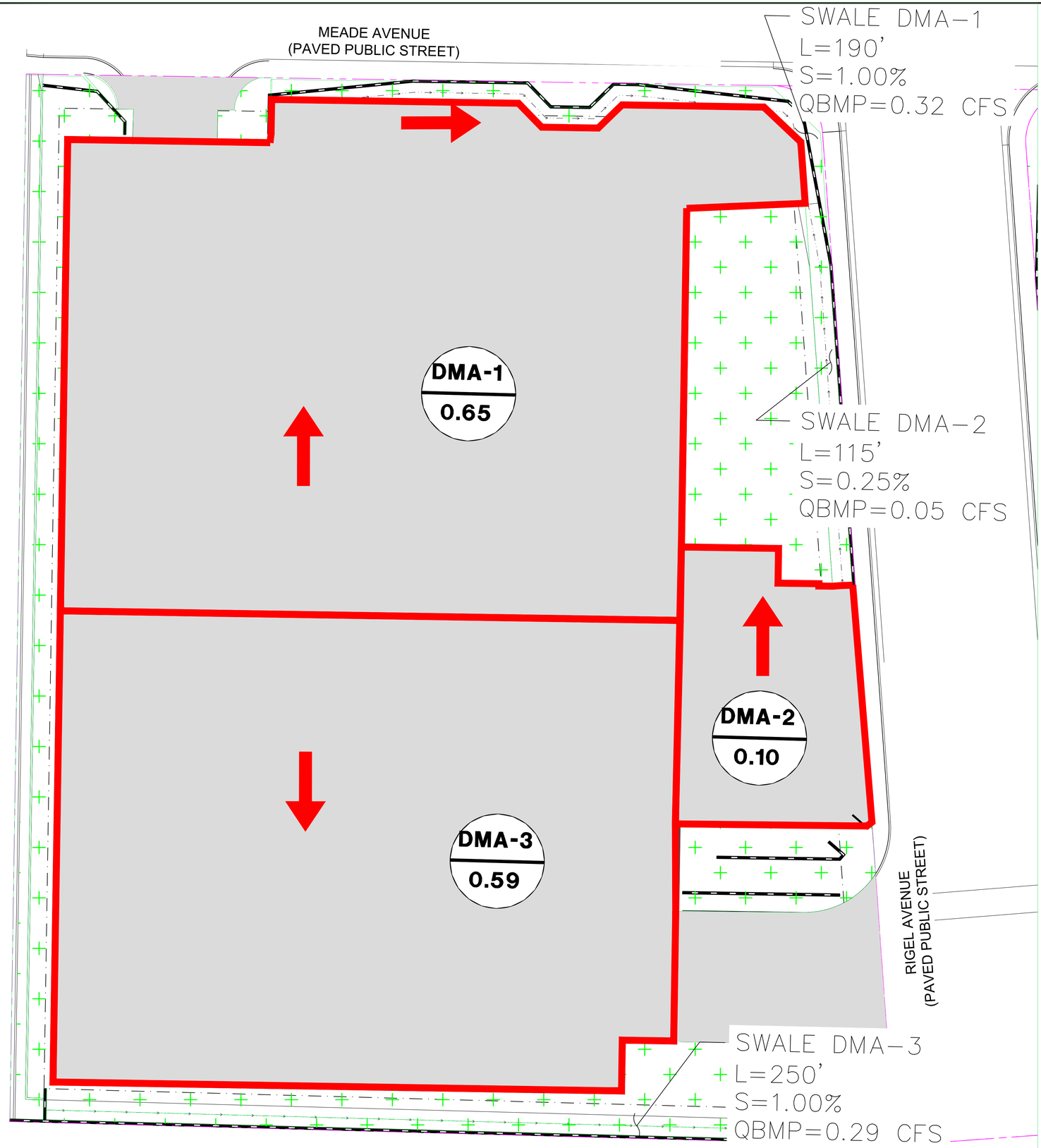
Appendix C – Parking Lot LID Calculations

- LID Parking Lot LID Map & Calculations
- Table 505 2-Year 6-Hour Rainfall Depth-Duration-Frequency (McCarran)
- Normal Depth Sections – BMP Swales



GRAPHIC SCALE IN FEET
0 10 20 40
SCALE: 1" =20'

NORTH

LEGEND

- DMA-1 / 0.98 — DRAINAGE MANAGEMENT AREA / AREA
- ON-SITE FLOW ARROW
- TREATED IMPERVIOUS AREA
- LANSCAPE AREA
- BUILDING AREA

PARKING LOT DATA CALCULATIONS

Note: Stormwater Quality Design Volume calculated using steps from Section 1500 Figures 1501-1503 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description:		Area 15 District 2	
Parking Lot Data		Acreage	
Property Size (PS)	=	1.79	
Building Area (BA)	=	0.00	
Total Hardscape/ Landscape Area (TPA)	=	0.37	
Parking Lot Area (PLA) = (PLA = PS-BA-TPA)	=	1.42	
Minimum PLA to be treated = (PLA * 0.75)	=	**1.07**	acres
Area to be treated by the proposed LID BMPs			
Drainage Area DMA-1	=	0.65	
Drainage Area DMA-2	=	0.10	
Drainage Area DMA-3	=	0.59	
Total	=	**1.34**	acres

Since 1.34 ac >= 1.07 ac then site satisfies Parking Lot LID criteria

No.	REVISIONS	DATE	BY

Kimley»Horn
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PHONE: 702-498-3500
WWW.KIMLEY-HORN.COM

10/25/2022

KHA PROJECT	092965011
DATE	10/25/2022
SCALE	AS SHOWN
DESIGNED BY	TEA
DRAWN BY	SS
CHECKED BY	RD

LID BASIN MAP

AREA 15
DISTRICT 2
PREPARED FOR
NEW VEGAS HOLDING COMPANY, LLC
CITY OF LAS VEGAS NEVADA

LID

PROJECT NAME: Area 15 District 2

CALC'D BY: SS CHECKED BY: RRD

DATE: 11/15/22 KH No. 91965012

PARKING LOT DATA CALCULATIONS

Note: Stormwater Quality Design Volume calculated using steps from Section 1500 Figures 1501-1503 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: Area 15 District 2

Parking Lot Data			Acreage	
Property Size (PS)		=	1.79	
Building Area (BA)		=	0.00	
Total Hardscape/ Landscape Area (TPA)		=	0.37	
Parking Lot Area (PLA) = (PLA = PS-BA-TPA)		=	1.42	
Minimum PLA to be treated = (PLA * 0.75)		=	**1.07**	acres
Area to be treated by the proposed LID BMPs				
Drainage Area	DMA-1	=	0.65	
Drainage Area	DMA-2	=	0.10	
Drainage Area	DMA-3	=	0.59	
	Total	=	**1.34**	acres

Since 1.34 ac >= 1.07 ac then site satisfies Parking Lot LID criteria

PROJECT NAME: Area 15 District 2

CALC'D BY: SS CHECKED BY: RRD

DATE: 11/15/22 KH No. 91965012

PARKING LOT LID CALCULATIONS - Peak QBMP FOR DRAINAGE AREA "1"

Note: Stormwater Quality Design Volume calculated using steps from Section 1502.3 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: Area Event Parking Lot

Drainage Area = **0.65** acres

Avg % Impervious = **98** %

0.7794

Determine BMP Design Precipitation - 85th Percentile Rainfall Depth 1.11485537

Is site located within McCarran Airport Rainfall Area? (Yes/No?) **YES**

If yes, use Table 505 to obtain 2-year 6-hour rainfall depth; this is your **D2**

If no, use Figure 501 to obtain 2-year 6-hour rainfall depth; this is your **D2**

D2 = **0.72**

Compute ratio of D2 of site to D2 for the McCarran Area

$\mathbf{D2_{site}/D2_{McCarran}}$ = **1.00**

Compute 85th Percentile Rainfal depth $\mathbf{D_{85}}$ using following equation

0.32

Calculate BMP Design Peak Discharge, **QBMP**

Page 1 of 2 Use the following regression equation to calculate the unit discharge (**Qp/A**) for the 90 percent average percent impervious area condition based on $\mathbf{D_{85}}$ value

Y = 1.5042**X** - 0.0066

where, **Y** = Average **Qp/A** in cfs/ac

X = $\mathbf{D_{85}}$ in inches

Qp/A = **0.47** cfs/ac

Adjust the **Qp/A** for site based on actual percent impervious using the following regression equation

Y = 0.0059**X** +0.4688

where, **Y** = Ratio **Qp/A** to 90% Impervious Value (unitless)

X = Percent Impervious

Y = **1.05**

Qp/A (adjusted) = **0.50** cfs/ac

QBMP = **Qp/A (adjusted) * Area**

= **0.32 cfs**

PROJECT NAME: Area 15 District 2

CALC'D BY: SS CHECKED BY: RRD

DATE: 11/15/22 KH No. 91965012

PARKING LOT LID CALCULATIONS - Peak QBMP FOR DRAINAGE AREA "2"

Note: Stormwater Quality Design Volume calculated using steps from Section 1502.3 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: Area Event Parking Lot

Drainage Area = **0.10** acres

Avg % Impervious = **98** %

0.7794

Determine BMP Design Precipitation - 85th Percentile Rainfall Depth 1.11485537

Is site located within McCarran Airport Rainfall Area? (Yes/No?) **YES**

If yes, use Table 505 to obtain 2-year 6-hour rainfall depth; this is your **D2**

If no, use Figure 501 to obtain 2-year 6-hour rainfall depth; this is your **D2**

D2 = **0.72**

Compute ratio of D2 of site to D2 for the McCarran Area

$\mathbf{D2_{,site}/D2_{,\ McCarran}}$ = **1.00**

Compute 85th Percentile Rainfal depth $\mathbf{D_{85}}$ using following equation

0.32

Calculate BMP Design Peak Discharge, **QBMP**

Page 1 of 2 Use the following regression equation to calculate the unit discharge (**Qp/A**) for the 90 percent average percent impervious area condition based on $\mathbf{D_{85}}$ value

Y = 1.5042**X** - 0.0066

where, **Y** = Average **Qp/A** in cfs/ac

X = $\mathbf{D_{85}}$ in inches

Qp/A = **0.47** cfs/ac

Adjust the **Qp/A** for site based on actual percent impervious using the following regression equation

Y = 0.0059**X** +0.4688

where, **Y** = Ratio **Qp/A** to 90% Impervious Value (unitless)

X = Percent Impervious

Y = **1.05**

Qp/A (adjusted) = **0.50** cfs/ac

QBMP = **Qp/A (adjusted) * Area**

= **0.05 cfs**

PROJECT NAME: Area 15 District 2

CALC'D BY: SS CHECKED BY: RRD

DATE: 11/15/22 KH No. 91965012

PARKING LOT LID CALCULATIONS - Peak QBMP FOR DRAINAGE AREA "3"

Note: Stormwater Quality Design Volume calculated using steps from Section 1502.3 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: Area Event Parking Lot

Drainage Area = **0.59** acres

Avg % Impervious = **98** %

0.7794

Determine BMP Design Precipitation - 85th Percentile Rainfall Depth 1.11485537

Is site located within McCarran Airport Rainfall Area? (Yes/No?) **YES**

If yes, use Table 505 to obtain 2-year 6-hour rainfall depth; this is your **D2**

If no, use Figure 501 to obtain 2-year 6-hour rainfall depth; this is your **D2**

D2 = **0.72**

Compute ratio of D2 of site to D2 for the McCarran Area

$\mathbf{D2_{site}/D2_{McCarran}}$ = **1.00**

Compute 85th Percentile Rainfal depth $\mathbf{D_{85}}$ using following equation

0.32

Calculate BMP Design Peak Discharge, **QBMP**

Page 1 of 2 Use the following regression equation to calculate the unit discharge (**Qp/A**) for the 90 percent average percent impervious area condition based on $\mathbf{D_{85}}$ value

Y = 1.5042**X** - 0.0066

where, **Y** = Average **Qp/A** in cfs/ac

X = $\mathbf{D_{85}}$ in inches

Qp/A = **0.47** cfs/ac

Adjust the **Qp/A** for site based on actual percent impervious using the following regression equation

Y = 0.0059**X** +0.4688

where, **Y** = Ratio **Qp/A** to 90% Impervious Value (unitless)

X = Percent Impervious

Y = **1.05**

Qp/A (adjusted) = **0.50** cfs/ac

QBMP = **Qp/A (adjusted) * Area**

= **0.29 cfs**

Worksheet for SW1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	1.00 %
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.00 cfs

Results	
Normal Depth	0.54 ft
Flow Area	1.2 ft²
Wetted Perimeter	4.43 ft
Hydraulic Radius	0.26 ft
Top Width	4.30 ft
Critical Depth	0.43 ft
Critical Slope	3.09 %
Velocity	1.73 ft/s
Velocity Head	0.05 ft
Specific Energy	0.58 ft
Froude Number	0.589
Flow Type	Subcritical

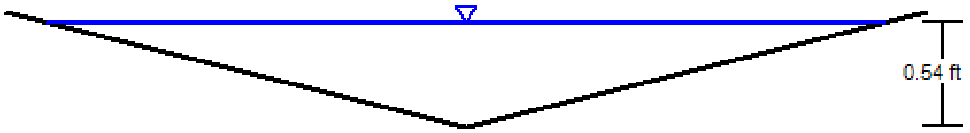
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

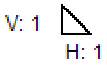
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.54 ft
Critical Depth	0.43 ft
Channel Slope	1.00 %
Critical Slope	3.09 %

Cross Section for SW1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	1.00 %
Normal Depth	0.54 ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.00 cfs





Worksheet for SW2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.25 %
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.00 cfs

Results	
Normal Depth	0.70 ft
Flow Area	1.9 ft²
Wetted Perimeter	5.74 ft
Hydraulic Radius	0.34 ft
Top Width	5.57 ft
Critical Depth	0.43 ft
Critical Slope	3.09 %
Velocity	1.03 ft/s
Velocity Head	0.02 ft
Specific Energy	0.71 ft
Froude Number	0.308
Flow Type	Subcritical

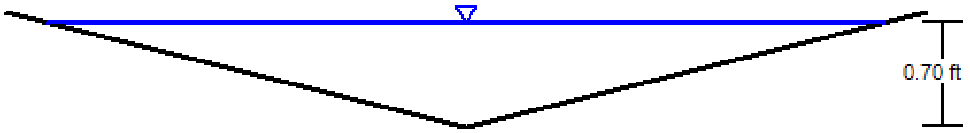
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

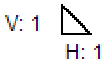
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.70 ft
Critical Depth	0.43 ft
Channel Slope	0.25 %
Critical Slope	3.09 %

Cross Section for SW2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.25 %
Normal Depth	0.70 ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.00 cfs





Worksheet for SW3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	1.00 %
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.50 cfs

Results	
Normal Depth	0.58 ft
Flow Area	1.4 ft²
Wetted Perimeter	4.82 ft
Hydraulic Radius	0.28 ft
Top Width	4.67 ft
Critical Depth	0.48 ft
Critical Slope	3.00 %
Velocity	1.83 ft/s
Velocity Head	0.05 ft
Specific Energy	0.64 ft
Froude Number	0.598
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	0.58 ft
Critical Depth	0.48 ft
Channel Slope	1.00 %
Critical Slope	3.00 %

Cross Section for SW3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.035	
Channel Slope	1.00	%
Normal Depth	0.58	ft
Left Side Slope	4.000	H:V
Right Side Slope	4.000	H:V
Discharge	2.50	cfs