

## Appendix F

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# Transformative Directions and Action Plans

The Rain City Strategy consists of transformative directions that are meant to be implemented in the medium and long term, with three GRI action plans that define the efforts needed in the near term. This appendix provides the Transformative Direction Action Plan and the action plans related to (1) Streets and Public Spaces, (2) Buildings and Sites and (3) Parks and Beaches. Altogether, the strategy is recommending nine transformative directions and 46 implementation and enabling programs. Sample actions are also associated in each program to support the delivery of the high-level programs and advance the implementation of GRI assets across the city.



# Rain City Strategy - Transformative Directions [Directions]

Transformative Direction Details			Transformative Direction Status & Milestones			Contribution to Rain City Strategy Objectives Legend: ●○○ = low, ●●○ = medium, ●●● = high						Evaluation Legend: ●○○ = low ●●○ = medium ●●● = high		
Direction No.	Transformative Direction Title	Transformative Direction Description	Direction Status (Expand Existing Direction or New Direction)	Next Milestone	Next Milestone Year	Remove Pollutants	Reduce Volume Entering Pipes	Increase Green Area	Increase Managed Impervious Area	Mitigate Urban Heat Island Effect	Encourage Greater Harvest & Reuse	Impact	Effort	Criticality
TD-01	Strive to become a water sensitive city	Embed water sensitive values and design principles into integrated water utility planning and urban and land use planning to ensure that water is considered, managed and valued across all planning scales at sites, districts, areas and citywide. Encourage greater adoption of water sensitive design principles by incorporating water resource management as a core element of City-Wide Plan.	New Direction	Engage the City-Wide Plan Working Group to integrate water sensitive design principles into the City-Wide Plan.	2019	●●●	●●●	●●●	●●●	●●○	●●●	●●●	●●●	●●●
TD-02	Respond with urgency to climate change	Develop and adopt a more holistic way of planning, delivering and managing water resources, utilities and green rainwater infrastructure to adapt to a changing climate in accordance with city council's Climate Emergency Response, the Climate Adaptation Strategy and the Resilience Strategy. This work will include conducting a vulnerability assessment of sewer and drainage system risks, overland flood risks, economic risks, lifeline infrastructure risks, and others. It will identify priority areas to undertake GRI and other climate adaptive measures to avoid and/or mitigate negative impacts associated with frequent and intense rainfall events.	Expand Existing Direction	Convene a working group to define scope, deliverables and timelines to conduct a citywide climate vulnerability & risk assessment.	2020	●●○	●●●	●●●	●●●	●●●	●●●	●●●	●●○	●●●
TD-03	Accelerate action to protect the health and vitality of surrounding waterbodies	Revisit the City's current strategy for eliminating combined sewer overflows to assess current state and clarify goals and objectives beyond combined sewer overflow mitigation. An integrated grey and green rainwater infrastructure approach is expected to achieve improved water quality, climate resilience and social outcomes than a grey-only strategy. Research is needed to benchmark grey-green approaches by other leading municipalities, better understand the current system performance, identify gaps and evaluate the best value for money approaches to optimize existing infrastructure and deliver new infrastructure to mitigate combined sewer overflows from each of the city's watersheds.	New Direction	Convene a working group to define scope, deliverables and timelines.	2020	●●●	●●●	●●○	●●○	●●○	●●○	●●●	●●○	●●●
TD-04	Revitalize watersheds and waterfronts to enable communities and natural systems to thrive	Develop urban watershed plans for each of Vancouver's 19 urban watersheds. This analysis will include an assessment of the watershed's current land use, physical waterfront, environmental, ecological, biological, social and infrastructure characteristics. Ultimately, they will propose a suite of capital projects, programs, operational improvements, and policy recommendations that collectively meet the specific challenges and priority objectives of each watershed. Implementation of watershed plans should be prioritized based on needs such as contribution to combined sewer overflows, major urban development projects, climate adaptation, enhancing waterfront access, flood management, ecological function, equity and other needs.	New Direction	Convene a working group to define scope, identify priority watersheds and deliverables and timelines	2019	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●

Transformative Direction Details			Transformative Direction Status & Milestones			Contribution to Rain City Strategy Objectives Legend: ●○○ = low, ●●○ = medium, ●●● = high						Evaluation Legend: ●○○ = low ●●○ = medium ●●● = high		
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TD-05	Shape systems to integrate and value all forms of water	Develop an integrated approach to utility planning, where all water within and around the city is treated as a valued resource for protecting and enhancing the community and the environment. An integrated water utility framework ensures that the management, construction and utilization of our water resources and infrastructure is conducted in a holistic manner, where all types of water are leveraged to achieve additional benefits. Apply the framework to develop and adopt a strategic approach to funding and financing of water utilities based on optimizing existing assets and prioritizing new capital investments to achieve the best outcomes. Integrated utility planning is a major component of watershed plans, and a step towards becoming a water sensitive city.	Expand Existing Direction	Convene a working group to define scope, deliverables and timelines	2020	●●●	●●●	●●●	●●●	●●○	●●●	●●●	●●●	●●●
TD-06	Explore intersectionality, equity, and Indigenous reconciliation through urban water management	Undertake an inclusive dialogue with a broad range of voices and to explore how reconciliation and intersectionality can guide green rainwater infrastructure policies, programs and integrated water utility investments to address historic and systemic inequality. Initiatives may be guided by the foundational components of the framework for City of Reconciliation.	New Direction	Convene a working group to define scope, deliverables and timelines.	2020	●●○	●●○	●●●	●●○	●●●	●●○	●●●	●●○	●●●
TD-07	Drive innovation and system effectiveness through data and analytics	Acquire a comprehensive understanding of rainfall patterns, water quality, green rainwater infrastructure performance and sewer and drainage system performance and the many other related systems and characteristics of the urban watersheds through monitoring, data collection, data analytics and hydrologic and hydraulic modelling.	Expand Existing Direction	Continue to expand citywide data collection, analytics, monitoring and hydrologic and hydraulic model development.	2019	●●●	●●●	●●○	●●○	●●○	●●○	●●●	●●○	●●●
TD-08	Enable a culture of collaboration	Facilitate a shift in city culture and process to enable the successful implementation of the Rain City Strategy as part of the city's transition to a water sensitive city. Encourage this shift through greater cross-departmental and cross-branch collaboration and updating internal processes to improve coordination and alignment. Staff knowledge and capacity to support the implementation of the Rain City Strategy will be strengthened through training, standards, guidelines and other approaches and tools.	Expand Existing Direction	Continue to formalize the structure and roles of the branches within the Integrated Strategy & Utility Planning division.	2019	●●○	●●○	●●○	●●○	●●○	●●○	●●●	●●●	●●●
TD-09	Invest in education, capacity-building and partnerships to mobilise action	Engage and educate industry professionals, other levels of government, not-for-profits and academia on how and why the city is shifting its approach to rainwater management through an integrated water approach and climate resiliency as part of transitioning to a water sensitive city. Use these engagements to share knowledge and build capacity of industry, government and academia to support the implementation of integrated approaches to water management, including green rainwater infrastructure, across the city. Engage with practitioners and the public to raise awareness of rainwater management, climate change and green rainwater infrastructure, empowering them to take positive actions in their community.	Expand Existing Direction	Convene a working group to define scope, identify priority watersheds and deliverables and timelines	2020	●●○	●●○	●●○	●●○	●●○	●●○	●●●	●●○	●●●

## Rain City Strategy - Transformative Directions [Sample Actions]

Transformative Directions & Associated Sample Actions	
Direction and Action No.	Transformative Directions & Associated Action Descriptions
<b>TD-01</b>	<b>Strive to become a water sensitive city</b>
1.1	Engage the City-Wide Plan Working Group to integrate water sensitive design principles into the City-Wide Plan.
1.2	Develop an engagement and education plan to promote a water sensitive approach in utility plans, land use plans, urban design plans and parks plans.
1.3	Engage with stakeholders and partners to promote the city's water sensitive objectives including Metro Vancouver, Provincial and Federal Ministries and others.
<b>TD-02</b>	<b>Respond with urgency to climate change</b>
2.1	Convene a formal working group to define scope, deliverables, and timelines to conduct a citywide climate vulnerability & risk assessment.
2.2	Reduce rainwater and wastewater inputs to the sewer network using green rainwater infrastructure, grey infrastructure and water conservation and efficiency approaches.
2.3	Monitor, record and communicate the wider climate adaption benefits of green rainwater infrastructure.
2.4	Strategic application of green rainwater infrastructure to maintain and expand the urban forest for instance by increasing soil volumes and access to water.
2.5	Undertake a vulnerability and risk assessment (at citywide, watershed, district and site scales) to a changing climate (rainfall, heat, drought and sea level rise).
2.6	Utilize vulnerability and risk assessment data to inform built form across the city.
2.7	Continuously refine design standards (i.e., IDF curves) to account for the latest climate change projections.
2.8	Undertake research and benchmark design standards from other jurisdictions with regards to climate change projections.
2.9	Map and design a resilient lifeline infrastructure network.
<b>TD-03</b>	<b>Accelerate action to protect the health and vitality of surrounding waterbodies</b>
3.1	Convene a formal working group to define scope, deliverables, and timelines.
3.2	Undertake review of policy(ies) on sewer connections on private properties.
3.3	Explore and develop a restorative action plan on cross-connections for combined sewer overflow.
3.4	Explore partnership with Port of Vancouver on water quality.
3.5	Explore engagement with Vancouver Aquarium and Ocean Wise pollution tracker.
3.6	Develop an engagement strategy to communicate and engage residents on what they can do to mitigate combined sewer overflows (e.g. real-time text alerts like the NYC Wait campaign).
3.7	Undertake research and benchmark combined sewer overflow mitigation strategies in other jurisdictions.
3.8	Engage stakeholders to explore the opportunity of enhancing the treatment capability of the Iona Wastewater Treatment facility

## Transformative Directions & Associated Sample Actions

Direction and Action No.	Transformative Directions & Associated Action Descriptions
<b>TD-04</b>	<b>Revitalize watersheds and waterfronts to enable communities and natural systems to thrive</b>
4.1	Convene a formal working group to define scope and to identify priority watersheds and waterfronts, deliverables, and timelines.
4.2	Work with partners to develop and adopt a clear definition of watersheds and watershed plans.
4.3	Scope the planning, design and construction of surface water expression green rainwater infrastructure practices in relation to historic waterways and other networks (i.e. blue-green networks, bikeways).
4.4	Develop and adopt watershed-specific rainwater infiltration and detention targets and design specifications
4.5	Identify infiltration potential on a citywide scale (i.e. block by block geotechnical investigation)
4.6	Develop and adopt a watershed bylaw that would enable watershed specific targets and design specifications.
4.7	Develop and adopt a waterfront bylaw that would enable waterfront specific targets and design specifications.
4.8	Establish a pilot watershed planning approach in Oakridge Town Centre and Cambie Corridor.
4.9	Establish a pilot featuring water sensitive approaches for on-site and capital projects.
4.10	Identify and quantify biodiversity and wildlife habitat relating to green rainwater infrastructure. Set objectives for species and populations of wildlife (targets).
4.11	Delineate a citywide green rainwater infrastructure network including ecosystem hubs, sites, and corridors.
4.12	Develop an internal process for managing the planning and delivery of projects led by green rainwater infrastructure as identified through watershed plans.
4.13	Include public consultation to find creative and local ideas and flavours or collect local knowledge.
4.14	Undertake collection of data to understand watershed's groundwater characteristics (i.e., location of groundwater or soil contamination, aquifer characteristics, and other data)
4.15	Explore community outreach or educational programs to define watershed.
4.16	Identify the overland flow conveyance to receiving waterbodies including major and minor drainage systems.
4.17	Identify major public spaces, parks, schools that intersect with drainage paths.
4.18	Evaluate major drainage flow path into low lying areas that are or will become diked in the future to address sea level rise.
4.19	Reserve a proportion of land area in the community planning process for water management (i.e. 10%). The spaces set aside can be multi-functional and allow for other uses including planting either on grade or on structure.
4.20	Develop a full drainage assessment including green rainwater infrastructure tools early in community planning process to identify infiltration potential, city controlled land or right-of-way, natural topography, access to stormwater, and partnering opportunities to locate district serving stormwater assets.

## Transformative Directions & Associated Sample Actions

Direction and Action No.	Transformative Directions & Associated Action Descriptions
4.21	Reconcile cross-departmental definitions of terms like permeable and impermeable. (i.e., areas of soil and landscape may be classified as permeable, but permeable pavement may not in some departments).
4.22	Explore regulation options to limit impermeable areas such as paved yards, roads, sidewalks, parking spaces, and alleys by using permeable materials (i.e. AstroTurf).
4.23	Align infrastructure, utility and land use planning and include green rainwater infrastructure to ensure improvements in water quality, healthy watersheds, and water sensitive urban design.
4.24	Establish a citywide target on maximum percent impervious area requirement.
4.25	Work with external stakeholders who have jurisdiction at waterfront boundaries.
4.26	Engage and work with non-governmental organization (NGOs) to develop a comprehensive planning and designing of GRI to protect and enhance the city's waterfront.
4.27	Engage and work with Park Board to develop an integrated approach on planning and designing of GRI to help mitigate ecological threats to the city's waterfront.
4.28	Engage and work with Park Board to develop an integrated approach to restore degraded natural waterfront areas and shorefront habitats.
4.29	Improve water quality through GRI implementation that benefits natural habitats, support public space amenities, and enhance city's waterfronts.
4.30	Engage and work with federal and local agencies to improve regulation, coordination, and oversight of the waterfront and waterways.
4.31	Engage with the public to increase scientific understanding, public awareness, and stewardship of the natural waterfront.
<b>TD-05</b>	<b>Shape systems to integrate all forms of water</b>
5.1	Demonstrate leadership in integrated water utility planning through development of Cambie Corridor and Broadway Area Utility Plans.
5.2	Explore opportunities of managing private property runoff on streets and public spaces such as laneway storage opportunities (i.e. Flats Rainwater Management Plan)
5.3	Apply an integrated water framework to develop and adopt a strategic approach to funding and financing of water utilities based on optimizing existing assets through asset management and operation and maintenance activities and prioritizing new capital investments to achieve the best outcomes.
5.4	Undertake comprehensive review of bylaws for conflicts and alignment with the IRMP and Rain City Strategy goals and targets
5.5	Develop and adopt a rainwater bylaw that provides a framework for regulating rainwater on public and private property.
5.6	Work with others to embed an integrated water utility framework into land use planning.
5.7	Engage senior staff across city departments to inform and obtain buy-in on an integrated approach to water utility planning through the One Water Steering Committee and other governance structures.

## Transformative Directions & Associated Sample Actions

Direction and Action No.	Transformative Directions & Associated Action Descriptions
<b>TD-06</b>	<b>Explore reconciliation with Indigenous communities, intersectionality, and equity through water</b>
6.1	Listen, learn and co-create a shared understanding of equity and reconciliation with Indigenous communities, particularly as it relates to rainwater management and green rainwater infrastructure, with a variety of communities and knowledge holders.
6.2	Undertake research with thought leaders in the community and peer cities to understand how equity could be incorporated into integrated water utility services. This work inspires thinking of how equity objectives could be integrated into water and green rainwater infrastructure planning, design and implementation.
6.3	Engage with First Nations and Indigenous community to learn about local traditional ecological knowledge (TEK) and how it can inform planning, programs and implementation of GRI and integrated water utility.
6.4	Participate and help shape the development of a City-wide Equity Framework being led by Arts, Culture, and Community Services department at the City of Vancouver. Use the Equity Framework as a guide to apply intersectional equity lens in the planning, designing, and managing of integrated water utilities, including green rainwater infrastructure, across the city.
6.5	Use the City of Reconciliation framework as a guide to inform the planning, designing and managing of integrated water utilities, including green rainwater infrastructure across the city.
<b>TD-07</b>	<b>Drive innovative and system effectiveness through comprehensive data and analytics</b>
7.1	Continue to expand citywide data collection, analytics, monitoring and hydrological and hydraulic model development.
7.2	Update baseline data and metrics with climate change indicators.
7.3	Update baseline data and metrics with remote sensing.
7.4	Develop and adopt a flow monitoring requirement.
7.5	Develop data collection and management method to ensure that all co-benefits of green rainwater infrastructure can be effectively monitored and measured.
7.6	Develop performance audit procedure for green rainwater infrastructure practices.
7.7	Continue to develop green rainwater infrastructure monitoring program
7.8	Explore the use of smart controls and sewer system optimization to reduce the occurrence and volume of combined sewer overflows.
7.9	Develop a more comprehensive citywide hydrologic and hydraulic model.
7.10	Develop metrics and dashboards for parameters being monitored that can be used to track changes and improvements to water utilities over time.
7.11	Undertake study to better understand the connectivity of the city's impervious areas to the sewer and drainage network, including effective impervious areas across the city. Identify areas with low and high connectivity to the sewer and drainage network and use findings to inform where to prioritize green rainwater infrastructure retrofits.



## Transformative Directions & Associated Sample Actions

Direction and Action No.	Transformative Directions & Associated Action Descriptions
<b>TD-08</b>	<b>Enable a culture of collaboration</b>
8.1	Continue to formalize the structure and roles of the branches within the city's Integrated Strategy & Utility Planning Division.
8.2	Update internal processes to better enable coordination and alignment across the city's Branches, Divisions, and Departments when planning for water.
8.3	Develop or update governance structure to better support and enable cross-departmental collaboration.
8.4	Develop a change management plan to support the city staff involved in changes to their work plans and ways of doing work as part of delivering the Rain City Strategy.
8.5	Develop and adopt training of City staff for design and construction and reinstatement of existing green rainwater infrastructure practices.
8.6	Develop a community (ecosystem) of practice to improve knowledge sharing, data collection and sharing, education around implementing green rainwater infrastructure, and how industry and community can get involved and contribute to achieve the vision, goals and targets and make resilient neighborhoods.
8.7	Conduct training for City of Vancouver operations staff on green rainwater infrastructure fundamentals and on how to undertake operation and maintenance of the different types of green rainwater infrastructure assets deployed on streets and public spaces.
8.8	Organize a workshop for City Staff on erosion and sediment control on streets and public spaces, and on construction sites.
8.9	Develop communication strategy, branding, or messaging with consistent terms for green rainwater infrastructure and rainwater management.
8.10	Engage with First Nations to learn about local traditional ecological knowledge (TEK) and how it can be incorporated in the design process of green rainwater infrastructures.
8.11	Develop and/or improve existing Green Streets framework to include green rainwater infrastructure adoption or sponsorship program, with additional resources and staffing.
8.12	Undertake research on how to reach a broad cross-section of people across the city to ensure inclusive engagement.
8.13	Develop an educational material or campaign on financing green rainwater infrastructure, the associated cost, and the potential savings in streets and public spaces.

## Transformative Directions & Associated Sample Actions

Direction and Action No.	Transformative Directions & Associated Action Descriptions
<b>TD-09</b>	<b>Invest in education, capacity-building and partnerships to mobilise action</b>
9.1	Convene a formal working group to define scope and to identify priority watersheds, deliverables, and timelines.
9.2	Develop and launch a public awareness and empowerment campaign on green rainwater infrastructure and water management.
9.3	Focus the awareness and empowerment campaign on peer normalization through community based social marketing.
9.4	Improve educational and engagement approach around the role and value of nature in the city in relation to water management.
9.5	Engage with Science World about providing educational opportunities around rainwater management.
9.6	Engage with suppliers and product vendors to support a competitive green rainwater infrastructure market place.
9.7	Support regional capacity building initiatives for green rainwater infrastructure contractors, inspectors, and operators, such as the National Green Infrastructure Certification Program (NGICP) or other training programs.
9.8	Explore partnerships with post-secondary institutions on how to include green rainwater infrastructure in their course material (e.g. EGBC, UBC, SFU, BCIT etc.).
9.9	Explore how the city can facilitate capacity building initiatives for current and new practitioners such as professional development for designers and training sessions for industry professionals (e.g. industry leader talks, courses, presentations, master gardener training).
9.10	Establish a workforce development targeting local trades schools and programs in construction and horticulture.
9.11	Explore marketing strategies for real estate owners and developers related to green rainwater infrastructure assets (i.e. Salmon Safe Certification).
9.12	Undertake research to identify successful public engagement campaigns focused on what residents can do with respect to green rainwater infrastructure, water conservation and mitigating combined sewer overflows. Adapt and implement appropriate campaigns to reduce rainwater runoff, reduce discharges to the combined sewer network and mitigate combined sewer overflows (such as NYC's Wait campaign).

# Rain City Strategy - Streets and Public Spaces Action Plan [Programs]

Program Details			Program Status & Milestones			Contribution to Rain City Strategy Objectives Legend: ●○○ = low, ●●○ = medium, ●●● = high						Evaluation Legend: ●○○ = low ●●○ = medium ●●● = high		
Program No.	Program Title	Program Description	Program Status (Expand Existing Program or New Program)	Next Milestone	Next Milestone Year	Remove Pollutants	Reduce Volume Entering Pipes	Increase Green Area	Increase Managed Impervious Area	Mitigate Urban Heat Island Effect	Encourage Greater Harvest & Reuse	Impact	Effort	Criticality
<b>IMPLEMENTATION PROGRAMS</b>														
S&PS-01	<b>New Capital Projects Green Rainwater Infrastructure Integration Program</b>	Expand the implementation of green rainwater infrastructure beyond the existing opportunistic approach by making its implementation standard practice by developing and adopting design standards, targets, guidelines, capital and lifecycle financial plans and internal processes. These tools shall be used to facilitate the implementation of green rainwater infrastructure in new capital projects in streets and public spaces.	Expand Existing Program	Convene a working group to define scope, deliverables and timelines.	2020	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●
S&PS-02	<b>Strategic Retrofits Green Rainwater Infrastructure Program</b>	Expand the implementation of green rainwater infrastructure beyond the existing opportunistic approach by developing and adopting design standards, targets, guidelines, capital and lifecycle financial plans and internal processes to facilitate retrofitting existing streets and public spaces with green rainwater infrastructure.	New Program	Convene a working group to define scope, deliverables and timelines.	2020	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●
S&PS-03	<b>Blue-Green Systems that Enable Water Management and Biodiversity Program</b>	Implement green rainwater infrastructure along streets and public spaces as an integral part of blue-green systems. These systems optimize rainwater management from adjacent streets, increase urban forest cover and provide corridors for enhanced biodiversity and wildlife connectivity. Pilot and demonstration projects will be implemented to determine how to best integrate and align these with the city's active transportation routes. The findings from these pilot and demonstration projects shall be applied to streamline the delivery of blue-green systems across the city.	New Program	Convene a working group to define scope, deliverables and timelines.	2020	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●
S&PS-04	<b>Permeable Pavement Program</b>	Undertake research to assess the opportunities, barriers, lessons learned and business case for the use of permeable pavement on the city's streets and public spaces. Use research findings to develop and implement a program to facilitate the effective design, construction and maintenance of permeable pavement.	New Program	Convene a working group to define scope, deliverables and timelines.	2020	●●○	●●●	●○○	●●○	●●○	●○○	●●○	●●○	●●○
S&PS-05	<b>Laneway Rehabilitation &amp; Retrofit Program</b>	Undertake research to assess the opportunities, barriers, lessons learned and financial tools and mechanisms for retrofitting laneways to enable them to manage rainwater runoff and potentially adjacent private properties. Use research findings to develop and implement a retrofit program with new laneway typologies and integrate green rainwater infrastructure into existing city rehabilitation programs.	New Program	Convene a working group to define scope, deliverables and timelines.	2020	●●○	●●●	●○○	●●●	●○○	●○○	●●●	●●●	●●○

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S&PS-06	<b>Green Rainwater Infrastructure Pilot and Demonstration Project Program</b>	Implement innovative green rainwater infrastructure practices at select locations in streets and public spaces. Document lessons learned during the design and construction of the practices as well as performance monitoring data and incorporate learnings as part of an adaptive management process to enhance the ongoing delivery of green rainwater infrastructure.	Expand Existing Program	Existing demonstration projects are being monitored and evaluated while new demonstration projects are being built, including new stormwater tree trench designs for bikeways, dry wells, and updated bioretention corner bulge designs. Evaluations and monitoring will be reported on regularly with the next report coming in 2020.	2020	●●○	●●○	●●○	●●○	●●○	●●○	●●●	●●○	●●○
S&PS-07	<b>Streets and Public Spaces Adjacent to Schools Green Rainwater Infrastructure Retrofit Program</b>	Work with School District and Schools to explore potential opportunities for engaging students to learn and be part of the water cycle by implementing and maintaining green rainwater infrastructure on streets and public spaces adjacent to school grounds.	New Program	Engage with school district to explore synergies and opportunities for green rainwater infrastructure implemented on streets and public spaces adjacent to schools.	2020	●●○	●●○	●●○	●●○	●●○	●○○	●●●	●●○	●●○
S&PS-08	<b>District Scale Non-potable Water Systems Program</b>	Undertake research to assess the business case, opportunities and barriers for district scale non-potable water systems in Vancouver. Develop and modify policies to enable the development of safe and well-regulated district scale non-potable water systems.	New Program	Convene a working group to define scope, deliverables and timelines.	2020	●●○	●●○	●○○	●○○	●○○	●●●	●●○	●●●	●●○
S&PS-09	<b>Green Rainwater Infrastructure Asset Management Program</b>	Clarify green rainwater infrastructure asset management roles and responsibilities with partners, including asset stewardship and maintenance responsibilities. Identify sustainable funding mechanisms and develop plans to finance the management of assets over their life cycle. Streamline internal processes and adopt standards to facilitate the management of green rainwater infrastructure assets to preserve and optimize their service life.	Expand Existing Program	The Asset Management & Infrastructure Planning Project, which began in May 2019 and will continue into 2020, is evaluating asset management department-wide. The project consultant will have an additional focus on how green rainwater infrastructure assets can be most effectively managed among the branches with shared responsibilities.	2020	●●○	●●○	●●○	●●○	●●○	●●○	●●○	●●●	●●●

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S&PS-10	Green Rainwater Infrastructure Operation and Maintenance Program	Work with partners to investigate service delivery models for green rainwater infrastructure operation and maintenance, including the potential for a stewardship-based model. Identify sustainable funding mechanisms and develop plans to finance operation and maintenance activities. Select the preferred service delivery model and streamline internal processes to enable the effective operation and maintenance of green rainwater infrastructure that preserves and extends their level of service.	New Program	Develop options for sustainable funding mechanisms to support ongoing operation and maintenance activities & trial maintenance procedures with appropriate operation branches and formalize into standard operating procedures.	2020	●●○	●●○	●●○	●●○	●●○	●●○	●●○	●●●	●●●
S&PS-11	Sediment Management and Source Control Program	Work with partners to develop and adopt a holistic program for limiting and managing sediment deposited on streets and public spaces and captured by green rainwater infrastructure practices, drains, catch basins and sewers. Identify potential sources and 'hot spots' for sediment and how to better manage these to protect sediment accumulation on streets and public spaces and to ensure that green rainwater infrastructure practices are protected from heavy sediment loads.	New Program	Engage the Solid Waste Program Management branch to create an integrated approach including street sweeping, catch basin cleaning, erosion and sediment control and green rainwater maintenance sediment removal to improve system performance and reduce pollutant discharge to receiving waterbodies.	2020	●●●	●●○	●○○	●●○	●○○	●○○	●●○	●●○	●●○
<b>ENABLING PROGRAMS</b>														
S&PS-12	Citywide Green Rainwater Infrastructure Financial Planning and Sustainable Funding Program	Identify sustainable sources of long-term funding for green rainwater infrastructure, including funding sources associated with pollutant generation. Use funding source(s) to develop and implement a holistic financial plan that encompasses capital costs, asset management and operation and maintenance to enable green rainwater infrastructure implementation in capital projects and retrofits in streets and public spaces. Undertake research to develop a business case to identify funding requirements to manage these assets to preserve and extend their service life and level of service.	New Program	Convene a working group to define scope, deliverables and timelines.	2020	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●
S&PS-13	Research and Innovation Program	Continuously improve ways of managing rainwater by undertaking research and keeping up-to-date on innovations in the green rainwater infrastructure sector. Contribute to industry best practice and innovations in the sector by reporting monitoring data and analysis and lessons learned at conferences and workshops.	Expand Existing Program	Engage local academic institutions and other external partners to identify opportunities and synergies.	2020	●●○	●●○	●●○	●●○	●●○	●●○	●●○	●●○	●●○

Program Details			Program Status & Milestones			Contribution to Rain City Strategy Objectives Legend: ●○○ = low, ●●○ = medium, ●●● = high						Evaluation Legend: ●○○ = low ●●○ = medium ●●● = high		
Program No.	Program Title	Program Description	Program Status (Expand Existing Program or New Program)	Next Milestone	Next Milestone Year	Remove Pollutants	Reduce Volume Entering Pipes	Increase Green Area	Increase Managed Impervious Area	Mitigate Urban Heat Island Effect	Encourage Greater Harvest & Reuse	Impact	Effort	Criticality
S&PS-14	Shift in City Process & Capacity Building	Facilitate a shift in city culture and process to enable the successful implementation of green rainwater infrastructure. Encourage this shift through greater cross-departmental collaboration and updating internal processes to improve coordination and alignment. Staff knowledge and capacity to support the implementation of green rainwater infrastructure will be strengthened through training, standards, guidelines and other approaches and tools.	Expand Existing Program	Convene a working group to define scope, deliverables and timelines.	2020	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●●
S&PS-15	Industry Capacity Building & Public Engagement	Facilitate capacity building amongst developers, designers and contractors to share knowledge regarding the City's design standards, guidelines and industry best practices for implementing green rainwater infrastructure in the City's new capital projects. Engage with practitioners and the public to raise awareness of rainwater management, climate change and green rainwater infrastructure, empowering them to take positive actions and be environmental stewards in their community.	New Program	Engage local academic institutions and other external partners as well as developers, designers and contractors to identify practitioner needs, opportunities and synergies.	2020	●●○	●●○	●●○	●●○	●●○	●●○	●●●	●●○	●●●
S&PS-16	Water Quality Monitoring Program	Work with partners to continue and enhance stormwater and combined sewer overflow monitoring for quantity and quality across the city and use the data to prioritize and inform green rainwater infrastructure implementation and other water quality initiatives.	Expand Existing Program	Convene a working group to define scope, deliverables and timelines.	2020	●●●	●●○	●●○	●○○	●●○	●○○	●●○	●●○	●●○

## Rain City Strategy - Streets and Public Spaces Action Plan [Sample Actions]

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
<b>IMPLEMENTATION PROGRAMS &amp; ASSOCIATED SAMPLE ACTIONS</b>	
<b>S&amp;PS-01</b>	<b>New Capital Projects Green Rainwater Infrastructure Integration Program</b>
1.1	Develop and adopt design standards, guidelines, and internal processes on how to integrate green infrastructure planning and design in public transit construction, coastal flood protection, overland flood routes, safe routes to school, greenways, bikeways and pavement to plaza projects.
1.2	Develop and adopt design standards, guidelines, and internal processes to facilitate the integration of green rainwater infrastructure in city strategies and plans.
1.3	Undertake research to identify barriers to green rainwater infrastructure in existing city policies, regulations and standards and facilitate changes to policies, regulations and standards to streamline the implementation of green rainwater infrastructure.
1.4	Ensure that green rainwater infrastructure cost is incorporated in Municipal Road Network (MRN) projects.
1.5	Continuously reuse material with Kent Services, including recycled aggregate and pavement grindings.
1.6	Identify the roles and responsibilities of teams involved in planning and designing green rainwater infrastructure.
1.7	Undertake review of current service delivery methods. The current service delivery model is for primarily for GI Branch to do current design in house. Alternative delivery models to consider are embedding GI design with other branches and external delivery options.
1.8	Specify appropriate level of service for all green rainwater infrastructures in streets and public spaces.
1.9	Investigate the appropriate design storm event for peak flow control, volume control, and water quality.
1.10	Undertake research to establish the appropriate runoff coefficient for green roof and permeable pavement.
1.11	Investigate the potential modification of IRMP performance standards to reflect 2100 precipitation patterns and to consolidate the standard to a single volume managed to meet both water quality and volume control.
1.12	Develop and adopt design specifications for permeable area coverage and topsoil depth requirements to ensure that the pervious areas can capture 48mm in 24 hours.
1.13	Develop and adopt protocol for green rainwater infrastructure that safely allows infiltration in or around contaminated soils and groundwater contaminant plumes.
1.14	Establish a city-wide geotechnical investigation protocol for green rainwater infrastructure.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
1.15	Compare City of Vancouver IRMP targets and design specifications with other environmental certification standards (e.g. LEED, Salmon Safe) to determine if they can be deemed to meet the IRMP requirements.
1.16	Update Rainwater Management Bulletin to better explain how to implement green rainwater infrastructure to meet IRMP targets and specifications.
1.17	Modify and adopt a utility corridor standard that includes green rainwater infrastructure that accommodates trees and all utilities for a variety of street typologies. Ensure Utility Standards to include offset requirements and tolerances between utilities and UMB.
1.18	Investigate the use of an orifice control incorporated in the design of green rainwater infrastructure. (E.g. applying a 10-15mm orifice on the sub-drains of green rainwater infrastructure).
1.19	Develop and adopt a rainwater management checklist for new capital projects. Checklist to include items such as targets and design specifications, design review stages and construction inspection protocols, construction checkpoints, post-construction assumptions, and handover acceptance. Explore handback requirements for Final Acceptance at the end of the warranty period of green rainwater infrastructure and identify who performs the final acceptance and end of warranty management in streets and public spaces.
1.20	Develop a policy that requires new capital projects being delivered to meet rainwater management targets and design specifications in streets and public spaces. Policy should assess the feasibility and impacts of a pay-in-lieu system to cover instances where rainwater management targets cannot be met, or can only be partially met. Pay-in-lieu assessment to include identifying the source of pay-in-lieu funds, and the party(ies) collecting and managing the pay-in-lieu funds.
1.21	Formalize green rainwater infrastructure design standards for commonly used assets (i.e., corner bioretention bulge, stormwater tree trenches, infiltration trenches and soakaways, and permeable pavement)
1.22	Develop technical reports, memos, and factsheets addressing common concerns of green rainwater infrastructures including but not limited to health & safety, insect vectors, collection of heavy metals in soils and plants, and non-potable water safety.
1.23	Develop and/or modify right-of-way design standards for various street types to allow for the appropriate green rainwater infrastructure options.
1.24	Include inlet capacity evaluation into right-of-way green rainwater infrastructure designs to maximize runoff capture and minimize bypass.
1.25	Organize a workshop that communicates how to comply with IRMP targets and design specifications using green rainwater infrastructure standards, and the processes developed through this program.
1.26	Leverage large sites and capital projects to enhance the delivery of green rainwater infrastructure in streets and public spaces (i.e., exceed targets and design specifications and/or implement pilots and demonstration projects)



Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
1.27	Develop design standards for green rainwater management infrastructure to go 'above and beyond' existing targets and design standards in streets right-of-way. (i.e., increase capture target to 48mm in 24 hours) and provide clear guidance on how to implement standard within streets and public spaces.
1.28	Modify the Guide to Boulevard Plantings to include appropriate planting and care for bioretention bulges and other green rainwater infrastructure located in the boulevard.
1.29	Monitor and improve the sustainability of material flow and management practices relating to urban excavated soil.
1.30	Investigate and develop a strategy to mitigate green rainwater infrastructure encroachment issues by homeowners on boulevards.
1.31	Identify mechanisms to enforce conformance to IRMP targets and design standards using green rainwater infrastructure.
1.32	Develop a strategy for implementing green rainwater infrastructure in areas with geotechnical challenges.
1.33	Explore the legal considerations for changing groundwater regimes.
1.34	Co-locate green rainwater infrastructure with waste, recycling and composting bins to reduce the potential for litter to be deposited in green rainwater infrastructure assets.
1.35	Develop and adopt green rainwater infrastructure design standards for developer-delivered green rainwater infrastructure assets delivered in streets and public spaces.
1.36	Explore opportunities to minimize impervious areas through the use of green rainwater infrastructure, de-paving, and other initiatives in streets and public spaces.
1.38	Develop and adopt green rainwater infrastructure best practices that support and enhance biodiversity in the city. Work in partnership with the Vancouver Park Board to create blue-green systems that provide water management and enhance biodiversity across the city and use the Park Board Biodiversity Strategy as a guide to enhance biodiversity.
<b>S&amp;PS-02</b>	<b>Strategic Retrofits Green Rainwater Infrastructure Program</b>
2.1	Utilize watershed plans to identify and prioritize streets and public spaces to retrofit with green rainwater infrastructure that are linked to watershed specific targets.
2.2	Undertake an economic appraisal of green rainwater infrastructure retrofit opportunities identified through watershed plans and other mechanisms. Use appraisal to prioritize strategic retrofits that provide the greatest benefits for the least cost.
2.3	Identify areas where there is an alignment of goals amongst partners with green rainwater infrastructure retrofits on streets and public spaces, such as with infrastructure renewal needs, public safety improvements, and urban forestry targets.
2.4	Work with partners to develop and continuously improve internal processes for facilitating green rainwater infrastructure retrofits.
2.5	Modify right-of-way design standards for various street types to identify green rainwater infrastructure retrofit options.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
2.6	Identify green rainwater infrastructure retrofit options for City of Vancouver's existing curbless residential streets and laneways.
2.7	Develop a strategy for using green rainwater infrastructure retrofits to help manage areas with geotechnical challenges (i.e., reduce settlement in peat areas)
2.8	Pursue projects with large scale retrofit opportunities, such as many standardized green rainwater infrastructure retrofits in one neighborhood, to achieve economies of scale and reduce implementation costs.
2.9	Co-locate green rainwater infrastructure with waste, recycling and composting bins to reduce the potential for litter to be deposited in green rainwater infrastructure assets.
2.10	Facilitate public access and enjoyment of the city's waterfront and beaches using green rainwater infrastructure assets (i.e., use green rainwater infrastructure to provide "soft" engineered transitions between land and sea as opposed to sea walls and other "hard" surfaces).
2.11	Explore opportunities to minimize impervious areas through the use of green rainwater infrastructure, de-paving, and other initiatives in streets and public spaces.
2.12	Develop and adopt green rainwater infrastructure best practices that support and enhance biodiversity in the city. Work in partnership with the Vancouver Park Board to create blue-green systems that provide water management and enhance biodiversity across the city and use the Park Board Biodiversity Strategy as a guide to enhance biodiversity.
<b>S&amp;PS-03</b>	<b>Blue-Green Systems with Enhanced Water Management and Biodiversity Functions Program</b>
3.1	Identify opportunities to align the location of blue-green systems with other city and Park Board priority areas (i.e., active transportation routes, greenways, bluedways, corridors providing connectivity between parks and major green spaces, and others)
3.2	Develop and adopt design standards, guidelines, and internal processes on how to integrate green infrastructure planning and design into blue-green systems.
3.3	Explore opportunities to locate blue-green systems in areas with historic watercourses. Use green rainwater infrastructure practices that manage rainwater on the surface using swales or other methods to recreate or reflect the historic watercourse.
3.4	Undertake research to determine priority streets and public spaces to integrate blue-green systems (i.e., streets with large adjacent catchment areas that could be easily connected to the practices, optimize minor and major drainage systems with capacity or growth pressures, and other items)
3.5	Implement pilot and demonstration project(s) with a monitoring program to collect and analyze data on their performance and social impacts. Use learnings to improve the delivery of ongoing blue-green systems.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
3.6	Explore opportunities to minimize impervious areas through the use of green rainwater infrastructure, de-paving, and other initiatives in streets and public spaces.
3.7	Develop and adopt green rainwater infrastructure best practices that support and enhance biodiversity in the city. Work in partnership with the Vancouver Park Board to create blue-green systems that provide water management and enhance biodiversity across the city and use the Park Board Biodiversity Strategy as a guide to enhance biodiversity.
3.8	Engage and work with Park Board to use park acquisition, tree planting, and the development planning process to expand and connect parks in building the city's ecological blue-green systems.
3.9	Identify opportunities for habitat restoration in boulevards, road ends and right-of-ways as part of Biodiversity Strategy goal to build the city's ecological network.
3.10	Incorporate biodiversity values into planning and designing of GRI assets for new and redevelopment projects in Streets & Public Spaces.
3.11	Update tree and plant selection, density and maintenance guidelines to increase the value of urban biodiversity for birds and other species across the city.
3.12	Use the biodiversity monitoring plan from Biodiversity Strategy to monitor and report progress of meeting biodiversity target.
<b>S&amp;PS-04</b>	<b>Permeable Pavement Program</b>
4.1	Research the best practices and benchmark permeable pavement programs in other jurisdictions.
4.2	Develop design standards and guidelines to facilitate the implementation of permeable pavement.
4.3	Undertake research to identify the best locations for permeable pavement within the city's standard street typologies taking into account construction, operation and maintenance considerations.
4.4	Identify maintenance, equipment, and training requirements to enable wider deployment of permeable pavement across the city on roads, bicycle lanes, sidewalks, and parking lay-bys.
4.5	Establish a permeable pavement testing facility at a City operations yard.
4.6	Establish a pilot for new materials and construction techniques for permeable pavement on laneways, bike paths, parking lay-bys, certain boulevards, and potentially for low traffic residential streets. Explore new and improved permeable pavement options in the industry.
4.7	Undertake a lifecycle cost analysis of different types of permeable pavement materials and different locations within standard street typologies and compare to other green rainwater infrastructure practices to determine how best to implement permeable pavement in streets in public spaces.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
<b>S&amp;PS-05</b>	<b>Laneway Rehabilitation &amp; Retrofit Program</b>
5.1	Undertake a lifecycle cost analysis of laneway green rainwater infrastructure retrofit options (including but not limited to full-width permeable pavement, partial-width 'strip' of permeable pavement down the laneway centre, sub-surface infiltration gallery, place-making vegetated retrofits and others). Green rainwater infrastructure selection in laneways must take into consideration continual construction and cutting into laneways for utilities and other services in the laneway to ensure the practice(s) selected are appropriate.
5.2	Develop design standards and guidelines to facilitate the implementation of green rainwater infrastructure into the City's laneway reconstruction program.
5.3	Investigate the use of green rainwater infrastructure on laneways to manage rainwater runoff from adjacent private properties including the legal and cost implications of the approach.
5.4	Undertake research to identify the policies and financial tools & mechanisms needed to provide a sustainable funding source for the ongoing operation and maintenance of laneway retrofits. This research shall include laneway retrofits managing runoff from public surfaces only, private surfaces only and a combination of both public and private sources.
5.5	Develop and/or revise policies to ensure that there are mechanisms to charge developers for damage to laneway infrastructure caused as a result of redevelopment/construction activities. Ensure that restitution of damaged green rainwater infrastructure is included in policy.
5.6	Work with partners to identify typical city and third party utilities located underneath laneways and identify ways to incorporate both utilities and green rainwater infrastructure in laneways.
<b>S&amp;PS-06</b>	<b>Green Rainwater Infrastructure Pilot and Demonstration Project Program</b>
6.1	Implement one or more of green rainwater infrastructure demonstration projects showcasing surface expression as part of a blue-green system in streets and public spaces.
6.2	Implement one or more green rainwater infrastructure pilot projects to mitigate settling issues on streets and public spaces with peat.
6.3	Develop reports, memos, case studies, fact sheets, presentations and other materials summarizing results and lessons learned from pilot and demonstration projects. Use materials to support green rainwater infrastructure education, outreach and capacity building.
6.4	Monitor the delivery and performance of pilot and demonstration projects and use findings to improve green rainwater infrastructure design and construction standards, as well as construction and operation and maintenance procedures.
6.5	Work with partners, including the Street Activities Branch, to monitor and analyze how residents and visitors use public spaces that incorporate green rainwater infrastructure (i.e., green rainwater infrastructure implemented as part of the pavement to plaza program).

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
<b>S&amp;PS-07</b>	<b>Streets and Public Spaces Adjacent to Schools Green Rainwater Infrastructure Retrofit Program</b>
7.1	Engage with school district to explore synergies and opportunities for green rainwater infrastructure implemented on streets and public spaces adjacent to schools.
7.2	Research and benchmark school site green rainwater infrastructure programs in other jurisdictions.
7.3	Develop a sustainable long-term funding model for green rainwater infrastructure retrofits on streets and public spaces adjacent to schools, and potentially also school sites.
7.4	Clarify roles and responsibilities for ongoing operation and maintenance and lifecycle asset management of green rainwater infrastructure constructed on or adjacent to school board property.
7.5	Develop a green rainwater infrastructure retrofit program for streets and public spaces adjacent to schools that is linked with a curriculum program.
7.6	Work with the Vancouver School Board to develop educational materials on green rainwater infrastructure in alignment with the Vancouver School Board curriculum.
7.7	Establish stewardship program within the school to help manage green rainwater infrastructure implemented on school sites and any nearby boulevards with green infrastructure.
7.8	Work with partners, including the Development and Major Projects Branch, to identify opportunities to utilize green rainwater infrastructure on new and/or redeveloping school sites across the city.
7.9	Leverage green rainwater infrastructure engagement opportunities with schools to highlight the value of the city's infrastructure.
7.10	Leverage school engagement programs to engage with school community about water management and environmental stewardship.
<b>S&amp;PS-08</b>	<b>District Scale Non-potable Water Systems Program</b>
8.1	Undertake business case analysis of district scale non-potable water systems that include a variety of source waters including groundwater, stormwater, wastewater (via 'sewer mining') and building rainwater, greywater and blackwater sources.
8.2	Develop and/or modify policies and bylaws to permit the construction and long-term operation of district scale non-potable water systems
8.3	Explore district scale green rainwater infrastructure opportunities related to heat exchange
8.4	Investigate the use of 'sewer mining' to capture water for district scale non-potable water systems.
8.5	Engage Vancouver Coastal Health to support the expansion of district scale non-potable water sources and uses across Vancouver while ensuring the health and safety of water users.
8.6	Investigate different service delivery models for district scale non-potable water systems, including the creation of new city utility, regulations needed for privately managed systems, and P3 models.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
8.7	Identify opportunities for non-potable water use on streets and public spaces using strategic non-potable water supplies accessible by the city's fleet vehicles
8.8	Work closely with internal stakeholders to advance non-potable water regulatory regime including the number of permitted uses of non-potable water and the number of permitted sources of non-potable water.
<b>S&amp;PS-09</b>	<b>Green Rainwater Infrastructure Asset Management Program</b>
9.1	Establish an identifier code to ID green rainwater infrastructure practices constructed on streets and public spaces. This code should be integrated with Hansen IDs.
9.2	Clarify roles and responsibilities for ongoing operation and maintenance and lifecycle asset management of green rainwater infrastructure constructed on streets and public spaces.
9.3	Investigate different models for green rainwater infrastructure asset management with other branches (including but not limited to a single responsible party model, multiple responsible parties, and other models).
9.4	Integrate green rainwater infrastructure into the Hansen Asset Management System.
9.5	Develop asset management strategies and processes including but not limited to asset data management (VanMAP), data collection from other branches, and data audits of historically built green rainwater infrastructures and green rainwater infrastructure in privately built right-of-ways.
9.6	Establish green rainwater infrastructure protection zones for city crews, and third parties.
9.7	Research and benchmark green rainwater infrastructure asset management programs in other jurisdictions including relevant policy(ies) pertaining to green rainwater infrastructure.
9.8	Develop a level of service standards for green rainwater infrastructure assets and create an inspection schedule. Level of service standard has been created for landscape green rainwater infrastructure assets and those assets are being inspected in bi-annually. Other green rainwater infrastructure assets need to have a level of service standard established and require inspections.
9.9	Develop and refine green rainwater infrastructure asset renewal plan. Landscape green rainwater infrastructure asset renewal program has been developed and needs refinement. Green rainwater infrastructure asset categories including sub-surface infiltration needs to be created.
9.10	Investigate maintenance agreements with new developments including who maintains and inspects green rainwater infrastructure practices that have been constructed by developers on streets and public spaces.
9.11	Identify resources required for green rainwater infrastructure inspection and enforcement.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
<b>S&amp;PS-10</b>	<b>Green Rainwater Infrastructure Operation and Maintenance Program</b>
10.1	Modify operations and maintenance manuals including Sewer Operations Manual to include green rainwater infrastructure asset needs and considerations.
10.2	Undertake an analysis on the effect of different operation and maintenance service levels on the level of service/performance on different types of green rainwater infrastructure practices.
10.3	Undertake research to assess the costs and benefits of establishing a dedicated crew for green rainwater infrastructure operation and maintenance. Compare the costs and benefits to existing and alternative maintenance arrangements.
10.4	Undertake research to identify how social enterprises and other alternative models can operate and maintain green rainwater infrastructure practices (e.g. summer student programs and citizen science programs)
10.5	Include operation and maintenance considerations into discussions regarding green rainwater infrastructure asset management roles and responsibilities and asset management strategy. Ensure discussion includes green rainwater infrastructure assets that have been constructed both prior to and following the adoption of the Rain City Strategy.
10.6	Research and benchmark green rainwater infrastructure operation and maintenance programs in other jurisdictions.
10.7	Train operations crews on best practices and standard operating procedures for conducting the operation and maintenance of the green rainwater infrastructure practices typically implemented on streets and public spaces.
10.8	Identify opportunities for the use of City of Vancouver Modified Work Programs, to enable staff to undertake light-duty operations and maintenance tasks on green rainwater infrastructure.
10.9	Identify opportunities for green rainwater infrastructure stewardship (i.e., as part of the Green Streets Program through the Street Activities Branch)
10.10	Work with partners to identify roles and responsibilities associated with restoration of green rainwater infrastructure practices impacted by street works following their construction (i.e., new city and third party utilities crossing through green rainwater infrastructure practices)
10.11	Develop methods of estimating green rainwater infrastructure restoration costs by city crews.
10.12	Undertake research to determine rehabilitation and renewal requirements for green rainwater infrastructure, and develop and adopt a program to undertake these as part of their lifecycle asset management.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
<b>S&amp;PS-11</b>	<b>Sediment Management and Source Control Program</b>
11.1	Support an update to the catch basin cleaning program that incorporates preventative maintenance for green rainwater infrastructure practices that use catchbasins as inlets and targets hot spot and high sediment loading areas.
11.2	Support an update to the City's Street Sweeping Strategy that includes water quality objectives, the maintenance of green rainwater infrastructure such as permeable pavement, and the requirement for regular street sweeping during active construction.
11.3	Evaluate options for sediment recovery at Vernon Grit Facility to reduce landfill use and costs.
11.4	Evaluate environmental and water quality management at the City of Vancouver Sediment Recovery Station for potential improvements.
11.5	Explore options for catchbasin cleanout alternatives that may not require the expense and equipment of a vac-truck such as catchbasin insert options.
11.6	Establish maintenance protocol for surface sediment traps, including responsible maintenance group, schedules, and alternative delivery options like social enterprise.
11.7	Establish erosion and sediment control plan enforcement and fees.
11.8	Develop and adopt policy(ies) to protect existing green rainwater infrastructure assets from nearby construction activities (including protection from equipment and from sediment). Policy(ies) to include a provision for full restoration of green rainwater infrastructure negatively impacted by nearby construction activities. During policy development, explore potential impacts of policy on where and how materials are stored during construction and who inspects the green rainwater infrastructure practices and who enforces the policy(ies) and/or administers fees.
11.9	Develop or modify existing policies to enable the expansion of sediment and erosion control requirements to include protection of green rainwater infrastructure practices.
11.10	Train inspectors on how to identify high risk sources of contaminants (including sediment from construction sites) and their potential impacts on downstream green rainwater infrastructure practices to enforce sediment and erosion control policies.
11.11	Work with the appropriate city departments to ensure that snow and ice response methods do not have significant negative impacts on green rainwater infrastructure practices (i.e., use of sand, salt, brine, etc.)
11.12	Review street de-icing practices and their potential impacts on different types of green rainwater infrastructure practices. Work with partners to explore ways to mitigate any identified negative impacts to green rainwater infrastructure practices from de-icing practices while maintaining existing street safety/service levels.



Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
<b>ENABLING PROGRAMS &amp; ASSOCIATED SAMPLE ACTIONS</b>	
<b>S&amp;PS-12</b>	<b>Citywide Green Rainwater Infrastructure Financial Planning and Sustainable Funding Program</b>
12.1	Undertake research to identify different internal funding models to finance green rainwater infrastructure capital costs and life cycle asset management costs that take into consideration all benefits of green rainwater infrastructure (e.g. ecosystem service approach, utility fee, user polluter pay model, capital planning, and drainage utilities). Review models amongst key internal stakeholders to develop preferred model(s) for implementing green rainwater infrastructure in streets and public spaces.
12.2	Develop an external funding model that accounts for all benefits of green rainwater infrastructure (e.g. ecosystem service approach, utility fee, user polluter pay model, capital planning) and cost levies.
12.3	Explore broader set of considerations in rate-settings for water, sewer, and stormwater.
12.4	Develop a mechanism to secure a two year funding for establishment of green rainwater infrastructure.
12.5	Undertake research of correlating cost of services and drivers around green rainwater infrastructure, drainage, and stormwater management including user-pay methods in transportation and service connection (water, sewer, and storm) fees.
12.6	Explore partnerships and grant applications related to green rainwater infrastructure in provincial and federal agenda settings.
12.7	Identify key funders (e.g. Metro Vancouver, TransLink, province and federal government) including funders based on co-benefits (e.g. VCH)
12.8	Develop incentives for using groundwater, rainwater, greywater for non-potable use (e.g. toilet flushing, irrigation) through incentive programs (e.g. grants, credit programs, tax credit, etc.)
12.9	Undertake research of different exemptions or subsidies that can be provided for stormwater fee implementation.
12.10	Develop specific tax incentive that varies depending on the neighborhood demand or specific issues to be resolved using a user-pay model.
12.11	Develop utility model for private development to have water managed in public facilities.
12.12	Identify maintenance funding within capital funding to ensure operation and maintenance funding is in place for new green rainwater infrastructure capital projects.
12.13	Explore and develop a framework for valuing green rainwater infrastructure to ensure that future investments take into account of the potential for green rainwater infrastructure to deliver economic benefits.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
12.14	Develop methods and tools to understand performance of green rainwater infrastructure assets (e.g. WERF study of co-benefits).
12.15	Continuously monitor and report on life cycle costs for green rainwater infrastructure assets.
12.16	Integrate green rainwater infrastructure funding in capital and O&M capital and operating budgets for each department that is responsible for implementing green rainwater infrastructure practices.
12.17	Undertake research to assess the feasibility, impacts and identify sources of additional funding to facilitate the implementation of a pay-in-lieu system. A pay-in-lieu system would apply to capital projects delivered in streets and public spaces where rainwater management targets cannot be met, or can only be partially met by the department delivering the capital project.
<b>S&amp;PS-13</b>	<b>Research and Innovation Program</b>
13.1	Undertake research and develop a soil strategy that explores the effectiveness of soil moisture and structure, soil management strategies on construction sites, and new resources of high quality soil amendments (e.g. biosolids and biochar).
13.2	Undertake research on the incorporation of wastewater treatment plant biosolids into the City's soil amendments, considering potential leaching of pollutants like nutrients.
13.3	Undertake research on the performance, lifecycle costs and lessons learned implementing different types of green rainwater infrastructure practices implemented in other jurisdictions.
13.4	Undertake and develop primer on common green rainwater infrastructure concerns in streets and public spaces.
13.5	Undertake research on insurance considerations for drainage and flooding as associated with green rainwater infrastructure practices.
13.6	Explore research opportunities to enhance knowledge of the ecological health benefits of green rainwater infrastructure in streets and public spaces.
<b>S&amp;PS-14</b>	<b>Shift in City Process &amp; Capacity Building</b>
14.1	Develop and implement a comprehensive training program for city staff that encompasses the design, construction, operation and maintenance, and reinstatement of green rainwater infrastructure practices.
14.2	Conduct training for City of Vancouver operations staff on green rainwater infrastructure fundamentals and on how to undertake operation and maintenance as well as how to reinstate green rainwater infrastructure practices on assets implemented on streets and public spaces.
14.3	Organize a workshop for city staff on erosion and sediment control on streets and public spaces, and on construction sites.
14.4	Engage with First Nations to learn about local traditional ecological knowledge (TEK) and how it can be incorporated in the design process of green rainwater infrastructures.
14.5	Develop and/or improve existing Green Streets framework to include green rainwater infrastructure adoption or sponsorship program, with additional resources and staffing.
14.6	Undertake research on how to reach a broad cross-section of people across the city to ensure inclusive engagement.
14.7	Develop a change management plan to support the staff transition to greater green rainwater infrastructure implementation in new capital projects and retrofit projects.

Programs & Associated Sample Actions	
Program and Action No.	Programs & Associated Sample Action Descriptions
<b>S&amp;PS-15</b>	<b>Industry Capacity Building and Public Engagement Program</b>
15.1	Facilitate the creation of toolkits and guidance documents as well as training and maintenance support for the general public and community groups to improve awareness of green rainwater infrastructure and encourage their stewardship on streets and public spaces adjacent to private properties.
15.2	Develop a mobile display or engagement tool to explain the connection between water cycle, water quality issues and green rainwater infrastructure.
15.3	Develop an educational program on the health and safety of green rainwater infrastructure including insect vectors, collection of heavy metals in soils and plants, and non-potable water safety.
15.4	Develop and install interpretive signage on green rainwater infrastructure locations.
15.5	Work with third party groups on options to design and build demonstration pavilion showcasing green rainwater infrastructures. The pavilion to function as a demonstration project and educational hub.
15.6	Leverage existing green rainwater infrastructure on Olympic Village as an educational tool.
15.7	Explore how to include public art in green rainwater infrastructures and the public or industry awareness and empowerment campaign.
15.8	Establish an annual Rain Paint design competition in a public space setting (e.g. playful interaction in the rain).
15.9	Establish a green rainwater infrastructure event to coincide with World Water Day (March 22).
15.10	Establish a green rainwater infrastructure event to coincide with King Tide Day.
15.11	Establish a green rainwater infrastructure event to coincide with Master Gardener day.
15.12	Establish a green rainwater infrastructure event to coincide with a Rain Barrel sale.
15.13	Develop partnership with community groups, non-profit organizations, and private businesses to implement green rainwater infrastructure.
15.14	Offer a 'rain garden starter pack' including care booklet and tray of native plan plugs for garden sponsors.
15.16	Engage school students on water management and environmental stewardship.
<b>S&amp;PS-16</b>	<b>Water Quality Monitoring Program</b>
16.1	Continuously monitor water quality in alignment with Liquid Waste Management Plan regulatory requirements and develop Vancouver specific approach.
16.2	Recommend an alternative solution to adaptive management framework for Vancouver's piped network.
16.3	Undertake analysis of sediment loading across the city to inform a street sweeping strategy.
16.4	Develop an inventory of high pollutant generating properties to help guide the policy development process of point source control requirements.
16.5	Undertake research on the link between emerging contaminants (e.g. Fentanyl or micro plastics) in stormwater.
16.6	Perform water quality monitoring at Olympic Village constructed wetland.
16.7	Perform a study of sediment and contaminant accumulation in catchbasins.

# Rain City Strategy - Buildings & Sites Action Plan [Programs and Sample Actions]

Program Details			Program Implementation Approaches & Tools				Sample Actions
Program No.	Program Title	Program Description	Regulatory Roadmap	Enabling Early Adopters	Capacity Building	Corporate Leadership	
<b>IMPLEMENTATION PROGRAMS</b>							
B&S-01	<b>Advance Rainwater Management Policies and Regulations</b> — <i>Supporting Implementation Through New and Existing Policies and Regulations</i>	Facilitate the integration of green rainwater infrastructure through the refinement of existing policies and regulations such as the Green Buildings Policy for Rezonings and the Sustainable Large Developments Policy for Rezonings and through the development of additional policies and regulations.	●	●	●	○	<ul style="list-style-type: none"> <li>● Provide public guidance documents, nimble tools (such as supporting calculations), templates, report examples and local case studies to support existing regulations.</li> <li>● Review and refine existing regulations and standards as required to advance the integration of effective rainwater management into new developments.</li> <li>● Investigate pathways for enhanced compliance, including alternative approaches (e.g., pay-in-lieu system) and potentially more robust standards for large sites.</li> <li>● Develop and adopt additional regulations, such as a Rainwater Management By-law, as needed.</li> </ul>
B&S-02	<b>Improve Review and Compliance of Rainwater Management Plans</b> — <i>Bolstering the Internal Review Process to Ensure the Targets of Rain City are Being Achieved on Buildings &amp; Sites</i>	Strengthen the review processes within the rezoning, development and building permit stages to ensure efficiency, validate compliance, and improve outcomes. Ensure continuity between design, construction and occupancy stages.	●	●	●	○	<ul style="list-style-type: none"> <li>● Undertake research on data collection and evaluation protocols and procedures to assess existing green rainwater infrastructure assets.</li> <li>● Set targets for the review process and audit completed projects to gauge policy and process refinement opportunities.</li> <li>● Explore a tracking mechanism and new regulatory instruments to ensure long-term operational performance of green rainwater infrastructure.</li> <li>● Investigate integrated water management opportunities through the review process, incorporating rainwater management, groundwater discharge, sewer capacity and potable water use.</li> <li>● Explore the possibility of landscape inspection requirement with accompanying holdback or bond to ensure proper maintenance of green rainwater infrastructure practices (i.e. bioretention).</li> </ul>
B&S-03	<b>Single Family Dwellings, Laneway Homes, and Townhouses</b> — <i>Assessing New &amp; Existing Building Opportunities</i>	Engage key stakeholders, including home builders, designers and public, to evaluate opportunities and develop incentive programs and regulations, as appropriate, to implement green rainwater infrastructure in new and existing Part 9 buildings (simple structures).	●	●	●	○	<ul style="list-style-type: none"> <li>● Explore solutions, including incentives and pilot programs, for rainwater management for typical development typologies, including for laneway homes.</li> <li>● Investigate alternative compliance pathways that address Council priorities for increased housing, affordability and sustainability.</li> <li>● Integrate learnings from "Research and Innovation" in the development of potential programs.</li> </ul>
B&S-04	<b>Mid- and High-Rise Structures</b> — <i>Assessing New &amp; Existing Building Opportunities</i>	Engage industry to evaluate opportunities and develop incentive programs and regulations to integrate green rainwater infrastructure in new and existing Part 3 buildings (complex structures) not already captured through existing policies.	●	●	●	○	<ul style="list-style-type: none"> <li>● Explore solutions, including incentives and pilot programs, for rainwater management for Part 3 buildings and sites.</li> <li>● Establish timelines for expectations that are cognizant of the complexities and long-term nature of development planning.</li> <li>● Integrate learnings from "Research and Innovation" in the development of potential programs.</li> </ul>
B&S-05	<b>Rainwater Harvesting Program</b> — <i>Building on Existing Policy</i>	Implement inspections of new and existing rainwater harvesting systems under the Council-approved Operating Permit program to protect public health and verify compliance.	●	●	●	●	<ul style="list-style-type: none"> <li>● Use lessons learned from inspections to potentially refine regulations.</li> <li>● Review new codes and standards, and revise the Vancouver Building By-law as required.</li> </ul>

Program Details			Program Implementation Approaches & Tools				Sample Actions
Program No.	Program Title	Program Description	Regulatory Roadmap	Enabling Early Adopters	Capacity Building	Corporate Leadership	
B&S-06	<b>Resilient Roofs Program</b>	Examine policy and program options for resilient, blue-green roofs (and variations therein) for new and existing buildings, integrating learnings from "Research and Innovation." Ensure roofs are used most effectively, based on building form, use, and characteristics of the area.	●	●	●	●	<ul style="list-style-type: none"> <li>Initially, focus on research, data collection, and understanding of best practices, as well as exploring opportunities to enable early adopters. The subsequent phase will shift to policy development. Sample actions could include: <ul style="list-style-type: none"> <li>Collect data of existing blue-green roof assets within the city.</li> <li>Conduct jurisdictional review of North American cities that have implemented green roof bylaw/requirements/incentives.</li> <li>Investigate opportunities to remove barriers to green roof implementation (such as potential warranty issues, insurance implications and competing uses).</li> <li>Research toolkits for design and maintenance.</li> <li>Develop policy and/or regulations to ensure green roofs are implemented where it makes most sense to do so, in conjunction with other roof top uses and amenities.</li> </ul> </li> </ul>
B&S-07	<b>Civic Facilities</b> — <i>Demonstrating Corporate Leadership</i>	Continue to implement innovative practices in city-owned buildings. Document lessons learned from the design, construction and operations of innovative green rainwater infrastructure already installed at civic facilities. Study performance through monitoring and incorporate learnings to enhance delivery and inform potential green rainwater infrastructure policies and programs.	○	○	●	●	<p>Much like how City-owned buildings have led the way on energy efficiency and low greenhouse gas emissions, a similar pathway is envisioned for green rainwater infrastructure. Sample actions could include:</p> <ul style="list-style-type: none"> <li>Identify and implement demonstration projects at civic facilities (such as roofing projects and plaza renovations).</li> <li>Incorporate green rainwater infrastructure opportunities with city yard master plans (e.g. Manitoba Yard master plan).</li> <li>Incorporate green rainwater infrastructure opportunities with the City Hall Campus master plan.</li> <li>Incorporate green rainwater infrastructure opportunities with near-term capital projects.</li> </ul>
<b>ENABLING PROGRAMS</b>							
<b>Capacity Building and Engagement</b>							
B&S-08	<b>Public Engagement and Activation</b> — <i>Empowering Positive Community Action</i>	Engage with the public to raise awareness of rainwater management, climate change and green rainwater infrastructure, empowering positive action in the community.	○	●	●	○	<p>Public awareness, support and participation in Rain City will be critical for success, particularly on the private realm. Sample actions include:</p> <ul style="list-style-type: none"> <li>Consider existing participatory models (such as New York City's "Wait" pilot program).</li> <li>Investigate voluntary programs with potential incentives and technical support (such as a downspout disconnect program, contingent on geotechnical and building structural considerations).</li> </ul>
B&S-09	<b>Industry Capacity Building</b> — <i>Fostering Industry Excellence</i>	Facilitate capacity building amongst developers, designers and contractors to share knowledge regarding design standards, guidelines and industry best practices for implementing green rainwater infrastructure.	○	●	●	○	<p>It is critical that builders, engineers, architects and developers be supported to implement green rainwater infrastructure practices on their projects to meet the City's requirements. As part of this capacity-building, industry dialogue can also help inform future policies and regulations to be most effective. Sample actions include:</p> <ul style="list-style-type: none"> <li>Work with Metro Vancouver Stormwater Interagency Liaison Group to update the Metro Vancouver Stormwater Source Control Guide to include design guidelines for various development types in the city.</li> <li>Connect with third party certification organizations to stimulate implementing green rainwater infrastructure practices on a building level (e.g. Fraser Basin Salmon Safe Certificate).</li> <li>Engage with developers and consultants on potential approach, challenges and opportunities to build capacity for delivery of green rainwater infrastructure practices on new development.</li> </ul>

Program Details			Program Implementation Approaches & Tools				Sample Actions
Program No.	Program Title	Program Description	Regulatory Roadmap	Enabling Early Adopters	Capacity Building	Corporate Leadership	
<b>Monitoring and Evaluation</b>							
B&S-10	<b>Monitoring, Data Analysis and Metrics</b> — <i>Assuring an Evidence-Based Approach</i>	Monitor, measure and analyze data to facilitate a robust, evidence-based approach to policy and program development. Use reliable data to prioritize efforts and highlight areas for improvement. Consider neighbourhood and watershed-level metrics such as impermeable area, extent of sewer separation and degree of effective connectivity. Evaluate metrics quantifying the relative flows from Streets & Public Spaces, Buildings & Sites and Parks & Beaches to focus efforts effectively.	●	○	●	○	<ul style="list-style-type: none"> <li>● Audit existing rainwater management systems</li> <li>● Develop metrics specific to buildings &amp; sites to measure progress, effectiveness and impact over time (which can serve as a dashboard for the Buildings and Sites Working Group)</li> <li>● Work in partnership with Engineering to determine where green rainwater infrastructure is most needed (to inform prioritization or more robust requirements)</li> <li>● Consider neighbourhood and watershed-level metrics such as impermeable area, extent of sewer separation and degree of effective connectivity to focus efforts effectively.</li> </ul>
<b>Research and Innovation</b>							
B&S-11	<b>Infiltration</b> — <i>Evaluating Geotechnical and Building Foundation Aspects</i>	Assess infiltration opportunities and barriers within the Vancouver context.	●	●	●	○	<ul style="list-style-type: none"> <li>● Consider geotechnical and building code perspectives to inform potential initiatives such as infiltrating green rainwater infrastructure practices and downspout disconnection, an update to existing guidance.</li> <li>● Research design standards and code requirements on setbacks from structures</li> </ul>
B&S-12	<b>Resilient Roofs with Water Management Capabilities</b> — <i>Assessing Opportunities and Barriers</i>	Evaluate the engineering implications, business case, opportunities, barriers and lessons learned (including actual outcomes) for resilient, blue-green roofs (and variations therein) for new and existing buildings. Consider the context of potentially competing roof-top demands such as building mechanical equipment.	○	○	●	○	<ul style="list-style-type: none"> <li>● Evaluate the engineering implications of green roofs and blue-green roofs</li> <li>● Measure outcomes and evaluate lessons learned from existing green roofs, focused locally but could also draw from other cities in the region and elsewhere</li> <li>● Better understand warranty and insurance challenges and seek to remove or reduce these potential barriers.</li> </ul>
<b>LINKED (COMPLEMENTARY) PROGRAMS</b>							
B&S-13	<b>Non-Potable Water Systems</b> — <i>Assessing New Opportunities and Evaluating Public Health and Engineering Aspects</i>	Develop policies to facilitate the implementation of safe and well-maintained non-potable water systems in Vancouver.	●	●	●	○	<ul style="list-style-type: none"> <li>● Undertake research to assess the public health implications, engineering feasibility, business case, opportunities, and barriers (such as variability in quality and supply) to expand the non-potable water uses and sources permitted in Vancouver.</li> <li>● Review codes and standards implemented in other jurisdictions, and revise the Vancouver Building By-law to expand the non-potable water uses and sources permitted and improve regulation of non-potable water use in Vancouver.</li> </ul>
B&S-14	<b>Reduce Sanitary Discharge to Sewer</b> — <i>Maximizing Existing Sewer Capacity Cost-Effectively</i>	Continue to implement water conservation and efficiency efforts to drive down sanitary loads from building and sites. Create capacity to manage rainwater within the existing combined sewer infrastructure by reducing sanitary discharges (including groundwater, condensate, etc.).	●	●	●	○	<ul style="list-style-type: none"> <li>● Conduct a cost-benefit assessment to identify the most cost effective means of reducing discharges to the sewer and drainage system from both rainwater and sanitary sewer sources on Single Family Dwellings, Laneway Homes and Townhouses.</li> <li>● Develop incentive programs and/or regulations to implement the most cost-effective measures to reduce discharge to the sewer and drainage system from single family homes.</li> </ul>

## Rain City Strategy - Parks and Beaches Action Plan [Programs]

Program Details		
Program No.	Program Title	Program Description
<b>IMPLEMENTATION PROGRAMS</b>		
P&B-01	<b>Green Rainwater Infrastructure Integration into Park Development Standards Program</b>	Develop new and/or modify existing Park Development Standards, Standard Technical Specifications and Best Management Practices to facilitate the integration of green rainwater infrastructure in parks, beaches and recreational spaces. Ensure that new and modified standards, specifications and best management practices adopt the provincially-mandated Citywide Integrated Rainwater Management Plan, including the IRMP's rainwater management design standard and performance target. This initiative will be guided by high-level principles, which shall be developed and adopted to inform an integrated water management approach across all parks, beaches and recreational spaces.
P&B-02	<b>Protect and Enhance Park Service Levels through Green Rainwater Infrastructure Retrofits</b>	Explore opportunities to integrate green rainwater infrastructure retrofits in parks, beaches and recreation spaces to address drainage issues and manage areas prone to surface water ponding and flooding and to enhance park biodiversity and visual amenities. Ensure that green rainwater retrofits on parks, beaches and recreation spaces protect, and ideally enhance, service levels.
P&B-03	<b>Non-potable Water Systems and Water Conservation &amp; Efficiency</b>	Explore opportunities for the use of non-potable water systems, and water conservation & efficiency to reduce potable water use and reduce park discharges to the city's sewer and drainage system. Retrofit and new capital project opportunities to pursue include the use of non-potable water systems for irrigating parks and recreation areas, implementing re-circulating systems on splash pads and water features, and the use of smart controls to minimize discharges to the sewer system from non-critical water features during combined sewer overflows. This work shall include developing policies, design, operation and maintenance standards to ensure the safe and well-regulated use of these measures to ensure the health and wellbeing of park and recreation area users.
P&B-04	<b>Green Rainwater Infrastructure Integration into Playing Fields</b>	Undertake research to identify opportunities to update playing field design standards to incorporate green rainwater infrastructure as part of enhancing playing field drainage and improving field service levels. Retrofit an existing playing field or identify a playing field under development for a pilot / demonstration project that incorporates green rainwater infrastructure. Monitor the performance of pilot/demonstration project(s) and incorporate lessons learned to inform future playing field projects.
P&B-05	<b>Parks and Recreation Spaces Climate Change Adaptation Program</b>	Undertake research to identify risks to parks and recreation areas associated with drainage, flooding and drought and how these will be impacted by climate change. Develop and adopt more holistic way of planning, delivering and managing water resources, utilities and green rainwater infrastructure as part of achieving VanPlay's Goal #5 - adapt parks and recreation spaces to a changing climate.
P&B-06	<b>Create a Green Network That Will Connect Our Parks, Waterfront and Recreation Areas</b>	Work citywide to implement a layered green rainwater infrastructure, human, and ecological network to help achieve VanPlay Goal #6 to create a green network to connect parks, waterfronts, and recreation spaces. Utilize pilot and demonstration green network projects to determine how to best integrate green rainwater infrastructure and deliver benefits through these networks and apply findings to enhance their delivery across the city.
P&B-07	<b>Enhanced Urban Forest Program</b>	Undertake research to understand how green rainwater infrastructure can help protect, grow, and manage trees to create a diverse, resilient, and beautiful urban forest across the city. Use findings to guide the implementation of green rainwater infrastructure capital and retrofit programs that enhance the city's urban forest cover.
P&B-08	<b>Enhanced Park Biodiversity Program</b>	Undertake research to understand the biodiversity benefits associated with green rainwater infrastructure and use findings to enhance the delivery of the Park Board's Biodiversity Strategy. Green rainwater infrastructure practices shall be used as part of improving the quality of Vancouver's natural areas and to support biodiversity and increase access to nature.

Program Details		
Program No.	Program Title	Program Description
P&B-09	<b>Minimize Impervious Surfaces within Parks and Recreation Spaces</b>	In new and existing parks, implement Park Board design best practices, such as permeable pavement and other green rainwater infrastructure practices to minimize impervious surfaces and drain impervious surfaces to green rainwater infrastructure practices to enhance how rainwater is managed.
P&B-10	<b>Multi-stakeholder Land Acquisition for Rainwater Management and Park Use in Key Watershed Areas</b>	Contribute to a reduction in paved surfaces and associated rainwater runoff as well as provide a location for the management of rainwater and park amenity space through land acquisition across the city. Work with partners to find synergies for the acquisition of new land in areas with critical drainage or flooding issues, urban heat island issues and other concerns, and use this land for rainwater management and recreational use.
P&B-11	<b>Green Rainwater Infrastructure Operation and Maintenance and Asset Management</b>	Identify sustainable funding mechanisms and develop plans to finance the management of green rainwater infrastructure assets in parks, beaches and recreation areas including operation and maintenance over their life cycle. Implement an effective operation and maintenance program for green rainwater infrastructure assets that preserves and extends their level of service and their service life.
P&B-12	<b>Protect and Enhance Beaches and Waterfront Program</b>	Work in partnership with First Nations rights-holders, other levels of government and with stakeholders to protect and enhance the city's beaches and waterfront through improvements to rainwater quality and reduction of combined sewer overflows into waterways. Seek opportunities to implement green rainwater infrastructure to enhance recreational uses of beaches and the waterfront, improve aquatic habitat for fish and wildlife and help mitigate and adapt to impacts associated with climate change.
<b>ENABLING PROGRAMS</b>		
P&B-13	<b>Citywide Green Rainwater Infrastructure Financial Planning and Sustainable Funding Program</b>	Identify equitable sources of long-term funding for green rainwater infrastructure, including funding sources associated with pollutant generation. Use funding source(s) to develop and implement a holistic financial plan that encompasses capital costs, asset management and operation and maintenance to enable green rainwater infrastructure implementation in capital projects and retrofits in parks, beaches and recreation spaces. Undertake research to develop a business case to identify funding requirements to manage these assets to preserve and extend their service life and level of service.
P&B-14	<b>Research and Innovation Program</b>	Continuously improve ways of managing rainwater in parks, beaches and recreation spaces by undertaking research and keeping up-to-date on innovations in the green rainwater infrastructure sector. Contribute to industry best practice and innovations in the sector by reporting monitoring data and analysis and lessons learned at conferences and workshops.
P&B-15	<b>Shift in Park Board Process &amp; Capacity Building</b>	Facilitate adaptation of Park Board processes to enable the successful implementation of green rainwater infrastructure. Encourage this shift through greater collaboration and updating internal processes to adapt to a changing environment. Staff knowledge and capacity to support the implementation of green rainwater infrastructure will be strengthened through training, standards, guidelines and other approaches and tools.
P&B-16	<b>Industry Capacity Building &amp; Public Engagement</b>	Facilitate building capacity amongst designers and contractors by communicating Park Development Standards, Standard Technical Specifications and Best Management Practices applicable to implementing green rainwater infrastructure in new parks capital projects. Achieve the Park Board's VanPlay Goal #7 to engage with industry professionals, designers, and contractors through environmental stewardship and educational programs to build awareness on how green rainwater infrastructure integrates with wild spaces and vital biodiversity across the city's parks, beaches and recreational spaces.



