CP|H
CONSULTANTS

Site Planning
Civil Engineering
Land Use Consulting
Project Management

February 26, 2014

EXHIBIT 11
PAGE 1 OF 5

Ryan Miller
Public Works
City of Woodinville
17301 – 133rd Avenue NE
Woodinville, WA 98072

RE: Brickyard Ridge Subdivision (PPA13002) — CPH Project No. 0067-13-002
Downstream Storm Drainage Conveyance Calculations

Dear Mr. Miller,

This letter and enclosures are provided to provide the additional requested conveyance calculations for the storm drainage system downstream of the Brickyard Ridge site. Detailed conveyance calculations were performed using available survey data for the system for approximately ¼ mile downstream of the outflow from the proposed Brickyard Ridge detention vault. The enclosed calculations confirm that this storm drainage system has adequate capacity to contain the 100-yr peak flows with the addition of the Brickyard Ridge project.

Please, contact me directly at (425) 285-2392 or by e-mail at jamie@cphconsultants.com if you have questions or need any additional information to complete your review of this analysis. Thank you.

Sincerely,

CPH Consultants

Jamie B. Schroeder, PE
Vice President

Enclosures: Drainage Calculations

RECEIVED
FEB 6 2014
CITY OF WOODINVILLE
DEVELOPMENT SERVICES

733 7th Avenue, Suite 100 | Kirkland, WA | 98033
www.cphconsultants.com | p: (425) 285-2390 | f: (425) 285-2389

BRICKYARD RIDGE VAULT and BYPASS OUTFLOW

EXHIBIT 11
PAGE 2 OF 5

Flow Frequency Analysis
Time Series File:dsout.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates---			-----Flow Frequency Analysis-------			
Flow Rate (CFS)	Rank	Time of Peak	- - Peaks - - (CFS)	Rank	Return Period	Prob
0.397	2	2/09/01 18:00	1.21	1	100.00	0.990
0.087	7	1/05/02 16:00	0.397	2	25.00	0.960
0.289	3	3/06/03 21:00	0.289	3	10.00	0.900
0.081	8	8/26/04 2:00	0.289	4	5.00	0.800
0.143	6	1/05/05 17:00	0.243	5	3.00	0.667
0.243	5	1/19/06 0:00	0.143	6	2.00	0.500
0.289	4	11/24/06 7:00	0.087	7	1.30	0.231
1.21	1	1/09/08 9:00	0.081	8	1.10	0.091
Computed Peaks			0.941		50.00	0.980

EXHIBIT 11
PAGE 3 OF 5

WOODRIDGE POND OUTFALL

Flow Frequency Analysis
Time Series File:rdout.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates---

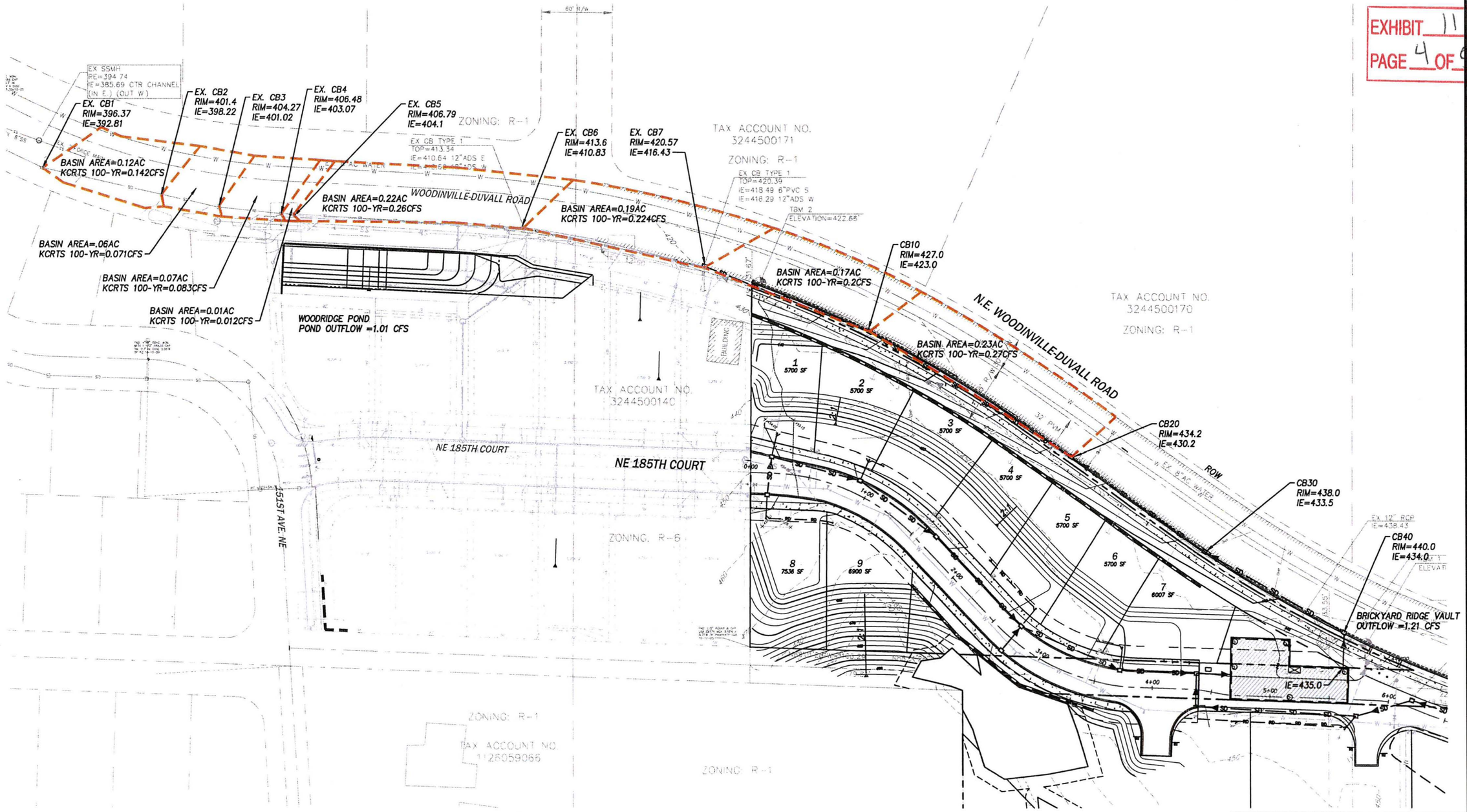
Flow Rate (CFS)	Rank	Time of Peak
0.320	2	2/09/01 20:00
0.054	7	12/29/01 11:00
0.252	3	3/06/03 21:00
0.044	8	8/26/04 7:00
0.088	6	1/08/05 1:00
0.196	5	1/18/06 23:00
0.240	4	11/24/06 8:00
1.01	1	1/09/08 9:00
Computed Peaks		

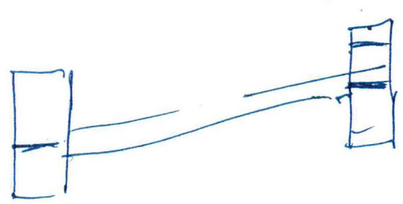
-----Flow Frequency Analysis-------

- - Peaks - - (CFS)	(ft)	Rank	Return Period	Prob
1.01	8.17	1	100.00	0.990
0.320	8.00	2	25.00	0.960
0.252	7.11	3	10.00	0.900
0.240	6.98	4	5.00	0.800
0.196	6.57	5	3.00	0.667
0.088	6.11	6	2.00	0.500
0.054	4.69	7	1.30	0.231
0.044	3.06	8	1.10	0.091
0.780	8.13		50.00	0.980

CITY OF WOODINVILLE , KING COUNTY, WA PTN. OF SEC. 11, TWP 26N, R5E W.M.

EXHIBIT 11
PAGE 4 OF 5





0 40 80
PLAN IN FEET

CP|H CONSULTANTS
Site Planning • Civil Engineering
Land Use Consulting • Project Management
733 7th Avenue, Suite 100 | Kirkland, WA 98033
Phone: (425) 285-2390 | FAX: (425) 285-2389
www.cphconsultants.com
Copyright © 2013 CPH Consultants, LLC. All Rights Reserved.

NO.	DATE	REVISION	BY	CK.
1				

BRICKYARD RIDGE PLAT
CONVEYANCE EXHIBIT

OWNER/ APPLICANT: BRICKYARD RIDGE, LLC, CONTACT: THOMAS DeDONATO
10257 NE 64TH STREET, KIRKLAND, WA 98033
PHONE: 425.417.3455 FAX: 425.827.2898
EMAIL: TJD@SPRO.NET

PROJECT SURVEYOR: GROUP FOUR INC., CONTACT: DANIEL ROUPE, PLS
1911 VERNON ROAD, STE. A, LAKE STEVENS, WA 98258
PHONE: (425) 408-1152 FAX: (425) 877-1341
EMAIL: DANR@GRP4.COM

SCALE	PROJECT NO.	SHEET
AS NOTED	0067-13-002	FIGURE 1

EXHIBIT 11
PAGE 5 OF 5

PROJECT: BRICKYARD RIDGE
DATE: 2/26/2014
CPH PROJECT No. 0067-13-002

DESCRIPTION: Storm drain conveyance system for Brickyard Ridge Plat: Backwater Spreadsheet.

PIPE SEGMENT D/S CB	PIPE SEGMENT U/S CB	1 Design Flow Q (cfs)	2 Length (ft)	3 Pipe Size (in)	4 Manning's n	5 Downstream Invert Elevation (ft)	6 Upstream Inlet Elevation (ft)	Pipe Slope (ft/ft)	7 Barrel Area (sq. ft)	8 Barrel Velocity (fps)	9 Barrel Velocity Head (ft)	10 TW Elevation (ft)	Barrel Perimeter (ft)	Friction Slope S_f	11 Friction Loss (ft)	12 Entrance HGL Elevation (ft)	Enterance Loss Coefficient k_e	13 Entrance Head Loss (ft)	14 Exit Head Loss (ft)	15 Outlet Control Elevation (ft)	d_c/D	Critical Depth (ft)	Critical Velocity (fps)	16 Inlet Control Elevation (ft)	17 Approach Velocity Head (ft)	K_b	18 Bend Head Loss (ft)	Q_3/Q_1 (%)	K_j	19 Junction Head Loss (ft)	20 Head Water (ft)	Rim Elevation (ft)	Overflow?
OUTFALL	CB1 - EX	3.483	10	12	0.012	392.50	392.81	0.031	0.79	4.43	0.31	392.50	3.14	0.01	0.08	393.81	0.50	0.15	0.31	394.27	0.57	0.57	4.28	394.42	0.13	0.00	0.000	0%	0.00	0.00	394.29	396.37	Contained
CB1 - EX	CB2 - EX	3.341	100	12	0.012	392.81	398.22	0.054	0.79	4.25	0.28	393.50	3.14	0.01	0.74	399.22	0.50	0.14	0.28	399.64	0.57	0.57	4.28	399.73	0.12	0.00	0.000	0%	0.00	0.00	399.61	401.4	Contained
CB1 - EX	CB3 - EX	2.26	53	12	0.012	398.22	401.02	0.053	0.79	2.88	0.13	394.50	3.14	0.00	0.18	402.02	0.50	0.06	0.13	402.21	0.57	0.57	4.28	402.01	0.12	0.00	0.000	0%	0.00	0.00	402.09	404.27	Contained
CB3 - EX	CB4 - EX	2.177	53	12	0.012	401.02	403.07	0.039	0.79	2.77	0.12	395.50	3.14	0.00	0.17	404.07	0.50	0.06	0.12	404.25	0.57	0.57	4.28	404.06	0.09	0.00	0.000	0%	0.00	0.00	404.16	406.48	Contained
CB4 - EX	CB5 - EX	2.165	11	12	0.012	403.10	404.10	0.091	0.79	2.76	0.12	396.50	3.14	0.00	0.03	405.10	0.50	0.06	0.12	405.28	0.57	0.57	4.28	405.07	0.07	0.00	0.000	0%	0.00	0.00	405.21	406.79	Contained
CB5 - EX	CB6 - EX	1.905	195	12	0.012	404.16	410.83	0.034	0.79	2.43	0.09	397.50	3.14	0.00	0.47	411.83	0.50	0.05	0.09	411.97	0.57	0.57	4.28	411.80	0.06	0.00	0.000	0%	0.00	0.00	411.91	413.6	Contained
CB6 - EX	CB7 - EX	1.681	150	12	0.012	410.83	416.43	0.037	0.79	2.14	0.07	398.50	3.14	0.00	0.28	417.43	0.50	0.04	0.07	417.54	0.57	0.57	4.28	417.37	0.04	0.00	0.000	0%	0.00	0.00	417.50	420.57	Contained
CB7 - EX	CB10	1.481	152	12	0.012	416.43	423.00	0.043	0.79	1.89	0.06	399.50	3.14	0.00	0.22	424.00	0.50	0.03	0.06	424.08	0.57	0.57	4.28	423.92	0.04	0.00	0.000	0%	0.00	0.00	424.05	427	Contained
CB10	CB20	1.21	200	12	0.012	423.00	430.20	0.036	0.79	1.54	0.04	400.50	3.14	0.00	0.19	431.20	0.50	0.02	0.04	431.26	0.57	0.57	4.28	431.10	0.04	0.00	0.000	0%	0.00	0.00	431.22	434.2	Contained
CB20	CB30	1.21	138	12	0.012	430.20	433.50	0.024	0.79	1.54	0.04	401.50	3.14	0.00	0.13	434.50	0.50	0.02	0.04	434.56	0.57	0.57	4.28	434.41	0.04	0.00	0.000	0%	0.00	0.00	434.52	438	Contained
CB30	CB40	1.21	136	12	0.012	433.50	434.00	0.004	0.79	1.54	0.04	402.50	3.14	0.00	0.13	435.00	0.50	0.02	0.04	435.06	0.57	0.57	4.28	434.92	0.00	0.00	0.000	0%	0.00	0.00	435.06	440	Contained
CB40	VAULT	1.21	29	12	0.012	434.00	435.00	0.034	0.79	1.54	0.04	403.50	3.14	0.00	0.03	436.00	0.50	0.02	0.04	436.06	0.57	0.57	4.28	435.90	0.00	0.00	0.000	0%	0.00	0.00	436.06	442	Contained

BASIN	AREA (SF)	AREA (AC)	100 YR FLOW (CFS)
CB10	10,140.00	0.23	0.271
CB7	7,458.00	0.17	0.2
CB6	8,188.00	0.19	0.224
CB5	9,427.00	0.22	0.26
CB4	606.00	0.01	0.012
CB3	2,883.00	0.07	0.083
CB2	2,663.00	0.06	0.071
CB1	5,044.00	0.12	0.142
TOTAL	46,409.00	1.07	

Note: Flowrates calculated using KCRTS

	CAPACITY	P_{PRED} (ESY)
CB 1 TO CB 2	6.5 CFS	3.6 CFS