

PRELIMINARY DRAINAGE REPORT

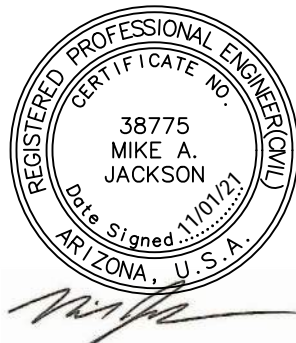
**WEST WING
RECYCLING AND TRANSFER STATION
MARICOPA COUNTY, AZ**

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CEC Project 312-017

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Civil & Environmental Consultants, Inc.

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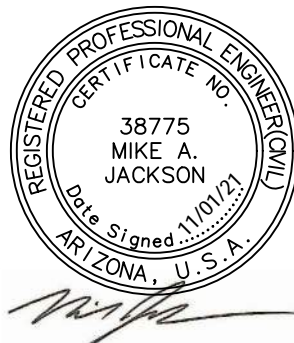
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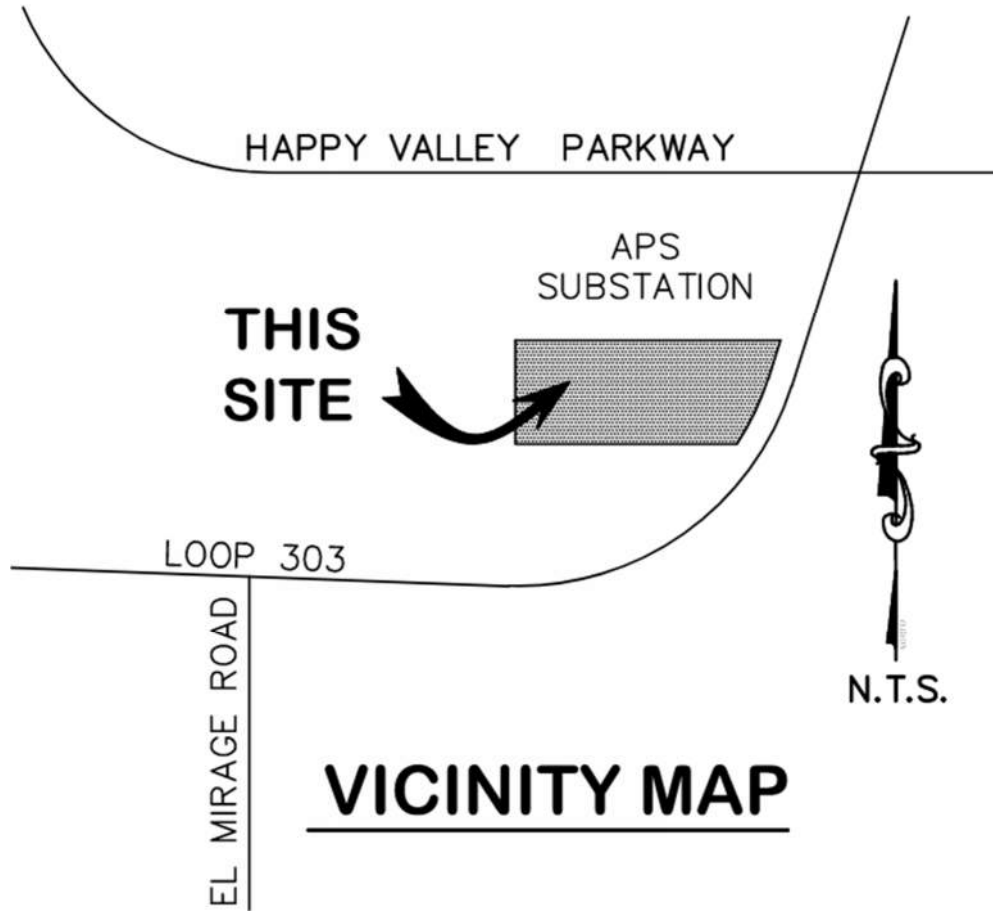
1.0 INTRODUCTION

The purpose of this preliminary drainage report is to provide the conceptual drainage analysis for the proposed recycling and transfer facility. The West Wing Recycling and Transfer Station (Site) is located southwest of the southwest corner of the intersection of Happy Valley Parkway and Loop 303, Maricopa County, Arizona. It is further described as a portion of the southwest quarter of Section 12, Township 4 North, Range 1 East of the Gila and Salt River Meridian. Refer to the vicinity map on the following page.

The site encompasses approximately 10.01 acres of Parcel No.1 (+/- 75.22 acres); APN: 503-53-025U. The proposed commercial development consists of a transfer station, scale house, designated parking area, and onsite retention. Site development improvements include the construction of driveway entrances to provided ingress and egress off the existing road located south of the proposed site. Refer to **Appendix D- Figure 3** for the proposed site layout.

This preliminary drainage report consists of discussions and calculations defining the onsite and offsite storm water management concepts to comply with the drainage requirements established by Maricopa County. The preparation of this report has been done in accordance with the Drainage Design Manual for Maricopa County, Volumes I and II, Hydrology and Hydraulics.

VICINITY MAP



2.0 EXISTING CONDITIONS AND OFFSITE DRAINAGE

The proposed Site is located on approximately 10.01 acres of net land designated as IND-2 IUPD zoning per Maricopa County. The Site is currently undeveloped and drains north to south onto a temporary retention basin at an average slope of 1%. The site contains two manmade channels that convey offsite runoff along the south and east boundaries to the site ultimate outfall at the southeast corner.

According to the Flood Insurance Rate Map (FIRM) #04013C1230 L, dated October 16, 2013, this property is located in flood zone “X”. This area is defined as “Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1-square mile; and areas protected by levees from 1% chance annual flood.”

Refer to the **Appendix A** for a copy of the FIRM map for this area.

Offsite drainage from the northern parcel, APN: 503-53-024H, discharges on-site through existing culvert, EXCV-1. The previous Final Drainage Report for WestWing Business Park-Onsite, dated April 2021, quantified an offsite flow of 277 cubic feet per second (cfs) at EXCV-1 to be diverted along the northeast and east boundary of the proposed site through existing channel, EXCH-1. Existing channel EXCH-1 conveys the runoff to existing culvert EXCV-2 located at the southeast corner of the site.

Refer to **Appendix D- Figure 1** for Existing Conditions Drainage Area Map.

The proposed site is also affected by offsite flows from the west parcel identified as State Trust Land. A portion of the State Trust Land, depicted as Drainage Area DA-1, drains north to south onto an existing channel, EXCH-2, that conveys the captured flow west to east along the site’s south boundary and outfalls at the existing culvert, EXCV-2. The 100-year peak flow entering the site at the southwest corner is approximately 37.55 cfs.

Refer to **Appendix B** for Hydrology Calculations.

3.0 PROPOSED DRAINAGE AND INFRASTRUCTURE IMPROVEMENTS

Offsite Drainage

The existing drainage facilities along the northeast and east boundaries will remain in place and will continue to discharge the 277 cfs at EXCV-2. The southwest offsite flow will be mitigated through four 24-inch storm drains conveying the 40 cfs under the proposed driveway, and will continue to be conveyed through EXCH-2 to the historical outfall at EXCV-2. Inlet headwalls and riprap will be incorporated for erosion protection.

The preliminary sizing of the storm drains were calculated using Hydraflow Hydrographs Extension for Autodesk® with a normal depth calculation. Calculations are presented in **Appendix C**. The final drainage report will provide a hydraulic grade analysis to ensure storm drains are sized appropriately.

Onsite Drainage and Stormwater Retention

Onsite drainage in paved areas will be handled through catch basins and curb openings conveying onsite runoff to their respective retention systems. Onsite retention will be designed to retain the required 100-year, 2-hour storm event for the proposed Site and will drain within the required 36-hours.

Refer to **Appendix D**, Figure 2- Proposed Conditions Drainage Area Map for drainage areas and proposed basin locations.

Retention volume requirements for the development are calculated as follows:

$$\text{Retention Volume} - V = P/12 * C * A$$

Where V = Volume, cubic feet

P = Rainfall Depth, 2.28 inches (NOAA 14 Atlas)

C = runoff coefficient, Industrial - 0.95; Landscape - 0.50

A = Area, Sq. Ft.

The following tables represent calculations for required retention for each drainage area for the Site.

Retention Calculations

DRAINAGE AREA	AREA	AREA	VOLUME REQUIRED	VOLUME PROVIDED	EXCESS/ SHORT
I.D.	(sf)	(Ac)	(cf)	(cf)	(cf)
DA1	69,013	1.58	12,457	12,605	148
DA2A	90,995	2.90	22,796	24,263	1,467
DA2B	35,299				
DA3	26,321	0.60	4,751	4,784	33
DA4	178,913	4.11	16,997	41,817	24,820
TOTAL	400,541	9.19	57,001	83,468	26,468

Retention Basin Volume Calculations

Onsite retention will consist of surface basins with maximum side slopes of 4:1 with a maximum depth of 3-feet. The volume for open basins is calculated using the conical method based on design contours.

RETENTION VOLUME PROVIDED CALCULATIONS: CONICAL METHOD

$$\text{RETENTION PROVIDED} = (\text{ELEV1}-\text{ELEV2})/3*((\text{A1}+\text{A2}+(\text{A1}*\text{A2})^{0.5}))$$

RETENTION BASIN ID	ELEV.	AREA (SF)	DEPTH DIFF. (FT)	AVG VOLUME (CF)	CUM VOLUME (CF)
1	1300	2,386	0.00		
	1301	3,533	1.00	2,941	2,941
	1302	4,806	1.00	4,153	7,094
	1303	6,247	1.00	5,511	12,605
2	1298	5,645	0.00		
	1299	7,205	1.00	6,409	6,409
	1300	8,908	1.00	8,041	14,450
	1301	10,746	1.00	9,813	24,263
3	1299	687	0.00		
	1300	1,230	1.00	945	945
	1301	1,900	1.00	1,553	2,498
	1302	2,695	1.00	2,286	4,784
4	1299	39,735	0.00		
	1300	43,934	1.00	41,817	41,817
TOTAL					83,468

Onsite Hydrology

The hydrology analysis for the proposed Site was performed based on procedures dictated in the Drainage Design Manual for Maricopa County, Volumes I Hydrology. The rational method was used to compute the onsite peak discharges for the 10-year and 100-year storm event, assuming a 5-minute time of concentration. The rational method equation is as follows:

$$Q=CiA$$

Where Q = peak discharge, cfs

C = runoff coefficient, Industrial - 0.95; Landscape - 0.50

i = average rainfall intensity, inches/hour (NOAA 14 Atlas)

A = Area, Sq. Ft.

ONSITE PEAK RUNOFF CALCULATIONS								
AREA	AREA	Tc	I ₁₀	I ₁₀₀	C ₁₀	C ₁₀₀	Q ₁₀	Q ₁₀₀
I.D.	(ac)	(min.)	(in/hr)	(in/hr)			(cfs)	(cfs)
EX1	12.89	11	3.62	5.72	0.40	0.51	18.66	37.55
DA1	1.58	5	4.93	7.81	0.80	0.95	6.23	11.72
DA2A	2.09	5	4.93	7.81	0.80	0.95	8.24	15.51
DA2B	0.81	5	4.93	7.81	0.80	0.95	3.19	6.01
DA3	0.60	5	4.93	7.81	0.80	0.95	2.37	4.45
DA4	4.11	5	4.93	7.81	0.40	0.50	8.10	16.05

Onsite Hydraulics and Drainage Infrastructure

Curb openings and grouted riprap spillways will be utilized to collect and convey stormwater flow into the onsite retention basins. Break over elevations for retention basins will be a minimum of 14-inches below finished floor elevations. Calculations for the curb opening widths are shown on the following table and in Appendix C.

CURB OPENING CALCULATIONS				
Curb Opening	Area	Q ₁₀₀	Width	Curb Opening Capacity
I.D.	I.D.	(cfs)	(ft)	(cfs)
CO#1	DA1	11.72	4.00	12.41
CO#2A	DA2A	15.51	6.00	19.49
CO#2B	DA2B	6.01	4.00	12.41
CO#3	DA3	4.45	4.00	12.41

Percolation Calculations

Percolation tests have not be performed for the Site in association with this Preliminary Drainage Report. Once these tests have been performed, final calculation will be utilized to compute percolation rates and dewatering times for the retention basins within the 36-hour Maricopa County criteria. The following is an estimated rate based on a minimum percolation rate of a drywell, 0.1 cfs.

Volume to be drained in 36 hours = 0.1 cfs * 36 hours * 3600 sec/hour = 12,960 cf

RETENTION	VOLUME	DRYWELLS
BASIN	PROVIDED	REQUIRED
ID	(cf)	(SF)
1	12,605	1
2	24,263	2
3	4,784	1
TOTAL	41,651	4

Existing Basin 4 is a one-foot temporary basin and will not need a drywell.

4.0 CONCLUSIONS

The proposed Happy Valley Recycling and Transfer Facility project will adhere to Maricopa County onsite drainage criteria to retain the 100-year, 2-hour storm onsite within the proposed retention basins. Retention basins are to have a maximum ponding depth of 3-feet and 4:1 side slopes unless otherwise approved by the County Engineer.

The low outfall elevation for the Site is located on the southwest side of the property at an elevation of 1296.49. The finished floor for the development is 1307.00 and the bottom of the transfer station pit is 1303.00. Offsite flows will be conveyed through the Site through a four 24-inch storm drains and will exit the property at existing outfall locations.

APPENDIX A – FEMA FIRM MAP

APPENDIX B – HYDROLOGY CALCULATIONS

Project Name: West Wing Recycling and Transfer Station

CEC JOB: 312-017

DATE: 06/16/2021

PREPARED BY: KA

CHECKED BY:

EXISTING CONDITIONS RUNOFF CALCULATIONS

Empirical Equation Papadakis and Kazan:

$$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$$

$T_c = 11.4L^{0.5}K_b^{0.52}S^{(-0.31)}i^{(-0.38)}$

Time of Concentration

Tc hours

Length of the hydraulically longest flow path

L miles

Watershed resistance coefficient (Table 5.3, DDMMC,
Vol. I Hydrology)

Kb

Watercourse slope

S ft/mi

The average rainfall excess intensity

i inches/ hr

Tc Drainage Area : EX1	
A (ac)	12.89
L (mi)	0.16
m	-0.01375
b	0.08
Kb=mlogA+b	0.065
S (ft/mi)	35.45787546
i (in/hr)	5.72
Tc (min)	11.06

Rational Equation:

$$Q = C \cdot I \cdot A$$

C = weighted

I= Intensity, in/hr

A = Area, Acre

EXISTING CONDITIONS PEAK FLOW					
AREA	AREA	Tc	I ₁₀₀	C ₁₀₀	Q ₁₀₀
I.D.	(ac)	(min.)	(in/hr)		(cfs)
EX1	12.89	11.06	5.72	0.51	37.55

APPENDIX C – HYDRAULIC CALCULATIONS

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Jun 16 2021

24-inch Storm Drains

Invert Elev Dn (ft) = 1299.62
Pipe Length (ft) = 50.00
Slope (%) = 0.30
Invert Elev Up (ft) = 1299.77
Rise (in) = 24.0
Shape = Circular
Span (in) = 24.0
No. Barrels = 4
n-Value = 0.013
Culvert Type = Circular Corrugate Metal Pipe
Culvert Entrance = Headwall
Coeff. K,M,c,Y,k = 0.0078, 2, 0.0379, 0.69, 0.5

Embankment

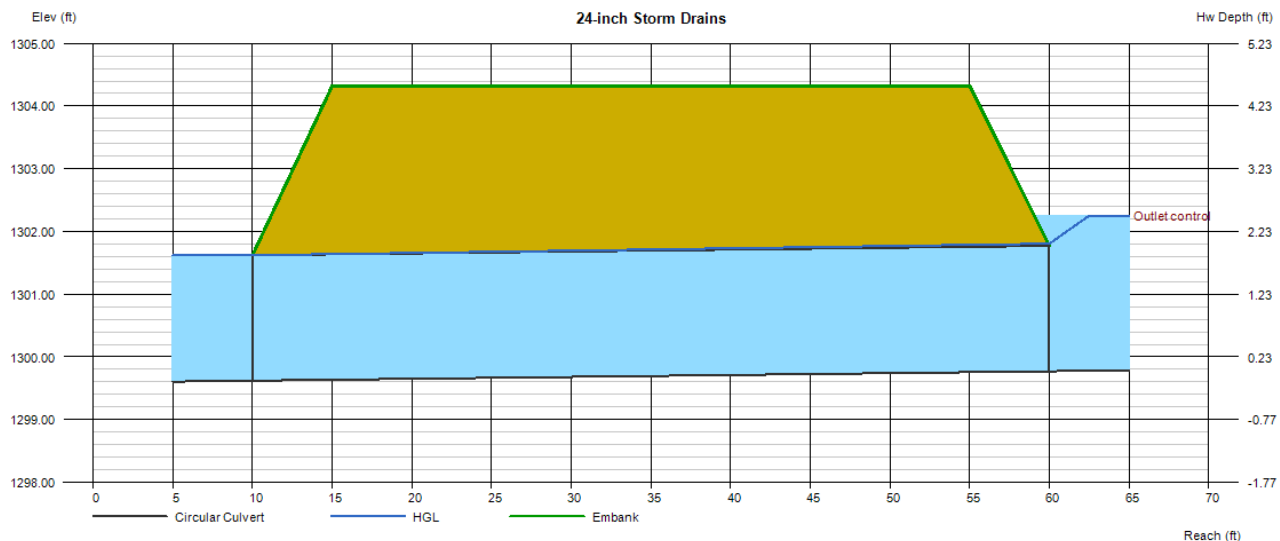
Top Elevation (ft) = 1304.32
Top Width (ft) = 40.00
Crest Width (ft) = 50.00

Calculations

Qmin (cfs) = 55.00
Qmax (cfs) = 55.00
Tailwater Elev (ft) = Normal

Highlighted

Qtotal (cfs) = 55.00
Qpipe (cfs) = 55.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 4.38
Veloc Up (ft/s) = 4.38
HGL Dn (ft) = 1301.62
HGL Up (ft) = 1301.81
Hw Elev (ft) = 1302.25
Hw/D (ft) = 1.24
Flow Regime = Outlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Jun 16 2021

4' Wide Curb Opening

Rectangular

Bottom Width (ft) = 4.00

Total Depth (ft) = 0.50

Invert Elev (ft) = 1304.00

Slope (%) = 1.00

N-Value = 0.013

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 12.41

Area (sqft) = 2.00

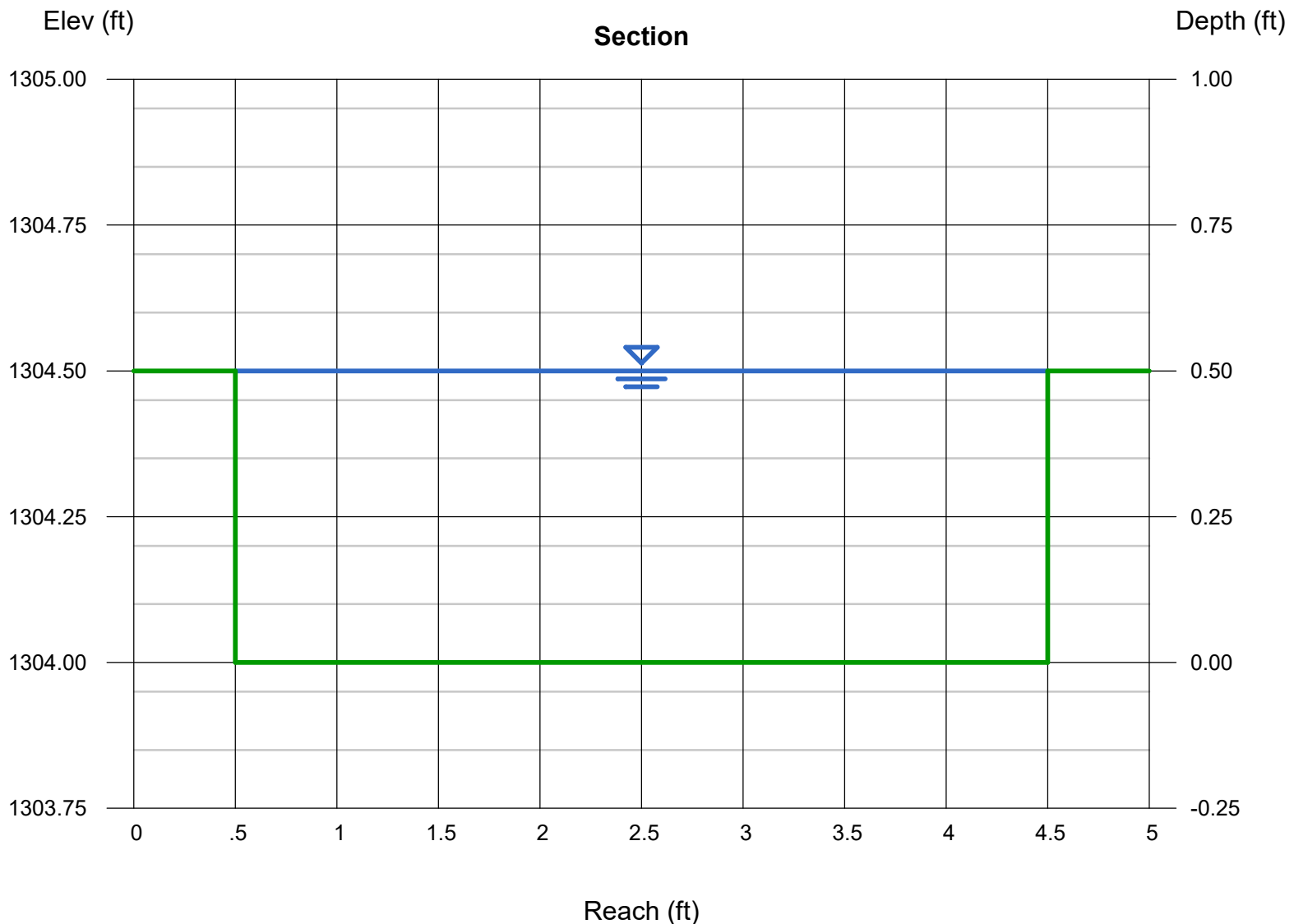
Velocity (ft/s) = 6.20

Wetted Perim (ft) = 5.00

Crit Depth, Yc (ft) = 0.50

Top Width (ft) = 4.00

EGL (ft) = 1.10



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Jun 16 2021

6' Wide Curb Opening

Rectangular

Bottom Width (ft) = 6.00

Total Depth (ft) = 0.50

Invert Elev (ft) = 1304.00

Slope (%) = 1.00

N-Value = 0.013

Calculations

Compute by: Known Depth

Known Depth (ft) = 0.50

Highlighted

Depth (ft) = 0.50

Q (cfs) = 19.49

Area (sqft) = 3.00

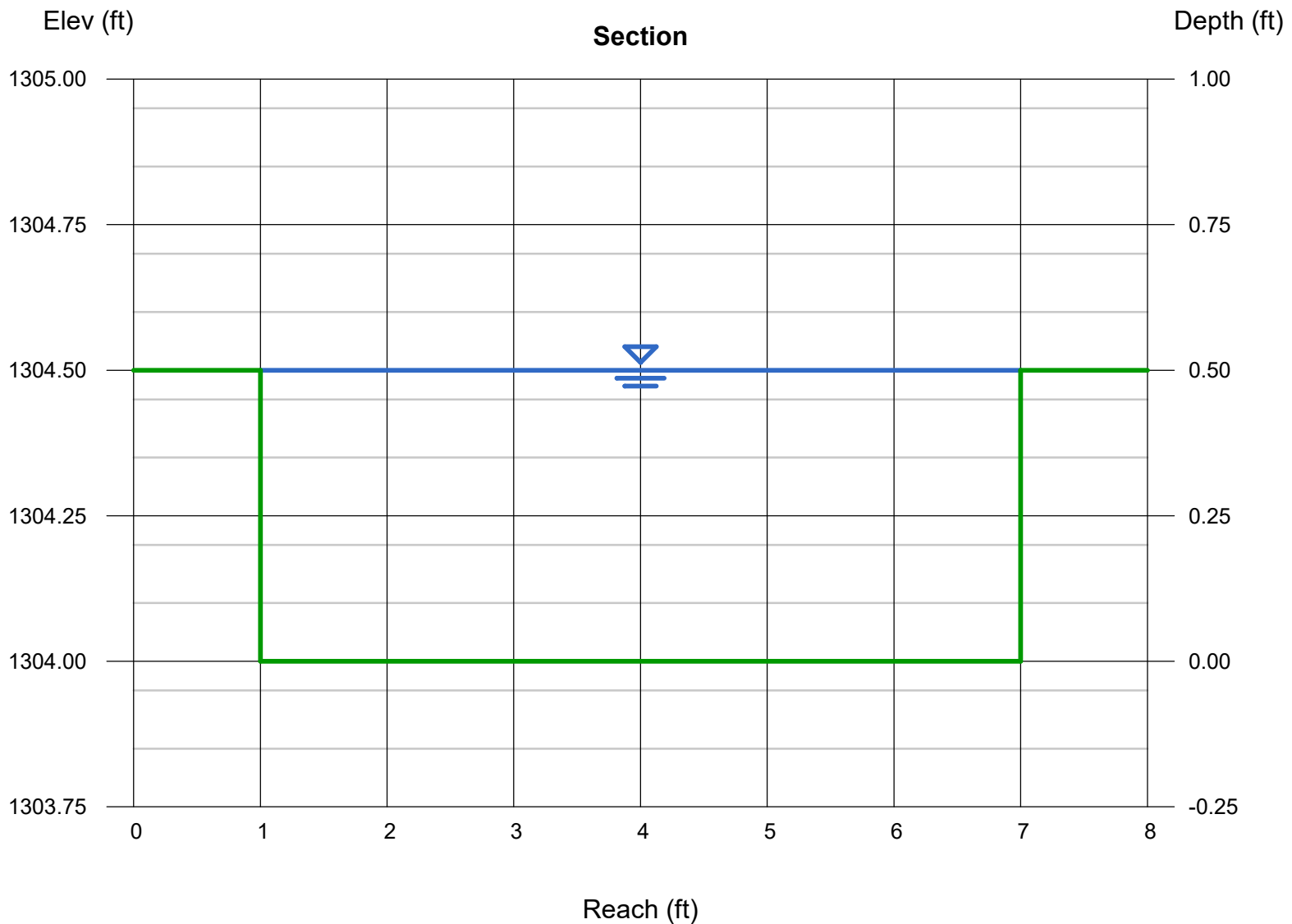
Velocity (ft/s) = 6.50

Wetted Perim (ft) = 7.00

Crit Depth, Yc (ft) = 0.50

Top Width (ft) = 6.00

EGL (ft) = 1.16



APPENDIX D – DRAINAGE EXHIBITS
