

# DRAINAGE REPORT & EROSION CONTROL

**To:** Garret Johnson, Owner, PCI  
**From:** Toby Lockhart, PE  
**Date:** November 14, 2022  
**Re:** Ridgeview Subdivision



## 1.0 Site Overview

The site is on the uphill (north) side of Glacier Highway (7400) and is located at the base of Heintzleman Ridge just above the Mendenhall Wetlands and the Gastineau Channel receiving water. Most of the roughly 20-acre site remains densely forested, with approximately 3-acres in the lower southwest corner having been cleared, but not grubbed.

There are five (5) 24-inch corrugated metal pipe (CMP) cross-culverts along the ~750-ft Glacier Highway frontage to which the property discharges stormwater runoff. There are five (5) associated drainages that cross the site from north to south, only one of which (drainage #1) originates from the top of Heintzleman Ridge. This drainage crosses the northwest corner of the proposed development and runs down the shared boundary with the Vista Del Sol Subdivision to the west. There is one other significant drainage (#6) that passes just to the east of the proposed development and was not considered in this evaluation. All other drainages (#2 - #5) originate within the 20-acre site and carry far less flow.

The proposed grading and drainage scheme minimizes the amount of runoff directed to drainage #1 and CMP-1, and divides and directs the remaining runoff to CMP-2, 3, 4 and 5.

## 2.0 Increase in stormwater runoff

Drainage basins shown on the attached Exhibits A & B were evaluated for pre- and post-development flows in accordance with the 2010 CBJ Manual of Stormwater Management Practices. The resulting increase in runoff flows in cubic feet per second (CFS) are summarized in Table 1 below:

Table 1 – Stormwater Runoff Summary			
Discharge Point	Increase in Runoff (CFS)*	Post-Development Total Flow (CFS)	Discharge Culvert Capacity (CFS)
CMP-1	-0.4	N/A	N/A
CMP-2	5.5	6.7	32.1
CMP-3	8.3	10.8	24.2
CMP-4	8.3	10.3	27.9
CMP-5	4.4	8.5	23.5

\*Results are based on an assumed precipitation intensity(i) = 3.04 inches/hour for a 5-min duration and a 25-year storm event. See attached calculations for more detail.

### **3.0 Connections to established channels**

The rough grading and drainage plan shown on plan sheets G-001, C-301, C-302, and C-303 depicts the overall surface grading and piping systems. Ultimately, each system will outfall to one of the five (5) 24-inch CMP cross-culverts along Glacier Highway.

### **4.0 Evaluation of downstream drainage ways**

Each Glacier Highway cross-culvert that will see an increase in flow has been evaluated and found to have ample capacity for the additional demand (see Table 1 above).

### **5.0 Summary of Required Improvements (CBJ 49.35, Article V)**

Following is a summary of the approach to CBJ code requirements for the drainage plan:

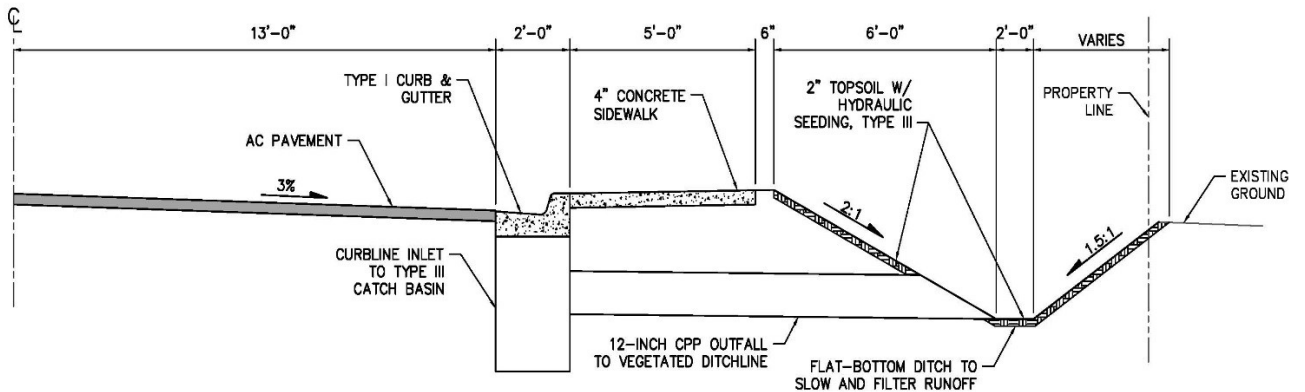
- a) Plan Requirements
  - 1) Increase in Runoff: See Table-1 above
  - 2) Evaluation of Existing Drainage Ways: See section 4.0 and Table-1 above
  - 3) Public and any required drainage facilities: See the plan and profile sheets (C-201, C-202, and C-203) for the drainage improvements within the Seymour Way Right of Way (ROW). See Sheet C-301 for two detention ponds at ~STA "S" 13+00 LT, and the drainage #1 outfall system along the west boundary of the property. See Sheets C-302 and C-303 for the east/west ROW connection to the Alaska Mental Health Trust property to the east of the proposed development.
  - 4) Outlet to Established Drainage: See section 4.0 above
- b) Easements: See the preliminary plat for proposed maintenance easements for:
  - (1) Existing drainage outfall along the common boundary between the proposed Ridgeview Subdivision and the Vista Del Sol Subdivision.
  - (2) Detention ponds (within Parent Lot 1) for Seymour Way roadway runoff.
  - (3) Slope easements along all proposed CBJ right of way for ditch and backslope maintenance.
- c) Drainage Systems Required: See plan sheets C-301, C-302, and C-303.
- d) Construction timing: See project narrative and phasing plan.

### **6.0 Erosion Control**

In accordance with the requirements of the Alternate Residential Subdivision (ARS) plan, the proposed development contains a minimum of 30% open space (mostly green space) within each parent lot. The inclusion of green space will reduce the volume of runoff and help treat contaminants at their source. In addition to meeting this green space requirement, several Best Management Practices (BMP's) have been incorporated into the drainage plan to treat contaminants at their source and reduce contaminants discharged to the environment.

### Curb Inlet Outfalls to Vegetated Ditchlines

Rather than employ a traditional enclosed stormwater collection system with structures and piping along Seymour Way, the grading and drainage plan calls for roadway runoff to be captured in curb inlets and discharged to a flat-bottom vegetated ditchline (see figure 1 below).



**Figure 1 – Vegetated Ditchline BMP**

### Detention Ponds

Two detention ponds of approximately 500 cubic yards each at approximate STA “S” 13+00, 60’ LT will be constructed to treat runoff from the two largest drainage basins (II and FF), as well as snow melt from the snow storage area at approximate STA “S” 14+00, 50’ LT.

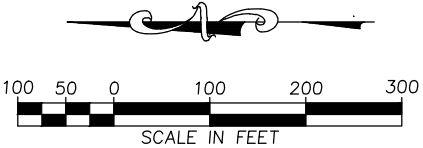
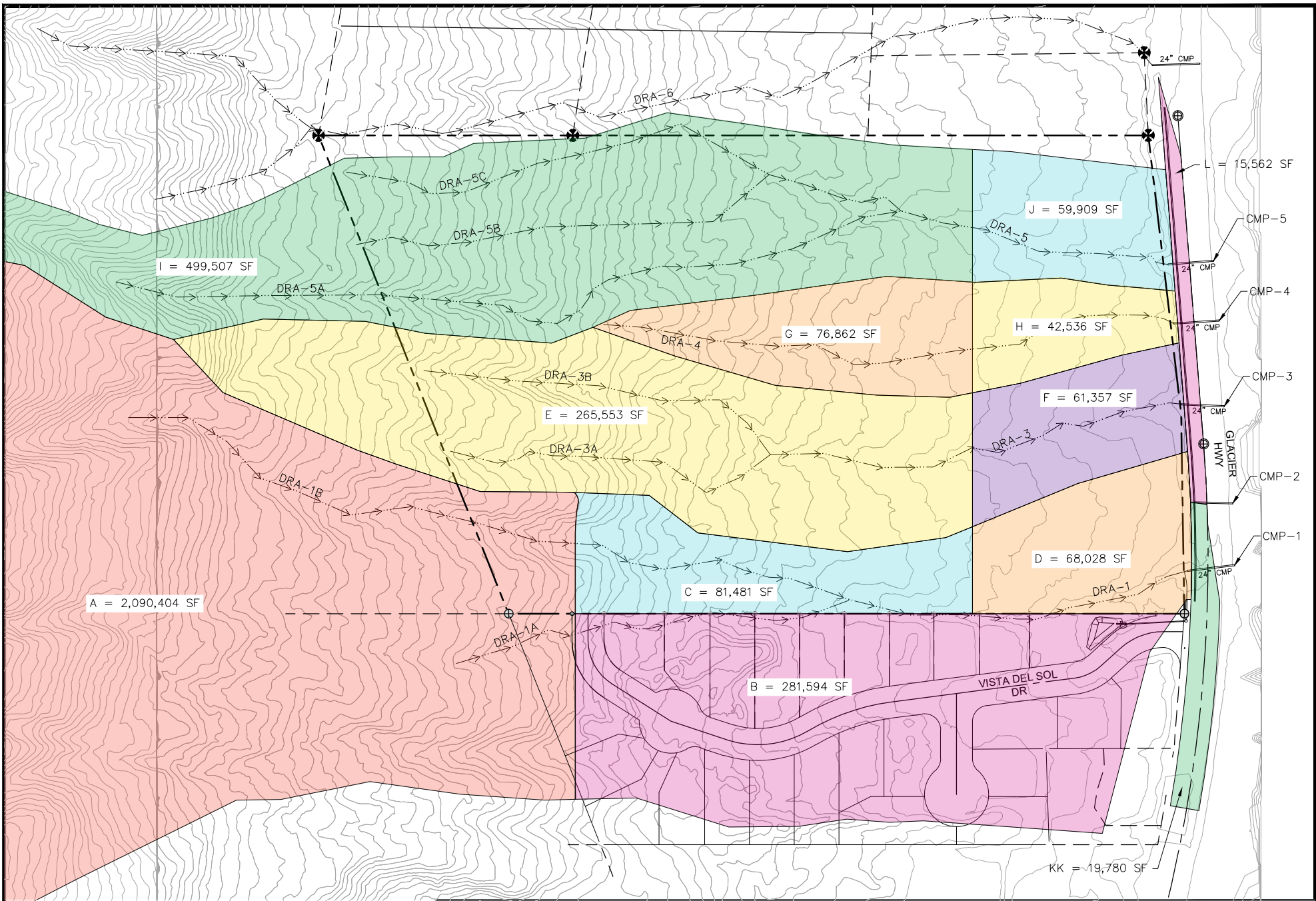
### Oil-Water Separators

An oil-water separator will also be installed at the outfall of each of the four post-development drainage basins prior to discharge to the Glacier Highway cross-culverts.

### **7.0 Drainage Summary**

The downstream drainage ways have been evaluated for the impact of the proposed improvements, and found to be adequate to handle the increase in runoff, and several BMP’s have been incorporated to manage and mitigate the increased runoff and treat contaminants prior to discharge to the environment.

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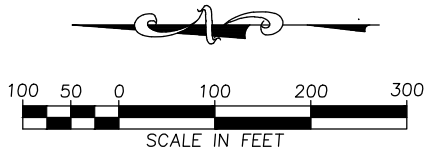
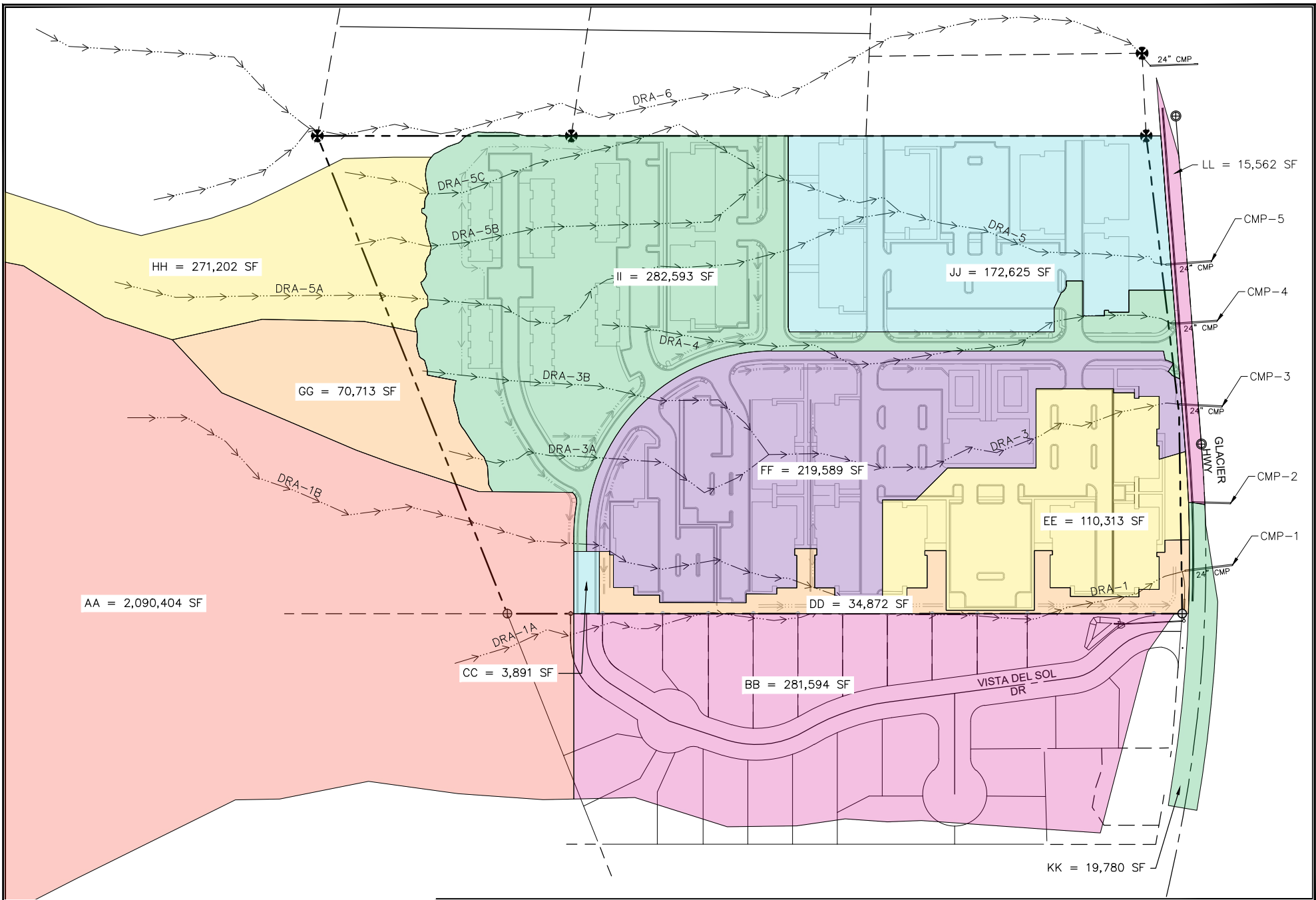


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RIDGEVIEW SUBDIVISION  
 EXHIBIT A  
 EXISTING DRAINAGE BASINS

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RIDGEVIEW SUBDIVISION  
EXHIBIT B  
POST-DEVELOPMENT  
DRAINAGE BASINS

Drainage Area Name	C	Area (SF)	Acres	Discharge	Description
<u>Existing Basins</u>					
A	0.1	2,090,404	48.0	CMP-1	Upper reaches (above 20 acres) - dense forest
B	0.42	281,593	6.5	CMP-1	Vista Del Sol - Single family residential - 3.0 DU/GA
C	0.1	81,481	1.9	CMP-1	Lower reaches - Ridgeview - dense forest
D	0.15	68,028	1.6	CMP-1	Lower reaches - Ridgeview partially cleared - light forest
E	0.1	265,553	6.1	CMP-3	Above partially cleared Ridgeview - dense forest
F	0.15	61,357	1.4	CMP-3	Partially cleared Ridgeview - light forest
G	0.1	76,862	1.8	CMP-4	Above partially cleared Ridgeview - dense forest
H	0.15	42,536	1.0	CMP-4	Partially cleared Ridgeview - light forest
I	0.1	499,507	11.5	CMP-5	Above partially cleared Ridgeview - dense forest
J	0.15	59,909	1.4	CMP-5	Partially cleared Ridgeview - light forest
K	0.9	19,780	0.5	CMP-2	Glacier Highway runoff
L	0.9	15,562	0.4	CMP-4	Glacier Highway runoff
<u>Proposed Basins</u>					
AA	0.1	2,090,404	48.0	CMP-1	Upper reaches (above 20 acres) - dense forest - Same as A
BB	0.42	281,593	6.5	CMP-1	Vista Del Sol - Single family residential - 3.0 DU/GA - Same as B
CC	0.9	3,891	0.1	CMP-1	Upper Ridgeview Hardscape - Seymour Way
DD	0.25	34,872	0.8	CMP-1	Lawns and greenspace along west boundary of improvements
EE	0.71	110,313	2.5	CMP-2	Total area of lower portion of parent lot 1
	0.25	33,094			30% Greenspace
	0.9	77,219			70% Hardscape
FF	0.71	219,589	5.0	CMP-3	Total area of upper portion of parent lot 1
	0.25	65,877			30% Greenspace
	0.9	153,712			70% Hardscape
GG	0.1	70,713	1.6		Upper reaches (above 20 acres) - dense forest
HH	0.1	271,202	6.2		Upper reaches (above 20 acres) - dense forest
II	0.35	282,593	6.5	CMP-4	Mostly parent lot 3 + the east side of Seymour Way
	0.25	141,297			50% Greenspace
	0.9	70,648			50% Hardscape
JJ	0.71	172,625	4.0	CMP-5	Mostly parent lot 2
	0.25	51,788			30% Greenspace
	0.9	120,838			70% Hardscape
KK	0.9	19,780	0.5	CMP-2	Glacier Highway runoff - Same as K
LL	0.9	15,562	0.4	CMP-4	Glacier Highway runoff - Same as L

# Stormwater Hydrologic Calculations

Based on the August 2010 CBJ Manual of Stormwater Best Management Practices

## PIPE CAPACITY CALCULATIONS

Mannings Equation from 19-4 of the Civil Engineering Reference Manual for the PE

$$Q = V * A = (1.49/n) A (R^{2/3}) (S^{1/2})$$

Where,

- Q = Flow rate in CFS
- V = Velocity in feet per second
- n = Manning coefficient (see Table 5-5)
- R = Hydraulic radius (A/P or D/4 for full pipe conditions)
- A = Cross-section area of the flow ( $\pi * (D^2) / 4$  for full pipe)
- P = Wetted perimeter of the flow ( $\pi * D$  for full pipe)
- D = Diameter (FT)
- S = Slope expressed as a decimal (rise over run)

Culvert	Q (CFS)	n	D (FT)	(Pipe Full Cond.)			S	Description
				R	A	P		
CMP-1	15.26	0.028	2	0.5	3.142	6.283	0.021	Major drainage to the west
CMP-2	32.11	0.028	2	0.5	3.142	6.283	0.093	Curb Inlet - slope from DOT plans - outfall not found
CMP-3	24.24	0.028	2	0.5	3.142	6.283	0.053	
CMP-4	27.86	0.028	2	0.5	3.142	6.283	0.070	Curb inlet at approach
CMP-5	23.54	0.028	2	0.5	3.142	6.283	0.050	

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## PEAK FLOW CALCULATIONS FOR CONVEYANCE

Peak Flow Determination via the Rational Method (Appendix D)

$$Q_r = (C)(I)(A)$$

Where,

- Q = Peak flow in cfs for a storm of return frequency R
- C = Estimated runoff coefficient (portion that becomes runoff) - from Table D-4 on page D-9  
With several land cover types, Cc = Composite C = (C1Area1 + C2Area2...+CnAn) / Total Area
- i = Water quality peak rainfall intensity (in/hour) - From NOAA\*
- A = Drainage subbasin area (acres)

\*For conveyance sizing, a Tc = 5 min with a 25-year return period yields i=3.04 per the online NOAA Precip Table.

### Peak Flows for Conveyance

Capacity(CFS)	Discharge Point	Q(cfs)	i	Cc	C	Area (SF)	Drainage Basin
15.26	<b>CMP-1</b>						
	Existing	1.3	3.04	0.12	0.1	81,481	C
					0.15	68,028	D
						149,509	Total
32.11	<b>CMP-2</b>						
	Existing	1.2	3.04	0.9	0.9	19,780	K
						19,780	Total
	Proposed	6.7	3.04	0.73	0.71	110,313	EE
				0.9	19,780	KK	
					130,093	Total	
24.24	<b>CMP-3</b>						
	Existing	2.5	3.04	0.11	0.1	265,553	E
					0.15	61,357	F
						326,910	Total
27.86	<b>CMP-4</b>						
	Existing	2.0	3.04	0.21	0.1	76,862	G
					0.15	42,536	H
					0.9	15,562	L
					134,960	Total	
23.54	<b>CMP-5</b>						
	Existing	4.1	3.04	0.11	0.1	499,507	I
					0.15	59,909	J
						559,416	Total
23.54	<b>CMP-5</b>						
	Proposed	8.5	3.04	0.705	0.71	172,625	JJ
						172,625	Total

\*Note: drainage areas A and B excluded for the net increase/decrease calculation because those basins are not changing.