- Lot “A” -

Revised Application for Rezoning

City of Courtenay

Appendix C

Site Servicing Report

- McElhanney Consulting Services Ltd. -

Rosebery Investments Ltd.
West Vancouver, BC

McElhanney

October 23, 2019

MCSL File: 2211-47226-01

Mr. Ian Buck, Director of Development Services
City of Courtenay
830 Cliffe Avenue
Courtenay, BC V9N 2J7

Dear Mr. Buck,

SITE SERVICING REPORT IN SUPPORT OF REZONING AND SUBDIVISION APPLICATIONS
LOT A, PLAN 2607, DL 138, COMOX DISTRICT, Rev.1

The following servicing report has been prepared on behalf of Rosebery Investments Ltd., in support of a rezoning and subdivision applications for the above noted parcel.

This servicing review covers municipal sanitary sewer, storm drainage, and potable water. Commentary is also provided relative to site access, third party utilities (BC Hydro, Telus and Shaw Cable) servicing, refuse collection, sustainability checklist conformity, and affordable housing policy conformity.

This report presents both the estimated development loads as well as the general servicing methodology, confirming the suitability of the subject parcel for the proposed rezoning and increased density. The results presented will inform detailed engineering design.

1.0 GENERAL

The subject property is legally identified as Lot A, Plan 2607, DL 138, Comox District and is located at the west end of Copperfield Road. The 5.82 ha parcel is situated along the west boundary of the City of Courtenay, within the Arden Corridor Local Area Plan (LAP). The property limits are bounded by the Copperfield Road right-of-way and undeveloped DL 95 to the north, the Comox Logging Road to the west and developed residential property to the south and east. Piercy Creek flows from west to east along the south and east property boundaries connecting with Tributary 11 at the far east end of the property before exiting the property to the east. The site is covered by a dense immature forest of coniferous and deciduous trees and wetlands adjacent Piercy Creek. The property grade is relatively flat with an average 3.5% slope to the south east toward Piercy Creek. Site elevations range from 46 to 62 metres above sea level.

An environmental review of the property, completed by Current Environmental, has determined the extents of Piercy Creek and identified wetlands within the property. When applying the 30

1211 Ryan Road
Courtenay, BC
V9N 3R6
Tel 250 338 5495
www.McElhanney.com

metre environmental setback as required by the Arden Corridor LAP, the resulting developable land area is +/- 2.600 hectares.

The application proposes to rezone the property from R-1A to a Comprehensive Development zone to allow for higher density residential development. The proposed development is a bare land strata with a mix of single and multi-family units. **Figure 1** overleaf, prepared by JWT Architecture and Planning/ JWT Design Ltd. outlines the proposed layout and mix of housing types.

2.0 LAND USE

The subject property is currently zoned Residential 1A (R-1A) and Suburban Residential OCP designation. The pending zoning bylaw amendment application seeks conversion from R-1A to a Comprehensive Development zone. Increasing the density in the 2.5 hectare development core area of the property will allow for a pocket of higher density development surrounded by environmental protection areas. This will maintain the suburban residential feel.

3.0 SUSTAINABILITY

The development proposal is compliant with the City's sustainability objectives as follows:

3.1 Land Use

- The residential zone contemplated is compatible with neighbouring uses and consistent with the objectives of the City's OCP.

3.2 Building Design

- Building details will be determined at the permitting stage.

3.3 Transportation

- Provide multi-functional street(s).
- Prioritizes pedestrian and cycling opportunities on the public street system and through the site location that can provide an alternative to public road.
- The subject property is located within walking distance to recreational opportunities. All can be accessed by proposed sidewalk and trail networks.
- The development will contribute towards the trail system by providing a connection from Copperfield Road through to the Piercy Creek trail network.

3.4 Infrastructure

- Includes stormwater techniques that are designed to reduce run-off, improve groundwater exchange and increase on-site retention.

3.5 Environmental Protection and Enhancement

- Protects riparian areas and other designated environmentally sensitive areas. The land occupied by Piercy Creek and its riparian area will be dedicated to the City as part of the overall development subdivision.
- Provides for native species, habitat restoration/improvement. Riparian area vegetation restoration is proposed to increase the value of the dedicated riparian areas.
- Includes tree lined streetscapes.

4.0 AFFORDABLE HOUSING POLICY

The proposed zoning amendment and subdivision is in conformance with the City's *Affordable Housing Policy*.

5.0 POTABLE WATER DEMAND

Potable water demands for the proposed development were estimated using City Bylaw 2919. Domestic demand is based on unmetered per capita demands for 47 dwelling units with an average occupancy of 2.6 people per unit. In the absence of detailed building plans, fire flows of 90 l/s have been used based on the City's Bylaw 2919 for minimum required fire flow for townhouses. **Table 1** below summarize the results:

Table 1 – Domestic Potable Water Demand

POTABLE WATER DEMAND		UNITS
Number of Dwellings	47	
Occupancy per Dwelling	2.6	c
Equivalent population	**123**	**c**
Average annual daily demand (A)	635	1/c/d
Maximum day demand (D)	2100	1/c/d
Peak hour demand (H)	3000	1/c/d/
Fire flow (F)	90	l/s
Average day demand (A)	0.90	l/s
Maximum day demand (D)	2.99	l/s
Peak hour demand (H)	4.27	l/s
Total design flows (Qdesign) to be the greater of the following:		

POTABLE WATER DEMAND		UNITS
Q(design) = D+F	92.99	l/s
Q(design) = H	4.27	l/s
Q(design) =	**92.99**	**l/s**

The sum of the total probable domestic water demand and fire flow rate is **92.99 l/s**. There is an existing 150mm diameter watermain stubbed at the end of Copperfield Road which is proposed to service the site.

We request the City undertake a water model analysis and advise if there is sufficient capacity and pressure within the City's existing water distribution network to accommodate the additional demand. If sufficient capacity is not available, we expect that the City will outline the offsite upgrades required to meet the required potable water demands of the proposed development.

6.0 SANITARY SEWERS

Estimated flows for the proposed development have been calculated based on City Bylaw 2919 and are presented in the following table.

Table 2 - Sanitary Flows

SANITARY SEWER		UNITS
Average Dry Weather Flow	360	l/c/day
Site Area (developable area)	2.600	ha
I&I Rate	0.12	l/s/ha
Dwelling Population per unit	2.6	people
Dwelling Units	47	
Equivalent Population	**123**	**people**
Peaking factor	3.2	
Inflow and Infiltration	0.31	l/s
Average Dry Weather Sewer Flow (ADWF)	0.51	l/s
Design Flow Q = ADWF x Pf + Infiltration	**1.94**	**l/s**

The project site is currently serviced via a 200 mm diameter PVC main which travels east down

Copperfield Road, south along Arden Road and then east down 20th Street, where it connects to the recently upgraded Central Arden Trunk Sewer.

We request the City undertake a sanitary sewer model analysis of the specific sections of downstream infrastructure, to either confirm that sufficient capacity is available to accept additional development flow or provide an outline of required offsite upgrades.

7.0 STORM DRAINAGE

7.1 Introduction

This Stormwater Management Plan has been prepared in accordance with the City of Courtenay Subdivision and Development Servicing Bylaw 2919 Section 4.1.1 Drainage Planning. We understand that the City does not have a Master Drainage Plan, Watershed Plan, or Integrated Stormwater Management Plan for the study area.

7.2 Study Area

The 5.82 ha study area is situated along the west boundary of the City of Courtenay, within the North Piercy Creek drainage basin. The property limits are bounded by undeveloped DL 95 to the north, Comox Logging Road to the west and developed residential property to the south and east. Piercy Creek flows from west to east along the south and east property boundaries connecting with Tributary 11 at the far east end of the property before exiting the property heading east. **Figure 2** below, adapted from the Comox Valley Regional District IMAP, shows an overview of the creeks in relation to the property.

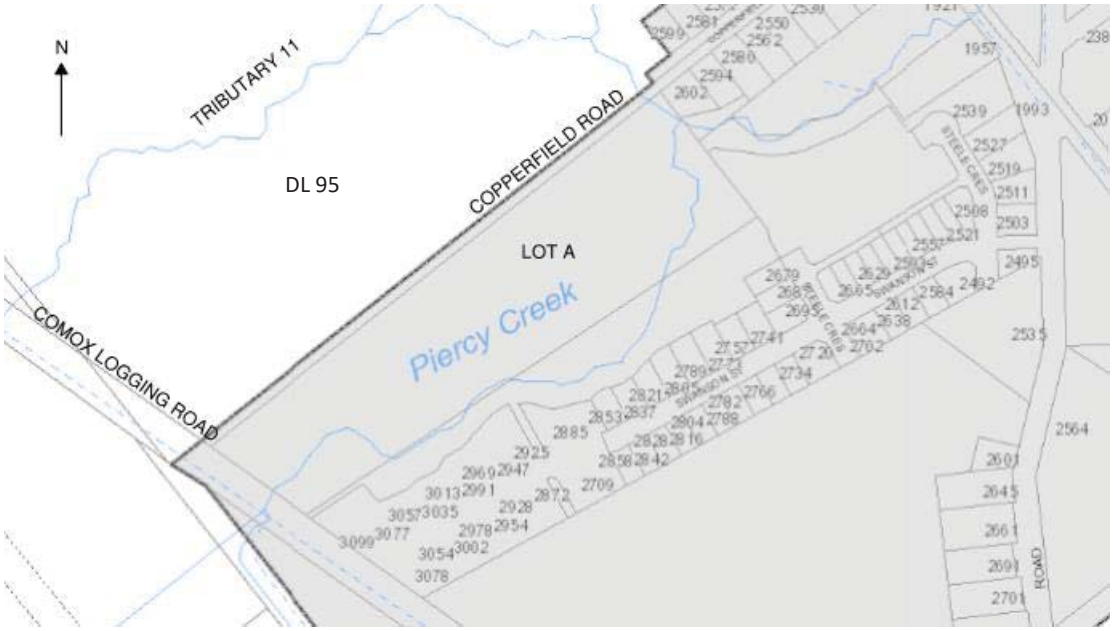


Figure 2: Existing Drainage

Drainage catchments impacting the study area are defined by the surrounding roads and creeks. Comox Logging Road defines the west limit, 20th Street defines the south limit, and Piercy Creek and Tributary 10 define the east limit. When accounting for riparian setbacks, the developable land area is 2.600 hectares. The catchment area for this study uses only the developable land area, totaling 2.600 hectares, for pre- and post-development analysis.

7.3 Guidelines and Targets

City of Courtenay Bylaw 2919 outlines the requirement for stormwater management for subdivisions and development within the City. Bylaw requirements are outlined below:

- Limit post-development peak flows to equal the corresponding pre-development peak flows for the 1 in 2, 1 in 5, 1 in 10 and 1 in 25 year return period 24-hour storm events.
- Provide escape routes to account for greater storms up to the 1 in 100 year return period storm events in a manner which does not result in flooding of any properties.
- Minimize the total runoff generated from storms through the application of site adaptive planning and the use of source controls.
- Control discharge such that the downstream watercourses receiving outflow from detention facilities are protected from surcharge and erosion.
- Convey flows up to the 1 in 10 year return period storm event in the minor system.
- Convey flows in excess of the 1 in 10 year return period storm event overland in the major system.
- Provide oil and grit separators for sites with parking for 11 or more vehicles.

7.4 Climate Data and Hydraulic Model

7.4.1 Climate Data

City of Courtenay Bylaw 2919 Intensity Duration Frequency (IDF) curves have been used for the 1 in 2, 1 in 5, 1 in 10, 1 in 25 and 1 in 100 year return storm events, developed using the Modified Chicago Distribution, in the computer simulated hydraulic modeling. The City's Bylaw IDF curve and design storms were derived from the Courtenay Puntledge BCHP rain gage, Station ID: 1021990 and include an additional 15% to account for predicted increase in rainfall volume and intensity due to climate change.

7.4.2 Hydraulic Modeling

PCSWMM 2017 Professional 2D software has been used to analyse the subject property to existing and post-development site response of the City's return period design storm events. Details of the computer simulated hydraulic modeling are provided in **Section 7.6.**

7.5 Basin Characteristics

The property is situated in an approximately 10 hectare catchment area which slopes to the south east draining to Piercy Creek. Upstream runoff is conveyed around the catchment by Tributary 11 to the north and ditching along the Comox Logging Road to the west. The subject property makes up the lower half of the catchment area. The upper half of the catchment area is located to the north in DL 95.

Post-development runoff from DL 95, which is conveyed across the subject property, is proposed to be diverted along the Copperfield road right-of-way to Tributary 11. Approximately 3.22 hectares of the 5.82 hectare site consist of riparian areas and wetlands which will be undisturbed by the development and continue to drain to Piercy Creek.

7.5.1 Geography and Topography

The site is covered by a dense immature forest of coniferous and deciduous trees and wetlands adjacent Piercy Creek. The property grade is relatively flat with an average 3.5% slope to the south east toward Piercy Creek. Site elevations range from 46 to 62 metres above sea level.

7.5.2 Surface and Subsurface Geology

Terran Geotechnical Consultants Ltd. has prepared a Geotechnical Investigation Report dated May 29, 2017, for the Site. The report includes a detailed review of the surface and subsurface conditions of the site prior to land development, including the following excerpts of significance to this SWMP:

- *General Site Soil Stratigraphy:*
  - *0.0 m to 0.15 m SAND (TOPSOIL) – silty, organics foliage and roots, very loose to loose, moist, black.*
  - *0.15 m to 0.9 m SAND – silty, some cobbles, trace gravel, loose to compact, moist to wet, reddish brown.*
  - *0.9 m SILT (TILL-LIKE) – sandy, trace gravel, trace cobbles, trace clay, very stiff to hard, compressed, cemented, dry, light brown.*
- *The soils represent the regional till that consist of glacial deposited clay, silt, sand, gravel and cobbles.*
- *Groundwater seepage was noted entering the test pit excavations above the sandy silt till like interface approximately 0.9m below the ground surface. The till like layer is nearly hydraulically impervious, and it is expected that the groundwater is perched and the water table is deeper in depth. The perched groundwater is expected to be present through the site to an approximate depth of 0.6 to 0.9m below the existing grade. Given the shallow depth of the till-like layer and the degree of saturation presented at the time of the investigation, percolation testing was omitted.*
- *Based on published literature the estimated percolation rates are between 1.0 x 10-3 to 10-2 mm/s* (3.6 to 36 mm/hr*) for silty sand, and between 1.0 x 10-8 to 10-6 mm/s* (3.6 x 10-5 to 0.0036 mm/hr) *for the till-like soils.*

- *The application of subsurface infiltration galleries is not recommended due to the shallow perched water table above the near impervious till-like soils.*
- *Open areas shall be vegetated and allow for rain water to infiltrate into the ground.*

7.6 Stormwater Management

The following Stormwater Management Plan analyzes the site using computer simulated hydraulic modeling to set a baseline for existing runoff, size proposed stormwater management mitigation infrastructure (source controls which reduce peak runoff rates and total volume by retaining and/or promoting infiltration and evapotranspiration), and provide simulated post-development runoff peak rates and total volumes.

7.6.1 Existing Runoff

To quantify existing site runoff, a hydraulic model was developed using PCSWMM software, enabling analysis of current site response. A complete listing of the model input parameters, based on present site parameters and soils information (provided by Terran Geotechnical Consultants ltd.), are summarized in *Table 3: Existing Site Specific Hydraulic Modeling Parameters.* Results of the modeled, existing site responses are summarized in *Figure 3: Runoff Hydrographs for the 2, 5, 10, 25 and 100-Year Design Storm Events under Existing Site Conditions*, and summarized in *Table 4: Existing Runoff Quantities.*

Table 3: Existing Site Specific Hydraulic Modeling Parameters

PARAMETER		EXISTING SITE
Area (ha)		2.600
Width (m)		120
Slope (%)		4.0
% Impervious		15.0
N Imperv		0.018
N Perv		0.24
Dstore Imperv (mm)		2
Dstore Perv (mm)		7
Zero % imperv		25
Curve #		77
Sub-area routing		Pervious

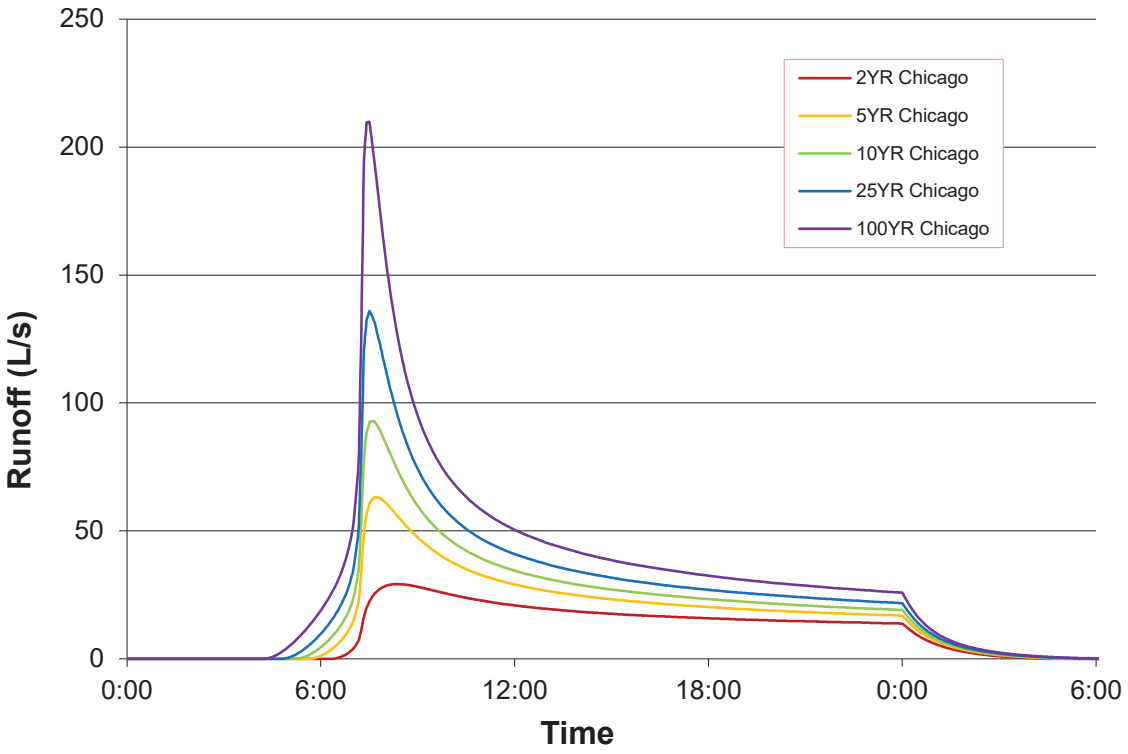


Figure 3: Runoff Hydrographs for the 2, 5, 10, 25 and 100-Year Design Storm Events under Existing Site Conditions

Table 4: Existing Runoff Quantities

24-HOUR DISTRIBUTION	TOTAL PRECIPITATION (mm)	EXISTING RUNOFF	
		TOTAL VOLUME (m^3)	PEAK DISCHARGE (Lps)
2-Year	89	29	1,197
5-Year	115	63	1,766
10-Year	133	93	2,173
25-Year	154	136	2,680
100-Year	187	210	3,465

The results set a baseline for existing site runoff and define post-development performance. Per City Bylaw 2919, the target for maintaining peak discharge rates is the 1 in 25 year design storm event.

7.6.2 Design Elements

The proposed Source Controls to be implemented for this project have been developed to promote onsite capture of runoff and groundwater recharge. Properly employed, this approach will mitigate peak runoff rates, and provide qualitative treatment of runoff, prior to discharge. The following source controls are proposed for the site:

7.6.2.1 General

- Amended Topsoil: Place 300mm of amended topsoil in all landscaped (pervious). Direct surface runoff from impervious surfaces to landscaped areas wherever possible;
- Disconnected Roof Leaders: Where grades allow, properties backing onto the existing riparian areas should have disconnected roof leaders allowing roof runoff to sheet flow to the riparian areas which will provide detention, infiltration, evaporation and transpiration;
- Rain Garden: Install a rain garden with outlet controls to reduce peak runoff rates and volume by promoting groundwater recharge;
- Detention Pond: Construct a detention pond to limit peak runoff rates up to the 1 in 25 year design storm event;
- Grit Sumps: Install grit sumps in catch basins and pond/ rain garden inlet and outlet manholes to provide pre-filtering and removal of larger particulate.
- Bio-swales: Constructed bioswales with aquatic planting both before and after the detention pond and aquatic plantings within the pond are proposed to remove Total Suspended Solids (TSS) and pollutant loading from stormwater runoff. Bio-swales should be designed to maximize detention time. Plantings should be selected by a qualified professional experienced in aquatic plantings to reduce TSS loading. Details of the bio-swales and plantings will be determined at the design stage.

7.6.2.2 Amended Topsoil

The use of amended soils will be fundamental in achieving a water balance for this site and assisting in maintaining the existing hydrology. Properly functioning amended soil can significantly increase the amount of initial abstractions of the pervious area of the site. Initial abstractions reflect the depth of rainfall lost to depression storage, either infiltrated or evapotranspirated. To fully utilize the effectiveness of amended topsoil, surface runoff from impervious surfaces should be directed to landscaped areas wherever possible.

Amended topsoil that meets the revised MMCD Specification outlined below should be placed on all pervious areas of the site. This soil can either be stripped from the

site and re-used (if available) or imported.

To account for compaction and clogging over time, the post-development mitigated model has assumed 20 mm of initial abstractions, for all pervious surfaces. This reflects the long-term performance of an average of 200 mm of amended soil. All amended soils should conform to the MMCD specification for growing medium, with the following amendments:

- Lawn Areas: topsoil should meet or exceed the MMCD specification for growing medium with the organic content amended to be 8%;
- Planters, Shrub and Groundcover Areas: topsoil should meet the MMCD specification for growing medium with organic content of 8 to 15%.

Refer to MMCD and Green Infrastructure Partnership, "Topsoil: Just How Do You Obtain a Performing Topsoil Layer, to Advance Rainwater Management & Water Conservation" for more information on amended soils.

7.6.2.3 Rain Garden

Site drainage form the western portion of the site (+/- 1.100 ha) will be routed through a rain garden with a total base area of 185 sq/m. The rain garden has been modeled in PCSWMM software with a hydraulic conductivity of 20 mm/hr, a total base area of 185 m2, and a depth of 0.75 m. The facility will consist of perforated pipe bedded in drain rock (porosity approximately equal to 0.4). A longevity factor of 0.75 was used in this analysis to account for plugging of pore spaces and degradation over time. This equates to an effective storage capacity of 41 cu.m. To ensure long term efficacy, the facility will be situated downstream of grit separators (catch basins).

Two orifices located in a control manhole will be used to maintain base flows and limit peak outflow. The lower 50mm diameter orifice will be set at the base elevation of the rain garden and the upper 75mm diameter orifice will be set at 0.5m above the rain garden invert. Overflow from the rain garden will be conveyed to the detention pond.
The rain garden will be located adjacent the onsite park and will discharge to the adjoining riparian area. Outflow from the rain garden control manhole will be designed to sheet flow in a dispersed manner over the adjoining riparian area to Piercy Creek. We understand the City will require review and approval from a geotechnical engineer of the proposed infiltration facility to confirm that the infiltration facility will not cause downstream nuisance groundwater breakout or slope stability issues.

7.6.2.4 Detention Pond

Overflow from the rain garden and site drainage from the lower 1.5 ha. of the site will be routed through a detention pond. The detention pond has been modeled in

PCSWMM software with a maximum depth of 0.75 m and a total volume of 565 cu.m. Infiltration has not been modeled for the detention pond; infiltration through the detention pond will act as a factor of safety, further reducing the modeled peak runoff rates and total volumes. To ensure long term efficacy, the detention pond will be situated downstream of grit separators (catch basins)..

The detention pond water levels will be controlled with two orifices and an overflow weir. The lower 125mm diameter orifice will be set at the base elevation of the pond while the upper 300mm diameter orifice will be set at 0.4m above the pond invert. An overflow weir will also be installed at the outlet of the pond to safely convey flows in excess of the 1 in 25 year design storm to the downstream receiving environment.

The detention pond will be located the east end of the site and will discharge to the existing riparian area. Outflow from the pond will be designed to be dispersed to the riparian area and allowed to sheet flow through the existing vegetation to Piercy Creek rather than concentrated in a single channel.

7.6.2.5 Runoff Quality

Runoff quality will be controlled be three systems, grit sumps, bio-swales and the detention pond. Grit sumps in the catch basins and pond inlet and outlet manholes will be the first line of defence to remove larger particulate. Bio-swales both up and downstream of the pond, and downstream of the rain garden are proposed to provide qualitative treatment of runoff by reducing hydrocarbon loading and Total Suspended Solids (TSS) prior to discharge to Piercy Creek. Infiltration to ground, through the rain garden will serve to further improve/ polish the quality of runoff. The detention pond complete with aquatic plantings will also improve water quality by aiding in the further removal of hydrocarbons and TSS.

7.6.3 Post-Development Runoff

Simulations for mitigated site response were completed using PCSWMM software. Model input parameters used are summarized in *Table 5: Site-Specific Stormwater Management Parameters*. The post-development mitigated model includes the source control design elements described above. Results of the modeled site response are indicated in *Figures 4 to 8.*

Table 5: Site-Specific Stormwater Management Parameters

PARAMETER	EXISTING SITE	POST-DEVELOPMENT	
Area (ha)	2.6	1.1	1.5
Width (m)	120	200	280
Slope (%)	4.0	4.0	4.0
% Impervious	15.0	65.0	65.0

PARAMETER	EXISTING SITE	POST-DEVELOPMENT	
N Imperv	0.018	0.018	0.018
N Perv	0.24	0.24	0.24
Dstore Imperv (mm)	2	2	2
Dstore Perv (mm)	7	30	30
Zero % imperv	25	25	25
Curve #	77	90	90
Sub-area routing	Pervious	Outlet	Outlet

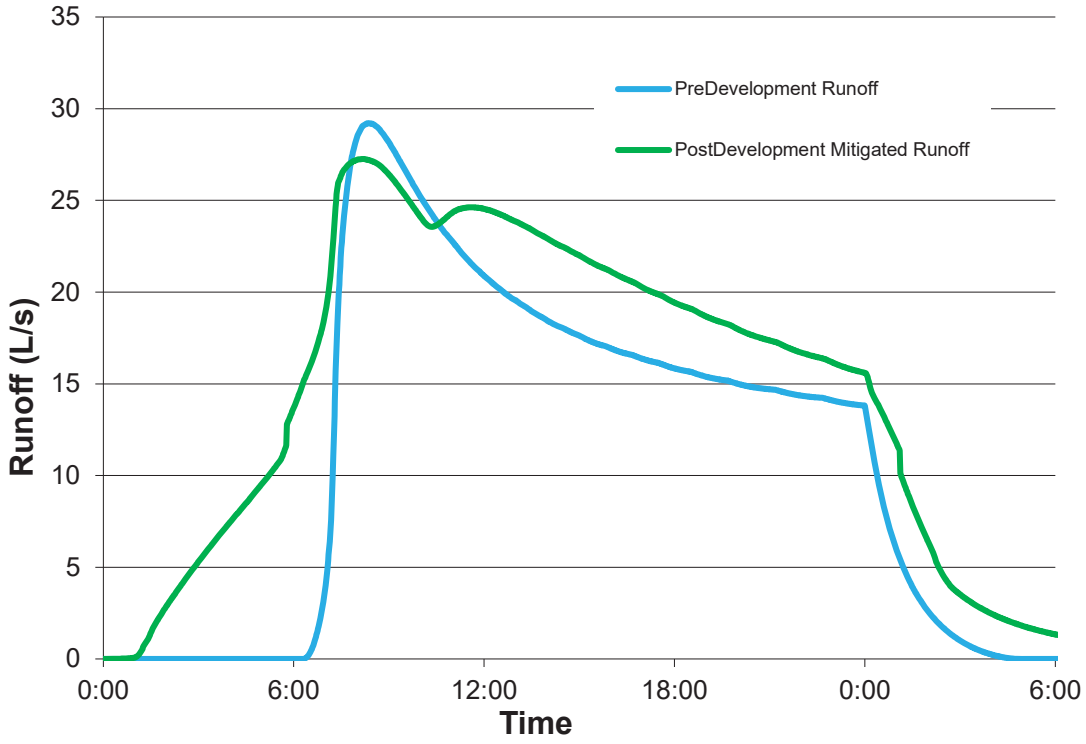


Figure 4: Runoff Hydrographs for the 2 year design rainfall event

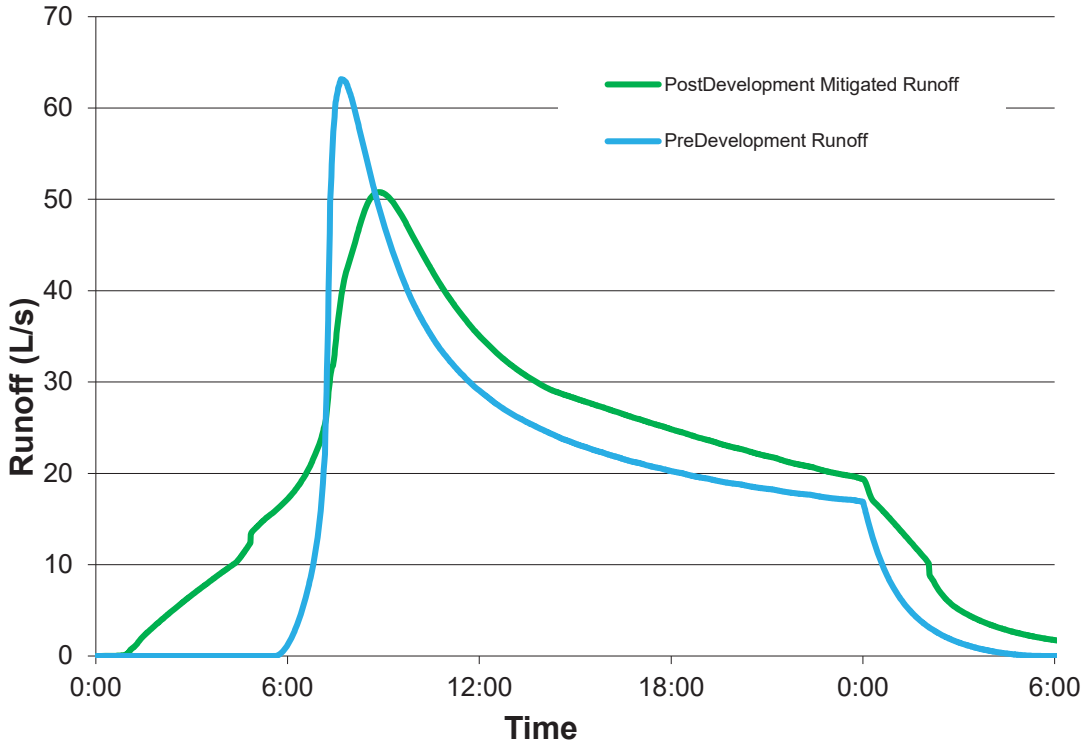


Figure 5: Runoff Hydrographs for the 5 year design rainfall event

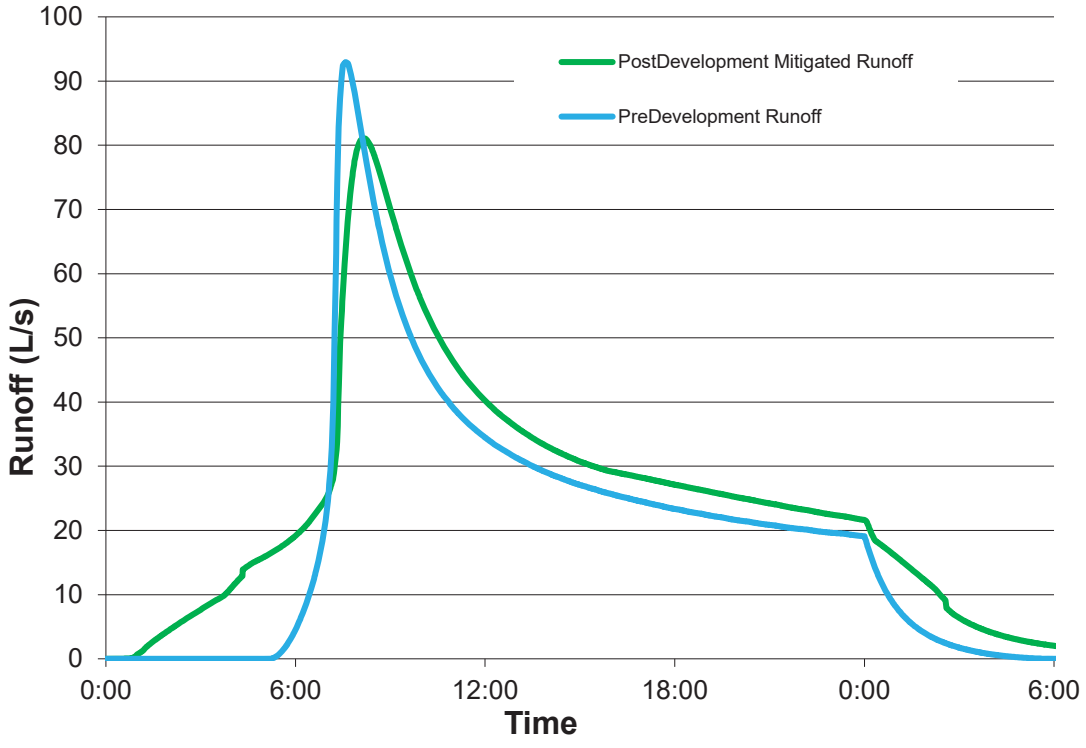


Figure 6: Runoff Hydrographs for the 10 year design rainfall event

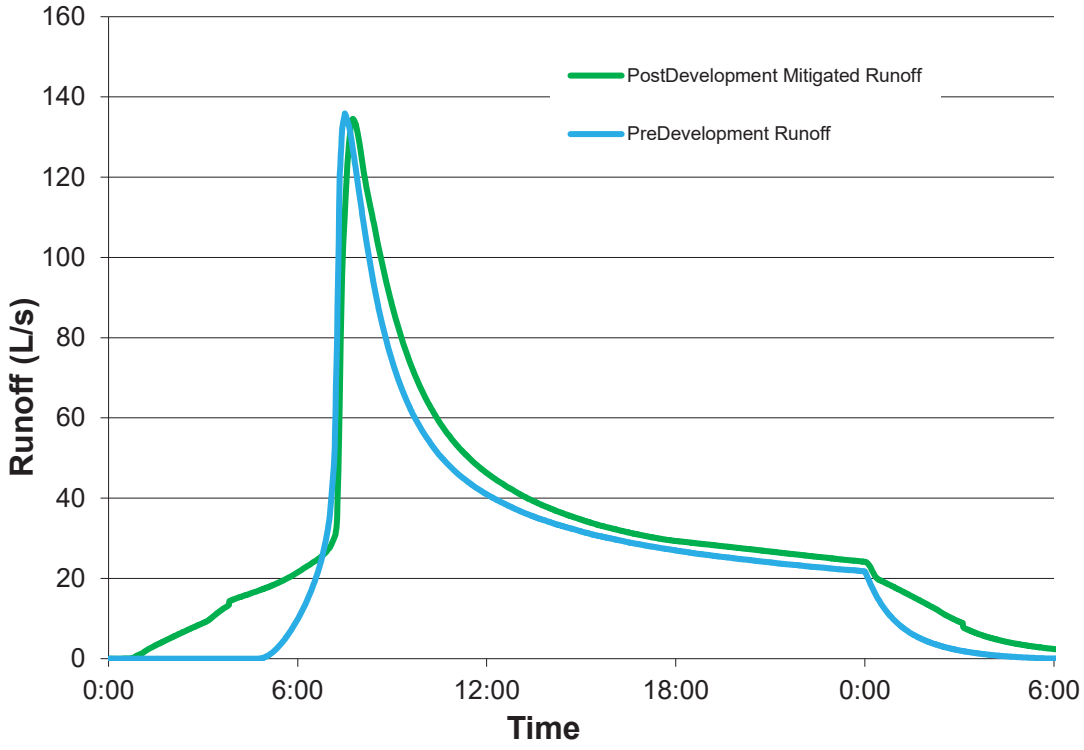


Figure 7: Runoff Hydrographs for the 25 year design rainfall event

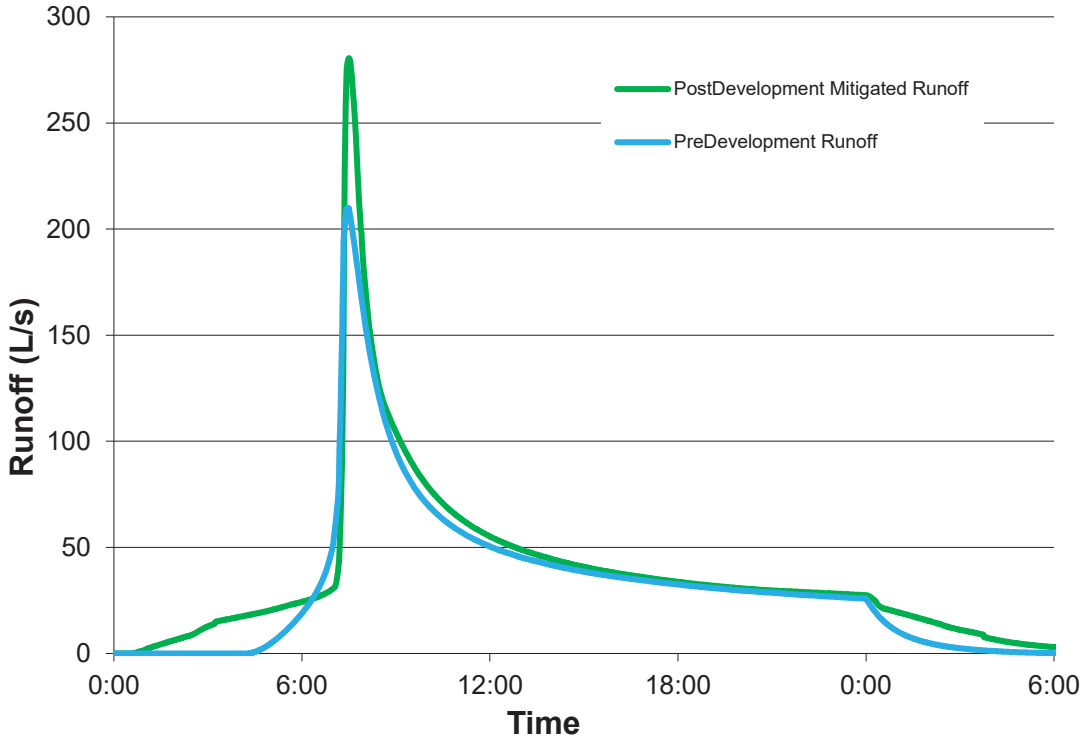


Figure 8: Runoff Hydrographs for the 100 year design rainfall event

Table 6: Existing and Post-Development Runoff Quantities, compares existing and post-development simulated runoff quantities for the site. The analyses show that with the use of the proposed Source Controls, which promote infiltration, evapotranspiration, and detention, Bylaw 2919 requirement to limit post-development runoff peak rates below existing rates up to the 1 in 25 year design storm event are attained.

Table 6: Existing and Post-Development Runoff Quantities

24-HOUR DISTRIBUTION	TOTAL PRECIPITATION (mm)	EXISTING		POST-DEVELOPMENT	
		Peak (Lps)	Total (m^3)	Peak (Lps)	Total (m^3)
2-Year	89	29	1,197	27	1,618
5-Year	115	63	1,766	51	2,265
10-Year	133	93	2,173	81	2,717
25-Year	154	136	2,680	135	3,270
100-Year	187	210	3,465	281	4,107

7.6.4 Conveyance

The stormwater collection/conveyance system will consist of a traditional minor piped system and a major overland system. Both the minor and major system will be designed to current City of Courtenay design standards. Peak 10-year return period (short duration) flows will be conveyed within the minor piped drainage system. Flows in excess of the 10-year return period design rainfall events will be conveyed via the major overland drainage system.

Low flow discharge from the rain garden and detention pond should be designed in conjunction with the project biologist to provide distributed, unconcentrated flows to the adjacent riparian wetland areas. Distributed flows will serve to further mimic predevelopment runoff. A defined vegetated pond outflow swale is proposed to convey pond discharge in excess of the 1 in 5 year design rainfall event to Piercy Creek. The outflow swale will be designed to safely convey flows up to the 1 in 100 year design storm event.

Sizes and grades for the minor and major storm system, as well as details of the distributed low flow pond discharge, will be determined at time of detailed design. The pond will also be designed to safely convey peak flows and volumes up to the 1 in 100 year design rainfall event.

7.7 Construction Sediment and Erosion Control

Prior to, or in conjunction with land clearing, grading or construction, sediment and erosion control measures must be implemented to preclude conveyance and discharge of fine silts and clay particles into the receiving environment. Construction activities should be carried out during dry weather periods that will reduce the chance of erosion. As rainfall is always a possibility, a sediment and erosion control plan must be in place prior to construction.

As a minimum, sediment and erosion control measures should be implemented in conjunction with the requirements of the Provincial document entitled *"Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia", and in compliance with the WLAP's (former MoELP's) "Environmental Best Management Practices for Urban and Rural Land Development in British Columbia", June 2004.*

During construction, a sediment containment system should be employed. The containment system should utilize cut-off ditches with sediment control 'check dams' and a temporary sediment control pond, that must be installed, as per *Develop with Care 2014* Guidelines. The following guidelines shall be used:

- Construction activity should be curtailed or postponed completely during periods of wetter weather.
- Stripping of existing organic topsoil should be undertaken during periods of dry weather only.
- Haul roads internal to the site should be maintained so as to prevent the tracking of mud and debris, both on and offsite. No accumulations of sediment/mud should be allowed on the municipality's roads.
- Import road sub-base fill and crushed gravel base course placement (capping) should follow immediately upon achieving the design subgrade in any given area.
- All catch basin inlets should be covered with filter cloth until construction is completed.
- The rain garden should remain offline until the site is fully vegetated.
- The pond should be constructed last to limit buildup of sediment due to construction.
- In the event of heavy precipitation, all works should be halted.

7.8 Maintenance

The operation and maintenance of the stormwater system will include the upkeep of catch basins, pipes, biofiltration swales, the rain garden and the detention pond, and other related components that are part of conveying stormwater within the drainage basin. Effective and timely maintenance will enable stormwater components to function as intended, mitigating risk to property and infrastructure.

It is recommended that the following actions be undertaken at the prescribed frequencies:

- Road surfaces should be cleaned and swept of debris annually. It is recommended to schedule this maintenance in early Spring (March and April).
- All catch basin/manhole sumps, should be checked every six months for sediment/debris build-up and cleaned accordingly. It is recommended to schedule this maintenance just before and just after the rainy season (September and April).

- All catch basin leads and main pipes should be checked every six months for sediment/debris build-up and cleaned accordingly. It is recommended to schedule this maintenance at the same time the catch basin/manhole sumps are checked.
- Rain garden inlet and outlet grit sumps should be checked every six months for sediment/debris build-up and cleaned accordingly. It is recommended to schedule this maintenance just before and just after the rainy season (September and April).
- Bio-swales should be checked every six months just before and just after the rainy season (September and April). Bio-swales should be checked for the following:
    - Adequate plant growth, replant as required.
    - Sediment buildup, remove as required.
    - Overgrowth, remove excess plant material as required to ensure adequate conveyance.
- The detention pond surfaces, inlet, and outlet piping should be checked annually to make sure adequate storage capacity is provided and to clean/remove sediment/debris accordingly. It is recommended to schedule this maintenance in the dry summer months (July and August).

8.0 SITE ACCESS

The development site is accessed by Copperfield Road (minor collector) via Arden Road (major collector). Arden Road is serviced by Lake Trail Road and Cumberland Road both of which are classified as Arterials. The conceptual site plan, **Figure 1**, prepared by JWT Architecture and Planning/ JWT Design Ltd., proposes an approximately 60m extension of Copperfield Road to access the site. As the extension of the Copperfield Road right-of-way is outside the City boundaries, the extended road will be built to Ministry of Transportation and Infrastructure requirements.

Multimodal access to the property is provided via Copperfield Road and a foot bridge across Piercy Creek which connects to a trail network along the south edge of the Creek. The trail network is proposed to be connected through the site joining Copperfield Road to the Piercy Creek trail network as outlined in **Figure 1**.

9.0 THIRD PARTY UTILITIES

We confirm that BC Hydro, and third party utility services are available along Copperfield Road. All development servicing will be underground per City bylaws.

10.0 CLOSURE

We trust the information provided herein is sufficient to process the applications. This said, we would be pleased to meet at the City's convenience, to discuss the contents and findings of this document as necessary.

Yours truly,

MCELHANNEY LTD.

Matt Sanderson, AScT.
Engineering Technologist

Reviewed By

Chris Durupt, P.Eng.
Project Engineer

CD/njg

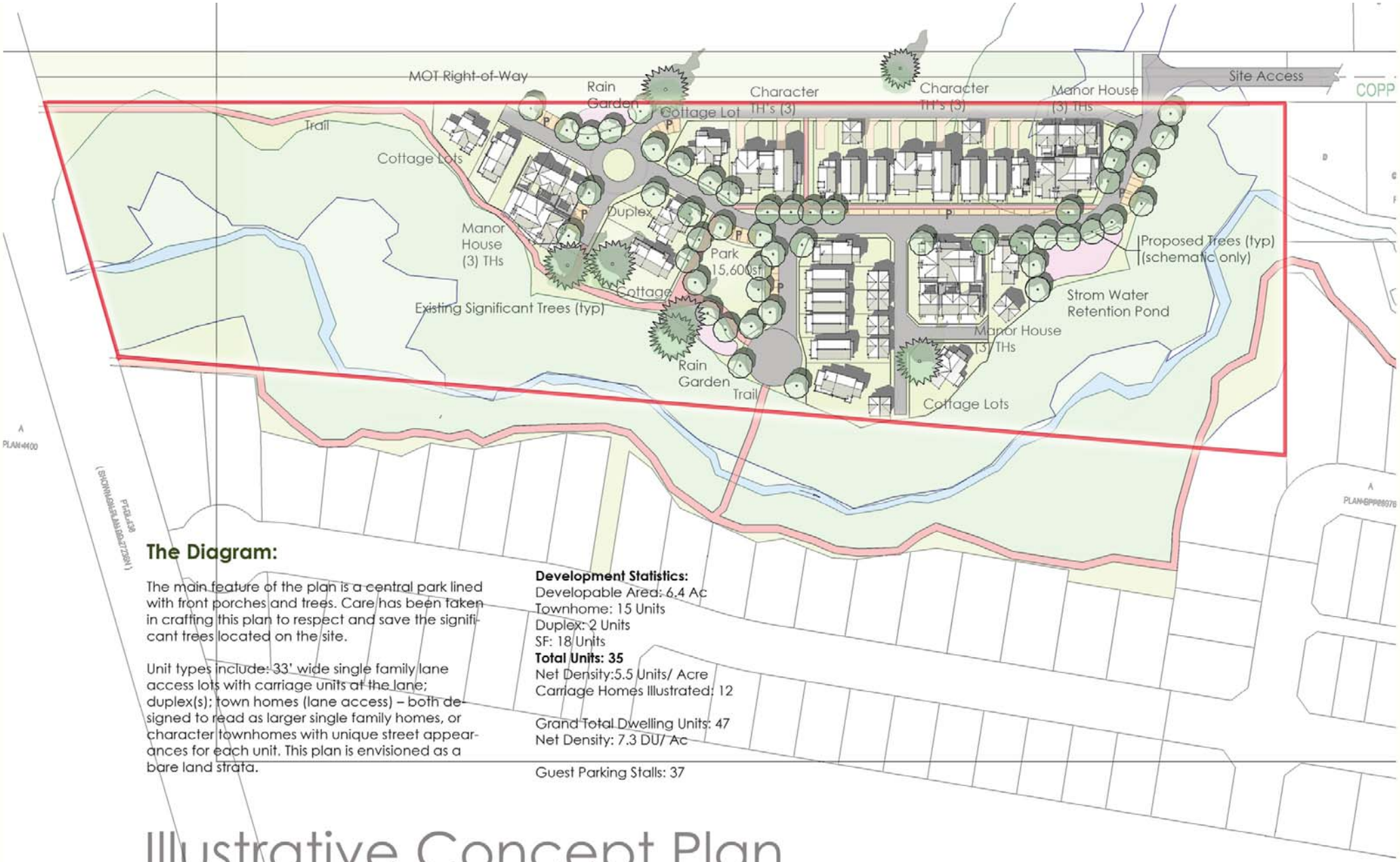
Enclosure

REVISION HISTORY

Date	Status	Revision	Author
October 23, 2019	Final	Rev.1	Matt Sanderson
Sept. 29, 2017	Final	Rev.0	Chris Durupt

LIMITATION

This report has been prepared for the exclusive use of Roseberry Investment Ltd. The material in it reflects the best judgement of the Consultant in light of the information available to the Consultant at the time of preparation. As such, McElhanney, its employees, sub-consultants and agents will not be liable for any losses or other consequences resulting from the use or reliance on the report by any third party.



The Diagram:

The main feature of the plan is a central park lined with front porches and trees. Care has been taken in crafting this plan to respect and save the significant trees located on the site.

Unit types include: 33' wide single family lane access lots with carriage units at the lane; duplex(s); town homes (lane access) – both designed to read as larger single family homes, or character townhomes with unique street appearances for each unit. This plan is envisioned as a bare land strata.

Development Statistics:
Developable Area: 6.4 Ac
Townhome: 15 Units
Duplex: 2 Units
SF: 18 Units
Total Units: 35
Net Density:5.5 Units/ Acre
Carriage Homes Illustrated: 12

Grand Total Dwelling Units: 47
Net Density: 7.3 DU/ Ac

Guest Parking Stalls: 37

Illustrative Concept Plan

September 30, 2019