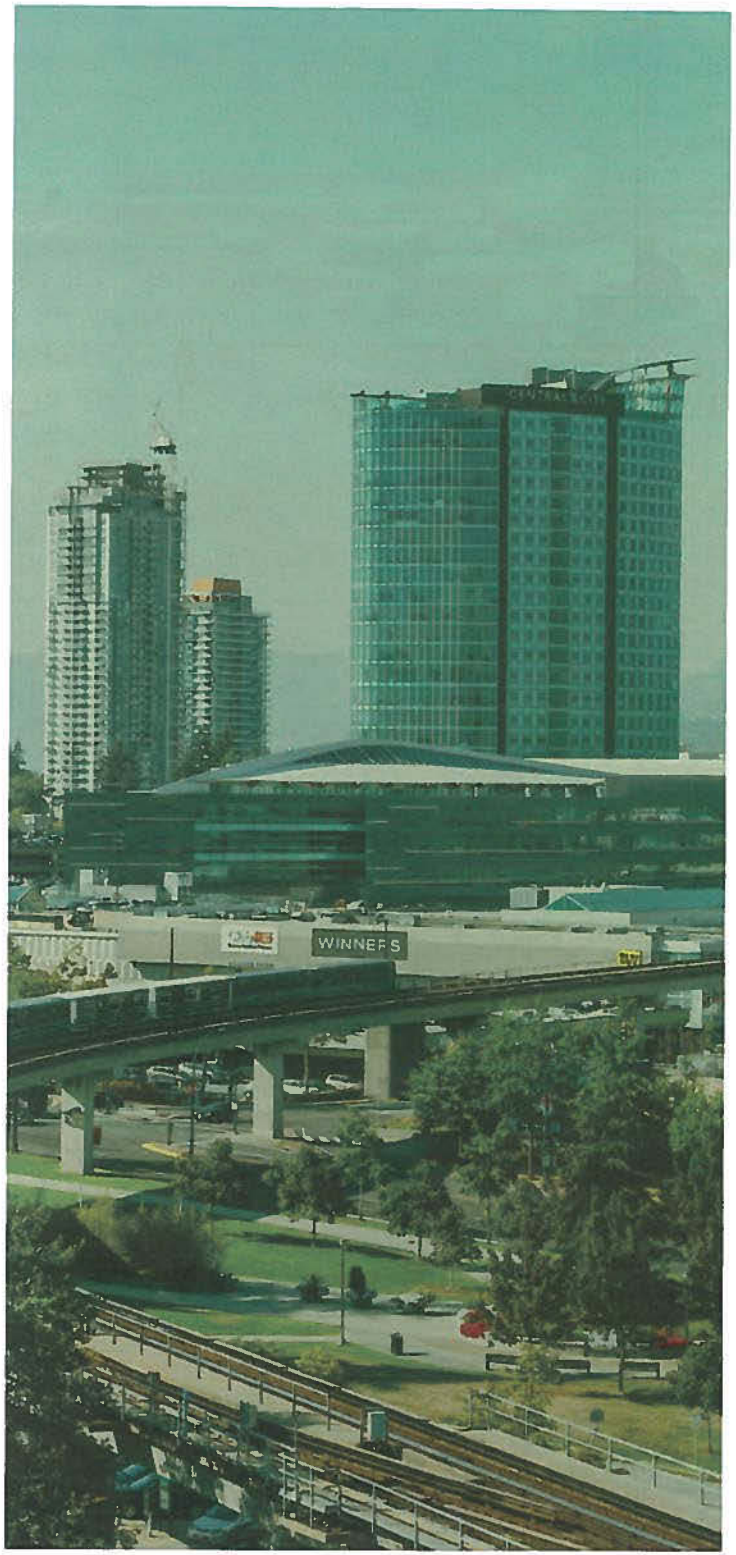
Section 219 covenants can protect trees or sensitive ecosystems on developing properties, impose maintenance or restoration requirements and restrict actions that could damage the protected features. For example, covenants can require documentation such as tree protection and replanting plans or risk assessments prior to undertaking the subdivision of land. Covenants usually include a baseline report documenting the state of the land at the time of registering the covenant (NATEP, 2018). The report can describe special features and serves as a benchmark for future monitoring. Covenants can help to provide clarity around what is protected on a site; both to the municipality as the site moves through the development process, and to future owners so that they know what is protected on their property. Covenants can be amended or discharged and do not have to be perpetual agreements.

Working landscape covenants can also be developed to allow sustainable activities such as organic farming or sustainable forestry on land under a conservation covenant (WCEL, 2005). This type of conservation covenant is more complex than ones that protect land in its natural state. Working landscape covenants should clarify the priority for the management of the covenant area and require a management approach to be established in accordance with those priorities and the objectives of the covenant.

Statutory rights of way created under Section 218 of the *Land Title Act* are sometimes used to secure access to a property, such as for a public trail, in addition to a Section 219 covenant that specifies the positive (e.g., maintenance requirement) and negative (e.g., restricting tree removals) obligations of the owner granting the covenant.



6.3 Section Table of Contents Tree Bylaws



6.3 TREE BYLAWS

The *Community Charter* enables Council to "regulate, prohibit or impose requirements in relation to [..] trees" (sections 8(3)(c), 50 and 52). Regional and local planning processes increasingly identify tree protection and replacement as important community values. While environmental DPAs often provide adequate protection for tree stands and ecosystems, tree bylaws serve to regulate the protection or replacement of individual trees or groups of trees found across the municipal landscape.

While there are established best practices for some bylaw components, others are less well-defined. The alternatives and options available should be selected after consideration of a municipality's urban forest governance context.

The following sections are organized in typical bylaw sections or themes. Each section describes the key components that should be considered when developing tree bylaws and highlights when a best practice recommendation or an alternative option would be relevant. Examples of communities that have used any of the approaches presented are not exhaustive but provide readers with further opportunities to explore and adapt the options that are most appropriate for their local context.

6.3.1 Bylaw Definitions

Bylaw definitions set a common understanding for terminology used throughout the bylaw. Many bylaw definitions refer to established technical standards and clarify how to interpret other sections of the bylaw.

6.3.1.1. Protected Tree

PURPOSE | To define what trees the bylaw applies to. Public or private trees (or both), tree size and species are common criteria discussed. The definition itself does not drive the protection or replacement outcomes; tree protection rather depends on the acceptable reasons for removal and the replacement requirements.

MUST HAVE: PROTECTED TREE SIZE

Tree bylaws need to identify the size of trees that the bylaw will apply to:

* Option 1: Small trees
* Option 2: Medium trees
* Option 3: Large trees

OPTION 1: SMALL TREES (for example ≥6 cm DBH)

Communities may decide to regulate trees at a small size when the bylaw is less restrictive of tree removals and is using the permit system to track tree removals or is restrictive only under certain circumstances (e.g., limits removals in one year or when related to a subdivision). This could be used in conjunction with other categories of protected trees that have greater restrictions on their removal.

Context

This approach may be most relevant for municipalities interested in tracking tree removals and not placing too many restrictions on the removal of protected trees.
Found in Nanaimo, Anmore, Québec City (QC)

Pros

- Regulates most of the trees and canopy in a municipality
- Provides a good indication of the rate of tree removals
- Can identify and encourage retention of young trees that are more adaptable to development disturbances, with development

Cons

- Creates very high permit volume unless there are exemptions allowing removals in some circumstances (e.g., a certain number of trees being cut without a permit each year)
- May not be supported by the community without allowances to remove some trees
- Creates higher costs for development related applications to survey many trees and prepare management plans
- It is not usually practical to restrict removals or require replacements for small trees so often the bylaw functions more as a permit to track removals

This option may be best implemented with additional protected tree definition options, to restrict the removal of specific trees of importance.

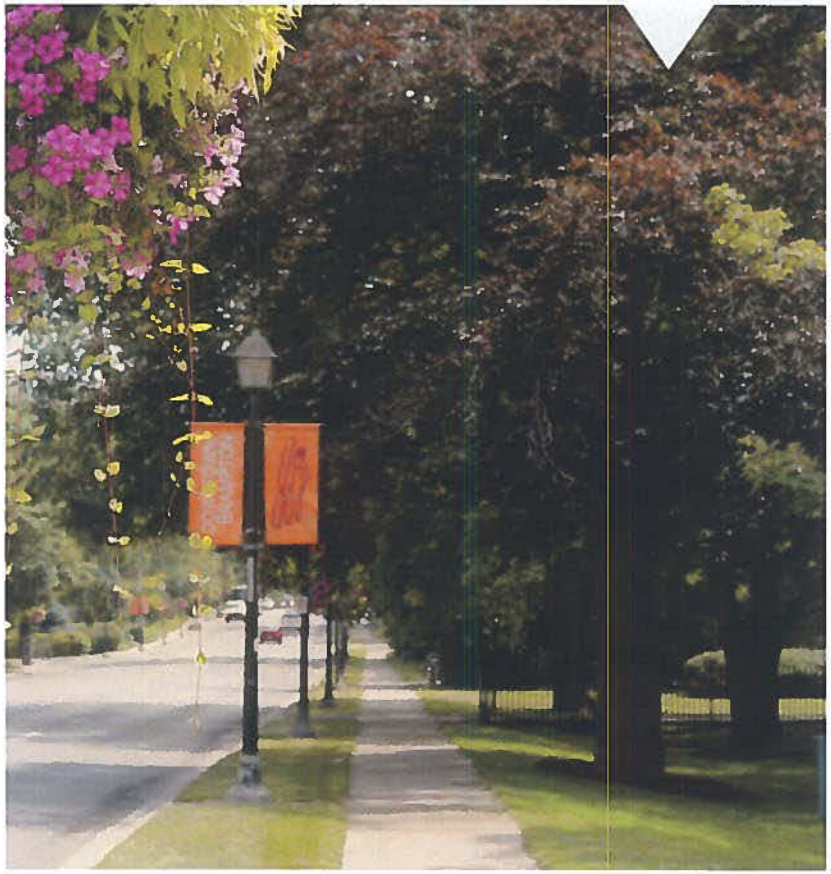
In practice

The Village of Anmore requires a tree cutting permit for all trees 10 cm or larger in DBH if the number removed is greater than annual allowable cut and not in direct hazard or conflict with infrastructure.

Hedges, alder and cottonwood are exempt from the definition.

In practice

Brampton does not require permits for trees with a DBH less than 30 cm.



OPTION 2: MEDIUM TREES (for example ≥20 cm DBH)

The tree bylaw applies to medium-sized trees, which enables municipalities to regulate reasons for removal and replacement requirements for those trees.

Context

Medium-size protected trees are the most common in Lower Mainland tree bylaws. This size class may be most appropriate for communities that are fairly urban and where most properties have few trees. Alternatively, it may be appropriate in communities that have many trees and where the bylaw is not restricting tree removal but is using the permit system to track removals.

Most commonly 20 cm DBH *found in Burnaby, Delta, Richmond, Port Coquitlam, Vancouver, New Westminster, Maple Ridge, Abbotsford, Courtenay, Squamish*
30 cm DBH *found in Surrey, White Rock, Victoria, Brampton (ON)*

Pros

- Typically regulates more than half of the trees and canopy in a municipality
- Seems to be a practical size for the number of trees brought into regulation based on the large number of municipalities using either 20 cm or 30 cm DBH
- Results in more tree replacement in the landscape than a larger protected tree size, if tied to a replacement requirement

Cons

- Creates relatively high permit volume unless there are exemptions allowing removals in some circumstances (e.g., a certain number of trees being cut without a permit each year)
- Increases regulation on private property. Tree replacement requirements also tend to be higher, which is a cost to applicants and may not receive broad community support.

For communities using this protected tree size to monitor removals, this would be best implemented with other categories of protected tree that have greater restrictions on their removal. Municipalities choosing this protected tree size should also consider defining hedges and whether they are protected under the bylaw.

OPTION 3: LARGE TREES (for example ≥50 cm DBH)

The tree bylaw applies to large-sized trees, which enables municipalities to regulate reasons for removal and replacement requirements only for mature specimens of larger species.

Context

This approach may be most appropriate for communities with limited resources and low development pressure that want to prioritize protecting the largest, oldest trees.
Found in the District of North Vancouver, West Vancouver

Pros

- Typically regulates the large canopy trees in a municipality
- Associated with a low volume of permits, generally easy for the community to support because few trees are regulated

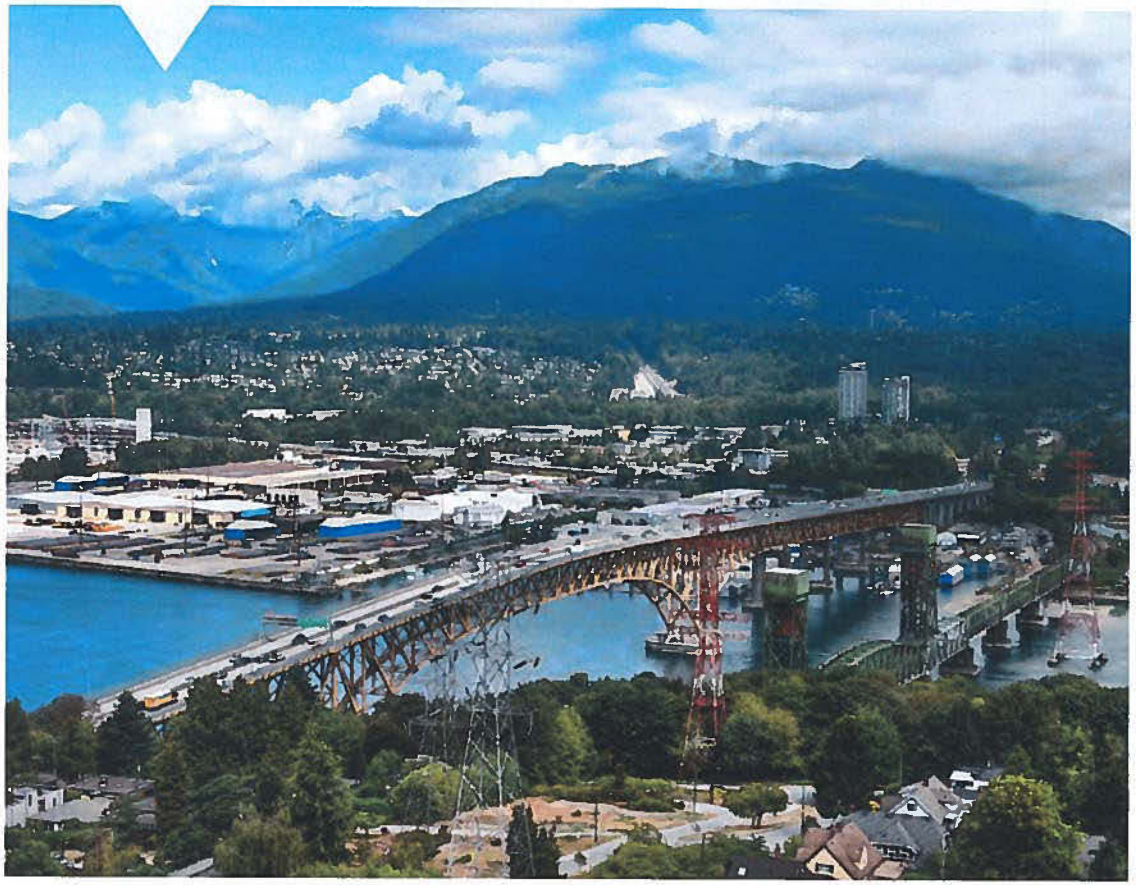
Cons

- Most of the urban forest is unregulated and can be cut without a permit
- Only regulates large trees that are relatively rare on properties, so may be perceived as a disincentive for having a larger tree on a property

In addition to defining the protected tree size, municipalities that require replacement trees as a bylaw requirement should protect replacement trees regardless of their size.

In practice

The District of North Vancouver defines large-diameter trees as 75 cm or greater.



In practice

Courtenay protects 6 species 0.5 m and taller in size.

ADDITIONAL OPTIONS | In addition to defining protected trees with a diameter size, several municipalities adopt tree protection or replacement requirements for other types of individual trees or tree stands of interest. These options become particularly relevant when a tree bylaw is permissive of removals because they offer a more targeted way to protect trees of special interest. Common categories of trees included in protected tree definitions are municipal trees, species of interest, trees on sensitive land, heritage or significant trees and hedges.

Municipal trees: Municipal trees must be protected and many communities choose to protect trees on public land through their tree bylaw, although they can also be protected under different bylaws. Regulating the protection of municipal trees in a tree bylaw can offer consistency and ease of access for information about tree protection on public and private land. However, some communities protect them in other bylaws such as a street and traffic bylaw or a parks and boulevard bylaw supported by a municipal tree policy.

Places where this approach is found: *Surrey, White Rock, Saanich, Victoria, Courtenay and many others*

Species of interest: Communities that want to maintain habitat value with tree species important to the local ecology may decide to include smaller trees of specific species to their protected tree definition. In these cases, the potential impacts of climate change on these species should be considered so that regulations enable replacement with species suitable to the future climate when necessary.

Trees on sensitive land: Communities may choose to protect trees located on sensitive lands defined by a mapped boundary or descriptive criteria, such as lands that:

- Are susceptible to flooding or erosion, or have unstable slopes or poor drainage
- Have special significance for animal, bird or plant life, including wetlands, forests and nesting areas
- Have cultural or historical significance
- Foster connectivity and biodiversity for flora and fauna
- Are adjacent to waterways

Places where this approach is found: *Saanich, Courtenay, Squamish, Mississauga (ON)*

Heritage or Significant trees: A municipality might choose to protect a specific list of trees when:

- Heritage trees have been identified in the community and owners have allowed trees to be placed on a register
- Specific qualities have been defined for trees (e.g., size, health, age, heritage, endangered, uniqueness) that will require a higher standard to be met to remove the tree – a set of criteria, nomination process and community board would typically be required to assess whether trees are significant

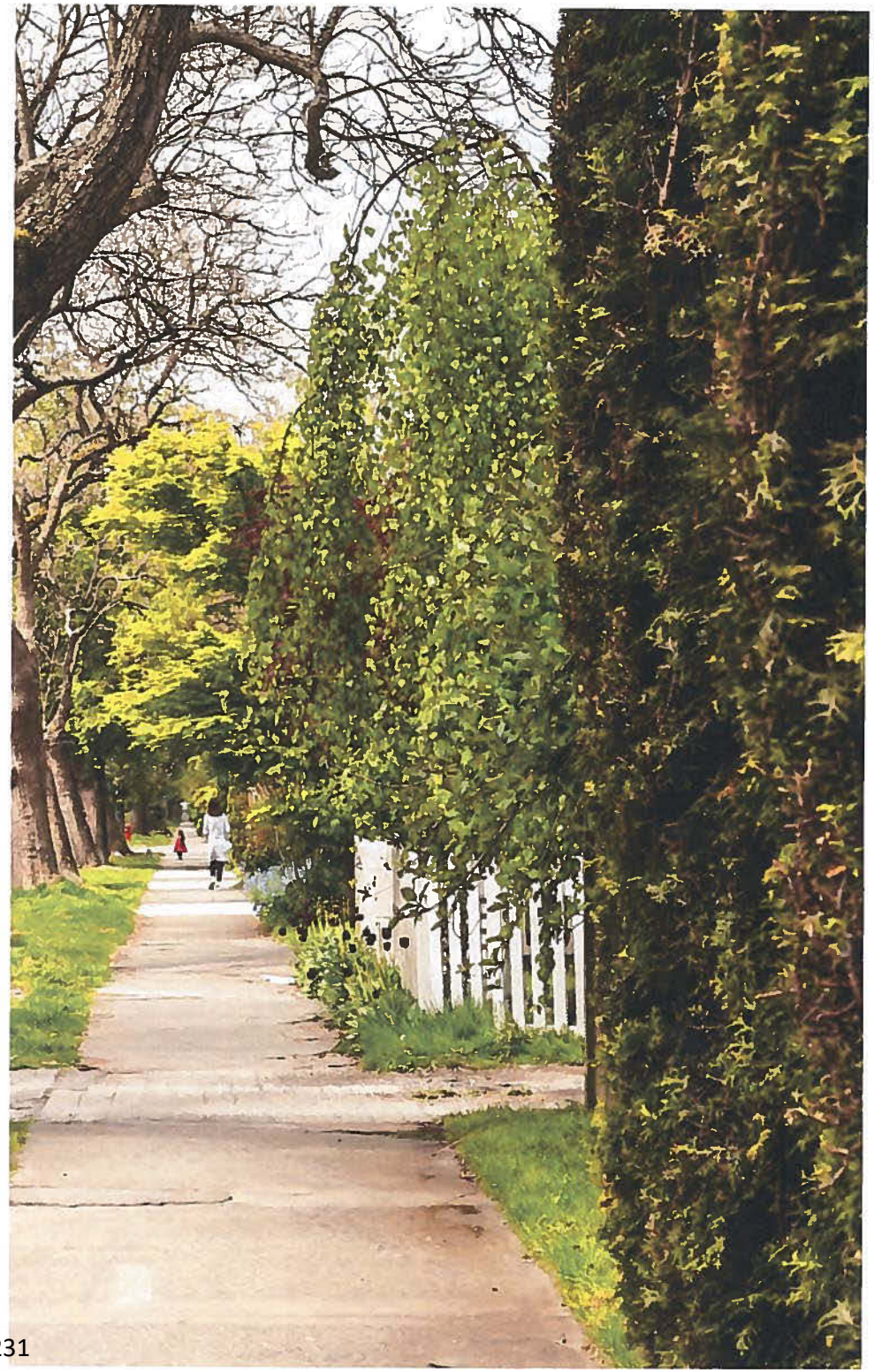
***Places where this approach is found**: Maple Ridge, New Westminster, Surrey, Mississauga (ON)*

Hedges: Hedges can be challenging to regulate when they contain trees that meet the protected tree size definition because:

- All trees in a hedge grow up together and it may be appropriate to retain them or remove them as a group even if only one or some of the trees meet acceptable reasons for removal
- Hedges can contain many protected trees that, if approved for removal under a bylaw with a high replacement ratio, would have unreasonably high tree replacement requirements
- Hedges are often sheared and pruned in a way that would be considered damaging to a regular tree and so it can be necessary to distinguish regular maintenance of hedges from tree damaging activities that would be a violation of a bylaw

Once a hedge is defined, it can either be protected or exempted under the bylaw as a hedge, rather than as individual protected trees.

***Places where this approach is found:** New Westminster*



6.3.1.2. Diameter at Breast Height

PURPOSE | A diameter at breast height (DBH) definition is typically used to indicate how to measure a tree and determine if it is a protected tree, to calculate the tree protection zone (see below) and sometimes to calculate replacement requirements.

MUST HAVE: Diameter at Breast Height Measurement

A measurable definition is a must have to consistently determine the DBH of a tree.

BEST PRACTICES FOR MEASURING DBH

The International Society of Arboriculture defines best practices for measuring DBH (Bond, 2013):

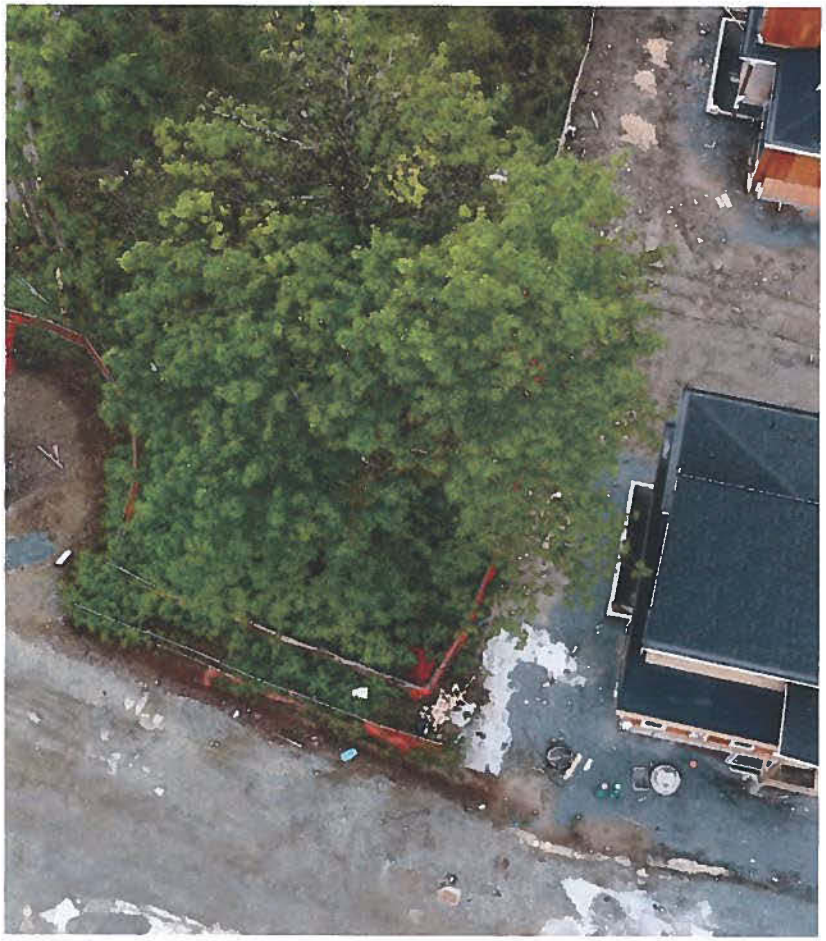
- For a 'typical' single trunk, DBH is found by measuring the diameter at 1.4 m above the ground[2]
- For a tree that branches out at or below 1.4 m, so that the diameter is smaller below 1.4 m, then the diameter is measured at the smallest point below the branching point
- For a multi-stemmed tree that branches between 1 and 1.5 metres, measure either:
  - The smallest point below the fork (Magarik, Roman, & Henning, 2020) or
  - Measure each stem 30 cm above the branching point and sum the result

Recent research recommends measuring multi-stemmed urban trees by taking the diameter measurement at 30 cm, or below the fork (Magarik, Roman, & Henning, 2020). The research found no significant differences between these and other multi-stemmed measurement methods, and that this approach was an improvement over other methods because of the ease of measurement, simplicity and repeatability.

[2] It is standard practice in forestry to measure DBH at 1.3 m (Husch, Beers, & Kershaw, 2003; Avery & Burkhart, 2002) and some bylaws use this height as the standard for measuring DBH.

6.3.1.3 Tree Protection Zone

PURPOSE | To define the area around a tree that must be protected to prevent damage to roots so that the tree can be successfully retained during construction, or to determine when a tree cannot be retained successfully.



MUST HAVE | Tree Protection Zone

A measurable definition is a must have to consistently determine the tree protection zone.

The International Society of Arboriculture's (ISA) best management practices for Managing Trees During Construction (Fite & Smiley, 2016) defines the tree protection zone as an arborist-defined area surrounding the trunk. It is intended to protect roots and soil within the critical root zone and beyond, to maximize future tree health and stability.

Typically, the tree protection zone is calculated using either a trunk diameter method or a dripline method. The ISA's best management practices and the American National Standards Institute A300 (Part 5) Standards refer to tree protection zone multiplication factors of between 6 x and 18 x DBH dependent on relative tree age and tolerance (based on Matheny and Clark, 1998, and the British Standards Institute) (Fite & Smiley, 2016). The American National Standards Institute A300 (Part 5) Standards state that the tree protection zone should not be less than 6 x DBH without mitigation measures. Australian and British Standards use a multiplier of 12 x DBH as standard. Best management practices for the Pacific Northwest recommend using both 12 x DBH and dripline plus 1 m and selecting whichever is larger to define the tree protection zone (Oregon State University, 2009).

Based on the available best management practices guidance, it is recommended that municipalities consider defining the tree protection zone as:

- The area, on an approved plan prepared by an arborist, that shows the land surrounding the trunk of a protected tree expected to contain the bulk of the critical root zone of the tree, or
- In the absence of an approved plan, the area of land surrounding the trunk of a protected tree contained within a circle having a radius calculated by multiplying the diameter at breast height of the tree by 12 or dripline plus 1 m, whichever is larger

TREE PROTECTION ZONE VS. CRITICAL ROOT ZONE

The International Society of Arboriculture (ISA) defines the tree protection zone as an arborist-defined area intended to protect roots and soil within the critical root zone and beyond, whereas the critical root zone is the area immediately adjacent to the trunk where roots essential for tree health and stability are located.

The tree protection zone is used to inform the area around the tree that should be fenced during construction and should always be larger than the critical root zone; however, final fencing location is informed by professional judgment, species tolerances and site constraints that reflect where most of the roots are believed to be located on a site. For example, fencing would not block a sidewalk, or if a building existed within the tree protection zone, then the roots are less likely to be growing under the foundation and the fencing would be adjusted accordingly. If the tree protection zone is reduced on one or more sides, then increasing the tree protection zone on the opposite side may be appropriate (Fite & Smiley, 2016).

The ISA's best management practices for Managing Trees During Construction (Fite & Smiley, 2016) note that the critical root zone is subjective, they also note that regulations may choose to define it (e.g., the City of New Westminster defines the critical root zone as 6 x DBH). In the event that the tree protection zone needs to be temporarily reduced for a construction activity, the ISA best management practices note that the tree protection zone should not be reduced to an area smaller than the critical root zone.

While cutting roots within the critical root zone should always be avoided, there are instances when cuts may be required (e.g., sidewalk or utility repair). The ISA BMPs note that stability is compromised for some species when roots are cut at a distance of 3 x DBH (Fite & Smiley, 2016). However, an arborist must judge the proximity of cuts that can be tolerated and still allow the tree to remain stable.

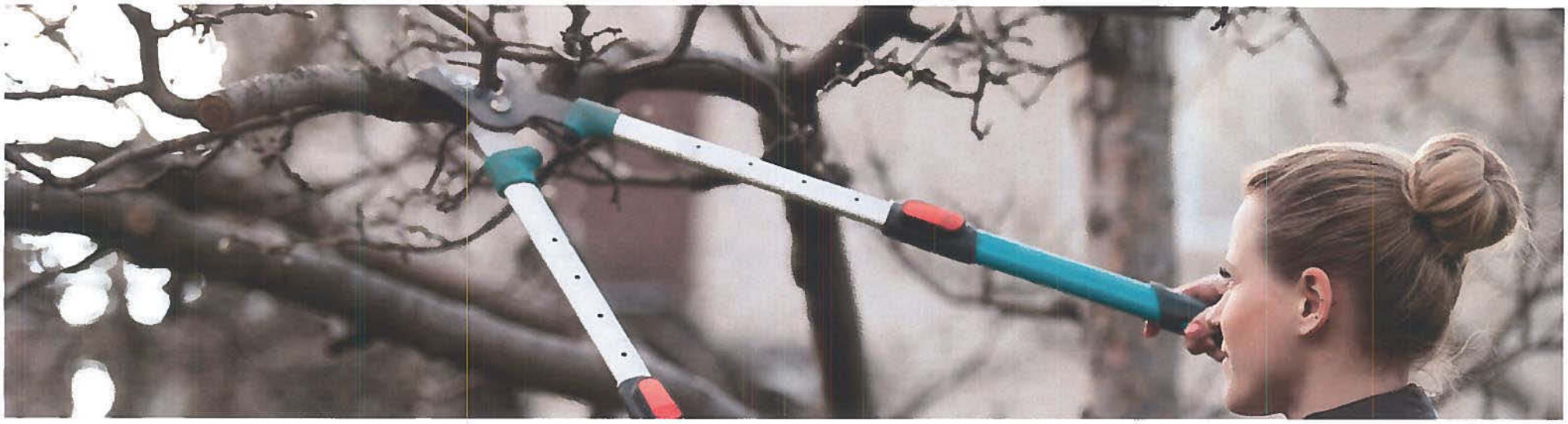
6.3.1.4 Applicant or Application Type

PURPOSE | A definition of different types of applicants or applications is used when the requirements of the bylaw need to be differentiated.

RECOMMENDATION | Application types can be differentiated if a community wants to vary requirements such as the information required to assess the permit application (e.g., arborist report, tree survey, replacement plan, etc.), permit fees, replacement requirements, securities or cash-in-lieu according to the scale and complexity of the permit type.

DEVELOPMENT REQUIREMENTS IN LAND USE REGULATIONS AND DPAS

Requirements specific to development can instead be addressed separately in land use regulations or development permit area guidelines, in which case a tree bylaw would typically exempt tree cutting and removal approved under subdivision or development permits. It should be noted that regulating trees under multiple bylaws creates parallel processes that are usually administered by different departments; this approach requires careful coordination to ensure that the outcomes of each regulation are consistent with municipal objectives for the preservation of trees and growth of tree canopy.



6.3.1.5 Pruning

PURPOSE | To define acceptable pruning that can be carried out on a protected tree with or without a permit.

MUST HAVE: Acceptable Pruning

Describing acceptable pruning clarifies both enforcement and the public's understanding of what type of pruning is acceptable. The pruning definition should be in accordance with the most current version of the American National Standards Institute Publication "American National Standard for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices" and the companion "Best Management Practices" Series of the International Society of Arboriculture. Explicitly defining tree damaging activities, such as topping and excessive crown reduction, helps to clarify what is not acceptable pruning.

Bylaws do not always require a permit for acceptable pruning; however, if pruning is being regulated, then the pruning definition should define the size of limb requiring a tree permit, and only require that permit for protected trees.

PRUNING BEST MANAGEMENT PRACTICES

The ISA's Best Management Practices for Pruning (Lilley, Gillman, & Smiley, 2002) note that pruning dose is guided by the objectives of the pruning, and the tolerance of tree to loss of foliage. Objectives listed in the Best Management Practices include:

- Improving structure
- Risk mitigation
- Clearance
- Maintaining health
- Restoration
- Size management
- Improving a view
- Improving aesthetics
- Managing wildlife habitat
- Reduce density

Pruning systems described in the best management practices include natural, pollard, topiary, hedge, espalier, pleach and fruit (Lilley, Gillman, & Smiley, 2002).

6.3.1.6 Other Best Practices Definitions

Other definitions that may be useful to include are:

- **Arborist:** means a person holding a current certification of ISA Certified Arborist issued by the International Society of Arboriculture
- **Tree risk assessor:** means a person who holds the International Society of Arboriculture's Tree Risk Assessment Qualification (TRAQ)
- **Arboricultural best practices:** means practices in accordance with the most current version of the American National Standards Institute Publication, "American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices" and the companion "Best Management Practices" Series of the International Society of Arboriculture
- **High or extreme risk tree:** means a tree that has, in the opinion of a Tree Risk Assessor, a high or extreme TRAQ risk rating
- **Qualified Environmental Professional:** means a person in good standing with a legislated self-regulating association in British Columbia who is acting within the individual's area of expertise and includes a professional Biologist, Agrologist, Arborist, Forester, Geoscientist, Engineer or Technologist

6.3.2 Exemptions

PURPOSE | Exemptions are used to enable certain groups or activities to proceed without a tree permit. Exemptions are needed when it would be impractical for a group to apply for tree permits given the frequency or volume of their work, or when other statutes give them the power to cut or remove trees. Exemption may include tree cutting or removal:

- For farming use
- Pursuant to the Hydro and Power Authority Act
- For Survey lines work pursuant to the Land Surveyors Act
- By the Government of Canada, the Province of British Columbia or Regional Government on their own properties
- By a public utility for the purpose of safety, maintenance or operation of the utility's service or infrastructure on their own properties
- By the municipality for works undertaken by the municipality on its own property

Some municipalities exempt their operations from the tree bylaw to enable a more efficient and adapted process to take place internally. Municipalities that exempt their operations from the bylaw should develop an internal policy that details the process to be followed by staff. This process should meet or exceed bylaw requirements. Research has shown that for local governments to be successful in preserving trees and growing canopy cover, they need to address those issues with good interdepartmental coordination (Ordonez & Livesley, 2020).

6.3.3 Prohibitions

PURPOSE | Prohibitions describe what is prohibited except when permitted in the bylaw and in accordance with the terms of a tree permit. Prohibitions typically include cutting, removal and damage, and often address requirements for compliance and accurate information.

RECOMMENDED: **Damaging activities**

Describing tree damaging activities provides clarity both for enforcement and for the public to understand what activities constitute damage. Just as with cutting or removal, there may be circumstances when tree damage is permitted in accordance with the bylaw and a tree permit. For example, cutting tree roots and altering the grade within a tree protection zone does damage the tree but may be required to accommodate a pathway. If the tree can tolerate the damage and still be safe to retain, then that damage could be allowed with a tree permit.

The definition of damage should be broad (e.g., any action that is likely to cause negative impacts to the health or structural integrity of a tree), but prohibitions, while not limiting that definition, can elaborate to include actions that could cause a tree to die or become hazardous such as:

- Pruning in a manner not in accordance with arboricultural best practice, including:
  - removal of more than 25% of the tree's total live foliage or bud bearing branches or limbs in any 12 month period
  - lift pruning where the lower branches of the live crown (green branches) of the tree are removed to reduce the live crown to less than 50 percent of the total tree height
  - topping, unless the tree in question has been previously topped and regenerative growth has a high likelihood of failure due to weak branch attachment, excessive branch elongation and end weight, or the formation of extensive decay or cavities that cannot be mitigated other than by re-topping the tree
- Poisoning or burning a tree
- Raising or lowering the grade within the tree protection zone
- Shearing, harming or undermining the roots of the tree growing within the tree protection zone
- Placing fill, building materials, asphalt, a building or structure or storing or stockpiling of material within a tree protection zone
- Operating, staging or parking trucks, backhoes, excavators, mini-excavators, hydro-excavators, mechanical trenchers or other heavy equipment within a tree protection zone
- Denting, gouging, drilling, harming or affixing anything to the branches or the trunk of a tree
- Removing bark from a tree
- Depositing concrete, washout or other liquid or chemical substances harmful to the health of a tree in a tree protection zone
- Removing soil from a tree protection zone
- Conducting blasting operations within a tree protection zone
- Conducting blasting or excavating operations outside of a protected root zone that would harm roots or disturb soil inside a tree protection zone

Describing tree damaging activities can improve enforcement by defining specific actions that would be considered a bylaw violation unless permitted in the terms of an approved tree permit.

6.3.4 Permitted Removal Reasons

PURPOSE | To define why a permit will or will not be issued to remove a tree. Describing the acceptable reasons for removal enables transparent and consistent decision-making by staff issuing tree permits. These reasons listed determine the strength of the bylaw in terms of protecting trees from removal.

6.3.4.1. Risk, dead and dying trees

PURPOSE | To define why a permit will or will not be issued to remove a tree. Describing the acceptable reasons for removal enables transparent and consistent decision-making by staff issuing tree permits. These reasons listed determine the strength of the bylaw in terms of protecting trees from removal.

MUST HAVE: Dead, dying or high or extreme risk trees

The following reasons for removal must be enabled:

- Tree is high or extreme risk or has an imminent likelihood of failure and the risk or failure cannot be mitigated other than by cutting or removing the tree
- Tree is dead, or more than 50% of its crown is dead (or an alternative threshold that indicates when a tree would be accepted to be dying)

6.3.4.2. Conflict with Buildings or Structures

PURPOSE | To avoid conflicts that would sterilize development rights.

MUST HAVE:Conflict with principal or accessory buildings, off-street parking and utilities

A tree bylaw cannot sterilize development rights by preventing development to permitted use or density according to zoning. However, the extent to which applicants must modify designs or construction to retain trees can be controlled by reasons to permit removal. There are two ways in which communities choose to allow removals to enable permitted use.

- Option 1: **Tree can be removed to accommodate design**
- Option 2: **Design must be changed to accommodate trees if possible**

Option 1: Tree can be removed to accommodate design

Tree removal is permitted whenever protected trees are in conflict with buildings, parking or utilities proposed.

Context

This approach may be most suitable for municipalities with undeveloped/rural land within the Urban Containment Boundary where heavily treed lots are being subdivided in the wildland urban interface.

Pros

- Enables communities to focus on planting replacement trees in appropriate locations following development
- Reduces the potential impacts on development
- Is less resource intensive to implement than the alternative

Cons

- Will not often require trees to be retained during development

Option 2: Design must be changed to accommodate trees if possible

Tree removal is permitted only if it is not possible to retain the tree. Applicants may be required to make changes to their design to accommodate the retention of protected trees while still building to the current zoning.

Context

This approach may be most suitable for already developed and densifying municipalities and where the community places a high value on the preservation of protected trees. Communities using this approach should provide staff with additional guidance on what trees this would apply to and how to determine when it is not possible to retain the tree. This guidance may include criteria related to tree health and condition or safe useful life expectancy in the new site conditions.

Pros

- More often requires the retention of existing trees

Cons

- Results in greater impacts to development projects to accommodate tree retention
- Is more resource intensive for the municipality (longer applications review and interactions with applicants expected)

Note

Bylaws may distinguish between principal buildings and accessory buildings, off-street parking and utilities to require design changes only for some of those items.

TREE REMOVALS ON AGRICULTURAL LANDS

Municipalities in British Columbia cannot regulate tree removals that take place for farming use. However, some municipalities require affidavits from landowners to attest that the removals are for the purpose of farming. A tree bylaw can still apply to agricultural land when trees are being removed for non-farming uses, such as development.

Given the limitations for municipalities to regulate trees on agricultural land, communities with large proportions of agricultural land may instead consider implementing or promoting incentive and stewardship programs.

ADDITIONAL OPTIONS | Other common reasons to permit tree removals include wildfire risk, invasive species, yearly removal allowances, proximity to building foundations, infrastructure damage, construction access and trees on structures that require upgrades or replacement.

- **Wildfire:** Communities within the wildland-urban interface that manage wildfire risk through a Development Permit Area should ensure that the tree bylaw is consistent with FireSmart requirements, as detailed in their wildfire DPA. To ensure that wildfire risk management measures are appropriate, they should be guided by a Community Wildfire Protection Plan that defines high-risk areas, and a DPA that provides development guidelines for reducing risk in those areas. Measures to reduce risk may include conifer tree removal or pruning and FireSmart landscaping requirements.

- **Invasive species:** Communities may wish to enable the removal of invasive tree species that would otherwise be protected by their tree bylaw. Enabling the removal of invasive tree species may provide more consistency in municipalities that regulate or have policy related to invasive species. It should refer to specific lists or species from credible sources, such as the province of British Columbia or the Invasive Species Council.

- **Construction access:** Communities may consider allowing tree removals for trees located within the required construction access path, if the construction access cannot be modified to retain or avoid cutting the protected tree(s).

- **Proximity to building foundation:** Some communities choose to enable the removal of trees near building foundations. Enabling this can allow for poorly located trees to be removed and replaced by an appropriate species planted in a more suitable location. However, it could also lead to the removal of healthy trees that are not causing issues in some cases.

- **Infrastructure damage:** Some communities choose to enable the removal of trees that are causing or will imminently cause structure or infrastructure damage that cannot be mitigated other than by cutting or removing the protected tree. Implementing this option can allow for trees causing damage to be removed and replaced by an appropriate species planted in a more suitable location. However, staff will need additional guidance on determining when damage cannot be mitigated and the bylaw should enable the option to require a qualified environmental professional (e.g., professional engineer) or arborist provide an opinion on whether or not the damage can be mitigated other than by cutting or removing the tree.

- **Yearly removal allowance:** Communities sometimes elect to include an annual allowance of trees that can be removed for any reason. If considering such an allowance, it should be limited by factors such as tree density, tree size, zoning, lot size or a combination of them; those limits would prevent progressive clear cutting while providing flexibility to manage numerous trees on forested lots.

- **Trees on structures:** Communities that have trees planted on structures (i.e., above parkades or on roof-tops) may consider enabling the removal of trees for repairs to the structure.

6.3.5 Permit Application Information Requirements

PURPOSE | To enable staff to determine whether a permit application meets the bylaw requirements to issue a tree permit.

MUST HAVES | At a minimum, basic information should be required with every permit application.

BASIC PERMIT INFORMATION REQUIREMENTS

All permit applications must be accompanied by:

- The address and legal description of the lot/s
- Proof that the owner, or an authorized owner's agent, is submitting the application
- Written consent from the adjacent property owner that they support the application, where a tree shared between two properties is proposed for removal
- Reasons why the applicant is applying to cut or remove a protected tree
- A description and map/plan drawing of the protected trees included in the application

RECOMMENDED FOR DEVELOPMENT: Information requirements for all applications related to development*

Tree bylaws should provide clear information requirements, particularly for applications related to development. They should require sufficient and consistent information to enable staff to review permit applications efficiently.

Development-related applications are complex. Accurate information about trees is needed to understand which trees can be safely and effectively retained, and which trees need to be removed. Non-development-related permit applications can also sometimes require more information, for example, when a tree is proposed for removal because of risk and a tree risk assessor's opinion is needed. For these reasons, it is recommended that the bylaw enable staff to request when needed:

- A legal survey identifying the location of existing trees accurately.
- An arborist report and inventory detailing the location and condition of protected trees and trees proposed for removal.
- A risk assessment report from a tree risk assessor confirming that a tree is high risk if the application entails removal or cutting of a high risk tree.
- A tree management plan mapping the location of protected trees, their tree protection zones, recommended protection measures, location of tree protection fencing and trees proposed for removal.
- A replacement tree plan mapping the location and species of replacement trees to be planted. Build in the need to have these reflected in all landscape plans or at least cross referenced in the landscape plans.
- Additional information from qualified environmental professionals when sensitive lands are involved, for example, to assess impacts of removing trees in riparian areas or steep slope areas.
- A tree fencing confirmation letter from an arborist confirming that protective fencing has been installed per an approved tree management plan.
- A letter of assurance from an arborist, signed by the owner, to specify construction activities requiring arborist supervision to prevent and mitigate damage.

Terms of reference for these information requirements can be included in schedules or standard operating procedures.

***Tree bylaws should also enable staff to require or relax some of these additional requirements on an as needed basis.**

Municipalities can ask for a confirmation that a permit application is consistent with provincial and federal laws, for example require a Bird Nesting Survey for tree removals proposed during the nesting season.

6.3.6 Requirements and Incentives for Tree Retention and Replacement

Replacement requirements determine how protected trees are replaced when they are removed. There are numerous approaches to tree replacement. The appropriate choice should be tied to meeting the community's goals for tree preservation and growth.

6.3.6.1. Replacement Requirements – Achieving Successional Replacement

PURPOSE | To achieve successional replacement by defining the number of replacement trees required for every protected tree removed. Ratios are not generally effective for increasing the number of trees and growing tree canopy in low-canopy areas because they only require planting on properties that already have trees.

MUST HAVE: Replacement ratio

A replacement ratio can be consistently applied to require that each tree removed is replaced. This approach would require applicants to replace every protected tree removed with one or more replacement trees.

- Option 1: **1:1 or 2:1 replacement ratio**
- Option 2: **1:many replacement ratios based on diameter of tree removed**

Option 1: 1:1 replacement ratio with large trees (2:1 if small trees)

Context

A municipality might choose 1:1 or 2:1 replacement ratio when:

- Properties have limited space for additional trees and a higher replacement ratio would typically result in over-crowding
- The bylaw incorporates requirements to meet soil volume and spacing standards that will maximize the survival and growth of replacement trees
- The bylaw prioritizes replacement with a large tree species but provides flexibility to replace with smaller trees if the site is constrained
- It is coupled with other approaches to encourage or require canopy growth

Found in: *Vancouver, Victoria*

Pros

- Encourages large tree species replacement and healthy growing environments
- Enables most properties to replace a tree in the space created by the tree removed
- Does not penalize properties that already have trees by requiring even more trees as replacements when a tree is removed

Cons

- Does not replace tree canopy removed as quickly as a higher replacement ratio.
- Does not increase the number of trees or grow tree canopy in low-canopy areas. It cannot be used to meet canopy cover targets.

Option 2: 1:many replacement ratios based on diameter of tree removed

This approach would require applicants to replace every protected tree removed with multiple replacement trees.

Context
The 1:many replacement ratio would be most appropriate for communities that have lots of space for more tree planting.

Found in: *White Rock (ranges from 2:1 to 6:1), Courtenay (3:1 if below density target), Saanich (2:1 or 3:1 removals for roads/services), Squamish (2:1 to 6:1 for significant trees, up to density target), Abbotsford (2:1 or 3:1), Oakville (1:1 to 1:12 based on size of tree removed)*

Pros
- Enables instant replacement of more of the tree canopy removed

Cons
- To properly compensate for the canopy removed, many more trees may be required than would be practical or reasonable to require as a replacement ratio (Nowak & Aevermann, 2019).
- Urban properties are often unable to fit multiple replacement trees without overcrowding and poor planting location choices, likely leading to more failures and removals in the future.
- Creates an incentive for people to plant small trees or hedges to try and fit replacements on their property, which is at odds with canopy cover goals.
- Penalizes properties that have more trees by requiring them to replace even more trees on their properties, while having few requirements for properties with few or no trees.
- Does not increase the number of trees and grow canopy in low-canopy areas. It cannot be used to meet canopy cover targets.

USING 1:MANY REPLACEMENT RATIOS TO ACHIEVE CANOPY GROWTH

While tree bylaws may attempt to achieve canopy growth through the implementation of higher replacement ratios, this practice is not recommended. When replacement ratios are high, either the trees are disadvantaged by being crowded into inadequate growing space and never reaching healthy maturity, or the applicant is disadvantaged by paying a large sum in cash-in-lieu. Another unintended consequence of high replacement ratios is that they penalize properties with more trees by requiring high replacement or cash-in-lieu and reward properties with few or no trees by imposing few requirements when they re-develop.

6.3.6.2 Replacement Requirements – Achieving Canopy Growth

PURPOSE | To require that every property meets a minimum tree or canopy cover target.

MUST HAVE: Minimum Target
A target can be measured and consistently applied to each property. There are two main approaches to growing tree canopy using tree bylaws in Canada and tree ordinances in the United States: • Option 1: **Tree density target** • Option 2: **Canopy cover target**

Option 1: Tree density target

The tree density target approach establishes a target number of trees per unit area that applicants are required to achieve after the tree removal takes place.

Context

A municipality might choose tree density target when:

- The density of trees is targeted towards meeting a canopy cover goal that has been established for the community
- The municipality wants to increase canopy in low canopy locations by requiring properties with few or no trees to meet the density target with development
- The municipality is rural and is allowing some tree removals but wants to limit the extent of removals permitted per property (e.g., under an annual removal allowance)

Found in: *Maple Ridge, Courtenay, Gatineau (QC)*

Pros

- Effectively increases the rate of tree planting across the community, even on properties that have few or no trees
- Evens out the requirements across the community so that all properties have to contribute to meeting the target
- Neutralizes the perception of a penalty for having trees on a property that occurs when tree bylaws only include replacement ratios for tree removed.
- Can establish a relationship between tree density and canopy using tree canopy data

Cons

- Adds another replacement requirement to calculate on top of a ratio
- Must be calculated, which is simple when an arborist report is required with development, but staff may otherwise have to assist applicants when non-development applications allow tree removals down to a minimum tree density

Best implemented with differentiation for meeting the requirements during development versus non-development contexts. If an annual removal allowance is in place, it may be necessary to protect trees that are of particular importance to the community such as species of special interest, significant or specimen trees to prevent their removal under the allowance.

Option 2: Canopy cover target

The canopy cover approach establishes a canopy cover target that applicants must achieve on the lot after the tree removal takes place. The canopy area retained on site is measured and if the canopy target is not met then the shortfall is met by planting replacement trees. A replacement tree list defines a canopy area credit for small/medium/large tree species. Applicants plant the number of replacement trees that add up to the canopy area required to meet the target on site. The canopy cover target approach is used in Oak Bay and in several tree ordinances in the US to calculate replacement requirements.

Context

A municipality might choose a minimum tree canopy cover target when:

- The canopy cover target(s) set in the tree bylaw can work towards meeting a canopy cover goal that has been established for the community
- The municipality wants to increase canopy in low canopy locations by requiring properties with few or no trees to meet the canopy target with development
- The municipality is rural and is allowing some tree removals but wants to limit the extent of removals permitted per property (e.g., under an annual removal allowance)
- The community has many existing large canopy trees that overhang properties and wants provide incentives to protect and maintain offsite trees

Found in: *Oak Bay, Anmore, various US municipalities (e.g., Baltimore MD, Lake Forest Park WA, Fort Worth TX)*

Pros

- Effectively increases the rate of tree planting across the community, even on properties that have few or no trees
- Evens out the requirements across the community so that all properties have to contribute to meeting the target
- Neutralizes the perception of a penalty for having trees on a property that occurs when tree bylaws only include replacement ratios for tree removed.
- Relates directly to meeting canopy cover goals
- Reduces properties replacement requirements when canopy overhangs their property, which provides incentives to retain and protect offsite trees during development

Cons

- Adds another replacement requirement on top of a ratio
- Must be calculated and is more complex to calculate than tree density
- Must assume a relationship between species and typical canopy outcomes to simplify calculations for replacement requirements, so that replacement species can be credited for a certain amount of tree canopy at maturity

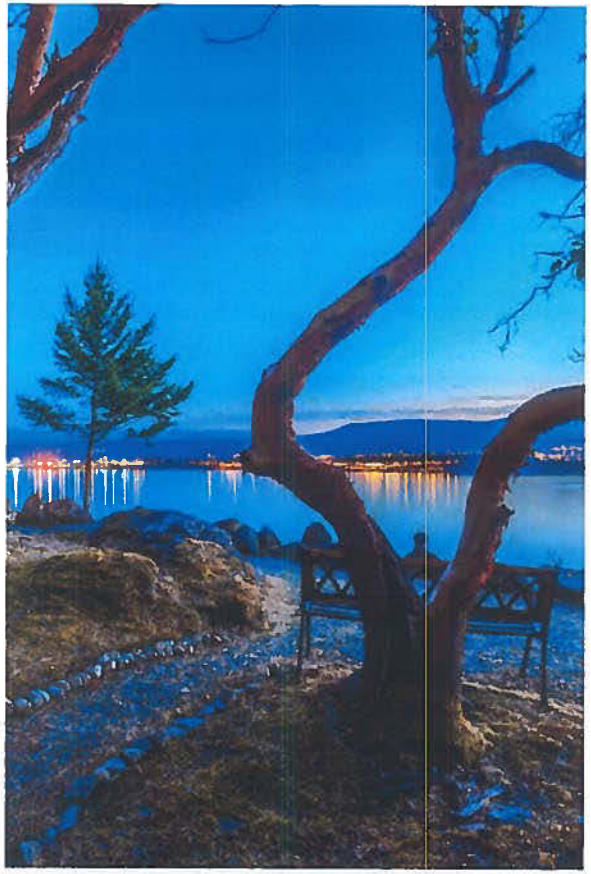
Best implemented with differentiation for meeting the requirements during development versus non-development contexts. If an annual removal allowance is in place, it may be necessary to protect trees that are of particular importance to the community such as species of special interest, significant or specimen trees to prevent their removal under the allowance.

In practice

The City of Courtenay implements a tree density target of 50 trees per net developable hectare. This means most single-family properties require 3-4 trees.

In practice

The District of Oak Bay uses a canopy cover target approach when the owner of a parcel applies for a building permit. The canopy target varies by zone and ranges from 50% for Community Institutional Zoning to 20% for Multi Unit Residential.



In practice

In Nanaimo, cash-in-lieu is capped at a maximum per hectare value.

6.3.6.3 Cash-in-lieu

PURPOSE | To fund tree planting elsewhere on public or private property.

MUST HAVE: Cash-in-lieu

A dollar amount that applies consistently and is adequate to cover the cost of planting and establishing trees.

Cash-in-lieu enables municipalities to collect funding to plant replacement trees. To be effective, cash-in-lieu should cover the cost of replacing the trees.

Context

A municipality might choose to have a cash-in-lieu option when:

- Properties have limited space for replacement trees
- Infill development or higher site coverage development is limiting opportunities for tree planting on site post development
- If coupled with a minimum tree density or canopy target, it is used as a means of every property contributing to a canopy cover goal either by planting tree on site or by funding planting elsewhere

Commonly Found in: *Bylaws that implement replacement requirements, for example in White Rock, Surrey, Vancouver, Township of Langley, Nanaimo, Oakville (ON)*

Pros

- Funds tree planting or enhancement towards growing canopy cover in the municipality
- Can fund stewardship efforts to encourage private land planting and tree maintenance

Cons

- Can become very costly if a 1:many replacement ratio is in place and effectively penalize properties with more existing trees
- If set too low, or enabled as a choice, then people may opt for cash-in-lieu instead of replacing trees

ADDITIONAL OPTIONS | Municipalities may wish to consider the additional options for managing replacement requirements that are species- or location-based, for dead or high or extreme risk trees, or credits to reduce the requirements.

Species based replacement*

A municipality might choose to add species-specific replacement requirements to:

- Require specific species of trees for the replacements of species of interest or native species in sensitive areas (e.g., like for like replacement)
- Reduce replacement requirements for fast growing species that tend to volunteer (e.g., alder or cottonwood) when a 1:Many ratio applies otherwise

*Future species suitability as a result of climate change should be considered when setting species-specific replacement requirements.

Location based replacement

A municipality might choose to define location based replacement requirements to:

- Require specific species of trees or replacement ratios for sensitive lands
- Require different replacement requirements for municipal trees

Exclusion of dead or high or extreme risk trees

- A municipality might choose to exclude dead or high or extreme risk trees to avoid discouraging owners from applying for a removal permit

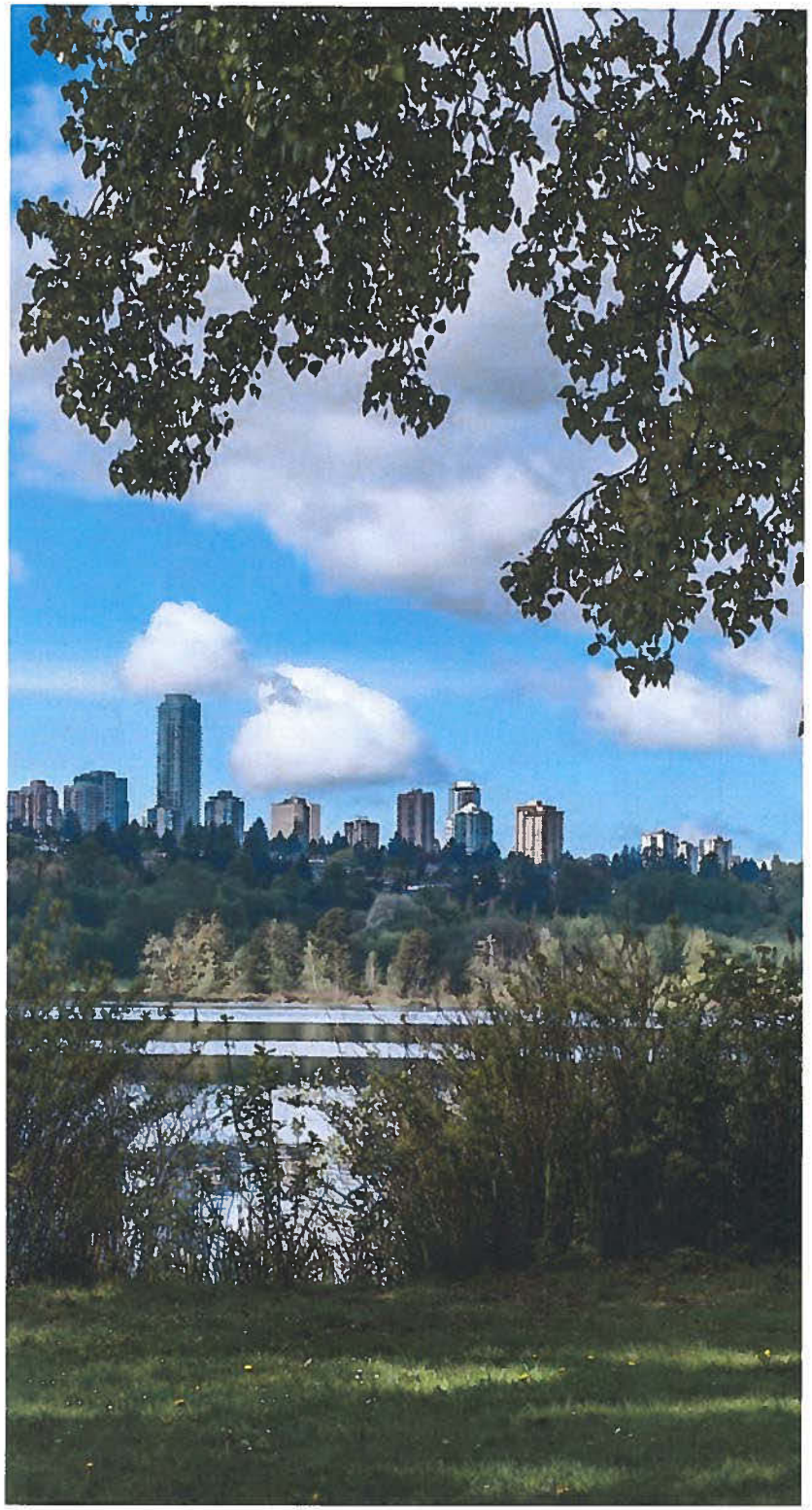
Incentives for tree retention

A municipality might choose to reduce an applicant's replacement requirements if they retain certain trees on site (e.g., large, healthy trees). Credits can function as an incentive for tree retention when they meaningfully reduce the number of additional trees that must be planted on site. Some bylaws allow non-protected trees to be counted as replacement trees.

Other incentives such as a reduction in permit fees could help incentivize tree retention, or a reduction in securities could help incentivize redesign or implementing protection measures around retained trees.

In practice

The City of New Westminster reduces the retained tree securities by 50% for applicants that agree to modify a design to retain protected trees.



STEWARDSHIP AND INCENTIVES

In addition to or as an alternative to replacement tree planting for successional replacement or canopy growth, communities should consider stewardship and incentive programs to encourage tree planting and stewardship on private land.

- **Subsidised tree sales:** many municipalities in the region hold subsidised tree sales for their residents to encourage tree planting.
- **Adopt-a-tree programs:** some municipalities implement programs where residents are invited to water new street trees.
- **Citizen science programs:** such programs can support data collection for urban forest management. For example, the City of Melbourne's Citizen Forester Program recruits volunteer community members to help collect data on many urban forest components. The City has also led a genetic sampling program to learn about the genetic diversity of elm populations in the city, collect observations on pollinator species or carry out habitat planting.
- **Stormwater utility:** The City of Victoria charges a stormwater utility to property owners that offers incentives for properties that manage a stormwater more sustainably. The utility's rainwater rewards program credits on-site rainwater management installations that enable rainwater storage or infiltration.

6.3.7 Replacement Tree Planting Standards

Planting standards serve to guide applicants in the planting of replacement trees to maximize the establishment success of those trees.

6.3.7.1 Species list

PURPOSE | A species list can be used to encourage climate and site appropriate species choices.

RECOMMENDED: **Species List**

Species lists should:

- Be a list of approved species that is a schedule of the bylaw, or a list published online, but that allows flexibility for updates and for professionals to submit an alternative for approval
- Be large enough to support meeting diversity targets for urban tree species
- Include proven species (native and non-native) that are suitable for current and future climate

6.3.7.2 Spacing and soil volume

PURPOSE | Prescribing minimum spacing and soil volume requirements will ensure that trees have adequate space to grow.

RECOMMENDED: Spacing and soil volume

Requirements should include:

- Replacement trees should be planted at least 2 m away from a building foundation wall (or more for larger tree species), at least 1 m away from any property line of a lot, above and at least 1 m away from an underground utility, driveway or other paved surface, and in an approved location
- Minimum spacing from existing trees and other replacement trees should be set at 2 m for small trees, 4 m for medium trees and 6 m for large trees
- Soil volume required for replacement trees should be estimated based on canopy size at maturity

BEST PRACTICE TO CALCULATE SOIL VOLUME

TREE SIZE	Min soil volume (m^3)[4]	Shared or irrigated soil volume (m^3)
Small tree canopy spread is up to 6 m	8	6
Medium tree canopy - spread is up to 10.0 m	20	15
Large tree canopy - spread is greater than 10.0 m	35	30

Credit soil volume according to actual content of soil:

- Soil: Volume of soil (Length x Width x Depth)
- Soil cells: Volume of soil cell installation (Length x Width x Depth) x 0. 92
- Structural soil: Volume of structural soil (Length x Width x Depth) x 0.2

[4] 0.3 m^3 minimum soil per 1 m^2 of crown projection based on Lindsey and Bassuk (1990).

6.3.7.3 Stock and planting standards

PURPOSE | Stock and planting standards are meant to maximize the chance of survival of replacement trees to maturity.

RECOMMENDED: Stock and planting standards

Requirements should include:

- Replacement trees must meet requirements set out in the latest edition the Canadian Nursery Trades Association "Canadian Standards for Nursery Stock"
- Define the size of planting stock that is acceptable (often 6 cm caliper for deciduous and 2 m height for conifer) but may be smaller for non-development tree permit applicants
- Define the acceptable timing of planting based on local planting season

6.3.8 Actions on Site

Actions on site are steps that applicants must take as a condition of a tree permit.

6.3.8.1 Tree protection measures

PURPOSE | To prevent damage when a tree permit is being issued with a development related permit where trees being retained.

RECOMMENDED: Fencing measures

Fencing requirements should include:

- A standard tree protecting fencing detail as a schedule in the bylaw.
- Signage indicating that the fencing is for tree protection. Signage could include contact information for the project arborist and a dollar value associated with the tree to indicate the cost of damage.
- Fencing should remain in place for the duration of the construction work.
- Removing fencing should be a violation of the bylaw except when part of an activity approved by the tree permit and under the supervision of an arborist.

RECOMMENDED: Supervision measures

If activities are occurring close to trees such that fencing needs to be removed or absent, then arborist supervision of the activities is an alternative method to prevent or minimize damage. Supervision requirements should include:

- A letter of assurance from the owner and arborist to define activities that will be supervised by an arborist, and supervision should be documented
- Documented supervision by the arborist of any planned works within the tree protection zone, pre-construction tree pruning, post-construction assessment or any other activities defined as requiring supervision

RECOMMENDED: Alternative measures

When tree protection fencing cannot be installed or maintained at the recommended distance, alternative tree protection measures (Fite and Smiley, 2016) may include:

- Mulching (15-30 cm)
- Laying minimum ¾ inch (2 cm) plywood, beams, commercial logging or road mats, on ground or over a 10 cm layer of mulch (on fabric to enable easier removal)
- Applying 10 – 15 cm of gravel over a taut, staked, geotextile fabric
- Protecting the trunk with wood planks on a closed-cell foam pad bound with straps or wire (no fasteners into the tree)
- Irrigation
- Any other measures defined to protect trees on site

6.3.8.2 Notification and marking

PURPOSE | Posting a notice of impending tree removals and marking trees to be removed lets the public know that an approved tree removal is taking place.

RECOMMENDED: Notification and marking

Requirements should include:

- A notice to post, similar other permits types (e.g., building permits), provided with the approved permit
- Trees to be removed be marked with flagging tape or survey paint

6.3.9 Securities

Securities are used as refundable deposits to guarantee that an applicant will follow through with actions required by a tree permit.

6.3.9.1 Securities for tree retention

PURPOSE | To guarantee that an applicant will follow through with tree protection measures that are conditions of the tree permit related to a development application.

RECOMMENDED: Tree retention securities

Securities must be determined using a method that can consistently calculate the security amount and be of a sufficient amount to deter bylaw infractions while still being affordable in the context of the project being undertaken.

It is recommended that securities:

- Be a set value for trees or categories of trees (e.g., value by diameter class)
- Be capped at a maximum value to avoid securities being unaffordable
- Incorporate flexibility to waive the security for on site trees that are not at risk of damage
- If applied to municipal trees, incorporate flexibility to be valued according to the Council of Tree and Landscape Appraisal Formula in addition to the cost of removal and planting
- Be returned upon final completion and confirmation by an arborist that the tree was protected as required in the permit, and supported by documentation of arborist supervision of any activities described in a letter of assurance
- Be transferred to a dedicated reserve fund for tree planting if forfeited, as opposed to general revenues

Context

Any community requiring tree protection measures may benefit from retention securities. However, municipalities will require sufficient staffing to manage securities.

Found in: *Surrey, New Westminster, White Rock, Courtenay (at Director's discretion)*

Pros

- Functions to guarantee the applicant and arborist follow through on protection and supervision measures for retained trees
- Requires evidence of compliance from the project arborist to reduce staff enforcement
- Provides another compliance tool in addition to penalties

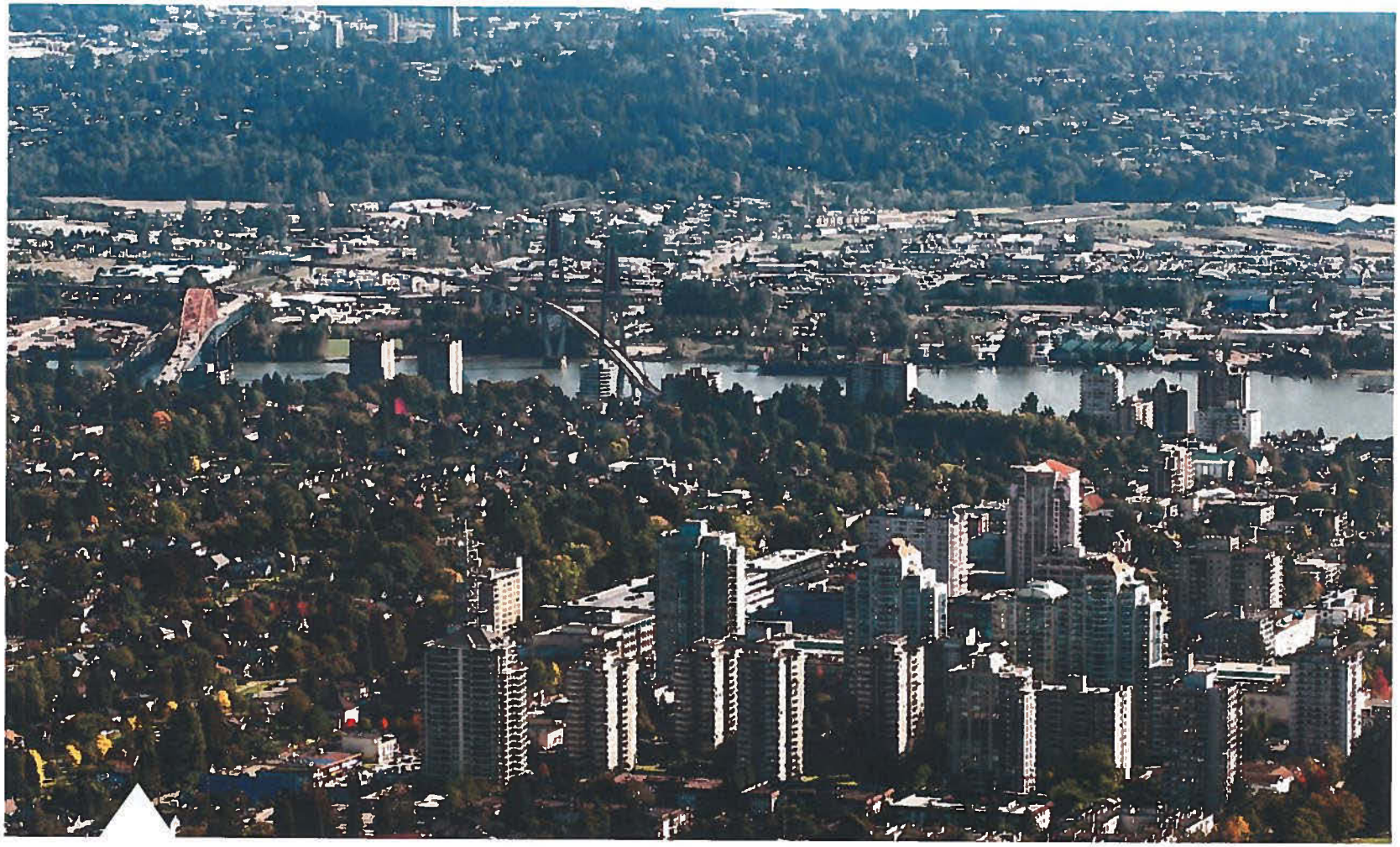
Cons

- Increases the administration requirements of tree bylaws, with securities having to be calculated, held and then returned pending approval of documentation provided
- Requires applicants to provide cash or a letter of credit for the duration of the project

Variation

- **Amenity value-based** replacement securities, where trees are valued according to the Council of Tree and Landscape Appraisal Formula
- **Applicant/application type-based** tree retention securities typically require large sums to be held for larger development contexts in order to encourage compliance while avoiding burdening applicants for smaller works permits

Securities are best implemented with a requirement for arborist supervision and letters of assurance that can provide staff with evidence that work was carried out according to the requirements.



In practice

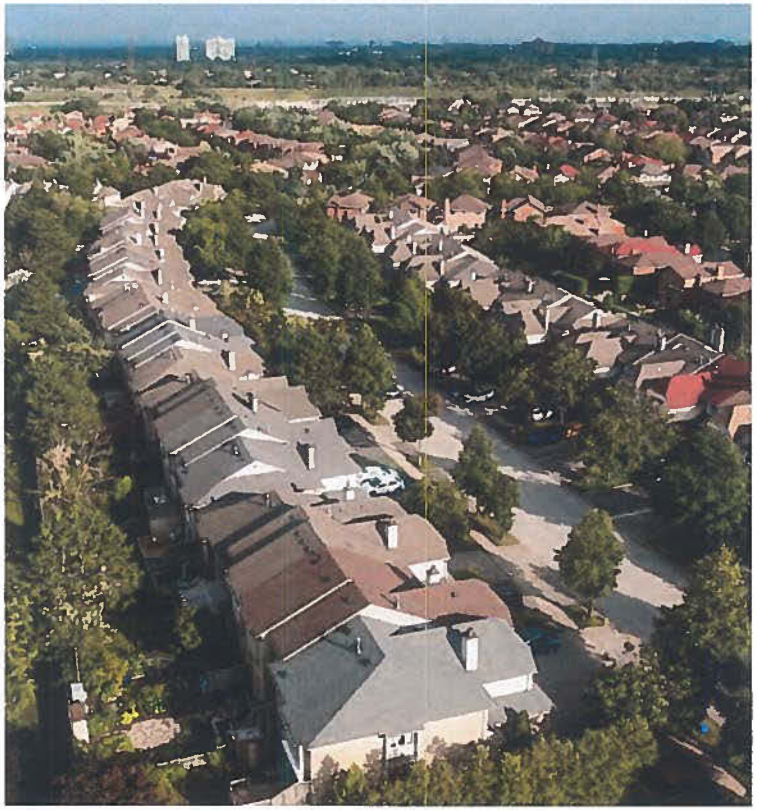
New Westminster's retained tree securities vary by size; the security for a protected tree is $2500 and greatly increases for a retained specimen tree, which is set at $10,000.

6.3.9.2 Securities for tree replacement

PURPOSE | To guarantee that an applicant plants and maintains replacement trees that are conditions of the tree permit.

In practice

In Mississauga, a tree replacement security deposit is determined on a case-by-case basis by the City.



RECOMMENDED: Replacement securities

Securities must be determined using a method that can consistently calculate the security amount and be of sufficient value to incentivize the planting of replacement trees.

It is recommended that securities:

- Be set at an amount that covers the cost of replacing a tree and maintaining it to establishment
- If cash-in-lieu is enabled, be set at an equivalent value for applications related to development
- Despite the previous points, if there is a 1:many replacement ratio or the cash-in-lieu amount is high, replacement securities can be modified to a type of applicant or application to avoid burdening non-development applicants
- Be returned once a tree has been planted and has survived for a set period of time

Context

Any community requiring tree protection measures may benefit from retention securities. However, municipalities will require sufficient staffing to administer securities.

Found in: *Delta, Surrey, Vancouver, Abbotsford, Victoria, Mississauga (ON)*

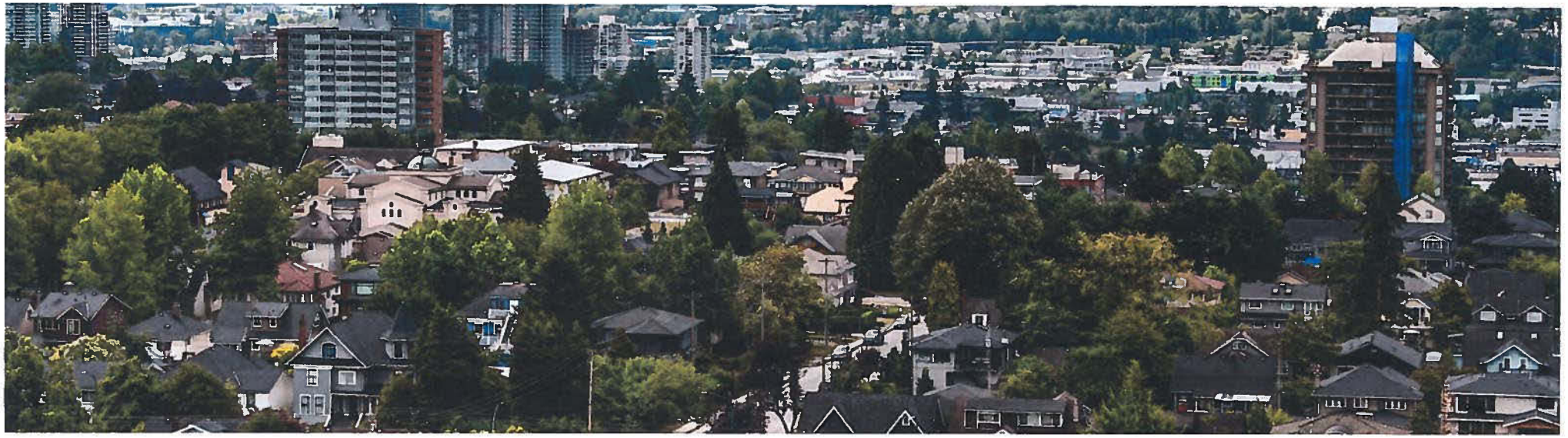
Pros

- Incentivizes the applicant to follow through with planting and maintaining replacement trees
- Provides another compliance tool in addition to penalties

Cons

- Increases the administration requirements of tree bylaws, with money having to be calculated, held and then returned pending approval of documentation provided
- May require an additional inspection point at the end of the security period

Cash-in-lieu and replacement securities should be equivalent amounts to simplify enforcement by enabling the municipality to retain securities without having to fine applicants to recover the balance amount for cash-in-lieu.



COMPLIANCE WITH REPLACEMENT TREE PLANTING

A recent report from the University of Toronto (Conway, Khatib, Tetreault, & Almas, 2021) reviewed the level of compliance for replacement tree planting requirements in the City of Toronto. A survey sent to homeowners who received a tree removal permit found that 70% of respondents had complied with their permit's replacement tree planting requirement. The researchers conducted site visits and found a very high short-term survival rate for trees planted. The highest survival rate was for trees planted by professionals. The species planted where not all adequate for the local climate and were occasionally misreported to the City. Researchers concluded that an inspection would increase compliance and improve documentation on the replacement trees planted. They also suggested that species guidance and professional tree planting would improve the replacement planting outcomes. Authors also noted the importance of tracking and record keeping systems at the municipal level to enable adequate follow-up and the promotion of compliance.

ADDITIONAL OPTIONS | In order to ensure that replacement plantings take place, municipalities may wish to consider additional options to encourage tree replacement:

1. Enforcement is used as an alternative to securities in some municipalities such as Richmond in order to ensure that replacement planting is carried out as intended. To be as effective as securities, enforcement requires sufficient resources to carry out proactive inspections.

2. Stewardship measures can be used to encourage the planting of replacement trees, such as the municipality providing a free or low-cost replacement tree. Stewardship measures are usually perceived in a more positive light by the public and make replacement tree planting more accessible to applicants with lower incomes. However, such measures come at a cost to the municipality and should be supported by adequate budgets.

   Note: bylaw fees, cash-in-lieu or transferred securities collected in a reserve fund could be set up to support residents with tree care and planting on private land.

6.3.10 Penalties

PURPOSE | Penalties seek to deter bylaw infractions and require remedial measures.

MUST HAVES: Long form prosecution

Tree bylaws should enable municipalities to make use of the Offence Act and fines to penalize bylaw infractions.

Municipalities can enforce their tree bylaws with the long form information process under the provincial Offence Act. The Act provides municipalities with the ability to enforce penalties up to $50,000 if they do not have established penalties (as described under municipal ticketing) or for enforcing major bylaw contraventions.

MUST HAVES: Municipal ticketing

Municipalities can set up fines for tree bylaw infractions for specific minor to medium contraventions. **The Municipal Ticket Information system** enables municipalities to enforce and prosecute contraventions to tree bylaws through infractions listed in a Municipal Ticketing Bylaw. Penalties cannot exceed $1,000 but multiple fines can be issued for damaging a single tree if multiple infractions apply.. Tickets that are disputed go to provincial court.

The Bylaw Notice Adjudication System enables municipalities to establish an administrative system as an alternative to the provincial court for resolving minor local government bylaw contraventions. Local governments may join together to administer a bylaw notice system jointly to cover a broader geographic area more cost-effectively. Penalties cannot exceed $500.

ADDITIONAL OPTIONS | In addition to enabling the use of available enforcement mechanisms, municipalities may wish to consider additional measures to provide themselves with further options to enforce their tree bylaw, including stop work orders, securities transfer and replacement tree requirements.

Stop work orders

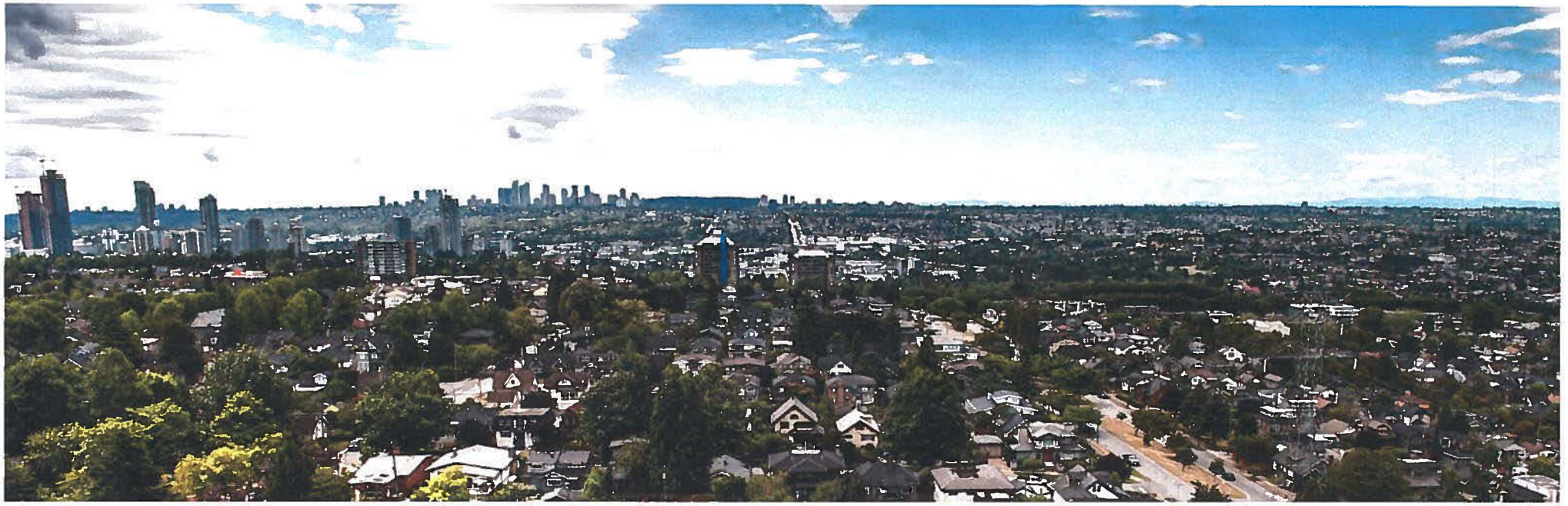
Municipalities can use stop work orders to interrupt work that is causing damage to retained trees until remediation measures are taken. This measure should only be used in situations where irremediable damage is being caused, where it may offer an effective solution to stop such damage when it is occurring.

Securities transfer

Municipalities could consider including provisions within their tree bylaws to automatically transfer unclaimed securities to their reserve funds after a set period of time. Including such a provision may offer more clarity and transparency to staff and applicants as to the expected process and timeline to comply to permit conditions before securities are transferred.

Requiring replacement trees

Some municipalities require people found to be in violation of the bylaw to plant replacement trees as a means of enforcement. This approach may be helpful in cases where applicants removed trees without knowledge or understanding of the tree bylaw requirements. It may however prove challenging to enforce in cases where applicants were purposefully tying to evade the bylaw and are not interested in planting trees on their properties. In such cases, fines may be a better way to recover funds to plant elsewhere in the municipality.



6.3.11 Tree Bylaw implementation

Practitioners surveyed for this project in the fall of 2020 highlighted the importance of the implementation process for creating an effective regulatory environment that balance canopy preservation and growth with competing priorities. Findings of the literature review further emphasize the importance of several factors beyond the bylaw content that will significantly impact urban forest outcomes.

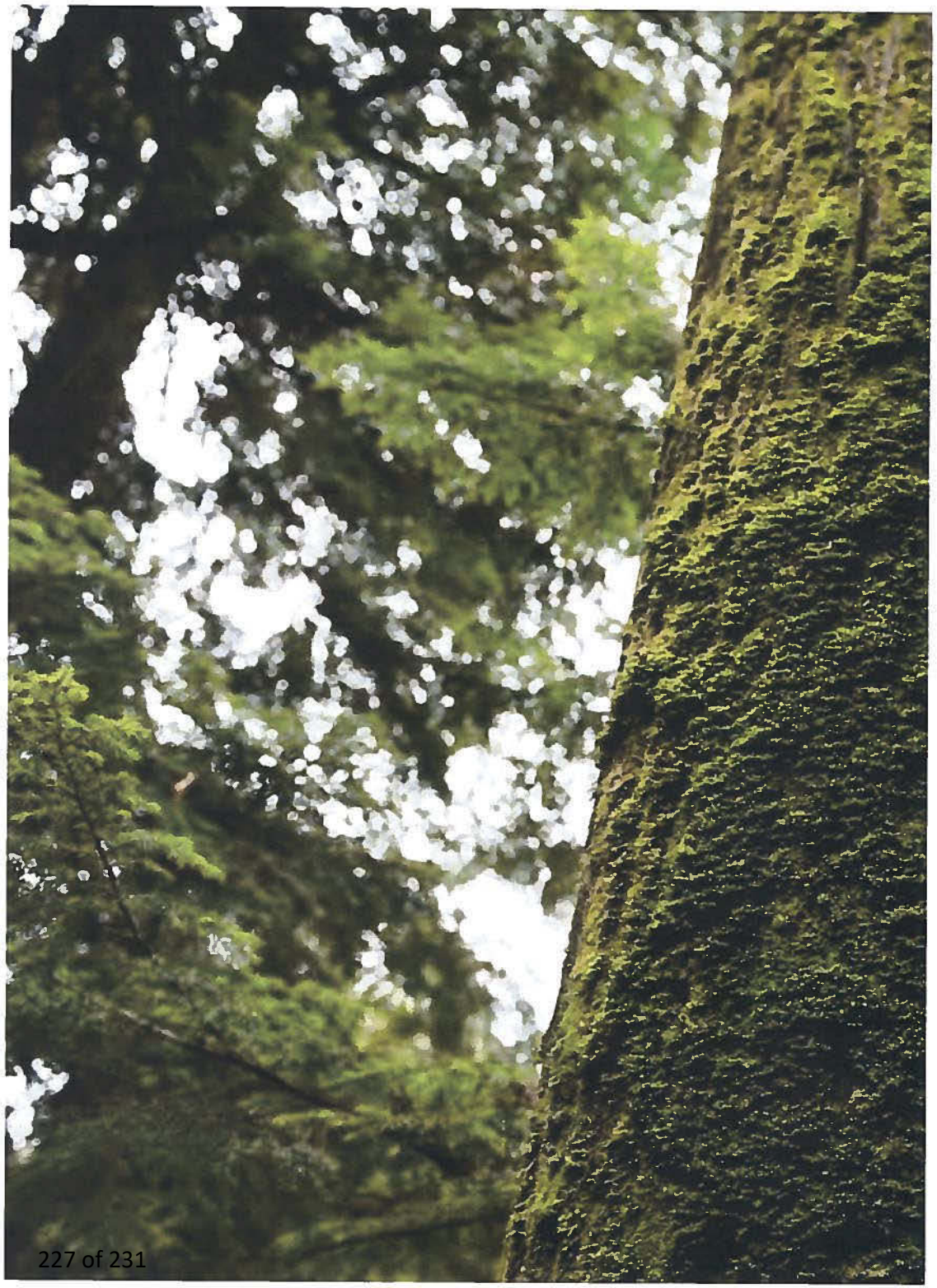
Bernhardt and Nichols propose seven implementation criteria for effective tree ordinances (Bernhardt & Swiecki, 2001; Nichols, 2007). These criteria are discussed in detail in the literature review and align closely to many of the comments compiled in the practitioner survey. The criteria include:

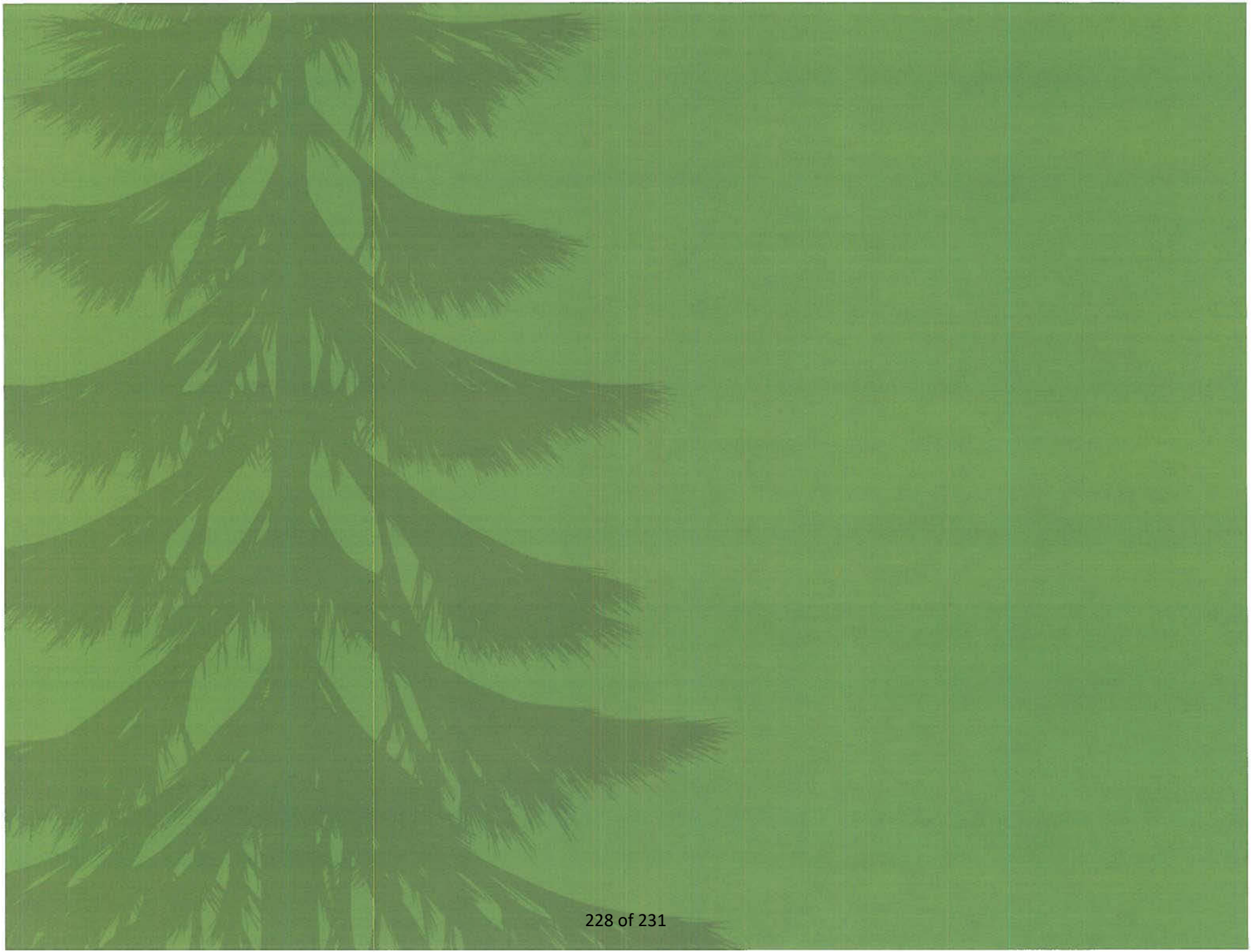
- **Clearly stated goals:** Describe the capacity of the bylaw to achieve certain goals with clear connection to any wider management strategies. Goals are essential to interpret the bylaw and evaluate its effectiveness.
- **Designated responsibility:** Assign authority of a single person responsible for bylaw implementation.
- **Basic performance standards:** Designate best management practices and standards to guide the bylaw whenever possible.
- **Flexibility:** Allow for site-specific decisions to be made by arborists and qualified environmental professionals on a case-by-case basis when appropriate. An appeal process is recommended to ensure decision-making is based on the technical merit of applications.
- **Enforcement:** Employ a variety of penalties consistently.
- **Comprehensive management strategy:** Develop a comprehensive management strategy alongside the bylaw to align goals and integrate them throughout community resources.
- **Developed with community support:** Align with community values and priorities that citizens are willing to comply with, and support.

7.0 Conclusion

The benefits of trees are widely recognised and valued by communities across Metro Vancouver and around the world, particularly in the context of climate change adaptation. Local governments are showing an increasing interest in developing or improving regulations to preserve trees and grow tree canopy. Yet, a limited number of resources exist to inform the design and implementation of regulatory tools for this purpose.

The *Metro Vancouver Tree Regulations Toolkit* provides readers with practical information about how they can develop comprehensive policy and regulations to preserve trees and grow tree canopy within British Columbia's current legislative framework. It is intended to offer information about the options available and important components to consider for each regulatory tool to allow readers to make decisions about the most appropriate options for their local context. This document will need to be periodically reviewed and updated as legislation and best practices in the region evolve.





8.0 References

Bernhardt, E. A., & Swiecki, T. J. (2001). *Guidelines for developing and evaluating tree ordinances*. Urban Forestry Program, California Department of Forestry and Fire Protection, Sacramento, CA., 76.

Bond, J. (2013). *Best Management Practices - Tree Inventories* Second Edition. International Society of Arboriculture.

British Columbia Ministry of Community, Sport and Cultural Development. (2011). *Development Permit Areas for Climate Action: A guide for energy conservation, water conservation and GHG emissions reduction*.

Britton-Foster, A., Grant, G., & Curran, D. (2016). *Environmental Development Permit Areas: In Practice and in Caselaw*. Environmental Law Centre, University of Victoria.

City of Guelph. (2014). *City of Guelph Downtown Streetscape Manual & Built Form Standards* Section 2.0 Streetscape Manual.

City of Kitchener. (2015). *Urban Forest Appendix Details for Section M-Development Manual Tree Planting & Establishment Bests Management Practices*.

City of Ottawa. (2020). R4 Zoning Review: Proposed Zoning Amendments (File# D02-02-20-0018).

Conway, T., Khatib, J., Tetreault, J., & Almas, A. (2021). *Toronto's Private Tree By-Law: Assessing Homeowners' Replacement Tree Planting Compliance, Attitudes, Tree Species and Survival*. Mississauga: University of Toronto.

Curran, D., Dumont, J., Low, S., & Tesche, M. (2012). *Topsoil Bylaws Toolkit*. Okanagan Basin Water Board.

Fite, K., & Smiley, E. (2016). *Best Management Practices - Managing Trees During Construction* (Second ed.). International Society of Arboriculture.

Hilbert, D., Koeser, A., Roman, L., Hamilton, K. L., Hauer, R., Campanella, H., . . . Perez, H. (2019). Development practices and ordinances predict inter-city variation in Florida urban tree canopy coverage. *Landscape and Urban Planning*, 190, 13 pp.

Landry, S., & Pu, R. (2010). The impact of land development regulation on residential tree cover: An empirical evaluation using high-resolution IKONOS imagery. *Landscape and Urban Planning*, 94-104.

Land Title Act, RSBC 1996, c.250. (1996).

Land Trust Alliance of BC. (2009). *Conservation Covenants – A Guide for Developers and Planning Departments*. Retrieved from the Stewardship Centre of BC.

Lawrence, A., De Vreese, R., Johnston, M., Konijnendijk, C., & Sanesi, G. (2013). *Urban forest governance: Towards a framework for comparing approaches* (12 ed.). Urban Forestry & Urban Greening.

Lilley, S., Gillman, E., & Smiley, T. (2002). *Best Management Practice Pruning (Third Edition)*. International Society of Arboriculture.
Lindsey, P., & Bassuk, N. (1991). Specifying soil volumes to meet the water needs of mature urban trees in containers. *Journal of Arboriculture, 17, No. 6*, 17(6).

Local Government Act, RSBC 2015, c 1. (2015). Magarik, Y., Roman, L., & Henning, J. (2020). How should we measure the DBH of multi-stemmed urban trees? *Urban Forestry and Urban Greening. 47:126481*, 11 p.

LTA of BC (Land Trust Alliance of BC. (2014). *Conservation Covenants in British Columbia.*

Marritz, L., & Hunter, K. (2020). *Soil Volume Minimums for Street Trees Organized by State/Province*. Retrieved from deeproot Green Infrastructure for Your Community.

Metro Vancouver. (2017). *Urban Forest Climate Adaptation Framework for Metro Vancouver*.

Metro Vancouver. (2019). *Regional Tree Canopy Cover and Impervious Surfaces - Analysis of Tree Canopy Cover and Impervious Surfaces in Metro Vancouver*.

Mincey, S., Schmitt-harsh, M., & Thurau, R. (2013). Zoning, land use, and urban tree cover: The importance of scale. *Urban Forestry & Urban Greening, 12*, 191-199.

Nelitz, M., Cooke, J., Curran, D., & Glotze, I. (2013). *Enhancing climate resilience of Subdivision and Development Servicing (SDS) Bylaws in the Columbia Basin: A guidance document*. Columbia Basin Trust.

Nichols, S. (2007). *Urban Tree Conservation: a White Paper on Local Ordinance Approaches*. Montgomery, Alabama: Montgomery Tree Committee.

Nowak, D., & Aevermann, T. (2019). Tree compensation rates: Compensating for the loss of future tree values. *Urban Forestry & Urban Greening, 41*, 93-103.

Ordonez, C., & Livesley, S. (2020). *Global review of incentive schemes for the retention and successful establishment of trees on private urban land - Project NY18002*. Hort Innovation.

Oregon State University. (2009). *Tree Protection on Construction and Development Sites: A Best Management Practices Guidebook for the Pacific Northwest*.

Seattle Department of Construction & Inspections. (2019). Tip 242 - Tree Protection Regulations in Seattle. *Seattle Permits - part of a multi-departmental City of Seattle series on getting a permit*.

Stewardship Centre BC. (2016). *Green Bylaws Toolkit for Conserving Sensitive Ecosystems and Green Infrastructure*.

Stubbs, CJ, Cook DD, Niklas, KJ. (2019). A general review of the biomechanics of root anchorage. *Journal of Experimental Botany*. 70(14):3439-3451.

Troy, A., Grove, J., O'Neil-Dunne, J., & Pickett, S. (2007). Predicting opportunities for greening and patterns of vegetation on private urban lands. *Environmental Management, 40*(3), 394-412. doi:10.1007/s00267-006-0112-2

UK Trees and Design Action Group. (2014). *Trees in Hard Landscapes a guide for Delivery*.

West Coast Environmental Law. (2005). *Greening your Title – A Guide to Best Practices for Conservation Covenants*.

Wilson, J., Clay, M., Martin, E., Stuckey, D., & Vedder-Risch, K. (2003). Evaluating environmental influences of zoning in urban ecosystems with remote sensing. *Remote Sens. Environ., 86*(3), 303-321.