UPDATE #3

TO THE

TECHNICAL DRAINAGE STUDY

FOR

SUMMERLIN STORAGE

(MINI STORAGE FACILITY AT WESTCLIFF AND RAINBOW)

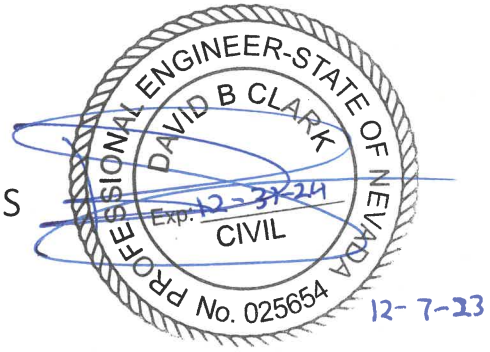
(APN 138-27-802-001)

IN

CITY OF LAS VEGAS, NEVADA

PREPARED FOR

Summerlin Parkway Storage, LLC
2165 Horse Prairie Drive
Henderson, NV, 89052
Ph. (702)-348-5100



SUBMITTED TO

CITY OF LAS VEGAS

DECEMBER 2023

HORROCKS PROJECT NUMBER: NV-LD-3629-21

Horrocks Engineers
1401 N Green Valley Pkwy, Suite 160
Henderson, NV 89074
Ph. (702)-966-4063

Horrocks.

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: SUMMERLIN STORAGE (MINI STORAGE FACILITY AT WESTCLIFF AND RAINBOW - UPDATE#3) Date: 12-07-2023

Location of Development: a) Descriptive (Cross Streets) North/South: Rainbow Blvd

East/West: Westcliff Drive

b) Section: 27 Township: 20S Range: 60E

c) APN : 138-27-802-001

Name of Owner: Summerlin Parkway Storage, LLC

Telephone No.: 702-348-5100 Fax No.: E-Mail Address: blake.chaseconstruction@gmail.com

Address: 2165 Horse Prairie Drive, Henderson, NV, 89052

Contact Person-Name: David B. Clark **Telephone No.:** 702.966.4063

* **E-Mail Address:** dclark@horrocks.com **Fax No.:**

Firm: Horrocks Engineers

Address: 1401 N Green Valley Pkwy, Suite 160 Henderson, NV 89074

Type of Land Development/Land Disturbance Process:

	Rezoning		Subdivision Map		Clearing and Grading Only
	Parcel Map		Planned Unit Development		Other (Please specify below)
	Large Parcel Map	X	Building Permit		

1. Total Owned Land Area: At Site: 2.5+/- acres Being Developed/Disturbed: 2.5+/- acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☒ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ **Yes**** ☐ **No**
4. Proposed type of development (Residential, Commercial, Etc.): Public
5. Approximate upstream land area which drains to the subject site: 7 acres
6. Has the site drainage been evaluated in the past? ☐ **YES** ☒ **NO** If yes, please identify documentation:
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
   The existing rectangular concrete channel
8. Briefly describe your proposed schedule for the subject project:
   ASAP

Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

*New Required Field

**Review and concurrence of the Clark County Regional Flood Control District is required.

Local Entity File No.

Revision	Date

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

Horrocks.

MEMORANDUM

TO: Development Review

495 S Main St,

Las Vegas, NV 89101

FROM: David Clark

DATE: **December 7, 2023**

SUBJECT: **Update #3 to the Technical Drainage Study for Summerlin Storage (Mini Storage Facility at Westcliff and Rainbow), APN: 138-27-802-001 (DS5459H)**

Horrocks Engineers hereby submits this Update #3 to the Technical Drainage Study for Summerlin Storage (Mini Storage Facility at Westcliff and Rainbow (DS 5459D), originally submitted June 02, 2021, Addendum#1 dated July 26, 2021, and Supplement dated November 02, 2021, and approved on December 29, 2021. The Update#1 to the TDS was submitted on March 16, 2023, Addendum#1 dated April 27, 2023, and approved on May 16, 2023. The Update#2 to the TDS was submitted on July 19, 2023, and approved on July 20, 2023. This memo discusses revisions to replace covered storage along the western portion of the site with a building.

Discussion

This update addresses replacement of a proposed covered storage to a building, Building C. The additional of the Building C only affects the grading immediately around the Building C footprint and is not affecting the offsite or onsite hydrology calculations or the proposed storm drain system. The drainage patterns remain the same as in the approved Update#2.

The revisions include a revised normal depth calculation for section 1 to show the new flow characteristics abased on the revised section that the building creates. Section 1A is now included and is the swale between the building and the western site boundary. Section 1 includes a 6% slope on the west side of the valley gutter. Section 1A shows a 4:1 side slope on the west side of the swale as labeled on the grading plans and uses a 5:1 on the east side of the swale. The typical section shows a 3:1 maximum, but the FF and FL labels shows a maximum side slope between 15-20%. The 20% side slope was chosen to present a realistic and conservative normal depth calculations.

The new building meets all finished floor criteria of being at least twice the depth of flow and at least 6" above the adjacent top of curb elevations or flowlines. The flow summary and normal depth tables have been updated on Figure 7. The Finished Floor Analyses table has been updated to include Building C at six locations: the four corners of the building as well as at a midpoint on each side of the building. See the Appendix for revised Figure 7 Ultimate Condition Basin Map with the revised basin summary, and normal depth tables. The revisions are outlined in red. All pertinent hydraulic calculation can be found in the Appendix.

It is anticipated that the text above and the attached Update#3 along with grading plans is consistent with originally approved study, Update#1, and Update #2 and meets all the Manual and CLV requirements. We respectfully request CLV approval of Update#3 to the Technical Drainage Study. Please don't hesitate to contact us with any questions.

Sincerely,
Horrocks Engineers

David Clark, PE
Horrocks Engineers

Sal Limbu, EI
Horrocks Engineers

APPENDIX

CLV Approval Letter

Figure 7: Ultimate Condition Basin Map (Revised)

Normal Depth Calculation

Finished Floor Analysis Table

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: July 20, 2023
TO: **Land Development Services** Department of Building & Safety			FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin Storage – Update # 2**		COPIES TO: Horrocks Engineers
Cross Streets:	NWQ of Rainbow Boulevard & Westcliff Drive		Summerlin Parkway Storage, LLC
File Number:	F:\Depot\DSMemos\DS5459H.doc		Bart Anderson, P.E., DevCo
Parcel Number:	138-27-802-001		CCRFCD
Zoning Action:	21-0538-EOT1 & 21-0538-EOT2		
FEMA Flood Zone	YES	NO X	
Proposed Storm Drain	YES X	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal (Paid: 6/9/2021)	6/2/2021 & 6/9/2021	6/22/2021	Not Approved	$400.00	4325787: $400
2nd Submittal	7/26/2021	8/17/2021	Not Approved	$400.00	4383456: $400
3rd Submittal (Supplement)	11/2/2021	11/9/2021	Conditional Approval	N/C	N/C
CCRFCD	12/15/2021	12/29/2021	Concurrence Recv'd	N/C	N/C
4th Submittal	3/16/2023	4/3/2023	Not Approved	$100.00	5187807: $100
5th Submittal	4/27/2023	5/11/2023	Approved	$400.00	5247748: $400
Supplement	5/15/2023	5/16/2023	See Comments Below	N/C	N/C
6th Submittal	7/19/2023	7/20/2023	Approved	$100.00	5361482: $100
			TOTAL FEES (LDDRS):	**$1,400.00**	**----**

REMARKS: Update #2: Extended the Public Storm Drain from the Rock Springs Drive through the site.

Supplement: Recorded Drainage Easement Received

4th & 5th Submittals: Update #1 & Addendum to add trees in the drainage channel

The Drainage Study for the subject project has been reviewed and:

X	is approved subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Clark County Public Works Department concurrence.

1. Revise Detail #7, Sheet C.6.1: Provide complete RCP Headwall Detail. The concrete headwall needs to include footing and cut-off wall details. The cut-off wall shall extend a minimum of 2-foot below the wall footing. The Headwall structure needs to tie into both the retaining wall footing and the adjacent CMU retaining wall. The retaining wall design needs to show the minimum wall thickness.
2. Revise Cul-de-Sac improvements to only show and construct roadway improvements within the western 30-foot BLM Grant. Update Improvement Plans accordingly.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS
HDR/AYS/PBJ

T/R/S: T20S/R60E/27
AREA L-27

BASIN	AREA/FLOW (AC)	Q100 (CFS)	FLOWRATE FOR 100-YR	NOTE
ON_D	2.46	8.0	3.25	-
Total area treated for BMP1	0.65	2.1	3.25	BMP1 Section 9
Total area treated for BMP2	0.29	0.9	3.25	BMP2 Section 14
Total flow treated for BMP3	CU3	1.1	-	BMP3 Section 16
Note: See Figure 8 BMP Exhibit for details				

FACILITY	SIZE	DESCRIBTION	FLOW (CFS)	NOTES
DI#1	(16" X 16")	ON_D11	1.3	Sump inlet with 0.06' depth
DI#2	(16" X 16")	ON_D5	1.1	Sump inlet with 0.04' depth
DI#3	(16" X 16")	ON_D4	1.2	Sump inlet with 0.05' depth
DI#4	10' CM	Captures a portion of CU2	14.5	Sump inlet with 0.55' depth
DI#5	NDOT Type 2B	CU2A	7.8	Sump inlet with 0.18' depth
SD#1	12"RCP	ON_D11 + ON_D5 + ON_D4	3.6	
SD#2	30" RCP		14.5	DI#4
SD#3	30" RCP	SD#2 + CU2A	22.3	DI#4 + DI#5
SD#4	30" RCP	SD#1 + SD#3	25.9	

ULTIMATE CONDITION NORMAL DEPTH CROSS SECTION SUMMARY

Cross Section	Description	Q_{100} (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
Section 1_ULT_100 YR	ON_D2	1	0.50	0.19	1.52	0.29
Section 1A_ULT_100 YR	HALF of ON_D2	0.5	0.70	0.23	1.17	0.27
Section 2_ULT_100 YR	ON_D11	1.3	0.40	0.22	1.48	0.33
Section 3_ULT_100 YR	ON_D2 + ON_D3	2	0.50	0.40	2.09	0.84
Section 4_ULT_100 YR	ON_D6	0.4	0.50	0.22	1.58	0.35
Section 5_ULT_100 YR	ON_D4	1.2	0.40	0.21	1.45	0.30
Section 6_ULT_100 YR	ON_D7	0.9	0.65	0.29	1.98	0.57
Section 8_ULT_100 YR	CU3	1.1	0.83	0.20	2.15	0.43
Section 8_Emergency Overflow ULT_100 YR	CU2 +OF_D4A+ (ON_D1)*0.3 + ON_D8 + 3.6** + ON_D7	53.7	0.83	2.22	4.75	10.55
***Section 9_ULT_BMP1_100 YR	Total area treated for BMP1	2.1	1.00	0.52	1.98	1.03
Section 10_ULT_100 YR	ON_D10	0.1	0.50	0.20	0.86	0.17
Section 11_Parking Lot Capacity_ULT	Parking Lot Capacity	26.7	1.20	0.20	3.16	1.58
Section 11_Parking Lot_ULT_100 YR	CU2 + OF_D4A	48.3	1.20	0.59	3.65	2.15
Section 12_ULT_100 YR	CU5	2.6	2.00	0.21	2.69	0.56
Section 13_ULT_100 YR	CU4 + CU5 + SD#4	62.0	3.87	1.20	17.18	20.62
***Section 14_ULT_BMP2_100 YR	Total area treated for BMP2	0.9	0.99	0.38	1.55	0.59
Section 15_ULT_100 YR	ON_D1 + OF_D1	3.7	3.24	0.14	3.05	0.43
***Section 16_ULT_BMP3_100 YR	Total area treated for BMP3	1.1	1.00	0.31	1.63	0.67
Section 17_ULT_100 YR	SD#4	25.9	3.49	0.99	7.00	6.93
NOTES:						
** Storm Drain Flow						
*** See figure 8 for BMP detail						

Ultimate Condition			
Basin	Area (acres)	Q_{100} (cfs)	Q_{10} (cfs)
CU1	-	26.0	13.0
CU2	-	43.5	22.3
CU2A	-	7.8	0.0
CU3	-	1.1	0.6
CU4	-	33.5	30.4
CU5	-	2.6	1.4
OF_D1	0.96	3.0	2.0
OF_D2	0.61	2.0	1.0
OF_D3	3.97	12.0	6.0
OF_D4	3.65	11.0	6.0
OF_D5	0.31	1.0	1.0
OF_D6	1.98	7.0	3.0
OF_D7	4.31	14.0	7.0
OF_D8	1.46	5.0	3.0
ON_D	2.46	8.0	4.0
BOA_CAP***	-	26.7	26.7
CU1 = OF_D6 + OF_D7 + OF_D8			
CU2 = CU1 + OF_D3 + OF_D5 + OF_D1 + (ON_D1)*0.70			
CU2A = CU2 + (ON_D1)*0.30 - DI#4 + OF_D4A - BOA CAP***			
CU3 = ON_D8 + ON_D7			
CU4 = CU3 + BOA_CAP*** + OF_D4B			
CU5 = ON_D2 + ON_D3 + ON_D6 + ON_D9 + ON_D10			
** Storm Drain Flow			
*** Runoff that is contained within the Bank Of America parking lot by the Curb. See section 11			

Developed Prorate Calculations					
Basin	Area (acres)	Q_{100} (cfs)	CFS/AC	Q_{10} (cfs)	CFS/AC
OF_D4	3.65	11	3.01	6	1.64
ON_D	2.46	8	3.25	4	1.63
OF_D4A	1.77	5.3	3.01	2.90	1.64
OF_D4B	1.88	5.7	3.01	3.08	1.64
SUM	**3.65**	**11.0**	3.01	**6.0**	1.64
ON_D1	0.23	0.7	3.25	0.37	1.63
ON_D2	0.32	1.0	3.25	0.52	1.63
ON_D3	0.30	1.0	3.25	0.49	1.63
ON_D4	0.36	1.2	3.25	0.59	1.63
ON_D5	0.35	1.1	3.25	0.57	1.63
ON_D6	0.11	0.4	3.25	0.18	1.63
ON_D7	0.29	0.9	3.25	0.47	1.63
ON_D8	0.05	0.2	3.25	0.08	1.63
ON_D9	0.03	0.1	3.25	0.05	1.63
ON_D10	0.03	0.1	3.25	0.05	1.63
ON_D11	0.39	1.3	3.25	0.63	1.63
SUM	2.46	8.0	N/A	4.0	N/A

0 50' 100'
SCALE: 1" = 50'

KEY:

- OF_D4 3.65 — BASIN NAME/AREA
- OF_D4A 1.77 — PRORATE BASIN NAME/AREA
- CU2 — CONCENTRATION POINT
- FLOW DIRECTION
- 1 — CROSS SECTION
- BASIN BOUNDARY
- PRORATE BASIN BOUNDARY
- CCRFCD EXISTING FACILITY
- PARCEL LINE

HORROCKS ENGINEERS
1401 N. Green Valley Pkwy., Suite 160
Henderson, NV 89074
(702) 966-4063
www.horrocks.com

WARNING
IF THIS BAR DOES NOT MEASURE 2" THEN DRAWING IS NOT TO SCALE
0 1 2

REVISIONS
REV # | DATE
*SEE GENERAL NOTES SHEET

DRAWING INFO
DATE 03/17/2021
DESIGNED SBL
DRAWN SBL
CHECKED DBC
PROJECT NV-2198-2001

SUMMERLIN STORAGE
(MINI STORAGE FACILITY AT WESTCLIFF AND RAINBOW)
LAS VEGAS, NEVADA
ULTIMATE CONDITION BASIN MAP
APN: 138-27-802-001

FIGURE 7
PAGE

Section 1_INT&ULT_100 YR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.50 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+17.00	0.56
0+25.00	0.08
0+26.50	0.00
0+28.00	0.08
0+49.00	1.34

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+17.00, 0.56)	(0+25.00, 0.08)	0.016
(0+25.00, 0.08)	(0+28.00, 0.08)	0.013
(0+28.00, 0.08)	(0+49.00, 1.34)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.19 ft
Roughness Coefficient	0.015
Elevation	0.19 ft
Elevation Range	0.00 to 1.34 ft
Flow Area	0.7 ft²
Wetted Perimeter	6.71 ft
Hydraulic Radius	0.10 ft
Top Width	6.70 ft
Normal Depth	0.19 ft
Critical Depth	0.18 ft
Critical Slope	0.70 %
Velocity	1.52 ft/s
Velocity Head	0.04 ft
Specific Energy	0.23 ft

Results	
Froude Number	0.854
Flow Type	Subcritical

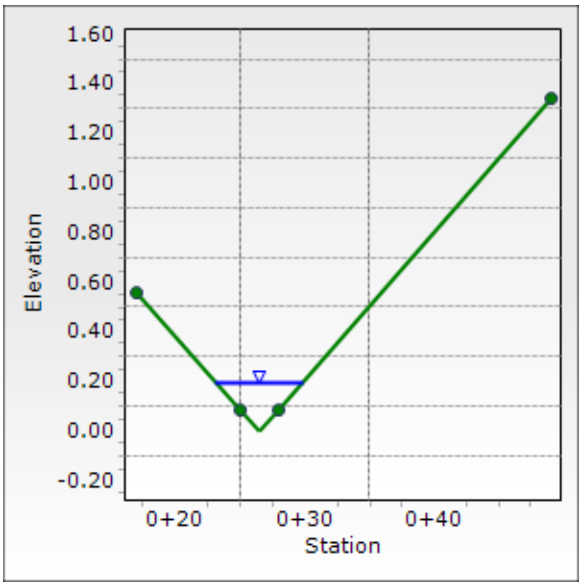
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.19 ft
Critical Depth	0.18 ft
Channel Slope	0.50 %
Critical Slope	0.70 %

Cross Section for Section 1_INT&ULT_100 YR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.50 %
Normal Depth	0.19 ft
Discharge	1.00 cfs



Section 1A_INT&ULT_100 YR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	0.70	%
Discharge	0.29	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.25
0+05.00	0.00
0+10.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.25)	(0+10.00, 1.00)	0.025

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results		
Normal Depth	0.23	ft
Roughness Coefficient	0.025	
Elevation	0.23	ft
Elevation Range	0.00 to 1.25	ft
Flow Area	0.2	ft²
Wetted Perimeter	2.16	ft
Hydraulic Radius	0.11	ft
Top Width	2.11	ft
Normal Depth	0.23	ft
Critical Depth	0.19	ft
Critical Slope	2.06	%
Velocity	1.17	ft/s
Velocity Head	0.02	ft
Specific Energy	0.26	ft
Froude Number	0.603	
Flow Type	Subcritical	

GVF Input Data

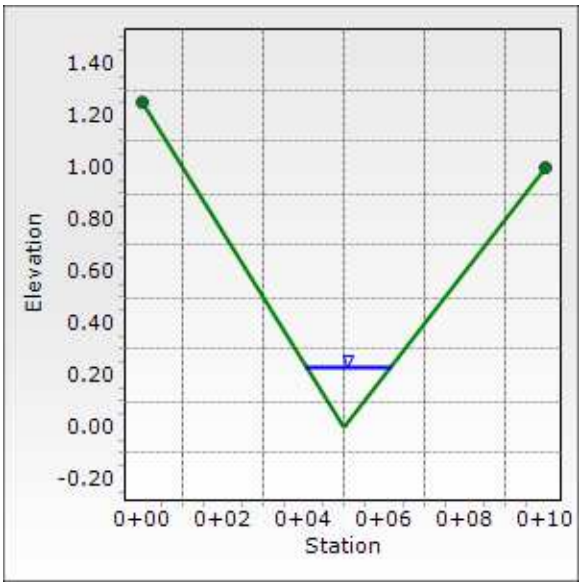
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.23 ft
Critical Depth	0.19 ft
Channel Slope	0.70 %
Critical Slope	2.06 %

Cross Section for Section 1A_INT&ULT_100 YR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.70 %
Normal Depth	0.23 ft
Discharge	0.29 cfs



FINISHED FLOOR ANALYSIS TABLE

Project Number	NV-2198-2001	Project Name:	Summerlin Storege (Mini Storage Facility at Westridge & Rainbow)
Date:	12/6/2023	Designed By	DBC/SBL

Bldg #	FF Elev.	TBC	Flow Line	Flow Depth	WSE	Min FF Elev.	Freeboard	2X D Criteria[1]	6" Criteria[2]	Comments
A	13.20	-	12.48	0.19	12.67	12.98	0.53	YES	YES	Southwest portion
A	13.20	12.02	-	0.40	11.92	12.52	1.28	YES	YES	Northwest corner
A	12.25	-	11.60	0.22	11.82	12.10	0.43	YES	YES	Northeast Portion
A	12.25	11.42	-	0.40	11.32	11.92	0.93	YES	YES	Northeast corner
A	12.25	-	11.60	0.21	11.81	12.10	0.44	YES	YES	Southeast portion
A	12.25	11.15	-	0.29	10.94	11.65	1.31	YES	YES	Southeast corner
B	12.25	-	11.60	0.21	11.81	12.10	0.44	YES	YES	Southwest portion
B	12.25	10.68	-	0.29	10.47	11.18	1.78	YES	YES	Southwest corner
B	12.25	-	11.60	0.22	11.82	12.10	0.43	YES	YES	Northwest portion
B	12.25	11.42	-	0.40	11.32	11.92	0.93	YES	YES	Northwest corner
B	11.35	10.85	-	0.40	10.75	11.35	0.60	YES	YES	Northeast corner
B	11.35	10.11	-	0.29	9.90	10.61	1.45	YES	YES	Southeast Corner
C	13.34	-	12.82	0.23	13.05	13.32	0.29	YES	YES	Southwest corner
C	12.84	-	12.13	0.23	12.36	12.63	0.48	YES	YES	West Portion
C	12.43	-	11.54	0.23	11.77	12.04	0.66	YES	YES	Northwest corner
C	13.38	-	12.72	0.19	12.91	13.22	0.47	YES	YES	Southeast Corner
C	12.93	-	12.23	0.19	12.42	12.73	0.51	YES	YES	East Portion
C	12.43	-	11.72	0.19	11.91	12.22	0.52	YES	YES	Northeast corner

Bldg #	FF Elev.	Flow line	Flow Depth	WSE	Min FF Elev.	Min. FF Criteria	Note
A&B	12.25	11.75	0.20	11.95	11.95	YES	North side in between buildings A & B
A&B	12.25	11.75	0.20	11.95	11.95	YES	South side in between buildings A & B

1. Per Section 304.4 of HCDDM, The finished floor shall be set at a a vetical distance above the gutter flowline of at least twice the depth of flow in the gutter flowline up to a maximum of 18 inches above the WSE in the street. The TC is generally 0.50' above gutter flowline for this project.

2. Per Section 304.4. E.1 of HCDDM, CLV requries minimum finished floor elevation is 6 inches above highest adjacent top of curb and/or flow line

GRADING PLANS