
To: **Jill Brimacombe**
Gracorp Capital
700 – 700 W Pender St., Vancouver BC V6C 1G8
via email: jbrimacombe@gracorpcapital.com

From: **Justin Cheung**
Date: **April 25, 2018**

File: **AC45** Page: **1** of **6**

Re: **Marine/Kerr Development**
Integrated Rainwater Management Design Report

1.0 Purpose

The purpose of the report is to establish a rainwater management strategy specifically for the subject development to comply with Vancouver's March 2016 (current) edition of the Citywide Integrated Rainwater Management Plan (IRMP). The submission of this report and a rainwater management plan drawing is one of the requirements for Gracorp Capital's rezoning application.

2.0 Project Description

The Marine/Kerr Development is an amalgamation of three existing lots: 8420 Kerr Street (A&F Printing), 3122 SE Marine Drive, and 3130 SE Marine Drive. The consolidated parcel will be redeveloped into a seven-storey condominium building.

3.0 Performance Objectives

The current edition of Vancouver's IRMP specifies the following performance objectives:

- Return the first 24mm of rainwater per day into natural pathways such as infiltration into subsoils or evapotranspiration to the air.
- Treat the water quality of the next 24mm of rainwater per day to remove pollutants such as hydrocarbons, heavy metals, sediments from erosion, excess nutrients, and bacteria.
- Convey safely rainwater from storm events over 48mm per day to minimize damage to buildings and property.

4.0 Rainwater Management Plan

4.1 Rainwater Management Strategy

We consulted the Best Management Practice Toolkit (Volume II of the Citywide IRMP), and developed a rainwater management strategy primarily involving the use of roof leaders, absorbent landscapes, and lawn basins. The following parameters were established when developing the IRMP:

- The pore space in the absorbent soils is to contain 48mm of rainwater over the treatment area without overflowing.
- Stored rainwater will completely dissipate by evapotranspiration and ground infiltration between Significant Rain Events (SREs) in the spring, summer, and fall. Significant Rain Events are defined as days where precipitation exceeds 25mm per day.
- The ability of rainwater to dissipate by ground infiltration will depend on the native soil properties. It is anticipated that the permeability of native soil will decrease significantly during the winter months, thus reducing the effectiveness of the BMPs during these months.

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Table 1 below summarizes the BMPs used for this project and their respective functions:

Table 1 – BMP Summary

Infrastructure	Peak Flow Reduction	Runoff Quality	Comment
Roof Leaders	No	No	Connected to landscaped areas for flow reduction and treatment.
Absorbent Landscapes	Yes	Yes	Rainwater retention on-site and evapotranspiration to replicate natural conditions. Water quality treatment.
Lawn Basins	No	Yes	Pollutant and silt containment. Capture overflow in the landscaped areas.

The main challenge with this approach is that the perimeter of the underground parking structure occupies most of the site, leaving a small area around the perimeter for landscaping. In order to address this challenge, discussions were held with the architect (DYS) and the structural engineer (Glotman Simpson) to ensure that the top of the underground parking structure is sufficiently low to accommodate placement of growing medium over the structure. The structural design of the building will also ensure allowance for the weight of growing medium, trees, and plants placed over the underground parking structure.

Coordination with the mechanical engineer (Albert Bicol) will be required to finalize the distribution of roof flows into the landscaped areas.

4.2 Calculations

We analyzed the architectural and landscape designs and classified the surfaces into two main categories: hard and soft surfaces. Area take-offs for each category were further separated into “Ground Floor” and “Top Floor”, and were shown on the IRMP drawing.

The “Ground Floor” plan provides a representation of the site layout on the ground, which is a combination of the first floor of the building on the south side of the site, and the third floor of the building on the north side of the site. The “Ground Floor” plan identifies the types of surfaces that will be exposed to rainfall, which are summarized in Table 2.

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Table 2 – “Ground Floor” Area Take-offs

Hard Surfaces	Area (m²)
Pavers	371.2
Concrete Sidewalk/Driveway	62.4
Building	1,173.9
Subtotal – Hard Surfaces	1,607.5
Soft Landscapes	
	Area (m²)
Main Planting Zones	486.5
Planting pockets	22.8
Planters	82.2
Subtotal – Soft Landscapes	591.5
Total Site Area	2,199.0

The top floor plan shows the roof, patios, and planters, as seen from bird’s-eye view, as summarized in Table 3.

Table 3 – “Top Floor” Area Take-offs

Hard Surfaces	Area (m²)
Pavers	325.7
Building Roof	926.2
Subtotal – Hard Surfaces	1,607.5
Soft Landscapes	
	Area (m²)
Planters	65.8
Subtotal – Soft Landscapes	65.8
Total Top Floor Area	1,317.7

It was assumed that all planters and planting pockets will achieve the IRMP performance objectives independently. Therefore, these areas were excluded from the treatment area.

- Treatment area = 2,199.0 – (22.8 + 82.2 + 65.8) = 2,028.2m²
- Storage and treatment capacity required = 2,028.2m² x 48mm = 97.4m³

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In order to achieve the required storage capacity, the architect and the landscape architect (ETA) are to ensure that an average absorbent soil depth of 0.67m will be provided across the three major planting zones.

$$- 486.5\text{m}^2 \text{ (planting zones)} \times 0.67\text{m} \text{ (average depth)} \times 0.3 \text{ (porosity)} = 97.8\text{m}^3$$

5.0 Operations and Maintenance Considerations

The following recommendations regarding the maintenance of the on-site drainage infrastructure shall be followed by the management company of the strata:

5.1 Trees and Planting

Maintenance of trees, shrubs, and ground cover shall include pest and disease control, weeding, watering, cultivation, mulching, and pruning to maintain plants in a vigorous, healthy, and normal growing condition, providing an appearance and characteristic of their species and appropriate to their surroundings.

All plant areas shall be carefully scarified with appropriate hand tools designed for this purpose. Do not scarify within 1-2m radius of trees. This operation shall be carried out 2-3 times per growing season, or as required to prevent caking of surface soil or mulch. Replace or respreads damaged, missing, or disturbed compost mulch to a total depth of 50mm. Keep mulch 10cm from base of trees.

Regular and adequate watering shall be provided in order to promote health plant growth. Remove dead, broken, or hazardous branches from plant material. Remove and replace dead plants and plants not in healthy growing condition.

Pesticides, herbicides, and fungicides shall be applied in accordance with Federal, Provincial, and Municipal regulations as required to control insects, fungus, and disease.

5.2 Sodded Lawn

Maintenance of grass areas shall include cutting on a regular basis during growing season (April through September). All clippings and debris shall be removed and disposed of off-site. Regular and healthy watering shall be provided in order to promote healthy grass growth.

Visual inspection of the grassed areas shall be conducted annually. Any grass showing signs of unhealthy growth shall be seeded. Invasive weeds or moss shall be removed and disposed of off-site. Aerating of the lawn shall be conducted every 1-3 years. Inspect root growth annually to determine need for aerating.

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5.3 Weed Control

Conduct bi-monthly inspection and removal of weeds from all landscaped portions of the site. Weeds shall be removed in their entirety, including root systems or any other below ground parts.

5.4 Lawn Basins

Maintenance of lawn basins is to include annual removal of leaves, silt, and other debris that collects on and around the surface grate and inside the sump. The surface grate must be removed during cleaning to access the sump.

5.5 Manholes and Underground Pipes

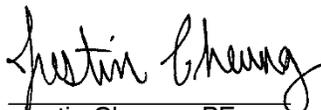
Manholes and underground pipes do not require regular maintenance. Flushing and/or vacuum cleaning will only be necessary should a blockage be evident due to ponding or slow flow rates. Cleaning shall be performed only by certified professionals. Non-qualified persons shall not enter any manholes.

6.0 Closing

The IRMP is a product of collaboration between the civil engineer, mechanical engineer, structural engineer, landscape architect, and the architect. The IRMP was developed in consideration of the proposed building type, landscape aesthetics, environmental constraints, and economics. We trust the IRMP satisfies the requirement for Gracorp Capital's rezoning application for the subject project.

Please do not hesitate to call the undersigned should you have any questions regarding the IRMP.

Prepared by:


Justin Cheung, PEng



Reviewed by:


Stephen Clinton, PEng

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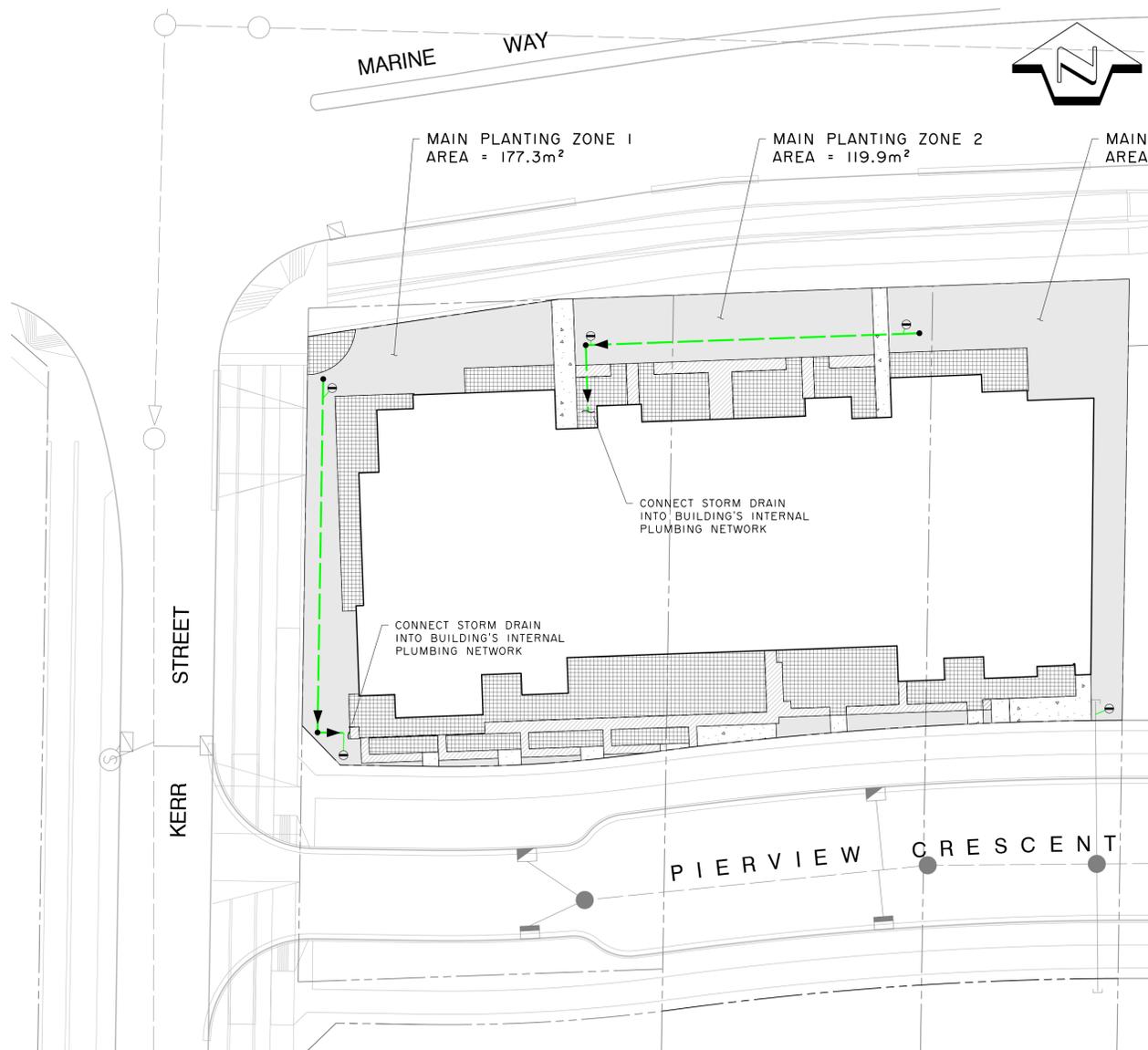
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Attachment: Rainwater Management Plan drawing prepared by InterCAD Services Ltd.

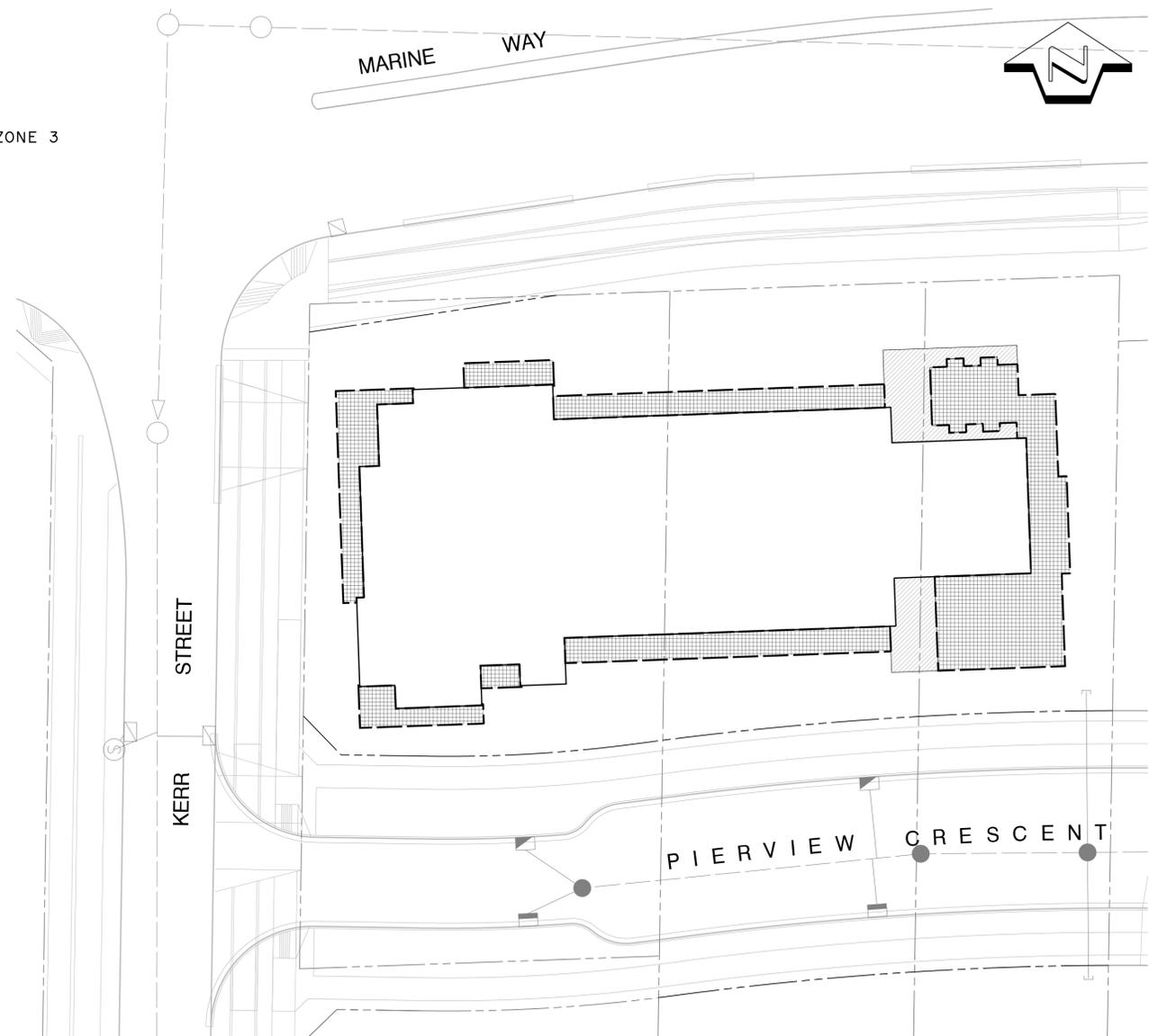
References

City of Vancouver – Citywide Integrated Rainwater Management Plan – Volumes I & II– FINAL DRAFT (March 2016). Retrieved March 2018 at: <http://vancouver.ca/home-property-development/city-wide-integrated-stormwater-management-plan.aspx>

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"GROUND FLOOR" - F1 TO F3



TOP FLOOR - F7

LEGEND

- PROPERTY LINE (LEGAL)
- PROPERTY LINE (PROPOSED)
- PROPOSED OVERFLOW STORM DRAIN
- PROPOSED LAWN BASIN c/w SUMP
- PROPOSED CLEANOUT
- EXISTING STORM SEWER
- EXISTING MANHOLE
- EXISTING CATCH BASIN

AREA CALCULATIONS - "GROUND FLOOR"

	PLANTING AREA	
	MAIN PLANTING ZONES	= 486.5m ²
	MINOR PLANTING POCKETS	= 22.8m ²
	PLANTERS	= 82.2m ²
	PAVERS	= 371.2m ²
	CONCRETE SURFACES	= 62.4m ²
	BUILDING / ROOF	= 1,173.9m ²
TOTAL SITE AREA		= 2,199.0m²

AREA CALCULATIONS - TOP FLOOR

	PLANTERS	= 65.8m ²
	PAVERS	= 325.7m ²
	BUILDING / ROOF	= 926.2m ²
TOTAL		= 1,317.7m²

RAINWATER MANAGEMENT CALCULATIONS

OBJECTIVES

1. RETURN THE FIRST 24mm OF RAINWATER PER DAY INTO NATURAL PATHWAYS SUCH AS INFILTRATION INTO SUBSOILS OR EVAPOTRANSPIRATION TO THE AIR.
2. TREAT THE WATER QUALITY OF THE NEXT 24mm OF RAINWATER PER DAY TO REMOVE POLLUTANTS SUCH AS HYDROCARBONS, HEAVY METALS, SEDIMENTS FROM EROSION, EXCESS NUTRIENTS AND BACTERIA.
3. CONVEY SAFELY RAINWATER FROM STORM EVENTS OVER 48mm PER DAY TO MINIMIZE DAMAGE TO BUILDINGS AND PROPERTY.

CALCULATIONS

CALCULATE TREATMENT AREA:

- = TOTAL SITE AREA - (PLANTERS + MINOR PLANTING AREAS)
- = 2,199.0m² - (82.2m² + 65.8m² + 22.8m²)
- = 2,028.2m²

CALCULATE REQUIRED STORAGE CAPACITY IN MAIN PLANTING AREAS FOR OBJECTIVE 1 AND OBJECTIVE 2:

- = TREATMENT AREA x (24mm + 24mm)
- = 2,028.2m² x 0.048m
- = 97.4m³

AVERAGE GROWING MEDIUM DEPTH = 0.67m

CALCULATE STORAGE CAPACITY:

- = AREA OF MAIN PLANTING ZONES x AVERAGE GROWING MEDIUM DEPTH
- = 486.5m² x 0.67m
- = 97.8m³

NO.	DATE	REVISIONS	BY	APPROVED
1	18-04-25	Rezoning Application	J.C.	
0	18-04-18	Issued for Coordination	J.C.	

