Powder Mountain Resort

Village Nest & Overlook Pointe

Supplemental Document to Storm Water Master Plan

Prepared for:

Summit Powder Mountain

Prepared by:
Talisman Civil Consultants, LLC
1588 South Main Street, Suite 200
Salt Lake City, Utah 84115

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1.0 INTRODUCTION

In 2019, Talisman Civil Consultants prepared a storm drain master plan for Powder Mountain. The purpose of the master plan document is to provide information that can be utilized to design key aspects of the Powder Mountain storm drain system. This document is intended to build upon the master plan and describe a newly proposed storm drain detention pond that will provide storage volume for the Village Nest & Powder Point developments. Supporting calculations are provided to ensure that new infrastructure conforms to the design standards identified in this document and the original master plan.

2.0 METHODOLOGY

The parameters used to evaluate the present and future capacity requirements of the storm drain conveyance system are based on the Weber County Storm Water Management Plan & Design Methods and Considerations. Key design principles are:

- Design the initial collection and conveyance system for the 10-year, 24-hour storm.
- Design the major collection of multiple initial systems (e.g., ponds) for the 100-year, 24-hour storm.
- Ensure that the post-development discharge rate is less than or equal to pre-development discharge rate.

The software used to perform the drainage calculations is Bentley Haestad's SewerGEMS, utilizing physical attributes derived from an existing topographic LiDAR survey, and proposed storm drain design. NOAA Atlas 14 precipitation intensity tables with a latitude and longitude corresponding to Powder Mountain were used as the basis of storm data within the hydraulic model. See Table 1 below or the Appendix in the Main Powder Mountain Storm Drain Master Plan.

Table 1 – NOAA Atlas 14 Powder Mountain Precipitation Data

Storm Event	10 Year 24-Hour	100 Year 24-Hour
Rainfall (in)	3.97	5.76

The storm water model utilizes SCS curve number methodology which includes:

- The Soil Conservation Service Method (commonly known as SCS or TR-55 Method) was used to analyze the hydrology of site.
- The basis of the curve number method is the empirical relationship between the retention (rainfall not converted into runoff) and runoff properties of the watershed and the rainfall. It accounts for most runoff producing watershed characteristics: soil type, land use/treatment, surface condition, and antecedent moisture condition.
- Composite Curve Numbers (CN Values) were developed by reviewing impervious, and pervious areas.
- The NOAA Atlas 14 precipitation data was used to create SCS Type II & storm distribution hydrograph curves.

3.0 Analysis & Results

Catchment Areas

The site is broken down into 5 tributary catchment areas. Each catchment area was delineated according to the existing topography, and proposed grading and drainage plans. The total tributary area equates to approximately 878,854 square feet. See Exhibit SD05 in the Appendix.

Each catchment area is defined with an SCS curve number. Higher curve numbers are a result of greater percentage of impervious area and/or more impervious soils which equate to more storm runoff. Lower curve numbers equate to less runoff because water is infiltrated directly into the ground, and/or must navigate grasses and shrubbery, etc. The curve numbers for fully impervious areas are defined at 98. Whereas the curve number for the surrounding natural landscape is 70, consistent for mountainous brush weed grass mixture cover types of fair condition. The parcels for Village Nest were conservatively assumed to be 100% impervious. The parcels at Powder Point were assumed to have 4,500 square feet of impervious area for future buildings and driveways, consistent with the master plan. Furthermore, roadways were deemed completely impervious.

Time of concentration was calculated via the Rational Method and assigned to each catch basin. See the Catchment Tables in the Appendix for a tabular summary of each catchment area including total area, SCS curve number and time of concentration.

Detention

To calculate the required detention pond volume, predevelopment/post development analysis was conducted using the 100-year, 24-hour storm (5.76”) per the Weber County Storm Water Management Plan.

The predevelopment discharge rate was found by running the model assuming natural vegetation cover and soil type. The post development discharge rate was found by running the model after adjusting the curve numbers to reflect the amount of assumed impervious area added by future development.

The pond discharge rate was limited to the predevelopment discharge rate. The difference between the predevelopment flow rate and the post development flow rate over a 24-hour period would define the detention volume required. See Tables 2 on the next page.

Table 2 – Predevelopment vs Post development Curve Numbers

Catchment Area	Predevelopment CN	Post Development CN
1	70	92
2	70	75
3	70	84
4	70	74
5	70	70

- The overall peak predevelopment discharge rate was found to be 39.22 cfs.
- The overall peak post development discharge rate was found to be 35.15 cfs.

This resulted in a minimum detention volume of 27,190 cubic feet to detain the pre/post runoff difference per a 24-hour SCS Type II storm. Actual pond volume was designed to be 3' deep with 31,600 cubic feet of volume, resulting in just under 4,500 cubic feet of excess volume. Furthermore, 1' of free board has been added to bring the total depth to 4'. See the Pond Tables & Graph in the Appendix.

Two (2) 24" outlets are required to limit the discharge rate to predevelopment conditions. Results from the model indicate the post-development discharge rate to be 35.15 cfs.

Conveyance

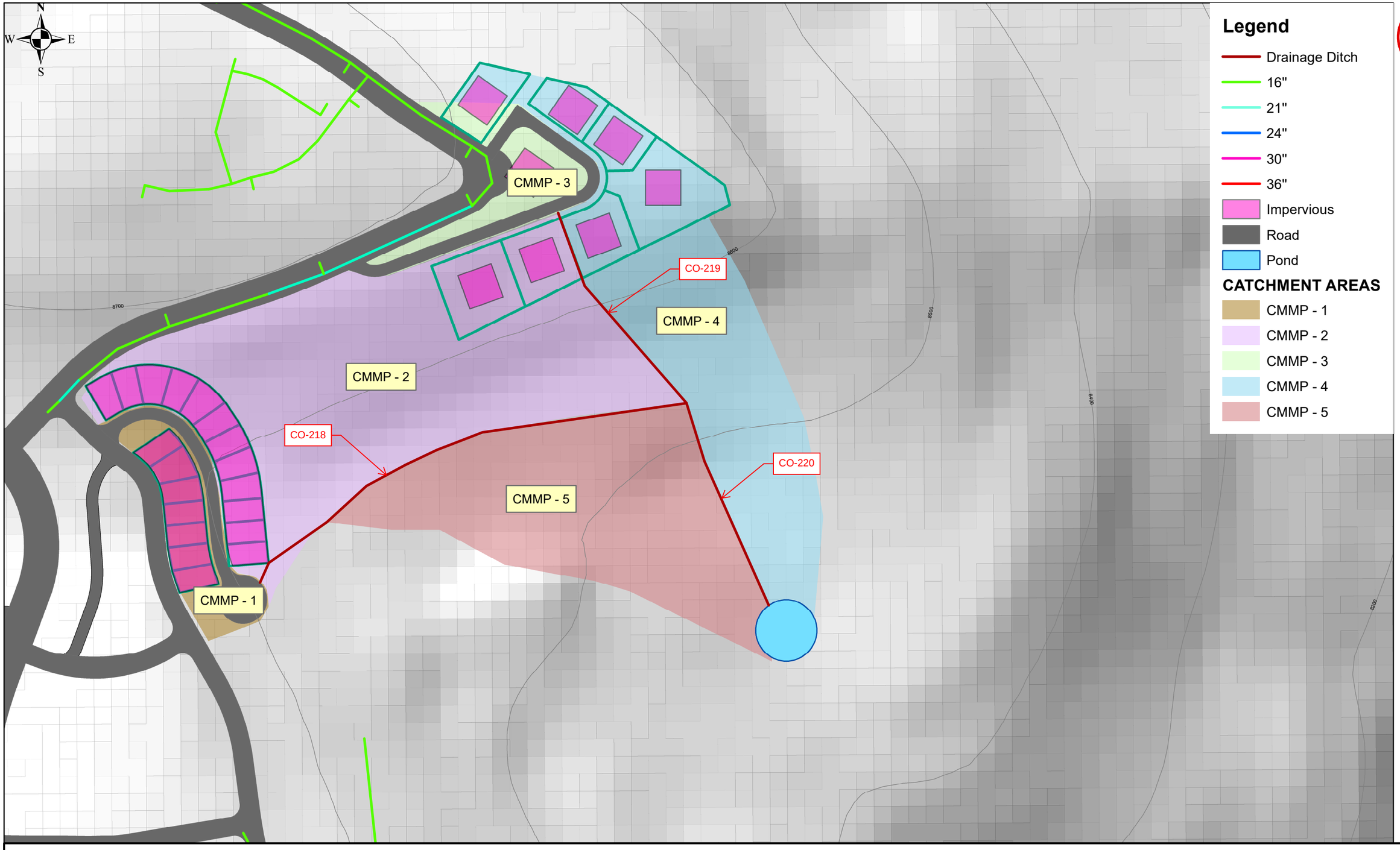
Runoff will be conveyed from Village Nest and Powder Point via rip-rap lined V ditch. The ditch will be 4' wide and 1' deep, lined with D_{50} 4" rip rap at a depth of 8" and lined with 4oz unwoven fabric. Model results indicate the ditches will adequately convey the 10-year and 100-year storm. See the Conduit Table in the Appendix.

4.0 Summary

In summary, the storm water design satisfies the Weber County Stormwater Master Plan Standards. A model schematic and all supporting storm water calculations and documentation can be found in the Appendix.

Appendix

SD05



POWDER MOUNTAIN: FUTURE DEVELOPMENT

Storm Drain Exhibit 05 - Powder Point & Village Nest

March 2023

0 130 260 520 780 1,040 Feet

TALISMAN CIVIL CONSULTANTS

FILENAME: N:\SLB0793\Cadd\22-200.49 - Village Nest Updates\GIS\mxd\EasternMasterPlannedPond.mxd

Catchment Table - Predevelopment Conditions (100 Year Storm)

Current Time: 1440.00 min

Label	Outflow Element	Area (User Defined) (ft^2)	SCS CN	Time of Concentration (min)	Volume (Total Runoff) (ft^3)	Flow (Maximum) (cfs)
CMMP - 1	CB-MP-1	54,477.070	70.000	7.000	6,267.0	2.47
CMMP - 2	CB-MP-3	350,275.000	70.000	8.000	40,295.0	15.51
CMMP - 3	CB-MP-2	58,194.740	70.000	7.000	6,695.0	2.64
CMMP - 4	O-1	222,133.000	70.000	8.000	25,554.0	9.84
CMMP - 5	O-1	193,774.000	70.000	7.000	22,292.0	8.78

Catchment Table - Postdevelopment Conditions (100 Year Storm)

Current Time: 0.00 min

Label	Outflow Element	Area (User Defined) (ft^2)	SCS CN	Time of Concentration (min)	Volume (Total Runoff) (ft^3)	Flow (Maximum) (cfs)
CMMP - 1	CB-MP-1	54,477.070	92.000	7.000	14,486.0	5.61
CMMP - 2	CB-MP-3	350,275.000	75.000	8.000	50,314.0	19.55
CMMP - 3	CB-MP-2	58,194.740	84.000	7.000	11,824.0	4.79
CMMP - 4	O-1	222,133.000	74.000	8.000	30,583.0	11.85
CMMP - 5	O-1	193,774.000	70.000	7.000	22,292.0	8.78

Pond Table - Predevelopment Conditions (100 Year Storm)

Current Time: 1440.00 min

Label	Flow (Total In Maximum) (cfs)	Flow (Out to Links Maximum) (cfs)	Storage (Maximum) (ft^3)	Is Ever Overflowing?
PO-1	39.22	29.53	21,902.7	False

Pond Table - Postdevelopment Conditions (100 Year Storm)

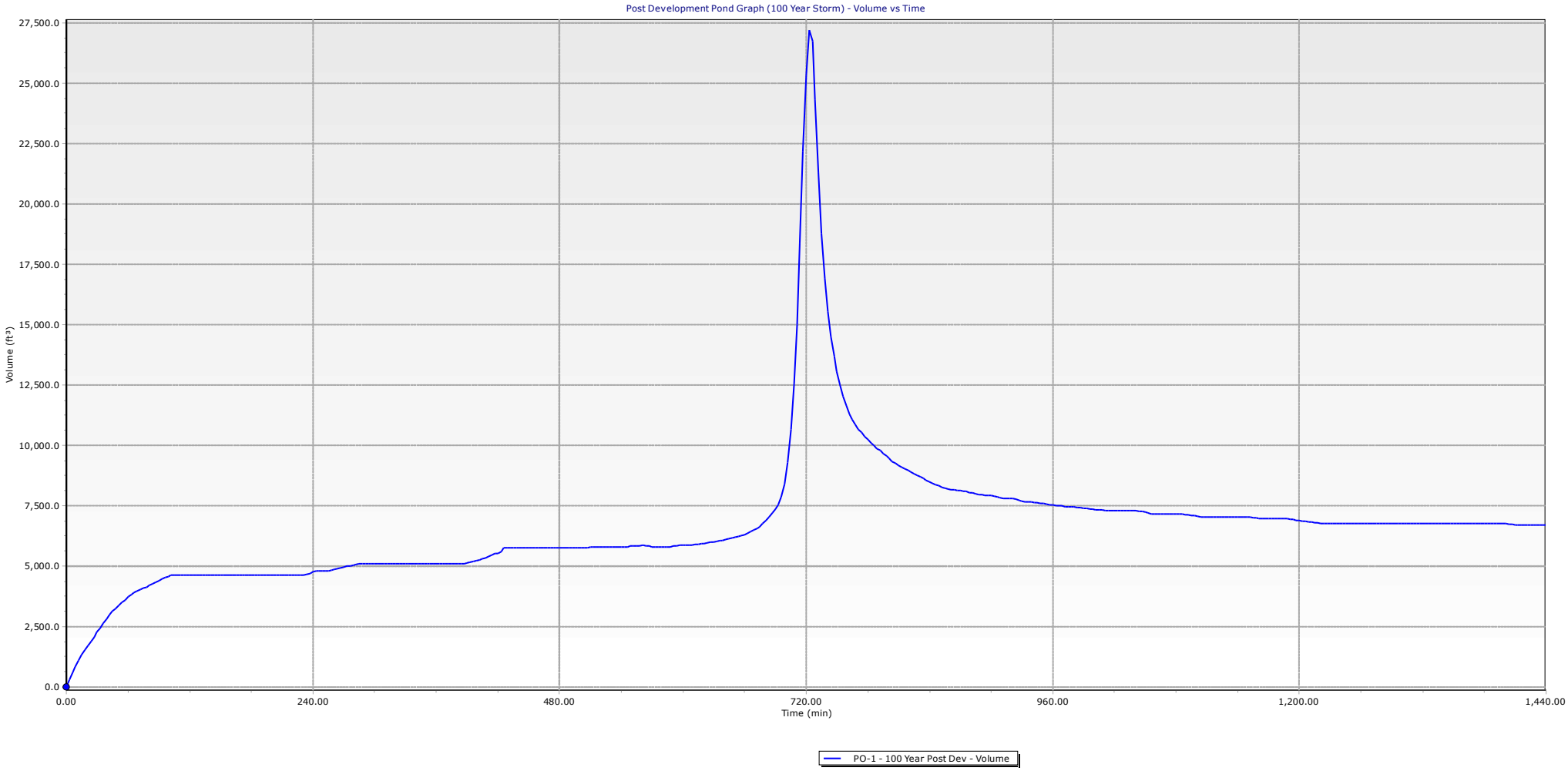
Current Time: 0.00 min

Label	Flow (Total In Maximum) (cfs)	Flow (Out to Links Maximum) (cfs)	Storage (Maximum) (ft^3)	Is Ever Overflowing?
PO-1	50.38	35.15	27,190.5	False

Conduit Table - Postdevelopment Conditions (100 Year Storm)

Current Time: 720.00 min

Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (Scaled) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Rise (ft)	Span (ft)	Manning's n	Velocity (ft/s)	Flow (cfs)	Flow (Maximum) (cfs)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)
CO-217	POS-1	8,450.50	O-2	8,440.00	48.6	0.216	24.0			0.013	24.29	16.50	17.63	105.19	15.7
CO-218	CB-MP-1	8,601.00	CB-MP-3	8,514.00	927.0	0.094		1.0	4.0	0.010	13.95	4.87	5.52	53.24	9.2
CO-219	CB-MP-2	8,664.00	CB-MP-3	8,514.00	445.2	0.337		1.0	4.0	0.010	21.52	4.42	4.79	100.88	4.4
CO-220	CB-MP-3	8,514.00	O-1	8,453.00	453.8	0.134		1.0	4.0	0.010	26.30	28.83	29.89	63.72	45.2
CO-221	POS-2	8,450.50	O-2	8,440.00	54.2	0.194	24.0			0.013	23.36	16.40	17.52	99.60	16.5


Post Development Pond Graph (100 Year Storm) - Volume vs Time
Volume (ft³)
27,500.0
25,000.0
22,500.0
20,000.0
17,500.0
15,000.0
12,500.0
10,000.0
7,500.0
5,000.0
2,500.0
0.0
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.00
Time (min)
PO-1 - 100 Year Post Dev - Volume