edge consultants

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SUSTAINABLE DESIGN STRATEGY REZONING REPORT



August 05, 2020

5163-5187 Joyce Street, Vancouver, BC Energy Report

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INTRODUCTION

As a part of the project rezoning application package to the City of Vancouver for the project located at 5163-5187 Joyce Street the client and design team have committed to incorporating sustainability features into the proposed design of the development.

There are two (2) paths a developer may choose to demonstrate compliance with the new City of Vancouver green building rezoning requirements. These performance paths are:

A. Near-Zero Emission Building – Passive House

OR

B. Low Emission Green Building – chosen Path

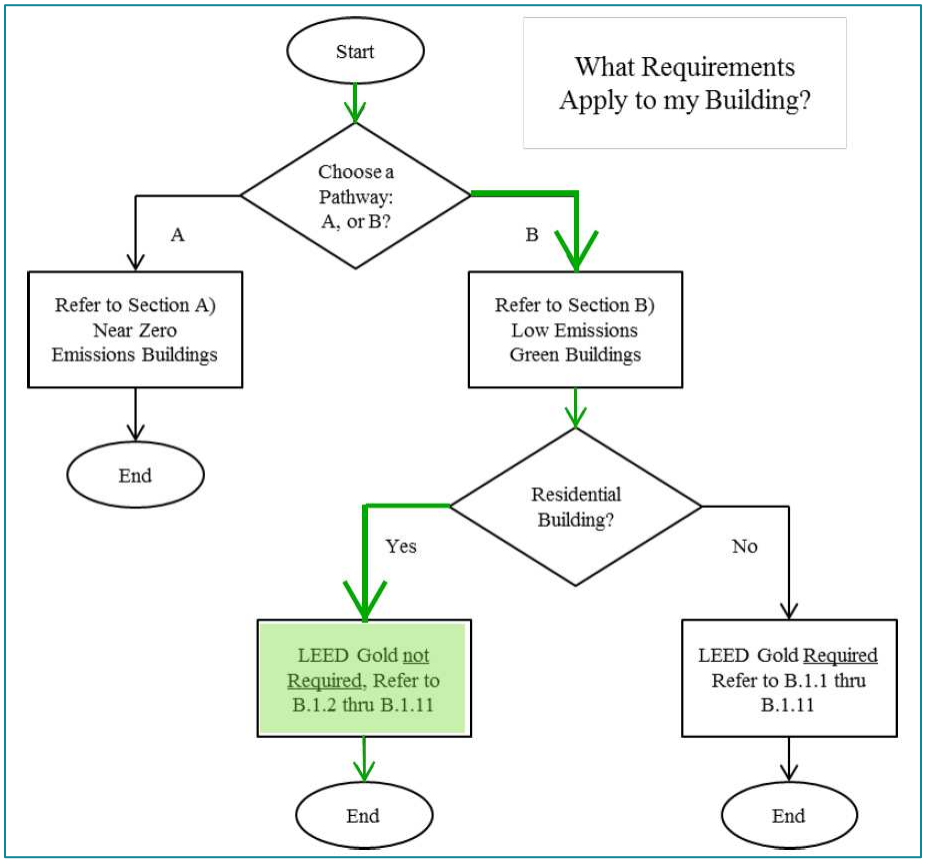


Figure 1: Compliance path

The building falls under the building types with a city recognized low carbon energy system". The following are the policy energy performance limits for this project:

Energy Performance Residential 7+ Stories	TEUI kWh/(m^2.year)	TEDI kWh/(m^2.year)	GHGI $kgCO_2e/(m^2.year)$
Required Target	122.9	31.4	5.8

Table 2: Performance limits

Sustainable Design Summary

Building Envelope

1. **Airtightness testing** of building performance to prevent excessive air leakage, reducing heat loss, lowering utility bills and preventing drafts.
2. **Enhanced levels of wall, roof and parking spray insulation** to decrease heat loss and lower annual heating bills.
3. **High-performance residential glazing** with a U-Value of 0.32 BTU/h.ft^2/^{o}F and SHGC of 0.32.
4. **Embodied carbon emission calculations** to determine the impact of construction making future construction in the province more sustainable.

HVAC Systems & Energy

1. **In-suite heat recovery ventilation system** to lower heating utility bills and ensuring good indoor air quality.
2. **Low temperature ambient loop heat pump system** for heating and cooling in residential units with thermostats in each room for optimum occupancy control.
3. **Enhanced commissioning** to verify the building components are working as per the design documents before occupancy.
4. **Limited refrigerant emissions** to reduce global warming potential.
5. **Energy sub-metering** will be provided to tenants, so they only pay for the energy they use.
6. **Domestic Hot Water (DHW)** by 91% efficient gas-fired condensing boilers

Indoor Air Quality

1. **Direct Ventilation** will be provided to each bedroom in occupied space. This ensures good indoor air quality throughout the home.
2. **Low emitting materials** ensure VOCs (Volatile Organic Compounds) and odors from materials are minimized, creating a healthier environment for occupants.
3. **Indoor air quality testing** will take place before occupancy ensuring construction contaminants such as odors and VOC's have been properly flushed from the building before occupancy.

Integrated Rainwater Management & Green Infrastructure

The project design team has incorporated integrated rainwater management and green infrastructure measures for the management of the site's rainfall in consultation with the City-Wide Integrated Rainwater Management Plan Volumes I & II and the City's Rainwater Management Bulletin.

Resilient Drinking Water Access

Accessible **water potable fixtures** Will be provided at ten locations around the building that will be accessible to occupants and will have a minimum pressure of 10 PSI for use in emergencies.

Documentation

Required supporting documentation has been included as follows:

- Item B.2: completed Preliminary Zero Emissions Building Plan (ZEBP) Energy Checklist, demonstrating the project meets the performance limits for energy use (TEUI), heat loss (TEDI), and greenhouse gas emissions (GHGI), together with key inputs and a summary of detailed energy model inputs for detailed and/or 3rd party review included as Appendix A;

- Item B.6.2: Preliminary embodied emissions calculations, and a description of specific measures that will be explored during design to reduce embodied emissions;
- Item B.10: Description of the site IRMP, including strategies of green and grey infrastructure measures included in the landscape and building design; more details forthcoming;
- A commitment by the owner to meet the requirements of the Green Buildings Policy for Rezoning with documentation to be submitted at a later project phase, included as Appendix B, comprises:
    - B.3: Design, build, and testing to meet a building airtightness target of 2.0 L/s/m² @ 75 Pa
    - B.4: Complete an enhanced commissioning process;
    - B.5.1 & 5.2: Design and build to include building metering and sub-metering of energy, and to enter into an agreement on energy reporting, including assistance for building future owners;
    - B.6.1: Complete refrigerant emissions calculations;
    - B.7: Design and build a direct ventilation system;
    - B.8: Design and build with low-emitting materials;
    - B.9: Test indoor air quality before occupancy;
    - B.11: Design and build a resilient potable water access

GREEN BUILDING POLICY COMPLIANCE

B.1.1 LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

LEED Gold is not required for residential buildings under the City of Vancouver Green Buildings Policy for Rezoning. As the project building is more than 50% residential, LEED registration, design, and certification to a Gold standard rating is not required. Refer to figure one above.

B.1.2 PERFORMANCE LIMITS

The project at 5163-5187 Joyce Street Vancouver, BC, is a residential development located in Vancouver, BC. It comprises 293 residential units, commercial, amenity space and five levels of below-grade parkade, and support facilities.

The proposed mechanical HVAC system for the suites consists of distributed water to air heat pumps connected to a common ambient loop that has a central air source heat pump, boiler and cooling tower. The central air to water heat pumps provides heat to the loops year-round with the boilers only running below 0^0C or in periods of high heating demand/load. Ventilation will be provided to each suite by a ERV unit. Ventilation in the corridor will be provided by a central make up air unit connected to a hot water loop. Electrical baseboards provide freeze protection for all other areas. The parkade is unheated with exhaust fans controlled by CO and combustible sensors. DHW preheat by air source heat pump, high efficiency boiler top-up and low flow fixtures. Other features include high-performance building envelope and glazing. Edge Consultants have taken no credit for reduced infiltration in the energy model.

Based on our preliminary iterations of the model and the inputs as outlined in the model input sheet (Appendix B – Energy Model Report) the results of our simulation indicated the following results:

Energy Performance Residential 7+ Stories	TEUI kWh/(m^2.year)	TEDI kWh/(m^2.year)	GHGI kgCO_2e/(m^2.year)
Required Target	122.9	31.4	5.8
Modeled Result	97.0	30.7	4.4
Comparison (%)	-21.1%	-2.3%	-24.7%
Result	Compliant	Compliant	Compliant

Table 2: Energy model results

The simulation demonstrates that this building is **compliant** with the City of Vancouver's Green Building's policy for rezoning.

A report has been developed to confirm that the project design is on target to meet the requirements as dictated by the Green Buildings Policy for Rezoning 2016, pathway B. Low Emissions Green Building, effective May 1, 2018. The report includes preliminary strategies explored by Edge, to achieve the various requirements of the Low Emissions Green Building pathway, a Preliminary Zero Emissions Building Plan (ZEBP) Energy Checklist showing that the project meets the performance limits for energy use (TEUI), heat loss (TEDI), and greenhouse gas intensity (GHGI), together with key inputs, and a summary of detailed energy model inputs for detailed and/or 3rd party review. See the full preliminary Zero Emissions Building Plan (ZEBP) Energy Checklist and summary of detailed energy model report in Appendix B.

B.1.3 Whole Building Airtightness Testing

Airtightness testing and reporting for whole-building and suites are required for this residential building. The owner is committed to achieving the specified building airtightness target of 2.0 l/s*m^2 @ 75 Pa air leakage or sealed according to good engineering practice, and the suite-level air leakage target of 1.2 l/s*m^2 @ 50 Pa as tested to ASTM E779, or an equivalent standard. If choosing to model a reduced infiltration rate, the project must commit to achieving the corresponding airtightness target, to be confirmed by mandatory air tightness testing. Edge Consultants have taken no credit for reduced infiltration in the energy model.

Note: projects must provide all airtightness documentation required by the AHJ at each phase of project approval, and projects using reduced infiltration rates may have additional documentation requirements.

B.1.4 Enhanced Commissioning

The owner is committed to completing an enhanced commissioning process for all building energy systems following ASHRAE Guideline 0-2005, and 1.1-2007, or an alternative commissioning standard.

B.1.5 Energy System Submetering & Reporting

1.5.1 Energy System Sub-Metering

Separate master metering is required for each energy utility (e.g.: Electricity, Gas, etc.) and sub-metering is required of all major energy end-uses and major space use within the building. The creation of an Energy Star Portfolio Manager account is required for the project with all basic property information as designed, including setup of meters for all energy utilities servicing the building.

1.5.2 Energy Reporting

The owner must agree with the City of Vancouver to report energy use data for the building as a whole and certain common areas and building systems and to provide for the hiring of a service provider to assist the future building owners for a minimum of three years in collecting and submitting the energy use data to the City.

B.1.6 Refrigerant Emissions & Embodied Emissions

1.6.1 Refrigerant Emissions

The project must calculate and report the life-cycle equivalent annual carbon dioxide emissions the project building, in $kgCO_2e/m^2$, from the emission of refrigerants. Emissions from refrigerants will be calculated in the case that the total installed heating and cooling capacity of equipment containing refrigerants is 35 kW or greater, using the following formula:

$kgCO_2e/m^2 = [GWP_r * R_c * (0.02 * L + 0.1)] / (L * A)$

Outputs representing the overall refrigerant emissions associated with the building's mechanical components will be provided to the City of Vancouver for Building Permit. The owner has documented the commitment to meet this requirement in the appended Letter of Commitment.

1.*6.2 Embodied Emissions*

Athena Impact Estimator version 5.4 was used to calculate the preliminary embodied emissions for the project. The Life Cycle Assessment (LCA) boundary accounts for cradle-to-grave impacts, including resource extraction, product manufacturing and transportation, building construction, product maintenance and replacement, and building demolition/deconstruction/disposal (EN 15804/15978 modules A1-A5, B2-B4, and C1-C4). Operating energy and water consumption are excluded. The LCA includes systems identified in the Green Building Policy for Rezoning – Process and Requirements. A building lifetime of 60 years is assumed.

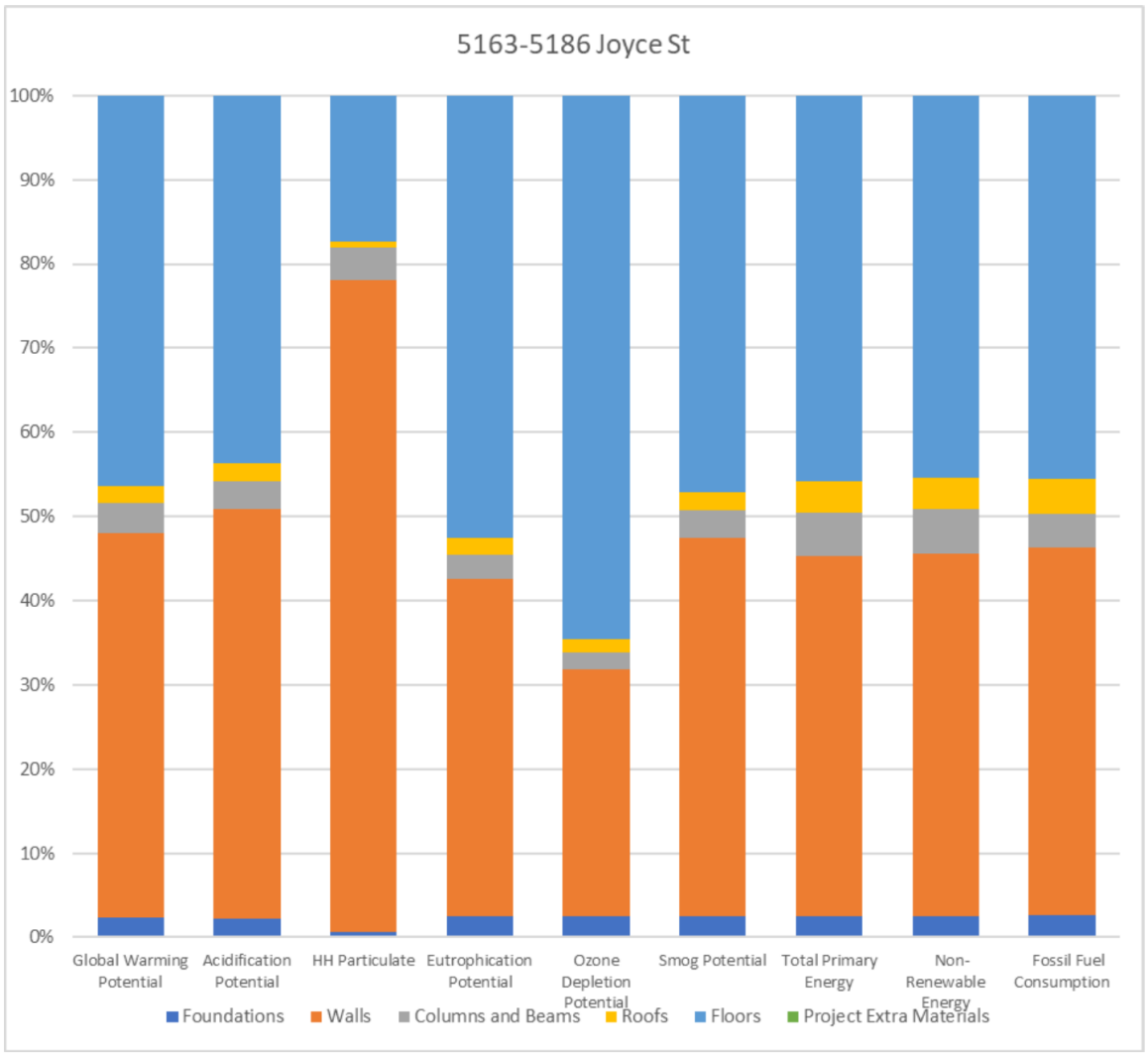


Figure 3: LCA summary

LCA Measures	Unit	A to C	A to D
Global Warming Potential	kg CO2 eq	9,820,000	9,920,000
Acidification Potential	kg SO2 eq	54,700	52,700
HH Particulate	kg PM2.5 eq	28,200	28,400
Eutrophication Potential	kg N eq	3,710	3,730
Ozone Depletion Potential	kg CFC-11 eq	0	0
Smog Potential	kg O3 eq	943,000	931,000
Total Primary Energy	MJ	101,000,000	99,400,000
Non-Renewable Energy	MJ	97,300,000	95,300,000
Fossil Fuel Consumption	MJ	83,500,000	84,400,000

Table 1: Total Environmental Impacts

LCA Measures	Unit	A to C
Lifetime GWP intensity	kg CO2e/m2	424.53
Annual GWP intensity	kg CO2e/m2-yr	7.08
Total project lifetime GWP	kg CO2e	9,818,105.31

Table 2: GWP Intensity (embodied carbon)

B.1.7 Verified Direct Ventilation

The building will be designed and constructed with a ventilation system that provides outdoor air directly to all occupiable spaces in the quantities defined by applicable code, including bedrooms, living rooms, and dens in residential units. The ventilation system shall allow for the designed flow rates to be tested and verified at the occupiable space level as part of the enhanced commissioning process.

B.1.8 Low Emitting Materials

Interior materials will be selected following the specified Low Emitting Materials content requirements to minimize emissions from Volatile Organic Compounds (VOCs) and added urea-formaldehyde.

B.1.9 Indoor Air Quality Testing

Testing for formaldehyde, particulates, ozone, total volatile organic compounds, and carbon monoxide will be conducted before occupancy following the targets and methods specified by the rezoning policy. The results as compared to acceptable target concentration levels and standards will be reported to the City for occupancy permits.

B.1.10 Integrated Rainwater Management & Green Infrastructure

See Appendix C

B.1.11 Resilient Drinking Water Access

The project design incorporates potable water access points capable of operating on city water pressure alone and without electricity. The fixtures will be accessible for all building occupants and located where residual city water pressure is a minimum of 10 psi. Points of water access will be provided for every 75 people. Based on a preliminary occupancy count of 731 people, this would equate to a total of ten access points.

SUMMARY

The building design and construction for the project incorporates a variety of strategies demonstrating a committed and effective approach to meeting the requirements of the City of Vancouver's Green Building Policy for Rezoning 2017. The implementation of these strategies will ultimately yield a sustainable building with a minimized environmental footprint, optimized energy performance, and indoor air quality that promotes occupant health

APPENDIX A – LETTER OF COMMITMENT

1112152 BC Ltd.
Tel: 604-620-9111
#101 - 8889 Laurel St. Vancouver, BC V6P 3V9

July 29, 2020

Planning Urban Design + Sustainability Department
City of Vancouver
453 West 12th Avenue
Vancouver, BC V5Y 1V4

Email planning@vancouver.ca

Re: 5163-5187 Joyce commitment to meet the requirements of the Green Buildings Policy for Rezoning.

As a part of the Rezoning Application package for the development at **5163-5187 Joyce** by **1112152 BC Ltd.**, hereby commit to meeting the requirements of the Green Buildings Policy for Rezoning and commit to providing the required documentation at time of Development Permit Application, Building Permit Application and Occupancy Permit Application. At this concept stage of design, the Applicant commits to the following requirements:

B1.2: Requirements of performance limits. The owner is committed to meeting the energy requirements noted in the projects building energy model report following targets which will comply with Green Buildings Policy for Rezonings dated

B.1.3: Airtightness Testing: design, build, and test to meet an airtightness target of 2.0 L/s/m^2 @ 75 Pa;

B.1.4: Enhanced Commissioning: complete an enhanced commissioning process;

B.1.5: Energy System Sub-Metering and Reporting: design and build to include building metering and sub-metering of energy, and to enter into agreement on energy reporting, including assistance for building future owners;

B.1.6: Refrigerant Emissions and Embodied Emissions: complete refrigerant emissions calculations;

B.1.7: Verified Direct Ventilation: design and build a direct ventilation system;

B.8: Low-Emitting Materials: design and build with low-emitting materials;

B.9: Indoor Air Quality Testing: test indoor air quality prior to occupancy;

B.11: Resilient Drinking Water Access: design and build a resilient potable water access point.

The design team and future operations team will coordinate to incorporate the measures required to meet all requirements of the Green Buildings Policy for Rezoning.

Sincerely,

Brianna Guo

1112152 BC Ltd.

APPENDIX B –ENERGY MODELING REPORT

edge consultants

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ENERGY MODELING REZONING REPORT



July 24, 2020

5163-5187 Joyce Street, Vancouver, BC Energy Report

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EXECUTIVE SUMMARY

The project at 5163-5187 Joyce Street Vancouver, BC, is a residential development located in Vancouver, BC. It comprises 293 residential units, commercial, amenity space and five levels of below-grade parkade, and support facilities.

The proposed mechanical HVAC system for the suites consists of distributed water to air heat pumps connected to a common ambient loop that has a central air source heat pump, boiler and cooling tower. The central air to water heat pumps provides heat to the loops year-round with the boilers only running below 00C or in periods of high heating demand/load. Ventilation will be provided to each suite by a ERV unit. Ventilation in the corridor will be provided by a central make up air unit connected to a hot water loop. Electrical baseboards provide freeze protection for all other areas. The parkade is unheated with exhaust fans controlled by CO and combustible sensors. DHW preheat by air source heat pump, high efficiency boiler top-up and low flow fixtures. Other features include high-performance building envelope and glazing. Edge Consultants have taken no credit for reduced infiltration in the energy model.

As a part of the rezoning Application package, the following report has been developed to provide confirmation the project design is on target to meet the requirements as dictated by the Green Buildings Policy for rezoning 2016, pathway B. Low Emissions Green Building, effective May 1, 2017. The following report includes preliminary sustainability strategies explored by Edge Consultants, to achieve the various requirements of the Low Emissions Green Building pathway, along with all required supporting evidence at this stage, as listed:

As per item B.2 of the green buildings policy for rezoning, a summary of strategies and measures to achieve performance limits for energy use, heat loss, and greenhouse gas intensity has been provided in this report including:

- The completed Preliminary Zero Emissions Building Plan (ZEBP) Energy Checklist, demonstrating the project meets the performance limits for energy use (TEUI), heat loss (TEDI), and greenhouse gas intensity (GHGI), together with key inputs.
- A summary of detailed energy model inputs for detailed and/or 3rd party review.

There are three phases to the City of Vancouver's energy modeling guidelines to meet or exceed the following targets

- TEDI (Thermal Energy Demand Intensity)
- EUI (Energy Use Intensity)
- GHGI (Greenhouse Gas Intensity)

Energy Performance Residential 7+ Stories	TEUI kWh/(m^2.year)	TEDI kWh/(m^2.year)	GHGI $kgCO_2e$/(m^2.year)
Required Target	122.9	31.4	5.8
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1.0 INTRODUCTION

1.1. PROJECT DESCRIPTION

The project at 5163-5187 Joyce Street Vancouver, BC, is a residential development located in Vancouver, BC. It comprises 293 residential units, commercial, amenity space and five levels of below-grade parkade, and support facilities.

The proposed mechanical HVAC system for the suites consists of distributed water to air heat pumps connected to a common ambient loop that has a central air source heat pump, boiler and cooling tower. The central air to water heat pumps provides heat to the loops year-round with the boilers only running below 0^0C or in periods of high heating demand/load. Ventilation will be provided to each suite by a ERV unit. Ventilation in the corridor will be provided by a central make up air unit connected to a hot water loop. Electrical baseboards provide freeze protection for all other areas. The parkade is unheated with exhaust fans controlled by CO and combustible sensors. DHW preheat by air source heat pump, high efficiency boiler top-up and low flow fixtures. Other features include high-performance building envelope and glazing. Edge Consultants have taken no credit for reduced infiltration in the energy model.

Building Type(s)	Floor Area (m^2)	Floor Area (ft^2)
Residential (7+ Stories)	24,055	258,923
Retail (Group D & E except Office)	1,475	15,879
Total Modeled Floor Area	**25,530**	**274,802**
Architectural Floor Area	26,000	279,862
Modeled versus Architectural Area	-1.8%	
Below-Grade Parkade Area	5,814	62,580
Note: The difference between the gross floor area as indicated on the architectural plans and the modelled floor area are permitted a tolerance of +/- 5% accuracy as per City of Vancouver energy modelling guidelines Version 2.0.		

Table 1: Modeled floor area

Role	Company	Contact	Phone Number	Email
Client	Hugo Reid Development	Jason Newton	+1 (236) 999 9727	Jason@hugoreid.com
Architect	J+S Architects	Jesse Basran	+1 (604) 210 9698	jesse.b@jsarchitect.ca
Energy Modeler	Edge Consultants	Eoghan Hayes	+1 (604) 338-1063	ehayes@edgec.ca

Table 2: Project consultants and contact details

1.2. Building Geometry and Constructions

The overall amount of glazing for the above-grade levels of the project building is 50%. The building opaque assemblies comprise an R-6 effective window wall spandrel. The roof is insulated with R-30 continuous Insulation above deck on podium levels and R-20 insultation on rooftop of tower. The fenestration for the residential windows has a U-value (Glazing and frame combined) of 0.32 BTU/h.ft^2.^{0}F, SHGC = 0.32. The parkade ceiling is modeled with 5" of R-20 spray insulation beneath conditioned areas.

Note. The owner is committed to hitting the TEDI targets required for the project and will ensure these targets are adhered to during the detailed design and construction phases of the project.

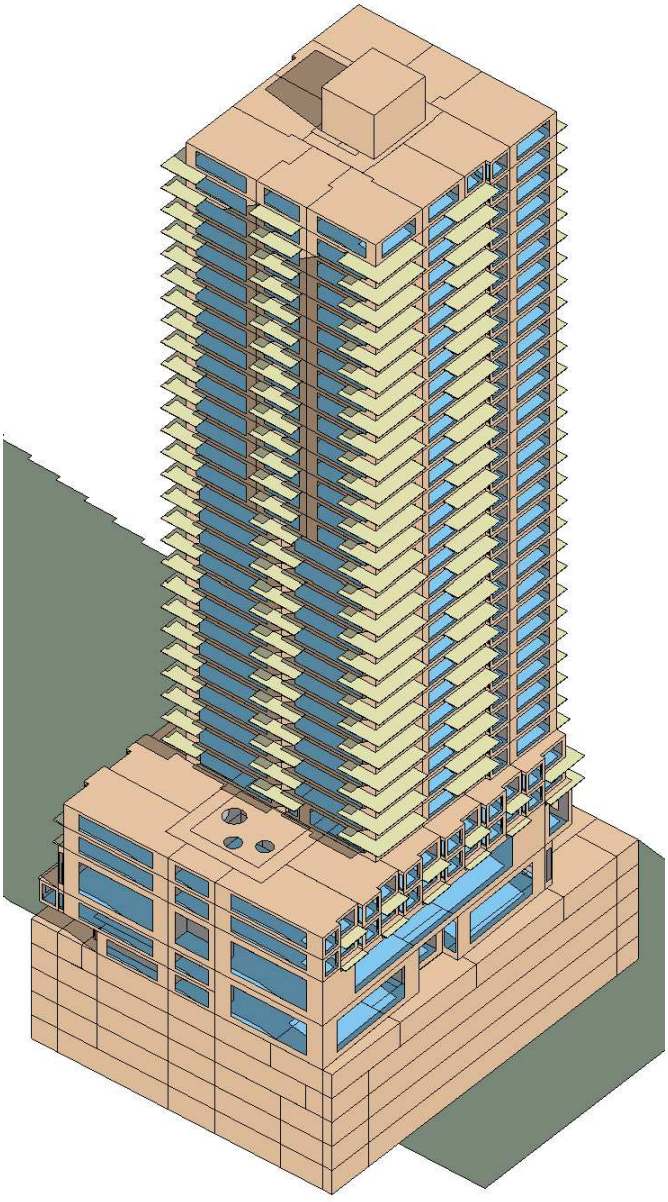


Figure 1: *Building geometry (IESVE Software)*

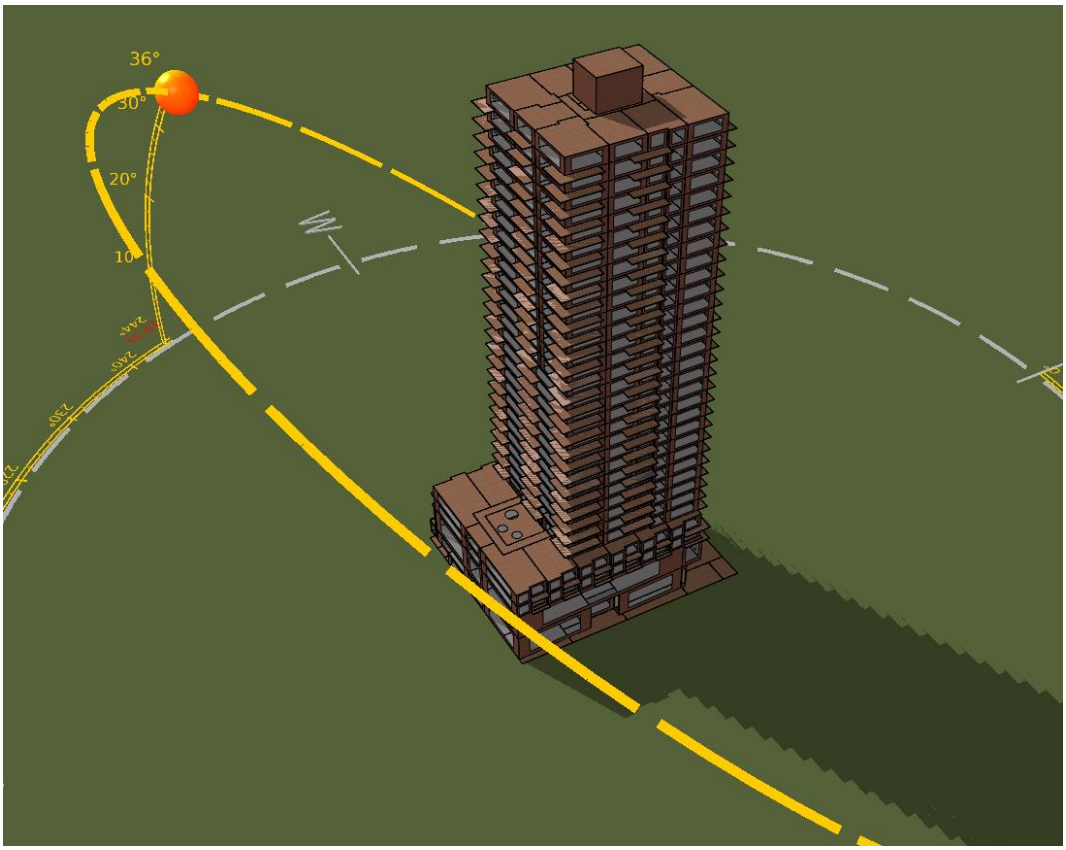


Figure 2: *Building geometry (IESVE Software)*



Figure 3: *Building geometry (IESVE Software)*

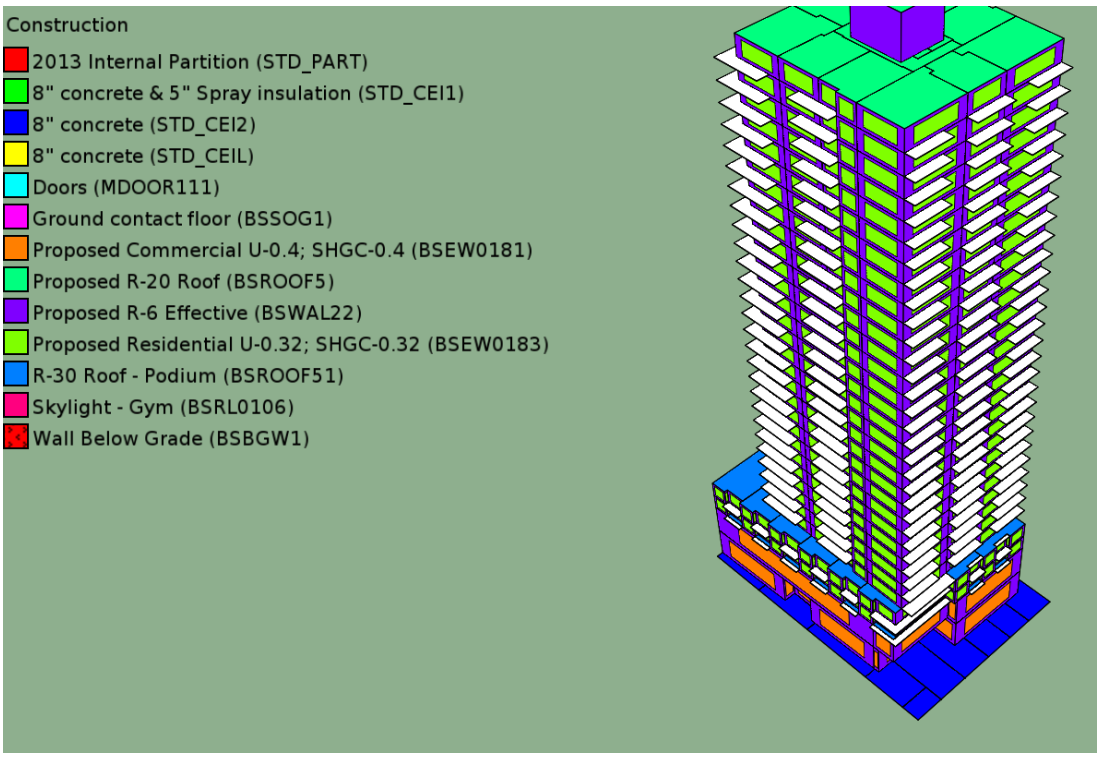


Figure 4: Proposed modeled constructions (IESVE Software)

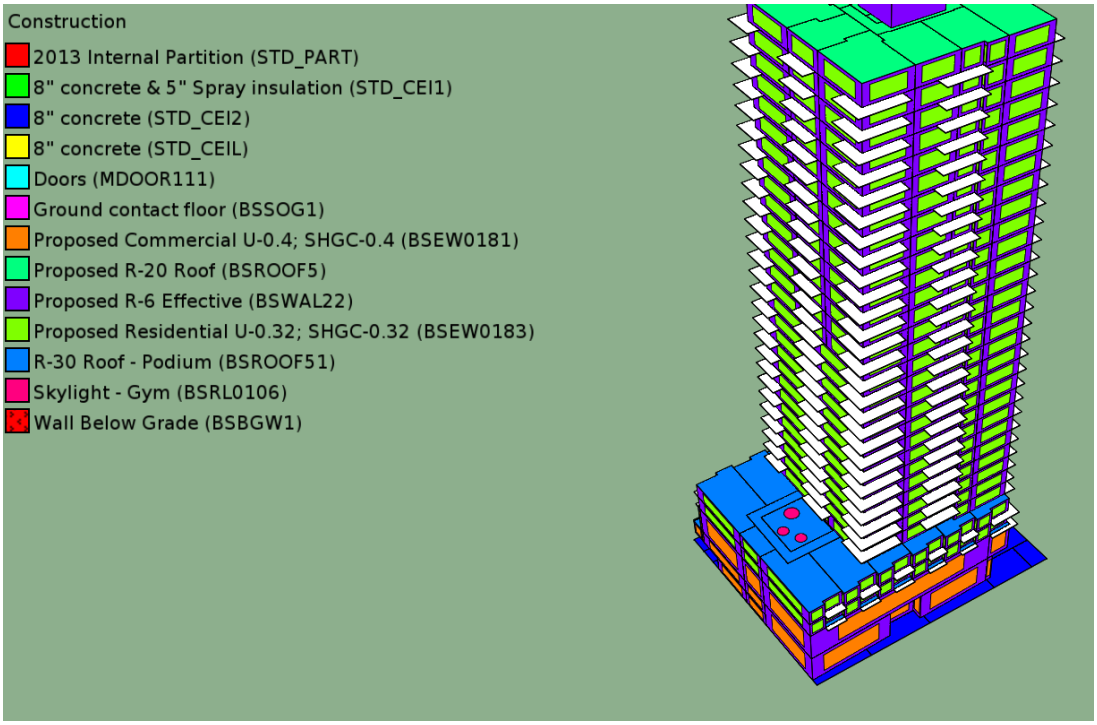


Figure 5: Proposed modeled constructions (IESVE Software)

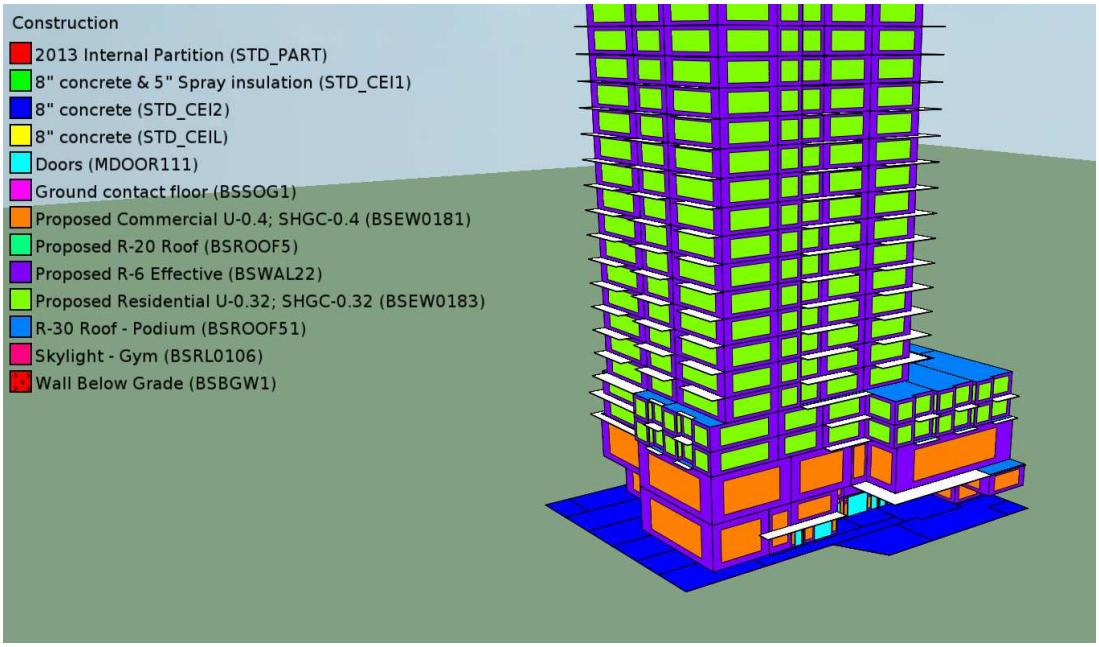


Figure 6: Proposed modeled constructions (IESVE Software)

2.0 ENERGY MODEL INPUT SHEET

Model Input Sheet		edge
Title/Address	5163-5187 Joyce Street, Vancouver, BC	© Copyright Edge Consultants
Prepared by	Matt Canavan	
Checked By	Eoghan Hayes	
Date Prepared	14-Jul-2020	
Model Details	Rezoning	
Modelled Floor Area (m^2)	25,547	Architectural Area: 26000 meters squared. MFA as per COV EMG V2.0 Definition
Number of Levels (above grade)	32	Parkade Levels: 5
Number of Suites	293	
Climate Zone	4C	
Heating Degree Days	2850	
Cooling Degree Days	-98	
Weather file	CAN_BC_Vancouver.Intl.AP.718920_CWEC2016.epw	
Peak Summer Design Temperature	30 °C Dry Bulb / 22 °C Wet Bulb	VBBL 2019
Peak Winter Design Temperature	-8°C	

Category	Description	Proposed Design	Notes & Comments
Building Envelope	**Wall - Above Grade**	Window wall spandrel	Assumed effective value - all BETBG calculation will be confimred by envelope consultant
	R-Value (RSI)	1.1	
	U-Value (W/m^2-K)	0.946	
	R-Value (Imperial)	6.0	
	Wall - Below Grade	Concrete no insultation	Typical value
	R-Value (RSI)	0.7	
	U-Value (W/m^2-K)	1.420	
	R-Value (Imperial)	4.0	
	Roof	Insulation above deck	Typical value -all insulation values for residential and commercial tbc
	R-Value (RSI)	3.6	
	U-Value (W/m^2-K)	0.279	
	R-Value (Imperial)	20.3	
	Roof - Podium	Insulation above deck	Typical value -all roof insulation values for residential and commercial tbc
	R-Value (RSI)	5.3	
	U-Value (W/m^2-K)	0.189	
	R-Value (Imperial)	30.0	
	Slab over parkade	5" Spray Insulation below conditioned floor area	Typical value
	R-Value (RSI)	3.5	
	U-Value (W/m^2-K)	0.284	
	R-Value (Imperial)	20.0	
	Glazing Type 1	Residential Glazing	Typical value -all glazing values for residential and commercial tbc
	U-Value (W/m^2-K)	1.82	
	U-Value ($Btu/h.ft^2$-F)	0.320	
	Solar Heat Gain Coefficient	0.32	
	Shading Coefficient	0.37	
	Glazing Type 1	Commercial Glazing	Typical value -all glazing values for residential and commercial tbc
	U-Value (W/m^2-K)	2.27	
	U-Value ($Btu/h.ft^2$-F)	0.40	
	Solar Heat Gain Coefficient	0.40	
	Shading Coefficient	0.46	
	Swing doors - Opaque	0.5	Typical value
	Glazing Percentage	50%	Based on Model geometry
	Infiltraton (l/s per m^2)	0.2	As per COV EMG version 2.0 - no credit for infiltration taken in energy model

HVAC	**Residential Suites -** Occupancy	731	As per COV Energy Modelling Guidelines: Two people for first bedroom, additional person for each additional bedroom. One person per studio.
	Ventilation	ERV 75% efficient/ fan power 50W combined ERV runs continuously	0.35 ACH or 15 CFM per person - 62.1-2001 without Add. N
	Heating / Cooling Market Suites	Water source Heat pump on ambient loop	Mechanical cooling confirmed - cooling tower with heat exchanger, ASHP for Heat recovery, 91% efficient Boilers
	Heating	COP = 3	
	Cooling	EER = 14	
	Heating Setpoint	22°C with 18°C setback.	NECB Schedule G.
	Cooling Setpoint	24°C	NECB Schedule G.
	Retail/Amenity/gym Spaces	Water source Heat pump on ambient loop	Mechanical cooling confirmed - cooling tower with heat exchanger, ASHP for Heat recovery, 91% efficient Boilers
	Heating	COP = 3	
	Cooling	EER = 14	
	Heating Setpoint	22 °C with 18°C setback.	
	Cooling Setpoint	24°C	
	Corridors - Ventilation	15 CFM per door.	Parkade lobby pressurization as per 62.1-2001 without add N.
	Heating	Water source Heat pump on ambient loop	Mechanical cooling confirmed - cooling tower with heat exchanger, ASHP for Heat recovery, 91% efficient Boilers
	Other Areas - Heating	Electric baseboards.	No cooling.
	Heating Setpoint	7.22°C	
Lighting (W/m^2)	Residential Suites	5.0	LPDs as per COV Energy Modelling Guidelines
	Conference/Meeting/Multi-purpose room	13.3	Default NECB values
	Corridor - Residential	7.1	Schedule as per COV Energy Modelling Guidelines
	Lobby for MURB	9.7	Schedule as per CoV EM Guidelines
	Retail - Mall Concourse	11.9	Default NECB values
	Stairway - Residential	7.4	Schedule as per COV Energy Modelling Guidelines
	Storage Room	6.8	Default NECB values
	Mech & Elec Space	4.60	
	Parking Area	2.10	Schedule as per COV Energy Modelling Guidelines
	Exterior Lighting	4 kW	Assumed exterior connected lighting power.
Plug Loads (W/m^2)	Residential Suites	5.0	As per COV Energy Modelling Guidelines
	Conference/Meeting/Multi-purpose room	1.0	NECB default value
	Lobby for MURB	1.0	NECB default value
	Retail - Mall Concourse	1.0	NECB default value
	Storage Room	1.0	NECB default value
	Mech & Elec Space	1.0	NECB default value
	Library	1.0	NECB default value
	Number of Elevators	4	3kW per elevator as per COV Energy Modelling Guidelines. NECB equipment schedule applied.
Domestic Hot Water	Residential Suites (l/s/person)	0.00122	COV Energy Modelling Guidelines value, with savings applied as per LEED methodology.
	Residential Lavatory (GPM)	0.5	Low-Flow Residential Lavatory
	Residential Kitchen Sink (GPM)	2.2	No savings claimed. Default BCBC flow rates used.
	Residential Shower (GPM)	1.5	Low-Flow Residential Shower
	Residential Suites (W/person)	0.0	TBC
	Conference/Meeting/Multi-purpose room (W/person)	45	As per NECB-2015
	Retail - Mall Concourse (W/person)	30	As per NECB-2015
	Storage Room (W/person)	300	As per NECB-2015
	Library (W/person)	90.0	As per NECB-2015
	Gymnasium (W/person)	90.0	As per NECB-2015
	DHW Generation Efficiency (%)	91%	Condensing Boiler - 30% electrical per-heat
Targets	TEDI kWh/(m^2.year)	31.4	Assumptions - Water Source ambient loop with Heat Pump - not a city recognised low carbon energy system
	TEUI kWh/(m^2.year)	122.9	Assumptions - Water Source ambient loop with Heat Pump - not a city recognised low carbon energy system
	GHGI $kgCO_{2e}$/(m^2.year)	5.8	Assumptions - Water Source ambient loop with Heat Pump - not a city recognised low carbon energy system
Notes			

Table 3: Model input sheet[1]

[1] Disclaimer 1 see Appendix C

3.0 ENERGY MODEL RESULT SHEET

Zero Emissions Building Plan Energy Checklist
Large Buildings (Residential >3 Storeys, Mixed-Use, Commercial)

Please complete all fields that apply to the project, using information that represents the current stage of design. For fields that do not apply or for which there is no information yet, please enter "N/A". Refer to the latest Green Building Policy for Rezonings (and supplementary Bulletin) at vancouver.ca/zeroemissions

Project Information (enter all that apply)

Project Address	5163-5187 Joyce Street, Vancouver, BC
Secondary Address	
Project Working Title	Joyce
Gross Floor Area indicated on Arch. Drawings (m²)	26,000
Parkade Area (m²)	5,814

Building Information and Performance Limits

For building types with Performance Limits, enter this information in this section

Building Type(s)	Modelled Floor Area (m²)	Rezoning or VBBL only?	City-Recognized Low Carbon Energy System?	Limits TEUI	Limits TEDI	Limits GHGI
Residential (7+ Stories)	24,072	Rezoning	No	120	32	6
Retail (Group D & E except Office)	1,475	Rezoning	No	170	21	3
				0	0	0
Total	25,547		**TEDI limit for this portion of building**		**31.4**	

For other building types, create a baseline energy model to establish limits, and enter this information in this section

Building Type	Modelled Floor Area (m²)	Rezoning?

Enter Other Building Type Baseline Model Performance	Energy (kWh)	Em. Factor	Emissions (kgCO2e)		TEUI	TEDI	GHGI
Total Annual Electricity Use		0.011	-	Baseline:	0	0	0
Total Annual Natural Gas Use		0.185	-	Target:	0	0	0
Total Annual District Energy Use		0.070	-				
Total	-		-				
Total Annual Heat Demand - for TEDI							

			TEUI	TEDI	GHGI
Total Modelled Floor Area (m²)	25,547	**Whole-Building Performance Limits**	**122.9**	**31.4**	**5.8**
Modelled Floor Area within 5% of Gross Floor Area?	Yes				

Modelled Building Performance

	Energy (kWh)	Fuel Type	Em. Factor	Emissions (kgCO2e)	TEUI	GHGI
Interior Lighting	591,295	Electricity	0.011	6504	23.1	0.3
Exterior Lighting	17,520	Electricity	0.011	193	0.7	0.0
Heating - W-A Heat Pumps	271,835	Electricity	0.011	2990	10.6	0.1
Heat Recovery - A-W Heat Pumps	123,884	Electricity	0.011	1363	4.8	0.1
Heating Ambient loop boilers	39,998	Natural Gas	0.185	7400	1.6	0.3
Heating Electricity - Baseboards	1,878	Electricity	0.011	21	0.1	0.0
Cooling	183,810	Electricity	0.011	2022	7.2	0.1
ERV fan	128,404	Electricity	0.011	1412	5.0	0.1
Exhaust Fans (Parking, Storage etc.)	20,990	Electricity	0.011	231	0.8	0.0
Fans (Fan coils and MUAU)	278,010	Electricity	0.011	3058	10.9	0.1
Domestic Hot Water	447,892	Natural Gas	0.185	82860	17.5	3.2
Pre-heat 30% Domestic Hot Water	61,724	Electricity	0.011	679	2.4	0.0
Plug Loads	341,273	Electricity	0.011	3754	13.4	0.1
Elevators	46,428	Electricity	0.011	511	1.8	0.0
Heat rejection	61,281	Electricity	0.011	674	2.4	0.0
Total Annual Electricity Use	2,128,332		0.011	23,412		
Total Annual Natural Gas Use	487,890		0.185	90,260		
Total Annual District Energy Use	-		0.070	-		
Total	2,616,222			113,671		
Total Electricity Generated On-Site (kWh)			% of Use	0.0%		
Total Purchased Renewable Electricity (kWh)			% of Use	0.0%		
Total Purchased Renewable Natural Gas (kWh)			% of Use	0.0%		

Note: purchase renewables used to demonstrate compliance must be secured to satisfaction of AHJ

Adjusted Electricity Emissions Factor (kgCO2e/kWh)	0.011
Adjusted Natural Gas Emissions Factor (kgCO2e/kWh)	0.185

Annual Heat Demand of portions with Perf. Limits (kWh)				-
Total Annual Heat Demand - for TEDI (kWh)	921,151	36.1 kWh/m²		
Total Annual Cooling Demand - *for info only* (kWh)	764,152	29.9 kWh/m²		

	TEUI	TEDI	GHGI
Modelled Whole-Building Performance	**102.4**	**36.1**	**4.4**

Corridor Pressurization Adjustment

			TEUI	TEDI	GHGI
Heating Degree Days	2850				
Number of Suite Doors Pressurized	293				
Airflow for Pressurization per Door (L/s/door)	7.22				
Area of Corridors Pressurized (m²)	1768.88				
Make-Up Air Fuel Type	Electricity				
Make-Up Air Emissions Factor	0.011	Adjustments for Corridor Pressurization	5.4	5.4	0.1
Suite-level Metering for Space Heating	No	Adjustments for Suite Submetering of Heating	-		

Note: select yes if the energy used for heating is metered at the suite level

Adjusted TEDI Performance of Portions with Limits		(5.4)	
Adjusted Whole-Building Performance for Compliance	**97.0**	**30.7**	**4.4**

Passive Cooling and Overheating Analysis

Does this building have full mechanical cooling?	Yes	(if yes, this section may be left blank)
Does this building house vulnerable populations?	No	(if yes, the overheated hours limit is 20hrs rather than 200hrs)
If yes, please describe		

	Overheated Hours	Peak Temp.(°C)
L4 Unit-D		
L4 Unit-C		
L4 Unit-C		
L4 Unit-B		
L4 Unit-B		

Modelled Inputs

Modelled Above-Ground Wall Area (m²)	2,793	Vertical facade-to-Floor Area Ratio (VFAR)	0.11
Window-to-Wall Area Ratio (WWR)	50%	Window-to-Floor Area Ratio	0.05
Infiltration Rate (L/s/m²$_{sc}$)	0.2		
Wall Effective R-Value - incl. thermal bridging (m²K/W)	1.1	6.00 (ft²hr°F/Btu)	Average Floor Edge Psi-Value (W/m°K)
Roof Effective R-Value - incl. thermal bridging (m²K/W)	3.6	20.34 (ft²hr°F/Btu)	Avg. Window Transition Psi-Value (W/m°K)
Average Window Effective U-Value (W/m²°K)	1.82	0.32 (Btu/ft²hr°F)	Window Solar Heat Gain Coefficient 0.32
Average Suite Occupant Density (m²/pers)	23.1		Average Lighting W/m² 5.9
Average Suite Ventilation Rate (L/s/m²)	0.165		DHW Low-Flow Savings (%) 24.0
Average HRV Effectiveness	75%		DHW Drain Heat Recovery Effectiveness N/A

Heating System Type (fuel, plant, distribution, etc.)	Distributed heat pumps on ambient loop, condensing boilers 91% Efficient cooling tower with heat exchanger , HRV 75% effe
Cooling System Type (fuel, plant, distribution, etc.)	Cooling in rental suites and amenity space, not in social housing
DHW System Type (fuel, plant, distribution, etc.)	91% Efficient gas-fired condensing boilers
Solar Shading Strategies (type, location, operation, etc.)	Balconies

Modeller Information

Modeller Name	Eoghan Hayes
☑	*These results have been created using the COV Energy Modelling Guidelines version:* 2
Company	Edge Consultants Suite 208- 1110 Hamilton Street, Vancouver, BC
Phone Number	604 - 338 - 1063
Email	ehayes@edgec.ca

ZEBP Energy Checklist v1.8 - 2020-01-28

Table 2: Energy Model Results

4.0 ENERGY BREAKDOWN

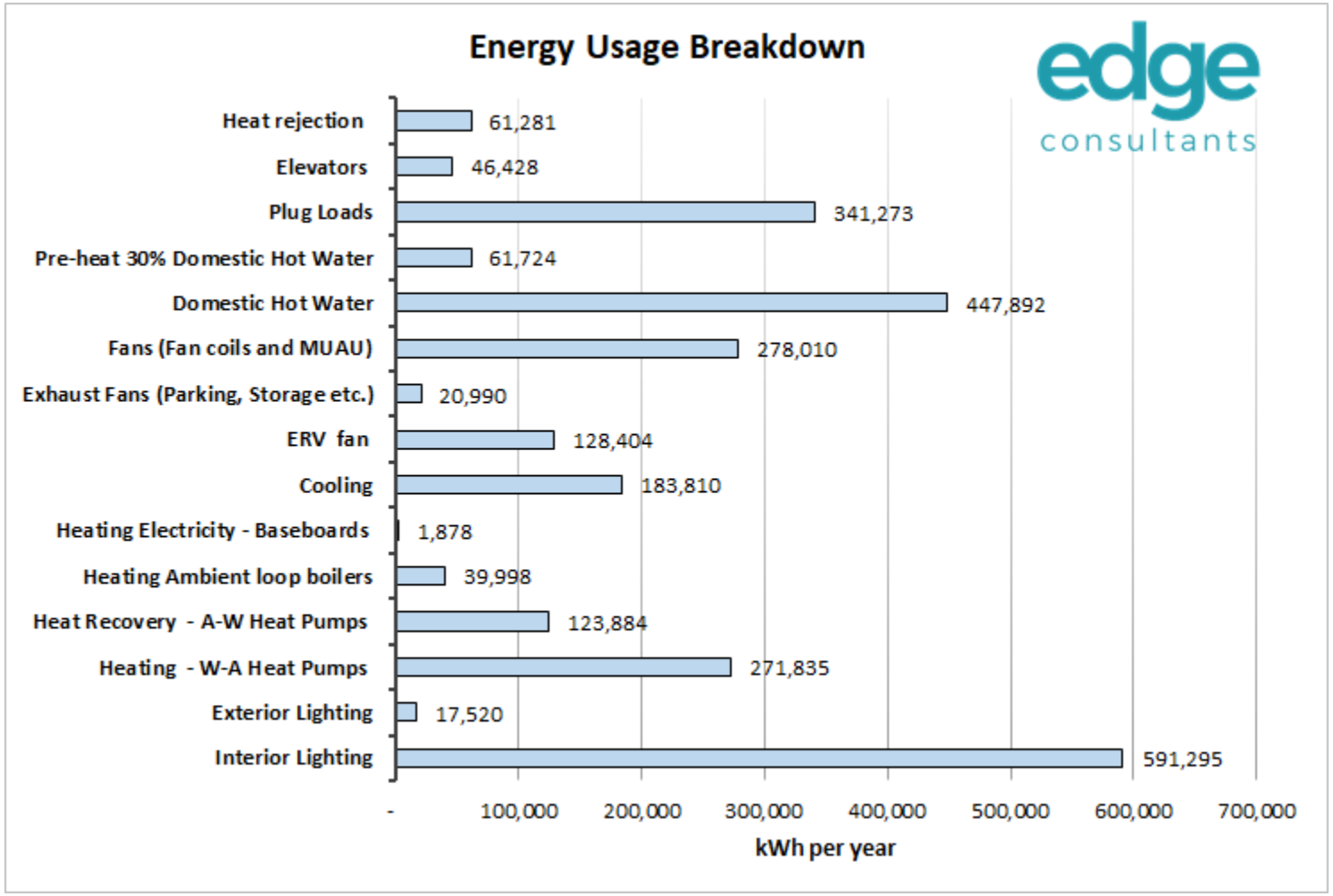


Figure 6: Energy end-use breakdown

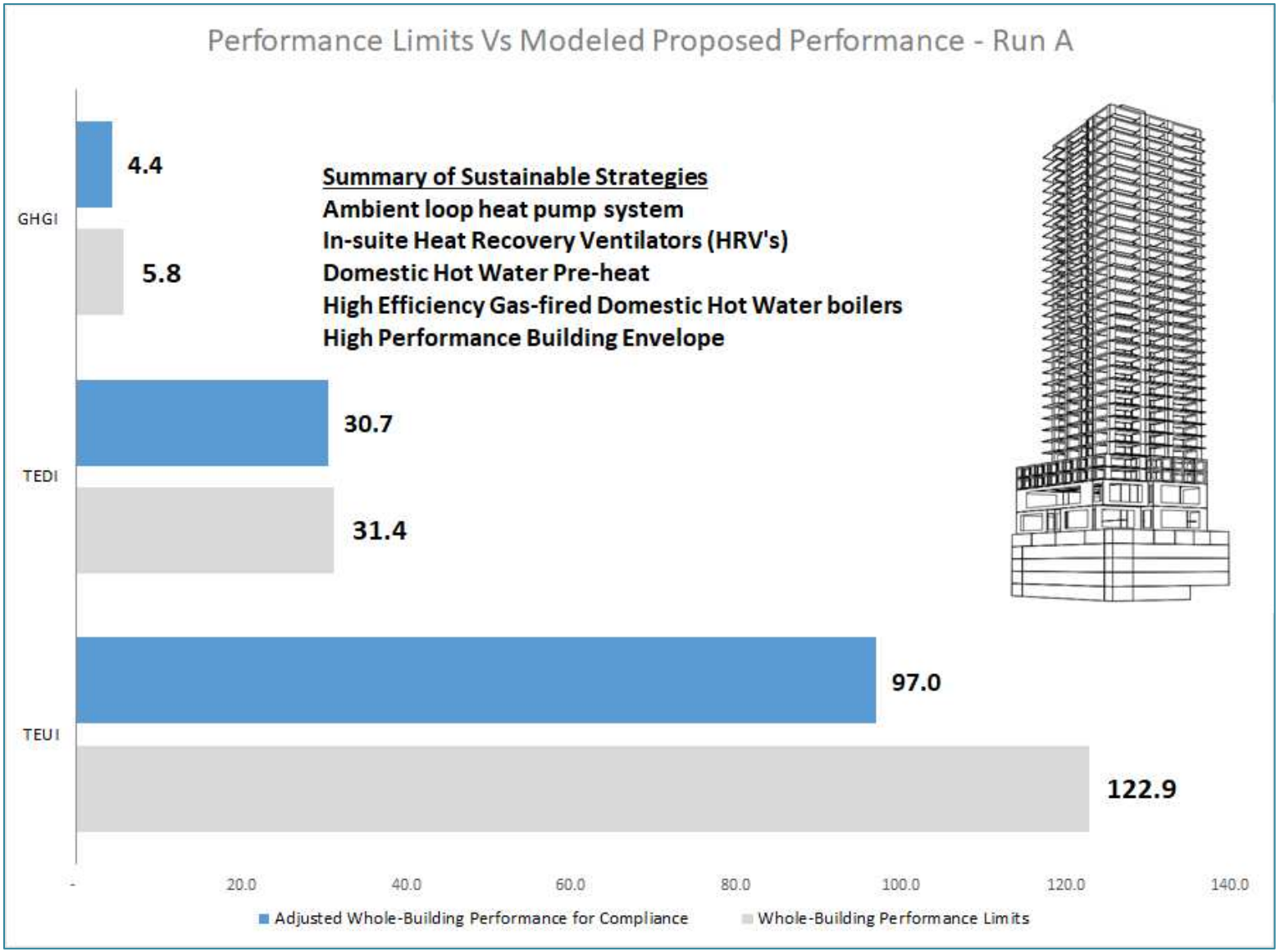


Figure 7: Energy end-use breakdown

5.0 PROPOSED HVAC SYSTEM

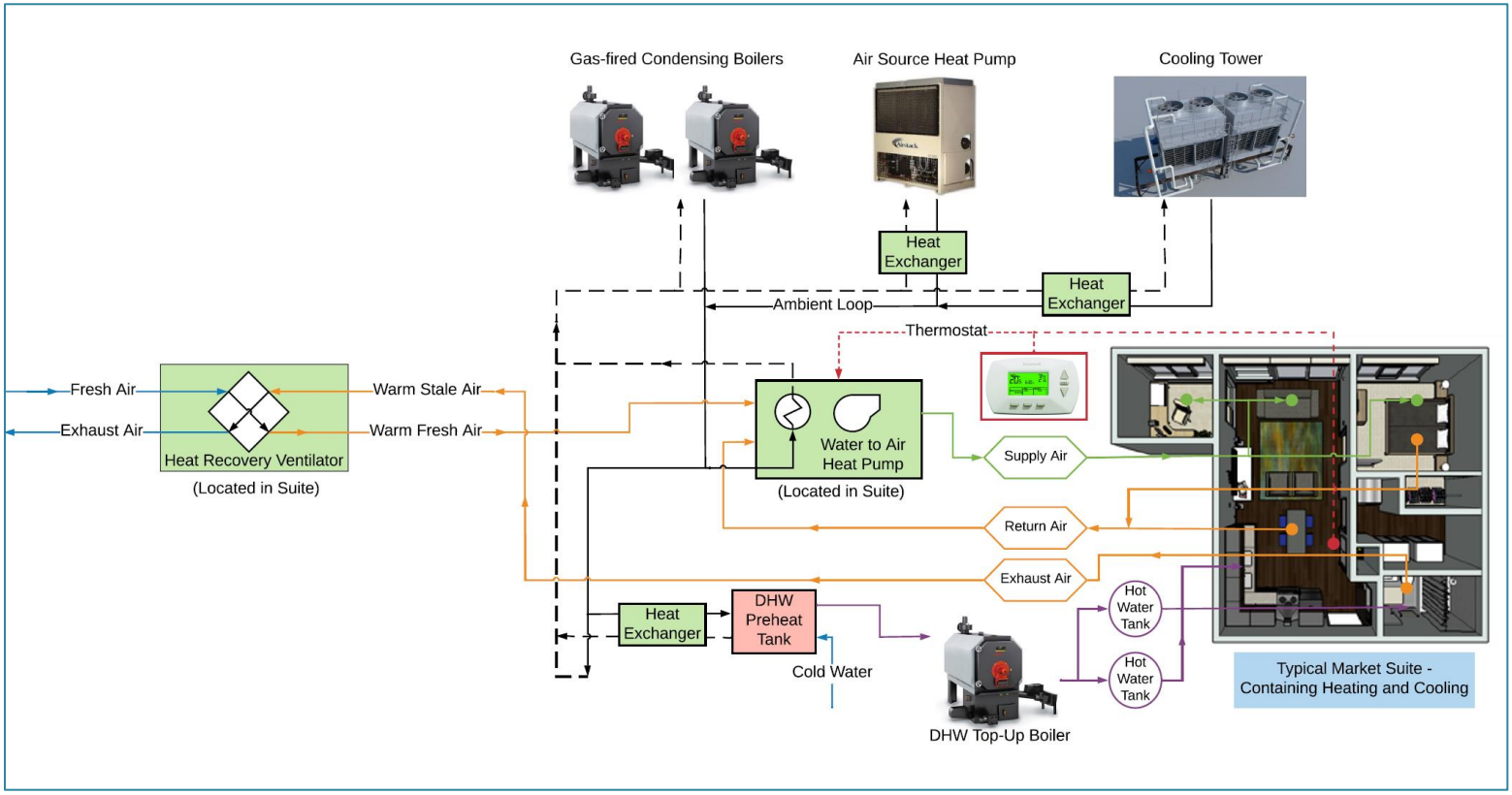


Figure 8: Proposed Suite Layout

6.0 CONCLUSIONS

Based on the model input sheet as noted on page six and seven of this report and the supplementary information received from the project team, the results of the energy model simulation to the required performance targets are:

Energy Performance Residential 7+ Stories	TEUI kWh/(m^2.year)	TEDI kWh/(m^2.year)	GHGI kgCO_2e/(m^2.year)
Required Target	122.9	31.4	5.8
Modeled Result	97.0	30.7	4.4
Comparison (%)	-21.1%	-2.3%	-24.7%
Result	Compliant	Compliant	Compliant

The simulation demonstrates the current proposed design building **is compliant** with the targets as outlined as required in the City of Vancouver's Green Building's policy for rezoning based on the model input sheet of this report.

Edge Consultants

Report Prepared by:



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Principal
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July 24, 2020

APPENDIX A – PROPOSED ELECTRICAL AND MECHANICAL DETAILS

The MER (Mechanical Engineer of Record) is responsible for the service water heating/ domestic hot water system design for the project. Information is for preliminary purposes of the energy model and assisting the design team with achieving the COV low carbon energy targets specified in this report. Should the information in this document change from fundamental efficiency values and design the MER must notify Edge and the client in order to ensure the project targets are not compromised in the building permit, or construction phases of the project.

APPENDIX B – CONSTRUCTIONS

Information is for preliminary purposes of the energy model and assisting the design team with achieving the COV low carbon energy targets specified in this report. Should the information in this document change from fundamental assembly thermal values and design the Architect & project team must notify Edge and the client in order to ensure the project targets are not compromised in the building permit, or construction phases of the project.

APPENDIX C – DISCLAIMERS / COV/STEP CODE ENERGY MODELING DISCLAIMER

Disclaimer 1: Edge Consultants do not agree with certain model inputs stated in the COV energy modeling guidelines regarding plug and internal loads in suites. The Step Code applies a one size fits all approach to all residential buildings which is amicable in getting buildings more sustainable but has the unintended consequence of setting lower than expected overall energy target values than post-construction. It is important to note the disclaimer in the COV energy modeling guidelines (Refer to Appendix C of this report) to ensure the client and all intended recipients of this report are fully aware of the BC Step Code approach and that expectations may not align with how the client or any other parties understand the BC Step code approach.

https://guidelines.vancouver.ca/E006.pdf

"1.2 Modelled vs Actual Results
The results of models created to meet these guidelines are intended for regulatory purposes only, to enable the Authority Having Jurisdiction (AHJ) to determine whether a building complies with the applicable policy or code. Much like an emissions test on a car, test results are used for standardized comparison, and are not necessarily predictive of actual performance. The energy and thermal comfort performance of actual buildings will depend on many factors that can vary from these standardized assumptions, including intensity and hours of use, weather, occupant behavior, as-built vs as-designed parameters, among many others. This applies to performance in both actively and passively cooled buildings.
In addition to varying from actual energy use, the standardized assumptions used may vary from those used in other ratings systems or modelling guidelines developed for their respective programs, which will cause differences in modelled performance. As noted above, the standardized inputs in these guidelines were developed to facilitate easy comparison with fixed limits and between projects, with better prediction of actual performance as a secondary goal. For this reason, some assumptions may be higher or lower than other references."

APPENDIX C - Integrated Rainwater Management & Green Infrastructure

PRELIMINARY INTEGRATED RAINWATER MANAGEMENT PLAN (IRMP)

5163 – 5187 JOYCE STREET

1128587 BC LTD

VECTOR PROJECT NO.: 19-2460-20
REV. 0, JULY 28, 2020

150-6450 Roberts Street, Burnaby, BC V5G 4E1 604-298-2333

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1.0 INTRODUCTION 1

2.0 EXISTING CONDITIONS 1

3.0 PROPOSED DEVELOPMENT PLAN 1

4.0 STORMWATER MANAGEMENT OBJECTIVES & BEST MANAGEMENT PRACTICES (BMPs) 1-5

5.0 HYDROLOGIC MODEL AND ANALYSIS 6

6.0 MAINTENANCE GUIDELINES 7-9

7.0 CONCLUSION 10

Appendix 1 – Aerial Photo of Site & Surrounding Area

Appendix 2 – Proposed Integrated Rainwater Management Plan

Appendix 3 – City of Vancouver Rainfall IDF Curves (2014, 2100), Hydrographs & Model Results

Appendix 4– Landscaping Site Plans

1.0 INTRODUCTION

Vector Engineering Services Ltd has been retained to provide civil engineering and Integrated Rainwater Management Plan design on behalf of 1128587 BC Ltd. for the property located at 5187 Joyce Street, in Vancouver, BC. The subject site is located along the west side of Joyce Street, south of Vanness Avenue (see aerial photo in Appendix 1).

As a condition of development, the City of Vancouver has requested an Integrated Rainwater Management Plan for the site. In response to this requirement, Vector Engineering Services Ltd. was retained to provide analysis of the site drainage and establish an Integrated Rainwater management strategy for the proposed new development. The hydrologic calculations and storm modeling of the site are summarized in this report and are hereby submitted for review.

2.0 EXISTING CONDITIONS

The subject site is approximately 0.16 hectares in area, consisting of commercial lots. The current groundcover condition at the site is 92% impervious. The site currently slopes in a south to south-east direction.

3.0 PROPOSED DEVELOPMENT

The development plan calls for construction of a mixed-use 32-storey high-rise building with 4 storeys of parking underground. With the proposed development of the site, the total overall impervious site coverage will decrease to 85%. The impervious areas will consist of building roofs, pedestrian rest areas, parkade ramp and hard landscaped areas. The remainder of the site will consist of a variety of landscaped areas, above the parkade roof slab. (See Appendix 2).

4.0 STORM WATER MANAGEMENT OBJECTIVES AND BMPS

To improve the quality of the rainwater runoff and improve the health of natural water bodies, the City of Vancouver has adopted a City Wide Integrated Rainwater Management Plan and a Rezoning Policy for Sustainable Large Developments. This plan requires all new developments requiring rezoning to incorporate rainwater management measures to control post development runoff rates and to improve the quality of rainwater runoff using Best Management Practices.

The rainwater management system for this site has been designed in accordance with the City Wide Integrated Rainwater Management Plan criteria, the Rezoning Policy for Sustainable Large Developments requirements, and the amendment to Building Bylaw

regarding Water Use in Buildings: Enhanced Public Safety, Efficiency and Long-Term Resiliency Measures adopted in January 2019.

As per City of Vancouver Rainwater Management criteria we have considered several options to reduce the stormwater discharge, reduce the peak runoff flow rate, and treat surface runoff to reduce contaminants.

The measures proposed are required to meet the following targets:

- Post-development peak runoff rate = Pre-development peak runoff rate for the five-year 24-hour duration storm.
- Capture and retain 24mm of rainfall in 24 hours from all areas, including rooftops, paved areas and landscape.

Additional references include the Metro Vancouver Stormwater Source Control Design Guidelines and the Land Development Guidelines for the Protection of Aquatic Habitat which was developed jointly by the Department of Fisheries and Oceans Canada and the British Columbia Ministry of Environment, Lands and Parks (M.O.E.).

The source controls adopted for this development consist of several measures to be implemented onsite as well as offsite. The source controls are shown on the attached drawing, Integrated Rainwater Management Concept Plan and are summarized below.

4.1 Tier 1 Priority Green Infrastructure Practices – Rain Water Harvesting for Reuse

The primary purpose of rainwater harvesting is to reduce domestic water demand and runoff from impermeable surfaces. Rainwater harvesting involves collecting rainwater and storing it for non-potable uses.

The City criteria for using rainwater harvesting is to use the harvested rainwater within a 96-hour period all year round. The use of harvested rainwater for irrigation, non-potable water use, cannot meet this criterion or is very costly at this design stage and therefore the rainwater harvesting source control option has been disregarded.

4.2 Tier 2 Priority Green Infrastructure Practices – Retention within Non-Infiltrating Landscape

The primary purpose of the absorbent landscaping is to reduce runoff from impermeable surfaces by intercepting and retaining rainwater. The target is to retain the first 24 mm per day (24 hours) of rainfall.

To implement this practice, we are proposing to install absorbent topsoil with thicknesses between 450mm and 750mm in the proposed tree areas, underlain by a system of Permavoid cells on top of the underground parkade. The surface and roof runoff will be directed into the topsoil and Permavoid cells prior to discharge into the municipal system. The Permavoid cell area is 75% of the total of absorbent soil area in each of the planter zones.

The drainage runoff will be directed into the Permavoid cells, which will be provided with overflow discharge into the building storm system as follows:

HARD LANDSCAPING AREA DRAINS AND ROOF DRAINAGE:

PRIMARY:

Divert water to Permavoid / planter media by opening normally closed (n.c.) solenoid valve (low level pipe connection).

SECONDARY:

Upon water detection (soil saturation level or overflow sensor through building bms system) - close solenoid valve; this will divert water to the storm drainage via a pipe connection above the solenoid valve.

EMERGENCY FAIL:

Planter solenoid fails closed. If it does not close, planter storage cell overflow goes to drain tile sump pumps in the foundation until maintenance corrects. This is to prevent accidentally over-saturating the soil, impacting trees.

24 mm OF RAINFALL RETAINING MODELING RESULTS:

The entire site area was divided into sub catchment areas that identify the hardscaping and roof areas tributary to each absorbent soil and Permavoid cell area.

The required rainfall volume to be retained onsite was calculated for each subcatchment area, respecting the target of retaining the first 24mm of rainfall in 24 hours. This was then compared to the absorbent soil capacity and volume provided by each Permavoid cell associated with the absorbent soil areas.

For the purpose of this application a soil absorbency capacity of 20% was considered.

A summary is provided in the Table 1 below and detailed calculations are shown on the Proposed Post-Development Integrated Rainwater Management Plan attached in Appendix 2.

Table 1

Sub catchment Areas	Retention Volume Required	Total Retention Volume Provided	Volume Provided by "Permavoid"	Volume Provided by Absorbent Soil
A1	25.87 m^3	50.51 m^3	25.87 m^3	24.64 m^3
A2	13.44 m^3	21.03 m^3	10.89 m^3	10.14 m^3
Total	**39.30 m^3**	**71.54 m^3**		

The post-development site area including rooftops, paved areas and landscaping is approximately 1638 m^2.

24mm of rainfall volume = 1638 m^2 x 24mm = 39.3 m^3.

The post-development site layout will have a total landscape area of 260.36 m^2 consisting of areas of absorbent soils with thicknesses between 450mm and 750mm over the parkade slab

The landscaping plan calls for absorbent landscaping areas with soil thickness varying from 450mm in shrub landscaped areas to 750mm in treed areas.

The total soil volume provided is 185.86 m^3 which will have a rainfall volume retaining capacity of 37.17 m^3.

The hard landscaping such as walkways, pedestrian rest areas and other hard landscaping will be graded to drain towards the adjacent soft landscaped areas, which will be provided with an overflow catch basin tied into the site drainage system inside the underground parkade structure.

The water storage will be consolidated on Level 1 where the trees and planting along the breezeway can take advantage of the stored water. The 40 cubic meters of water storage required for the project will cover a footprint of 150 square meters at a depth of 267mm. A HDPE or similar liner will be used to store the water in a void space created by Permavoid or a similar system. Soil will be installed above the reservoir in planters and in a layer of soil cells under the paving to allow water to wick up from below. Soil moisture sensors and a smart controller will be used to disengage these

irrigation zones when the soil moisture levels are maintained adequately by wicking from the reservoir.

The roof runoff will be directed into the site drainage system inside the underground parkade structure.

4.3 Tier 3 Priority Green Infrastructure Practices – Detention Storage with Treatment and Slow Release

4.3.1 Water Quality

The on-site stormwater drainage system is designed to separate clean runoff from the roof and landscaped areas from the contaminated first flush runoff on the roadways and parking areas. Water from the roof and landscaped areas will be routed to the proposed detention tank located along the east side of the site. Runoff from areas subject to vehicular access will be routed to a series of stormwater treatment features. Primary treatment of stormwater from parking areas and roadways is derived from hooded catch basins and a conventional oil-water separator to retain sediment as well as oil and hydrocarbons leaking from vehicles accessing the subject site.

Secondary treatment of stormwater for hydrocarbons, heavy metals and suspended solids will be provided by the soft landscaping soils and planting as the entire site drainage will go through the absorbent soils.

4.3.2 Stormwater Detention

As outlined previously in Section 4.0 of this report, the criterion used for the stormwater analysis is to limit the five-year 24-hour (2100 IDF curve) post-development peak runoff to the five-year 24-hour (2014 IDF Curve) pre-development peak runoff.

Detention tanks collect and store stormwater runoff during a storm event, then release it at controlled rates to the downstream drainage system, thereby attenuating peak discharge rates from the site.

The modeling results show that there is no detention volume required to meet the City of Vancouver peak runoff reduction to the to the five-year 24-hour (2014 IDF Curve) pre-development level. However, a flow control manhole with a discharge rate of 9.4 l/sec will be provided upstream of the site connection to municipal system.

The proposed development is not anticipated to have an adverse effect on the downstream conveyance and stream channel capacity.

Details of the flow control manhole and orifice calculations are shown on Appendix 2.

5.0 HYDROLOGIC MODEL AND ANALYSIS

The following drainage modeling and analysis was used for design of the Stormwater Management System for this project.

5.1 Rainfall Data

The rainfall data used in the hydrologic analysis was based on the five-year return period rainfall, as per the City's Stormwater Management Design Criteria and City of Vancouver Rainwater Management Bulletin dated July 2018.

The City of Vancouver IDF curve (2014), AES rainfall data for pre-development conditions and IDF curve (2100), AES rainfall data for post-development conditions have been modeled and tabulated for storms of 5 year 24-hour duration, was selected for the hydrologic analysis (Appendix 3).

5.2 Existing Runoff

To simulate the two-year stormwater runoff for the existing condition, the relative impervious and pervious areas were analyzed and hydrologic models were computed using the Illudas method from a computer program "HYDSYS for Drainage". For the purpose of establishing a release rate for comparison between pre and post development conditions, soil type C (slow infiltration rates) was input into all drainage models.

In accordance with the City Vancouver Integrated Rainwater Management Design Criteria, the pre-development computer model simulations were completed for five-year storms with durations of 24 hours for the City of Vancouver IDF curve (2014), AES rainfall data.

Based on the described parameters above, the peak runoff value and volume for the five-year 24 hour rainfall event was calculated to be as follows:

Five year 24 hour existing peak flow and total rain volume

Existing Site $Q_{5yr,\ 24hr} = 9.4$ l/sec
Total rain volume V5yr, 24hr= 142 m^3

Allowable Release Rate

In accordance with the City Vancouver Integrated Rainwater Management Design Criteria, allowable release rate = Existing $Q_{5year24hour}$

Max. $Q_{5yr,\ prop}$ = 9.4 l/sec

A copy of the modeling results for existing pre-development conditions has been attached in Appendix 3.

5.3 Post Development Runoff

The post development stormwater runoff was also analyzed and hydrologic models were computed using the same HYDSYS software. The models were adjusted to reflect the change in total site areas and impervious surface areas between the pre-development and post development conditions. The soil type and overland flow parameters are the same as for the existing condition, however the impervious site coverage has decreased from the estimated 92% to 85%.

Based on the described parameters above, the peak runoff value and volume for the five-year 24 hour rainfall event for the City of Vancouver IDF curve (2100), AES rainfall data was calculated to be as follows:

Five year 24 hour post development peak flow and volume

Proposed Site $Q_{5yr,\ 24hr}$ = 11.1 l/s
Total rain volume V5yr, 24hr= 146 m^3

6.0 Maintenance Guidelines

The absorbent landscaping is a key component of the proposed Stormwater Management Plan for this development. It has been designed as a permanent low-maintenance system requiring regular monitoring and periodic maintenance.

Monitoring and maintenance of individual components of the system will consist of the following measures described below:

Catchbasins and Oil-Water Separators

- Inspect oil-water separator and all catch basins for debris and sediment accumulation.
- Remove grate/lid.

- Remove debris as found.
- Remove accumulated sediment and oil using truck mounted suction pump equipment with storage tank when sediment reaches ½ of the sump depth.
- Sediment shall be disposed offsite at an approved landfill.
- Replace grate/lid.
- All catchbasins to be recharged with clean water after silt/sediment removal.

Landscaping

Monitoring (annually by Landscape Architect):

- Inspect plants for die-back, for growth and for general health.
- Observe extent of yearly dieback.
- Forward growing medium sample to laboratory for testing if general plant health in question.
- Inspect plants for signs of pests or diseases.
- Inspect plants for breakage or wind damage.
- Review lawn maintenance operations.
- Observe plant and planter maintenance, weed and debris removal.
- Observe growing medium settlement.
- Review planter edging, flashing, gravel borders.
- Inspect for standing water, saturation or other indications of poor drainage.
- Review irrigation system function and coverage where applicable.
- Prepare annual report.

Maintenance Operations (by maintenance contractor):

- Perform establishment maintenance operations to BCSLA/BCLNA BC Landscape Standard, latest edition for 55 days from Substantial Performance.
- Perform general maintenance operations to BCSLA/BCLNA BC Landscape Standard, latest edition after 55 days from Substantial Performance.
- Replace dead or dying plant materials regularly.
- Fertilize plant materials per plant requirements.
- Respond to laboratory soil test recommendations if indicated.
- Perform pest/disease management as required.
- Prune dead, diseased or broken branches, prune shrubs and trees for form and to optimize flowering yearly.
- Perform standard lawn maintenance operations regularly.
- Stabilize trees or shrubs where indicated.
- Remove weeds, debris and cultivate growing medium regularly.
- Add soil amendment where soil settlement has occurred yearly.

- Maintain and repair edging, flashing, and gravel borders as required.
- Observe, report and perform drainage improvements where indicated.
- Adjust irrigation system regularly for coverage.
- Repair irrigation system leaks immediately.
- Perform winterization and spring start-up procedures.
- Document maintenance operations regularly.

7.0 CONCLUSION

Peak flow attenuation will be provided by the construction of a flow control sump structure with a release rate equal with the 5-year 24-hour (2014 IDF Curve) pre-development storm peak flow.

Volume reduction will be provided with the installation of absorbent topsoil, 450 mm and 750 mm thick, in the proposed landscaped areas This will be underlain by a system of 150mm thick Permavoid cells on top of the underground parkade. The surface and roof runoff will be directed into them prior to discharge into the municipal system. This will provide the retention of the 24mm rainfall from the total site area in 24 hours.

Stormwater treatment will be provided by the separation of the first flush flow. Runoff from the roadway access and surface parking areas will be directed to oil separators. Conventional oil/water separators will be installed within the parkade and connected to the sanitary sewer system.

Runoff from the building roof hard surfaces and landscaped area will be directed to the absorbent soils and Permavoid cells for rainwater retention. The overflow from the absorbent soils and Permavoid cells will be directed to the stormwater flow control sump.

The rainwater management system for this site has been designed in accordance with the City Wide Integrated Rainwater Management Plan criteria and the Rezoning Policy for Sustainable Large Developments requirements.

A copy of the proposed Integrated Rainwater Management Plan has been attached in Appendix 2. Copies of the drainage model printout for pre-development and post development conditions have been attached in Appendix 3.

Should you require additional information please contact the undersigned.

Reviewed by:

Dan Diaconu, P.Eng.
Project Engineer

Robin Uren, P.Eng.
Project Engineer

CC J+S Architect Attn: Jeff Shen

APPENDIX 1

AERIAL PHOTO OF SITE & SURROUNDING AREA

CONTRACTOR TO USE EXTREME CAUTION WHEN WORKING IN THE VICINITY OF A RETAINING WALL AND/OR ADJACENT STRUCTURE. THE CONTRACTOR IS REQUIRED UNDER PART 20.78 OF THE WORKSAFE BC REGULATIONS TO ENGAGE THE SERVICES OF A QUALIFIED REGISTERED PROFESSIONAL WHEN EXCAVATING ADJACENT TO AN EXISTING STRUCTURE. NO WORK IS TO PROCEED IN THE VICINITY OF THE STRUCTURE WITHOUT WRITTEN INSTRUCTIONS FROM THE QUALIFIED REGISTERED PROFESSIONAL AND SUCH COPY SUBMITTED TO CONTRACT ADMIISTRATOR.

IMPORTANT:
CONTRACTOR IS RESPONSIBLE TO SCOPE AND EXPOSE EX. UTILITIES/SERVICES, AND RECORD LOCATION, SIZE & INVERT ELEVATIONS AT PROP. OR POTENTIAL CROSSINGS PRIOR TO CONSTRUCTION. THE AS-BUILT UNDERGROUND INFORMATION SHOWN ON THIS DRAWING IS DERIVED FROM THIRD PARTY RECORDS AND VECTOR ENGINEERING IN NO WAY WARRANTS ITS ACCURACY. REPORT ANY DISCREPANCIES AND/OR CONFLICTS TO CONTRACT ADMINISTRATOR PRIOR TO CONSTRUCTION.

THE CITY OF BURNABY REQUIRES THAT ALL EXCAVATIONS UTILIZE PROPER SHORING PROCEDURES AS PER PART 20 OF THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS TO THE WORKERS COMPENSATION ACT FOR ALL EXCAVATIONS DEPTH OF 1.2 METERS AND OVER. TRENCH CERTIFICATION BY A QUALIFIED PROFESSIONAL WILL NOT BE ACCEPTABLE.

THE SEAL ON THIS DRAWING SIGNIFIES CERTIFICATION OF CIVIL ENGINEERING ASPECTS OF THIS SITE, BUT DOES NOT SIGNIFY RESPONSIBILITY FOR GEOTECHNICAL OR ENVIRONMENTAL ENGINEERING DESIGN. IN NO WAY DOES VECTOR ENGINEERING SERVICES LTD. OR ITS EMPLOYEES ACCEPT LIABILITY OR WARRANTY THE WORK WITH RESPECT TO THE EFFECT OF SETTLEMENT ON THE CIVIL WORKS.

DATUM-GEODETIC
BENCHMARK: MON. V-3531
ALBERNI ST. & CARDERO ST.
ELEV = 13.247m

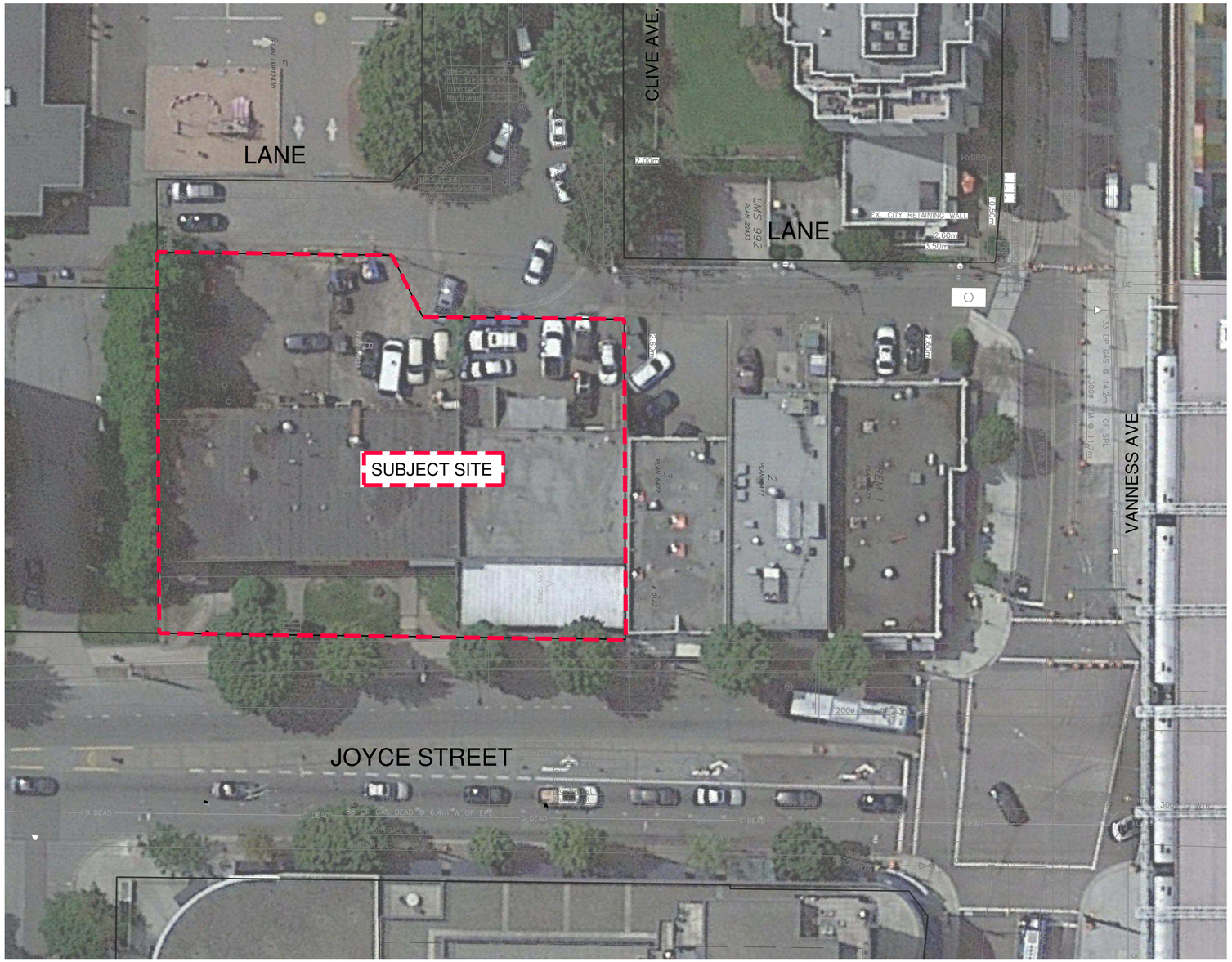
LEGEND

PHASE BOUNDARY

PRE - DEVELOPMENT AREAS

	AREA [m²]	%
IMPERVIOUS	1,509 m²	92.0%
PERVIOUS	131 m²	8.0%
TOTAL:	1640 m²	100%

D.L. 37



PLOT DATE: July 28, 2020

DESIGN

REV NO	REVISIONS	DATE	DRAWN	DESIGN
1	FIRST SUBMISSION	2020-07-27	AM	DD

CITY OF VANCOUVER

SWM

PRE DEVELOPMENT PLAN
5163 & 5187 JOYCE STREET

Vector ENGINEERING
vectoreng.ca
604 298-2333

SCALE	1:250H 1:25V (24"X34" PAPER)	START DATE	NOV 2019
DRAWN BY	AM	DESIGN BY	DD
CHECKED BY	RU	APPROVED BY	APPROVED
VECTOR JOB NO.	19-2460-20	CLIENT	1128587 BC LTD FELIX LIU

DWG. NO. 2 OF 3
REV. 1

DESTROY ALL PRINTS BEARING PREVIOUS NO.

APPENDIX 2

PROPOSED INTEGRATED RAINWATER MANAGEMENT PLAN

IMPORTANT:
CONTRACTOR IS RESPONSIBLE TO SCOPE AND EXPOSE EX. UTILITIES/SERVICES, AND RECORD LOCATION, SIZE & INVERT ELEVATIONS AT PROP. OR POTENTIAL CROSSINGS PRIOR TO CONSTRUCTION. THE AS-BUILT UNDERGROUND INFORMATION SHOWN ON THIS DRAWING IS DERIVED FROM THIRD PARTY RECORDS AND VECTOR ENGINEERING IN NO WAY WARRANTS ITS ACCURACY. REPORT ANY DISCREPANCIES AND/OR CONFLICTS TO CONTRACT ADMINISTRATOR PRIOR TO CONSTRUCTION.

THE SEAL ON THIS DRAWING SIGNIFIES CERTIFICATION OF CIVIL ENGINEERING ASPECTS OF THIS SITE, BUT DOES NOT SIGNIFY RESPONSIBILITY FOR GEOTECHNICAL OR ENVIRONMENTAL ENGINEERING DESIGN. IN NO WAY DOES VECTOR ENGINEERING SERVICES LTD. OR ITS EMPLOYEES ACCEPT LIABILITY OR WARRANTY THE WORK WITH RESPECT TO THE EFFECT OF SETTLEMENT ON THE CIVIL WORKS.

SITE CATCHMENT AREAS	SOFT LANDSCAPING	ROOF	HARD LANDSCAPING	TOTAL SITE AREA
POST-DEVELOPMENT	260.4 m^2	650 m^2	743.5 m^2	1638 m^2

PRE-DEVELOPMENT 2014 IDF CURVE - 5 YEAR 24 HOURS RUNOFF RATE = 0.0094 m^3/sec
ALOWABLE RELEASE RATE = 0.0094m^3/sec

POST-DEVELOPMENT 2100 IDF CURVE - 5 YEAR 24 HOURS RUNOFF RATE = 0.011m^3/sec

POST-DEVELOPMENT IRMP SOURCE CONTROL SUMMARY:

1. ONSITE RAINWATER DETENTION:

TARGET: RELEASE POST DEVELOPMENT 5 YEAR STORM EVENT (2100 IDF CURVES) AT THE PRE-DEVELOPMENT 5 YEAR STORM EVENT (2014 IDF CURVES)

ALOWABLE RELEASE RATE = 0.0094m^3/sec

DETENTION VOLUME REQUIRED = 0m^3

DATUM-GEODETIC
BENCHMARK: MON. V-3531
ALBERNI ST. & CARDERO ST.
ELEV = 13.247m

3. TIER 2 - ABSORBENT LANDSCAPING ON PODIUM

TARGET: RETAIN ONSITE FIRST 24mm OF RAINFALL IN 24 HOURS
RETAINED VOLUME REQUIRED = 1638m^2x 0.024m = 39.3m^3

SUBCACHMENT AREA A1 - LEVEL 5

TOTAL SUBCACHMENT AREA = 239.5m^2 HARDSCAPING + 650m^2 ROOF + 188.5m^2 LANDSCAPING = 1078 m^2

RETAINED VOLUME REQUIRED = 1078m^2 X 0.024m = 25.87 m^3

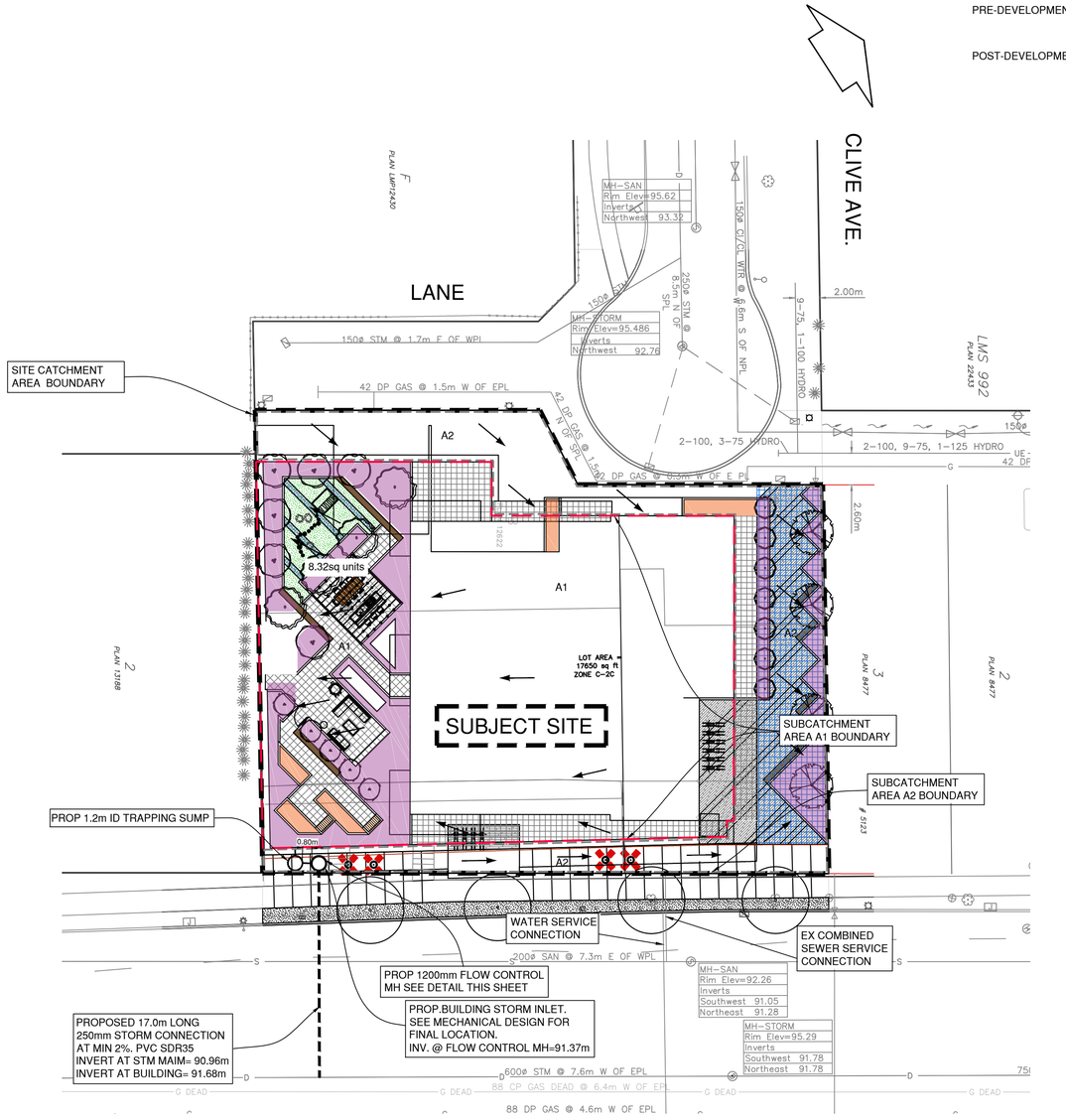
"PERMAVOID" CELLS VOLUME = 188.46m^2 x 0.15m = 28.27 m^3
SOIL VOLUME AVAILABLE = 169.24m^2 x 0.75m + 19.22m^2 x 0.45m = 135.58 m^3
SOIL ABSORBENCY CAPACITY = 123.23m^3 x 20% = 27.12 m^3
RETENTION VOLUME PROVIDED = 28.27m^3 + 27.12m^3 = 55.39 m^3 > 25.87 m^3

SUBCACHMENT AREA A2

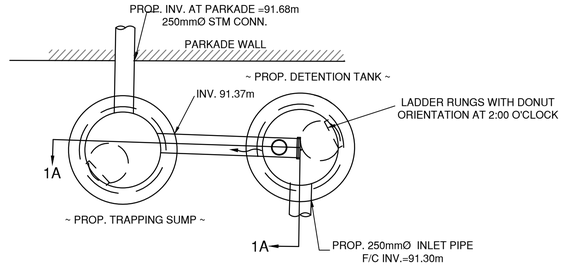
TOTAL SUBCACHMENT AREA = 488.1m^2 HARDSCAPING + 71.9m^2 LANDSCAPING = 560 m^2

RETAINED VOLUME REQUIRED = 560m^2 X 0.024m = 13.44m^3

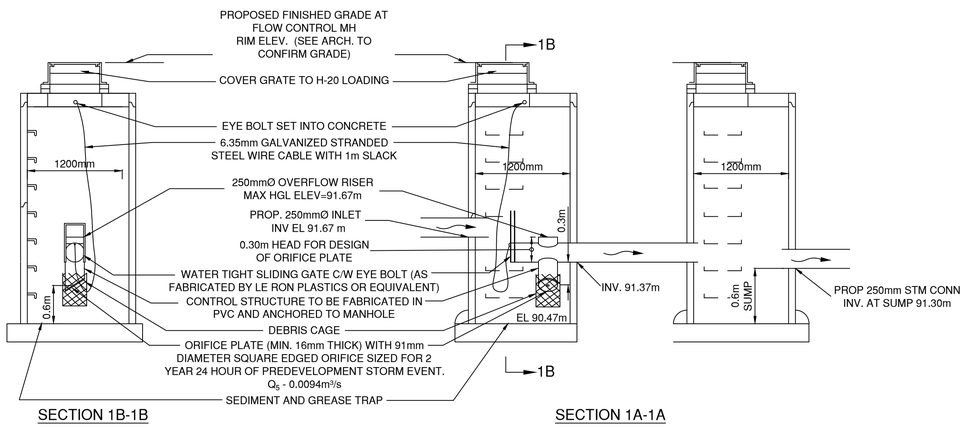
"PERMAVOID" CELLS VOLUME = 71.9m^2 x 0.15m = 10.79m^3
SOIL VOLUME AVAILABLE = 59.74m^2 x 0.75m + 12.16 x 0.45m = 50.28 m^3
SOIL ABSORBENCY CAPACITY = 50.28m^3 x 20% = 10.06 m^3
RETENTION VOLUME PROVIDED = 10.79m^3 + 10.06m^3 = 20.85m^3 > 13.44 m^3



JOYCE STREET



PLAN VIEW



SECTION 1B-1B SECTION 1A-1A

1200mm FLOW CONTROL MANHOLE & 1200mm TRAPPING SUMP
N.T.S

LEGEND

750mm (30") GROWING MEDIUM ON FILTER CLOTH ON 150mm (6") "PERMAVOID" CELLS

450mm (18") GROWING MEDIUM ON FILTER CLOTH ON 150mm (6") "PERMAVOID" CELLS

SITE CATCHMENT AREA BOUNDARY

SUBCATCHMENT AREA A1 BOUNDARY

SUBCATCHMENT AREA A2 BOUNDARY

OVERLAND FLOW DIRECTION

SOIL DEPTH DIAGRAM

BUILDING LEVEL	750mm (30") GROWING MEDIUM ON FILTER CLOTH ON 150mm (6") "PERMAVOID" CELLS	450mm (18") GROWING MEDIUM ON FILTER CLOTH ON 150mm (6") "PERMAVOID" CELLS	TOTAL SOFT LANDSCAPING
GROUND LEVEL	59.74 m^2	12.16 m^2	71.90 m^2
LEVEL 5	169.24m^2	19.22 m^2	188.46 m^2
TOTAL AREA	228.98m^2	31.38 m^2	260.36 m^2
TOTAL VOLUME	171.74 m^3	14.12 m^3	185.86 m^3

SUBCATCHMENT AREAS	RETENTION VOLUME REQUIRED	RETENTION VOLUME PROVIDED	RETENTION PROVIDED BY	
			PERMAVOID CELLS	ABSORBENT SOIL
A1	25.87 m^3	50.72 m^3	25.87 m^3	24.64 m^3
A2	13.44 m^3	21.03 m^3	10.89 m^3	10.14 m^3
TOTAL	39.31 m^3	71.75 m^3		

ORIFICE AREA CALCULATION

Ao = ORIFICE AREA (m^2)
C = COEFFICIENT FOR SQUARE-EDGED ORIFICE (0.6)
g = GRAVITATIONAL ACCELERATION (m/sec^2)
h = DESIGN HEAD (m)
D = ORIFICE DIAMETER (m)
Q = ALLOWABLE RELEASE RATE (m^3/s) (PREDEVELOPMENT 5 YEAR STORM)
Ao = Q / (C x SQRT(2gh))
Ao = 0.0094 / (0.6 x SQRT(2 x 9.81 x 0.30) = 0.006m^2
D = SQRT(4Ao / PI)
D = SQRT(4 x 0.005 / PI) = 0.091m = 91mm

PLOT DATE: July 27, 2020

REV NO	REVISIONS	DATE	DRAWN	DESIGN
1	FIRST SUBMISSION	2020-07-27	AM	DD

CITY OF VANCOUVER

SWM

POST DEVELOPMENT PLAN
5163 & 5187 JOYCE STREET

Vector ENGINEERING
vectoreng.ca
604 298-2333

SCALE	1:250H 1:25V (24"X34" PAPER)	START DATE	NOV 2019
DRAWN BY	DP/AM	DESIGN BY	DD
CHECKED BY		APPROVED BY	APPROVED
VECTOR JOB NO.	19-2460-20	CLIENT	1128587 BC LTD FELIX LIU

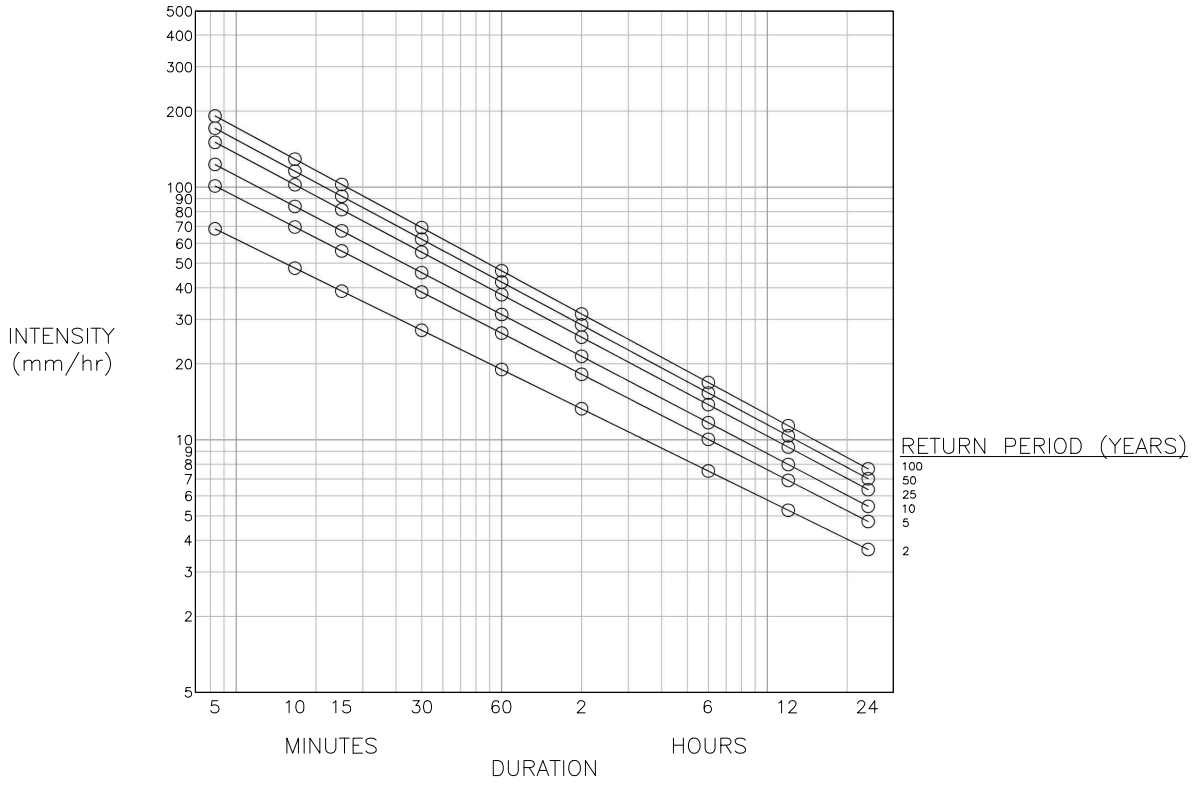
DWG. NO. 3 OF 3
REV. 1

DESTROY ALL PRINTS BEARING PREVIOUS NO.

APPENDIX 3

CITY OF VANCOUVER RAINFALL IDF CURVES (2014) AND (2100)
HYETOGRAPHS, HYDROGRAPHS & MODEL RESULTS

CITY OF VANCOUVER – IDF CURVES (2100)



INTENSITY DURATION FREQUENCY (IDF) EQUATION INTERPOLATION COEFFICIENTS (2100)

$R = A * T^{B}$

WHERE:
T = TIME IN HOURS
A,B = COEFFICIENTS
R – RAINFALL INTENSITY IN mm/hr

RECURRANCE INTERVAL	PROBABILITY	A	B
1 IN 2 YR	50%	18.96	–0.516
1 IN 5 YR	20%	26.41	–0.540
1 IN 10 YR	10%	31.32	–0.550
1 IN 25 YR	4%	37.51	–0.559
1 IN 50 YR	2%	42.09	–0.564
1 IN 100 YR	1%	46.64	–0.568

SOURCE:
"VANCOUVER RAINFALL STUDY AND IDF UPDATE,"
URBAN SYSTEMS LTD, VANCOUVER BC,
PS20150252, DECEMBER 2015.

APPLICATION

25 YEAR – TRIBUTARY AREA GREATER THAN 40.5ha (100acres)
10 YEAR – DESIGN, BUSINESS, COMMERCIAL AND INDUSTRIAL AREAS.
5 YEAR – DESIGN, RESIDENTIAL AREAS, INVESTIGATIONS

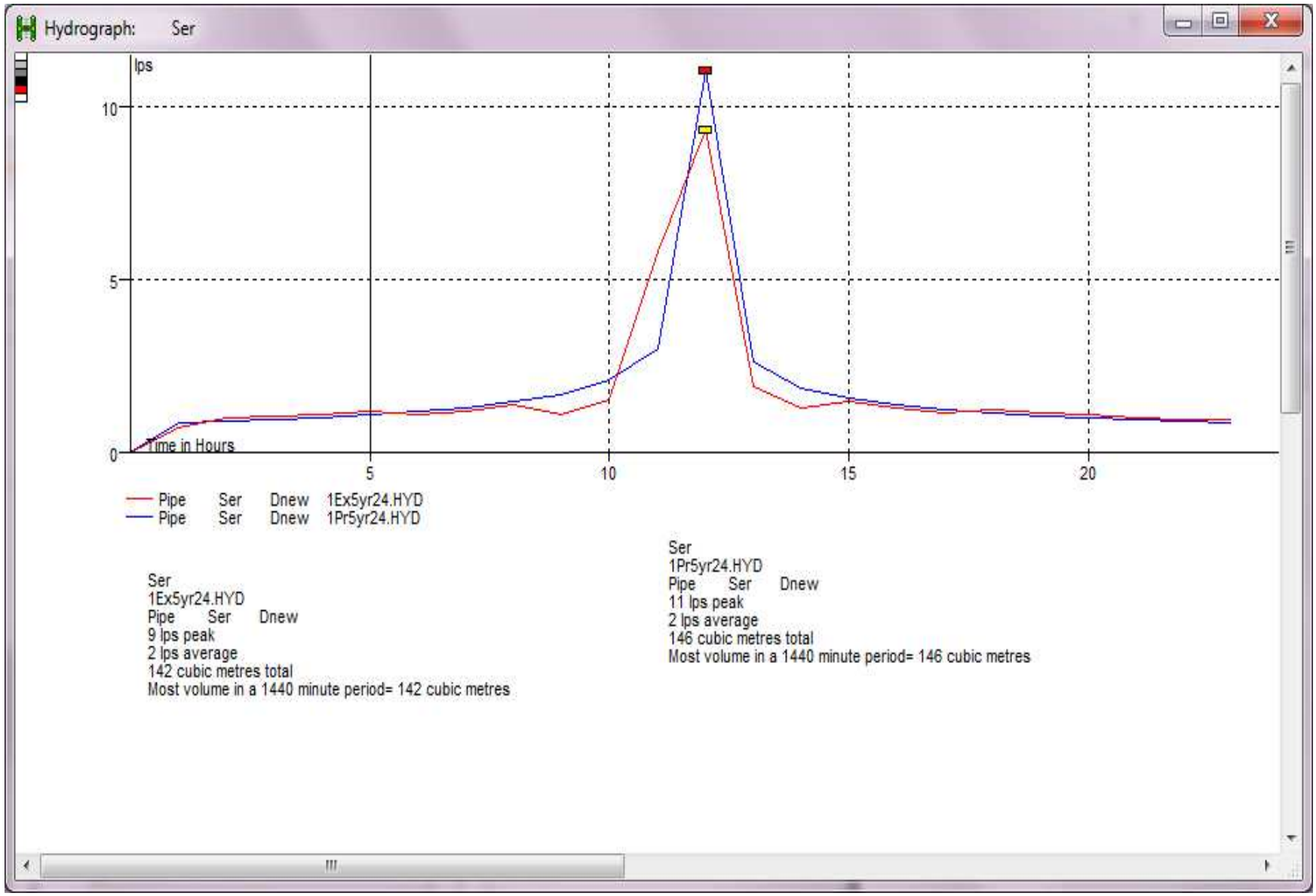
MINIMUM INLET TIME

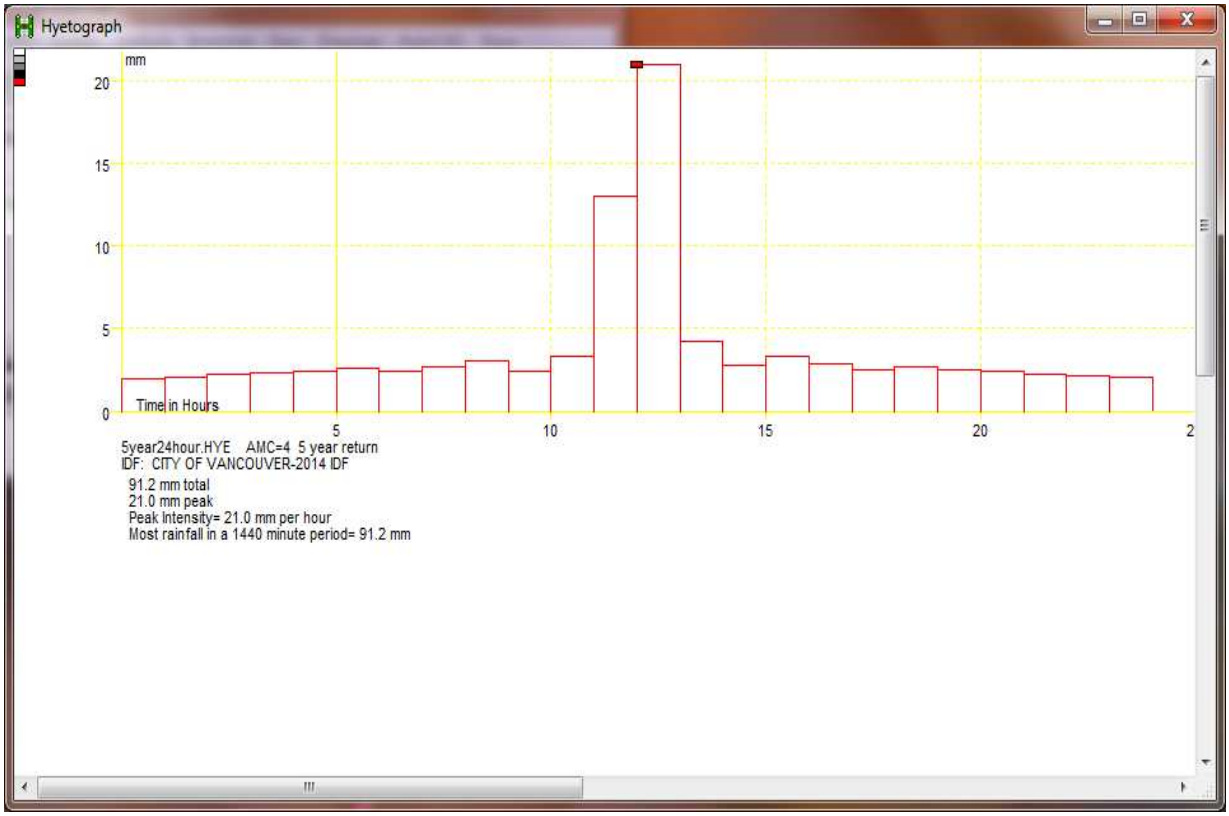
RESIDENTIAL AREA	10 MINS.
BUSINESS	5 MINS.
CENTRAL BUSINESS DISTRICT & WEST END	5 MINS.

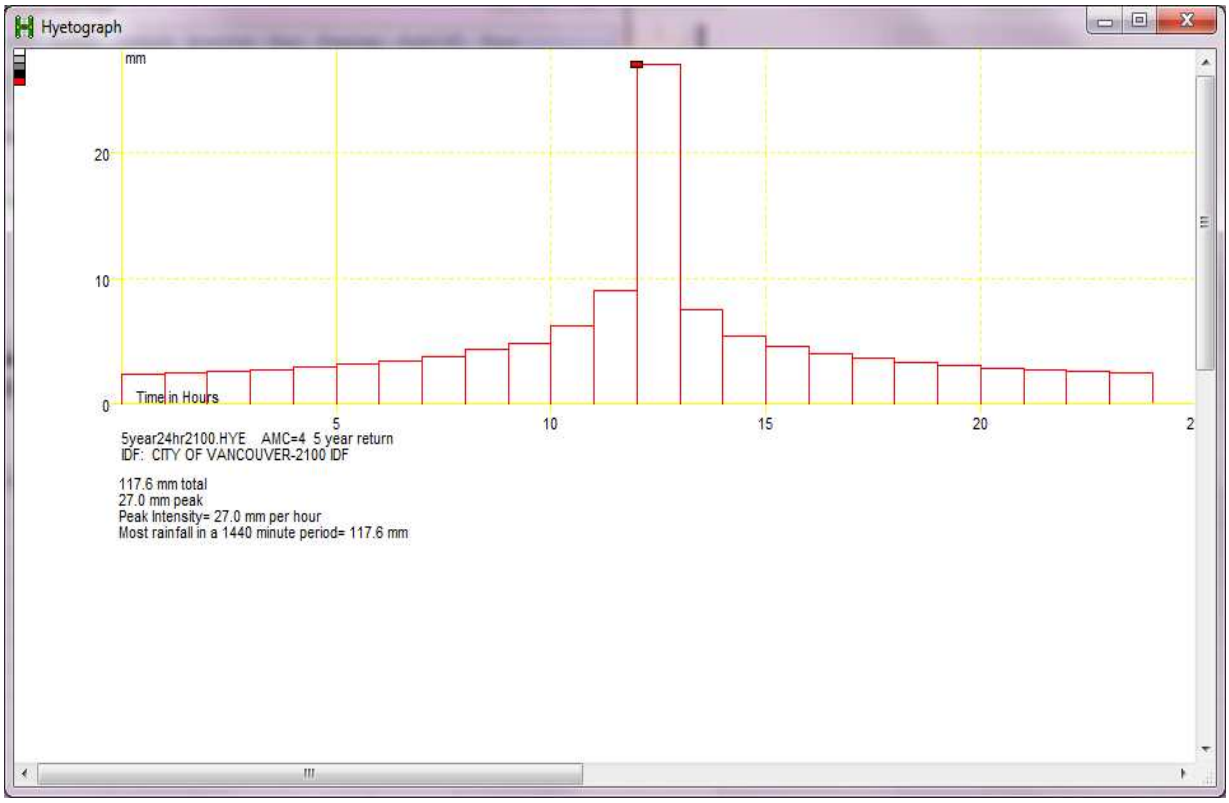
ENGINEERING SERVICES - CITY OF VANCOUVER

CITY OF VANCOUVER	SEWERS & DRAINAGE DESIGN BRANCH	SEWER – STANDARDS RAINFALL INTENSITY EQUATION 2100 IDF CURVE	SCALE: N.T.S.
	DRAWN BY: SP		STANDARD SECTION
	DESIGN:		
	REFERENCES:		REVISION:.....

PLOTTED: October–19–17 1:41:56 PM
FILE: Y:\SEWER_DESIGN\Procedures & Forms\Sewer Design Manual\Sewer Design Manual – STANDARD DRAWINGS\S–COMPILATION\STANDARD DRAWINGS PAGE 1–20.dwg
THIS PRINT SUPERSEDES ALL PRINTS OF THIS DRAWING BEARING PREVIOUS REVISION NUMBERS


Hydrograph: Ser
lps
10
5
0
Time in Hours
5
10
15
20
Pipe Ser Dnew 1Ex5yr24.HYD
Pipe Ser Dnew 1Pr5yr24.HYD
Ser
1Ex5yr24.HYD
Pipe Ser Dnew
9 lps peak
2 lps average
142 cubic metres total
Most volume in a 1440 minute period= 142 cubic metres
Ser
1Pr5yr24.HYD
Pipe Ser Dnew
11 lps peak
2 lps average
146 cubic metres total
Most volume in a 1440 minute period= 146 cubic metres


Hyetograph
mm
20
15
10
5
0
Time in Hours
5
10
15
20
5year24hour.HYE AMC=4 5 year return
IDF: CITY OF VANCOUVER-2014 IDF
91.2 mm total
21.0 mm peak
Peak Intensity= 21.0 mm per hour
Most rainfall in a 1440 minute period= 91.2 mm


Hyetograph
mm
20
10
0
Time in Hours
5
10
15
20
5year24hr2100.HYE AMC=4 5 year return
IDF: CITY OF VANCOUVER-2100 IDF
117.6 mm total
27.0 mm peak
Peak Intensity= 27.0 mm per hour
Most rainfall in a 1440 minute period= 117.6 mm

Design Criteria: C:\Users\Daniel\Desktop\Documents\Documents\CivilSys\Models\2460-Joice\1Ex5y24hr.DCT
Drainage Model: C:\Users\Daniel\Desktop\Documents\Documents\CivilSys\Models\2460-Joice\1Ex5y24hr.HYN
Rainstorm: C:\Users\Daniel\Desktop\Documents\Documents\CivilSys\Rain Data\Vancouver\5year24hour.HYE
Storm description: IDF: CITY OF VANCOUVER-2014 IDF

60 min increment, AMC= 4 5 yr return
ILLUDAS ** ILLINOIS STATE WATER SURVEY ** ILAG82 August, 1997
Time Shift Routing Activated.

Design Mode

RAINFALL PATTERN

0.079 0.082 0.086 0.091 0.096 0.103 0.095 0.105 0.120 0.095
0.131 0.512 0.827 0.168 0.110 0.130 0.112 0.100 0.106 0.099
0.093 0.088 0.084 0.080

RUN NUMBER	BASIN AREA ACRES	TIME INCREMENT MINUTES	SOIL GROUP 1234=ABCD
1	0.4	60.0	3

TOTAL RAIN INCHES	FREQUENCY YEARS	DURATION MINUTES	AMC	PAVED ABS. INCHES	GRASS ABS. INCHES
3.59	5	1380.0	4	0.10	0.20

Pipe Ser Dnew Branch 1 Reach 0 28-Jul-20 11:34

PAVED ENTRY TIME= 2.9 MIN

ACCUM CONTRIBUTING AREAS: CPA=0.4, SPA=0.0, CGA=0.0

TRAVEL TIME SO SMALL THAT ROUTED =DESIGN HYDRO.

LENG FT	SLP PCT	N	HT FT	BW FT	V/H INS	DIA CFS	CAPAC FPS	VEL Q-CFS	DESIGN Q-CFS	INLET CUBIC FT	DETENTION REQUESTED	STORAGE
33	1.00	0.013	0.00	0.00	0.00	12	3.40	4.48	0.00	0.0	0	
REQUIRED PIPE =						8	1.21	3.46	0.33	0.33	0.00	

EXISTING PIPE HAS ADEQUATE CAPACITY

OUTFALL HYDROGRAPH IN CFS, ACCUMULATED RUNOFF IN CU FT= 5029

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.1 0.2 0.3 0.1 0.0 0.1 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

THE JOB IS FINISHED

Design Criteria: C:\Users\Daniel\Desktop\Documents\Documents\CivilSys\Models\2460-Joice\1Pr5y24hr.DCT
Drainage Model: C:\Users\Daniel\Desktop\Documents\Documents\CivilSys\Models\2460-Joice\1Pr5y24hr.HYN
Rainstorm: C:\Users\Daniel\Desktop\Documents\Documents\CivilSys\Rain Data\Vancouver\5year24hr2100.HYE
Storm description: IDF: CITY OF VANCOUVER-2100 IDF

60 min increment, AMC= 4 5 yr return
ILLUDAS ** ILLINOIS STATE WATER SURVEY ** ILAG82 August, 1997
Time Shift Routing Activated.

Design Mode

RAINFALL PATTERN

0.095 0.099 0.104 0.110 0.117 0.126 0.137 0.151 0.170 0.192
0.245 0.354 1.063 0.294 0.214 0.184 0.160 0.143 0.131 0.121
0.114 0.107 0.102 0.097

RUN NUMBER	BASIN AREA ACRES	TIME INCREMENT MINUTES	SOIL GROUP 1234=ABCD
1	0.4	60.0	3

TOTAL RAIN INCHES	FREQUENCY YEARS	DURATION MINUTES	AMC	P INCHES	AVED ABS. INCHES	GRASS ABS.
4.63	5	1380.0	4	0.10	0.20	

Pipe Ser Dnew Branch 1 Reach 0 28-Jul-20 11:35

PAVED ENTRY TIME= 2.9 MIN

ACCUM CONTRIBUTING AREAS: CPA=0.3, SPA=0.0, CGA=0.1

GRASSED ENTRY TIME= 23.0 MIN

TRAVEL TIME SO SMALL THAT ROUTED =DESIGN HYDRO.

LENG FT	SLP PCT	N	HT FT	BW FT	V/H INS	DIA CFS	CAPAC FPS	VEL Q-CFS	DESIGN Q-CFS	INLET CUBIC FT	DETENTION REQUESTED	STORAGE
33	1.00	0.013	0.00	0.00	0.00	12	3.40	4.48	0.39	0.39	0.00	
REQUIRED PIPE =						8	1.21	3.46	0.00	0.0	0	

OUTFALL HYDROGRAPH IN CFS, ACCUMULATED RUNOFF IN CU FT= 5169

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.1 0.1
0.1 0.1 0.4 0.1 0.1 0.1 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

THE JOB IS FINISHED

APPENDIX 4

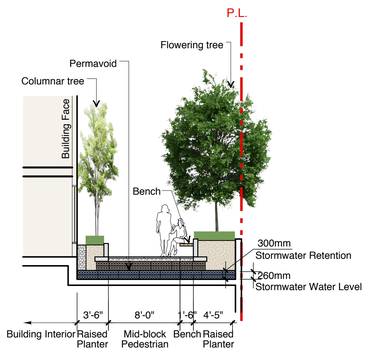
LANDSCAPING SITE PLANS

LEGEND

- SHRUB PLANTING
- HEDGE
  Privacy Screening
- CAST IN PLACE CONCRETE PAVING (PEDESTRIAN ONLY)
  Light broom finish with sawcut control joints
- ENTRY PAVING
  Special paving
- PATIO PAVING
  18"x18" Hydrapressed slabs
- POURED IN PLACE RUBBERIZED PLAY SURFACE
  Colours and layout to be designed
- PERMAVOID
  Modular Interlocking Plastic System for Stormwater Retension

FURNITURE LEGEND

- METAL BIKE RACK
- WOOD BENCH



01 L-1.1 **SECTION THROUG MID-BLOCK PEDESTRIAN**
SCALE: 1/8" = 1'-0"

ADJACENT SITE

CLIVE AVENUE

JOYCE STREET

LANE

RAISED PLANTING BED
01 L-1.2
COLUMNAR TREE
LARGE SHADE TREE
FEATURE PAVING
CUSTOM BENCH
PERMAVOID SYSTEM BELOW (BLUE GRID HATCH)
PROPERTY LINE 104.86'
8' WIDE MID-BLOCK PEDESTRIAN
PROPERTY LINE 66.03'
PROPERTY LINE 76.94'
PROPERTY LINE 2'2.51'
PROPERTY LINE 2.47'-4" (POSSIBLE SETBACK 0'-6")
PROPERTY LINE 152.71'
OUTLINE OF L2 ABOVE
OUTLINE OF CANOPY ABOVE
LINE OF BALCONY ABOVE
LINE OF BUILDING ABOVE
CENTRELINE OF LANE
PLAZA
LIBRARY ENTRY
LIBRARY LOBBY
C.R.U ENTRY
C.R.U #1
C.R.U #2
FFE 313.50'
FFE 313.25'
RAMP
EXIT CORRIDOR
BICYCLE STORAGE (2)
REFUSE & RECYCLING
TYPE: RESIDENTIAL
ELEV #1
ELEV #2
ELEV #3
ELEV #4
PARTITION WALL
O/H DOOR
F.F.
xt9;RESIDENTIAL LOADING
COMMERCIAL LOADING
COMMERCIAL LOADING
3'-6" HIGH CONCRETE WALL
CORRIDOR
RESIDENTIAL LOBBY & COMMON
VEST.
MAIL ACCESS
STORAGE
REFUSE & RECYCLING
TYPE: COMMERCIAL
DEDICATED BIKE RAMP DOWN TO L1 @10%
DEDICATED BIKE RAMP UP DOWN L1 @15%
RAMP DOWN TO P1 @10%
RAMP DOWN TO P1 @15%
ENTRY GATE
BICYCLE STORAGE (40)
EXIT STAIR #2
EXIT CORRIDOR
S.R.W. FROM JOYCE 19'-0"
EXISTING STREES TO BE RETAINED
METAL BIKE RACK
6 RACKS = 12 BIKE PARKING
RESERVED FOR E-SCOOTER PARKING
Existing Lamp Standard
METAL BIKE RACK
4 RACKS = 8 BIKE PARKING
Existing Sign Post
Existing Lamp Standard

N

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J+S ARCHITECT

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Issues:

191203	ISSUED FOR REVIEW
200724	ISSUED FOR REZONING

Drawn by:	LF
Checked by:	DC
Date:	JUL 24, 2020
Scale:	1/8" = 1'-0"
Project No.:	19071

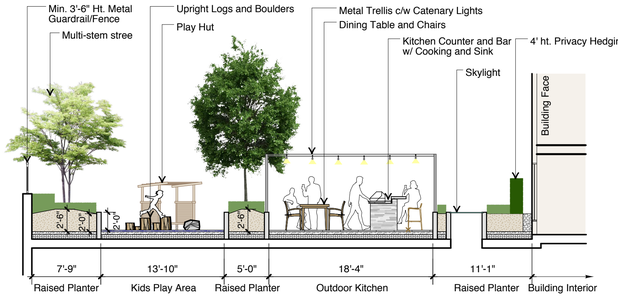
Mixed-Use
32-Storey HighRise

Project Address
5163-5187
Joyce Street,
Vancouver BC

Drawing Title
Landscape Plan

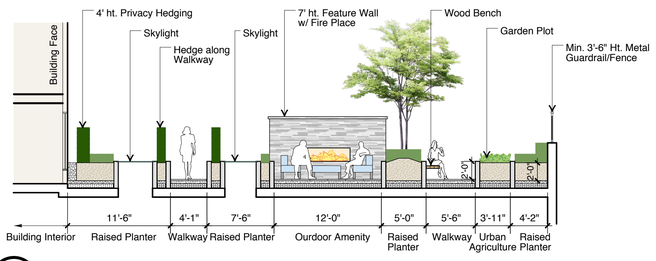
Level 1

L - 1.1



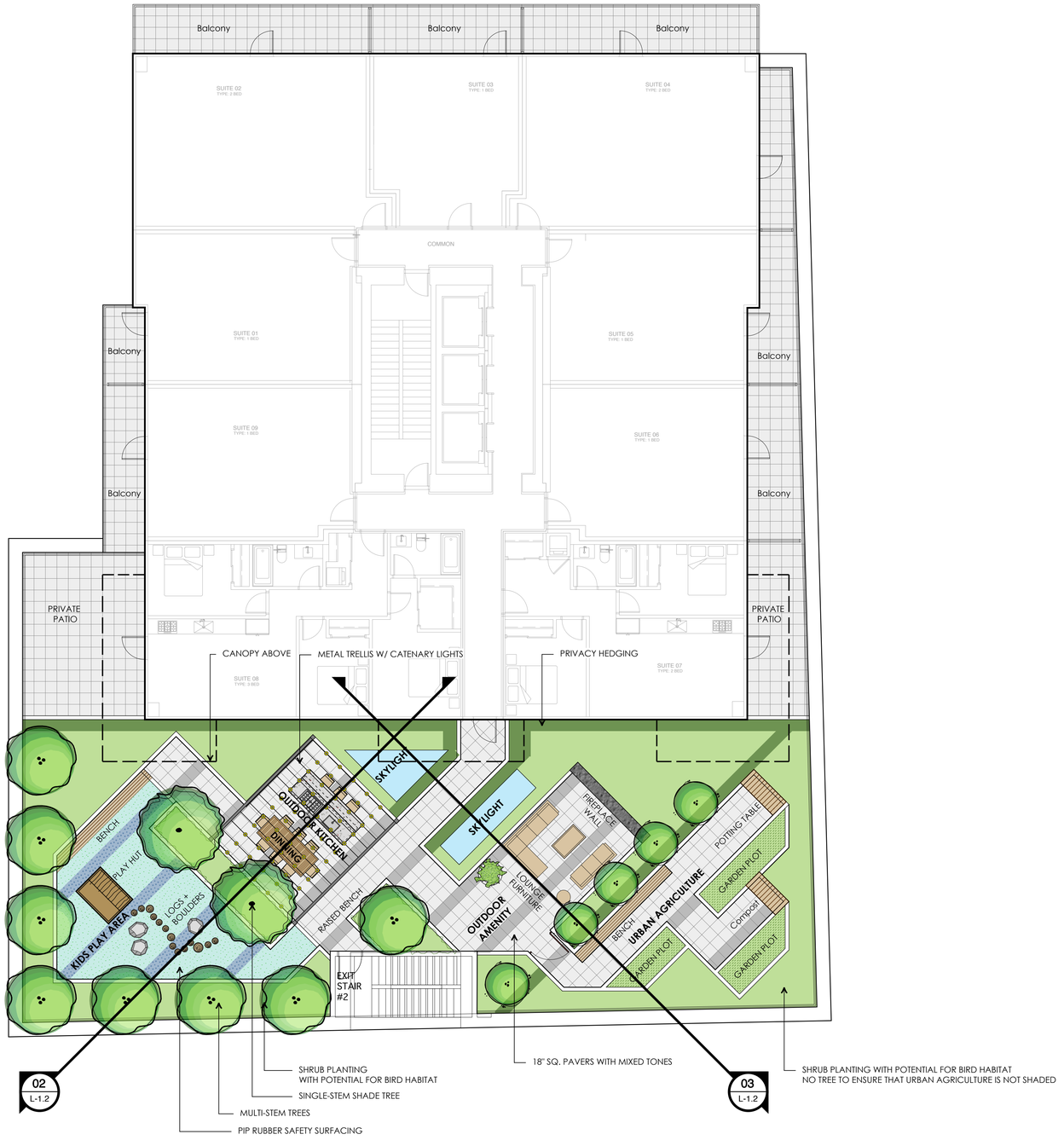
02 L-1.2 **SECTION THROUGH PODIUM WEST SIDE**

SCALE: 1/8" = 1'-0"



03 L-1.2 **SECTION THROUGH PODIUM EAST SIDE**

SCALE: 1/8" = 1'-0"



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Drawing Title

Landscape Plan

Level 5

L - 1.2