



REPORT

Report Date: May 13, 2020
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Meeting Date: May 26, 2020

[Submit comments to Council](#)

TO: Vancouver City Council
FROM: General Manager of Engineering Services
SUBJECT: Sewage and Rainwater Management Plan for Vancouver

RECOMMENDATION

- A. THAT Council approve the approach outlined in this report to develop a comprehensive sewage and rainwater management plan for Vancouver, to address pollution from sewage and urban run-off along with risks presented by climate change, aging infrastructure and urban growth; working in collaboration with Metro Vancouver, Park Board, First Nations, and other partners, and in close coordination with the Vancouver Plan and key environmental policy areas.
- B. THAT Council direct staff to report back in 2021, with a progress update on the development of the sewage and rainwater management plan for Vancouver, including recommended short-term accelerated actions to reduce pollution from sewage and polluted urban runoff.
- C. THAT this report be provided to the Vancouver Board of Parks and Recreation for information.

REPORT SUMMARY

Combined sewer overflows (commonly referred to as “CSOs”) and polluted urban runoff impact aquatic environments and are one factor limiting public access to waters, including summertime beach closures. Vancouver has a regulatory requirement to eliminate CSOs by 2050. It is also a City and Park Board priority to increase public access to water, including two new major parks planned at the east basin of False Creek.

In addition, population growth and land-use decisions being contemplated in adopted community plans face uncertainty when it comes to sewage and drainage system capacity. This can be addressed through a range of interventions, including infrastructure capacity upgrades and development policy that eases the burden on sewage and drainage systems. This is being considered through the Vancouver Plan, which is a strategic and integrated policy plan for the future of the city. This involves significant community engagement and technical review.

The impacts of climate change, including the increasing intensity of rainfall events, sea level rise and drought add further strain on sewage and drainage services. Billions of dollars will be required between now and 2050 to renew and adapt aging infrastructure.

To address these challenges, staff recommend development of a Sewage and Rainwater Management Plan (“SRMP”) for Vancouver. This would start with an assessment of the current state review of best practices from leading jurisdictions, and a gap analysis to determine what may be needed to meet regulatory requirements. Following that, planning work will incorporate a rigorous analysis of a range of options to manage risks and achieve best value outcomes for Vancouver. The final plan will identify the actions and fiscally responsible investments needed to address pollution from CSOs and urban runoff. It will also provide a framework to guide the renewal of infrastructure through measures that meet the needs of a growing city, meet regulatory requirements, adapt to climate change, enhance Vancouver’s natural systems, and support health, resilience, equity and Reconciliation.

Sewage and drainage services are jointly provided by the City and Metro Vancouver, with the City providing local infrastructure services and the regional government managing conveyance and treatment systems. The SRMP must optimize investments and outcomes across both systems, and also inform the update to the Metro Vancouver Liquid Waste Management Plan (“LWMP”), which will serve as a regulatory plan for the regional government and its members. A high level of collaboration is required with Metro Vancouver to align with and meet the timeline requirements of the LWMP. A review strategy for the LWMP is being developed by Metro Vancouver for consideration by the Provincial regulator later this fall, which likely require submission of the final LWMP to the Province for review and approval in 2023.

Staff are recommending a phased and comprehensive approach for the development of the SRMP, building on the policy framework of the Rain City Strategy and lessons learned in other leading cities who have similar challenges to Vancouver. Action while planning will be taking place throughout to maintain progress on the improvement of water quality and pilot options for potential roll-out at city-wide scale. The approach for partner, stakeholder and public engagement will be tailored over time to factor in the rapidly changing landscape associated with the COVID-19 pandemic response, in a consistent manner with other City planning initiatives.

COUNCIL AUTHORITY/PREVIOUS DECISIONS

The development of the SRMP for Vancouver will need to align with and build on a number of City and Park Board, strategies and priorities, including:

- Aquatic Environments Action Plan (2020)
- The Vancouver Plan (planning and engagement program, 2019)
- The Rain City Strategy (2019)

- Integrated Blue-Green Systems Planning (2019)
- Motion – Accelerate combined sewer overflow mitigation (2019)
- VanPlay: Parks and Recreation Services Master Plan (2019)
- Resilient Vancouver Strategy (2019)
- Climate Emergency Response (2019)
- Motion – Watershed Revival (2019)
- Motion – 1995 Greenways Refresh (2019)
- Motion – False Creek to the Fraser River Blueway (2019)
- Park Board – On Water: Non-Motorized Watercraft Strategy (2019)
- Motion – Mandatory Green roofs (2018)
- Climate Change Adaptation Strategy (updated in 2018)
- Cambie Corridor Utility Servicing Plan (2018)
- Biodiversity Strategy (2016)
- Healthy City Strategy (2014)
- Urban Forest Strategy (2014)
- Transportation 2040 (2012)
- Greenest City 2020 Action Plan (GCAP) (2011)
- Broadway Plan (underway; Terms of Reference approved in 2018)

CITY MANAGER'S/GENERAL MANAGER'S COMMENTS

Staff propose development of a SRMP to address recent Council and Park Board directions, including accelerated action on CSO mitigation, implementation of the Rain City Strategy, and other directions that fundamentally shift the way that water is valued and managed within the city.

Due to the significant costs and complexities associated with sewage and rainwater management, a comprehensive and rigorous planning process is needed to optimize investments, policies, regulations and City advocacy. The plan must also address challenges associated with receiving environment water quality, aging infrastructure, climate change, and population growth. It also needs to include a collaborative approach with key partners, including Metro Vancouver and First Nations, which is essential to achieve interjurisdictional alignment and to deliver on equity and Reconciliation objectives. The proposed Sewer and Rainwater Management Plan will be closely coordinated with the development of the Vancouver Plan, which will guide future growth and land use city-wide.

REPORT

1. Background/Context

The primary purpose of the City's sewer and drainage system is to protect life, the environment and property from pollution and flooding. Sanitary waste and drainage are collected from more than 100,000 service connections from homes and businesses, curbs and gutters flowing into 44,000 catch basins, a system of pipes 2,140 km in length and 25 pump stations. This City system drains into the collections and treatment facilities operated by the Greater Vancouver Sewerage and Drainage District (referred to as "Metro Vancouver" in this report). In areas of the city with separated sanitary and stormwater pipes, rainwater runoff is discharged to outfalls along the City's waterfront.

Rainwater runoff is also managed by the City's Green Rainwater Infrastructure ("GRI") assets.

Originally, the sewer system was built as a combined sewer system in which sanitary waste and rainwater flows were collected in a single combined sewer pipe in the street. During periods of rainfall, CSOs occur when the capacity of the combined sewer system is exceeded and the system overflows via outfalls into the receiving waters of Burrard Inlet, False Creek and the Fraser River. Since the late 1950s, the City began the practice of installing separated sanitary and storm pipes when new neighbourhoods were developed. Beginning in the 1970s, the City began replacing existing combined pipes with separated pipes in targeted areas of the Downtown and West End to address water quality issues. Approximately 54% of mainline sewer pipes are currently separated, along with 58% of property connection pipes.

In late 2018 and 2019, a number of Council imperatives around resilience, climate adaptation, climate emergency, watershed revival, blue-green systems and accelerating action on CSOs emerged. Park Board commissioners also passed a number of resolutions to accelerate efforts to address CSOs and restore the water quality in False Creek and other waters surrounding Vancouver. In addition to the impacts to coastal biodiversity, each year Park Board beaches experience closures when levels of *E. coli* bacteria exceed recommended guidelines. This is likely resulting from multiple sources of pollution, including CSOs and urban runoff. Further, major new waterfront parks are planned at the east basin of False Creek.

In November 2019, Council approved the Rain City Strategy, which focuses on the use of GRI solutions¹ to reduce pollution from urban runoff, adapt to climate change impacts, reduce the volumes of CSOs and ease the burden on infrastructure associated with increased rainwater volumes and urbanization. The Park Board also endorsed this strategy in February 2020. The Rain City Strategy builds upon provincial regulatory obligations and nearly two decades of GRI leadership, pilot and demonstration projects developed by the City, Park Board, community, industry and academia in Vancouver.

The Park Board, through its VanPlay: Parks and Recreation Services Master Plan, has continued to emphasize the importance of natural systems, flow of water connectivity, and urban biodiversity as foundations for thriving cities and ecosystems. VanPlay offers a vision for integrated water multifunctionality – access to nature, rainwater management, ecosystems, recreation etc., and relies on clean water.

Collectively, these initiatives from Council and Park Board have shaped the imperatives for a paradigm shift around water management in Vancouver and have influenced the ambitions and directions in the Rain City Strategy.

In 2019, based on Council's direction, staff initiated planning and community engagement process to create the Vancouver Plan, a long-term strategic plan addressing social, economic, environmental and cultural policy areas along with growth management and land-use directions for the future. This comprehensive city-wide

¹ GRI comes in many forms and uses soils, plants, trees and built structures such as green roofs, swales, permeable pavements, infiltration trenches, rainwater tree trenches and rain gardens to capture, store and remove pollutants from runoff before being absorbed in the ground or returning it to our waterways and atmosphere. GRI can also include the harvest and reuse of rainwater that helps reduce demand on drinking water supply and provide greater water security.

planning process will integrate key policies and strategies across City departments, as well as the concurrent updates to the Regional Growth Strategy and the Regional Transportation Strategy. With the current COVID-19 situation, these coordinated planning processes can also implement early actions that contribute to city-wide recovery efforts as well as strategic actions to enhance long-term community resiliency.

Vancouver's Regulatory Obligations

In 2011, the Province endorsed the regional LWMP which sets regulatory obligations for Vancouver around (1) Eliminating CSOs by 2050 by replacing aging combined sewers with separated sanitary and storm pipes, (2) having and implementing an Integrated Rainwater Management Plan (IRMP), and (3) monitoring and mitigating water quality impacts from polluted urban runoff.

All municipalities in Metro Vancouver must have IRMPs and must report to the Province, through Metro Vancouver biannually, on their progress and compliance. In 2016, the City of Vancouver's IRMP was adopted by Council, with a focus on runoff water quality and addressing the impacts of the sewer and drainage system on local receiving waters and aquatic ecosystems. The IRMP established a long-term target to capture and remove runoff pollutants from 90% of Vancouver average annual rainfall, with a strong emphasis on GRI approaches that utilize a combination of engineered and ecosystem services methods to manage rainwater volume and water quality.

For the update to the LWMP, Metro Vancouver will be submitting a review strategy for consideration by the Province later in 2020. This review strategy will likely propose that the final LWMP be submitted to the Province for review and approval in 2023. Subject to approval by the Province, the updated LWMP will establish a new regime of regulatory requirements for Metro Vancouver and its members, including the City of Vancouver.

Imperatives for a Paradigm Shift around Sewage and Rainwater Management

In addition to these regulatory obligations and Council policy, four key drivers have influenced the One-Water² approach to planning:

1. Climate Emergency and Resilience

Vancouver City Council has declared a climate emergency and is at a pivotal point in terms of the need to both mitigate and adapt to the effects of climate change. Most people will experience climate change as either too much or too little water or high heat, all of which contribute to community, infrastructure and ecosystem vulnerability. More extreme weather events, increasing precipitation in winter, declining snowpack in our drinking watersheds, reduced precipitation in summer, and rising sea levels will increase flooding, drought, heat stress, and drinking water supply pressures in Vancouver.

² The One Water approach factors in the interconnections between different types of water resources and systems to make holistic and optimized water management decisions. Using integrated water management framework helps to ensure that water infrastructure systems deliver the appropriate level of service to human populations, protect receiving waters and aquifers, and maximizes co-benefits realized through the use of natural systems to manage water.

2. Sewer and drainage impacts on water quality and aquatic ecosystems

The water quality issues related to our sewer and drainage system are two-fold. The first is that Vancouver, as with many cities incorporated pre-20th century, has a combined sewer system. That means that rainwater runoff from rooftops and roadways are combined into the same pipes that convey sewage to the wastewater treatment plant. During rain events, the combined volume of rainwater and sewage can overwhelm the pipe system that directs flow to the treatment plant, leading to discharges known as CSOs, into Burrard Inlet, the Fraser River or False Creek. In 2018, in the Vancouver Sewerage Area, there were over 33 billion litres of CSO discharge³ recorded, and in 2019 over 22 billion litres.

Beyond CSOs, water quality in receiving environments can be adversely impacted by pollutants carried in urban runoff, such as hydrocarbons, heavy metals, litter and microbes. The current system of outfalls in combined and separated areas currently provides minimal treatment of runoff pollutants prior to discharge. GRI has been demonstrated to be effective for reducing some types of runoff pollutants for the limited number of installations in place.

3. Growth, utility cost pressures and value-for-money investments

Water-related infrastructure makes up one of the most costly building blocks of modern cities. Growth being contemplated today faces uncertainty when it comes to sewer and drainage system capacity. This can be addressed through a range of interventions, including infrastructure capacity upgrades and development policy that eases the burden on sewage and drainage systems. With the pressures to upgrade our systems to serve growth, increase water quality treatment, adapt to changing rainfall patterns due to climate change and address the infrastructure renewal gap, the expected cost of sewage and rainwater management infrastructure serving Vancouver is in the billions of dollars over the next three decades. Given this, there is a need to explore options for more cost-effective and higher value-for money approaches to water services delivery.

4. Livability, equity and reconciliation with Indigenous communities

Water is a vital resource and life force for communities and ecosystems. For millennia First Nations communities have developed around their relationships with water. Post-contact, in the past hundred years or so in Vancouver, through land development, de-forestation, the burying of streams and development of modern sewer and drainage infrastructure, our relationships with water, the land and natural systems have been disrupted.

The Rain City Strategy provides an opportunity to explore how environmental protection through new approaches to rainwater management could help Vancouver's commitment as a City of Reconciliation. In addition, GRI can support equity, contribute to neighbourhood resiliency, urban cooling, green jobs,

³ The Vancouver Sewerage Area includes the joint municipal and regional system that serves Vancouver, parts of Burnaby and the University of BC Endowment Lands. CSO discharges include a mixture of rainwater (estimated at approximately 90% of CSO volume on average) and sanitary sewage (estimated approximately 10% of CSO volume on average).

access to nature and green public spaces, and mental health and well-being so that our communities and ecosystems thrive. Figure 1 lists the nine transformative directions of the Rain City Strategy.

FIGURE 1. THE NINE TRANSFORMATIVE DIRECTIONS OF THE RAIN CITY STRATEGY

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|---|---|
| 1. Strive to become a water sensitive city | 6. Explore intersectionality, equity and Indigenous reconciliation through urban water management |
| 2. Respond with urgency to climate change | 7. Drive innovation and system effectiveness through data and analytics |
| 3. Accelerate action to protect the health and vitality of surrounding waterbodies | 8. Enable a culture of collaboration |
| 4. Revitalize watersheds and waterfronts to enable communities and natural systems to thrive | 9. Invest in education, capacity building and partnerships to mobilize action |
| 5. Shape systems to integrate and value all forms of water | |

Work Already Underway to Reduce Pollution from Sewage and Urban Run-off

A number of programs and initiatives are underway or have been completed which are targeted to reduce pollution from sewage and urban run-off:

1. **Mainline Sewer Programs:** This includes the replacement of end-of-life combined sewer pipes with new separated storm and sanitary sewer pipes. In addition, a smaller proportion of the system is separated annually via sewer capacity upgrades to serve new developments. The effects of separation work are not always immediate, as separated pipes often drain into combined pipes downstream in the interim as sewer separation progresses, and older private property connections often remain combined.
2. **Sewer Connection Programs:** The New Service Connection Program connects new or renovated buildings to the mainline sewer system, and separates rainwater from sanitary flows. In addition, owners of buildings with combined connections and not undergoing redevelopment or renovation can apply to the City for a financial incentive towards separation of rainwater from sanitary flows.
3. **Catchment Investigation Program:** This program uses a variety of investigative methods to identify possible locations where sanitary pipes are connected to drainage pipes, as well as storm water inflows into separated sanitary pipes. Elimination of these cross-connections helps to reduce sanitary sewage outflows into receiving waters.
4. **Green Infrastructure Capital Program:** Green Infrastructure reduces and slows the inflow of rainwater into the sewer system, removes run-off pollutants,

and can be designed to achieve other City goals such as climate resiliency, healthier urban forest, reduction in urban heat island, biodiversity, and public safety improvements. New projects are monitored to improve data on performance outcomes, to support the evolution of city-wide water planning and design work. Projects at a variety of scales are being delivered throughout the city as part of the 2019-2022 Capital Plan. Projects that are larger in scale include:

- **Quebec Street:** Includes eight different green infrastructure practices managing runoff from 4 blocks of the Quebec St arterial. Monitoring of the project will compare the rainwater retention and treatment capacity of bio-retention planters and rainwater tree trenches.
 - **Richards Street:** Will be the City's first blue-green corridor, and extending eight blocks along Richards Street. It consists of rainwater tree trenches within a median that protects the new separated bike path.
 - **Alberta Street & Columbia Park:** A blue-green corridor that retains most of the rainfall from the immediate neighborhood, removing pollutants from urban runoff and freeing up capacity in the sewer system to serve new development in the Cambie Corridor.
 - **St. George Street Railway:** is a blue-green corridor that will reflect a lost stream under St. George Street while treating and retaining runoff from adjacent streets in the Mt. Pleasant.
5. **Integrated Water Planning Initiatives:** City and Park Board staff are developing Integrated Water Management Plans to serve high growth areas including the Cambie Corridor and Broadway Study Area. These planning efforts are aligned with the One Water approach and Rain City Strategy findings, directions and watershed characterizations. These plans are expected to deliver optimized water servicing solutions that will scale up our implementation of GRI and inform the City's long-term water planning methods. For example, a study is underway to evaluate the feasibility of a major green rainwater infrastructure initiative at Charleson Park which could potentially free up sewer capacity to support population growth in the Broadway Study Area and help prevent runoff pollutants from entering False Creek. In addition, a planning framework is being developed and piloted on emerging land use planning areas that considers water servicing at the outset to both shape and serve future growth, building typologies and the public realm.
6. **System Monitoring and Modelling:** Work is underway to expand monitoring of critical components of sewage and drainage infrastructure. This monitoring will provide real-time and historical data to allow a better understanding of the functioning of the existing system, as well as discharges to receiving environments. In addition, work is also underway to establish a city-wide computer model to simulate the sewage and drainage system, which is an essential tool needed to support system planning.

2. Strategic Analysis

The Need for a Comprehensive Plan

CSOs and polluted urban runoff impact aquatic environments and are one contributor in limiting public access to waters. In addition, sewer and drainage infrastructure is insufficient for meeting the needs of a growing city and the risks presented by climate change, ecosystem health needs and water resource protection. Billions of dollars will be required between now and 2050 to renew and adapt aging infrastructure. For this degree of cost, complexity and risk exposure, the industry standard best practice is to undertake a comprehensive planning process that incorporates a rigorous analysis of a wide range of potential options to achieve desired outcomes.

Sewer separation activities have been underway since the 1970s, and currently 54% of mainline sewers are separated, along with 58% of connections to properties. Some areas, including the Downtown peninsula and False Creek, are now largely separated due to targeted efforts to address historical water quality issues related to sewage. Receiving waters surrounding these largely separated areas, however, are still being impacted from sewage discharges from remaining CSOs, and polluted urban run-off. For most other areas of the city, sewer separation work has been targeted to replace end-of-life assets, and some separated sewers still drain into a combined system. An exception is the Champlain Heights neighbourhood, which is one of the newest areas of the city and the original utility servicing included separated sewers.

Completing sewer renewal and separation work city-wide has an estimated cost of \$3.7 billion⁴ in 2020 dollars, and would require major construction on ~46% of Vancouver's road network. For this reason, sewer separation work is generally targeted to replacing end-of-life assets, or is a by-product of capacity upgrades to serve new developments. The City has the regulatory commitment under the current LWMP to separate 1% of sewers annually and eliminate CSOs by 2050, originally established with consideration given to a long-term asset replacement approach as combined sewers reach end-of-life. The process to update this regulatory plan is currently scheduled to begin in 2021, and the SRMP provides a critical opportunity to review a diverse range of potential solutions to eliminate CSOs, and inform the update to the LWMP.

In July 2019, Council directed staff to report back on next steps for development of a plan to mitigate CSOs to achieve accelerated water quality outcomes by 2029. Since then, staff have undertaken a broad scan to identify leading cities⁵ who have undertaken planning work to eliminate CSOs and pollution from urban run-off. Staff have learned

⁴ \$3.7 billion is a high-level estimate based on recent years costs experienced in City construction. It includes \$2.8 billion for mainline sewer replacement, \$0.5 billion for City-side connection replacements and \$0.4 billion for overhead costs. This cost is based on 2020 dollars, and subject to inflation and construction cost escalation. It is limited to costs of City-owned infrastructure, and does not include sewer connection separation work that would be required on private properties. It also does not include GRI to address stormwater runoff pollution, pump stations or Metro Vancouver investments to the Iona Island Wastewater Treatment plant and conveyance infrastructure.

⁵ Staff have conducted a jurisdictional scan to understand what planning approaches have been taken by other cities with combined sewer systems to address pollution from CSOs and urban run-off. Leading cities identified include New York City, Seattle, Portland, Philadelphia, Copenhagen, London, Rotterdam, Ottawa, Edmonton, Toronto and Sydney.

that a range of different grey⁶ and green infrastructure solutions are being used by other cities, as well as a variety of policy and regulatory tools to reduce sewage and rainwater flows from private properties.

Staff have also learned that undertaking a comprehensive planning effort must factor in a range of risk areas and uncertainties, given the long time-scale for investments and costly nature of sewage and rainwater management infrastructure. In addition to the need to address pollution sewage and urban runoff, an integrated plan must also factor in climate change impacts, water resource security, population growth, aging infrastructure, seismic risk, equity and Reconciliation.

Building on the lessons learned in the development of the Rain City Strategy, new approaches to water management and GRI can provide a range of co-benefits. These include enhanced biodiversity, and improved human and ecological health through the fostering of natural systems. Staff recommend that the SRMP takes a comprehensive approach to evaluating and assigning appropriate value to such co-benefits, in context of the Rain City Strategy Direction #1: strive to become a water sensitive city. Figure 2 provides an artist's concept of what this could look like on the Vancouver harbour-front. Staff also recommend that the SRMP build on the lessons learned through recent integrated water initiatives which have utilized the One Water approach to planning.

FIGURE 2. ILLUSTRATIVE VISION OF A WATER SENSITIVE FUTURE



Illustration by Matthew Thompson

⁶ “Grey infrastructure” includes traditional conveyance-based infrastructure (e.g. pipes and pump stations), along with tanked storage and centralized treatment facilities.

Recommended Scope of a SRMP for Vancouver

The SRMP for Vancouver should guide policy, regulation, advocacy and strategic long-range investments for sewage and rainwater management. Based on pre-engagement activities, it is recommended that the SRMP be developed with the following goal areas in mind, subject to revision following engagement with partners, stakeholders and the public:

1. **Address pollution** arising from CSOs and urban runoff, strategically based on environmental risk and access to water priorities
2. **Minimize risks** to service levels and affordability associated with aging infrastructure, population growth, seismic events, and climate change including sea level rise, increased rainfall intensity, flooding, and drought
3. **Enhance biodiversity and improve health and well-being** through fostering natural systems
4. **Ensure efficient, cost effective investments and regulations** that deliver value and support prosperity for current and future generations
5. Support **equity** for all Vancouverites, **and Reconciliation** with Indigenous communities

The SRMP will focus on producing a range of deliverables that strategically define future infrastructure investments, interjurisdictional advocacy, policy and regulation. Appendix A provides a summary of key questions to be resolved by the plan.

A Collaborative Approach with Metro Vancouver

Sewage and rainwater management services are jointly provided by the City and Metro Vancouver. The City is responsible for providing sewer and drainage services to individual properties, and managing local collection and conveyance, while Metro Vancouver is responsible for major conveyance and sewage treatment infrastructure. To prevent suboptimal outcomes, planning work must holistically consider the infrastructure and services provided by both jurisdictions.

Metro Vancouver is scheduled to submit a review strategy for the LWMP to the Provincial regulator in late 2020, with the final LWMP update preliminarily scheduled to be completed and submitted to the Province by 2023. Following approval by the Province, the actions embedded in the LWMP will become legislated requirements for Metro Vancouver and member municipalities to adhere to.

Staff recommend a high level of collaboration with Metro Vancouver on all fronts of plan development, including information sharing, problem solving, system monitoring, and computer modelling, scenario development and analysis, and strategic decision making. In addition, a high level of coordination and collaboration will be required with Metro Vancouver's engagement process for the LWMP, as Metro Vancouver will be engaging with many of the same groups to be engaged with in the SRMP development (see section on Other Partners and Collaborators below). Metro also reviews municipal plans with regard to coordination of regional sewage and drainage servicing, and the

integration of this work with the Vancouver Plan is essential. This collaborative approach needs to address two key objectives:

1. Identify infrastructure, policy and regulation options that are optimized across the joint municipal-regional system; and
2. Align LWMP commitments and SRMP directions.

Other Partners and Collaborators

Building on the lessons learned through development of the Rain City Strategy, as well as other recent water initiatives, the development of an integrated SRMP will require input from a diverse range of voices. Key groups include:

- **Musqueam, Squamish and Tsleil-Waututh Nations:** The City of Vancouver acknowledges it is situated on the unceded traditional territories of the Musqueam, Squamish and Tsleil-Waututh peoples, and that each Nation has a rich living culture and history on these lands. An early discussion was initiated at a recurring quarterly meeting between Musqueam, Squamish and Tsleil-Waututh staff and City staff.

In addition, the City is aware of the Burrard Inlet Action Plan being developed by the Tsleil-Waututh Nation and is participating in the associated Water Quality Roundtable and Technical Working Group. This is an initiative being led by the Tsleil-Waututh Nation, in partnership with the Province to update the water quality objectives for Burrard Inlet.

Much more dialogue is needed to understand the needs and interests of local First Nations, to inform the collaboration approach and the development of the SRMP.

- **Senior Governments:** Environmental requirements that pertain to utility servicing cross jurisdictions of the Federal and Provincial Governments, and it is critical that the SRMP not only align with current regulatory requirements, but also incorporate flexibility to be able to adapt to potential future changes. This critical piece of work will also help Vancouver better advocate for regulatory evolutions that align with the most desirable strategies and outcomes. In addition, the development of new infrastructure will require significant investment, and early inclusion of senior government funding agencies in the plan development is essential. Engagement with senior levels of government will require a high level of coordination and alignment with Metro Vancouver.
- **Non-Profit and Community Groups:** a number of organizations have demonstrated interest in the protection of receiving waters.
- **The Development Community:** The SRMP will need to provide a roadmap that meets the utility servicing requirements associated with population growth and densification.

- **The General Public:** As part of the Vancouver Plan engagement process, opportunities will be sought to inform the public, interest groups and stakeholders, as well as solicit interest and input on development of the SRMP. In addition, further opportunities to engage the public will be identified and explored through the planning process. The engagement approach will need to factor in equity as an overarching objective in the plan development, particularly in the context of adapting utility servicing to uses of receiving waters and climate change impacts, including flooding, urban heat, and access to nature.
- **City Staff:** Development of the SRMP is a significant interdepartmental initiative. To ensure strategic alignment with other City policies, initiatives and programs deep engagement will be needed with staff from a number of City departments, including Engineering Services; Planning, Urban Design and Sustainability; Real Estate and Facilities Management; Development Buildings and Licensing; Finance, Risk and Supply Chain Management; and the Vancouver Board of Parks and Recreation.

Engagement activities will need to be tailored over time to address the rapidly changing landscape associated with the COVID-19 pandemic, and will be delivered in a consistent manner with engagement activities of other City planning initiatives. This may result in certain engagement activities being deferred to later stages of the plan development, with an initial focus of planning work to focus on technical current state analysis, environmental assessments, data gathering and modeling tools development. As part of the report back to Council in 2021, staff will provide an overall engagement update to Council.

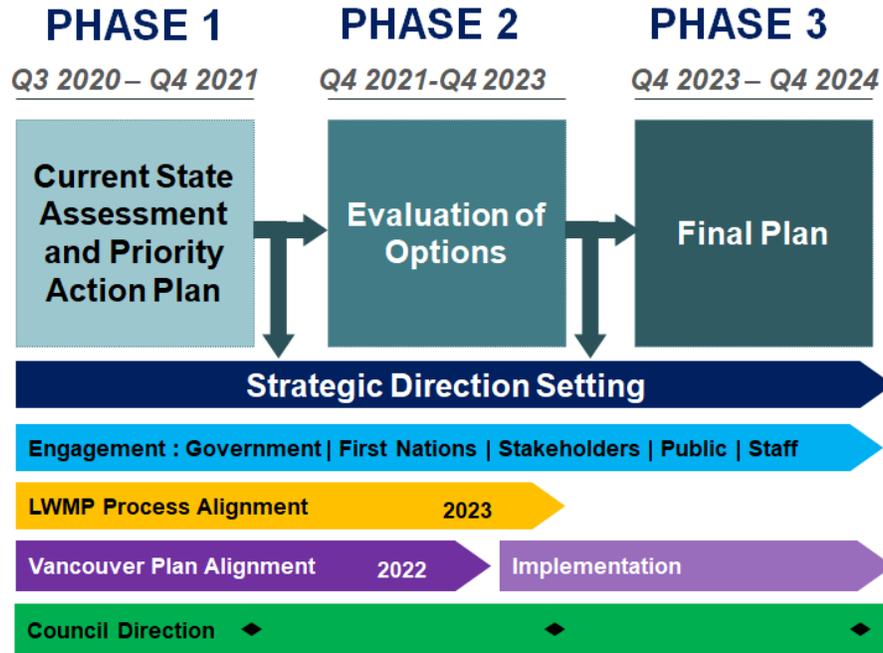
A Phased Approach to Plan Development

Staff recommend that a phased approach be taken in the development of the SRMP, factoring in planning approaches proven in leading jurisdictions. Partner, stakeholder and public engagement will be tailored to each phase of the plan development, with the approach tailored to factor in the COVID-19 pandemic as appropriate. The three phases of the proposed work plan are as follows, with the detailed work plan provided in Appendix A.

- **Phase 1 – Strategy, Current State Assessment, and Priority Action Plan:** Initial work will focus on fully defining the overarching strategic framework and then on developing the current state understanding, baseline projection and priority actions for analysis in Phase 2. Findings and recommendations will be framed against global and local leading practices. This phase will also identify short-term “no regrets” actions to take while planning to achieve accelerated water quality outcomes.
- **Phase 2 – Evaluation of Options:** This phase of work will focus on completing a staged and comprehensive analysis of a range of different infrastructure and policy solutions at different scales, utilizing the strategic framework of decision criteria developed in Phase 1. A key deliverable of this phase will be the identification of preferred pathways for detailed business analysis and plan development to take place in Phase 3.

- Phase 3 – Final Plan Development:** The optimal pathway will be further refined to guide City investments into the future. This includes detailed business case analysis, financing strategies and a long-term roadmap for infrastructure investments, operational improvements, policy and regulation and frameworks to support watershed planning and the prioritization of work.

FIGURE 3. A PHASED APPROACH TO PLAN DEVELOPMENT



The development of the SRMP has a number of interdependencies with the Vancouver Plan. For example, the SRMP will need to provide a servicing and funding strategy for meeting the water-related growth needs of the city, and it will also need to align with the environmental, social and economic policy of the Vancouver Plan. A high level of coordination is required on engagement and scenario development.

Subject to Council approval of Recommendation A, a consultant will be engaged with relevant global experience, combined with local knowledge and expertise, to support all phases of plan work as outlined in Appendix A.

3. Implications/Related Issues/Risk

Financial

The City and its customers face increasing cost pressures associated with maintaining, renewing and increasing the capacity and performance outcomes for sewer and drainage infrastructure. Future water infrastructure investments necessitated by population growth, asset renewal, water quality and ecosystem health protection and climate change are expected to be in the billions of dollars over the coming decades. There is a significant financial, social and environmental imperative to strategically examine how to deliver services efficiently and optimize investments in a financially sustainable way.

Currently, the local serving sewer and drainage infrastructure is managed by the City while larger regional infrastructure is managed by Metro Vancouver. A comprehensive plan is needed to manage a range of issues and risks, and achieve affordability and best-value outcomes for customers across the jointly managed system.

The 2019 to 2022 Capital Plan has allocated \$137 million for the renewal and separation of aging sewer pipes as part of the City's ongoing renewal program. A further \$111 million was planned for upgrades triggered by growth as part of a new program to respond to development. Based on current estimates, the cost to complete the separation of aging combined sewer pipes throughout the city as part of the renewal program is approximately \$3.7 billion.

Without further interventions or alternate approaches, sewer separation work may increase the volume of flows from urban run-off entering receiving waters. This may necessitate further action towards reducing pollution from runoff, which may include pollution prevention policies, expansion of green infrastructure or other water treatment solutions that have not yet been costed. A comprehensive plan and options analysis is needed to identify the best value strategies for Vancouver to address CSOs and urban runoff pollution while easing the stress on infrastructure caused by climate change and population growth. It is also needed to inform the substantial asset renewal and growth related investments the City makes annually to transform the system over time to meet future needs and desired outcomes.

An approved multi-year capital project budget of \$2.4 million is already in place to hire initial staff and secure a consultant to proceed with Phase 1 work. Future phases of work will be subject to Council approval of the related capital budgets in 2021 and beyond. Staff view this planning work as a critical investment given the billions of dollars of infrastructure investments required in the decades to come.

Environmental

Despite significant progress over recent decades, billions of litres of CSOs are still discharged every year into receiving water environments. The Vancouver Sewage Area has one of the largest volumes of CSO discharges across the country and has a regulatory requirement to eliminate CSOs by 2050. Sewage discharges impact the environment and are one potential factor under investigation related to summertime beach closures. It is also recognized that polluted urban runoff can result in significant environmental and ecological impacts. Development of the SRMP is essential for understanding and addressing aquatic pollution arising from sewage discharges and polluted urban runoff.

In addition, the impacts of climate change, including increasing intensity of rainfall events, sea level rise, and drought create significant risk for the city, its people and ecosystems. The SRMP will include a roadmap for adapting the City's sewage and rainwater management services to a changing climate.

Building on the framework of the Rain City Strategy, the SRMP will place appropriate value on solutions that help mimic and restore the natural water cycle in Vancouver and help reduce pollutant discharges to our waterways, including False Creek, Burrard Inlet and the Fraser River. An ecological risk-based approach will focus on using resources wisely and optimizing benefits and costs across multiple community objectives.

Legal

Vancouver has regulatory obligations it must meet around the elimination of combined sewer overflows, implementing its IRMP and reducing the impacts of our sewer and drainage system on local receiving waters. The City's efforts to meet its obligation to eliminate combined sewer overflows by 2050 require an accelerated and diversified approach, and development of a SRMP is essential for charting Vancouver's path to meeting its regulatory obligations and reducing risks associated with non-compliance and environmental impacts.

In addition, the SRMP is proposed to inform the development of the updated LWMP, which will serve as a new regulatory framework beyond 2023.

Equity, Intersectionality and Reconciliation with Indigenous Peoples

Considering how an intersectional lens can be applied to planning sewage and rainwater management services will require considering the legacy of inequitable distribution of investment and system benefits and impacts within communities in the city.

Concepts such as accessibility to water resources and infrastructure, public health, environmental justice, cultural and spiritual values, public participation, and place making can all be found within the sphere of influence of the SRMP. The SRMP also provides an opportunity to address action areas associated with reconciliation and greater and more meaningful collaboration with Musqueam, Squamish, Tsleil-Waututh Nations, and urban Indigenous communities.

CONCLUSION

Sewage and polluted urban runoff enter Vancouver's waterbodies, impacting the environment and are one contributor limiting public access to waters, including summertime beach closures. In addition, sewer and drainage infrastructure is insufficient for meeting the needs of a growing city and the risks presented by climate change.

This report recommends the development of a comprehensive Sewage and Rainwater Management Plan for Vancouver. This would comprise of a long term action and investment plan to address sewage and urban run-off pollution and renew infrastructure through measures that meet the needs of a growing city, are adaptive to climate change, foster Vancouver's natural systems, and support health and resilience. The Plan will be developed in close coordination with the Vancouver Plan so that social, economic, environmental, cultural, growth management and land-use directions are closely aligned with effective sewer and rainwater management strategies.

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APPENDIX A: SCOPE AND WORK PLAN FOR A SEWAGE AND RAINWATER MANAGEMENT PLAN FOR VANCOUVER

The SRMP will focus on producing a range of deliverables that strategically define future infrastructure investments, interjurisdictional advocacy, policy and regulation. Table 1 provides a summary of key questions to be resolved by the plan.

TABLE 1. KEY QUESTIONS TO BE ADDRESSED BY THE SRMP

Infrastructure	Interjurisdictional Advocacy	Policy and Regulation
<ul style="list-style-type: none"> • How do we optimize the performance of our existing infrastructure? • What are the decision frameworks at the citywide and watershed scale to determine where, when and what investments should be made to the piped network, green rainwater infrastructure, and decentralized water reuse and treatment? • What are the prioritized short and long term capital requirements and strategic investments for the next 30 years? • What measures can be put in place to ensure that the plan is adaptive, incorporating new information and lessons learned? 	<ul style="list-style-type: none"> • What collaboration is required with Metro Vancouver infrastructure and operating practices meet shared objectives? • What commitments are needed in the Metro Vancouver LWMP? • What are our requests of senior levels of government, in coordination with Metro Vancouver, for policy, regulation and funding? 	<ul style="list-style-type: none"> • What performance criteria and service levels do we use to guide water management? • What changes are needed to ensure climate change, risk and ecosystem health are integrated into planning? • What changes are needed to ensure that sewage and rainwater management are considered upfront in land use and community planning? • What level of risk is acceptable? How do we manage risk through capital and operations programs • What by-law amendments and development policies are needed?

Based on review of best practices, staff recommend that a phased approach be taken in the development of the SRMP, factoring in planning approaches proven in leading jurisdictions. Partner, stakeholder and public engagement will be tailored to each phase of the plan development, with the approach tailored to factor in the COVID-19 pandemic as appropriate. The three phases of the proposed work plan are described below:

PHASE 1 – STRATEGY, CURRENT STATE ASSESSMENT, AND PRIORITY ACTION PLAN:

Initial work will focus on fully defining the overarching strategic framework and then on developing the current state understanding, baseline projection and priority actions for analysis in alignment with the framework. Findings and recommendations will be framed against global and local leading practices. A key action item is identification of short-term “no regrets” actions to take while planning to achieve accelerated water quality outcomes. The work will include the following activities:

- Partner and stakeholder engagement will inform the foundational strategic framework of objectives for the SRMP, which will also support water-related aspects of the Vancouver Plan. This framework will be subject to refinement in later stages of the plan process.

- Complete a current-state assessment of City, Park Board and Metro Vancouver sewage and rainwater management systems, including comparison with global leading practices, benefits, risks and costs.
- Expansion of system monitoring to improve understanding of how existing sewage and rainwater infrastructure performs, and development of computer modelling tools to support Phase 2 options analysis.
- Analysis will be completed to forecast where the city will be in 2030 and 2050, if existing programs and practices do not change. This will include an assessment of risks associated with climate change, receiving waters environmental health, population growth and aging infrastructure.
- Recommendations will be made for actions to take while planning, including immediate “no regrets” actions to achieve accelerated water quality outcomes.
- Development of decision criteria and frameworks to guide evaluation of potential solutions to address plan objectives.

PHASE 2 – EVALUATION OF OPTIONS:

This phase of work will focus on developing options that are consistent with the decision criteria and framework developed in Phase 1. The work will include the following activities:

- Develop recommendations for optimizing existing capacity and system performance
- Complete a staged and comprehensive analysis of a range of potential infrastructure and policy solutions at a variety of scales
- Select preferred pathway(s) for Phase 3 business analysis and SRMP development
- Generate recommendations for inclusion in Metro Vancouver LWMP and for integration with regional infrastructure and system planning

PHASE 3 –FINAL PLAN DEVELOPMENT:

The optimal pathway will be further refined to guide City investments into the future. The work will include the following activities:

- Complete detailed business case analysis of short-listed solution options
- Develop financial plan, including funding strategy
- Develop long-term green and grey infrastructure plan and road map
- Recommend operational improvements

- Recommend policy and regulatory changes to support plan objectives
- Frameworks for watershed planning and prioritization of work
- Asset management recommendations
- Key performance indicators and targets to guide Plan
- Triggers and milestones to adapt the plan to changing conditions such as those brought on by climate change