# CORPORATION OF THE CITY OF VERNON 

## ADVISORY PLANNING COMMITTEE <br> NOVEMBER 28, 2023, AT 4:00 PM <br> OKANAGAN LAKE ROOM (COUNCIL CHAMBERS) CITY HALL

## AGENDA

1) CALL TO ORDER
2) LAND ACKNOWLEDGEMENT

As chair of the City of Vernon's Advisory Planning Committee (APC), and in the spirit of this gathering, I recognize the City of Vernon is located in the traditional territory of the Syilx people of the Okanagan Nation.
3) ADOPTION OF AGENDA
4) ADOPTION OF MINUTES
a) October 24, 2023 (Attached)
5) NEW BUSINESS
a) ZON00365 (1607 $43^{\text {RD }}$ AVENUE)
b) SECONDARY SUITE AND ACCESSORY DWELLING BYLAW AMENDMENTS
6) INFORMATION ITEMS
a) Staff Liaison to provide verbal update of APC related items discussed at recent Council meetings.
7) NEXT MEETING

The next meeting is tentatively scheduled for December 12, 2023.
8) ADJOURNMENT

## THE CORPORATION OF THE CITY OF VERNON

## MINUTES OF THE

## ADVISORY PLANNING COMMITTEE MEETING

 HELD OCTOBER 24, 2023 AT 4:00 PM OKANAGAN LAKE ROOM, CITY HALLPRESENT: Monique Hubbs-Michiel, Chair Jessica Kirkham
Kennedy Mund
Craig Neville
Margo Jarman
Harpreet Nahal
Kyla Gaudreau
Mayor Cumming (4:00 pm)
Claire Ishoy
Jordan Hart

ABSENT: Scott Chatterton, Vice Chair
Margo Lupien
Councillor Mund

STAFF: Michelle Austin, Planner - Staff Liaison
Matt Faucher, Planner
Ellen Croy, Manager, Transportation Jade Adams-Longworth, Secretary I - Corporate Services

## ORDER

LAND
ACKNOWLEDGEMENT
As Chair of the City of Vernon's Advisory Planning Committee, and in the spirit of this gathering, I recognize the City of Vernon is located in the traditional territory of the Syilx people of the Okanagan Nation.

ADOPTION OF THE Moved by Margo Jarman, seconded by Harpreet Nahal:

## AGENDA

The meeting was called to order at 3:59 p.m.

THAT the agenda of the October 24, 2023 Advisory Planning Committee meeting be adopted as amended.

## CARRIED.

ADOPTION OF THE Moved by Clair Ishoy, seconded by Craig Neville:
THAT the amended minutes of the September 12, 2023 Advisory Planning Committee meeting be adopted.

AND FURTHER THAT the minutes of the September 26, 2023 Advisory Planning Committee meeting be adopted.

## CARRIED.

## NEW BUSINESS:

Harpreet Nahal declared a conflict of interest and left the meeting at 4:00 p.m.

Mayor Cumming entered the meeting at 4:00 p.m.

## REZONING

AMENDMENT AND DEVELOPMENT VARIANCE PERMIT APPLICATION FOR 3300 31 ${ }^{\text {st }}$ AVENUE (ZON00407/DVP00617)

A Planner, provided an overview of the application as follows:

- This application is seeking to develop the property at $330031^{\text {st }}$ Avenue to create both Commercial units (on the bottom) and Residential units (above).
- The property is currently a vacant lot, but services are in place and ready to be hooked up.
- If the Commercial units require outdoor or patio space, they can purse a permit to use a parking space (similar to what other businesses downtown do).
- The property is zoned at C7: Heritage Business District, and the applicant is looking to rezone to C8: Central Business District.
- These zones use floor space ration (FSR) to regulate density. Density for some other zones is regulated using units/per hectare.
- The applicant is requesting four (4) variances:

1. Sec. 4.1.2: To permit a building greater than 15 m in height located in a commercial zone to project lines extending toward the building at right angles from the center line of the rear lane at an angle of $70^{\circ}$ to the horizontal.

- Only the top two levels on the rear side of the building would be encroaching on the setback for the $70^{\circ}$ build triangle.
- A shadow analysis was conducted and there would be minimal shadows cast on the surrounding buildings for short periods.
- The Committee noted that site lines and shadows are cast by tall buildings, but that shouldn't restrict density. And that a six-storey building is very different then a twelve-storey building.

2. Sec. 7.1.2 (Table 7.1): Reduce the minimum required parking stalls ( 124 to 76 stalls).
3. Sec. 7.1.2 (Table 7.1): Reduce the minimum required visitor parking stalls ( 14 to 0 stalls).
4. Sec. 10.8.5: To relax the minimum setback for any portion of a building about 15 m in height (from 3.0 m to 1.44m).

- The setbacks on the west side of the property would be met.
- The setback on the east side of the property would need to be reduced from 3.0 m to 2.6 m .
- The setback on the rear side of the property would need to be reduced from 3.0 m to 1.44 m .
- Clarification was given that the building would continue straight up verses tiering in, and that there would be no overhang.
- These variances would allow for 95 residential units and 14 commercial units with a total of 0.8 stalls per unit.
- Commercial parking stalls would be multi-use in the evenings.
- The parking stalls would be assigned to the units and tenants in the building.
- While there is less parking then units, there is significantly more bike parking (at a 3:1 ratio).
- Residential bicycle parking would be within storage lockers on parkade levels that can be accessed by residents.
- Visitor bicycle parking would be on the main commercial level, and would be accessible to the public.
- The applicant and developer should look at putting EV charging for the bike storage lockers and parkade.
- The Committee noted that they would like to see the City bring forward an initiative that requires developers to include more EV charging, and the possibility of having car-share options in new developments.
- Clarification was given that no traffic impact assessment was required, and that the City reviews safety locations and at-risk intersections with ICBC frequently.
- Currently there is no need for an additional traffic light.
- There would be some affordable units, but the rent would be controlled through the property owner.
- The Committee noted that the proposed development has nice architecture and would fit in nicely in the area (with the City's Parkade and the Art Gallery near it).

Moved by Margo Jarman, seconded by Claire Ishoy:
THAT the Advisory Planning Committee recommends that Council support Zoning Application 00407 (ZON00407) to rezone Lot A, DL 72, ODYD, Plan KAP89332 (3300 31st Avenue) from C7 - Heritage Business District to C8 - Central

Business District as outlined in the report titled "Zoning and Development Variance Permit Applications for 3300 31st Avenue" dated October 17, 2023, and respectfully submitted by the Current Planner;

AND FURTHER, the Advisory Planning Committee recommends that Council direct Administration to hold a public hearing, pursuant to 464(1) of the Local Government Act, on a proposed bylaw to rezone Lot A, DL 72, ODYD, Plan KAP89332 (3300 31 ${ }^{\text {st }}$ Avenue) from C7 - Heritage Business District to C8 - Central Business District;

AND FURTHER, the Advisory Planning Committee recommends that Council support of Zoning Application 00407 (ZON00407) is subject to the following:
a) That prior to final adoption of the zoning amendment bylaw, a Development Permit be ready for issuance;

AND FURTHER, the Advisory Planning Committee recommends that Council support Development Variance Permit Application 00617 (DVP00617) to vary Zoning Bylaw 5000 for Lot A, DL 72, ODYD, Plan KAP89332 (3300 31 ${ }^{\text {st }}$ Avenue), as follows:
a) Section 4.1.2, to permit a building greater than 15 m in height located in a commercial zone to project above lines extending toward the building at right angles from the centre line of the rear lane at an angle of $70^{\circ}$ to the horizontal;
b) Section 7.1.2, Table 7.1, minimum required parking stalls for the use of Apartment Housing from 124 to 76;
c) Section 7.1.2, Table 7.1, minimum required visitor parking stalls for Residential Uses from 14 to 0; and
d) Section 10.8.5, to relax the minimum setback for any portion of a building above 15 m in height from 3.0 m to 1.44 m from any property line abutting a street.

AND FURTHER, the Advisory Planning Committee recommends that Council support of Development Variance Permit Application 00617 (DVP00617) is subject to the following:
a) That the site plan, floor plan, building elevations and renderings illustrating the general siting, layout and dimensions of the proposed development (Attachment 1) in the report titled "Rezoning and Development Variance Permit Applications for $330031^{\text {st }}$ Avenue" dated October 17, 2023, and respectfully submitted by the Current

## Planner, be attached to and form part of DVP00617 as Schedule 'A'. CARRIED.

Ellen Croy left the meeting at 4:35 p.m.

## INFORMATION ITEMS:

The Staff Liaison provided an update of recent Council decisions on bylaws and applications previously considered by the Advisory Planning Committee.

## NEXT MEETING

ADJOURNMENT

The next meeting for the Advisory Planning Committee is tentatively scheduled for November 7, 2023.

The meeting of the Advisory Planning Committee adjourned at 4:38 pm.

## CERTIFIED CORRECT:

Chair

THE CORPORATION OF THE CITY OF VERNON REPORT TO COUNCIL

SUBMITTED BY: Michelle Austin<br>Planner, Planning

COUNCIL MEETING: REG $\mathbb{X}$ COW $\square$ I/C $\square$<br>COUNCIL MEETING DATE: December 11, 2023<br>REPORT DATE: November 23, 2023<br>FILE: 3360-20 (ZON00365)

## SUBJECT: ZONING APPLICATION FOR $160743^{\text {RD }}$ AVENUE

## PURPOSE:

To present for Council's consideration a zoning application for the property located at $160743^{\text {rd }}$ Avenue. The intent is to rezone the property from R5 - Four-plex Housing Residential to RH1 - Low-rise Apartment Residential and develop two apartment buildings with a total of 141 residential units.

## RECOMMENDATION:

THAT Council support Zoning Application 00365 (ZON00365) to rezone Lot B, Sec 2, Twp 8, ODYD, Plan KAP59453, Except Strata Plan KAS1926 (Phase 5) (1607 43rdAvenue) from R5 - Four-plex Housing Residential to RH1 - Low-rise Apartment Residential as outlined in the report titled "Zoning Application for $160743^{\text {rd }}$ Avenue" dated November 23, 2023 and respectfully submitted by the Planner;

AND FURTHER, that Council's support of ZON00365 is subject to the following:

1. That, prior to final adoption of the bylaw,
a) a restrictive covenant be registered on title of the subject property:
i. limiting the maximum number of dwelling units to 150 ;
ii. requiring, at the development permit stage, compliance with the Geotechnical Assessment, prepared by Ecora Engineering \& Resource Group Ltd., dated November 2020 (Attachment 11); and
b) a reciprocal access easement be registered on title guaranteeing access to all Phases of Strata Plan KAS1926 from $43^{\text {rd }}$ Avenue; and
c) a Traffic Safety Analysis be provided to ensure safety for all road users at the driveway access at $43^{\text {rd }}$ Avenue.
2. That, prior to submission of a Building Permit application, a development permit be required to ensure compliance with the mitigation measures outlined in the Environmental Impact Assessment, prepared by Phoenix Environmental Services Ltd., dated July 23, 2023 (Attachment 9).

## ALTERNATIVES \& IMPLICATIONS:

1. THAT Council not support Zoning Application 00365 (ZON00365) to rezone Lot B, Sec 2, Twp 8, ODYD, Plan KAP59453, Except Strata Plan KAS1926 (Phase 5) (1607 43 ${ }^{\text {rd }}$ Avenue) from R5 - Four-plex Housing Residential to RH1 - Low-rise Apartment Residential as outlined in the report titled "Zoning Application for $160743^{\text {rd }}$ Avenue" dated November 23, 2023 and respectfully submitted by the Planner.

Note: This alternative does not support the rezoning application and prevents the project from moving ahead. Under the existing R5 zoning, a maximum of 33 units would be allowed.

## ANALYSIS:

## A. Committee Recommendations

At its meeting of November 28, 2023, the Advisory Planning Committee passed the following resolution:
"(That the Advisory Planning Committee recommends that Council...)."

## B. Rationale:

1. The subject property is located at 1607 43 ${ }^{\text {rd }}$ Avenue, across from Vernon Mobile Home Park (Figures 1 and 2). It has an area of approximately 1.12 ha ( 2.77 ac ) and is relatively flat. It is mostly vacant except for an access road and existing surface parking for an adjacent six-plex (Attachment 1).
2. The property is a remnant portion of a larger multi-family development, named Vernon Springs, that was partially completed in the late 1990's. Vernon Springs includes a mix of multi-family buildings ranging from semi-detached to six-plexes to the east and northeast of the subject property.
3. Development plans are to construct two low-rise (4 storey) apartment buildings containing a total of 141 residential units with underground parkades and exterior surface parking (Attachment 2). Building A, on the west side of the access road, would comprise a below grade parkade with two four-storey apartment buildings above


Figure 1 - Location


Figure 2 - Aerial containing 85 units with a mix of 1 bedroom and 2 bedrooms. Building B, on the east side of the access road, would also comprise a fourstorey apartment building above a parkade containing 56 apartment units with a mix of 1 bedroom, 1 bedroom plus a den and 2 bedrooms. Access from $43^{\text {rd }}$ Avenue is proposed using the existing driveway on the adjacent lot to the east. The subject property would need to obtain an access easement from that property owner.
4. Following rezoning, considerations regarding form and character would be addressed at the development permit stage. The provided conceptual architectural drawings (Attachment 2) illustrate the potential site development, including renderings, contours, a site plan, building and site sections, floor plans, building elevations, and a landscape plan (Attachment 3). The elevations for Building A show three stories, but a proposal for four stories is under consideration by the owner.
5. The subject property is zoned R5 - Four-plex Housing Residential (Attachments 4 and 5). The application is to rezone the property from R5 to RH1 - Low-rise Apartment Residential (Attachment 6).

Should Council support the recommendation, Administration would issue a public notice of initial readings and prepare a proposed bylaw to be brought forward for Council's consideration to rezone the property. In accordance with Sec. 464 (1) of the Local Government Act, holding of a public hearing is not required on the proposed rezoning bylaw because 1) an Official Community Plan (OCP) is in effect for the property and 2 ) it would be consistent with the OCP.
6. The maximum allowable density of the $R 5$ zone is 30 units per ha ( 12 units per ac), which would allow up to 33 units on subject property. Density for the proposed project calculates to 126 units per ha ( 51 units per ac) and so the need to rezone to a higher density zone. The proposed RH1 zoning establishes the maximum allowable density through FSR rather than units per hectare (acre). There is no unit-per-hectare ceiling in the RH1, meaning that there is no restriction on the number of units that can be constructed, apart from compliance with other development controls such as FSR, lot coverage, height, and setbacks. The maximum allowable density of the RH1 zone is an FSR of 2.0. The project proposal is for an FSR of 0.5 .
7. The subject property is designated as Residential Medium Density (RMD) in the OCP (Attachment 7). The RMD land use designation supports apartments, townhouses and mixed use with a maximum density of 110 units per ha ( 44.5 units per ac). With a lot area of 1.12 ha ( 2.77 ac ), the property could support up to 123 units under the RMD designation. The proposed project envisions a somewhat higher count of 141 units. In zoning districts utilizing Floor Space Ratio (FSR) for density, such as the proposed RH1, Section 7.5 of the OCP indicates that there is no maximum unit per hectare (acre). However, Administration recommends that a restrictive covenant be registered on the title to cap the number of dwelling units at 150 . This measure aims to prevent excessive density within the RMD designation while still permitting some flexibility in the final design. Notably, the owner concurs with this approach.
8. Regional Growth Strategy (RGS) Bylaw 2500, 2011 identifies the subject property as being within an area intended for growth.
9. Table 1 below compares the R 5 and RH 1 zoning regulations.

|  | Existing R5 | Proposed RH1 |
| :---: | :---: | :---: |
| Housing Form | - SDH <br> - Duplex/Semi-detached Housing <br> - Three-plex Housing <br> - Four-plex Housing <br> - Secondary Suites within SDH | - Apartment Housing <br> - Stacked Row Housing <br> - Seniors Housing (including Assisted and Supportive) |
| Max. Density | 30 units/ha $=33$ units | - $\mathrm{FSR}=1.25$ <br> - $\operatorname{FSR}$ with a housing agreement $=1.35$ <br> - FSR where parking provided completely beneath habitable space or common amenity areas $=2.0$ <br> - Max. FSR with all bonuses $=2.0$ |
| Max. Site Coverage | - $40 \%$ <br> - Max. $50 \%$ with impermeable surfaces | - $65 \%$ <br> - Max. $85 \%$ with impermeable surfaces |
| Max. Height | - 10 m <br> - 4.5 m for secondary buildings and structures | - 16.5 m <br> - 4.5 m for secondary buildings and structures |
| Min. Yards | - $4 m$ for Front and Flanking <br> - $2 m$ for Side <br> - $6 m$ for Rear | - 4.5 m for Front, Side and Flanking <br> - 9 m for Rear |

Table 1: Zoning Comparison
10. Surrounding land uses (i.e. zoning and actual use) are compatible with the proposed multi-family development, as shown in Table 2.

|  | Zoning | Actual Use |
| :--- | :--- | :--- |
| North | RM1 - Row Housing Residential | Countryside Place (multi-family housing) |
| East | RM1 <br> R5 - Four-plex Housing Residential | Vernon Springs multi-family housing <br> Single detached housing (SDH) |
| South | R5 <br> RH2 - Stacked Row Housing Residential <br> R7 - Mobile Home Residential | Mobile Home Park |
| West | R5 <br> RH2 | Undeveloped / multi-family housing |

Table 2: Surrounding Properties - Zoning \& Actual Use
11. A Trip Generation and Impact Analysis letter (Attachment 8) has been provided with estimated trip generation, using the Institute of Transportation Engineers (ITE) Trip Generation Manual, and an assessment of the impact of the proposed development (up to 160 units) on the road network, based on road classification. The analysis predicts that during both the morning (AM) and evening (PM) peak hours, there will be fewer than 100 vehicle trips generated. It concludes that the quantity is insufficient to impact the level of service of the intersection approach at $43{ }^{\text {rd }}$ Avenue and Pleasant Valley Road or to cause the road classification to change. Although requested, a complete Traffic Impact Assessment was not provided. The Trip Generation and Impact Analysis letter provided did not verify sight lines or recommend upgrades to improve visibility and safety for all road users and, in particular, active transportation users. Therefore, Administration recommends a Traffic Safety Analysis for the site access at $43^{\text {rd }}$ Avenue be provided prior to bylaw adoption.
12. Under the City's Environmental Management Areas (EMA) Strategy, the subject property has a "medium" conservation value (Figure 3). An Environmental Impact Assessment (EIA) (Attachment 9) has been provided, further describing the property's conservation value. This assessment explains that much of the site has been disturbed as a result of previous development activities including excavations for building foundations that did not get built. It identifies the following vegetation communities on the property that hold significant environmental value: a


Figure 3 - EMA Polygons pond/wetland, a deciduous forest, and a common cattail marsh. The pond/wetland in the southwest corner is currently protected by a no-disturb covenant (Attachment 10). The EIA outlines mitigation strategies to enhance the environmental value of the existing vegetation communities that should be implemented at the time of development. Administration recommends that an environmental development permit (DP) be required prior to submission of a Building Permit application to ensure the EIA mitigation strategies are implemented. It is uncertain at this stage (i.e. rezoning) whether an EMA DP would be mandatory otherwise.
13. A Geotechnical Assessment (Attachment 11), prepared by Ecora Engineering \& Resource Group Ltd., dated November 2020, has been provided. A summary of findings can be found in Section 9. Briefly, the assessment found:

- clay soils with medium to very high potential for swelling;
- groundwater seepage at depths inferred between 1 and 3 metres below ground level (mbgl), which may be higher during periods of heavy rainfall and snow-melt. Seepage may be encountered during excavation of the proposed underground basement parkades and utility installations;
- soils are not considered to be susceptible to liquefaction in the event of an earthquake; and
- shallow foundations are not considered appropriate for the proposed buildings, unless ground improvement techniques are utilized.

The assessment states that the site is situated for the proposed development provided the site improvement recommendations are followed during the design and construction phases of the project. Detailed recommendations can be found in Sections 9 and 10 of the assessment including ground improvement options, deep foundation options, frost considerations, site preparation and drainage considerations, and stormwater management. Administration recommends compliance with the assessment at the development permit stage.
14. Administration supports the rezoning application for the following reasons:
a) It is congruent with the RGS Bylaw which identifies the subject property as a growth area.
b) It is consistent with the OCP RMD designation to accommodate medium density multi-family development.
c) While the site presents challenges in terms of environmental and geotechnical factors, the accompanying professional reports propose effective mitigation measures to enhance conditions and render the project site feasible.
d) The project helps to meet essential housing needs by revitalizing a dormant site undeveloped for over 25 years.

## C. Attachments:

Attachment 1 - Photos
Attachment 2 - Architectural Drawings
Attachment 3 - Conceptual Landscape Plan
Attachment 4 - Zoning Map
Attachment 5 - R5 Zoning Regulations
Attachment 6 - RH1 Zoning Regulations
Attachment 7 - OCP Map
Attachment 8 - Trip Generator and Impact Analysis Letter
Attachment 9 - Environmental Impact Assessment
Attachment 10 - Covenant
Attachment 11 - Geotechnical Assessment

## D. Council's Strategic Plan Alignment

Governance \& Organizational Excellence
Recreation, Parks \& Natural Areas
Environmental Leadership

Livability
Vibrancy
Not Applicable

## E. Relevant Policy/Bylaws/Resolutions:

1. Official Community Plan Bylaw 5470:
> OCP Designation - Residential Medium Density (RMD)
> Development District - 2 Neighbourhood
2. Zoning Bylaw 5000:
> Sec. 9.12 RH1: Low-rise Apartment Residential
FINANCIAL IMPLICATIONS:
$\boxtimes$ None $\square$Budget Previously Approved

New Budget Request
(Finance Review Required)

X
Michelle Austin
Planner, Planning

Terry Barton, Director
Community Infrastructure and Development

Patricia Bridal, CAO
Date: $\qquad$

REVIEWED WITHCorporate ServicesBylaw Compliance Real Estate
$\square$ RCMP
$\square$ Fire \& Rescue Services
Human Resources
Financial Services
COMMITTEE: APC (Nov. 28/23)
OTHER:
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Figure 1 - Proposed access (existing driveway). Photo taken facing N from 43 Ave.


Figure 2 - Existing parking area. Photo taken facing N from driveway entrance.


Figure 3 - Former excavated area \& site for S portion of Building A. Photo taken facing NW from driveway.


Figure 4 - Former excavated area \& site for N portion of Building A. Photo taken facing NW from driveway.


Figure 5 - Former excavated area \& site for N portion of Building A. Photo taken facing SW from driveway.


Figure 6 - Former excavated area \& site for Building B. Photo taken facing E from driveway.
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| VERNON SPRINGS |  |  |
| :---: | :---: | :---: |
| LOT B PLAN KAP59453 |  |  |
| Curent Zoning: R5 | Required | Provided |
| Principal Use | RHI | RHI |
|  | Low-Rise Apartment Residential | Low-Rise Apartment Residential |
|  | Apartment Housing | Apartment Housing |
| Parcel Size | Minimum $1400 \mathrm{~m}^{2}$ | $11188 \mathrm{~m}^{2}$ |
| Lot Wiath | Minimum 30 m | 115 m |
| Lot Depth | Minimum N/Am | 152 m |
| Net Floor Area | N/A | $6878 \mathrm{~m}^{2}$ |
| Floorplate | $0 \mathrm{~m}^{2}$ | $2741.2 \mathrm{~m}^{2}$ |
| Parkade Floorplate | $0 \mathrm{~m}^{2}$ | $3579.3 \mathrm{~m}^{2}$ |
| Floor Area Ratio | 1.5 | 0.5 |
| Maximum Lot Coverage | 65\% | 25\% |
| Site Coverage (Including Divewoys and Parking Areas) | 85\% | 43\% |
| Maximum Building Height | 16.5 m | 15.1 m |
| Setbacks | Front yard - 4.5 m - 14-9 $1 / 6^{\prime \prime}$ | Front yard (South) -8.4m |
|  | Side yard - 4.5 m - 14-9 1/6" | Side yard (East) - 8.8 m |
|  | Rear yard - $9 \mathrm{~m}-29^{-6} 61 / 3^{\prime \prime}$ | Rear yord (North) - 14.6 m |
|  | Side yord -4.5m = 14-9 $7 / 6^{\prime \prime}$ | Side yord (West) - 16.8 m |
| Private open space | Bachelor dwelling - $5 \mathrm{~m}^{2}$ | See private open space calcs |
|  | 1 bedroom dwelling $-10 \mathrm{~m}^{2}$ | See private open space calcs |
|  | More than I bedroom dwelling - $15 \mathrm{~m}^{2}$ | See private open space calcs |
| Londscaping | N/A | Refer Landscaping |
| Bicycle Parking | Class $1=60$ | 60 |
|  | Class II $=30$ | 30 |











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## VERNON SPRINGS 1607 43RD AVENUE

CONCEPTUAL
LANDSCAPE PLAN



### 9.6 R5: Four-plex Housing Residential

### 9.6.1 Purpose

The purpose is to provide a zone for the development of a maximum of four ground oriented dwelling units in the form of single detached, semi-detached, duplex, threeplex or four-plex housing on urban services. The R5c sub-zoning district allows for care centre, major as an additional use. The R5h sub-zoning district allows for home based business, major as an additional use. (Bylaw 5467)

### 9.6.2 Primary Uses4

- care centre, major (use is only permitted with the R5c sub-zoning district)
- duplex housing
- four-plex housing
- group home, major
- semi-detached housing
- single detached housing
- three-plex housing
- seniors housing


### 9.6.3 Secondary Uses

- boarding rooms
- care centres, minor
- home based businesses, minor
- home based businesses, major (in single detached housing only) (use is only permitted with the R5h sub-zoning district)
- secondary suites (in single detached housing only)
- seniors assisted housing
- seniors supportive housing


### 9.6.4 Subdivision Regulations

- Minimum lot width is 20.0 m , except it is 22.0 m for a corner lot.
- Minimum lot depth is 30.0 m .
- Minimum lot width for single detached housing is 14.0 m , except it is 16.0 m for a corner lot.
- Minimum lot area for single detached housing is $450 \mathrm{~m}^{2}$.
- Minimum lot area is $700 \mathrm{~m}^{2}$, except it is $800 \mathrm{~m}^{2}$ for a corner lot, or $10,000 \mathrm{~m}^{2}$ if not serviced by a community sewer system. (Bylaw 5339)


### 9.6.5 Party Wall Subdivision Regulations

| Lot Type | Minimum Lot area |  | Minimum Lot Width |  |
| :--- | :---: | :---: | :---: | :---: |
|  | interior | corner | interior | corner |
| Semi-Detached Housing | $350 \mathrm{~m}^{2}$ | $400 \mathrm{~m}^{2}$ | 10.0 m | 12.0 m |
| Three-Plex Housing | $235 \mathrm{~m}^{2}$ | $285 \mathrm{~m}^{2}$ | 7.0 m | 9.0 m |
| Four-Plex Housing | $175 \mathrm{~m}^{2}$ | $225 \mathrm{~m}^{2}$ | 7.0 m | 9.0 m |

### 9.6.6 Development Regulations

- Maximum site coverage is $40 \%$ and together with driveways, parking areas and impermeable surfaces shall not exceed $50 \%$.
- Maximum floor space ratio is 0.6 .
- Maximum height is 10.0 m , except it is 4.5 m for secondary buildings and secondary structures.
- Minimum front yard is 4.0 m , except it is 6.0 m for a garage or carport to the back of curb or sidewalk for a front entry garage, or it is 0.6 m to the side of the garage and 2.6 m to the front building façade for side-entry garage and driveway layouts.
- Minimum side yard is 2.0 m for a 1 or 1.5 storey portion of a building or a secondary building or structure and 2.5 m for a 2 or 2.5 storey portion of a building, except it is 4.0 m from a flanking street unless there is a garage accessed from the flanking street, it is 4.0 m or it is 2.6 m to the building for a side-entry garage and driveway from a flanking street and at least 6.0 m from the back of curb or sidewalk. Where there is no direct vehicular access to the rear yard or to an attached garage or carport, one side yard shall be at least 3.0 m . The minimum side yard setback for shared interior party walls shall be 0.0 m . The minimum side yard setback for single detached housing is 1.5 m , except it is 4.0 m from a flanking street unless there is a garage accessed from the flanking street, it is 4.0 m or it is 2.6 m to the building for a side-entry garage and driveway from a flanking street and at least 6.0 m from the back of curb or sidewalk.
- Minimum rear yard is 6.0 m for a 1 or 1.5 storey portion of a building and 7.5 m for a 2 or 2.5 storey portion of a building, except it is 1.0 m for secondary buildings.
- The maximum height of any vertical wall element facing a front, flanking or rear yard (including walkout basements) is 6.5 m , above which the building must be set back at least 1.2 m .
- Maximum density is 30 units per gross hectare ( 12 units/gross acre).
- Maximum four dwelling units located in a building.


### 9.6.7 Other Regulations

- In order for bareland strata developments to be consistent with the character of the surrounding neighborhood, the strata plan shall be considered as one site for defining the overall use, density and site coverage.
- A minimum area of $25 \mathrm{~m}^{2}$ of private open space shall be provided per dwelling.
- Where development has access to a rear lane, vehicular access to the development is only permitted from the rear lane.
- For seniors assisted housing, seniors housing and seniors supportive housing, a safe drop-off area for patrons shall be provided on the site.
- For strata developments, common recreation buildings, facilities and amenities may be included in the strata plan. Recreational buildings shall be treated as secondary buildings for the purpose of determining the height and setbacks of the building as specified in each zone.
- For multi-unit residential housing, one office may be operated for the soul purpose of the management and operation of the multi-unit residential development.
- In addition to the regulations listed above, other regulations may apply. These include the general development regulations of Section 4 (secondary development, yards, projections into yards, lighting, agricultural setbacks, etc.); the specific use regulations of Section 5; the landscaping and fencing provisions of Section 6; and, the parking and loading regulations of Section 7.
- As per Section 4.10.2 - All buildings and structures, excluding perimeter fencing (garden walls and fences) on lots abutting City Roads as identified on Schedule " B " shall not be sited closer to the City Road than the setback as per the appropriate zone measured from the offset Rights of Way as illustrated on Schedule " $B$ ". (Bylaw 5440)


### 9.12 RH1 : Low-Rise Apartment Residential

### 9.12.1 Purpose

The purpose is to provide a zone primarily for medium density apartments on urban services.

### 9.12.2 Primary Uses

- apartment housing
- care centres, major
- group home, major
- seniors assisted housing
- seniors housing
- seniors supportive housing
- stacked row housing


### 9.12.3 Secondary Uses

- home based businesses, minor
- real estate sales centres (in apartment housing only)


### 9.12.4 Subdivision Regulations

- Minimum lot width is 30.0 m .
- Minimum lot area is $1400 \mathrm{~m}^{2}$, or $10,000 \mathrm{~m}^{2}$ if not serviced by a community sewer system.


### 9.12.5 Development Regulations

(a) Density:

The maximum Floor Space Ratio (FSR) is 1.25 , except that:

- With a housing agreement pursuant to Section 4.9, the maximum density shall be increased by FSR 0.10; and
- Where parking spaces are provided completely beneath habitable space of a primary building or beneath useable common amenity areas, providing that in all cases the parking spaces are screened from view, the maximum density shall be increased by FSR 1.25; or
- Where all the required parking is not accommodated completely beneath the habitable space of a primary building or useable common amenity areas, the additional density permitted shall be determined through multiplying the FSR 1.25 by the percentage of parking proposed to be provided beneath habitable space of a primary building or useable common amenity areas;
Provided that the maximum Floor Area Ratio with all bonuses shall not exceed FSR 2.00 .


## (b) Building Regulations:

- Maximum site coverage is $65 \%$ and together with driveways, parking areas and impermeable surfaces shall not exceed $85 \%$.
- Maximum height is 16.5 m , except it is 4.5 m for secondary buildings and secondary structures.
* Minimum front yard is 4.5 m .
- Minimum side yard is 4.5 m , except it is 4.5 m from a flanking street.
- Minimum rear yard is 9.0 m , except it is 1.0 m for secondary buildings.


### 9.12.6 Other Regulations

- A minimum area of $5.0 \mathrm{~m}^{2}$ of private open space shall be provided per bachelor dwelling, congregate housing bedroom or group home bedroom, $10.0 \mathrm{~m}^{2}$ of private open space shall be provided per 1 bedroom dwelling, and $15.0 \mathrm{~m}^{2}$ of private open space shall be provided per dwelling with more than 1 bedroom.
- No continuous building frontage shall exceed 40.0 m for a 3 to 4.5 storey building, or 65.0 m for a 2 storey building. If the frontage is interrupted by an open courtyard equivalent in depth and width to the building height, the maximum continuous 4.5 storey building frontage may be 80.0 m provided that no building section exceeds 40.0m.
- For multi-unit residential housing, one office may be operated for the sole purpose of the management and operation of the multi-unit residential development. (Bylaw 5440)
- For seniors assisted housing, seniors housing and seniors supportive housing, a safe drop-off area for patrons shall be provided on the site.
- In addition to the regulations listed above, other regulations may apply. These include the general development regulations of Section 4 (secondary development, yards, projections into yards, lighting, agricultural setbacks, etc.); the specific use regulations of Section 5; the landscaping and fencing provisions of Section 6; and, the parking and loading regulations of Section 7. (Bylaw 5339)
- As per Section 4.10.2 - All buildings and structures, excluding perimeter fencing (garden walls and fences) on lots abutting City Roads as identified on Schedule "B" shall not be sited closer to the City Road than the setback as per the appropriate zone measured from the offset Rights of Way as illustrated on Schedule "B". (Bylaw 5440)


RLD - Residential Low Density RMD - Residential Medium Density PUBINS - Public \& Institutional

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## OCP Designation

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August 25, 2023

07-23-0006

Harpreet S. Nahal
Lawyer
Lake City Law
101A-3100 30th Avenue
Vernon, BC
V1T 2C2

VIA E-MAIL: hnahal@lakecitylaw.ca

Dear: Harpreet

## Re: 160743 Avenue

Trip Generation and Impact Analysis Letter
The following letter outlines what Bunt believes is an appropriate trip generation and impact analysis study for the development located at 160743 Avenue, Vernon. The study has taken into consideration the road classification of $43^{\text {rd }}$ Avenue and has reviewed the impact of a low number of trips on a road network.

We hope you find the outcome of the study satisfactory and that it will enable you to move forward with the Development. Please contact us if you have any questions.

Yours truly,
Bunt \& Associates


Erin Tattrie, RSE, GradTech
Transportation Technologist


Christephen Cheng, P.Eng.
Principal

## 1. INTRODUCTION

Lake City Law, on behalf of its client 1247845 Ltd., is undertaking a 160-unit multi-family low-rise development at $160743^{\text {rd }}$ Avenue, Vernon. Lake City Law has retained Bunt \& Associates Engineering Ltd. (Bunt) to review the trip generation and the associated impacts on the current traffic network.
1.1 Scope of Work

The scope of work includes:

- Trip Generation analysis using the $11^{\text {th }}$ Edition ITE Trip Generation Manual; and,
- Assessment of Impact on the road network based on road classification.
1.2 Site Context

The site is located on the north side of $43^{\text {rd }}$ Avenue 80 km west of Pleasant Valley Road. The site plan is shown in Exhibit 1.1.

### 1.3 Background

This letter has been prepared to provide a "Trip Generation Letter" to support the contemplated development. Table $\mathbf{1 . 1}$ summarizes the development based on the information provided by Lake City Law.

Table 1.1: Development Content

| LANDUSE | QUANTITY |
| :---: | :---: |
| Multi-family residential (low-rise) | 160 DU |
|  |  |

### 1.4 Organization

This letter is organized as follows:

- Section 1: Introduction
- Section 2: Trip Generation
- Section 3: Impact Analysis
- Section 4: Conclusion


Exhibit 1.1
Site Plan

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## 2. TRIP GENERATION

### 2.1 Concept

Trip Generation is a measure of travel behaviour based on the idea people regularly travel to and from various sites with specific land uses such as residential, retail, office, etc. The location of the sites impacts the number of trips entering and exiting, particularly regarding the mode of transportation (transit, walking, cycling, and personal vehicle).

An example of trip generation is a person leaving their home to go to work. Each departure from the home is a trip and each arrival at the home is a trip. If the number of trips to and from the house are counted over a period of time, say 3 hours, then the number of trips counted over that period can establish a trip generation rate.

### 2.2 Calculated Trip Generation

For the purposes of this analysis, Bunt is focusing on the estimated trip generation of a 160-unit multi-family low-rise development. The ITE $11^{\text {th }}$ Edition Trip Generation Manual provides an average rate for the AM and PM peak-hour periods, summarized in Table 2.1. The average rates are based on the ITE Trip Generation Database which includes studies conducted throughout the United States and Canada. To be conservative Bunt used the General Urban/Suburban trip rate.

Table 2.1: ITE $11^{\text {th }}$ Edition Trip Generation Rates

| LAND USE | LUC ${ }^{1}$ | QUANTITY |  | AM |  |  | PM |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Average Rate | \% Enter | \% Exit | Average Rate | \% Enter | \% Exit |
| Multi-family low-rise | 220 | 160 | DU ${ }^{2}$ | 0.40 | 24\% | 76\% | 0.51 | 63\% | 37\% |
|  |  |  |  |  |  |  |  |  |  |

Note(s): 1 - LUC = Land use code; an identifying reference number in the ITE Trip Generation Manual
2 - DU = Dwelling Unit
Table 2.2 summarizes the calculated trip generation using the ITE rates.

Table 2.2: ITE $11^{\text {th }}$ Edition Trip Generation Rates

| LAND USE | LUC $^{1}$ | QUANTITY |  | AM PEAK HOUR TRIPS |  |  | PM PEAK HOUR TRIPS |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | IN | OUT | TOTAL | IN | OUT | TOTAL |  |
| Multi-family low-rise | 220 | 160 | DU $^{2}$ | 15 | 49 | 64 | 52 | 30 | 82 |
|  |  |  |  |  |  |  |  |  |  |

Note(s): 1 - LUC = Land use code; an identifying reference number in the ITE Trip Generation Manual
2 - DU = Dwelling Unit
As shown in Table 2.2, the planned development is anticipated to generate 64 trips in the $A M$ and 82 trips in the PM peak hours.

## 3. IMPACT ANALYSIS

A traffic impact assessment (TIA) is used for assessing potential impacts on the surrounding transportation network from the trips generated by a proposed development. The purpose of a TIA is to indicate if or how to make the transportation network operate safely and efficiently with a design horizon of study.
3.1 Analysis Thresholds for a TIA

Typically, 100 vehicle trips or more added new trips generated in the peak hour is considered the industry thresholds for when a full Transportation Impact Assessment is required'. A hundred vehicles per hour (vph) is a magnitude that can change the level of service of an intersection approach; and left or right-turn lanes may be needed to satisfactorily accommodate site traffic without adversely impacting through (non-site) traffic.

In the case of the proposed development as shown in Table 2.2, the trips generated by the development are anticipated to be under 100 vehicle trips in both the AM and PM peak hours. Given this, it is anticipated that the development will not generate enough trips to impact the level of service or require left or right-turn lanes.

However, there are still additional considerations to keep in mind when the proposed development generates less than 100 vehicle trips in the peak hours such as:

- A change in the type of access operation; or
- The access being relocated.

These considerations are to make sure the development access does not adversely impact the operation of the access point or the road.

Based on the site plan, shown previously in Exhibit 1.1, the access location and operation will remain the same as the existing conditions.

### 3.2 Analysis by Road Classification

### 3.2.1 General Road Classification

Roads are assigned different classifications such as local, collector, and arterial based on traffic volume (veh/day), design speed, right-of-way width and other characteristics. Table 3.1

[^0]summarizes some of the characteristics by road classification, based on the TAC Geometric Design Guide for Canadian Roads.

Table 3.1: TAC Road Classification Information

|  | LOCALS |  | COLLECTORS |  | ARTERIALS |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Residential | Industrial / Commercial | Residential | Industrial / Commercial | Minor | Major |
| Traffic Service Function | Traffic movement secondary consideration |  | Traffic movement and land access of equal importance |  | Traffic movement major | Traffic movement primary consideration |
| Land service / access | Land access primary function |  | Traffic movement and land access of equal importance |  | Some access control | Rigid access control |
| Traffic Volume (veh/day) | <1,000 | <3,000 | <8,000 | 1,000-12,000 | $\begin{aligned} & 5,000- \\ & 20,000 \end{aligned}$ | 10,000-30,000 |
| $\begin{gathered} \text { Design speed } \\ (\mathrm{km} / \mathrm{h}) \end{gathered}$ | 30-50 |  | 50-80 |  | 50-70 | 60-100 |
| Right-of-way Width (m) | 15-22 |  | 20-24 |  | 20-45 |  |
|  |  |  |  |  |  |  |

### 3.2.2 Nearby Road Network

Bunt has applied the TAC Traffic volumes by road classification, in Table 3.1, to the surrounding road network for a high-level understanding of the existing traffic on each road. The high-level road volumes are summarized in Table 3.2.

Table 3.2: Existing Road Network Volumes

| ROAD | CLASSIFICATION | TAC VOLUME |
| :---: | :---: | :---: |
| 43 Avenue | Collector | $<8,000$ |
| Pleasant Valley Road | Collector | $<8,000$ |
| 17 Street | Local | $<1,000$ |
| 18 Street | Local | $<1,000$ |
| 20 Street | Collector | $<8,000$ |
|  |  |  |

If the maximum daily volume for a collector road is assumed to follow a similar distribution of vehicles per hour as noted in the Vehicle Time of Day Distribution table in the ITE Trip Generation Manual ( $11^{\text {th }}$ Edition), then the AM peak hour (i.e. the busiest hour between 7:00 AM and 9:00 AM) can be expected to carry approximately $12 \%$ of the day's trips (i.e. $8,000 \times 12 \%=960$ vehicles). For the PM peak hour (i.e. the busiest hour between 3:00 PM and 6:00 PM) would represent $23 \%$ of the daily volume and therefore can potentially carry 1,840 vehicles (i.e. $8,000 \times 23 \%=1,840$ ) during the peak hour period.

Assuming the existing road network has not exceeded the TAC Volumes per road classification, the development would add 64 trips to the road network in the AM peak hour and 82 trips in the PM peak hour. The small number of trips generated would likely not impact the overall operational performance of the road network nor cause the road classification to change.

## 4. CONCLUSION

The site will generate less than 100 trips during the AM and PM peak hours. Therefore, it is below the generally accepted threshold of 100 or more added (new) peak direction trips and therefore will not impact the road network. Additionally, the trips will not cause the road classification to change.

July 28, 2023

Harpreet S. Nahal
101A - 3100 30th Avenue
Vernon, BC
V1T 2C2

Dear Mr. Nahal:

## Re: Environmental Impact Assessment (EIA) - Proposed Residential Development, Vernon Springs, $160743^{\text {rd }}$ Avenue, Vernon, B.C.

Phoenix Environmental Services Ltd. (Phoenix) has prepared this Environmental Impact Assessment (EIA) report regarding the proposed multi-family residential development of the property situated at $160743^{\text {rd }}$ Avenue (the Site) in the City of Vernon, BC. The proposed development comprises two (2) low-rise apartment buildings with a mix of 3-storey and 4-storey buildings over underground parkades as well as exterior surface parking areas. Refer to the Location Map presented in Appendix A showing the location of the Site within the City of Vernon.

The proposed development appears to be an urban infill project. The Site is a remnant portion of a residential development complex that was partially developed in the late 1990's and there is an existing road with water and sewer utilities servicing extending through the middle of the Site. There are existing apartment buildings from the previous development to the southeast with the civic address of $160743^{\text {rd }}$ Ave. and northeast of the Site with the civic address of 4308 Pleasant Valley Road. Much of the Site has been disturbed as a result of previous development activities including excavations for building foundations that did not get built. The Site contains forested habitat areas and a small pond that are protected by restrictive covenants registered during the prior development of the existing multi-family buildings at 4308 Pleasant Valley Road and the existing road through the middle of the Site. Under the City of Vernon's Environmental Management Areas (EMA) Strategy, there is a mapped EMA polygon encompassing the Site and parts of the adjacent lands designated as Medium Conservation Value (yellowcoded) shown on the City's web map - North Okanagan Map

This EIA is prepared with reference to the City of Vernon Environmental Management Areas Strategy and related guidelines for environmental assessment and impact mitigation. This report provides a summary of existing environmental conditions of the Site such as vegetation communities, stream and aquatic habitats, and wildlife habitats at the Site, including Federally- and Provincially listed Species at Risk. This report also describes the proposed development concept for the Site and provides an assessment of potential environmental impacts and recommends associated mitigation measures.

## 1 INTRODUCTION

The City of Vernon has founded its Environmental Management Areas (EMA) Strategy on Sensitive Ecosystem Inventory (SEI) mapping for the Vernon vicinity and surrounding areas. An EMA Strategy Map has identified ecosystem areas of low, moderate, and high sensitivity that correspond with the existing development pattern, slope conditions and sensitive ecosystem areas. Accounting for available
background information and ecological data, mapped ecosystem sensitive polygons, and the development history of the City, the EMA Strategy has identified three Development Districts that cover all land use areas within the City. The Site is located within Development District 2 - Neighbourhood District (DD 2). As mentioned, a Moderate sensitivity polygon (yellow polygon) has been mapped the subject Site. Moderate sensitivity polygons influence development to a lesser degree than areas mapped as High sensitivity polygons (red polygons) for which greater degrees of development restriction and environmental management requirements are applied to proposed developments. Moderate sensitive polygon areas require that development proposals respond to property specific conditions and the presence or absence of key natural and habitat features. Land use alterations, changes to permitted uses and citing of all proposed land uses are required to undertake conservation, protection, and mitigation planning. Most of the areas surrounding the Site have been mapped by the City as Low (green) ecological sensitivity. This EIA has been conducted in order to address the conservation and protection needs at the Site commensurate with Moderate conservation values that have been identified for the Site through the EMA Strategy, while also meeting City objectives for reasonable development potential of the Site and vicinity.


Figure 1: Location of the Site in Vernon and mapped EMA Polygons at and nearby the Site
This report provides a bio-physical inventory of the Site including a description of topographic and geologic features, vegetation communities, watercourses, wildlife and wildlife habitat, and potential occurrence of Species at Risk. This report also describes the measures incorporated into the proposed plan to provide aquatic and terrestrial habitat conservation, protection of key environmental features, and the mitigation measures to be taken toward environmentally sound construction methods and development at the Site. In addition to identifying project-specific habitat conservation and protection for the proposed development, this EIA includes a conceptual plan for stormwater management best practices associated with the proposed development.

Environmental Impact Assessment<br>Proposed Multi-Family Residential Development<br>1607 43rd Avenue, Vernon, BC

## 2 PROJECT DESCRIPTION

A proposed residential development plan for the Site, referred to as Vernon Springs, has been prepared in 2021 by Bluegreen Architecture Inc. (Bluegreen). The proposed multi-family residential development entails construction of two low-rise apartment buildings. Building A along the west side of the existing access road at the Site will comprise a single concrete parkade podium with two 3 -storey wood frame apartment buildings above containing 63 apartment units with a mix of 1-bedroom and 2-bedroom units. Building B along the east side of existing access road will comprise a 4 -storey apartment building above a concrete parkade containing 56 apartment units with a mix of 1 - bedroom, 1 bedroom $\&$ den and 2 bedroom units. In addition to underground parking in the parkades, there will be surface parking areas for autos and bicycles. Refer to the architectural drawings for the proposed development at the Site presented in Appendix B for addition details.

The Site and existing access road contain water, storm sewer and sanitary sewer utilities to which the proposed apartment complex will connect. Existing storm sewers extend along the access road, the east edge of the northeast portion of the Site, and diagonally from the access road to the southwest corner of the Site where the on-Site storm sewer extends south along a right of way and ties into the storm sewer along $43^{\text {rd }}$ Avenue. Existing sanitary sewer extends along the north side of the existing apartment building adjacent to the Site, across the access road to the mid-area of the Site and then extends northwest along a sanitary right of way to connect with sanitary sewer along adjacent Bighorn Road at the northwest corn of the Site. There is another sanitary sewer that extends along the north edge of the Site to Bighorn Road.

A Conceptual Landscape Design has been prepared for the proposed development in 2021 by Outland Design Landscape Architecture. The landscape plan will provide a variety of deciduous trees, shrubs and ground cover around the proposed buildings and along the access road, as well as several turf areas. Refer to the landscape plan presented in Appendix B for more details.

## 3 METHODS

The methodology for this Environmental Impact Assessment (EIA) has included use of existing information resources, mapping, and reports, as well as field reconnaissance, to assess key environmental attributes on and around the Site. Phoenix consulted resources including City of Vernon web map (North Okanagan Map), Surficial Geology mapping, Sensitive Ecosystems Inventory (SEI) mapping, fish, wildlife and ecological databases through iMap BC and the Conservation Data Centre. Phoenix also has referenced a site-specific geotechnical assessment report prepared in October 2020 by Ecora Engineering \& Resource Group Ltd. (Ecora).

A Phoenix biologist conducted a field assessment of the Site on April 17, 2023, during warm dry weather following snow melt. The vegetation communities, aquatic habitat and wildlife sign and activity were recorded throughout the Site during the field assessment in April 2023

## 4 SITE DESCRIPTION <br> 

The Site is approximately 11 hectares ( $11,188 \mathrm{~m}^{2}$ ) in size according to the architecture drawings (Appendix B). The legal description for the Site is Lot B, Plan KAP59453, Section 2, Township 8, Osoyoos Division Yale District, except Plan KAS1926 (PH I to V). The parcel identifier (PID) is 023-806-940. The civic address assigned to the Site by the City is $160743^{\text {rd }}$ Avenue.

A survey plan prepared for the Site by Russell Shortt Land Surveyors is included in the Bluegreen architectural drawing set presented in Appendix B. The survey plan includes topographic contours for the Site. The survey plan also shows the existing access road, several manholes, existing rights of way corridors at the Site, and an areas within and adjacent to the Site covered by Restrictive Covenant.


Figure 2: Aerial imagery of the Site in Vernon (yellow outline) and existing adjoining development (blue outline)
As shown in the 2022 aerial imagery of the Site in Figure 2, as well as the Location Map in Appendix A, the Site is mostly vacant except for the access road and existing surface parking for the adjacent apartment building to the southeast. The adjacent apartment building to the southeast (blue outline) also has a civic address of $160743^{\text {rd }}$ Avenue. There are adjoining buildings to the north and northeast of the Site that have a civic address of 4308 Pleasant Valley Road.

The areas adjacent to the Site largely comprise residential land uses with a cemetery across Pleasant Valley Rd. to the east of the Site and Girouard Park to the southwest across $43^{\text {rd }}$ Avenue.

## 5 TOPOGRAPHY AND GEOLOGY

The Site generally slopes to the west as does the surrounding area to the east. There is a prominent westward embankment along the northeast corner of the Site adjacent to 4308 Pleasant Valley Road. Otherwise, the Site is relatively flat. As shown on the survey plan (Appendix B), the Site is in a minor depression to the north of $43^{\text {rd }}$ Ave. and to the south of the adjacent apartment building at 4308 Pleasant Valley Road. Also, there are two areas of former excavations along the west side of the access road with relatively steep side-slopes and flat bottoms as shown on the survey plan. A small circular pond with steeps side slopes is located in the southwest corner of the Site.

Environmental Impact Assessment<br>Proposed Multi-Family Residential Development<br>1607 43rd Avenue, Vernon, BC

Surficial geology mapping by the Geological Survey of Canada (Vernon, Map 1392A) shows that native soils in the vicinity of the Site are classified as Fraser Glaciation Kamloops Drift comprising lacustrine deposits (Lv). Lacustrine deposits comprise silt with minor clay and sand which are typically deposited in a thin veneer and follow the underlying topography (generally less than 10 feet thick).

Site-specific soil features have been described in the 2020 Ecora Geotechnical Assessment report for the Site. The geotechnical assessment entailed a combination of cone penetration testing (CPT), dynamic cone penetration testing (DCPT), boreholes, and installation of two (2) groundwater monitoring wells. Soil types encountered by the geotechnical site investigations across the Site consisted of:

- Fill (Sand \& Gravel) comprising dense sand and gravel with varying amounts of silt and cobbles to a depth of 3.4 m below ground level (mbgl) primarily under the existing access road at the Site; underlain by
- Lacustrine Deposits (Clay/Silt) comprising very soft to compact silts and clays, with varying amounts of sands and gravels. The silts and clays were encountered directly at the surface to a maximum depth of 6.1 mbgl on the western and eastern side of the Site; underlain by
- Glaciofluvial Deposits (Sand) comprising dense to very dense sands, with varying amounts of silts and gravels extending to the maximum depth of exploration at 10.7 mbgl . The geotechnical report has noted that heaving sands were encountered at depths between $8.2-9.8 \mathrm{mbgl}$.

Standpipe (2) groundwater monitoring wells revealed that the depth to water (water table surface) ranged between $1.05-1.4 \mathrm{mbgl}$.

The Ecora geotechnical assessment has generally characterized native soils (excluding existing fill soils) at the Site as very soft to compact silts and clays with low permeability and a high water table. Low seismic and liquification hazards are present at the Site. Proposed building foundations will require ground improvement measures such as preloading, piling, or other options identified in the geotechnical assessment report.

## 6 STREAMS AND WATERCOURSES

A stream is any watercourse of natural or artificial origin that provides fish habitat. This includes rivers, creeks, ditches, ponds, lakes, springs and wetlands connected by surface flow to a waterbody that provides fish habitat, as defined in the BC Riparian Areas Protection Regulation (RAPR). Fish habitat includes streams supporting populations of fish; and also streams that lack fish presence but contribute water flow, food, and nutrients to fish bearing streams. Fish have been defined as all life stages of salmonids (e.g., coho, chum), game fish (e.g., sturgeon, bass, crayfish), and regionally significant fish. Under 2019 amendments to the Canada Fisheries Act, the definition of fish has been expanded to include all fish species, including crustaceans and marine mammals.

Based on field observations and mapping databases (e.g. City web map, iMap $B C$ ), there are not any creeks or ditches on the Site. During the April 2023 field assessment, a short ditch with standing water around an open manhole filled with water was observed on the adjacent property to the southwest of the Site at $160943^{\text {rd }}$ Avenue. There is also a small pocket cattail marsh at the southwest corner of $160943^{\text {rd }}$ Ave. adjacent to the Site. The adjacent cattail marsh appeared to be isolated and unconnected to any drainage features.

Environmental Impact Assessment<br>Proposed Multi-Family Residential Development<br>1607 43rd Avenue, Vernon, BC

There is a small pond at the southwest corner of the Site which has been retained and protected by an existing Restrictive Covenant. The small pond was observed on April 17, 2023 to contain shallow, standing water with tree and shrub vegetation in and around the pond and grassed side slopes to the pond top of bank. Refer to the Site Photos presented in Appendix C. The City web map for storm sewer infrastructure shows that there is a stormwater pipe at the south edge of the pond that is connected to a storm sewer in $43^{\text {rd }}$ Ave. and an extensive storm sewer network beyond. There is no indication that there is a surface flow connection of the pond to another water feature that may be fish habitat. As such, the small pond at the Site has been determined to be an isolated wetland. While the isolated pond wetland meets the definition of a "stream" under the BC Water Sustainability Act (WSA), it is not a fish habitat nor a "stream" as defined under the BC Riparian Areas Protection Regulation (RAPR) because it is an unconnected isolated wetland. Therefore, streamside setbacks or streamside protection and enhancement areas (SPEA) do not apply to the isolated pond wetland at the Site. However, the isolated pond wetland is protected under the WSA.

The closest fish-bearing stream to the Site is B.X. Creek around 380 m distant to the north of the Site. B.X. Creek (Watershed Code 310-939400-08200) has recorded populations of rainbow trout, brook trout, sucker, carp, prickly sculpin, and burbot (BC Habitat Wizard) and drains to Swan Lake. The Riparian Assessment Area (RAA) of B.X. Creek ( 30 m ) does not intersect the Site. There are no other fish habitats nearby the Site based on databases and field observations of the vicinity of the Site.


Figure 3: The natural stream, BX Creek, located north of the Site showing the Riparian Assessment Area along the stream.

## 7 VEGETATION COMMUNITIES

The Site is located within the Okanagan Very Dry Hot Interior Douglas-fir Variant (IDFxh1), as described by the Biogeoclimatic Ecosystem Classification (BEC) system developed for the Province of British

Environmental Impact Assessment<br>Proposed Multi-Family Residential Development<br>1607 43rd Avenue, Vernon, BC

Columbia and as indicated by the Sensitive Ecosystems Inventory (SEI) - Vernon Commonage, 2005. The Vernon Commonage SEI study area is located within the Southern Interior Ecoprovince, the northern extension of the Columbia Basin and lies within the North Okanagan Basin Ecosection. The Vernon Commonage SEI is bounded at the north by the urban area of the City of Vernon.

The following vegetation communities have been identified within and adjacent to the Site where existing urban development has not already occurred. Refer to the Habitat Map in Appendix A showing general habitat types found at the Site.

### 7.1 Deciduous Forest

The deciduous forest at the northeast area of the Site and adjacent to the north of the Site is dominated by black cottonwood (Populus balsamnifera trichocarpa), willow (Salix. sp.) and trembling aspen (Populus tremuloides) with scattered maple, birch and ornamental trees. The shrub layer is dominated by red-osier dogwood (Cornus stolonifera) and rose (Rosa.sp.). Due to the early spring timing of the field visit (e.g. prior to leaf out), shrub and tree species identification has been limited.

### 7.2 Pond Wetland

There is a small pond at the southwest corner of the Site. The pond was observed to contain shallow standing water during the April 2023 field assessment. The pond is a type of wetland and is an isolated wetland as discussed in section 6 of this report. There are cottonwood and willow trees and shrubs vegetating the margins of the pond with grasses covering the side slopes and areas surrounding the pond.

### 7.3 Disturbed Vegetation Type

The remainder of the Site has been disturbed by previous site clearing and grading for residential development that did not proceed. The disturbed areas of the Site are predominantly mowed grass.

Remnant excavations for building foundations that were not built are within the disturbed vegetation type as shown on the Habitat Map in Appendix A. The excavation areas are extensively lined with crushed ( $\sim 3-4$ in.) rock. The largest of the excavations near the northwest corner of the Site also has accumulations of silts between the rocks with small pockets of standing water observed in the lowest northwest and southeast corners. While appearing to be regularly mowed, there is bulrush (cattail) and sedge vegetation within the base of the excavation in the largest excavation to the northwest side of the Site. The side slopes of the excavations primarily consist of mowed grasses. The southern excavation is predominantly exposed crush rock along its base. A small pool of standing water and area of cattails extends to the southwest of the excavation along the south edge of the Site adjacent to $160943^{\text {rd }}$ Avenue. The area west of the southern excavation is within the Restrictive Covenant area that also encompasses the pond wetland.

### 7.4 Rare Plant Communities

Existing conservation database mapping ( $C D C, 1 \mathrm{Map} \mathrm{BC}$ ) has identified two rare plant communities for the Site that are no longer present as a result of subsequent residential development preparations at the Site and multi-family residential development at the adjoining areas to the northeast and southeast of the Site.

Environmental Impact Assessment<br>Proposed Multi-Family Residential Development<br>1607 43rd Avenue, Vernon, BC

There is a large polygon for a Typha latifolia (Common Cattail) Marsh that has been mapped (iMapBC) as covering the Site and adjacent properties. Refer to the polygon outlined in blue presented in Appendix $B$. The approximate outline of the Common Cattail Marsh is also outlined in green on the Habitat Map in Appendix A. This mapped polygon closely resembles the polygon mapped on the Vernon web map for the EMA Strategy Moderate Sensitivity (yellow) polygon shown on Figure 1.

The Typha latifolia (Common Cattail) Marsh (Occurrence ID 12945) is identified as a BC Blue-Listed Ecological Community. The Conservation Data Centre (CDC) record indicates that the Cattail Marsh community was first observed in 1994, and last observed in 2013. This wetland element occurrence is based on Terrestrial Ecosystem Mapping and has been confirmed by one field inspection. The element occurrence occupies an estimated $5.4 \%$ ( 0.24 ha ) of the area shown. Annual and seasonal fluctuations in water levels results in changes to the vegetation over time. The CDC record indicates that the vegetation and ecological community on this site may have changed since mapping or field sampling.

The CDC also has mapped the occurrence of a Cut-leaved water parsnip (Berula erecta) ecological community at the Site. Cut-leaved water parsnip is a semi-aquatic perennial wetland plant, found in marshy areas and along streams in the Okanagan Valley. It is widespread across its entire range, has high fire tolerance, low drought tolerance, may be toxic to livestock and is adapted to both fine and mediumtextured soils. The disturbed conditions at the Site are unlikely to support the presence of Cut-leaved water parsnip within the Site.

There is a Red-listed Ecological Community along B.X. Creek East of Swan Lake (Occurrence ID 10474) identified as a Populus trichocarpa / Symphoricarpos albus - Rosa spp. ecological community. The mapped polygon for the Populus trichocarpa / Symphoricarpos albus - Rosa spp. (black cottonwood/common snowberry/ rose) ecological community closely corresponds to the City's EMA Strategy High Sensitivity (red) polygon about 350 m north of the Site (refer to Figure 1).

There is a Schoenoplectus acutus Deep Marsh (hard-stemmed bulrush Deep Marsh) BC Blue-Listed Ecological Community (Occurrence ID 12486) recorded for Bate Creek 0.4 south of the City of Vernon.

## 8 WILDLIFE

### 8.1 Wildlife and Wildlife Habitats

The forested areas within the Site are likely used for movement and foraging by a variety of mammal species (e.g., deer, raccoon, bats), as well as by songbirds, woodpeckers and raptors. Local residents at Bighorn Rd. interviewed during the April 2023 field assessment indicated that barred owl have been observed within the deciduous forest in the Restrictive Covenant area adjoining the Site to the north, as well as deer and racoon.

The CDC has a mapped occurrence for the Red-listed American Badger (Taxidea taxus) that extends into the Site; however, this is a large area-wide occurrence throughout the Okanagan Valley. The Site does not offer suitable habitat for American Badger given its extensively urbanized setting and disturbed vegetation communities.

Wildlife species observed at the Site during the April 17, 2023 field assessment included:

# Environmental Impact Assessment <br> Proposed Multi-Family Residential Development <br> 1607 43rd Avenue, Vernon, BC 

- American Robin (Turdus migratorius)
- Dark-eyed Junco (Junco hyemalis)
- Wren (sp?)
- Mourning Dove (Zenaida macroura)
- Northern flicker (Colaptes auratus)
- Mallard (Anas platyrhynchos)
- Eastern Gray Squirrel (Sciurus carolinensis)

A stick nest that is likely used by American crow (Corvus brachyrhynchos) was observed in a cottonwood tree near the northeast corner of the Site. No raptor nests were observed in or around the Site.

## 9 IMPACT ASSESSMENT

The primary environmental features on the Site include the deciduous forest in the northeastern part of the Site and the pond wetland in the southwest corner. The pond wetland and adjacent forest bordering the north side of the Site have been set aside for protection through restrictive covenants registered when surrounding multi-family buildings were developed in the parcels adjoining the Site. Most of the Site has been previously disturbed and remains actively mowed. An existing, serviced access road bisects the Site. Two prominent areas of excavations constructed when adjoining multi-family residential buildings were developed occupy much of the area of the Site west of the road through the Site. Several sewers also cross through the Site.

The proposed multi-family residential development entails construction of two low-rise apartment buildings. Building A along the west side of the existing access road at the Site will comprise a single concrete parkade podium with two 3 -storey wood frame apartment buildings above containing 63 apartment units. The proposed Building A will occupy most of the existing excavated areas on the west side of the existing road through the Site. Building $B$ along the east side of existing access road will comprise a 4 -storey apartment building above a concrete parkade containing 56 apartment units. The location of Building $B$ is mostly a deciduous forest.

There are not any fish habitats at the Site that would be impacted by the proposed multi-family residential development at the Site. The isolated (unconnected) pond wetland, already protected by restrictive covenant, will be retained.

The loss of the deciduous forest in the northeast part of the Site will be the primary environmental impact associated with the proposed multi-family residential development. The loss of forest will result in reduced habitat availability for birds, small mammals, and deer. The deciduous forest that will be lost is small and fragmented within the surrounding extensively urbanized area of Vernon.

The mapped occurrence of a common cattail marsh ecological community has previously been affected by existing development alterations at and around the Site. Small pockets pf cattail remain nearby the Site and adjacent to the protected pond wetland.

The environmental impacts associated with the proposed multi-family residential development of the Site are expected to be minimal. No sensitive habitats of conservation concern will be lost or affected by the proposed development.

Environmental Impact Assessment<br>Proposed Multi-Family Residential Development<br>1607 43rd Avenue, Vernon, BC

The environmental impacts associated with the proposed multi-family residential development of the Site can be mitigated and partially offset by tree planting included with the proposed landscape plan (refer Appendix B). The environmental impacts can also be partially offset by providing replacement forest and expanded wetland habitat described in the first three recommendations that follow.

The following mitigation measures are recommended for incorporation into the project design and construction:

1. The triangular Restrictive Covenant ( RC ) area containing the pond wetland should be planted with native trees and shrubs to enhance side slopes of the pond wetland and adjacent areas of the RC area around the protected pond wetland. Adding ponderosa pine or similar coniferous native species as well as native birch and aspen trees should be considered to increase diversity and increase overall tree canopy coverage within the RC area.
2. The filled and mowed grass area between the pond wetland and the south Site boundary should be re-graded to lower the elevation within this area of the RC area, as well as within the area north of the pond wetland within the RC area. Following re-grading, planting of native trees and shrubs would occur.
3. The proposed turfed area along the west side of the proposed Building A and west boundary of the Site should be replaced with a broad (e.g. $3-\mathrm{m}$ wide) swale extending from the northwest corner of the Site to the existing pond wetland to which on-site roof leaders and landscaped area drainage can be directed. The swale should contain two or three rock berms spaced along its length to temporarily store water drained to the swale and the base of the swale should be planted with cattails to form a linear cattail marsh. The western edge of the swale area should be planted with trees and shrubs to provide a vegetated border along the west side of the Site as per the Conceptual Landscape Plan. The proposed swale/ linear marsh should continue through into the RC area and connect and drain to the pond wetland.
4. All land clearing and tree removal should be timed to avoid the songbird breeding window (April 1 to August 31). If tree removal and land clearing activities cannot avoid this construction timing window, then nesting bird surveys will need to be conducted to ensure compliance with the B.C. Wildlife Act and the Canada Migratory Birds Regulation.
5. Erosion and sediment control (ESC) facilities should be installed and maintained during construction of the proposed low-rise apartment buildings. Given the silty, lacustrine native soils at the Site and accounting for spatial limitations, collection, and pre-treatment of stormwater runoff during construction may need to include storage tanks, flocculant treatment, and pH adjustment for any concrete leachate entering the stormwater collection system for the ESC facilities. All exposed soils should be stabilized with dense straw and seed mix after final grading. Temporary stockpiles should be covered with poly-sheeting. Temporary exposed soil areas should be stabilized with dense straw. Inlet protection devices should be installed in all on-site and nearby by off-site catch basins until the project is substantially complete, including topsoil placement and landscaping.

## CLOSURE

It is hoped that this Environmental Impact Assessment has adequately described environmental features at the Site, the proposed residential development plan for the existing Site, probable impacts associated with the planned development, and measures to address potential impacts and provide habitat enhancement to offset forest losses at the Site.

Please contact us if you require any clarification or additional information regarding this report.

Sincerely,
Phoenix Environmental Services Ltd.


Ken Lambertsen, R.P.Bio.
Principal

Enclosures: Appendix A - Location Map, Habitat Map, CDC Occurrence Map Appendix B - Architectural Plans, Conceptual Landscape Plan Appendix C - Site Photos

## APPENDIX A

## Location Map <br> Habitat Map <br> CDC Occurrence Map





## APPENDIX B

## Architectural Plans

## Conceptual Landscape Plan



ISSUED FOR DEVELOPMENT PERMIT - 202x.xx.xx 1607 43RD AVE. VERNON, BC


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| Principal use | ${ }^{\text {RHI }}$ | ${ }^{\text {RHH }}$ |
|  | Low.ise Apartment Residential | LowRese Apartment Residentiol |
|  | Aparment Housing | Apartment Housing |
| Parcel Size | Minimum $1400 \mathrm{~m}^{2}$ | $11188 \mathrm{~m}^{2}$ |
| Lot Wiath | Minimum 30 m | 115 m |
| ${ }^{\text {Lof Depth }}$ | Mrimum N/Am | 152 m |
| Net foraracea | N/A | ${ }^{6878} \mathrm{~m}^{2}$ |
| Foorplate | $0 \mathrm{~m}^{2}$ | $2741.2 \mathrm{~m}^{2}$ |
| Parkode foomplate | $0 \mathrm{~m}^{2}$ | $3579.3 \mathrm{~m}^{2}$ |
| Foor Area Ratio | 1.5 | 0.5 |
| Moximum Lot Coverga | ${ }^{65 \%}$ | 25\% |
| Stie Coveroge (lncluding Divivewys ond Parking Areas) | ${ }^{85 \%}$ | 43\% |
| Moximum Buididig Height | 16.5 m | 15.1 m |
| settocks | Foron yord -4.5m-14:91/6 | Front yerd (South) -8.4m |
|  |  | Side yord (Estit -8,8m |
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|  | 1 bedroom dwelling $-10 \mathrm{~m}^{2}$ | See pivive open space calcs |
|  | More than I bedroom dwelling $-15 \mathrm{~m}{ }^{\text {a }}$ | See pilvate opens space calcs |
| Londscaping | N/A | Refer Londscaping |
| Bicycle Parking | Class $=60$ | 60 |
|  | Class $1=30$ | 30 |









## $\Theta^{N}$

VERNON SPRINGS
1607 43RD AVENUE
venoon BC
CONCEPTUAL
LANDSCAPE PLAN

$\qquad$


L1/1

## APPENDIX C

## Site Photos



Photo 1: View of the pond wetland looking south
Photo 2: Forest in RC area north of the Site looking northeast


Photo 3: View of existing excavation at NW area of the Site looking north


Photo 5: View of the southern excavation west of the ex. Road looking south

Photo 4: View of existing excavation at NW area of the Site looking south


Photo 6: View of isolated marsh between pond wetland and south boundary of the Site

Environmental Impact Assessment Proposed Multi-Family Residential Development

1607 43rd Avenue, Vernon, BC


Photo 7: View of small excavation area at the NE area of the Site and adjacent forest


Photo 9: Existing manholes near middle west area of the Site


Photo 11: View of stick nest to the NE of the Site adjacent to existing multi-family buildings


Photo 8: View of forest at the NE part of the Site where Building $B$ will be situated


Photo 10: View of existing road and development northeast of the Site


Photo 12: Existing road through the Site looking south from the north edge of the Site

tit ar is 46
KLD83133
LAND TIL TE GE
KAMLOOFSNELSON
Land Title Act
(Section 219.81)
Province of British Columbia GENERAL INSTRUMENT - PART 1
(This area for Land Title Office use)

1. Application: (Name, address, phone number and signature of applicant, applicant's solicitor or agent) DAVIDSON AND COMPANY Barristers and Solicitors client no. 10517 Signature of Agent

## F $\quad \begin{aligned} & \text { \#401-3205-32nd Street } \\ & \text { Vernon, B.C. V1T 2M4 545-5344 }\end{aligned}$

C'
(File \#82,547/WEC/bad)
${ }^{2}$
2. $\begin{aligned} & \text { Parcel Identifier and Legal Description of Land:* } \\ & \text { (LID) } \\ & \text { (Legal Description) }\end{aligned}$

4. Terms: Part 2 of this instrument consists of (select one only)
(a) Filed Standard Charge Terms
(b) Express Charge Terms X D.F. No.
(c) Release Annexed as Part 2 There is no Part 2 of this instrument
A selection of (a) includes any additional or modified terms referred to in Item 7 or in a schedule annexed to this instrument. If (c) is selected the charge described in Item 3 is released or discharged as a charge on the land described in Item 2.
5. Transferor (s):*
460356 B.C. LTD. (Inc. No. 460356) and THE OWNERS, STRATA PLAN NO. KASO1. 926
6. Transferees): (including occupations), postal address(es) and postal codes))* THE CORPORATION OF THE CITY OF VERNON a municipal corporation having its offices at 3400-30th Street, Vernon, British Columbia, V1T 5E6
7. Additional or Modified Terms: N/A
8. Execution(s):**This instrument creates, assigns, modifies, enlarges, discharges or governs the priority of the interests) described in Item 3 and the Transferor (s) and every other signatory agree to be bound by this Instrument, and acknowledge (s) receipt of a true copy of the filed standard charge terms, if any.


[^1]Land Title Act
Form D

## EXECUTIONS CONTINUED



Officer Certification:
Your signature constitutes a representation that you are a solicitor, notary public or other person authorized by the Evidence Act, R.S.B.C. 1996 C. 124 , to take affidavits for use in British Columbia and certifies the matters set out in Part 5 of the Land Title Act as they pertain to the execution of this instrument.

LAND title act
FORM E
SCHEDULE
Enter the required information in the same order as the information must appear on the Freehold Transfer form, Mortgage form, or General Instrument form.
2. Parcel Identifier and Legal Description of Land
(PID) (Legal Description)
The common property lying within the boundaries of Strata Plan KAS1926
023-806-931 Lot A, Sec. 2, Twp. 8, ODYD, Plan KAP59453 Except Strata Plan KAS1926 (Phase 1)

023-806-940 Lot B, Sec. 2. Twp. 8, ODYD, Plan KAP59453

## COVENANT - SECTION 219 LAND TITLE ACT

## WHEREAS:

A. The Transferor, The Owners Strata Plan No. KAS1926 is the owner of the common property lying within the boundaries of Strata Plan KAS1926 (Phase 1);
B. The Transferor 460356 B.C. Ltd. is the registered owner of Lot A Sec 2 Tp 8 ODYD Plan KAP59453 Except Strata Plan KAS1926 (Phase 1) and Lot B Sec 2 Tp 8 ODYD Plan KAP59453;
C. The Transferee has requested that the Transferors as owners of the Lands enter into this Covenant with the Transferee for the benefit of the general public and the protection of the natural environment of parts of the Lands, and the Transferors have agreed to do so pursuant to Section 219 of the Land Title Act and acknowledge that the granting of this Covenant is of benefit to the Transferors, making available to them additional dwelling units for development and subdivision.

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the premises and the sum of ONE DOLLAR ( $\$ 1.00$ ) now paid by the Transferee to the Transferors, receipt whereof is hereby acknowledged, the Transferors covenant and agree with the Transferee pursuant to Section 219 of the Land Title Act, R.S.B.C. 1996, Ch. 250 and amendments thereto as follows:

1. The covenants herein contained are and shall be deemed to be covenants running with the land and shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, successors, administrators and assigns, in perpetuity, or until such time as the covenants herein contained shall be ordered released and discharged by a Court of competent jurisdiction, or until such time as the Transferee or its successors for the time being shall execute in writing and in registrable form, a release and discharge of the covenants herein contained.
2. In this Covenant and the recitals hereto:
 "Covenant Parcels" means Parcel Á, Parcel B, Parcel C and Parcel D shown on the Covenant Plan.
"Covenant Plan" means a Reference Plan of parts of the Lands prepared from a survey conducted by R.J. Shoesmith, B.C.L.S. and completed on the 24th day of July, 1997 a reduced photocopy of which is attached hereto.
"Lands" means the lands described in the recitals to these Terms of Instrument - Part 2 and in Item 2 of Land Title Act Form C General Instrument - Part I attached hereto and forming part of this Covenant.
3. Henceforth those parts of the Lands shown as the Covenant Parcels on the Covenant Plan shall be maintained in their natural state and no trees shall be cut down or removed therefrom, nor shall the soil or vegetation within the Covenant Parcels be disturbed save and except as follows:
(a) Trees may be cut down and removed from the Covenant Parcels and the soil and vegetation thereof may be disturbed from time to time to the extent reasonably necessary to construct, install, maintain, operate, inspect, repair and replace from time
to time underground utility works and services generally within and under the Covenant Parcels;

Within Subject Property (Lot B, KAP59453)
(b) Those parts of Covenant Parcels $C$ and $D$ shown as one (1) meter in width on the Covenant Plan may be improved as may be reasonably necessary to create walkways to permit pedestrian access to the said Covenant Parcels $C$ and $D$; and
(c) The Covenant Parcels may be used for such other uses as the Transferee in its discretion may permit from time to time.
4. If hereafter any of the Transferors or their successors in title as the case may be, shall cut down or remove trees from a Covenant Parcel or cause the same to be cut down or removed or shall disturb the soil or vegetation of a Covenant Parcel or cause the same to be disturbed in the course of carrying out any of the uses permitted under Paragraph 3(a) hereof, such Transferor or its successor in title as the case may be, shall, when such uses are completed from time to time, promptly cause any resulting excavations to be filled in and the surface of the Covenant Parcel in question to be restored as much as is practicable to the same or a similar natural state in which it was found prior to such uses being carried out.
5. Wherever the masculine singular pronoun is used in this Agreement, the same shall be deemed to include and mean the plural, feminine, or body corporate or body politic as the context may require.
6. The Transferors acknowledge and agree that damages are not an adequate remedy for breach of the covenants herein contained and further that the Transferee, in the event of any such breach will and shall be entitled to apply to a Court of competent jurisdiction for an Order restraining and prohibiting the continuance of any such breach.
7. If any part of this Agreement is found to be illegal or unenforceable, that part will be considered separate and severable from the rest, and the remaining parts will not be affected thereby and will be enforceable to the fullest extent permitted by law.
8. Nothing herein contained or implied shall prejudice or affect the Transferee's rights and powers in the exercise of its functions pursuant to the Municipal Act of British Columbia or its rights and powers under all of its public and private statutes, bylaws, orders and regulations to the extent that the same are applicable to the Lands, all of which may be fully and effectively exercised in relation to the Lands as if these covenants had not been executed and delivered by the Transferors.

Page 6


END OF DOCUMENT

FORM 6

## CERTIFICATE OF STRATA CORPORATION

(Section 20(5))

The Owners, Strata Plan No. KAS $\mathbf{0 0 1 9 2 6}$ (a strata corporation) hereby certifies that the owners of the strata lots in the said strata plan by special resolution, duly passed, directed this strata corporation to execute the instrument, a true copy of which is annexed hereto, and that all persons other than the owners having registered interests in the land within the said strata plan and all other persons having interests (other than statutory interest) which have been notified to this strata corporation having consented in writing to the execution of the said instrument, and that the instrument conforms with the terms of the resolution.

460356 B.C. LTD.
by its authorized signatory as Owner/Developer on behalf of THE OWNERS, STRATA PLAN NO. MAS


## ecora



Geotechnical Assessment
Proposed 2 Building Apartment Complex Project 1607 43 $^{\text {rd }}$ Ave., Vernon, BC

Dated:
Ecora File No.:


इAMTH
November 2020
201457

## Presented To:

Mr. Harpreet Nahal
205 - 2901 32 ${ }^{\text {nd }}$ Street,
Vernon, BC, V1T 5M2

Prepared by:


Dylan Bryce, E.I.T. 11/26/2020

Geotechnical Engineer in Training
dylan.bryce@ecora.ca

Reviewed by:

Michael Laws, P.Eng
Date
Senior Geotechnical Engineer
michael.laws@ecora.ca

Version Control and Revision History

| Version | Date | Prepared By | Reviewed By | Notes/Revisions |
| :--- | :---: | :--- | :--- | :--- |
| 0 | $11 / 26 / 2020$ | JDB | MJL | Issued for Use |
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|  |  |  |  |  |

## Limitations of Report

This report and its contents are intended for the sole use of the Saath Development Corporation their agents and the applicable regulatory authorities. Ecora Engineering \& Resource Group Ltd. (Ecora) does not accept any responsibility for the accuracy of any data, analyses, or recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Saath Development Corporation, their agents, the applicable regulatory authorities or for any Project other than that described in this report. Any such unauthorized use of this report is at the sole risk of the user.

Where Ecora submits both electronic file and hard copy versions of reports, drawings, and other project-related documents, only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Ecora shall be deemed to be the original for the Project. Both electronic file and hard copy versions of Ecora's deliverables shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Ecora.

Ecora's General Conditions are provided in Appendix A of this report.

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## 1. Introduction

### 1.1 General

Ecora Engineering \& Resource Group Ltd. (Ecora) has been retained by the Saath Development Corporation (Saath) to conduct a preliminary geotechnical assessment for the proposed multi-family residential development located at $160743^{\text {rd }}$ Ave., Vernon, BC. The proposed scope of work was set-out in Ecora's proposal dated May $5^{\text {th }}$, 2020 titled "Geotechnical Engineering Services Proposal for the 3-building Apartment Complex Project at $160743^{\text {rd }}$ Ave., Vernon, BC" which included the following:

- Phase 1: Site Investigation consisting of three boreholes to a maximum depth of 10.8 meter below ground level (mbgl) using overburden excentric drilling (Odex), hollow/solid stem augers, cone penetration test (CPT), and dynamic cone penetration testing (DCPT) methodology to assess the nature of the existing on-site soils, depth to the ground water table, and collect representative soil samples for associated laboratory testing;
- Phase 2: Geotechnical Reporting which consists of the preparation of a geotechnical report summarizing the results of the geotechnical site investigation and provide seismic recommendations, ground improvement and potential temporary and/or permanent dewatering, earthworks recommendations, and geotechnical construction recommendations, and;
- Phase 3: Detailed Geotechnical Design comprising of the preparation of detailed design of the selected foundation/ground improvement options outlined in the geotechnical assessment report.

This report only pertains to Phase 1 and Phase 2 as summarized above, as the detailed geotechnical design will be completed once specific details of the proposed development are finalized.

### 1.2 Project Description

It is Ecora's understanding that Saath has contracted Bluegreen Architecture Inc (Bluegreen) to provide an architectural design concept for the 2-building apartment complex at $160743^{r d}$ Ave, Vernon, BC. Based on Bluegreen's Design Concept drawings dated July 20, 2020 it is Ecora's understanding that "Building A" will consist of a 69 unit 3 storey apartment building with underground parking while "Building B " will comprise a 52 unit 4 storey apartment building with underground parking. The approximate building footprint for "Building A" and "Building B" is $1992 \mathrm{~m}^{2}$ and $1624 \mathrm{~m}^{2}$, respectively. At the time that this report was written, it is Ecora's understanding that the basements will be constructed of cast in place concrete with typical wood framed construction comprising the remaining construction.

Although specific details of the proposed development have yet to be finalized, it is anticipated that the design of the proposed structures will fall within the requirements of Part 4 of the British Columbia Building Code (BCBC) 2018.

### 1.3 Site Description

The subject property is located at $160743^{\text {rd }}$ Ave., Vernon, BC (legal description Lot B Plan KAP63777 Section 2 Township 8 Osoyoos Division Yale District) on the northern side of 43rd Ave, approximately 1.5 km east of Highway 97 and 43 Ave intersection. The site is situated in a residential area and bound by a vacant lot to the west, 43 Ave to the south, and residential properties to the north and east. The existing property comprises an
irregular shaped 2.76 acres $\left(11,193 \mathrm{~m}^{2}\right)$ parcel. There are two Sewer Easements that cross the northwest portion of the property denoted as SROW KN011443 and SROW KN011445 and a Statutory right of way that runs along the northern property line.

The proposed "Building A" site is currently situated over City Of Vernon Sanitary and Storm Mains, and will also be built upon the wetlands along the north western edge of the property. The "Building B" footprint is currently situated in a forested area along the eastern side of the property. The site and surrounding area typically slopes gently downwards from the east to the west. It should also be noted that a dry/wet landscaped creek runs along the proposed northern edge of the "Building A" footprint as shown in Bluegreen's drawing entitled "Site Plan Existing" dated February 10, 2020. Figure 1.3 shows the current site plan configuration.

## 2. Background Review

### 2.1 Published Surficial Geology

Reference to Fulton, R.J., Berti, A.A, and Smith, G.W., 1974. Surficial geology, Vernon (west of sixth meridian), British Columbia. Geological Survey of Canada, Map, 1392A, scale 1:126,720 indicates that the subject site is underlain by lacustrine deposits from the Fraser Glaciation Kamloops Drift. The lacustrine deposits typically comprise silt with minor clay and sand which are typically deposited in a thin veneer and do not mask the underlying topography (generally less than 10 feet thick).

### 2.2 Published Bedrock Geology

Reference to the 1:100,000 GSC ‘Geology, Okanagan Watershed, British Columbia', (Okulitch, 2007-2011) indicates that the bedrock geology consists of "schist, garnet, muscovite, biotite; lesser schist, carbonaceous; quartzite, micaceous; minor marble; schist, amphibolitic; amphibolite; metaconglomerate" of the Silver Creek Formation. Bedrock in this area is considered to be at a considerable depth, and will not be encountered within the project depths.

### 2.3 Groundwater Monitoring Wells

Reference to the Provincial Well Database, iMapBC, indicates that two water wells (Tag \# 8326 \& 18663) was installed within 800 m from the centre of the subject site. The water well data is summarized in Table 2.3.a, and the detailed water well logs have been attached in Appendix B.

Table 2.3.a Water Well Summary

| Water Well No. | Approx. Distance from Center of Site (m) | Lithology | Depth (m bgl) | Static Groundwater (m bgl) |
| :---: | :---: | :---: | :---: | :---: |
| 8326 | 450 m (NW) | Gravel | 0-4.3 | 2.1 |
| 18663 | 800 m (SE) | Brown clay with stones, layers of sand | $4.3-6.1$ | 3.4 |
|  |  | Brown clay with stones, silty sand | $6.1-10.3$ |  |
|  |  | Brownish clay with rocks and gravel | 10.3-35.4 |  |
|  |  | Solid Rock | 35.4-43.9 |  |

*Data taken from iMapBC Water Well Reports (https://maps.gov.bc.ca/ess/hm/imap4m/)

### 2.4 Air Photo Review

Historical air photos were reviewed to gain an understanding of historical development at the subject site. This included the review of the following:

- GeoBC Historical air photos dated 1981 (Roll/Frame: bc81024/112 Operation Tag: B-023-uKN81), 1994 (Roll/Frame: bcc94043/180 Operation Tag: C-075-FI-94), 1997 (Roll/Frame: bcc97025/223 Operation Tag: B-074-F-97), 2001 (Roll/Frame: bcc01027/20 Operation Tag: C-013-FI-01),2004 (Roll/Frame: bcc04015/108 Operation Tag: C-002-FH-04), 2007 (Roll/Frame: bcc07002/183 Operation Tag: C-016-XM-07); and,
- Google Earth historical imagery dated 2004, 2011, 2012, 2013, 2015, 2016, and 2018.

The above air photos show that the existing storage area was constructed sometime between 2013 and 2015. It should be noted that there are more historical air photos predating 1981, however, only air photos from 1981 to 2020 were reviewed.

## 3. Geotechnical Site Investigations

### 3.1 Initial Geotechnical Site Investigation

Subsequent to the completion of Ecora's background review, Ecora conducted a geotechnical field investigation of the site on July $27^{\text {th }}, 2020$ comprising the advancement of 4 Cone Penetration Tests (CPTs) to a maximum depth of 7.0 m with solid stem auger boreholes drilled adjacent to each CPT to install reaction anchors for the CPT testing and to correlate the CPT results with visual soil descriptions. The CPTs were performed by Schwartz Soil Technical Inc. of Vancouver BC which were advanced with a B53 truck-mounted drill rig. The drill rig was supervised by Ecora personnel, Mr. Dylan Bryce, E.I.T., who maintained a continuous log of the encountered soils and collected representative soil samples for laboratory testing.

The locations and elevations of the boreholes were surveyed to a horizontal accuracy of 2.5 m utilizing a Arrow 100 Global Positioning System (GPS) following the completion of the drilling program. Table 3.1.a provides a summary of the borehole locations and termination depths. The locations of the boreholes are also shown on the attached Figure 1.3. Detailed borehole logs are included in Appendix C.

Table 3.1.a Summary of Preliminary Geotechnical Site Investigation

| CPT No. | Northing (m) | Easting (m) | Groundwater <br> Depth (mbgl) | Termination Depth (mbgl) | Termination Reason | $\begin{aligned} & \text { Anchor } \\ & \text { Borehole Depth } \\ & \text { (mbgl) } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{gathered} \text { CPT20-01 / } \\ \text { AH20-01 } \end{gathered}$ | 5571672.21 | 339446.59 | 1.2 | NA | Couldn't advance CPT from surface through granular layer. Attempted to auger through dense layer but the sand heaved | 6.1 |
| $\begin{gathered} \text { CPT20-02 / } \\ \text { AH20-02 } \end{gathered}$ | 5571748.84 | 339396.63 | 1.0 | 7.2 | CPT Refusal | 4.6 |
| $\begin{gathered} \text { CPT20-03 / } \\ \text { AH20-03 } \end{gathered}$ | 5571713.33 | 339466.87 | 1.1 | 4.3 | CPT Refusal | 6.1 |
| $\begin{gathered} \hline \text { CPT20-04 / } \\ \text { AH20-04 } \end{gathered}$ | 5571745.70 | 339494.79 | 1.8 | 6.5 | CPT Refusal | 4.6 |
| $\begin{gathered} \text { CPT20-05 / } \\ \text { AH20-05 } \end{gathered}$ | 5571701.26 | 339395.19 | 2.0 | 7.1 | CPT Refusal | 4.6 |
| $\begin{gathered} \text { CPT20-06 / } \\ \text { AH20-06 } \end{gathered}$ | 5571705.59 | 339437.21 | Not Encountered | NA | Couldn't advance CPT from surface through granular layer | 1.2 |
| $\begin{gathered} \text { CPT20-07 / } \\ \text { AH20-07 } \end{gathered}$ | 5571746.72 | 339436.95 | 3.0 | NA | Couldn't advance CPT from surface through granular layer | 4.6 |

* UTM coordinates obtained by handheld GPS. UTM Zone 11N.

A brief description of the geotechnical methods utilized during the site investigation are detailed below:

- Cone Penetration Testing - A technique whereby a $10 \mathrm{~cm}^{2}$ or $15 \mathrm{~cm}^{2}$ cone affixed to the end of a series of rods is hydraulically pushed into the ground at a constant rate to obtain continuous measurements of the resistance to penetration of the cone tip and of a surface sleeve. Pore water pressures are also typically recorded during penetration from a piezo element located behind the cone tip. Four CPT holes were advanced to a maximum depth of 7.0 m below ground level (mbgl). Dissipation testing was undertaken in low permeability soils at select depths. The CPT holes were backfilled with filter sand upon completion.
- Auger Drilling - A technique that uses a rotary drill with auger flights to penetrate the soil comprising hollow and solid stem. The 7 solid stem auger test holes were advanced to a maximum depth of 6.1 mbgl, directly adjacent to each of the CPT locations, in order to provide an anchor/reaction force for the advancement of the CPT holes and to confirm soil conditions in general accordance with ASTM D1452/6151. The test holes were backfilled with cuttings upon completion.

A standpipe piezometer was installed in each of the $\mathrm{AH} 20-02$ and $\mathrm{AH} 20-04$ upon reaching the target depths of the CPT advancement. A 2" (50 mm) diameter schedule 80 PVC standpipe, including a 3 m long slotted screen was installed. The borehole was backfilled with filter sand to 0.5 m from the surface, and then bentonite cuttings were used to seal the final 0.5 m to surface. Details of the standpipe installation for each borehole are presented on the logs in Appendix C.

### 3.2 Supplementary Geotechnical Investigation

Ecora conducted a supplementary geotechnical investigation on August 19th, 2020, comprising the advancement of 3 boreholes to a maximum depth of 9.8 mbgl using the Odex drilling methodology and a Dynamic Cone Penetration Test (DCPT) to a depth of 10.7 mbgl . The boreholes and DCPT were performed by On-the-Mark Locates of West Kelowna, BC which were advanced with a B53 truck-mounted drill rig. The drill rig was
supervised by Ecora personnel, Mr. Dylan Bryce, E.I.T., who maintained a continuous log of the encountered soils and collected representative soil samples for laboratory testing.

The locations and elevations of the boreholes were surveyed to a horizontal accuracy of 2.5 m utilizing a Arrow 100 Global Positioning System (GPS) following the completion of the drilling program. Table 3.2.a provides a summary of the borehole locations and termination depths. The locations of the boreholes are also shown on the attached Figure 1.3. Detailed borehole logs are included in Appendix C.

Table 3.2.a Summary of Supplementary Geotechnical Site Investigation

| CPT No. | Northing (m) | Easting <br> $(\mathbf{m})$ |  | Groundwater <br> Depth $(\mathbf{m b g l})$ | Termination <br> Depth $(\mathbf{m b g l})$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| BH20-01 | 5571713.18 | 339460.84 | 2.7 | 8.2 | Termination Reason |
| BH20-02 | 5571723.82 | 339431.21 | 2.7 | 9.8 | Heaving Sands |
| BH20-03 | 5571717.80 | 339394.18 | 3.0 | 9.1 | Heaving sands |
| DCPT20-01 | 5571715.04 | 339394.04 | NA | 10.7 | Peaving Sands |

* UTM coordinates obtained by handheld GPS. UTM Zone 11N

Standard Penetration Tests (SPT) were carried out at regular intervals within the depth zone investigated by the boreholes. The SPT is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil It comprises a thick-walled sample tube, with an outside diameter of 50 mm and an inside diameter of 35 mm , and a length of 650 mm . This is driven into the ground at the bottom of a borehole by blows from a drop hammer with a weight of $63.5 \mathrm{~kg}(140 \mathrm{lb})$ falling through a distance of $760 \mathrm{~mm}(30 \mathrm{in})$. The sample tube is driven into the ground and the number of blows needed for the tube to penetrate increments of 150 mm ( 6 in ) up to a depth of 450 mm ( 18 in ) is recorded. The sum of the number of blows required for the second and third $150 \mathrm{~mm}(6 \mathrm{in})$ increments of penetration is termed the "standard penetration resistance or the " N -value".

The Dynamic Cone Penetration Test (DCPT) is another in-situ dynamic penetration test similar to the SPT which was designed to estimate the general nature of encountered soil. It comprises a hardened steel cone driven into the ground by blows from a drop hammer with a weight of $63.5 \mathrm{~kg}(140 \mathrm{lb})$ falling through a distance of 760 mm ( 30 in ). The cone is driven 150 mm into the ground and the number of blows needed for the cone to penetrate each $150 \mathrm{~mm}(6 \mathrm{in})$ is recorded. The main difference from the SPT is that the DCPT does not retain a sample during driving, allowing for continuous driving, and that there are no published correlations for the DCPT to determine the engineering properties of soils. DCPT testing was performed in DCPT20-01 to a depth of 10.7 mbgl.

## 4. Encountered Subsurface Conditions

### 4.1 Soil Conditions

Based on the results of our geotechnical site investigation program, and laboratory testing, the following soil types were encountered across the subject site within the depth zone investigated in the following sequence:

- Fill (SAND \& GRAVEL), comprising dense sand and gravel, with varying amounts of silt and cobbles. The fill deposits were typically described as medium to coarse grained subrounded sand, fine to coarse surrounded gravel, moist, and brown. The fill deposit was typically found beneath the subject site roadway and near the City of Vernon Storm Mains from the surface to a maximum depth of 3.4 mbgl , which were typically underlain by;
- Lacustrine Deposits (CLAY/SILT), comprising very soft to compact silts and clays, with varying amounts of sands and gravels. The lacustrine deposits typically were moist to saturated, fine grained sand, fine to medium subangular gravel, medium plasticity, and grey to brown with SPT "N-values" in the range of 0 to 30 . Several CPT's indicated that there is organic layers interbedded within the lacustrine deposits. This unit was encountered directly at the surface to a maximum depth of 6.1 mbgl on the western and eastern side of the subject property as noted in BH20-03 and CPT20-03, respectively. However, typically the lacustrine deposits were found at depths up to 4.6 mbgl in the center of the subject property; which in turn, is underlain by;
- Glaciofluvial Deposits (SAND), comprising dense to very dense very sands, with varying amounts of silts and gravels. The glaciolacustrine deposits typically were moist to saturated, fine to medium grained sand, fine to medium subrounded gravel, and brown to grey with all recorded SPT-N values with SPT "N-values" in the range of 30 to 50+. These deposits extended to the maximum depth zone investigated (>10.7 mbgl).

Detailed borehole logs are presented in Appendix C.

### 4.2 Groundwater Conditions

The standing groundwater level was measured in each of the installed standpipe piezometers upon the completion of supplementary geotechnical drilling program, which would have allowed for the groundwater table to reach an equilibrium since the preliminary geotechnical investigation on August 19, 2020.

Measured groundwater levels are summarized in Table 4.2.a. All groundwater level monitoring was referenced relative to ground surface.

Table 4.2.a Summary of Groundwater Levels

| Groundwater <br> Monitoring <br> Well | Northing <br> $(\mathrm{m})$ | Easting <br> $(\mathrm{m})$ | Estimated <br> Ground <br> Elevation <br> $($ masl) | Depth to Groundwater <br> $(\mathrm{mbgl})$ | Groundwater Elevation <br> $(\mathrm{masl})$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| CPT20-02 | 5571748.84 | 339396.63 | 392.80 | 1.05 | $2020-08-19$ |

Ecora anticipates that the permanent groundwater table will be encountered during site preparation, utility installation and construction of the proposed development. It should also be noted that groundwater levels may be higher during certain times of year, especially periods of heavy rainfall and snow-melt. It is recommended that the site groundwater levels are monitored regularly prior to the start of construction.

### 4.3 Soil Laboratory Testing

### 4.3.1 General

Following completion of the geotechnical drilling investigation, a selection of representative samples were sent to Ecora's certified Canadian Council of Independent Laboratories (CCIL) Laboratory for the following testing:

- Grain size analysis (ASTM C136 \& ASTM D7928);
- Atterberg limits (ASTM D4318-17e1); and,
- Moisture content tests (ASTM D2216).


### 4.3.2 Soil Classification Testing

A summary of test results from Ecora's material testing laboratory are provided in Table 4.3.a and Table 4.3.b below, with detailed test reports provided as Appendix D.

Table 4.3.a Summary of Grain Size Analysis and Hydrometer Testing

| Test hole | Depth (m) | Moisture Content (\%) | Grain Size Distribution (\%) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Gravel | Sand |  |  |
|  |  |  |  |  | Silt | Clay |
| AH20-02 | 6.1 to 6.7 | 8.1 | 17.8 | 67.6 | 9.0 | 5.6 |
| AH20-02 | 9.2 to 9.8 | 19.1 | 5.2 | 88.7 |  |  |

Table 4.3.b Summary of Atterberg Test Results

| Test Hole | Depth <br> $(\mathbf{m})$ | Plastic <br> Limit (\%) |  | Liquid <br> Limit (\%) |  | Plasticity Index <br> $(\%)$ |  | Above or Below <br> A-Line |  | USGS Soil Classification <br> Description |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| AH20-02 | $3.4-3.7$ | 25 | 63 | 38 | Above | CH |  |  |  |  |
| AH20-03 | $1.2-1.5$ | 17 | 34 | 17 | Above | CM |  |  |  |  |
| AH20-04 | $3.7-4.0$ | 25 | 51 | 26 | Above | CH |  |  |  |  |
| AH20-05 | $1.5-1.8$ | 27 | 53 | 26 | Above | CH |  |  |  |  |

## 5. Seismic Considerations

### 5.1 General

The BCBC 2018 recommend a performance criterion where the threat to "life safety" for seismic hazards is less than a $2 \%$ chance in 50 years. This performance criterion assumes that there is a high probability that once every 2,475 years, a seismic event will occur resulting in extensive structural damage. There is a reasonable degree of confidence that a well-constructed and maintained building will not collapse despite experiencing extensive structural and non-structural damage as a consequence of such an extreme event. This life safety criteria does not consider the extent of soil movement that might occur (i.e., slope instability, lateral spreading etc., which may extend to under, or beyond, the structure).

### 5.2 Seismicity

The GSC has developed a probabilistic (5th Generation) seismic hazard model (Halchuck et. al, 2015) that forms the basis of the seismic design provisions of the 2015 National Building Code of Canada (NBCC, 2015).

Peak Ground Accelerations (PGA) and Spectral Accelerations (Sa(T)) for a reference "Class C" (very dense soil and soft rock) can be obtained from the Earthquakes Canada website (http://earthquakescanada.nrcan.gc.ca) for various return periods. The values for the project area are summarized in Table 5.2.a below.

Table 5.2.a Reference (Class C) Design PGA and $\mathrm{S}_{\mathrm{a}}(\mathrm{T})$ for Vernon Springs Apartments, Vernon, BC

| Return Period | PGA (g) | $\mathbf{S a}(\mathbf{0 . 2} \mathbf{( \mathbf { g } )}$ | $\mathbf{S a}(\mathbf{0 . 5}) \mathbf{( g )}$ | $\mathbf{S a}(\mathbf{1 . 0})(\mathbf{g})$ | $\mathbf{S a ( 2 . 0 ) ( \mathbf { g } )}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| 475 years | 0.023 | 0.051 | 0.051 | 0.039 | 0.025 |
| 1,000 years | 0.036 | 0.079 | 0.072 | 0.055 | 0.036 |
| 2,475 years | 0.061 | 0.133 | 0.108 | 0.080 | 0.055 |

### 5.3 Site Classification for Seismic Response

Based on Table 5.3.a below (reproduction of Table 4.1.8.4.A, BCBC 2018), along with site observations, in-situ test results and our experience with similar sites in the area, a seismic site classification of Class E "Soft Soil" is considered appropriate for the site, due to the presence of a clay layer greater than 3 m with a plasticity index greater than 20.

Table 5.3.a Site Classification based on Soil Compactness/Consistency (BCBC 2018)

| Site Class | Soil Profile Name | Average Properties in Top 30 m as per BCBC 2018 (Division B- Part 4) |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Soil Shear Wave Average | Standard Penetration Resistance, $\bar{N}_{60}$ | Soil Undrained Shear Strength $\mathrm{Su}(\mathrm{kPa})$ |
| A | Hard Rock | $\bar{V}_{s 30}>1500$ | Not Applicable | Not Applicable |
| B | Rock | $760<\bar{V}_{s 30}<1500$ | Not Applicable | Not Applicable |
| C | Very Dense Soil and Soft Rock | $360<\bar{V}_{s 30}<760$ | $50<\bar{N}_{60}$ | $100<$ Su |
| D | Stiff Soil | $180<\bar{V}_{s 30}<360$ | $15 \leq \bar{N}_{60} \leq 50$ | $50<\mathrm{S}_{\mathrm{u}}<100$ |
|  |  | $\bar{V}_{s 30}<180$ | $\bar{N}_{60}<15$ | su < 50 |
| E | Soft Soil | Any profile with more than 3 m of soil with the following characteristics: <br> Plasticity Index, Ip > 20; <br> Moisture Content, $w \geq 40 \%$; and <br> Undrained Shear Strength, $\mathrm{su}_{\mathrm{u}}<25 \mathrm{kPa}$ |  |  |
| F | Other Soils | Site specific evaluation required |  |  |

(1) Site Classes $A$ and $B$, hard rock and rock, are not to be used if there is more than 3 m of softer materials between the rock and the underside of footing or mat foundations. The appropriate Site Class for such cases is determined on the basis of the average properties of the total thickness of the softer materials (see Note A-4.1.8.4.(3) and Table 4.1.8.4-A).
(2) Where $\bar{V}_{s 30}$ has been measured in-situ, $F(T)$ values for Site Class A derived from Tables 4.1.8.4-B to 4.1.8.4-G are permitted to be multiplied by the factor $0.04+\left(1500 / \bar{V}_{s 30}\right)^{1 / 2}$
(3) Other soils include:
a) liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils, and other soils susceptible to failure or collapse under seismic loading;
b) peat and/or highly organic clays greater than 3 m in thickness;
c) highly plastic clays $(\mathrm{PI}>75)$ more than 8 m thick, and
d) soft to medium stiff clays more than 30 m thick.

### 5.4 Liquefaction Assessment

A simplified liquefaction triggering analysis was undertaken utilizing the averaged Cyclic Stress Ration (CSR) adjusted to a 7.1 magnitude event (corresponding to the $84^{\text {th }}$ percentile magnitude earthquake event contributing to the seismic hazard for Vernon), and a PGA of 0.11 corresponding to the $1 / 2,475$ year event, corrected for the Site Class E in accordance with the BCBC (2018). Strength profiles form the CPT and SPT results were utilized in
the analysis, based on the method of Idriss \& Boulanger (2014). The strength of the soil profiles were adjusted to account for the fines content, based on field estimates and laboratory test results of the encountered subsurface materials.

The results of the liquefaction triggering analysis based on the SPT strength profile of $\mathrm{BH} 20-02$ indicates that the subsurface soils encountered within the depth investigated are unlikely to liquefy, with negligible liquefaction induced vertical settlement based on the NBCC (2015) seismic hazard values.

The results of the liquefaction triggering analyses based on the CPT strength profiles indicates that the subsurface soils encountered within the depth investigated are also unlikely to liquefy, with negligible liquefaction induced vertical settlement based on the NBCC (2015) seismic hazard values.

Summary plots of the simplified liquefaction triggering analysis are presented in Appendix E.

## 6. Expansive Soils

### 6.1 General

Many plastic clays can swell considerably with the addition of water (wetting), and then shrink with the loss of water (drying). Foundations constructed on such clays are subject to large uplift and lateral forces caused by the volumetric changes of the clay during wetting and drying cycles. Potentially expansive soils can typically be recognized in the laboratory by their plastic properties. Inorganic clay of high plasticity, with liquid limits (LL) exceeding $40 \%$ and plasticity index (PI) over $15 \%$ usually have inherent swelling capacity.

Classification systems for expansive soils are based on the problems they create in the construction of foundations (i.e. potential swell). Table 6.1 summarizes the most widely used expansive classification system (O'Neill and Poormoayed, 1980). A more recent classification system proposed by Savage (2007) is also show in Figure 6.1.

Table 6.1.a Expansive Soil Classification System ${ }^{1}$

| Liquid Limit (\%) | Plasticity Index (\%) | Potential Swell ${ }^{2}$ (\%) | Potential Swell Classification |
| :---: | :---: | :---: | :---: |
| $<50$ | $<25$ | $<0.5$ | Low |
| $50-60$ | $25-35$ | $0.5-1.5$ | Marginal |
| $>60$ | $>35$ | $>1.5$ | High |

${ }^{1}$ Compiled from O'Neill and Poormoayed (1980)
${ }^{2}$ Potential Swell: Vertical swell under a pressure equal to overburden pressure
The depth of soil horizon which is subject to periodic changes of moisture content is usually referred to as the 'active zone'. The active zone depth varies depending on the location of the site, and it can be estimated by plotting the liquidity index against the depth of the soil profile over several seasons.

Consolidation settlement is another important concept which occurs over time in saturated soft inorganic clayey soils, or organic soils or non-engineered fine-grained fills subjected to an increased load such as that caused by construction of the foundation. The time rate and magnitude of consolidation settlement depends on several factors including the stiffness and stress history of the soil (i.e., normally consolidated or over-consolidated), drainage conditions and thickness of the clay layer (Bowles, 1988).

The stiffness of clays can be estimated using in-situ strength tests such as shear vane and penetration test (i.e., LDCP). The stress history of clays is more difficult to determine and generally requires more sophisticated laboratory testing (i.e., consolidation and triaxial testing).

### 6.2 Swelling Potential of Encountered Clay

Based on the laboratory test results presented in Table 6.1 and the above-mentioned classification system used for expansive soils, the native upper clay soils at the project site have a marginal to high potential for swell based on O'Neil and Poormoayed (1980), and medium to very high swelling potential based on Savage (2007). Discussion and recommendations related to construction in soils with swelling potential are discussed in Section 9.0.

## 7. Site Groundwater and Surficial Runoff Plan

During Ecora's geotechnical investigations, an existing wetland was noted within the northern section of the "Building A" footprint. Wetlands represent a sensitive ecosystem that can play a significant role in controlling the groundwater table at the subject property and the surrounding area. The extent of the groundwater interaction with a wetland is dependant upon soil, vegetation, the topography of the site and the hydraulic gradient between the wetland and the groundwater system. Ecora recommends that a permanent dewatering/groundwater management plan is prepared by a registered professional hydrogeologist during the preliminary design phase to address the water within the wetland area.

The groundwater management plan should outline where the proposed surficial water flows will be directed and contained, in compliance with the City of Vernon Bylaws and the 2018 BCBC.

## 8. Existing Site Utilities

Prior to Ecora conducting the geotechnical site investigations, a BC One Call was performed to locate all the utilities on site. It was noted that following utilities were within the building footprints:

## Building A

- City of Vernon Sanitary Lines and Nodes;
- City of Vernon Storm Lines Nodes;
- Underground Fibre;
- Underground Copper;
- Underground Trench; and,
- Direct Buried Copper.


## Building B

- BC Hydro - U/G Primary;
- Underground Trench;
- Direct Buried Copper; and,
- Underground Copper.

Ecora has taken the information provided in the BC One Call and overlayed the existing utilities with the site plan as shown in Figure 8.0. The utility companies should be consulted during the preliminary design phase to avoid any unexpected delays or incurred costs to the client.

## 9. Building Design Recommendations

### 9.1 General

The following presents a summary of our findings and analyses:

- The encountered subsurface conditions across the majority of the site at the location of the proposed buildings comprised "Very Soft to Compact" Clay/Silt from surface extending to a maximum depth of 6.2 mbgl ; which in turn was underlain by "Dense to Very Dense" Sands.
- The clays encountered from the surface to 4.6 mbgl ranged in swelling potential from marginal to high potential for swell based on O'Neil and Poormoayed (1980), and medium to very high swelling potential based on Savage (2007).
- At the time of the investigations, groundwater seepage was encountered during the drilling at inferred depths ranging between 1.0 and 3.0 mbgl . Measured groundwater levels were taken at CPT20-02 and CPT20-04 on August 19, 2020 which ranged between 1.05 mbgl and 1.40 mbgl . Based on the inferred and measured groundwater levels and depending on the time of year that construction occurs, seepage may be encountered during excavation of the proposed underground basement parkades and utility installations.
- Based on the encountered subsurface conditions and the low seismic hazard values for the site, the soils encountered in the boreholes are not considered to be susceptible to liquefaction.
- A seismic site classification of Class E is considered appropriate for the structural design of the proposed structures.
- Shallow foundations systems are not considered appropriate for the proposed buildings, unless ground improvement techniques are utilized as discussed below.

Based on our understanding of the project and the results of our geotechnical assessment, form a geotechnical perspective, the site is situated for the proposed development provided the following site improvement recommendations are followed during the design and construction phases of the project.

Due to the limited bearing capacity and the interbedded organic layers within the lacustrine deposits in the upper 4.1 m and 6.1 m for "Building A" and "Building B", respectively, the subsequent sections discuss the geotechnical issues involved with construction of the development and present recommendations for ground improvement and foundation options.

### 9.2 Ground Improvement Option 1 - Preload/Surcharge

### 9.2.1 General

Following the removal any trees, vegetation, and topsoil, Ecora recommends the site be preloaded by placing a fill surcharge of a minimum of 1.3 times the net long term building loads, extending 3 m laterally beyond the building(s) footprint at full height. The design of the preload mass may require incorporating lock block reinforced earth retaining walls in areas of tight constraint and/or in close proximity to other buildings on the property.

If possible the area of the preload should extend to the areas of proposed fill placement along the exterior of the proposed building so that no settlements are induced in exterior streetscaping elements such as stairs and pavements that could be associated with the building.

The preload material should be 75 mm minus lightly to moderately compacted fill with a dry unit weight after compaction greater than $18 \mathrm{kN} / \mathrm{m}^{3}$.

Settlement gauges or a horizontal inclinometer casing should be placed on existing grade over the proposed building footprint prior to placing preload fill and surveyed to monitor the preload performance. We recommend that 4 to 6 shallow gauges be installed per building to assess the settlement across the entire proposed building footprint. Gauges should then be read weekly during site filling, preload placement, and for the first month following completion of filling, and then once every two weeks for the following month. The settlement should then be monitored monthly until the geotechnical engineer of record instructs otherwise. During site filing, the readings should include fill elevation adjacent to the gauge. After each set of readings is completed, they should be sent to the Geotechnical Engineer of Record for review.

After placement of preload, a BC Land Surveyor should survey the lateral extent and elevation of the as-placed preload and provide the survey to the Geotechnical Engineer of Record for review. It is anticipated that the preload mass will need to be in place approximately 1 year to achieve $90 \%$ or greater of the ultimate consolidation. Table 9.2.a provides a list of pros and cons of preloading the subject site.

If preloading is the selected ground improvement option, then a deep foundation will be required as discussed in Section 9.5 and 9.6.

Table 9.2.a Summary of Pros \& Cons of Preload and Surcharge

## Pros

Cons

- Can be incorporated with site grading plans, as cuts and fills will be required within each building footprint
- Post-construction settlement is reduced to relatively small values, in particular for foundations over heterogeneous soils.
- The preload material may be re-used as general backfill of a site after the completed preloading.
- The preloading technique is a "quiet", free of vibrations or noise usually accompanying other techniques of ground improvement.
- Typically a more environmentally sensitive ground improvement technique
- Limits the potential for differential settlement across each building delays that may be economically unacceptable, however, vertical drains may be used to decrease the settlement time
- Supply and disposal of the fill material used for preloading may represent a costly item, unless it can be reused on the site
- Future extensions of the proposed structure need to be considered in the preloading program, which may impose an undesirable initial investment for the foundations of the future structures
- The cost of preloading is dependant on locating a material source that is a short distance from the site.
- The induced settlement will cause interface issues with existing utilities
- A hydrogeological/hydrology study will be required prior to hauling the preload mass to site. The study will determine where the water will be displaced once the site grading is completed.


### 9.2.2 Interface Issues

A large preload mass will not only induce settlements in the soils under the preload but also those adjacent to it and could cause deformation to adjacent structures, roadways and underground utilities. It is recommended that during detailed design the effect of the preload mass on adjacent properties and infrastructure is assessed. It is envisioned that this would comprise of a more advance 2 or 3 dimensional settlement analysis, e.g. finite element.

### 9.2.3 Sourcing of Preload Material

The ability to readily source a suitable preload material could have a significant effect on the cost of undertaking these works, as costs are typically governed by truck haulage. At the time that this report was being prepared, Ecora was unaware of a significant preload mass that is a short distance from the subject site.

### 9.3 Ground Improvement Option 2 - Soil Mixing

### 9.3.1 General

Lime or cement can be mixed into the upper 4.1 m of the fine grained soil by means of special equipment, which will produce a columns of treated soil. The soil-lime/soil-cement column will be capable of supporting point loads much greater than those that the untreated soil can support. When soillime/soil-cement columns are placed in a grid pattern over an area, they will have the combined beneficial effect of both increasing shear strength (bearing capacity) and reducing settlement, particularly the differential settlement. Soil-Lime/Soil Cement columns have been used to support spread footings and have also been used in combination with piled foundations for buildings where the piles support the structure and the columns support the ground floor as well as the immediate area outside the building.

Soil stabilization occurs when unslaked lime/cement is mixed to a moist reactive soil to generate long term strength gain through the following four reactions:

- Hydration reduces the water content and raises the temperature of the soil which in the process increases the shear strength of the soil. Hydration typically starts immediately and finishes within a relatively short period of time;
- Ion Exchange also starts immediately and finishes in a relatively short period of time which results in the formation of water stable aggregates which have low compressibility and high permeability compared to the original soil;
- Cementation (Pozzolanic Reaction) is comparatively slow compared to hydration and ion exchange. The resulting cementation of the soil particles results in a considerable increase in the shear strength and reduction of the compressibility of the soils; and,
- Carbonation is a result of a chemical reaction between the soil-lime/soil-cement and the air and results in a reduction in the soil strength. When the mixing of the lime takes place below the groundwater table, the influence is minimized.

The amount of lime necessary to achieve a maximum improvement of strength and compressibility is about $3 \%$ to $6 \%$ of dry lime per dry weight of the soil. The lime/cement has to be mixed thoroughly with the soil and quickly, or the reaction will be incomplete resulting in areas of the subgrade not being stabilized. Table 9.3.a indicates the pros and cons for lime soil stabilization.

Table 9.3.a Summary of Pros \& Cons of Soil Mixing

## Pros <br> Cons

- The drying of wet soil and the increase in soil workability are attributed to the immediate treatment of the soil; whereas the increase in the strength, durability and compressibility of the soil are associated with the long term treatment
- Subsurface soil plasticity reduction
- Deleterious chemical reactions comprising lime carbonation and sulfate salt reactions in the existing soils. Both reactions can cause soil distress, disintegration, and heaving resulting in soil strength loss
- Organic lens found during the geotechnical investigations may increase rates of decomposition inorganic soils

| Pros | Cons |
| :---: | :---: |
| - Reduction in moisture-holding capacity (drying) <br> - Decreased swell potential and volume change <br> - Improved soil stability and durability <br> - Ability to construct a solid working platform, would require less time than preloading and more timeline certainty | treated with lime, resulting in a decrease in pH values. Consequently, the organic materials may inhibit the pozzolanic reaction required to gain soil strength <br> - Environmental Impact Assessment may be required to use lime soil stabilization for a subject site of this size <br> - Studies have noted unclear behavior for the permeability of soil lime mixture when compared with the original soil structure |

It should be noted that if this design option is chosen, a lab program will be required to determine the exact percentage of lime/cement. Another alternative to soil mixing that is more environmentally friendly while providing similar ground improvement benefits are rammed aggregate piers; which would be used to stabilize the subsurface stratigraphy for shallow footings.

### 9.4 Ground Improvement Option 3 - Sub-Excavation and Replace

### 9.4.1 General

In some situations where the expansive soils are relatively shallow such as the site conditions within the subject property, it may be possible to excavate and replace the expansive soils with structural fill. As indicated in the historical reports provided by Saath, two areas were previously sub-excavated during the initial development of the subject property in 1997 removing peat and clay which was replaced with drain rock as shown in Figure 9.4. The Ecora field representative noted that these areas had become low points for water to pond, which has expanded the wetland area near "Building A" and has provided a suitable growing environment for coniferous trees and low lying shrubs within the "Building B" footprint. It is Ecora's opinion that the previously placed structural fill will need to be sub excavated, as the previously designed drainage beneath the foundations is not working as intended saturating the surrounding soils; which could potentially affect the bearing capacity.

If the Sub-Excavation and Replace option is chosen, shallow foundations will be utilized to support the structure with details to be provided in the detailed design. Table 9.4.a indicates the pros and cons for sub-excavation and replace.

Table 9.4.a Summary of Pros \& Cons of Sub-Excavation and Replace

| Pros | Cons |
| :---: | :---: |
| - Removes all unsuitable material such as soft clay and organics, which would allow for shallow foundations <br> - Mitigates the swelling potential of the high plastic clays <br> - Contractors readily available to perform this work | - Costs can vary significantly depending on the size of the excavation to remove all the unsuitable material <br> - Large amounts of structural fill may be required depending on the depth of the underground parkade <br> - Fees associated with trucking unsuitable material off site to a permanent location can greatly increase the cost |

### 9.4.2 Stripping with Sub-Excavation and Replace

The site preparation for the proposed building footprint areas shall comprise removal of vegetation, topsoil, fill material, organics, the lacustrine deposits and other deleterious material to expose native compact sand and gravel. Based on the soil conditions encountered in the boreholes and the existing and proposed site grading, we anticipate that stripping and sub-excavation depths required to remove the surficial native organic material and lacustrine
deposits to expose the native glaciofluvial deposits will range between 4.3 and 6.1 mbgl for "Building A" and "Building B", respectively. It should be noted that greater excavation depths may be required in localized areas depending on the dewatering process for "Building A" and the cut fill plan for both buildings, however, the amount of fill may be significantly less depending on the design depth of the underground parking structure.

### 9.4.3 Subgrade Preparation with Sub-Excavation and Replace

The stripped subgrade shall be moisture conditioned as required, compacted, and reviewed and approved by the Geotechnical Engineer prior to either of the ground improvement options being implemented, placement of fill or concrete form placement. The review of the subgrade shall include a "proof-roll" by completing several passes with approved heavy construction equipment. Any soft areas or areas showing poor performance (i.e. pumping, cracking, deflection etc.) should be sub-excavated and replaced with suitable structural fill. Structural fill is to be placed as per Section 10.3.

### 9.5 Deep Foundation Option 1 - Helical Screw Piles

### 9.5.1 General

Helical piles, sometimes referred as screw piles, are steel screw-in piling and ground anchoring system typically used in underpinning and shoring applications. Helical piles are manufactured using varying sizes of tubular or square hollow sections for the pile shaft with helical steel plates welded to the pile shaft. The geotechnical capacity of helical piles is generated through end bearing (i.e., with helices) and shaft skin friction. Table 9.5.a provides a brief summary of the pros and cons associated with helical piles.

Table 9.5.a Summary of Pros \& Cons of Helical Piles

| Pros | Cons |
| :--- | :--- | :--- |
| - $\quad$End bearing in addition to skin friction increase can be <br> utilized using different combination of helices $\&$ grout <br> column diameter | -The lineal cost of helical piles usually exceeds that of a <br> conventional piling system, especially driven piles |
| -Soil heaving can be mitigated, and less detrimental in <br> comparison to a shallow foundation | "imiteral capacity due to their high slenderness ratio |
| - Local contractor's availability to undertake works |  |

The number of helices, their diameter and position on the pile shaft as well as the plate thickness are designed based on the ground conditions and required design loads. A grout column above the leads section, where the helices welded to the pile shaft, can also be formed to increase the compression capacity due to mobilization of skin friction at the grout-ground interface.

### 9.5.2 Design in Compression

Table 9.5.b provides performance test summaries reported in the Bulletin 01-0202 from CHANCE, Hubbell Power Systems Inc. in 2002. The table presents general soil types supporting upper shaft, helical pile description including number of helices, helix diameter, grouted shaft length and diameter, overall pile length, effective torque values as well as the compression data with the maximum load applied during testing.

The information presented in Table 9.5.b should only be used as a guidance for the preliminary design purposes. Ecora recommends at least one verification test pile per building to assess the total pile capacity which comprise end bearing in addition to skin friction at the grout to ground interface.

Table 9.5.b Performance Test Summaries for Helical Piles (Bulletin 01-2002, CHANCE)

| Helical Pile Type / Soil Description Supporting Upper Shaft | Location | Helical Pile Description |  | Overal Length (ft) | Effective <br> Torque <br> (ft-Ib) | Compression Data Ultimate Load (kips (kN)) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Helix <br> Diameter <br> (in) | Grouted Shaft Diameter/ Length (in / ft) |  |  |  |
| SS175 Anchor Series (13/4" <br> Square Shaft, 10,000 ft-lb Torque Rating) |  |  |  |  |  |  |
| Sand | Clearwater, FL | 8/10/12 | 5 / 33 | 43 | 7100 | 166 (738) |
| Sand, silty | Olympia, WA | 10/12/14 | 7 / 35 | 35 | <4000 | 180 (800) |
| Sand, well graded | Lewes, DE | 10/12/14 | 7 / 56 | 66 | 10,000 | 144 (640) |
| SS200 Anchor Series (2" Square Shaft, 15,000 ft-lb Torque Rating) |  |  |  |  |  |  |
| Sand and Silt | Toronto, ON | 8/10/12 | $6 / 18$ | 25 | 15,000 | 108 (480) |
| Sand, Fill | Cambridge, MA | 10/12/14 | $6 / 5$ | 16 | 12,500 | 156 (693) |
| SS225 Anchor Series (2 $1 / 4^{\prime \prime}$ <br> Square Shaft, 20,000 ft-lb Torque Rating) |  |  |  |  |  |  |
| Fill, Silty Glacial Till | Mississauga, ON | 10/12/14 \& 14 | 6 / 28 | 31 | 20,000 | $410(1,823)$ |

### 9.5.3 Frost Heave Prevention

The Canadian climate results in freezing of the near-surface ground for several months each winter almost including the City of Vernon. The depth of season frost for Vernon is typically regarded as 0.9 mbgl (as discussed in Section 9.7) for a heated structure, depending on soil conditions and snow cover. Ground freezing frequently results in volumetric expansion of the soil which causes heaving of structures located above or adjacent to the freezing soil. Ecora acknowledges that the existing plan is to have an underground parking structure for each building, however, if there is no basement structure Ecora recommends installing a bond breaker from the ground surface to 2.0 mbgl . A bond breaker will prevent the volumetric expansion of the fine grained soils from providing uplift forces on the pile by preventing frozen soils from directly gripping the pile which would deliver frost jacking forces.

### 9.5.4 Potential Pile Installation Issues due to Cobbles and Boulders

Although no cobbles or boulders were noted during either investigation, the Ecora Geotechnical engineers noted large cobbles and boulder to the west of the proposed "Building B". If cobbles and/or boulders are encountered during pile installation the leading edge of the helix may fold causing a reduction in the rate of penetration, the installation torque, and the capacity of the pile. Various manufactures can provide thicker and higher strength helices for ground conditions containing oversized granular material. If the subsurface conditions vary during pile installation than those encountered during the geotechnical site investigations, as a field expedient the leading edge may be straightened mechanically or the folded up portion of the helix can be removed with an abrasive saw. If a torch is to be used, the cut should be kept at least $1 / 2^{\prime \prime}$ away from the helix to shaft weld.

### 9.6 Deep Foundation Option 2 - Timber Piles

### 9.6.1 General

Timber piles is an economical alternative to helical piles, where in addition to load bearing, densification of the surrounding soil can be achieved by soil displacement during pile installation and ground induced vibration during pile driving. Timber piles are typically best suited for use as friction piles in sands, silts and clays and are not recommended for driving through dense gravel or till, or for end bearing piles to rock since they are vulnerable to damage both at the head and the toe in hard driving. Timber piles are commonly used for depths ranging between 6 m to 15 m , with diameters ranging between 200 mm to 400 mm , which corresponds to the natural dimension of available tree trunks. Typical design loads of a timber piles vary between 100 kN to 500 kN .

Where untreated wood piles are exposed to soil or air above the permanent water, and, in particular, when they are subjected to intermittent submergence, they are vulnerable to decay. In such an environment such as the those found at the subject site, only treated piles should be used for permanent structures to resist decay. Table 9.6.aprovides a brief summary of the pros and cons associated with timber piles.

Table 9.6.a Summary of Pros \& Cons of Timber Piles

$$
\begin{aligned}
& \text { Pros } \\
& \text { - The cost per funning length of a timber pile is relatively } \\
& \text { low compared to a helical pile } \\
& \text { - Timber being a resilient material, are suitable for } \\
& \text { impact absorption during pile driving } \\
& \text { - Timber piles are typically easy to install } \\
& \text { - Due to the anticipated bearing stratum being } \\
& \text { approximately } 4.6 \text { mbgl, timber piles of that length } \\
& \text { should be readily available } \\
& \text { If necessary, timber piles are easy to uninstall if a pile } \\
& \text { is broken during driving }
\end{aligned}
$$

## Cons

Based on preliminary pile capacity calculations based on the LCPC method (Bustamante and Gianeselli, 1982) utilizing the CPT data, an allowable pile capacity of 200 kN could likely be achieved using a 0.3 m diameter Douglas Fir type timber pile to an embedment depth of 6 mbgl (See Figure 9.6)

Projects in the southern interior that have utilized this foundation type include the Sopa Square Tower and the Skye Tower in Kelowna, BC.

### 9.7 Frost Considerations

### 9.7.1 General

Frozen soils can produce heaving soils and uplift forces upon the piled foundations due to propensity of the soil to grow ice lenses and heave during freeze and thaw cycles. The magnitude of the frost action is related to the soils exposure to freezing temperatures, types of soil, and depth to the groundwater table.

The actual depth of the frost penetration depends on numerous factors such as soil type, water content, depth of groundwater table, extent of snow removal, heat loss from heated structures, minimum temperatures reached during winter, and duration the subgrade soils are frozen.

### 9.7.2 Frost Penetration

Frost susceptibility of soils refers to the propensity of the soil to grow ice lenses and heaving during freezing. Based on the US Corps of Engineers Frost Design Soil Classification the Frost Group of the surficial soils encountered in the upper 4.6 meters are F3, which classifies the soils as high in degree of frost susceptibility.

According to https://climateatlas.ca/map/canada/fdd baselinem the City of Vernon's Freezing Index is approximately 383.3 degree days below $0^{\circ} \mathrm{C}$. The frost penetration depth for the subject site is therefor estimated (from normal freezing index) to be at 0.9 m below the existing ground surface. Therefore, all utilities and shallow footings (potentially for structures on perimeter of buildings such as stairwells and deck footings) should be placed at least 0.9 m below final site grades to conform to the minimum frost protection requirement.

Where the underside of footings or utilities cannot be designed at the minimum depth ( 0.9 m below site grades) thermal insulation shall be incorporated in accordance with eh recommendations of "Design and Construction of Frost-Protected Shallow Foundations", ASCE 32-01 (published by American Society of Civil Engineers) into the foundation design

### 9.8 Slab and Flooring Systems

### 9.8.1 Slab On-Grade Floors

If any of the ground improvement techniques are selected for this project, then interior slab on grade can be utilized. Interior slabs on grade should be supported on a minimum 100 mm thick layer of under-slab fill consisting of 19 mm minus crushed gravel, overlying approved structural fill prepared in accordance with the recommendations in this report. The under-slab fill should be compacted to a minimum 95\% Modified Proctor Maximum Dry Density (MPMDD).

Slab On-Grade Floors should be designed in accordance with Section 9.13 of the 2018 BCBC with regards to damp proofing, waterproofing and soil gas control. All recommendations for site preparation provided in Section 10.0 .

### 9.8.2 Pile and Grade-Beam System

If none of the ground improvement techniques are selected, then a Pile and Grade-Beam System will be required due to the potential settlement and/or heave of the subsurface soils beneath the slab. A grade beam system typically supports the loads between piles where the structural floor slab system is tied into the grade beam. However, a floating slab resting on the grade beams can also prove to be a satisfactory system.

Good engineering design practices include giving consideration to the following issues:

- The piles need to be extended well below the depth of seasonable movement and have sufficient depth to resist uplift resulting from the expansion of the soil,
- The piles need to be reinforced to resist the potential uplift forces associated with the expansion of the soil in the upper portion of the soil profile;
- Consideration may be given to the possibility of using a material along the upper portion of the pile that reduces the adhesion of the soil to the pile in the swelling portion of the profile;
- The grade beams need to be tied into the grade beams;
- If pile and grade beam system is implemented with ground improvement techniques, a flexible utility conduit and structure interface will be required to prevent damage to underground utilities if settlement were to occur;
- A space must be left below grade beams (i.e., between the locations of the piles) in order to accommodate potential upward swelling of the soil below the grade beam. The amount of space that must be left below the grade beam varies depending upon the soil conditions but will commonly be int eh order of 150 mm or more; and,
- Positive surface drainage should be provided away from the structure by carefully selecting the slab surface and the outside grade elevations.


### 9.9 Calculation of Lateral Earth Pressures on Basement Walls

### 9.9.1 Static Earth Pressure

It is Ecora's understanding that each building has a proposed underground parkade, however, at the time of the preparation of this report the exact details of the underground parkade were unknown. Earth pressure design parameters for permanent basement walls shall be calculated using the parameters provided in Table 9.9.a for the basement walls in flat ground.

Table 9.9.a Earth Pressure Design Parameters for Basement Walls - Flat Ground

| Material | $\gamma\left(\mathrm{kN} / \mathbf{m}^{3}\right)$ | $\left.\phi^{\prime}{ }^{\circ}{ }^{\circ}\right)$ | $\mathbf{K}_{\mathbf{a}}$ | $\mathbf{K}_{\mathbf{p}}$ | $\mathbf{K}_{\mathbf{0}}$ | $\boldsymbol{v}$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Compacted Granular Structural Fill | 21 | 36 | 0.26 | 3.9 | 0.41 | 0.3 |
| Very Loose to Compact Clay (Lacustrine Deposits) | 17 | 26 | 0.39 | 2.6 | 0.56 | 0.4 |
| Dense to Very Dense Sand (Glaciofluvial Deposits) | 21 | 38 | 0.24 | 4.2 | 0.38 | 0.3 |

1. Calculated based on Equation $3-5$ presented in the US Army Corps of Engineers (1989) retaining wall design manual.

For the design of rigid (non-yielding) permanent walls constructed in place, "at-rest" earth pressure (Ko) conditions should be used in calculating lateral earth pressures.

The lateral earth pressure acting on any point on the wall shall be determined with the use of Equation 1 below.

$$
\begin{equation*}
\sigma_{h}=z \times \gamma \times K_{o} \tag{Equation1}
\end{equation*}
$$

Where:

- $\quad$ z = depth below final ground surface;
- $\quad \gamma=$ unit weight; and,
- $\quad \mathrm{K}_{\mathrm{o}}=$ at-rest earth pressure coefficient.


### 9.9.2 Hydrostatic Pressure

In determining the total lateral forces acting on any wall, the contribution from hydrostatic pressures must also be considered during detailed design, as the groundwater level is anticipated to be in close proximity to the proposed parkade foundations. It should be noted that the groundwater elevations recorded (Section 4.2) do not account for seasonal fluctuations and higher groundwater tables should be expected.

### 9.9.3 Compaction Pressures

In assessing the total lateral pressures acting on the permanent basement walls to be formed using temporary cut slopes backfilled with compacted granular structural fill, an allowance for the effects of compactive equipment working behind the basement walls during the placement of backfill material using the method of Ingold (1979), as discussed in Clayton (1993), is recommended, as presented on the attached Figure 9.9.3.

### 9.9.4 Seismic Pressures

In the calculation of seismic lateral earth pressures for the basement walls in flat ground, the dynamic thrust can be assessed with the use of the earth pressure parameters provided in Table 9.9.a and Table 9.9.b based on Equation 2 using the Mononobe and Matsuo (1929) and Okabe (1926).

Table 9.9.b Seismic Earth Pressure Design Parameters for Basement Walls - Flat Ground

| Material | $\mathbf{\Delta} \mathbf{P}_{\text {ae }}(\mathbf{k N / m})$ |
| :--- | :---: |
| Compacted granular structural fill | $0.36 \mathrm{H}^{2}$ |

$$
\Delta P_{a e}=\frac{1}{2} \gamma H^{2} \Delta K_{a e} \quad \text { (Equation 2) }
$$

Where:

- $\quad \gamma=$ unit weight;
- $\mathrm{H}=$ retained height; and,
- $\Delta \mathrm{K}_{\mathrm{ae}}=$ increase in the active earth pressure coefficient as a result of the design earthquake.


### 9.9.5 Surcharge Loading

A minimum surcharge loading of 12 kPa should be incorporated in the design of the rigid permanent basement walls to account for light vehicle traffic and/or parking close to the foundation walls.

## 10. Recommendations for Site Preparation

### 10.1 Stripping with Ground Improvement Options 1 \& 2

The site preparation for the proposed building footprint areas shall comprise removal of vegetation, topsoil, fill material, organics, and other deleterious material to expose native compact lacustrine deposits. Based on the soil conditions encountered in the boreholes and the existing and proposed site grading, we anticipate that stripping and sub-excavation depths required to remove the surficial native organic material and expose the native clays and silt subgrade will be minimal. Greater excavation depths may be required in localized areas depending on the dewatering process for "Building A" and the cut fill plan for both buildings.

### 10.2 Subgrade Preparation with Ground Improvement Option 1 \& 2

The stripped subgrade shall be moisture conditioned as required, compacted, and reviewed and approved by the Geotechnical Engineer prior to either of the ground improvement options being implemented, placement of fill or
concrete form placement. The review of the subgrade shall include a "proof-roll" by completing several passes with approved heavy construction equipment. Any soft areas or areas showing poor performance (i.e. pumping, cracking, deflection etc.) should be sub-excavated and replaced with suitable structural fill. Structural fill is to be placed as per Section 10.3.

### 10.3 Structural Fill

Structural fill in this report refers to permanent fill that will be located below foundations, slabs, and other settlementsensitive features. Imported structural fill shall comprise clean (free-draining), well-graded granular material such as 75 mm minus pit run sand and gravel or an approved alternative. A Geotechnical Engineer should be provided with the opportunity to review and approve alternative materials prior to their use at the site.

The structural fill material shall be moisture conditioned to within $2 \%$ of the optimum moisture content, placed in horizontal lifts typically not exceeding 150 mm in loose thickness and uniformly compacted to a minimum $95 \%$ of the material's Modified Proctor Maximum Dry Density (MPMDD) in accordance with ASTM D1557. In-place soil density testing on all structural fill shall be completed to confirm that adequate compaction is achieved.

Structural fill below foundations should extend horizontally beyond the foundations a distance at least equal to the thickness of fill below foundations.

### 10.4 Re-use of On-Site Material

Based on the high fines content of the encountered native material, it is our opinion that the native soils encountered within the boreholes are unsuitable for re-use as structural fill however, may be used as utility trench backfill provided that it is free of organics, any deleterious material and that the specified $95 \%$ MPMDD compaction can be achieved.

The drain rock on that was placed as the replacement material during the sub-excavation is also unsuitable for structural fill and utility trench backfill as it will provide an unwanted drainage path for groundwater flow.

Excavated material which is intended to be re-used at the site shall be stockpiled in a suitable area away from the earthworks and excavations. Excavated material which is unsuitable for re-use as fill shall be removed from site.

### 10.5 Temporary Excavation and Utility Trenching

Temporary excavation work should be carried out in accordance with requirements specified by the WorkSafe BC Occupational Health \& Safety Regulations, Part 20 presented in Figure 10.5. Soil sloughing, development of tension cracks atop the excavation, groundwater seepage or loose/soft soil conditions encountered during excavation may require flatter excavation slopes than those specified in the WorkSafe BC Occupational Health \& Safety Regulations, Part 20. A qualified Professional Geotechnical Engineer shall review all proposed temporary excavation works during construction, when required by WorkSafe BC.

Excavated material from trenches should either be removed from the site or placed a minimum distance away from the excavation, equal to the depth of the excavation. Where buildings or other structures are near the excavation, additional review of the proposed excavation work should be undertaken by a qualified Professional Geotechnical Engineer.

All utilities should be bedded as per the City of Vernon development bylaws. General trench backfill above the bedding should be placed in loose lifts not exceeding 300 mm thickness, and each lift should be compacted to a minimum of $95 \%$ of MPMDD.

### 10.6 Drainage Considerations

### 10.6.1 Construction Dewatering

At the time of the investigation, groundwater was measured within the groundwater monitoring wells at depths ranging between 1.0 m bgl and 1.4 mbgl . Based on the measured groundwater levels and depending on the time of year of construction, dewatering may be required during excavation of the proposed underground basement parkades, particularly for "Building A". Allowances should be made for dewatering as necessary during earthworks.

Construction dewatering can generally be performed by pumping the water from inside and/or outside of the excavation. The following temporary construction methods may be required for this project:

- An external dewatering system that consists of the installation of perimeter dewatering wells surrounding the excavation; and/or,
- A system of ditches leading to sumps equipped with pumps.

Typically, the design and operation of the dewatering system would be the responsibility of the construction Contractor, with review and approvals from the Geotechnical Engineer.

Bearing surfaces in the encountered on-site soils may be susceptible to disturbance, particularly as a result of anticipated shallow groundwater. In this regard, avoiding disturbance of the bearing surface is important.

It should be noted that the groundwater level inside the excavation should be kept at a minimum 1.0 m below the base of the excavation for allowing a clean and dry subgrade. In addition, even where an external dewatering system is implemented, there may be potential of slight water seeping into the excavation. Where seepage is encountered an internal dewatering system (pumping water from inside of the excavation) should also be anticipated. The internal dewatering system may be comprised of collection trenches/pits and sump pits with appropriate filtering.

Temporary dewatering will lower the surrounding groundwater table and may result in some additional deformation of the surrounding soils. The specific requirements of any temporary dewatering systems will need to be assessed during detailed design.

### 10.6.2 Permanent Waterproofing

With regards to waterproofing, the Water-Resisting Basement Construction Guide (CIRIA, 1995) recommends for deep basements with permanent hydrostatic pressures, a reinforced concrete structure including piled or in-situ perimeter walls plus internal vapour barrier protection (tanking) to mitigate water penetration.

Based on the proposed development and site constraints, the basement is likely to comprise a reinforced concrete monolithic box using low permeability concrete. Careful attention to detailing and crack control is required and changes in section should be avoided to prevent water leakage.

Tanking systems comprise either sheet (bonded or unbonded) membranes, hydrophilic membranes, cementitious renders, or liquid-applied membranes (not appropriate for internal tanking). Bonded membranes are generally selected for ease of application and reliability.

Tanking can be installed either on the exterior face of walls and floors (external), onto some external source of support (reversed), within the construction (sandwiched), or on the interior face of walls (internal) as shown on Figure 10.6. External or sandwich tanking systems are generally recommended for new basements where site and design conditions permit, however external tanking systems generally require at least 600 mm of working room (Figure 10.6) and sandwiched tanking systems generally apply to masonry structures.

The reliability of tanking systems is primarily dependent on:

- The formation of adequate joints where sheet systems are used;
- The prevention of damage to the membrane during construction; and,
- Achieving a satisfactory bond to the substrate.

A tanked structure is generally required to be monolithic with minimal movement (particularly transverse) between joints and the tanking system must be continuous from the lowest part of the structure to at least 150 mm above the finished ground level. Integral protection must not be damaged by wall fittings and care must be taken during construction to avoid damage to membranes. For internal tanking systems, consideration must be given to preventing the separation of the membrane from the substrate due to hydrostatic pressures which can be mitigated by providing a mechanical anchorage or sandwiching between structural and non-structural wall elements.

### 10.6.3 Storm Water Management and Site Storm Disposal

Sidewalks, paved or landscaped areas within a zone of approximately 2 m of the exterior perimeter of any buildings should be sloped to drain water away form the structure at a minimum gradient of $2 \%$. Site grading should be designed in such a manner so as to prevent the ponding of surface water near foundation s walls and paved areas. Roof rainwater leaders should be connected to a drainage system comprised of non-perforated rigid PVC drain pipes.

As indicated in Figure 8.0, several City of Vernon Stormwater Mains extends through the property. It is recommended that roof leader and surficial runoff drainage is connected to the nearest City of Vernon Water main system if site grading allows. An on-site stormwater disposal system (i.e. infiltration pits) is not considered to be as effective due to the low permeability of the encountered soils and the high water table. Should the City of Vernon stormwater system not have sufficient capacity to dispose of peak stormwater generated form the site, it may be necessary to tank the stormwater and slow release it into the City system.

Drainage considerations established during design and construction should be maintained for the life of the development. Altering drainage patterns can be detrimental to the performance of the building's floor slab and foundation.

## 11. Closure

We trust this report meets your requirements. Please contact the author of this report if you have any questions or comments concerning this report.

## References

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## Figures

Figure 1.3 Site Plan
Figure 6.1 Swelling Potential of Plastic Soils
Figure 8.0 Existing Site Utility Plan
Figure 9.4 Existing Ground Improvement Areas (1997)
Figure $9.6 \quad$ Timber Pile Capacity Estimate
Figure 9.9.3 Lateral Earth Pressure Distribution due to Compaction
Figure 10.5 Worksafe BC Temporary Excavation Sloping Requirements
Figure 10.6 Tanking Protection

$\mathrm{Pg}\left(1=\mathrm{K}_{\mathrm{R}} \mathrm{R}^{-2,13}\right)\left(6,25 \mathrm{PgR}^{-2,13}-0,73 \mathrm{~K}\right)-\mathrm{K}=0$


## Notes:

Graph taken from Savage, P.F. (2007). "Evaluation of Possible Swelling Potential of Soils"

Legend:
Based on laboratory test results

## Preliminary Geotechnical Assessment Proposed 2 Building Apartment Complex Project $160743^{\text {rd }}$ Ave., Vernon BC

Swelling Potential of Plastic Soils

```
Project No. 201457
Client: Saath Development Group Ltd.
Office: Kelowna
Scale: NTS
                                    Date: 2020-09-15
                                    DWN:
                            DB CHK: MJL



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\section*{Notes:}

CPet-IT v2.0.2.5. GeoLogismiki, 2007.

\section*{Preliminary Geotechnical Assessment Proposed 2 Building Apartment Complex Project \(160743^{\text {rd }}\) Ave., Vernon BC}

Timber Pile Capacity Estimate Using LCPC Method

\section*{Project No. 201457 \\ Client: \\ Office: \\ Scale: \\ Date: \\ DWN: \\ Saath Development Group Ltd. \\ Kelowna \\ NTS \\ 2020-09-22 \\ DB CHK: \\ MJL}


Notes:
\(\mathrm{H}_{\mathrm{r}}=\) Height Retained
\(p=\) Roller Load per unit length (assume \(20 \mathrm{kN} / \mathrm{m}\) )
\(\sigma^{\prime}{ }_{v}=\mathrm{Hx} \gamma\)
\(K_{p}=3.0\)
\(\gamma=21 \mathrm{kN} / \mathrm{m}^{3}\)

Preliminary Geotechnical Assessment Proposed
2 Building Apartment Complex Project \(160743^{\text {rd }}\) Ave., Vernon BC

\section*{Lateral Earth Pressure Distribution Due to Compaction}

Project No. 201457

Client: Saath Development Group Ltd.

Office: Kelowna

NTS

2020-09-22

DB CHK: DB

Figure 9.8.3


Figure 11.17 Dimensionless thrust factor for various geometries and soil Poisson's ratio values. After Wood (1973).


Figure 11.18 Dimensionless moment factor for various geometries and soil Poisson's ratio values. After Wood (1973).

\section*{Notes:}

Figures 11.117 \& 11.18 from Kramer (1996)
\(\mathrm{H}=\) Height Retained
\(\mathrm{L}=\) Distance between walls
V-0.3

\section*{Preliminary Geotechnical Assessment Proposed 2 Building Apartment Complex Project \(160743^{\text {rd }}\) Ave., Vernon BC \\ Dimensionless Factors for Calculation of Seismic Lateral Earth Pressures}
\begin{tabular}{ll} 
Project No. & 201457 \\
Client: & Saath Development Group Ltd. \\
Office: & Kelowna \\
Scale: & NTS \\
Date: & \(2020-09-15\) \\
DWN: & DB CHK: MJL
\end{tabular}

Project No. 201457
Client: Saath Development Group Ltd.
Office: Kelowna
Scale: NTS
Date: 2020-09-15
DB CHK: MJL
Figure 9.8.4
APC Meeting - November 28, 2023

Sloping


Requirements for Case 2 Slopes
\begin{tabular}{|l|l|l|}
\hline \multicolumn{2}{|c|}{ Height of Line AB } & \multirow{2}{*}{ Maximum Slope of Line BC (in hard } \\
and solid soil)
\end{tabular}

\section*{Notes:}

Work Safe BC (2008), Occupational Health and Safety Regulation Part 20 Construction, Excavation and Demolition.

Preliminary Geotechnical Assessment Proposed
2 Building Apartment Complex Project \(160743^{\text {rd }}\) Ave., Vernon BC
WorkSafe BC Temporary Excavation Sloping Requirements
\begin{tabular}{ll} 
Project No. & 201457 \\
Client: & Saath Development Group Ltd. \\
Office: & Kelowna \\
Scale: & NTS \\
Date: & \(2020-09-22\) \\
DWN: & DB CHK: DB
\end{tabular}


\section*{Appendix A}

\section*{General Conditions}

\section*{Standard of Care}

Ecora Engineering and Resource Group Ltd. (Ecora) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

\section*{Basis and Use of the Report}

This report and the recommendations contained in it are intended for the sole use of Ecora's Client. Ecora does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Ecora's Client unless otherwise authorized in writing by Ecora. Any unauthorized use of the report is at the sole risk of the user. In order to properly understand the suggestions, recommendations and opinions expressed herein, reference must be made to the whole of the report. We cannot be responsible for use by any party of portions of the report without reference to the whole report.

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Where Ecora submits both electronic file and hard copy versions of reports, drawings and other project-related documents, only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Ecora shall be deemed to be the original for the Project. Both electronic file and hard copy versions of Ecora's deliverables shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Ecora.

\section*{Soil, Rock and Groundwater Conditions}

Classification and identification of soils, rocks and geological units have been based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Ecora does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities such as traffic, excavation, groundwater level lowering, pile driving, blasting on the site or on adjacent sites. Excavation may expose the soils to climatic elements such as freeze/thaw and wet/dry cycles and/or mechanical disturbance which can cause severe deterioration. Unless otherwise indicated the soil must be protected from these changes during construction.

\section*{Environmental and Regulatory Issues}

The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

\section*{Sample Disposal}

Ecora will dispose all soil and rock samples for 30 days following issue of this report. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

\section*{Construction Services}

During construction, Ecora should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Ecora's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Ecora's report. Adequate field review, observation and testing during construction are necessary for Ecora to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Ecora's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

\section*{Job Site Safety}

Ecora is responsible only for the activities of our employees on the jobsite. The presence of Ecora's personnel on the site shall not be construed in any way to relieve the Client or any contractors on site from their responsibilities for site safety. The Client acknowledges that he, his representatives, contractors or others retain control of the site and that Ecora never occupy a position of control of the site. The Client undertakes to inform Ecora of all hazardous conditions, or other relevant conditions of which the Client is aware. The Client also recognizes that our activities may uncover previously unknown hazardous conditions or materials and that such a discovery may result in the necessity to undertake emergency procedures to protect our employees as well as the public at large and the environment in general.

\section*{Changed Conditions and Drainage}

Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Ecora be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Ecora be employed to visit the site with sufficient frequency to detect if conditions have changed significantly. Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Ecora takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

\section*{Services of Sub consultants and Contractors}

The conduct of engineering and environmental studies frequently requires hiring the services of individuals and companies with special expertise and/or services which we do not provide. Ecora may arrange the hiring of these services as a convenience to our Clients. As these services are for the Client's benefit, the Client agrees to hold the Company harmless and to indemnify and defend Ecora from and against all claims arising through such hiring's to the extent that the Client would incur had he hired those services directly. This includes responsibility for payment for services rendered and pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. In particular, these conditions apply to the use of drilling, excavation and laboratory testing services.

\section*{Appendix B}

Water Well Logs

BRITISH
COLUMBIA Groundwater Wells and Aquifers

\section*{Well Summary}
\begin{tabular}{ll} 
Well Tag Number: 8326 & Well Status: New \\
Well Identification Plate Number: & Well Class: Unknown \\
Owner Name: PARKER'S READY MIX & Well Subclass: \\
Intended Water Use: Unknown Well Use & Aquifer Number: 349 \\
Licensing Information & \\
\hline Licensed Status: Unlicensed & \\
Location Information &
\end{tabular}
\begin{tabular}{l} 
Street Address: \\
Town/City: VERNON \\
Legal Description: \\
\hline Lot \\
\hline Plan \\
\hline District Lot \\
\hline Block \\
\hline Section \\
\hline Township \\
\hline Range \\
\hline Land District \\
\hline Property Identification Description \\
(PID)
\end{tabular}

Description of Well Location:


Geographic Coordinates - North American Datum of 1983 (NAD 83) Latitude: 50.278535 Longitude: -119.257455 UTh Easting: 339159 UTM Northing: 5572038 Zone: 11 Coordinate Arcquisition Code: \((100 \mathrm{~m}\) accuracy) Digitized from old Dept. of Lands, Forests and Water Resources maps

Well Activity
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Activity & \(\downarrow\) & Work Start Date & \(\downarrow\) & Work End Date & さ & Drilling Company & \(\downarrow\) & Date Entered & \(\downarrow\) \\
\hline Legacy record & & 1950-01-01 & & 1950-01-01 & & Unknown & & August 13th 2003 at 3:13 AM & \\
\hline
\end{tabular}

Well Work Dates
\begin{tabular}{|c|c|c|c|c|c|}
\hline \begin{tabular}{c} 
Start Date of \\
Construction
\end{tabular} & \begin{tabular}{c} 
End Date of \\
Construction
\end{tabular} & \begin{tabular}{c} 
Start Date of \\
Alteration
\end{tabular} & \begin{tabular}{c} 
End Date of \\
Alteration
\end{tabular} & \begin{tabular}{c} 
Start Date of \\
Decommission
\end{tabular} & \begin{tabular}{c} 
End Date of \\
Decommission
\end{tabular} \\
\hline \(1950-01-01\) & \(1950-01-01\) & & & \\
\hline
\end{tabular}

\section*{Well Completion Data}
\begin{tabular}{lll} 
Total Depth Drilled: & Static Water Level (BTOC): 7.00 feet & Well Cap: \\
Finished Well Depth: 14.00 feet & Estimated Well Yield: 0.000 USGPM & Well Disinfected Status: Not Disinfected \\
Final Casing Stick Up: & Artesian Flow: & Drilling Method: Excavating \\
Depth to Bedrock: & Artesian Pressure: & Orientation of Well: VERTICAL \\
Ground elevation: & Method of determining elevation: Unknown &
\end{tabular}

Lithology
\begin{tabular}{|l|l|l|l|l|l|l|l|l|}
\hline From (ft bgl) & To (ft bgl) & Raw Data & Description & Moisture & Colour & Hardness & Observations & Water Bearing Flow Estimate (USGPhi) \\
\hline 0.00 & 0.00 & NO LOG- PROB. ALL GRAVEL & & & & & & \\
\hline
\end{tabular}

\section*{Casing Details}
\begin{tabular}{|l|l|l|l|l|l|l|}
\hline From \((\mathrm{ft})\) & To (ft) & Casing Type & Casing Material & Diameter & Wall Thickness & Drive Shoe \\
\hline & & There are no records to show & \\
\hline
\end{tabular}

Surface Seal and Backfill Details
\begin{tabular}{ll} 
Surface Seal Material: & Backfill Material Above Surface Seal: \\
Surface Seal Installation Method: & Backfill Depth: \\
Surface Seal Thickness: & \\
Surface Seal Depth: &
\end{tabular}

Liner Details
\begin{tabular}{|c|c|c|c|}
\hline Liner Material: & & Liner p & \\
\hline Liner Diameter: & Liner Thickness: & From & To \\
\hline Liner from: & Liner to: & & \\
\hline & & & how \\
\hline
\end{tabular}

\section*{Screen Details}
\begin{tabular}{|c|c|c|c|c|c|}
\hline Intake Method: & \multicolumn{5}{|l|}{Installed Screens} \\
\hline Type: & From & To & Diameter & Assembly Type & Slot Size \\
\hline Material: & & & & & \\
\hline Opening: & \multicolumn{5}{|c|}{\multirow[t]{2}{*}{There are no records to show}} \\
\hline Bottom: & & & & & \\
\hline
\end{tabular}

Well Development
\begin{tabular}{|c|c|}
\hline Developed by: & Development Total Duration: \\
\hline \multicolumn{2}{|l|}{Well Yield} \\
\hline Estimation Method: & Estimation Rate: Estimation Duration: \\
\hline Static Water Level Before Test: & Drawdown: \\
\hline Hydrofracturing Performed: No & Increase in Yield Due to Hydrofracturing: \\
\hline \multicolumn{2}{|l|}{Well Decommission Information} \\
\hline Reason for Decommission: & Method of Decommission: \\
\hline Sealant Material: & Backfill Material: \\
\hline \multicolumn{2}{|l|}{Decommission Details:} \\
\hline \multicolumn{2}{|l|}{Comments} \\
\hline No comments submitted & \\
\hline Altemative Specs Submitted: No & \\
\hline
\end{tabular}

\section*{Documents}
- WTN 8326 Well Record.pdf

\section*{Disclaimer}

The information provided should not be used as a basis for making financial or any other commitments. The Government of British Columbia accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.

BRITISH
COLUMBIA Groundwater Wells and Aquifers

\section*{Well Summary}
Well Tag Number: 18663
Well Identification Plate Number:
Owner Name: JOHN ISKIU
Intended Water Use: Unknown Well Use
Well Status: New
Well ■lass: Unknown
Well Subclass:
Aquifer Number:

Observation Well Number:
Observation Well Status:
Environmental Monitoring System (EMS) ID:
Alternative specs submitted: No
Licensing Information
Licensed Status: Unlicensed

\section*{Licence Number:}

Location Information
\begin{tabular}{l} 
Street Address: \\
Town/City: VERNON \\
Legal Description: \\
\hline Lot \\
\hline Plan \\
\hline District Lot \\
\hline Block \\
\hline Section \\
\hline Township \\
\hline Range \\
\hline Land District \\
\hline Property Identification Description \\
(PID)
\end{tabular}

Description of Well Location:


Geographic Coordinates - North American Datum of 1983 (NAD 83) Latitude: \(50.270593 \quad\) Longitude: -119.245866 UTW Easting: 339958 UTM Northing: 5571130 Zone: 11

Coordinate Arcquisition Code: ( 100 m accuracy) Digitized from old Dept. of Lands, Forests and Water Resources maps

Well Activity
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Activity & § & Work Start Date & § & Work End Date & \(\downarrow\) & Drilling Company & \ & Date Entered & \(\downarrow\) \\
\hline Legacy record & & 1964-04-01 & & 1964-04-01 & & Okanagan Rotary Well Drilling & & August 13th 2003 at 3:12 AM & \\
\hline
\end{tabular}

Well Work Dates
\begin{tabular}{|c|c|c|c|c|c|}
\hline \begin{tabular}{c} 
Start Date of \\
Construction
\end{tabular} & \begin{tabular}{c} 
End Date of \\
Construction
\end{tabular} & \begin{tabular}{c} 
Start Date of \\
Alteration
\end{tabular} & \begin{tabular}{c} 
End Date of \\
Alteration
\end{tabular} & \begin{tabular}{c} 
Start Date of \\
Decommission
\end{tabular} & \begin{tabular}{c} 
End Date of \\
Decommission
\end{tabular} \\
\hline \(1964-04-01\) & \(1964-04-01\) & & & \\
\hline
\end{tabular}

\section*{Well Completion Data}
\begin{tabular}{lll} 
Total Depth Drilled: & Static Water Level (BTDC): 11.00 feet & Well Cap: \\
Finished Well Depth: 144.00 feet & Estimated Well Yield: 210.000 USGPM & Well Disinfected Status: Not Disinfected \\
Final Casing Stick Up: & Artesian Flow: & Drilling Miethod: Other \\
Depth to Bedrock: 116.00 feet & Artesian Pressure: & Orientation of Well:VERTICAL \\
Ground elevation: & Method of determining elevation: Unknown &
\end{tabular}

Lithology
\(\left.\begin{array}{|l|l|l|l|l|l|l|l|l|}\hline \begin{array}{l}\text { From (ft } \\ \text { bgl) }\end{array} & \begin{array}{l}\text { To (ft } \\ \text { bgl) }\end{array} & \text { Raw Data }\end{array}\right)\)

\section*{Casing Details}
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline From (ft) & To (ft) & Casing Type & Casing Material & Diameter & Wall Thickness & Drive Shoe \\
\hline \multicolumn{7}{|c|}{There are no records to show} \\
\hline
\end{tabular}

Surface Seal and Backfill Details
\begin{tabular}{ll} 
Surface Seal Material: & Backfill Material Aibove Surface Seal: \\
Surface Seal Installation Method: & Backfill Depth: \\
Surface Seal Thickness: & \\
Surface Seal Depth: &
\end{tabular}

Liner Details
\begin{tabular}{|c|c|c|c|}
\hline \multirow[t]{4}{*}{Liner Material: Liner Diameter: Liner from:} & \multicolumn{3}{|c|}{Liner perforations} \\
\hline & Liner Thickness: & From & To \\
\hline & Liner to: & & \\
\hline & & \multicolumn{2}{|r|}{There are no records to show} \\
\hline
\end{tabular}

\section*{Screen Details}
\begin{tabular}{|c|c|c|c|c|c|}
\hline Intake Method: & \multicolumn{5}{|l|}{Installed Screens} \\
\hline Type: & From & To & Diameter & Assembly Type & Slot Size \\
\hline Material: & \multicolumn{5}{|c|}{\multirow{3}{*}{There are no records to show}} \\
\hline Opening: & & & & & \\
\hline Bottom: & & & & & \\
\hline
\end{tabular}

Well Development
Developed by:
Development Total Duration:
Well Yield
Estimation Method:
Static Water Level Before Test:

\section*{Estimation Rate: \\ Estimation Duration:}

Static Water Level Before Test:
Drawdown:
Hydrofracturing Performed: No
Increase in Yield Due to Hydrofracturing:

Well Decommission Information
\begin{tabular}{ll} 
Reason for Decommission: & Method of Decommission: \\
Sealant Material: & Backfill Material: \\
Decommission Details: &
\end{tabular}

\section*{Comments}

METHOD OF DRILLING = DRILLED

\section*{Altemative Specs Submitted: No}

\section*{Documents}
- WTN 18663 Well Record.pdf

\section*{Disclaimer}

The information provided should not be used as a basis for making financial or any other commitments. The Government of British Columbia accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.

\section*{Appendix C}

\section*{Borehole Logs}

\section*{BOREHOLE: AH20-01}

Project: Vernon Springs Apartment Complex
Project No: 201457
Location: 1607 43rd Ave.
Client: Saath Development Corporation
ecora
Zone: 11
Northing: 5571672.215
Easting: 339446.5988
Elevation: 395.309 m


Zone: 11 Northing: 5571713.33896128 Easting: 339466.87283195 Elevation: 395.743 m


Zone: 11 Northing: 5571745.70236967 Easting: 339494.79209079玉levation: 398.426 m


Zone: 11 Northing: 5571701.25954084 Easting: 339395.19556608ほlevation: 392.867 m


Zone: 11 Northing: 5571705.59724087 Easting: 339437.21378044 Elevation: 395.001 m


Zone: 11 Northing: 5571746.72461889 Easting: 339436.95626565ஞlevation: 393.747 m


\section*{BOREHOLE: BH20-01}

Zone: 11 Northing: 5571713.18333516 Easting: 339460.84146534ほlevation:


Zone: 11 Northing: 5571713.18333516 Easting: 339460.84146534§levation:



Zone: 11 Northing: 5571723.82878101 Easting: 339431.21180712飞手levation:


Zone: 11 Northing: 5571723.82878101 Easting: 339431.21180712飞 ºvation: \(^{2}\)


\section*{BOREHOLE: BH20-03}

Zone: 11 Northing: 5571717.80051977 Easting: 339394.18749450Elevation:


Zone: 11 Northing: 5571717.80051977 Easting: 339394.18749450Elevation:


Zone: 11 Northing: 5571715.04628418 Easting: 339394.04172196Elevation:


Zone: 11 Northing: 5571715.04628418 Easting: 339394.04172196Elevation:





\section*{ECORA}

\section*{U2 PORE PRESSURE DISSIPATION VERNON SPRINGS CPT20-03 4.26 METER DEPTH JULY 27, 2020}




\section*{ECORA}

\section*{U2 PORE PRESSURE DISSIPATION VERNON SPRINGS \\ CPT20-04 6.06 METER DEPTH \\ JULY 27, 2020}






\section*{Appendix D}

Lab Testing

\section*{ATTERBERG LIMITS ASTM D423, D424}

Project: Geotechnical Assessment - Vernon Springs Apartment Location: 1607 43rd Avenue, Vernon, BC

Sample Location/Source: AH20-02 @ 11'-12'
LIQUID LIMIT
(ASTM Designation D 423)
\begin{tabular}{|l|c|c|c|}
\hline Trial Number & 1 & 2 & 3 \\
\hline Tare Number & L 1 & L 2 & L 3 \\
\hline Number of Blows & 18 & 35 & 23 \\
\hline Mass of Wet Soil and Tare \((\mathrm{g})\) & 40.22 & 40.48 & 38.68 \\
\hline Mass of Dry Soil and Tare \((\mathrm{g})\) & 30.67 & 30.98 & 29.8 \\
\hline Mass of Tare \((\mathrm{g})\) & 15.63 & 15.65 & 15.74 \\
\hline Mass of Moisture \((\mathrm{g})\) & 9.55 & 9.5 & 8.88 \\
\hline Mass of Dry Soil \((\mathrm{g})\) & 15.04 & 15.33 & 14.06 \\
\hline Moisture Content \((\%)\) & 63.5 & 62.0 & 63.2 \\
\hline
\end{tabular}
\begin{tabular}{rc}
\multicolumn{2}{c}{ Test Results } \\
Liquid Limit: & \(\mathbf{6 3}\) \\
Plastic Limit: & \(\mathbf{2 5}\) \\
Plasticity Index: & 38
\end{tabular}

Project No.: 201457
Client: Soath Development Corp.

PLASTIC LIMIT
(ASTM Designation D 424)
\begin{tabular}{|l|c|c|}
\hline Trial Number & 1 & 2 \\
\hline Tare Number & P1 & P2 \\
\hline & & \\
\hline Mass of Wet Soil and Tare \((\mathrm{g})\) & 24.54 & 23.77 \\
\hline Mass of Dry Soil and Tare \((\mathrm{g})\) & 22.72 & 22.15 \\
\hline Mass of Tare \((\mathrm{g})\) & 15.64 & 15.66 \\
\hline Mass of Moisture \((\mathrm{g})\) & 1.82 & 1.62 \\
\hline Mass of Dry Soil \((\mathrm{g})\) & 7.08 & 6.49 \\
\hline Moisture Content \((\%)\) & 25.7 & 25.0 \\
\hline
\end{tabular}

Plasticity Classification (based on Liquid Limit \(\mathbf{W}_{\mathrm{L}}\) )
\[
\begin{array}{cl}
0 \text { to } 30 & \text { Low Plasticity } \\
30 \text { to } 50 & \text { Medium Plasticity } \\
>50 & \text { High Plasticity }
\end{array}
\]

Sample Number: 20-400
Date Tested: 14-Aug-20
Tested by: KRB
Checked by: SK


\section*{ATTERBERG LIMITS ASTM D423, D424}

Project: Geotechnical Assessment - Vernon Springs Apartment Location: 1607 43rd Avenue, Vernon, BC

Sample Location/Source: AH20-03 @ 4'-5'
LIQUID LIMIT
(ASTM Designation D 423)
\begin{tabular}{|l|c|c|c|}
\hline Trial Number & 1 & 2 & 3 \\
\hline Tare Number & L 1 & L 2 & L 3 \\
\hline Number of Blows & 20 & 29 & 36 \\
\hline Mass of Wet Soil and Tare \((\mathrm{g})\) & 36.55 & 36.39 & 33.26 \\
\hline Mass of Dry Soil and Tare \((\mathrm{g})\) & 31.16 & 31.23 & 28.93 \\
\hline Mass of Tare \((\mathrm{g})\) & 16.11 & 15.9 & 15.75 \\
\hline Mass of Moisture \((\mathrm{g})\) & 5.39 & 5.16 & 4.33 \\
\hline Mass of Dry Soil \((\mathrm{g})\) & 15.05 & 15.33 & 13.18 \\
\hline Moisture Content \((\%)\) & 35.8 & 33.7 & 32.9 \\
\hline
\end{tabular}

Test Results
Liquid Limit: \(\quad 34\)
Plastic Limit: 17
Plasticity Index: 17

Project No.: 201457
Client: Soath Development Corp.

PLASTIC LIMIT
(ASTM Designation D 424)
\begin{tabular}{|l|c|c|}
\hline Trial Number & 1 & 2 \\
\hline Tare Number & P1 & P2 \\
\hline & & \\
\hline Mass of Wet Soil and Tare \((\mathrm{g})\) & 24.21 & 24.81 \\
\hline Mass of Dry Soil and Tare \((\mathrm{g})\) & 23.02 & 23.5 \\
\hline Mass of Tare \((\mathrm{g})\) & 15.63 & 16.07 \\
\hline Mass of Moisture \((\mathrm{g})\) & 1.19 & 1.31 \\
\hline Mass of Dry Soil \((\mathrm{g})\) & 7.39 & 7.43 \\
\hline Moisture Content \((\%)\) & 16.1 & 17.6 \\
\hline
\end{tabular}

Plasticity Classification (based on Liquid Limit \(\mathbf{W}_{\mathrm{L}}\) )
\(\begin{array}{cl}0 \text { to } 30 & \text { Low Plasticity } \\ 30 \text { to } 50 & \text { Medium Plasticity } \\ >50 & \text { High Plasticity }\end{array}\)

Sample Number: 20-401
Date Tested: 14-Aug-20
Tested by: KRB
Checked by: SK


\section*{ATTERBERG LIMITS ASTM D423, D424}

Project: Geotechnical Assessment - Vernon Springs Apartment Location: 1607 43rd Avenue, Vernon, BC

Sample Location/Source: AH20-04 @ 12'-13'
LIQUID LIMIT
(ASTM Designation D 423)
\begin{tabular}{|l|c|c|c|}
\hline Trial Number & 1 & 2 & 3 \\
\hline Tare Number & L 1 & L 2 & L 3 \\
\hline Number of Blows & 13 & 23 & 38 \\
\hline Mass of Wet Soil and Tare \((\mathrm{g})\) & 42.17 & 43.83 & 33.79 \\
\hline Mass of Dry Soil and Tare \((\mathrm{g})\) & 33.04 & 34.27 & 27.8 \\
\hline Mass of Tare \((\mathrm{g})\) & 15.89 & 15.92 & 15.85 \\
\hline Mass of Moisture \((\mathrm{g})\) & 9.13 & 9.56 & 5.99 \\
\hline Mass of Dry Soil \((\mathrm{g})\) & 17.15 & 18.35 & 11.95 \\
\hline Moisture Content \((\%)\) & 53.2 & 52.1 & 50.1 \\
\hline
\end{tabular}

Test Results
Liquid Limit: 51
Plastic Limit: 25
Plasticity Index: 26

Project No.: 201457
Client: Soath Development Corp.

PLASTIC LIMIT
(ASTM Designation D 424)
\begin{tabular}{|l|c|c|}
\hline Trial Number & 1 & 2 \\
\hline Tare Number & P1 & P2 \\
\hline & & \\
\hline Mass of Wet Soil and Tare \((\mathrm{g})\) & 26.18 & 28.53 \\
\hline Mass of Dry Soil and Tare \((\mathrm{g})\) & 24.16 & 25.95 \\
\hline Mass of Tare \((\mathrm{g})\) & 16.00 & 15.82 \\
\hline Mass of Moisture \((\mathrm{g})\) & 2.02 & 2.58 \\
\hline Mass of Dry Soil \((\mathrm{g})\) & 8.16 & 10.13 \\
\hline Moisture Content \((\%)\) & 24.8 & 25.5 \\
\hline
\end{tabular}

Plasticity Classification (based on Liquid Limit \(\mathbf{W}_{\mathrm{L}}\) )
\(\begin{array}{cl}0 \text { to } 30 & \text { Low Plasticity } \\ 30 \text { to } 50 & \text { Medium Plasticity } \\ >50 & \text { High Plasticity }\end{array}\)

Sample Number: 20-402
Date Tested: 14-Aug-20
Tested by: KRB
Checked by: SK


\section*{ATTERBERG LIMITS ASTM D423, D424}

Project: Geotechnical Assessment - Vernon Springs Apartment Location: 1607 43rd Avenue, Vernon, BC
Sample Location/Source: CPT20-05 @ 5'-6'
LIQUID LIMIT
(ASTM Designation D 423)
\begin{tabular}{|l|c|c|c|}
\hline Trial Number & 1 & 2 & 3 \\
\hline Tare Number & L 1 & L 2 & L 3 \\
\hline Number of Blows & 15 & 24 & 36 \\
\hline Mass of Wet Soil and Tare \((\mathrm{g})\) & 46.54 & 43.92 & 42.67 \\
\hline Mass of Dry Soil and Tare \((\mathrm{g})\) & 35.59 & 34.18 & 33.54 \\
\hline Mass of Tare \((\mathrm{g})\) & 15.63 & 15.92 & 15.74 \\
\hline Mass of Moisture \((\mathrm{g})\) & 10.95 & 9.74 & 9.13 \\
\hline Mass of Dry Soil \((\mathrm{g})\) & 19.96 & 18.26 & 17.8 \\
\hline Moisture Content \((\%)\) & 54.9 & 53.3 & 51.3 \\
\hline
\end{tabular}

Test Results
Liquid Limit: 53
Plastic Limit: 27
Plasticity Index: 26

Project No.: 201457
Client: Soath Development Corp.

PLASTIC LIMIT
(ASTM Designation D 424)
\begin{tabular}{|l|c|c|}
\hline Trial Number & 1 & 2 \\
\hline Tare Number & P1 & P2 \\
\hline & & \\
\hline Mass of Wet Soil and Tare \((\mathrm{g})\) & 23.23 & 24.18 \\
\hline Mass of Dry Soil and Tare \((\mathrm{g})\) & 21.62 & 22.44 \\
\hline Mass of Tare \((\mathrm{g})\) & 15.75 & 15.83 \\
\hline Mass of Moisture (g) & 1.61 & 1.74 \\
\hline Mass of Dry Soil (g) & 5.87 & 6.61 \\
\hline Moisture Content (\%) & 27.4 & 26.3 \\
\hline
\end{tabular}

Plasticity Classification (based on Liquid Limit \(\mathbf{W}_{\mathrm{L}}\) )
0 to 30 Low Plasticity
30 to 50 Medium Plasticity
\(>50\) High Plasticity

Sample Number: 20-403
Date Tested: 14-Aug-20
Tested by: KRB
Checked by: SK


Project: Vernon Springs Apartment Complex Location: 1607 43rd Ave.
Sample Location/Source: BH20-02

Project No: 201457
Client: Saath Development Corporation
Depth: 6.1 m to 6.71 m

\begin{tabular}{|c|c|c|c|c|c|c|}
\hline \multirow{2}{*}{ COBBLES } & \multicolumn{2}{|c|}{ GRAVEL } & \multicolumn{3}{c|}{ SAND } & \multirow{2}{*}{\(* *\)} \\
\cline { 2 - 6 } & coarse & fine & coarse & medium & fine & \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \(\mathrm{D}_{100}\) & \(\mathrm{D}_{85}\) & \(\mathrm{D}_{60}\) & \(\mathrm{D}_{30}\) & \(\mathrm{D}_{15}\) & \(\mathrm{D}_{10}\) & \(\mathrm{C}_{\mathrm{c}}\) & \(\mathrm{C}_{\mathrm{u}}\) & \%Gravel & \%Sand & \%Silt & \%Clay \\
\hline 25 & 6.76 & 0.409 & 0.178 & 0.077 & 0.031 & 2.48 & 13.10 & 17.8 & 67.6 & \(\mathbf{9 . 0}\) & 5.6 \\
\hline
\end{tabular}

Description: SAND, some gravel, trace silt, trace clay
Natural Moisture Content: 17.2 \%
Material Specification: N/A
Intended Use: N/A
Comments:

Sample Number: 20-431
Date Tested: 2020-08-21
Tested By: KRB

Checked By: \(\qquad\)

Project: Vernon Springs Apartment Complex Location: 1607 43rd Ave.
Sample Location/Source: BH20-02

Project No: 201457
Client: Saath Development Corporation
Depth: 9.15 m to 9.76 m

\begin{tabular}{|c|c|c|c|c|c|c|}
\hline \multirow{2}{*}{ COBBLES } & \multicolumn{2}{|c|}{ GRAVEL } & \multicolumn{3}{c|}{ SAND } & \multirow{2}{*}{ SILT OR CLAY } \\
\cline { 2 - 5 } & coarse & fine & coarse & medium & fine & \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \(\mathrm{D}_{100}\) & \(\mathrm{D}_{85}\) & \(\mathrm{D}_{60}\) & \(\mathrm{D}_{30}\) & \(\mathrm{D}_{15}\) & \(\mathrm{D}_{10}\) & \(\mathrm{C}_{\mathrm{c}}\) & \(\mathrm{C}_{\mathrm{u}}\) & \%Gravel & \%Sand & \%Silt & \%Clay \\
\hline 25 & 1.05 & 0.479 & 0.258 & 0.163 & \(\mathbf{0 . 1 1 6}\) & \(\mathbf{1 . 2 0}\) & \(\mathbf{4 . 1 3}\) & 5.2 & \(\mathbf{8 8 . 7}\) & \(\mathbf{6 . 1}\) \\
\hline
\end{tabular}

Description: SAND, trace fines, trace gravel
Natural Moisture Content: 19.1 \%
Material Specification: N/A
Intended Use: N/A
Comments:

Sample Number: 20-432
Date Tested: 2020-08-21
Tested By: KRB

Checked By: \(\qquad\)

\section*{Appendix E}

\section*{Liquefaction Assessment}

SPT BASED LIQUEFACTION ANALYSIS REPORT
Project title : Vernon Springs Apartments
SPT Name: BH20-02

\section*{Location : Vernon, BC}
:: Input parameters and analysis properties ::
\begin{tabular}{llll} 
Analysis method: & Boulanger \& Idriss, 2014 & G.W.T. (in-situ): & 2.70 m \\
Fines correction method: & Boulanger \& Idriss, 2014 & G.W.T. (earthq.): & 2.70 m \\
Sampling method: & Standard Sampler & Earthquake magnitude M \({ }_{\text {w }}:\) & 7.10 \\
Borehole diameter: & 65 mm to 115 mm & Peak ground acceleration: & 0.11 g \\
Rod length: & 1.00 m & Eq. external load: & 0.00 kPa \\
Hammer energy ratio: & 1.00 & &
\end{tabular}


CRR 7.50 clean sand curve

F.S. color scheme
\(\square\) Almost certain it will liquefy
\(\square\) Very likely to liquefy
\(\square\) Liquefaction and no liq. are equally likely Unlike to liquefy
Almost certain it will not liquefy

\section*{LPI color scheme}
\(\square\) Very high risk
\(\square\) High risk
\(\square\) Low risk

\section*{LIQUEFACTION ANALYSIS REPORT}

Project title : Vernon Springs Apartment Building CPT file : CPT20-02

\section*{Input parameters and analysis data}




Zone \(A_{1}\) : Cyclic liquefaction likely depending on size and duration of cyclic loading Zone \(A_{2}\) : Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

\section*{LIQUEFACTION ANALYSIS REPORT}

Project title : Vernon Springs Apartment Building CPT file : CPT20-03
Input parameters and analysis data



Zone \(A_{1}\) : Cyclic liquefaction likely depending on size and duration of cyclic loading Zone \(A_{2}\) : Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

\section*{Ecora Engineering \& Resouce Group Ltd.}

\section*{LIQUEFACTION ANALYSIS REPORT}

Project title : Vernon Springs Apartment Building
CPT file: CPT20-04
Input parameters and analysis data
\begin{tabular}{ll} 
Analysis method: & B\&I (2014) \\
Fines correction method: & B\&I (2014) \\
Points to test: & Based on Ic value \\
Earthquake magnitude \(M_{w}:\) & 7.10 \\
Peak ground acceleration: & 0.11
\end{tabular}
\begin{tabular}{ll} 
G.W.T. (in-situ): & 1.00 m \\
G.W.T. (earthq.): & 1.80 m \\
Average results interval: & 3 \\
Ic cut-off value: & 2.60
\end{tabular}

Unit weight calculation: Based on SBT

Location : Vernon, BC

Use fill: Fill height: Fill weight: Trans. dete
\(\mathrm{K}_{\sigma}\) applied:

Clay like behavior applied: Limit depth applied: No Limit depth: MSF method:

Sands only N/A Method

\(M_{w}=7^{1 / 2}\), sigma' \(=1\) atm base curve


SBTn Plot


Ic (Robertson 1

CRR plot


FS Plot



Zone \(\mathrm{A}_{1}\) : Cyclic liquefaction likely depending on size and duration of cyclic loading Zone \(A_{2}\) : Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

\section*{Ecora Engineering \& Resouce Group Ltd.}

\section*{LIQUEFACTION ANALYSIS REPORT}

Project title : Vernon Springs Apartment Building CPT file : CPT20-05

\section*{Input parameters and analysis data}




Zone \(A_{1}\) : Cyclic liquefaction likely depending on size and duration of cyclic loading Zone \(A_{2}\) : Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

THE CORPORATION OF THE CITY OF VERNON REPORT TO COUNCIL

\author{
SUBMITTED BY: Barbara Everdene, Long Range \\ Planner \\ Michelle Austin, Planner \\ Matt Faucher, Planner
}

COUNCIL MEETING: REG \(\boxtimes\) COW \(\square\) I/C \(\square\)
COUNCIL MEETING DATE: December 11, 2023
REPORT DATE: November 22, 2023
FILE: 6450 (Projects/Secondary Suites)

\section*{SUBJECT: SECONDARY SUITE AND ACCESSORY DWELLING BYLAW AMENDMENTS}

\section*{PURPOSE:}

To propose amendments to Zoning Bylaw 5000 with updated regulations for secondary suites and accessory dwellings to streamline and encourage the development of this form of rental housing in the City.

\section*{RECOMMENDATION:}

THAT Council endorse amendments to Zoning Bylaw 5000 to update regulations for secondary suites and accessory dwelling units as outlined in the report titled "Secondary Suite and Accessory Dwelling Bylaw Amendments" dated November 22, 2023 and respectfully submitted by the Long Range Planner and Planners;

AND FURTHER, that Council give first and second reading and schedule a public hearing for Bylaw 5978 to amend Zoning Bylaw 5000.

\section*{ALTERNATIVES \& IMPLICATIONS:}
1. THAT Council receive, for information, the report titled "Secondary Suite and Accessory Dwelling Bylaw Amendments" dated November 22, 2023 and respectfully submitted by the Long Range Planner and Planners.

Note: If Council endorses this alternative, the secondary suite regulations of Zoning Bylaw 5000 would remain unchanged. This would mean that Section 1.2 of the Housing Action Plan to reduce barriers and incentivize the construction of new secondary suites and secondary dwellings would not be fulfilled.

\section*{ANALYSIS:}

\section*{A. Committee Recommendations:}

At its meeting of November 28, 2023, the Advisory Planning Committee passed the following resolution:
THAT the Advisory Planning Committee recommends that Council...

\section*{B. Rationale:}
1. Over the past decade, the City of Vernon has periodically reviewed the regulation of secondary suites in accordance with the following policy objectives, which inform the recommendations in this report:
a. Increase the supply of housing units to support community's need for rental housing
b. Encourage compact community development and low impact densification
c. Promote diverse, mixed income neighborhoods
d. Maintain peaceful and functional residential neighborhoods
2. As part of its Homes for People Action Plan, the Province has announced a new Secondary Suite Incentive Program to stimulate the development of secondary suites as rental housing units, to be administered by BC Housing as of April 2024. Over the past month, the Province has introduced new, draft housing legislation, namely the Housing Statutes (Residential Development) Amendment Act (Bill 44) and the Housing Statutes (Transit-Oriented Areas) Amendment Act (Bill 47) that will require comprehensive review by Administration. These provincial actions underline the importance of updating Zoning Bylaw 5000 to reduce barriers to the development of secondary suites and accessory dwelling units, and suggests that a further update may also be required once new legislation is in force.
3. To encourage compact community development and low impact densification, the enclosed bylaw amendments propose that for each single detached housing unit, one secondary suite and one accessory dwelling shall be permitted. Currently, no more than one additional dwelling unit (whether a secondary suite or accessory dwelling) is permitted per single detached housing unit. Administration recommends maintaining the regulation that for each semi-detached housing unit, only one secondary suite shall be permitted. These proposed changes are to reduce restrictions and enable the development of more habitable space to meet the urgent need for housing while maintaining standards of liveability on individual sites within residential neighbourhoods.
4. On September 6, 2022, Council approved, in principle, the preparation of draft amendments to Zoning Bylaw 5000 to make secondary suite regulations less restrictive in terms of maximum floor space, height, location on the lot, and on-site parking requirements to enable designers and builders to be more creative and responsive to specific site conditions and bring a more diverse mix of housing options to the market. Currently, the term "secondary suites" includes suites enclosed within single detached homes and semi-detached homes, as well as within detached secondary buildings. Administration proposes that the City align with provincial terminology and now refer to suites within detached secondary buildings as "accessory dwellings".
5. Draft amendments to Zoning Bylaw 5000 are enclosed as Attachment 1. Major proposed changes are briefly summarized in the two sections that follow.

\section*{Proposed Amendments to Secondary Suites}
6. Maximum Size. The proposed change aims to maximize the amount of habitable space in a secondary suite in proportion to the size of the primary dwelling.
\begin{tabular}{|l|l|}
\hline Current & Proposed \\
\hline \begin{tabular}{l} 
The net floor area of the suite shall not exceed the \\
lesser of \(90 \mathrm{~m}^{2}\) or \(45 \%\) of the entire net floor area.
\end{tabular} & \begin{tabular}{l} 
The gross floor area of the suite shall not \\
exceed \(49 \%\) of the entire gross floor area.
\end{tabular} \\
\hline
\end{tabular}
7. Parking. There are no substantive changes to the parking schedule for secondary suites in single detached or semi-detached dwellings.

\section*{Proposed Amendments to Accessory Dwellings}
8. Maximum Size. Traditionally, regulations for accessory dwellings have directed that they be substantially smaller in massing to the primary dwelling. Proposed changes would allow accessory dwellings to be larger than the current standard, while remaining in proportion to the primary dwelling, and allow for more flexible siting on a lot provided that required setbacks are met.
\begin{tabular}{|l|l|}
\hline Current & Proposed \\
\hline \begin{tabular}{l} 
The net floor area must be the lesser of \(80-90 \mathrm{~m}^{2}\) \\
or 60-70\% of the net floor area of the primary \\
dwelling, depending on lot size. The net floor area \\
calculation includes garages and basements.
\end{tabular} & \begin{tabular}{l} 
The net floor area of any accessory dwelling \\
shall not exceed \(100 \mathrm{~m}^{2}\). The net floor area \\
calculation excludes garages and basements. \\
\hline \begin{tabular}{l} 
Lot coverage of secondary buildings shall not \\
exceed \(14 \%\) or a maximum area of \(90 \mathrm{~m}^{2}\).
\end{tabular} \\
\begin{tabular}{l} 
Lot coverage of secondary buildings shall not \\
exceed \(14 \%\) or a maximum footprint of \(100 \mathrm{~m}^{2}\).
\end{tabular} \\
\hline
\end{tabular} l
\end{tabular}
9. Height. Traditionally, regulations for accessory dwellings have directed that they be subordinate in height to the primary dwelling. Proposed changes would allow accessory dwellings to be a maximum of 7 metres, but do not restrict them from being higher than a principal dwelling less than 7.0 metres high.
\begin{tabular}{|l|l|}
\hline Current & Proposed \\
\hline \begin{tabular}{l} 
A maximum of 1.5 to 2 storeys depending on lot \\
size and presence of a lane or flanking street, \\
maximum 2 storeys (1 storey is approx. 3 metres)
\end{tabular} & \begin{tabular}{l} 
A secondary building containing an accessory \\
dwelling shall not exceed 7.0 metres in height. \\
\hline \begin{tabular}{l} 
No secondary building containing a secondary \\
suite shall have a height more than the principal \\
building, as measured from the building grade of \\
each respective building.
\end{tabular}
\end{tabular} Clause removed. \\
\hline
\end{tabular}
10. Lot Siting. Traditionally, regulations for accessory dwellings have directed that they be located behind the primary dwelling at the back of the lot. Proposed changes allow flexibility on the siting of accessory dwellings, provided that they meet setback requirements.
\begin{tabular}{|l|}
\hline Current \\
\hline \begin{tabular}{l} 
Secondary buildings are not permitted in a front \\
yard and are not permitted between the primary \\
building and the front yard.
\end{tabular} \\
\hline
\end{tabular}

\section*{Proposed}

This clause would no longer apply to secondary buildings that contain an accessory dwelling.
11. Parking Requirements. The proposed parking schedule follows the current formula of 1 space per dwelling unit. Administration proposes that if a single detached house includes a secondary suite and an accessory dwelling on the lot, there would be a requirement for 2 parking spaces per single detached dwelling unit, 1 additional space per secondary suite and 1 additional space per accessory dwelling.

\section*{Zones that Permit Secondary Suites and Accessory Dwellings}
12. Table 1 summarizes all zones that permit secondary suites (" \(৩\) ") and accessory dwelling units ("ADUs") in the enclosed bylaw amendments. Note both single-detached and semi-detached housing may have a secondary suite, but only single-detached housing may have an accessory dwelling unit on the lot.

Table 1: Zones that Permit Secondary Suites and Accessory Dwelling Units
\begin{tabular}{|l|l|c|c|c|c|c|}
\hline Zone & Zone Name & Single-Detached & \(\bullet\) & ADU & Semi-Detached & \(\bullet\) \\
\hline A2 & Rural Large Holdings & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & N/A & N/A \\
\hline A3 & Rural Small Holdings & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & N/A & N/A \\
\hline RR & Rural Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & N/A & N/A \\
\hline R1 & Estate Lot Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & N/A & N/A \\
\hline
\end{tabular}
\begin{tabular}{|l|l|c|c|c|c|c|}
\hline R2 & Large Lot Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & N/A & N/A \\
\hline R3 & Medium Lot Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & N/A & N/A \\
\hline R4 & Small Lot Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline R5 & Four-plex Housing Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline R5A & Semi-Detached Residential & N/A & N/A & N/A & \(\checkmark\) & \(\checkmark\) \\
\hline R6 & Lakeshore Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline RTR & Resort Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline RM1 & Row Housing Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline RM2 & Multiple Housing Residential & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline HR1 & \begin{tabular}{l} 
Hillside Residential Single and \\
Two Family
\end{tabular} & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline HR2 & Hillside Residential Multi-Family & N/A & N/A & N/A & \(\checkmark\) & \(\checkmark\) \\
\hline RST1 & \begin{tabular}{l} 
Residential Single and Two \\
Family
\end{tabular} & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline RST2 & \begin{tabular}{l} 
Residential Single and Two \\
Family
\end{tabular} & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline RTCA & \begin{tabular}{l} 
Resort Commercial and \\
Residential
\end{tabular} & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline C10A & \begin{tabular}{l} 
Tourist Commercial and \\
Residential
\end{tabular} & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline
\end{tabular}

Legend: \(\bullet=\) suite; ADU = accessory dwelling unit \(\checkmark=\) permitted use

\section*{C. Attachments:}

Attachment 1 - Zoning Bylaw 5000 Text Amendments

\section*{D. Council's Strategic Plan Alignment:}
\(\square\) Governance \& Organizational Excellence
® Livability
Recreation, Parks \& Natural Areas
\(\square\) Vibrancy
\(\square\) Environmental Leadership
\(\square\) Not Applicable

\section*{E. Relevant Policy/Bylaws/Resolutions:}
1. Official Community Plan Bylaw 5470
> Sec. 7.0 Residential
- Goals - Support the provision of rental units in strata developments, purpose built rental developments and the provision of secondary suites.
- Supporting Policies - Continue efforts to accommodate secondary suites.
2. Housing Action Plan
> Strategic Direction 1: Increase the Supply of Rental Housing
- Sec. 1.2 Reduce barriers and incentivize the construction of new secondary suites and secondary dwellings, including allowing suites in semi-detached dwellings
- Sec. 1.3 Consider requiring new construction to be secondary suite ready
3. Council Resolutions:

At its Regular Meeting of August 14, 2023, Council passed the following resolution:
THAT Council endorse amendments to Zoning Bylaw 5000 to allow secondary suites in all residential zones as a permitted use in both single detached and semi-detached dwellings as outlined in the report titled "Secondary Suites in Semi-Detached Dwellings Bylaw Amendments" dated August 2, 2023 and respectfully submitted by the Long Range Planner;

AND FURTHER, that Council give first and second reading and schedule a public hearing to Bylaw 5969 to amend the City of Vernon Zoning Bylaw 5000;

AND FURTHER, that Council support in principle the release of all restrictive covenants in the name of the City of Vernon prohibiting secondary suites in semi-detached housing.

At its Regular Meeting of June 12, 2023, Council passed the following resolution:
THAT Council direct Administration to draft amendments to Zoning Bylaw 5000 to allow secondary suites in all residential zones, including RTR, RTC, and RTCA zones, as a permitted use in both single detached and semi-detached dwellings as outlined in the report titled "Secondary Suite Inclusion in Semi-Detached Dwellings" dated June 1, 2023 and respectfully submitted by the Long Range Planner.

At its Regular Meeting of September 6, 2022, Council passed the following resolution:
THAT Council direct Administration to draft amendments to Zoning Bylaw 5000 to allow secondary suites as a permitted use in semi-detached dwellings as outlined in the report titled "Secondary Suite Review, Proposed Updates, and Inclusion in Semi-Detached Dwellings" dated August 23, 2022 and respectfully submitted by the Long Range Planner;

AND FURTHER, that Council direct Administration to initiate public consultation on whether secondary suites should be allowed in all zones allowing single family dwellings, including RTR, RTC, and RTC A zones;

AND FURTHER, that Council direct Administration to draft bylaw amendments that require all new secondary dwellings to be assessed for Development Cost Charges (DCCs) in response to Province of BC clarification that prohibits specific land use subsidies like DCC waivers for secondary dwellings;

AND FURTHER, that Council direct Administration to review Zoning Bylaw 5000 regulations pertaining to secondary dwellings and report back with recommendations on refining the regulations to encourage the development of more secondary dwellings in the long term rental housing supply.

\section*{BUDGET/RESOURCE IMPLICATIONS:}
\(\boxtimes\) None \(\quad \square\) Budget Previously Approved \(\quad \square \underset{\text { (Finance Review Required) }}{\text { New Budget Request }}\)
\begin{tabular}{l} 
Prepared by: \\
\hline \begin{tabular}{l} 
Barbara Everdene \\
Long Range Planner
\end{tabular} \\
X \\
\hline \begin{tabular}{l} 
Matt Faucher \\
Planner
\end{tabular} \\
\hline Xichelle Austin \\
Planner \\
\(\frac{X}{\text { Terry Barton, Director }}\)\begin{tabular}{l} 
Planning \& Community Services
\end{tabular}
\end{tabular}

Approved for submission to Council:

Patricia Bridal, CAO
Date: \(\qquad\)
X
Matt Faucher
Planner

X
Michelle Austin
Planner
\begin{tabular}{l} 
X \\
\hline Terry Barton, Director \\
Planning \& Community Services
\end{tabular}

REVIEWED WITH

Corporate Services
B Bylaw Compliance
Q Real Estate
RCMP
Fire \& Rescue Services
Human Resources
Financial Services

Operations
\(\square\) Public Works/AirportFacilitiesUtilitiesRecreation ServicesParks

Current Planning
\(\boxtimes\) Long Range Planning \& Sustainability
® Building \& Licensing
\(\boxtimes\) Engineering Development Services
Infrastructure Management
- Transportation
\(\boxtimes\) Economic Development \& Tourism
\(\boxtimes\) COMMITTEE: APC (Nov. 28/23)
OTHER:

G:16400-6999 PLANNING AND DEVELOPMENT\6450 COMMUNITY PLANNING - ZONING BYLAW REVIEWIPROJECTSISecondary Suites 2023\231122_be_mf_ma_APC RPT_Secondary Suite \& ADU Amendments.docx

\section*{Table of Contents}

\section*{Section 5: Specific Use Regulations}
5.5 Secondary Suites \& Accessory Dwellings - Conditions of Use

\section*{PAGE \#S NEED TO BE UPDATED}
5.2 Minimum Dwelling Unit Size
5.2 5.3 Home Based Business, Minor
5.3 5.4 Home Based Business, Major
5.4 5.5 Home Based Business, Rural
5.5 5.6 Secondary Suites \& Accessory Dwelling Units - Conditions of Use
5.6 5.7 Bed and Breakfast Homes
5.7 5.8 Rooming Houses
5.8 5.9 Boarding Rooms
5.9 5.10 Cellar Living Accommodation
5.10 5.11 Bareland Strata Developments
5.11 5.12 Vehicular Oriented Uses
5.12 5.13 Car Washes
5.13 5.14 Care Centres
5.14 5.15 Domesticated Animals (Excluding Livestock
5.15 5.16 Employee Housing
5.16 5.17 Temporary Use Permit
5.175.18 Beekeeping
5.18 5.19 Temporary Shelter Services

\subsection*{1.8 Undersized Lots}
1.8.3 An owner of a lot having less than the required minimum lot size in a zone may apply for a secondary suite as a secondary use, provided the lot was created before adoption of the City of Vernon Zoning Bylaw No. 5000 (2004) and the development otherwise complies with all regulations of the Zoning Bylaw. (Bylaw 5467)

\subsection*{2.3 General Definitions}

BUILDING OR STRUCTURE, SECONDARY means a separate building or structure, normally ancillary, incidental, or subordinate to, and located on the same lot as the main primary building or structure. Typical secondary structures include but are not limited to propane tanks, flagpoles, garages, and garden sheds. This does not include a secondary building containing an Accessory Dwelling.

DWELLING, ACCESSORY means a building, or part of a building, that is a self-contained residential unit, has cooking, sleeping and bathroom facilities, and is secondary to a primary dwelling unit located on the same property.

HEIGHT means, with respect to a building, the maximum vertical distance between the building grade and the highest point of the structure of a nonsloping roof, or the mid-point between the eaveline and ridge of a sloping roof excluding dormers as provided for in Section 4.6 which describes restrictions for walkout basements. For the purpose of calculating height, a non-sloping roof will be considered any roof with either a single pitch or a pitch of 4:12 or less.

OPEN SPACE means that portion of a lot not occupied by parking or vehicle maneuvering areas, accessible to, and suitable for gardens, landscaping, and recreational use by building tenants or residents the public. Open space shall be free of any buildings, except buildings for purely recreational purposes in relation to the function of the open space.

OPEN SPACE, PRIVATE means that portion of a lot not occupied by parking or vehicle maneuvering areas, accessible to, and suitable for gardens, landscaping, and recreational use by building owners or tenants. Private open space shall be free of any buildings, except buildings for purely recreational purposes in relation to the function of the private open space. For clarity, the calculation of private open space may include decks, balconies, roof top patios, and amenity space designed for the use and enjoyment of building owners and tenants such as indoor pools, gyms or other similar facilities.

PENTHOUSE means a structure projecting above a building roof or parapet, housing a suite, elevator shaft or stairwell; or forming a wall or screen around equipment mounted on the roof.

SECONDARY SUITE means a self-contained secondary dwelling unit located within a single detached housing or semi-detached housing, or in a secondary building. A secondary suite has its own separate cooking, sleeping and bathing facilities. A dwelling unit connected to the primary dwelling by a covered outdoor passage or breezeway is considered an accessory dwelling.

YARD, FRONT means that part of the site situated between the front lot line and the front of the primary building or structure-minimum required front yard setback for any building or structure extending across the full width of the site.

YARD, REAR means that part of the site situated between the rear lot line and the rear of any building or structure minimum required rear yard setback for any building or structure extending across the full width of the site.

YARD, SIDE means that part of the site extending from the front yard to the rear yard and situated between the side lot line and the closest side of any
building or structure, except for fences-minimum required side yard setback for any building or structure extending across the full depth of the site.

YARD, FLANKING means that part of the site extending from the front yard to the rear yard and situated between the side lot line situated on abutting a flanking street and the-closest side of any building or structure, except for fences minimum required flanking street setback for any buildings or structures extending across the full depth of the site.

\section*{Section 4.5 Secondary Development}

\section*{Secondary buildings in Residential Zones}
4.5.4 Secondary buildings or structures, excluding fences, are not permitted in a front yard. No secondary buildings or structures, except for fences, are allowed in a front yard and/or between a primary building and a front yard. For through lots, secondary buildings or structures are permitted within the space between a primary building and a front yard abutting one of the streets.
4.5.5 A secondary building or structure shall not be used as a dwelling unless it is a permitted secondary suite accessory dwelling in which case the Conditions of Use pertaining to Secondary Suites Accessory Dwellings in Section 5.55 .6 .2 shall apply.
4.5.6 A secondary building or structure shall not exceed 4.5 m in height unless specified otherwise in the development regulations of a particular zone. or unless it is a Secondary Suite in which case Section 5.5 shall apply.
4.5.7 Lot coverage of secondary buildings or structures shall not exceed \(14 \%\) or a maximum area of \(90 \mathrm{~m}^{2}\) footprint of \(100 \mathrm{~m}^{2}\) for secondary buildings in the residential zones.
4.5.8 There shall be at least 2.0 m spatial separation between a secondary building and a primary building. The distance between a secondary building and a primary building must adhere to the BC Building Code.
4.5.9 Secondary buildings and structures shall be located on an interior lot as follows:
- a secondary building shall not be located closer than 18.0 m to the front lot line unless it complies with the side yard requirements for a primary building;
* i. a secondary building shall be located not less than 1.0 m from the side lot line or shall be unrestricted where the secondary building does not exceed the permitted fence height;
- a secondary building housing a secondary suite shall have the same side yard requirements as for the primary building in that zone;
- ii. mechanical equipment shall be located to comply with the side yard for the primary building.

\section*{Secondary buildings on Corner and Through Sites}
4.5.10 In addition to the provisions of Section 4.5.8, The distance between a secondary building and the side lot line abutting a flanking street, shall not be less than the side yard required for the primary building.

\subsection*{5.2 Minimum Dwelling Unit Size}
5.2.1 The minimum dwelling unit size is greater than \(29 \mathrm{~m}^{2}-\left(312 \mathrm{ft}^{2}\right) 30 \mathrm{~m}^{2}\) (323 ft²) net floor area.

\section*{INLCUDE RED CROSSED OUT TEXT FOR ALL OF SECTION 5.6}
5.6 "Secondary Suites - Conditions of Use" is rescinded and replaced with "Secondary Suites \& Accessory Dwellings - Conditions of Use":
5.6.1 Secondary Suites - Conditions of Use
5.6.1.1 Secondary suites are allowed only in single detached housing and/or semi-detached housing.
5.6.1.1 Only a minor home-based business, operated by the occupant, is permitted in a secondary suite.
5.6.1.2 For each single detached housing unit, one secondary suite and one accessory dwelling is permitted. For each semi-detached housing unit, one secondary suite is permitted.
5.6.1.3 The gross floor area of any secondary suite shall not exceed \(49 \%\) of the gross floor area of the respective single detached or semidetached housing unit.
5.6.1.4 Secondary suites must meet or exceed the minimum dwelling unit size.
5.6.1.5 A secondary suite must be provided with a minimum of \(15 \mathrm{~m}^{2}\) of private open space in addition to any private open space provided for the primary dwelling.
5.6.1.6 Secondary suites must have a separate entrance with exterior emergency responder access, in accordance with BC Building Code. Access through a shared hall is acceptable.
5.6.1.7 A 1.5 m wide unobstructed, lit, and clearly marked pathway from the street to the main entrance of the secondary suite must be provided, in accordance with the BC Building Code, ensuring easy wayfinding for emergency responders.

\subsection*{5.6.2 Accessory Dwellings - Conditions of Use}
5.6.2.1 Only a minor home-based business, operated by the occupant, is permitted in an accessory dwelling unit.
5.6.2.2 Accessory dwellings are only permitted on the same lot as single detached housing, with no strata titling allowed.
5.6.2.3 Each single detached housing unit can have one secondary suite and one accessory dwelling unit.
5.6.2.4 The net floor area of an accessory dwelling must not exceed \(100 \mathrm{~m}^{2}\).
5.6.2.5 The total combined footprint of secondary buildings and an accessory dwelling must not exceed \(150 \mathrm{~m}^{2}\).
5.6.2.6 Accessory dwellings must meet or exceed the minimum dwelling unit size.
5.6.2.7 The maximum height of an accessory dwelling is 7.0 m . The same applies to a combined secondary building and accessory dwelling.
5.6.2.8 An accessory dwelling must adhere to the same minimum front, side, and flanking street yard requirements as a primary building within the respective zone. The same applies to a combined secondary building and accessory dwelling.
5.6.2.9 The minimum rear yard for an accessory dwelling is 2.0 m , or 1.0 m where the rear lot line abuts a lane. The same applies to a combined secondary building and accessory dwelling.
5.6.2.10 The distance between an accessory dwelling and a primary building must adhere to the BC Building Code.
5.6.2.11 An accessory dwelling must be provided with a minimum of \(15 \mathrm{~m}^{2}\) of private open space in addition to any private open space provided for single detached housing and/or a secondary suite.
5.6.2.12 Accessory dwellings must have a separate entrance with exterior emergency responder access, in accordance with BC Building Code.
5.6.2.13 A 1.5 m wide unobstructed, lit, and clearly marked pathway from the street to the main entrance of the accessory dwelling must be provided, in accordance with the BC Building Code, ensuring easy wayfinding for emergency responders.
5.6.2.14 Roof decks are not permitted on accessory dwellings. Decks above the first storey must not face a neighboring private lot unless separated by a lane, flanking street, street, or other public right of way.
5.6.2.15 Accessory dwellings must be connected to a community water system.
5.6.2.16 Accessory dwellings must be connected to a community sewer system unless the lot is 1.0 ha ( 2.47 ac ) or larger with an onsite sewerage system meeting the regulations under the Public Health Act.

\subsection*{5.7 Bed and Breakfast Homes}
5.7.5 The bed and breakfast home use is not permitted in conjunction with a rooming house, secondary suite, accessory dwelling or boarding rooms.
5.7.6 Parking areas and private open space to be used by guests of a bed and breakfast home shall be located away from abutting development to minimize the impact of the operation on neighboring properties.
5.7.7 All parking areas and private open space to be used by guests of a bed and breakfast home have to be visually screened from abutting properties by opaque fencing or landscaping.

\subsection*{5.8 Rooming Houses}
5.8.4 Rooming houses are not permitted in conjunction with a bed and breakfast home, secondary suite, accessory dwelling or boarding rooms.

\subsection*{5.16 Employee Housing}
5.16.1 Employee housing dormitory and employee housing dwelling developments shall comply with the following regulations:
- Employee housing may not be strata subdivided; strata titling shall not be permitted.
- No continuous building frontage shall exceed 40.0 m .
- Private open space shall be provided in accordance with the following fations:
- A minimum area of \(5.0 \mathrm{~m}^{2}\) per dormitory sleeping unit and per bachelor dwelling;
- A minimum area of \(10.0 \mathrm{~m}^{2}\) of open space per 1 bedroom dwelling; and
- A minimum area of \(15.0 \mathrm{~m}^{2}\) of open space per dwelling with more than one bedroom.

\section*{TABLE 7.1 - PARKING SCHEDULE}

\section*{RESIDENTIAL \& RESIDENTIAL RELATED USES}

Duplex
Secondary Suites
Semi-Detached Housing
Single-Detached Housing with a
Secondary Suite and/or an
Accessory Dwelling

2 per dwelling unit
1 per suite
2 per dwelling unit
2 per single detached dwelling unit plus 1 per secondary suite plus
1 per accessory dwelling
Tandem parking is permitted for individual uses but must not be shared between different uses.

\section*{In OCP Development Districts 1 \& 2:}

Semi Detached Housing with a Secondary Suite
Duplex

2 per semi-detached dwelling unit, where 1 space may be used by a secondary suite

\section*{In OCP Development District 3:}
\begin{tabular}{ll} 
Semi Detached Housing with a & 2 per semi-detached dwelling unit plus \\
Secondary Suite & 1 per secondary suite \\
Duplex & \begin{tabular}{l} 
Tandem parking is permitted for \\
individual uses but must not be shared \\
between different uses.
\end{tabular} \\
&
\end{tabular}

\section*{A2: Rural - Large Holdings}

\subsection*{8.2.3 Secondary Uses}
- accessory dwellings

\section*{A3: Rural - Small Holdings}

\subsection*{8.3.3 Secondary Uses}
- accessory dwellings

\section*{RR: Rural Residential}

\subsection*{9.1.3 Secondary Uses}
- accessory dwellings

\section*{R1: Estate Lot Residential}

\subsection*{9.2.3 Secondary Uses}
- accessory dwellings

\section*{R2: Large Lot Residential}

\subsection*{9.3.3 Secondary Uses}
- accessory dwellings

R3: Medium Lot Residential

\subsection*{9.4.3 Secondary Uses}
- accessory dwellings

R4: Small Lot Residential

\subsection*{9.5.3 Secondary Uses}
- accessory dwellings

\section*{R5: Four-plex Housing Residential}

\subsection*{9.6.3 Secondary Uses}
- accessory dwellings
- secondary suites fin single detached housing and semi-detached housing only)

\section*{R6: Lakeshore Residential}

\subsection*{9.7.3 Secondary Uses}
- accessory dwellings
- secondary suites fin single detached housing and semi-detached housing only)

\section*{R7: Mobile Home Residential}

\subsection*{9.9.7 Other Regulations}
- The owner of a mobile home park must provide a minimum of \(6 \%\) of the gross mobile home park area as private open space for the use and enjoyment of residents, except in the case of a fee simple subdivision, the mobile home park is exempt from private open space provision. Buffer areas, storage compounds, street and roadway rights-of-way, parking areas or required utility easements within the mobile home park shall not be considered as forming any portion of the recreational or private open space requirement. \(50 \%\) of the recreation area shall be private open space in a location convenient and accessible to the tenants, ensuring that any
hillside or natural watercourse areas to be included in the recreation area is physically accessible to the tenants and is maintained in its natural state, or authorized improved state. Outdoor recreational areas shall be landscaped if not left in their natural state.
- For the purpose of calculating and satisfying recreational and private open space requirements, any indoor recreational space fully developed in a community or recreational centre shall be counted as triple its gross floor area. Any common outdoor recreational facility, such as a swimming pool, tennis court, shuffleboard, lawn bowling or putting greens, barbecue patio, etc. may be counted as double its surface area.

\section*{RTR: Resort Residential}

\subsection*{9.9.3 Secondary Uses}
- accessory dwellings
- secondary suites (in single and semi-detached housing only)

\section*{RM1: Row Housing Residential}

\subsection*{9.10.3 Secondary Uses}
- accessory dwellings
- secondary suites (in single detached and semi-detached housing only)

\section*{RM2: Row Housing Residential}

\subsection*{9.11.3 Secondary Uses}
- accessory dwellings
- secondary suites (in single detached and semi-detached housing only)

\section*{HR1: Hillside Residential Single and Two Family}

\subsection*{9.15.3 Secondary Uses}
- accessory dwellings
- secondary suites (only in single detached and semi-detached housing)

\subsection*{9.15.7 Other Regulations}
- Areas of a lot greater than \(30 \mathrm{~m}^{2}\) and exceeding \(30 \%\) slope shall be protected as undisturbed private open space, and shall be free from buildings, structures or development.
- Any areas disturbed "undisturbed private open space" as a function of approved lot development that are greater than \(30 \mathrm{~m}^{2}\) and exceeding \(30 \%\) slope shall be rehabilitated with area appropriate native vegetation, and once rehabilitation is complete shall be protected as undisturbed private open space and shall be free from buildings, structures or development.

\section*{HR2: Hillside Residential Multi-Family}

\subsection*{9.16.7 Other Regulations}
- Areas of a lot greater than \(30 \mathrm{~m}^{2}\) and exceeding \(30 \%\) slope shall be protected as undisturbed private open space, and shall be free from buildings, structures or development.
- Any areas disturbed as a function of approved lot development that are greater than \(30 \mathrm{~m}^{2}\) and exceeding \(30 \%\) slope shall be rehabilitated with site appropriate native vegetation and provided drip irrigation for a period of two years; once rehabilitation is complete the irrigation system it to be removed and the area shall be protected as undisturbed private open space and shall be free from buildings, structures or development.

\section*{HR3: Hillside Residential Apartment}

\subsection*{9.17.6 Other Regulations}
- Areas of a lot greater than \(30 \mathrm{~m}^{2}\) and exceeding \(30 \%\) slope shall be protected as undisturbed private open space, and shall be free from buildings, structures or development.
- Any areas disturbed as a function of approved lot development that are greater than \(30 \mathrm{~m}^{2}\) and exceeding \(30 \%\) slope shall be rehabilitated with site appropriate native vegetation and provided drip irrigation for a period of two years; once rehabilitation is complete the irrigation system it to be removed and the area shall be protected as undisturbed private open space and shall be free from buildings, structures or development.

\section*{RST1: Residential Single and Two Family}

\subsection*{9.18.3 Secondary Uses}
- accessory dwellings
- secondary suites (with single detached and semi-detached housing only)

RST2: Residential Single and Two Family

\subsection*{9.19.3 Secondary Uses}
- accessory dwellings
- secondary suites (with single detached and semi-detached housing only)

\section*{C10A: Tourist Commercial and Residential}

\subsection*{10.10a. 3 Secondary Uses}
- accessory dwellings
- secondary suites (single detached and semi-detached housing only)

\subsection*{10.10a.6 Other Regulations}
- A minimum area of \(10.0 \mathrm{~m}^{2}\) of private open space shall be provided per 1 bedroom dwelling, and \(15.0 \mathrm{~m}^{2}\) of private open space shall be provided per dwelling with more than 1 bedroom. For bareland strata developments an additional \(10.0 \mathrm{~m}^{2}\) per unit of common private open space shall be provided in addition to the private open space on each lot.

\section*{RTCA: Resort Commercial and Residential}

\subsection*{10.13a.3 Secondary Uses}
- accessory dwellings
- secondary suites (in single and semi-detached housing only)

\section*{P5: Private Park}

\subsection*{12.5.1 Purpose}

The purpose is to provide a zone for the preservation and enhancement of private park and private open space for private use.```


[^0]:    ${ }^{1}$ ITE (2010). Transportation Impact Analyses for Site Development. Chapter 2.

[^1]:    Officer Certification:
    Your signature constitutes a representation that you are a solicitor, notary public or other person authorized by the Evidence Act, R.S.B.C. 1996, c. 124 , to take affidavits for use in British Columbia and certifies the matters set out in Part 5 of the Land Title Act as they pertain to the execution of this instrument.
    *If space insufficient, enter "SEE SCHEDULE" and attach schedule in Form E.
    ** If space insufficient, continue executions on additional pages) in Form D.

