



**KOERS  
& ASSOCIATES  
ENGINEERING LTD.**  
*Consulting Engineers*

November 23, 2022  
9109-221-03

PO BOX 790  
194 MEMORIAL AVENUE  
PARKSVILLE, BC V9P 2G8  
Phone: (250) 248-3151  
Fax: (250) 248-5362  
www.koers-eng.com

Brooklyn Creek Watershed Society  
1734 Centennial Avenue East  
Comox, BC V9M 2W4

**Attention: Mr. Ian Moul  
President**

Dear Sirs:

**Re: Crown Isle Stormwater Runoff Management System  
Detention Pond 20 Discharge at Parry Place to Brooklyn Creek Watershed  
Hydrologic Overview**

---

Further to the request of Mr. Rick Waldhaus of the Crown Isle Group., we are pleased to present a hydrologic overview of the Crown Isle drainage system within the Brooklyn Creek watershed.

## **1 LETTER PURPOSE**

The purpose of this letter report is to provide a general overview of:

- the drainage system upstream of the point of discharge of the Detention Pond 20 (DP 20) outlet pipe at Parry Place, and
- how the Crown Isle golf course detention pond system manages and controls stormwater runoff prior to the point of discharge from DP 20.

We understand this report will be used by the Brooklyn Creek Watershed Society for the purpose of obtaining grant funding for a hydrologic assessment of Brooklyn Creek (carried out by others).

This letter report was prepared by Koers & Associates Engineering Ltd. for the account of Silverado Land Corp. The material in it reflects Koers & Associates Engineering Ltd. best judgement, in light of the information available to it, at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Koers & Associates Engineering Ltd., accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

## **2 DETENTION POND 20 DRAINAGE SYSTEM**

### **2.1 Catchment Area**

DP 20 services a catchment area of 157 ha (1.57 km<sup>2</sup>). The majority of the catchment, 138 ha (88%), is located within the Crown Isle development. The remainder, 19 ha (12%), is located in the top northwest corner of the catchment, along Lerwick and Ryan roads, and is outside of the Crown Isle development. These catchment areas are shown in **Figure 1**.

.../2



**Figure 1 – Detention Pond 20 Catchment Area**

The catchment area boundary shown in **Figure 1** is based on the City's storm drainage system network and the properties serviced by it and ground elevation contours (0.5 m interval) from the City's on-line GIS mapping program (CourtenayMap).

.../3

## 2.2 Land-Use

The entire catchment is within the City of Courtenay and development is governed by the City's Zoning and Official Community Plan bylaws. Land uses within the catchment area include: Residential (single and multi-family); Commercial, Institutional (Comox Valley Aquatic Centre and Comox Valley Hospital); Parks; and the Crown Isle golf course. A copy of a portion of the City's zoning map is shown in **Figure 2** along with the golf course detention pond system and the DP 20 catchment area boundary.

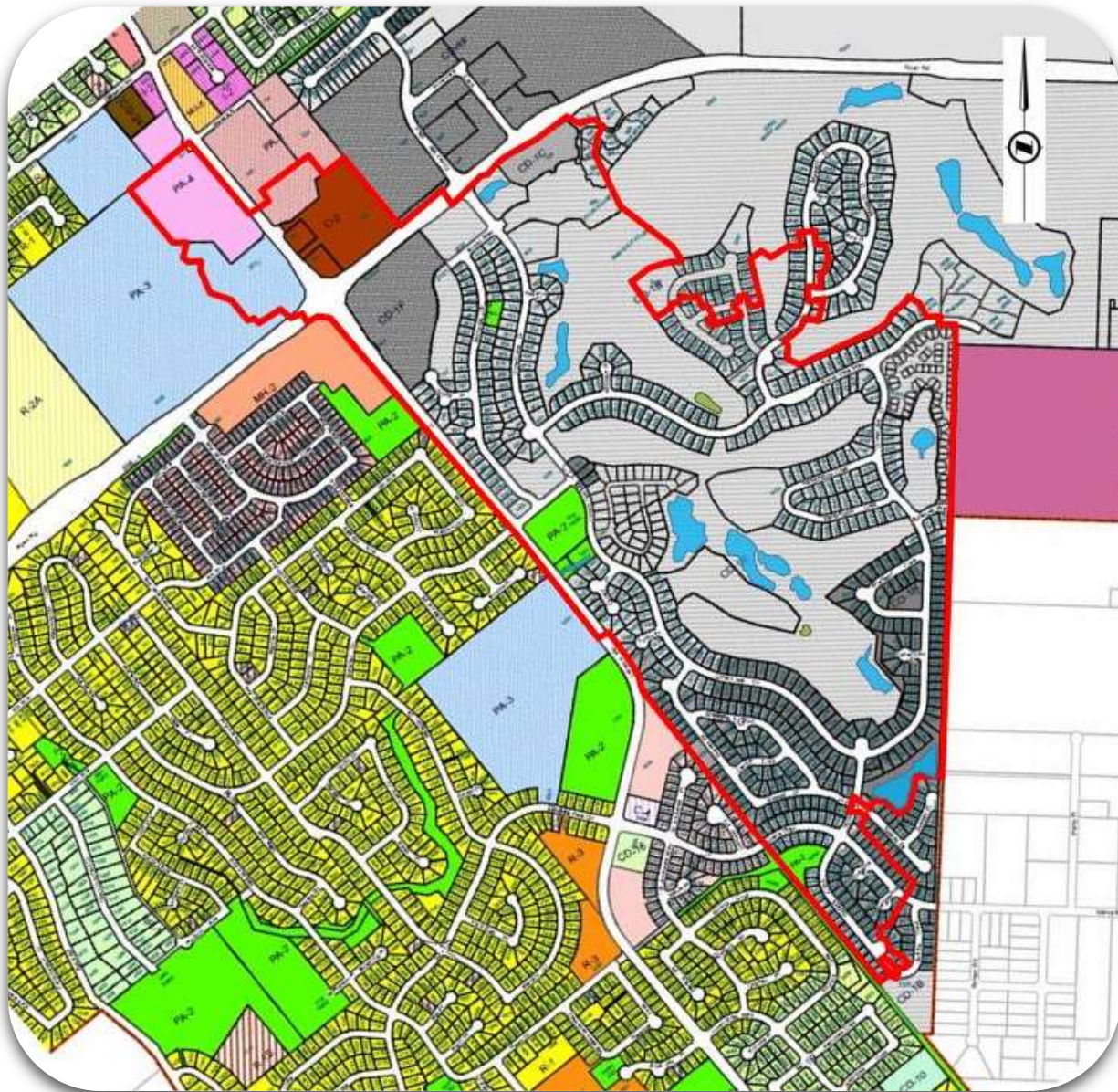


Figure 2 – Detention Pond 20 Catchment Area Land-Use

.../4

## 2.3 Storm Drainage System

Stormwater runoff within the catchment area is conveyed and managed by:

- the City's stormdrain network,
- on-site detention systems (within Multi-Family, Commercial, and Institutional properties),
- two dry detention ponds,
- a City wet detention pond, and
- detention ponds in the Crown Isle golf course.

A brief discussion of each is presented below.

### 2.3.1 City's storm drain network

**Figure 3** shows the City's storm drainage system along with the golf course detention ponds. All stormwater runoff within the catchment area passes through DP 20 and its outlet flow control manhole before discharging to Brooklyn Creek on the east side of Parry Place.

### 2.3.2 On-site systems

City of Courtenay bylaw(s) require commercial, institutional, industrial, and multi-family properties to be equipped with stormwater management infrastructure. The infrastructure is to be designed to reduce the resulting increase in runoff peak flows from the installation of impervious surfaces, e.g., rooftops, driveways, vehicle parking lots, walkways as well as remove debris and oils prior to being discharged into the City's storm drainage system which in turn discharges into the golf course detention pond system.

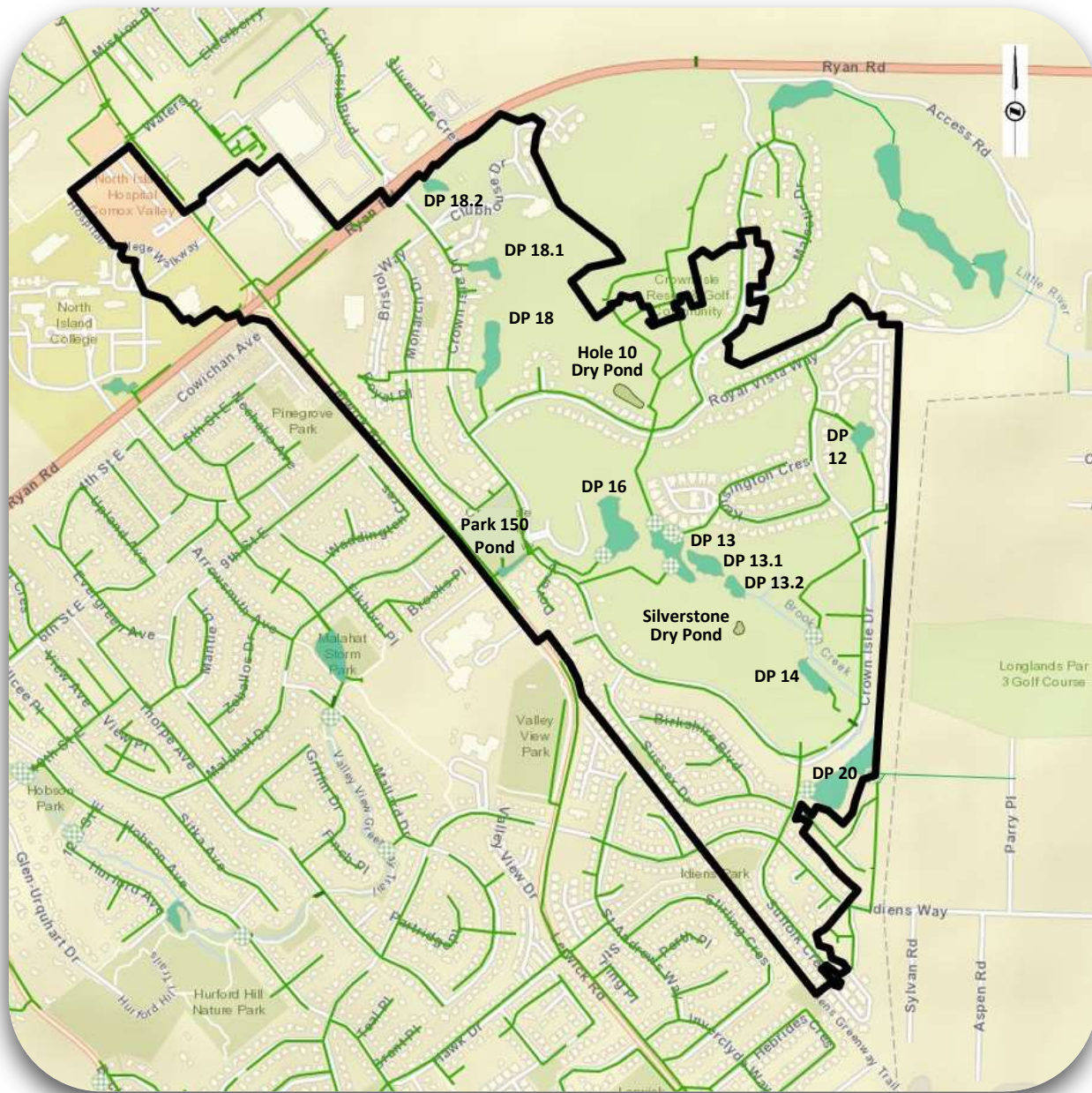
### 2.3.3 Dry detention ponds

There are two dry detention ponds within the catchment. They were constructed over the past two years as a requirement of the City's current subdivision and development approval. They are:

- An off-line dry stormwater detention pond adjacent to the 10<sup>th</sup> hole green which manages stormwater runoff from the Greystone Estates subdivision. Construction of this pond was completed in Year 2021. Runoff released from this pond flows into the City's storm drainage network that discharges into DP 13.
- A dry stormwater detention pond adjacent to the 15<sup>th</sup> hole fairway which manages stormwater runoff from the Silverstone Estates strata development. Runoff released from this pond flows into the open channel between DP 13.2 and DP 14.

.../5

Both of the dry ponds are equipped with an outlet flow control structure that is designed to limit post peak flows to be equal to pre-development peak flows for the 2 year, 5 year, 10 year, and 25 year return period design storm events based on the City's current design rainfall hyetograph. The location of each pond is shown on **Figure 3**.



**Figure 3 – Detention Pond 20 Catchment Area Storm Drain Network**

Brooklyn Creek Watershed Society

Mr. Ian Moul

### 2.3.4 150 Park Pond

There is a drainage channel in the City's Crown Isle Park 150 Year Grove on Crown Isle Drive adjacent to Malahat Drive that functions as a wet pond during rainfall events. The drainage channel receives most of its flow from the 19 ha of land located in the top northwest corner of the catchment that is outside of the Crown Isle development denoted by the red shaded area on [Figure 1](#). The rate of the flow out of the drainage channel is controlled by a flow control manhole. After passing through the flow control structure, runoff is conveyed by the City's storm drainage network and discharged into DP 13. If the water level depth in the flow control structure exceeds 1.04 m, runoff will also flow into DP 16.

### 2.3.5 Golf Course Detention Pond System

All stormwater runoff passes through one or more of the ten (10) golf course detention ponds within the catchment. Each detention pond is equipped with a flow control structure at its outlet. The detention pond and flow control structure are designed to reduce the peak flow leaving the pond. During a rainstorm event, the rate of flow entering begins to exceed the rate of flow leaving the pond, resulting in the rising of the water level as stormwater runoff is detained. As the rainstorm event subsides and the rate of flow entering the pond decreases, the water level falls and returns to its normal operating level.

The golf course detention system was constructed in the early 1990's as part of the Crown Isle development. The location of each feature is shown on [Figure 3](#).

## 2.4 Stormwater Detention Volumes

Prior to discharge to Parry Place, stormwater runoff passes through the stormwater management systems which have an estimated combined storage detention capacity of 67,300 m<sup>3</sup> as summarized on the following page in [Table 1](#).

.../7



**Table 1 – Detention Pond 20 Drainage System Storage Volumes**

Storage Location	Available Volume m <sup>3</sup>
<b><i>Crown Isle Detention Ponds</i></b> <sup>(1)</sup>	
Detention Pond (DP) 18.2	1,800
DP 18.1	2,600
DP 18	6,000
DP 16	10,200
DP 13	8,100
DP 13.1	4,900
DP 13.2	3,850
DP 14	5,750
DP 12	100
DP 20	19,600
<b><i>Crown Isle Detention Ponds total</i></b>	
63,000	
<b><i>Other Storage Locations</i></b> <sup>(2)</sup>	
101 Lerwick Rd CV Hospital	2,120
377 Lerwick Rd CVRD Aquatic Centre	60
388 Lerwick Rd Home Depot	n/a <sup>(3)</sup>
444 Lerwick Rd Crown Isle Shopping Plaza	660 <sup>(4)</sup>
1055 Crown Isle Dr The Timbers	20 <sup>(4)</sup>
1351 Crown Isle Dr 150 Park	360 <sup>(5)</sup>
2828 Bristol Way The Grove	n/a
1444 Crown Isle Dr Dry Pond Silverstone Estates	450 <sup>(6)</sup>
Hole 10 Dry Pond Greystone Estates	730 <sup>(6)</sup>
<b><i>Other Storage Locations total</i></b>	
> 4,400	
<b>Total Storage Volume, m<sup>3</sup></b>	
> 67,300	

**Notes:**

- (1) Storage volumes derived from topographic survey and rounded to the nearest 50 m<sup>3</sup> (see *Crown Isle Drainage System Optimization Study, January 17, 2018, Table 17, Full Build-Out Scenario No. 5*, prepared for Silverado Land Corp.).
- (2) Unless noted otherwise, the volumes for Other Storage Locations were obtained from published information by third party sources, such as site servicing reports or design drawings and have not been field checked or verified for accuracy. Storage volumes rounded to nearest 10 m<sup>3</sup>.
- (3) Stormwater runoff management system reported to include: rooftop detention; two infiltration trenches; an infiltration swale; two deep aquifer injection wells; and two oil/grit interceptors.
- (4) Based on record drawings.
- (5) Estimated based on approximate ditch length, width, and depth.
- (6) From detailed design drawings prepared by Koers & Associates Engineering Ltd. for these development projects. Based on topographic survey and rounded to nearest 50 m<sup>3</sup>.

Brooklyn Creek Watershed Society  
Mr. Ian Moul

The total detention storage capacity of 67,300 m<sup>3</sup> for the 157 ha catchment equates to a unit storage volume of more than 428 m<sup>3</sup>/ha.

## 2.5 Discharges from Detention Pond 20 to Parry Place

The Crown Isle golf course detention facilities are designed to manage and control stormwater runoff to reduce peak flows prior to the discharge from DP 20. Each pond has a control structure at the outlet that limit flows by detaining water, causing the water level to temporarily rise. Flows out of DP 20, the last in the system, pass through a flow control structure located inside a 1500 mm diameter manhole. The manhole is 3.7 m deep with a 900 mm dia. submerged inlet pipe from DP 20, a 900 mm dia. outlet, and 2.0 m high concrete wall in the middle with a rectangular opening at the bottom. In front of the opening is a metal rectangular orifice plate that can be raised or lowered to change the height of the opening and thereby influence the water level and the exiting rate of flow. A design cross section of the DP 20 flow control structure is shown in **Figure 4**.

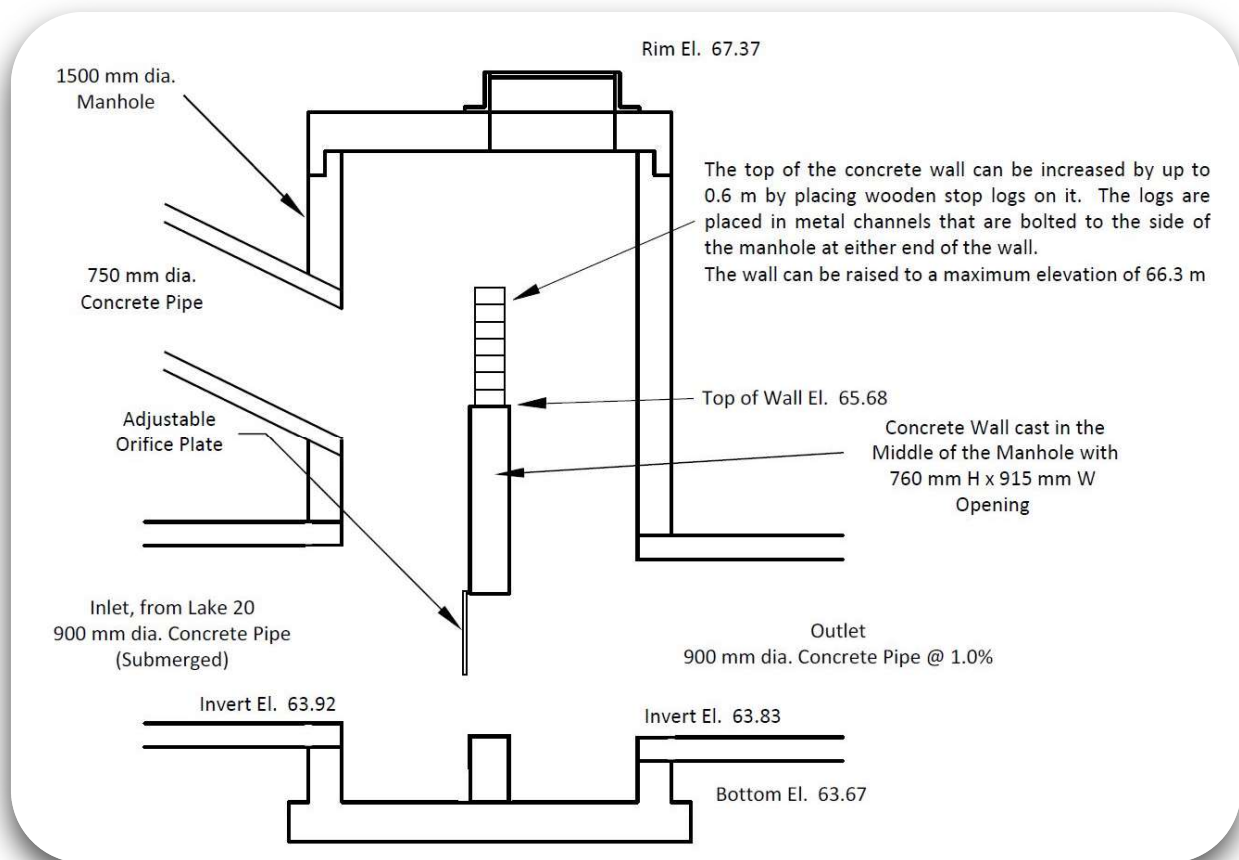


Figure 4 – Detention Pond 20 Outlet Flow Control Manhole

.../9



November 23, 2022

9

9109-221-03

Brooklyn Creek Watershed Society

Mr. Ian Moul

### 3 SUMMARY

The principal findings of this letter report are:

- The catchment area for DP 20 encompasses 157 ha (1.57 km<sup>2</sup>) of which 138 ha (88%), is located within the Crown Isle development.
- All land within the DP 20 catchment is within the City of Courtenay.
- Stormwater runoff from within the DP 20 catchment passes through various stormwater management systems before being discharged from DP 20.
- The stormwater detention facilities within the catchment have an estimated combined stormwater detention volume capacity of 67,300 m<sup>3</sup>.
- The Crown Isle golf course detention facilities are designed to manage stormwater runoff to reduce peak flows prior to the discharge from DP 20 entering Brooklyn Creek.
- The DP 20 flow control structure is constructed with features that allow it to restrict flow being discharged to Brooklyn Creek.

We trust this information is sufficient for your needs at this time. Please do not hesitate to contact us if you have any questions.

Yours truly,

KOERS & ASSOCIATES ENGINEERING LTD.



For Chris Holmes

Chris Holmes, P.Eng.  
Project Engineer

Permit to Practise No. 1001658

cc: Crown Isle Group. Mr. Rick Waldhaus



Richard Cave, ASCT  
Project Technologist

KOERS & ASSOCIATES ENGINEERING LTD.



ASSOCIATION OF CONSULTING  
ENGINEERING COMPANIES  
BRITISH COLUMBIA