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2023
Conference

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Stormwater and Erosion
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Credit Valley
Conservation
inspired by nature



Green Rainwater Infrastructure: Long-term Management of the Full Urban Water Cycle

March 22, 2023

Sophie Warren, P.Eng., Green Infrastructure Implementation

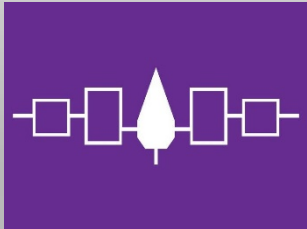


The City of Vancouver is on the unceded traditional territory of the Musqueam, Squamish and Tsleil-Waututh First Nations.



These lands are the foundation of thousands of years of living culture of the Musqueam, Squamish and Tsleil-Waututh peoples and have been stewarded by these nations since time immemorial.





We are meeting on the traditional territory of the Anishinabek, Huron-Wendat, Haudenosaunee and Ojibway/Chippewa peoples; the land that is home to the Metis; and most recently, the territory of the Mississaugas of the Credit First Nation who are direct descendants of the Mississaugas of the Credit.

Brampton resides within Treaty 19 (1818).

Overview

1. City of Vancouver Rain City Strategy (RCS)
2. Green Rainwater Infrastructure (GRI) Case Studies
3. GRI Maintenance and Rehabilitation



City of Vancouver Rain City Strategy



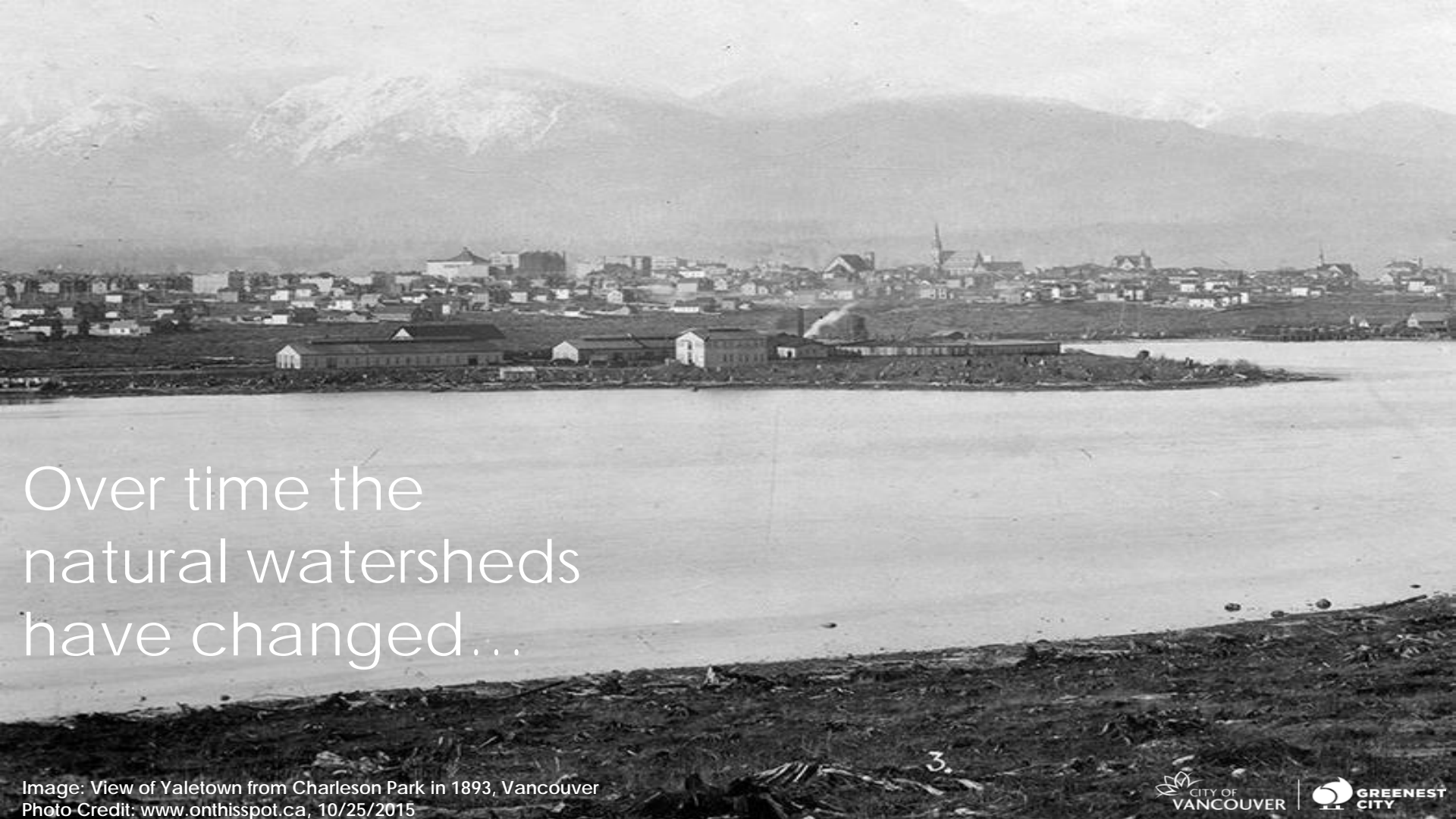
Our local waters
and even the rain
shape who we are

A photograph of a dense forest of tall evergreen trees, likely Douglas firs, shrouded in a thick mist or fog. The trees are dark green and stand against a pale, overcast sky. The mist is most prominent in the middle ground, creating a sense of depth and atmosphere. The overall scene is serene and evokes a sense of a temperate rainforest.

The city once was a
temperate rainforest

Image: Capilano River Regional Park, North Vancouver

Photo Credit: Robert Pennings



Over time the
natural watersheds
have changed...

Image: View of Yaletown from Charleson Park in 1893, Vancouver
Photo Credit: www.onthisspot.ca, 10/25/2015

to allow residents and businesses
to prosper and grow



Image: View of Yaletown from Charleson Park in 2013, Vancouver

Photo Credit: Wendy de Hoog



population growth



extreme storms and floods



densification



forest fires



sea level rise



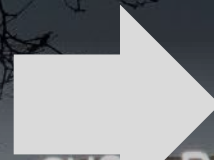
aging infrastructure



urban heat island



drought spells



rethinking water management

The Rain City Strategy

9

transformative
directions

3

action plans


A high level, 30-year plan that aims to manage rainwater through green rainwater infrastructure that

protects

restores

mimics

the natural water cycle



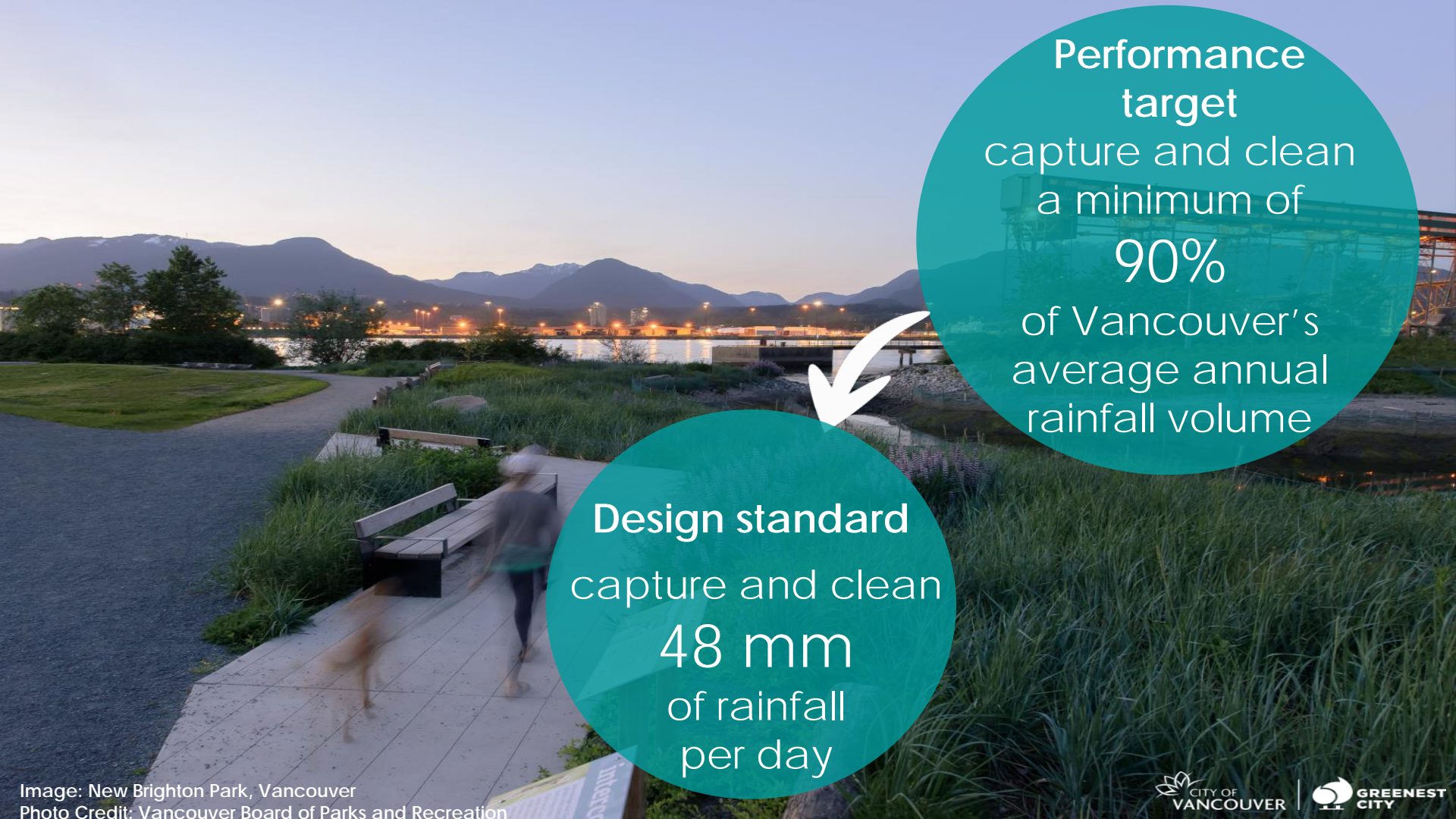
reduce
volume of
rainwater
entering the
pipe system

reduce
pollutants
in urban
rainwater
runoff

Objectives

Image: Green rainwater infrastructure project at Yukon & W 63rd

Photo Credit: Wendy de Hoog

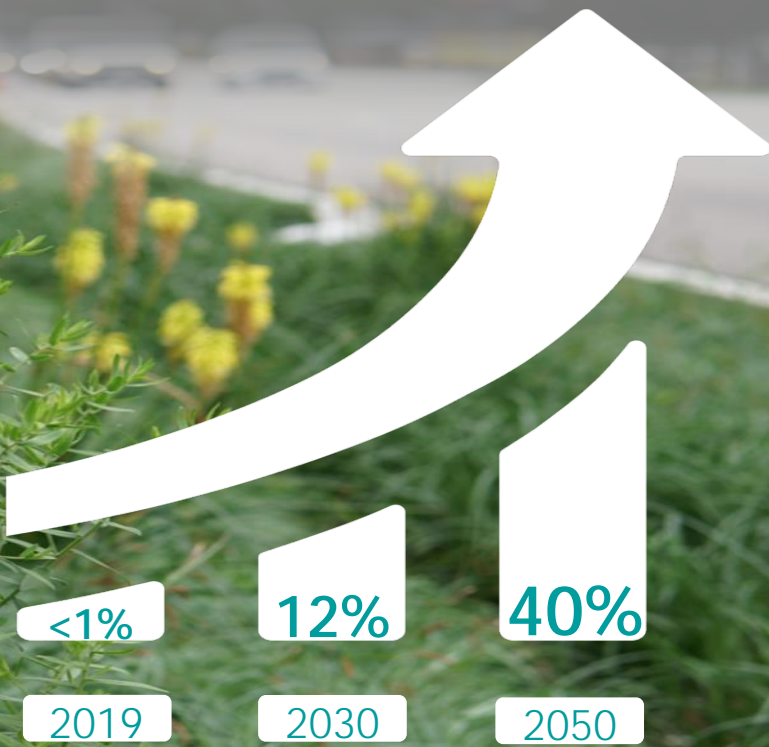


Performance
target
capture and clean
a minimum of
90%
of Vancouver's
average annual
rainfall volume

Design standard
capture and clean
48 mm
of rainfall
per day

Citywide green rainwater infrastructure implementation target

becomes
business as usual
through
renewal,
redevelopment,
retrofits

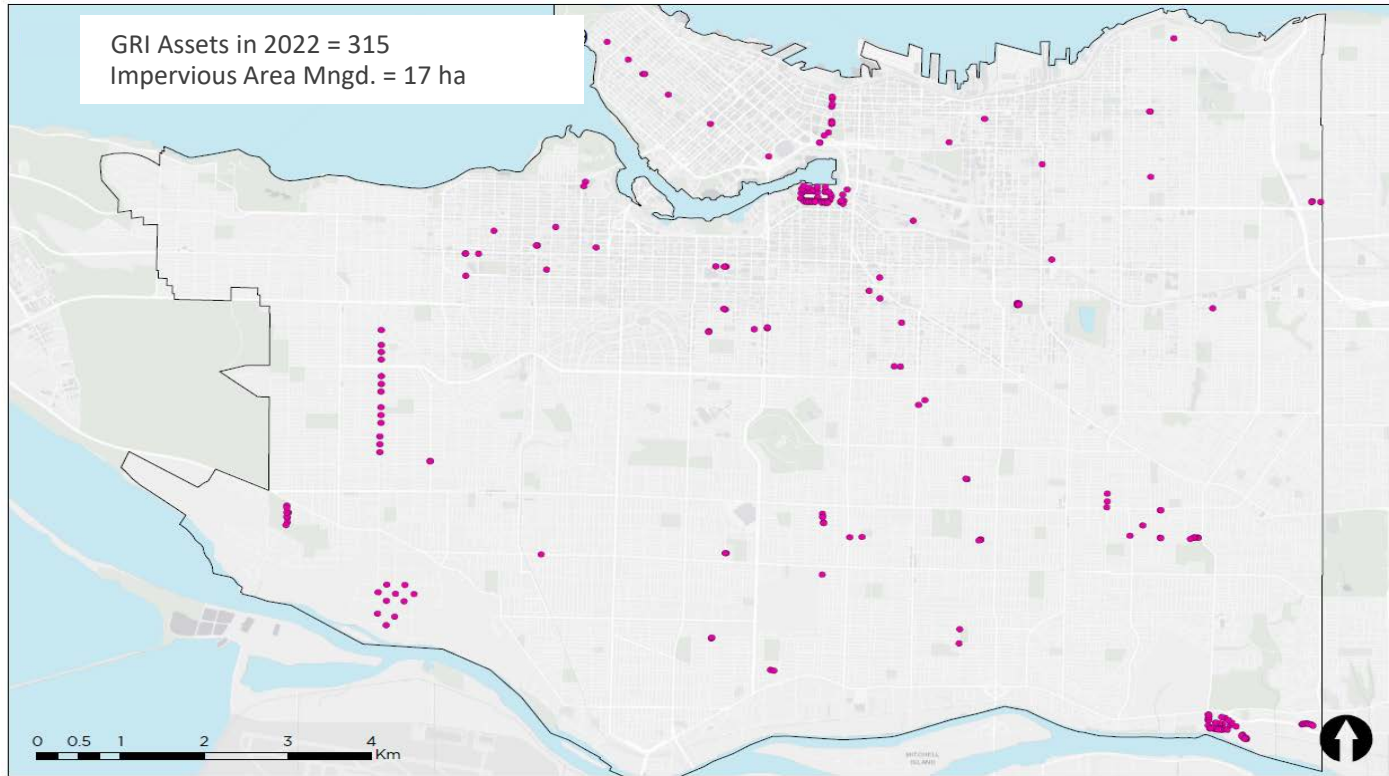




Implementation of GRI in Vancouver

Project: 63rd & Yukon Rain Gardens
Photo Credit: Wendy de Hoog

Vancouver's Public Space GRI



GRI Typologies in Vancouver



**169 bioretention
(54%)**



**43 permeable
pavement (14%)**



**26 Rainwater tree trenches
(8%)**



**77 sub-surface
infiltration (24%)**

Richards Street Blue-Green System




 **16 sensors installed**
Monitoring soil moisture levels

 **8 Blocks, two-way**
All ages separated bike Lane

 **4.2 Thousand lbs**
Carbon sequestration annually

 **1.1 hectares**
Street runoff managed annually

 **11 million litres**
Runoff diverted from sewers annually

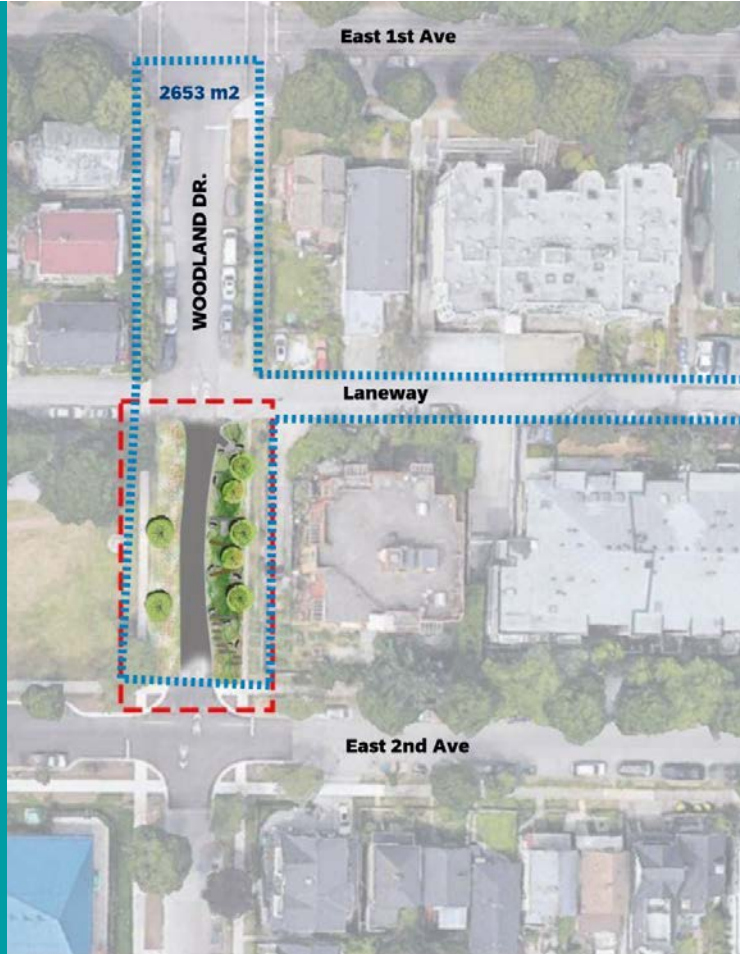
 **15 million litres**
Runoff treated on-site annually

 **100+**
New trees





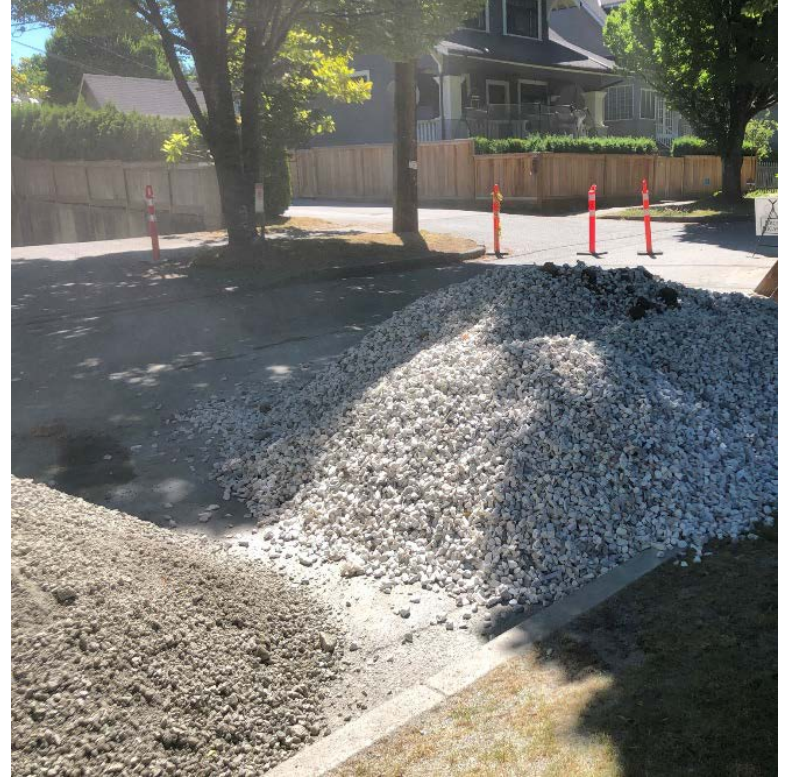
Woodland and 2nd Street Closure Bioswale

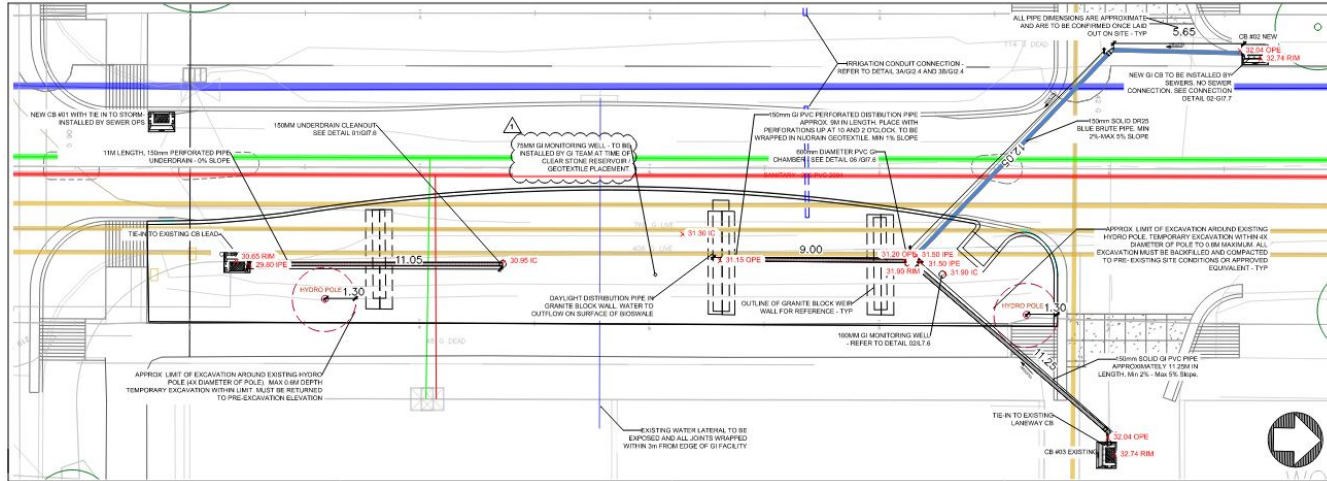


Current: Construction
Complete – Establishment
Period
Timeline: Q2 2022 - Q1 2023
Cost: \$300 K

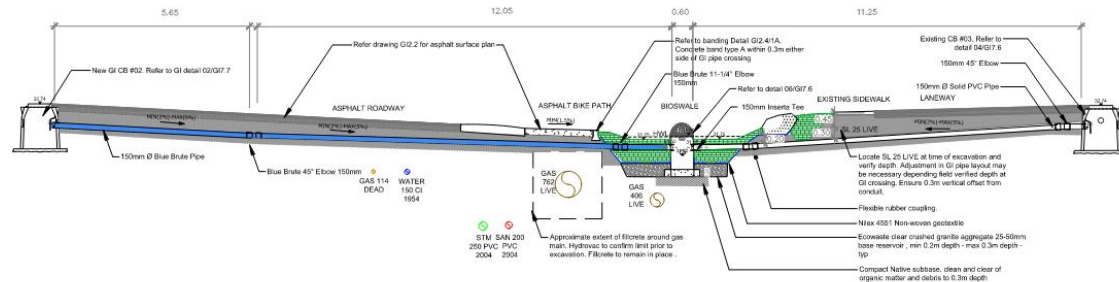
Highlights:

- Road closure with bioswale and AAA bike lane
- All existing trees protected
- 460 m2 new planted area
- Use of recycled materials
- Manages: 0.27 ha impervious area
- Captures & cleans: 4.0 M L/yr






Subsurface Plan Scale: 1:75



GI Connection Profile Scale: 1:50







we are striving for
ecological strategies that
will ensure our systems
provide cross the board
benefits and will survive
beyond 25 years

GRI Maintenance and Rehabilitation

Normal GRI Project Lifecycle



Bioretention Condition Assessments

Design lacking in stormwater function



Short-circuiting to catch basin



- Many of the City's existing bioretention bulges were designed and installed prior to the formation of the GI Branch (2016) and without consistent maintenance.
- GI's Vegetated Assets assessed for level of service in 2019; **48% are found to be under performing or ineffective**
- Many lack infiltration function, have water by-pass and contain invasive weeds that must be managed.
- The underperforming assets require rehabilitation to bring them back provide adequate drainage and infiltration.

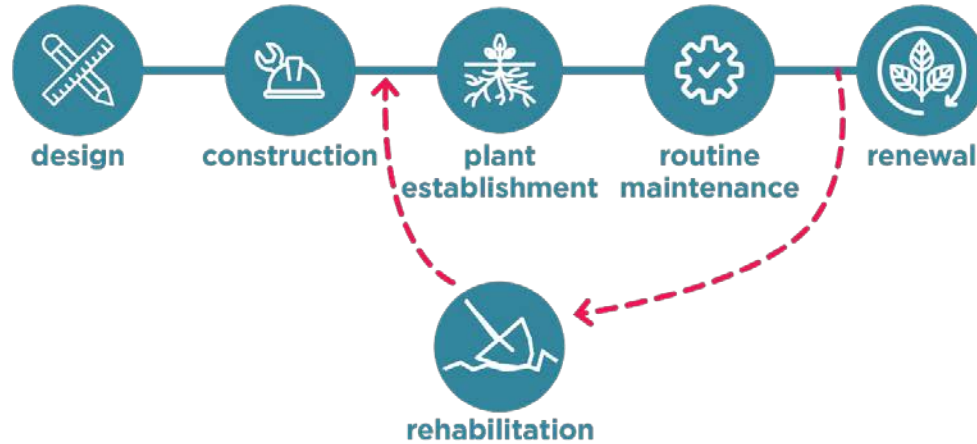


Undersized inlet

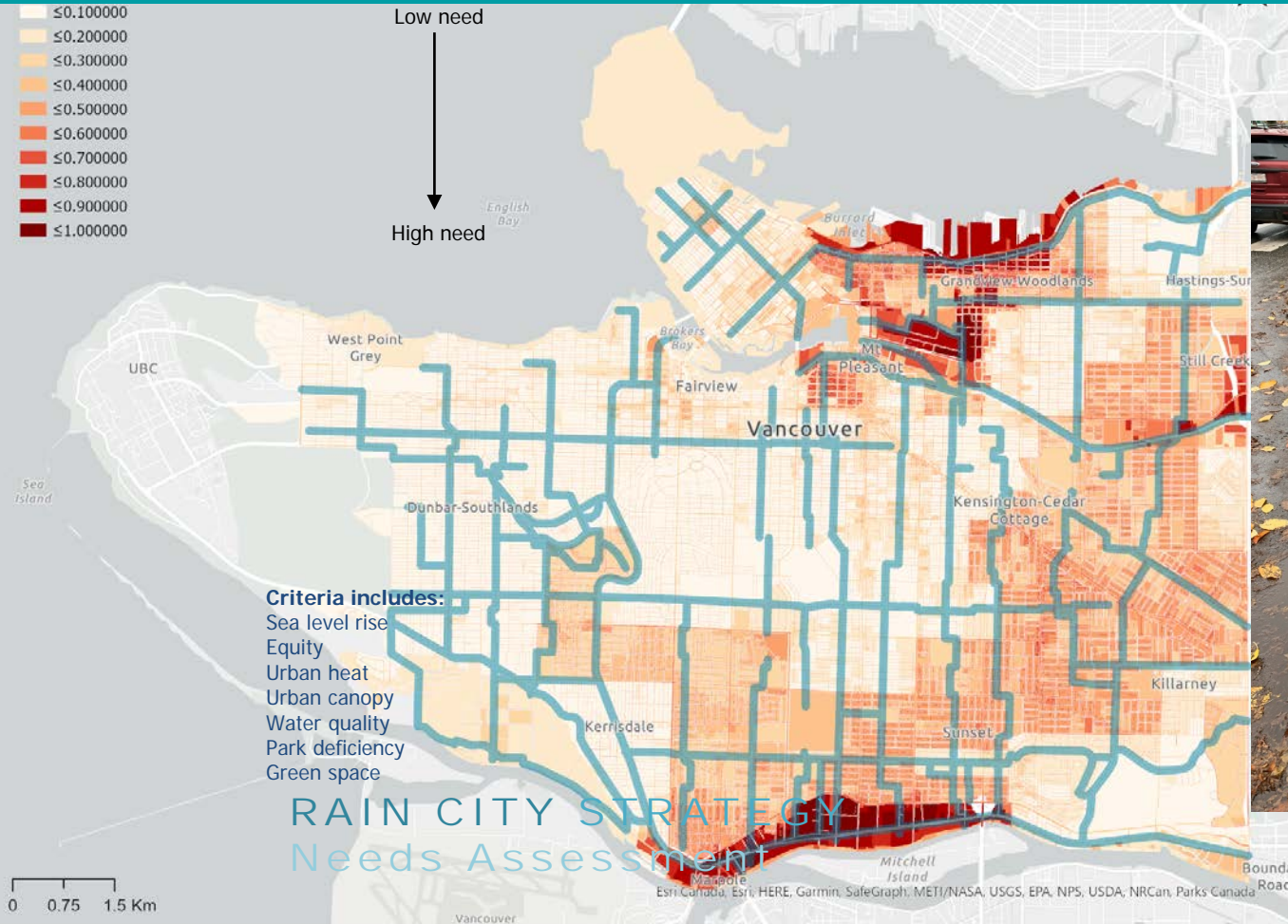


Inlet clogging, requires re-design of pre-treatment

Normal GRI Project Lifecycle



Rehab Site prioritization





Manitoba & W 16th Ave
Simon Fraser Elementary
School



Ontario & W 42nd Ave
Sir William Van Horne
School





Arbutus St
& W 8th Ave



Woodland
St & E 14th
Ave



Thank you

A photograph of a park landscape. In the foreground, a large, rusted metal sculpture of a submarine is partially submerged in a stream. The sculpture has two vertical pipes on top and several circular openings on its side. The stream flows through a lush green area with various plants and trees. In the background, a city skyline with several high-rise buildings is visible under a clear blue sky. A metal staircase with railings is on the right side of the image.

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