CONCEPTUAL DRAINAGE REPORT

FOR

STAGECOACH & WINDMILL SUBDIVISION

SCOTTSDALE, ARIZONA

Prepared for:

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Plan # 12-ZN-2019
Case #
Q-S #
[X] Accepted
[ ] Corrections
N.Baronas 1/8/20
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June 9, 2019
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Job # 1544

CONCEPTUAL DRAINAGE REPORT

FOR

STAGECOACH & WINDMILL SUBDIVISION

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1.0 INTRODUCTION

General Description

Stagecoach & Windmill is a proposed 23 lot subdivision on a vacant 30-acre parcel located in Scottsdale. The purpose of this report is to present a drainage design that is in compliance with the City of Scottsdale's Design Standards and Policies Manual (DS&PM), and is compatible with the existing development in the area.

Project Location

The Project is located south of Stagecoach Pass Road and West of Windmill Road as shown in Figure 1. The property is located in the northwest quarter of Section 1, Township 5 North, Range 4 East of the Gila and Salt River Base and Meridian.

The subject property is bound by Stagecoach Pass Road to the north, Windmill Road to the east and existing residences to the south (*Sand Flower* II) and west (*Tecolote* Montana). There is also a vacant (unsubdivided) parcel along the south and west side of the property.

2.0 FLOODPLAIN DESIGNATION

The site is currently located within FEMA Flood Zone "X" as shown on the FEMA Flood Insurance Rate Maps 04013C0895L and 04013C0884L dated October 16, 2013 (see Figure 2).

Flood Zone "X" 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% annual chance flood."

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3.0 EXISTING CONDITIONS

Topographic Conditions

The property consists of undeveloped native desert terrain and generally slopes in a southwesterly direction. The development's elevation change is approximately 21 feet, dropping from approximately 2,505 feet mean sea level (MSL) at the northeast corner of the development to approximately 2,484 feet above MSL along the southern boundary of the development.

Offsite Flows

Offsite flows enter the Project site from the north and east side of the property. Significant watercourses are conveyed to the site by three storm drain crossings located in Windmill Road. These existing storm drain crossings are drainage outfalls from detention facilities located in *Encanto Norte* and *Windmill a Bacon Signature Neighborhood* subdivisions directly east of the Project. An analysis of these offsite detention facilities will be performed with the final drainage report if required. Offsite flows pass through the site in natural wash corridors and exit the property along the south and west sides of the property.

Methodology of Analysis

The Flood Control District of Maricopa County's (FCDMC) *Drainage Design Management System* (DDMS) program was used to compute peak discharge rates for pre- and post-development flows from contributing watersheds (see Appendix B). Since offsite watersheds are less the 160 acres and have fairly uniform land-use, a Rational Method analysis was performed. Offsite contributing areas were delineated using City Quarter Section contour maps and topography from the *Carefree Drainage Master Plan Floodplain Delineation Study* (see Figure 3). IDF values are based on NOAA Atlas 14 rainfall intensities. Values for land use (runoff coefficient "C") are based on City of Scottsdale's DS&PM Figure 4-1.5 (non-default values).

4.0 PROPOSED DRAINAGE PLAN

Onsite Detention

According to the City's Drainage Ordinance, all runoff generated from the developed portion of the site must be managed and the peak discharge rate from the site reduced to at least pre-development values. However, since the property is located within the upper desert landform of the Environmentally Sensitive Lands Ordinance (ESLO), storing the 100-year, 2-hour storm event would require storage basins that would severely impact natural vegetation and the rural "feel" of the area. With the development being sparse in nature at approximately 0.8 dwelling units per acre and no mass grading being proposed, post-development flows are only slightly higher than pre-development flows. Therefore, on-line detention basins located immediately upstream of culverted roadway crossings are proposed to reduce the post-development flows to at or below the pre-development flows for all concentration points. The detention basin outfall will be designed to meter flows

downstream such that the 2-, 10- and 100-year storm peak discharges are attenuated. Figure 5 shows a conceptual detention basin outfall detail that will be used to determine stage-storage volumes for each design storm. For the purposes of this conceptual drainage design, only the 100-year storm was evaluated. Please refer to Appendix B for the results of the conceptual detention analysis. A HEC-1 analysis will be performed as part of the Design Review process to demonstrate that the proposed detention basins attenuate peak discharges for the 2-, 10-, and 100-year storm events.

Summary of Modeling Results

As previously discuss, FCDMC's DDMS program was used to compute pre- and post-development discharge rates. Runoff for each sub-basin was computed and then routed, if required, through downstream drainage sub-basins or detention areas. Table 4.1 below provides the comparative peak discharge rates for the pre- vs post-developed conditions at each point of concentration. As can be seen from the results, post-development peak flow rates are equal to or reduced from pre-development flow rates.

Table 4.1 – 100-year Flow Summary

Concentration Point	Pre-Development Flow Rate (cfs)	Post-Development Flow Rate (cfs)
CP2	97	80*
CP3	9	6
CP4	13	6
CP6	169	163*
CP7	44	38
CP8	14	6

* Post-development flow rates were calculated by diverting a portion of the contributing drainage area to a proposed onsite detention basin. The proposed detention basin will be designed to store the entire 100-year, 2-hour volume so that the sub-basin can effectively be removed from the contributing area.

Identification of Major Drainage Courses

There are no washes on the site with an anticipated 100-year flow rate equal to or greater than 750 cfs, therefore no washes are categorized as a Vista Corridor. The major water courses that traverse through the project have been identified as washes with a 100-year flow rate greater than 50 cfs. These washes will be maintained in their natural location and will not be re-aligned.

404 Washes

A preliminary investigation to identify possible jurisdictional washes and request for 404 Jurisdictional Delineation Verification will be submitted to the Army Corp of Engineers for review as part of a future phase of the project.

Individual Lot Requirements

This property is being developed as a large custom lot subdivision. Therefore, as lots are developed, individual lot *Grading & Drainage Plans* will be required for each lot along with the necessary drainage documentation. Each lot will be required to maintain existing drainage patterns so as not to cause adverse impacts to adjacent properties.

Easement Requirements

Where flows from the 100-year storm event are greater than 50 cfs, natural area open space (NAOS) drainage easements have been provided. Drainage easements will be dedicated to the limits of the 100-year storm event.

Roadway Crossings

Preliminary roadway crossings have been calculated using Federal Highway Administrations HY-8 program (see Appendix C). In all cases, the depth of flow over streets will be in accordance with City of Scottsdale Floodplain and Drainage Ordinance.

Maintenance

Ongoing maintenance of the proposed drainage system will be required to preserve the design integrity and purpose of the drainage system. Failure to provide maintenance can prevent the drainage system from performing its intended design purpose and can result in reduced performance. It is the responsibility of private developers, homeowners' associations, etc. for facilities on private property, within all drainage easements, private streets, and rights-of-ways unless accepted by the City for maintenance. A regular maintenance program is required to have drainage systems perform to the level of protection or service as presented in this report.

5.0 CONCLUSIONS

- The project is located within FEMA Flood Zone “X” as shown in Figure 2.
- Drainage corridors have been designated for the identified washes in accordance with City of Scottsdale’s DS&PM.
- Onsite detention will be provided to reduce post-development flows to at or below pre-development levels.
- The design of hydraulic structures are to be based on generally accepted engineering practices and in accordance with City of Scottsdale requirements.
- Individual lot *Grading & Drainage Plans* will be required for each lot at the time of custom lot development.
- All off-site flows will enter and exit the site as per historical conditions with no adverse effects to adjacent properties.
- This project will not adversely impact drainage conditions on adjacent properties.
- Drainage facilities shall be maintained so as to not cause or contribute to the creation of a public nuisance. At a minimum, maintenance shall include the removal of all debris and sediment from drainage facilities immediately following a storm event.
- Onsite detention basins will be used to address first flush stormwater quality requirements. The invert of the outflow pipe will be located 3 inches above the basin floor. Other measures may be used such as vegetated or rock bioswales subject to review and approval by the City’s Water Quality Coordinator and/or stormwater staff.

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APPENDIX A

FIGURES

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DATE: 6/6/19

SCALE: 1"=1000'

FIGURE 1
LOCATION MAP

JOB NO.

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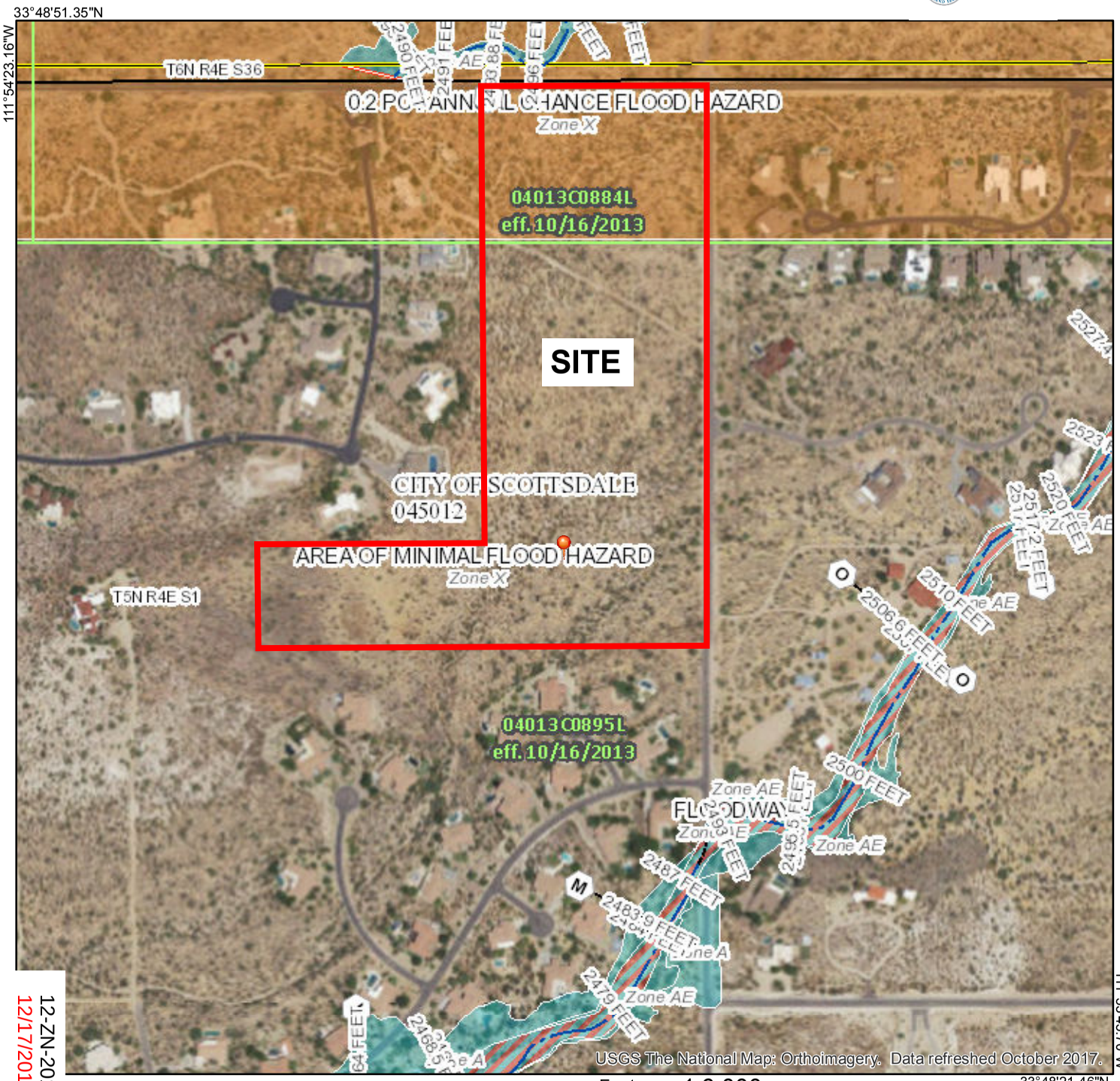
12/17/2019

National Flood Hazard Layer FIRMette

FEMA



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Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/6/2019 at 12:53:02 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following m elements do not appear: basemap imagery, flood zone label legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images fo unmapped and unmodernized areas cannot be used for regulatory purposes.

FIGURE 2

LEGEND

- BASX — DETENTION BASIN
- CPX — CONCENTRATION POINT
- PRE-DEVELOPMENT WATERSHED BOUNDARY
- POST-DEVELOPMENT WATERSHED BOUNDARY

N

120 60 0 60 120 240
SCALE: 1"=120'

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STAGECOACH AND WINDMILL
EXISTING CONDITIONS WATERSHED MAP

SCOTTSDALE, ARIZONA

DATE:

REVISIONS:

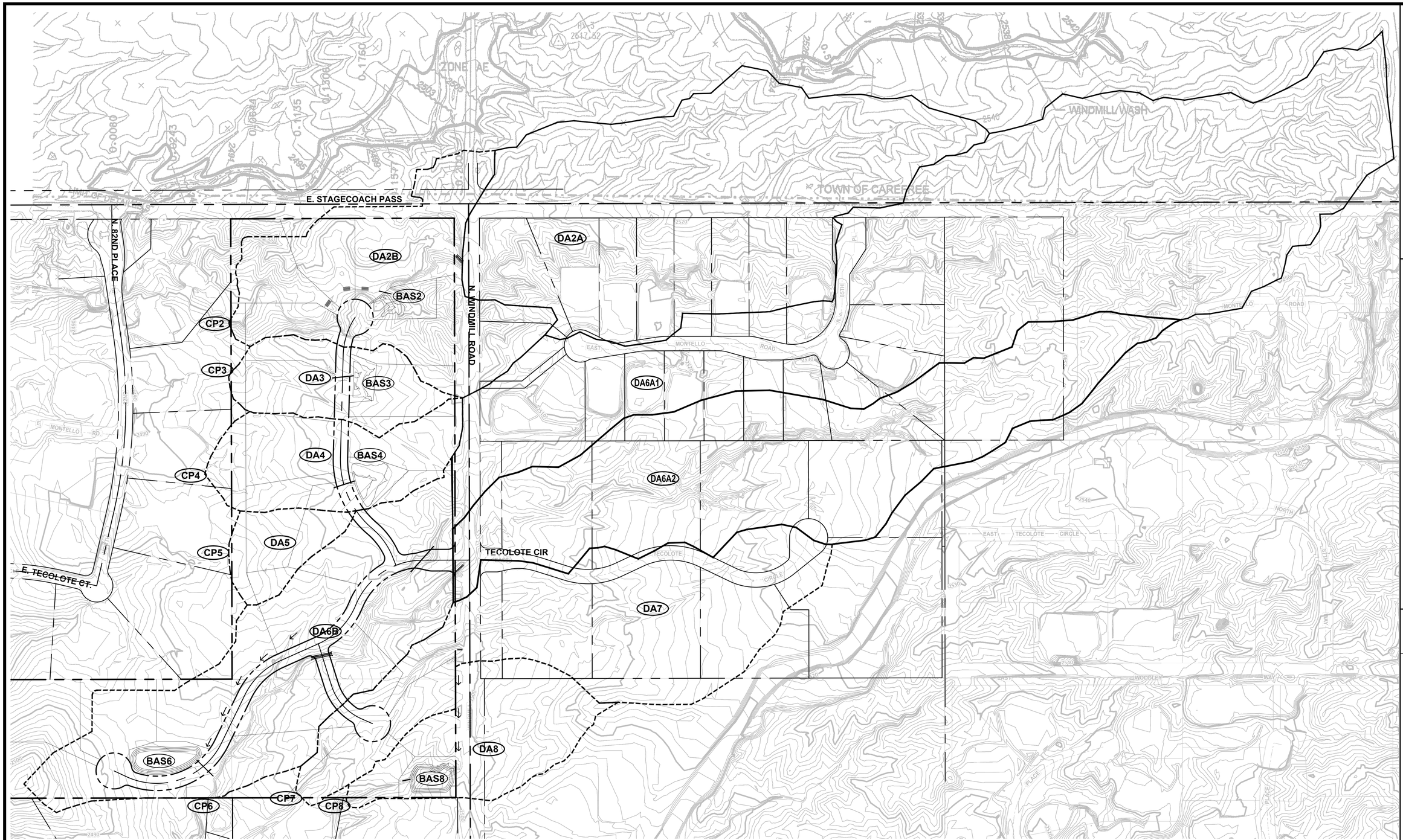
WATERSHED MAP

DATE: 6/5/19

PROJ. # : 1544

FIG. 3A

12-ZN-2019
12/17/2019



LEGEND

- (BASX) DETENTION BASIN
- (CPX) CONCENTRATION POINT
- PRE-DEVELOPMENT WATERSHED BOUNDARY
- POST-DEVELOPMENT WATERSHED BOUNDARY

N

120 60 0 60 120 240
SCALE: 1"=120'

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STAGECOACH AND WINDMILL
DEVELOPED CONDITIONS WATERSHED MAP

SCOTTSDALE, ARIZONA

DATE:

REVISIONS:

WATERSHED MAP

DATE: 6/5/19

PROJ. # : 1544

FIG. 3B

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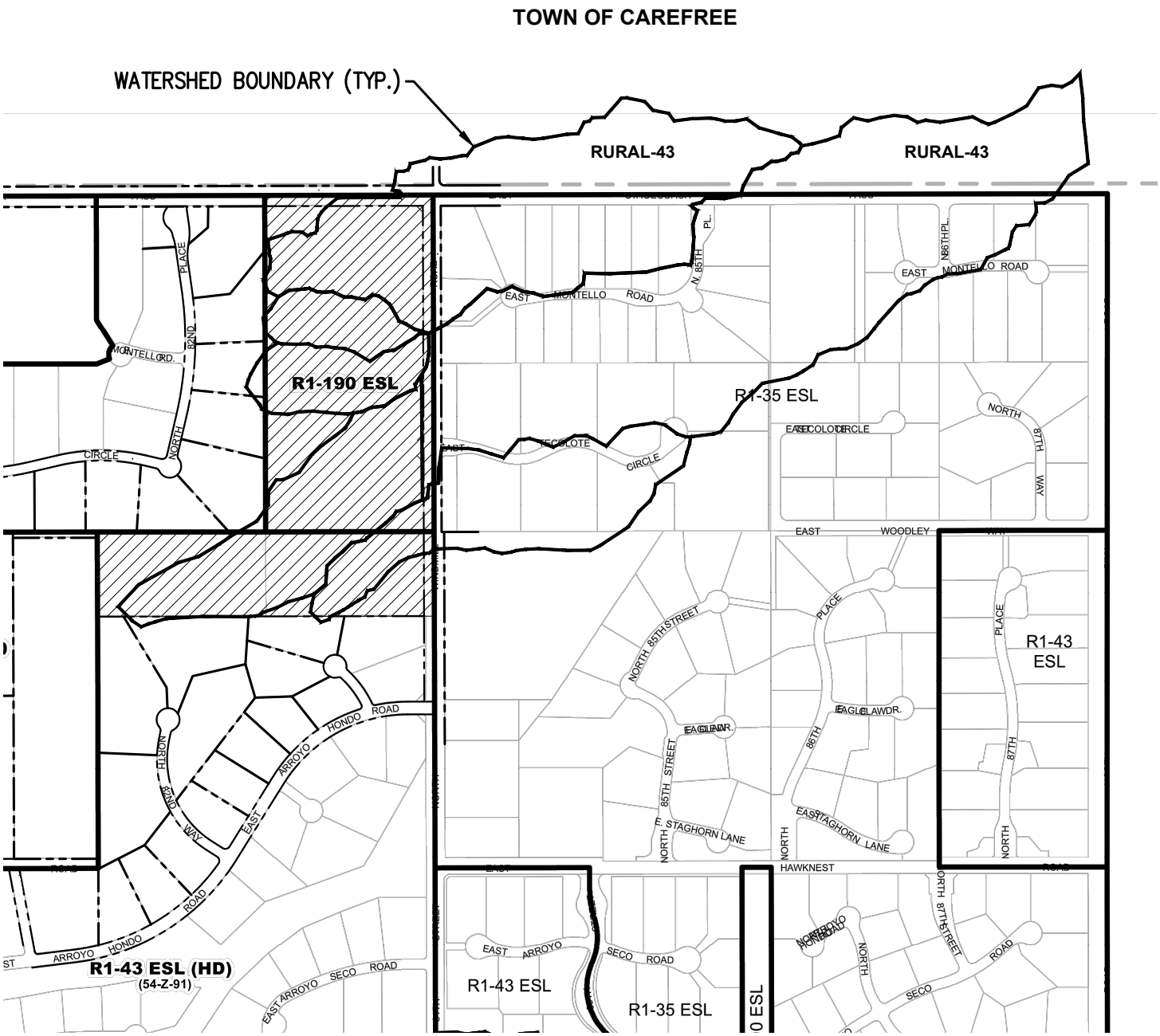

PROJECT SITE LAND USE ASSUMES UNDISTURBED NATURAL DESERT FOR PRE-DEVELOPMENT CONDITIONS AND R1-43 RESIDENTIAL DEVELOPMENT FOR POST-DEVELOPMENT CONDITIONS

N

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FIGURE 4
LAND USE MAP

JOB NO.

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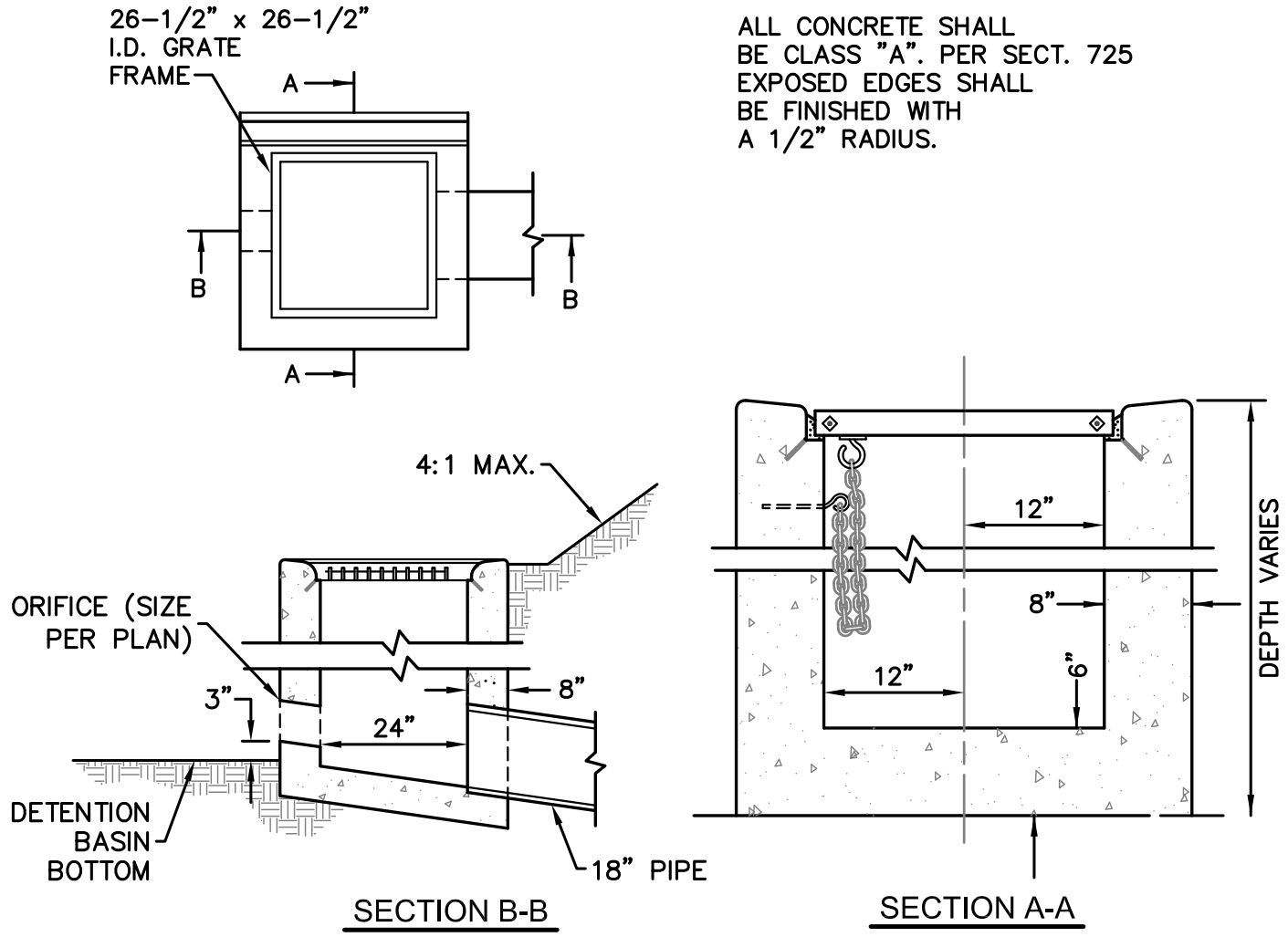

FIGURE 5
CONCEPT DETENTION BASIN OUTFALL
CATCH BASIN – TYPE G (MODIFIED)

APPENDIX B

HYDROLOGIC & DETENTION ANALYSIS

PRE-DEVELOPMENT

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: 1544-PRE

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
DA2	22.4	2,244	2,539.00	2,489.00	117.6	0.032	Q (cfs)	20.5	29.4	36.5	46.9	75.0	96.0
							C	0.38	0.38	0.38	0.38	0.52	0.58
							CA (ac)	8.51	8.51	8.51	8.51	11.65	12.99
							Volume (ac-ft)	0.4524	0.5622	0.6443	0.7503	1.1309	1.3769
							Tc (min)	12	10	10	9	8	8
							i (in/hr)	2.41	3.46	4.29	5.51	6.44	7.39
DA3	2.5	694	2,510.00	2,493.00	129.3	0.075	Q (cfs)	2.4	3.5	4.4	5.6	7.3	9.0
							C	0.37	0.37	0.37	0.37	0.42	0.45
							CA (ac)	0.93	0.93	0.93	0.93	1.05	1.13
							Volume (ac-ft)	0.0432	0.0547	0.0631	0.0731	0.0899	0.1059
							Tc (min)	10	9	8	7	7	6
							i (in/hr)	2.63	3.81	4.74	6.01	6.99	7.98
DA4	3.6	822	2,510.00	2,491.00	122.0	0.072	Q (cfs)	3.4	4.8	6.0	7.6	10.2	12.4
							C	0.37	0.37	0.37	0.37	0.42	0.45
							CA (ac)	1.33	1.33	1.33	1.33	1.51	1.62
							Volume (ac-ft)	0.0675	0.0830	0.0960	0.1104	0.1388	0.1619
							Tc (min)	11	9	9	8	7	7
							i (in/hr)	2.52	3.63	4.51	5.75	6.73	7.68
DA6	49.5	4,127	2,557.00	2,483.00	94.7	0.035	Q (cfs)	35.2	51.0	63.4	80.7	130.0	167.1
							C	0.38	0.38	0.38	0.38	0.52	0.58
							CA (ac)	18.81	18.81	18.81	18.81	25.74	28.71
							Volume (ac-ft)	1.3075	1.6412	1.8770	2.1814	3.2989	4.0252
							Tc (min)	20	18	16	15	14	13
							i (in/hr)	1.87	2.71	3.37	4.29	5.05	5.82
DA7	10.6	1,723	2,527.00	2,486.00	125.6	0.044	Q (cfs)	9.6	13.8	17.0	21.8	34.3	43.4
							C	0.38	0.38	0.38	0.38	0.51	0.56

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: 1544-PRE

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
							CA (ac)	4.03	4.03	4.03	4.03	5.41	5.94
							Volume (ac-ft)	0.2171	0.2715	0.3095	0.3608	0.5361	0.6384
							Tc (min)	12	11	10	9	9	8
							i (in/hr)	2.38	3.42	4.22	5.42	6.34	7.31
DA8	2.8	829	2,514.00	2,486.00	178.3	0.049	Q (cfs)	3.2	4.5	5.5	7.0	10.8	13.5
							C	0.38	0.38	0.38	0.38	0.51	0.56
							CA (ac)	1.06	1.06	1.06	1.06	1.43	1.57
							Volume (ac-ft)	0.0435	0.0538	0.0607	0.0708	0.1033	0.1241
							Tc (min)	7	7	6	6	5	5
							i (in/hr)	2.99	4.25	5.23	6.56	7.58	8.62

* Non default value

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Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: 1544-PRE

Sub Basin	Land Use Code	Area (acres)	Area (%)	Kb	Runoff Coefficient C						Description
					2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	
Major Basin ID: 01											
DA2	130	17.90	79.9	0.032	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
	700	4.50	20.1	0.032	0.37*	0.37*	0.37*	0.37*	0.42*	0.45*	General Open Space (Open space where no detail available)
		22.400	**100.0**								
DA3	700	2.50	100.0	0.075	0.37*	0.37*	0.37*	0.37*	0.42*	0.45*	General Open Space (Open space where no detail available)
		2.500	**100.0**								
DA4	700	3.60	100.0	0.072	0.37*	0.37*	0.37*	0.37*	0.42*	0.45*	General Open Space (Open space where no detail available)
		3.600	**100.0**								
DA6	130	39.60	80.0	0.029	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
	700	9.90	20.0	0.057	0.37*	0.37*	0.37*	0.37*	0.42*	0.45*	General Open Space (Open space where no detail available)
		49.500	**100.0**								
DA7	130	7.11	67.0	0.034	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
	700	3.50	33.0	0.066	0.37*	0.37*	0.37*	0.37*	0.42*	0.45*	General Open Space (Open space where no detail available)
		10.610	**100.0**								
DA8	130	1.89	67.0	0.037	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
	700	0.93	33.0	0.074	0.37*	0.37*	0.37*	0.37*	0.42*	0.45*	General Open Space (Open space where no detail available)
		2.820	**100.0**								

* Non default value

POST-DEVELOPMENT

Type / ID	Length (ft)	Velocity (ft/sec)	Tpipe (min)	Combine		Return Period (Years) 2	5	10	25	50	100
cFirstPipe											
Maior Basin ID: 01											
Sub Basin	-	-	-	-	Q (cfs)	18.2	26.1	32.5	41.6	70.5	90.2
DA2					CA (ac)	7.60	7.60	7.60	7.60	11.00	12.20
					Tc (min)	12.1	10.5	9.7	8.8	8.3	7.8
					i (in/hr)	2.40	3.44	4.27	5.48	6.41	7.39
					Volume (ac-ft)	0.4050	0.5039	0.5797	0.6732	1.0760	1.2937
Sub Basin	-	-	-	-	Q (cfs)	3.0	4.3	5.2	6.4	10.6	13.2
DA3					CA (ac)	0.95	0.95	0.95	0.95	1.38	1.53
					Tc (min)	6.3	5.5	5.1	5.0	5.0	5.0
					i (in/hr)	3.18	4.48	5.49	6.74	7.67	8.62
					Volume (ac-ft)	0.0348	0.0435	0.0488	0.0588	0.0975	0.1214
Storage	-	-	-	-	Q (cfs)	1.7	2.2	2.6	3.1	5.1	6.2
BAS3					CA (ac)	0.95	0.95	0.95	0.95	1.38	1.53
					Tc (min)	-	-	-	-	-	-
					i (in/hr)	-	-	-	-	-	-
					Volume (ac-ft)	0.0348	0.0435	0.0488	0.0588	0.0975	0.1214
Sub Basin	-	-	-	-	Q (cfs)	4.2	5.9	7.3	9.1	15.2	19.0
DA4					CA (ac)	1.37	1.37	1.37	1.37	1.98	2.20
					Tc (min)	7.0	6.1	5.7	5.2	5.0	5.0
					i (in/hr)	3.06	4.34	5.31	6.67	7.67	8.62
					Volume (ac-ft)	0.0541	0.0662	0.0765	0.0870	0.1398	0.1747
Storage	-	-	-	-	Q (cfs)	1.8	2.3	2.7	3.2	5.0	6.2
BAS4					CA (ac)	1.37	1.37	1.37	1.37	1.98	2.20
					Tc (min)	-	-	-	-	-	-
					i (in/hr)	-	-	-	-	-	-
					Volume (ac-ft)	0.0541	0.0662	0.0765	0.0870	0.1398	0.1747
Sub Basin	-	-	-	-	Q (cfs)	31.6	46.0	57.3	73.1	123.1	156.9
DA6A					CA (ac)	14.97	14.97	14.97	14.97	21.67	24.03
					Tc (min)	15.6	13.5	12.4	11.3	10.7	10.1
					i (in/hr)	2.11	3.07	3.83	4.88	5.68	6.53
					Volume (ac-ft)	0.9065	1.1419	1.3065	1.5189	2.4221	2.9140
Sub Basin	-	-	-	-	Q (cfs)	4.3	6.2	7.7	9.8	16.3	20.7
DA6B					CA (ac)	1.56	1.56	1.56	1.56	2.26	2.51
					Tc (min)	8.8	7.6	7.0	6.4	6.1	5.8
					i (in/hr)	2.77	4.00	4.95	6.25	7.22	8.25
					Volume (ac-ft)	0.0696	0.0866	0.0991	0.1153	0.1828	0.2208
Combine	-	-	-	2	Q (cfs)	33.3	48.1	59.9	76.8	129.5	167.0
COM6					CA (ac)	16.53	16.53	16.53	16.53	23.93	26.54
					Tc (min)	-	-	-	-	-	-
					i (in/hr)	-	-	-	-	-	-
					Volume (ac-ft)	0.9761	1.2285	1.4056	1.6342	2.6049	3.1348
Sub Basin	-	-	-	-	Q (cfs)	8.7	12.6	15.7	19.9	33.5	42.7
DA7					CA (ac)	3.41	3.41	3.41	3.41	4.93	5.47
					Tc (min)	10.5	9.1	8.3	7.6	7.2	6.8
					i (in/hr)	2.55	3.69	4.61	5.85	6.80	7.81
					Volume (ac-ft)	0.1680	0.2108	0.2396	0.2781	0.4435	0.5339
Sub Basin	-	-	-	-	Q (cfs)	5.4	7.7	9.3	11.4	18.7	23.4
DA8					CA (ac)	1.69	1.69	1.69	1.69	2.44	2.71
					Tc (min)	6.1	5.3	5.0	5.0	5.0	5.0
					i (in/hr)	3.21	4.53	5.52	6.74	7.67	8.62
					Volume (ac-ft)	0.0606	0.0750	0.0855	0.1048	0.1719	0.2151

* First Pipe

Type		Conveyance			Combine		Return Period (Years)					
ID	Length (ft)	Velocity (ft/sec)	Tpipe (min)			2	5	10	25	50	100
cFirstPipe											
Maior Basin ID: 01											
Storage	-	-	-	-	Q (cfs)	2.5	2.9	3.1	3.5	4.8	5.6
BAS8					CA (ac)	1.69	1.69	1.69	1.69	2.44	2.71
					Tc (min)	-	-	-	-	-	-
					i (in/hr)	-	-	-	-	-	-
					Volume (ac-ft)	0.0606	0.0750	0.0855	0.1048	0.1719	0.2151

* First Pipe

Flood Control District of Maricopa County
Drainage Design Management System
RATIONAL METHOD STORAGE FACILITIES
Project Reference: 1544-POST

Storage Basin ID: BAS3

Elevation Top of Dam: 2,502.00
Length of Dam: 20.00
Discharge Coefficient: 3.00
Weir Coefficient: 1.50

	1	2	3	4	5	6	7	8	9	10
Area (ac)	0.007	0.080	-			-	-	-	-	-
Discharge (cfs)	0.50	4.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elevation (ft)	2,501.00	2,502.00	-	-	-	-	-	-	-	-

	11	12	13	14	15	16	17	18	19	20
Area (ac)	-	-	-	-	-	-	-	-	-	-
Discharge (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elevation (ft)	-	-	-	-	-	-	-	-	-	-

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Peak Volume (ac-ft)	0.010	0.015	0.019	0.024	0.041	0.052
Peak Stage (ft)	2,501.23	2,501.34	2,501.42	2,501.53	2,501.93	2,502.19
Peak Discharge (cfs)	1.46	1.94	2.27	2.74	4.40	5.50

Storage Basin ID: BAS4

Elevation Top of Dam:
Length of Dam:
Discharge Coefficient: 3.00
Weir Coefficient: 1.50

	1	2	3	4	5	6	7	8	9	10
Area (ac)	0.045	0.170	-			-	-	-	-	-
Discharge (cfs)	0.40	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elevation (ft)	2,502.00	2,503.00	-	-	-	-	-	-	-	-

	11	12	13	14	15	16	17	18	19	20
Area (ac)	-	-	-	-	-	-	-	-	-	-
Discharge (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elevation (ft)	-	-	-	-	-	-	-	-	-	-

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Peak Volume (ac-ft)	0.023	0.032	0.039	0.047	0.078	0.098
Peak Stage (ft)	2,502.21	2,502.30	2,502.36	2,502.43	2,502.73	2,502.90
Peak Discharge (cfs)	1.58	2.07	2.40	2.81	4.47	5.47

Storage Basin ID: BAS8

Elevation Top of Dam:
Length of Dam:
Discharge Coefficient: 3.00
Weir Coefficient: 1.50

	1	2	3	4	5	6	7	8	9	10
Area (ac)	0.110	0.130	0.160	0.190		-	-	-	-	-
Discharge (cfs)	2.00	5.00	8.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
Elevation (ft)	2,492.00	2,493.00	2,494.00	2,495.00	-	-	-	-	-	-

	11	12	13	14	15	16	17	18	19	20
Area (ac)	-	-	-	-	-	-	-	-	-	-
Discharge (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elevation (ft)	-	-	-	-	-	-	-	-	-	-

Flood Control District of Maricopa County
Drainage Design Management System
RATIONAL METHOD STORAGE FACILITIES
Project Reference: 1544-POST

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Peak Volume (ac-ft)	0.013	0.026	0.036	0.048	0.095	0.126
Peak Stage (ft)	2,492.11	2,492.22	2,492.30	2,492.40	2,492.79	2,493.04
Peak Discharge (cfs)	2.32	2.66	2.89	3.21	4.38	5.13

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: 1544-POST

Sub Basin	Land Use Code	Area (acres)	Area (%)	Kb	Runoff Coefficient C						Description
					2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	
Major Basin ID: 01											
DA2	130	20.00	100.0	0.032	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
		20.000	**100.0**								
DA3	130	2.50	100.0	0.038	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
		2.500	**100.0**								
DA4	130	3.60	100.0	0.037	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
		3.600	**100.0**								
DA6A	130	39.44	100.0	0.030	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
		39.440	**100.0**								
DA6B	130	4.11	100.0	0.036	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
		4.110	**100.0**								
DA7	130	9.69	100.0	0.034	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
		9.690	**100.0**								
DA8	130	4.44	100.0	0.036	0.38*	0.38*	0.38*	0.38*	0.55*	0.61*	Large Lot Residential - Single Family (1 du per acre to 2 du
		4.440	**100.0**								

* Non default value

APPENDIX C

HYDRAULIC ANALYSIS

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 141 cfs

Maximum Flow: 141 cfs

Table 1 - Summary of Culvert Flows at Crossing: Culvert

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2489.50	0.00	0.00	0.00	1
2490.78	14.10	14.10	0.00	1
2491.38	28.20	28.20	0.00	1
2491.89	42.30	42.30	0.00	1
2492.37	56.40	56.40	0.00	1
2492.87	70.50	70.50	0.00	1
2493.59	84.60	84.60	0.00	1
2494.50	98.70	98.70	0.00	1
2495.07	112.80	107.14	5.45	15
2495.16	126.90	108.33	18.30	5
2495.22	141.00	109.41	31.32	4
2495.00	106.28	106.28	0.00	Overtopping

Rating Curve Plot for Crossing: Culvert

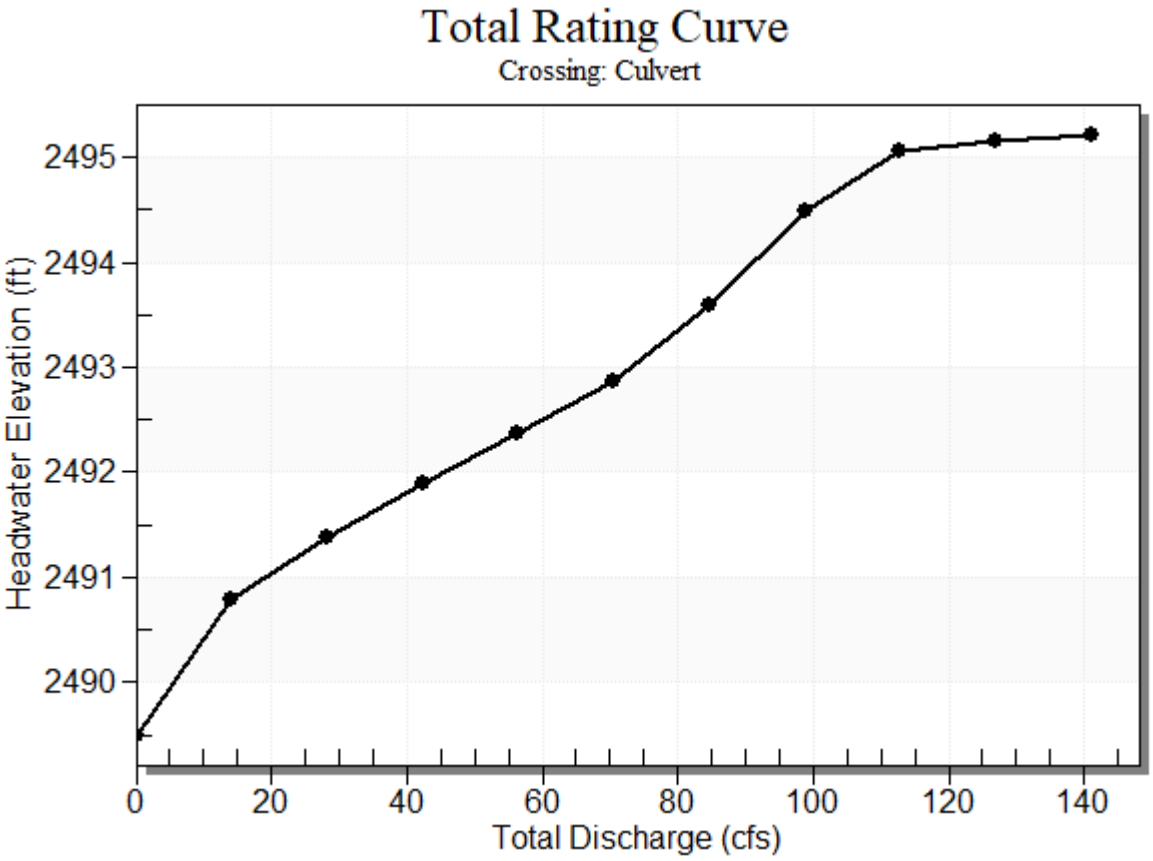


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2489.50	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
14.10	14.10	2490.78	1.141	1.281	2-M2c	1.029	0.833	0.833	0.471	4.402	2.994
28.20	28.20	2491.38	1.664	1.878	2-M2c	1.517	1.193	1.193	0.727	5.380	3.880
42.30	42.30	2491.89	2.116	2.386	2-M2c	1.975	1.478	1.478	0.941	6.099	4.496
56.40	56.40	2492.37	2.537	2.866	2-M2c	3.000	1.714	1.714	1.132	6.754	4.982
70.50	70.50	2492.87	2.960	3.373	7-M2c	3.000	1.926	1.926	1.309	7.353	5.384
84.60	84.60	2493.59	3.412	4.090	7-M2c	3.000	2.116	2.116	1.476	7.937	5.732
98.70	98.70	2494.50	3.914	4.998	7-M2c	3.000	2.284	2.284	1.635	8.547	6.038
112.80	107.14	2495.07	4.244	5.560	7-M2c	3.000	2.375	2.375	1.787	8.926	6.311
126.90	108.33	2495.16	4.293	5.656	7-M2c	3.000	2.387	2.387	1.935	8.981	6.559
141.00	109.41	2495.22	4.337	5.723	7-M2c	3.000	2.398	2.398	2.078	9.030	6.786

****

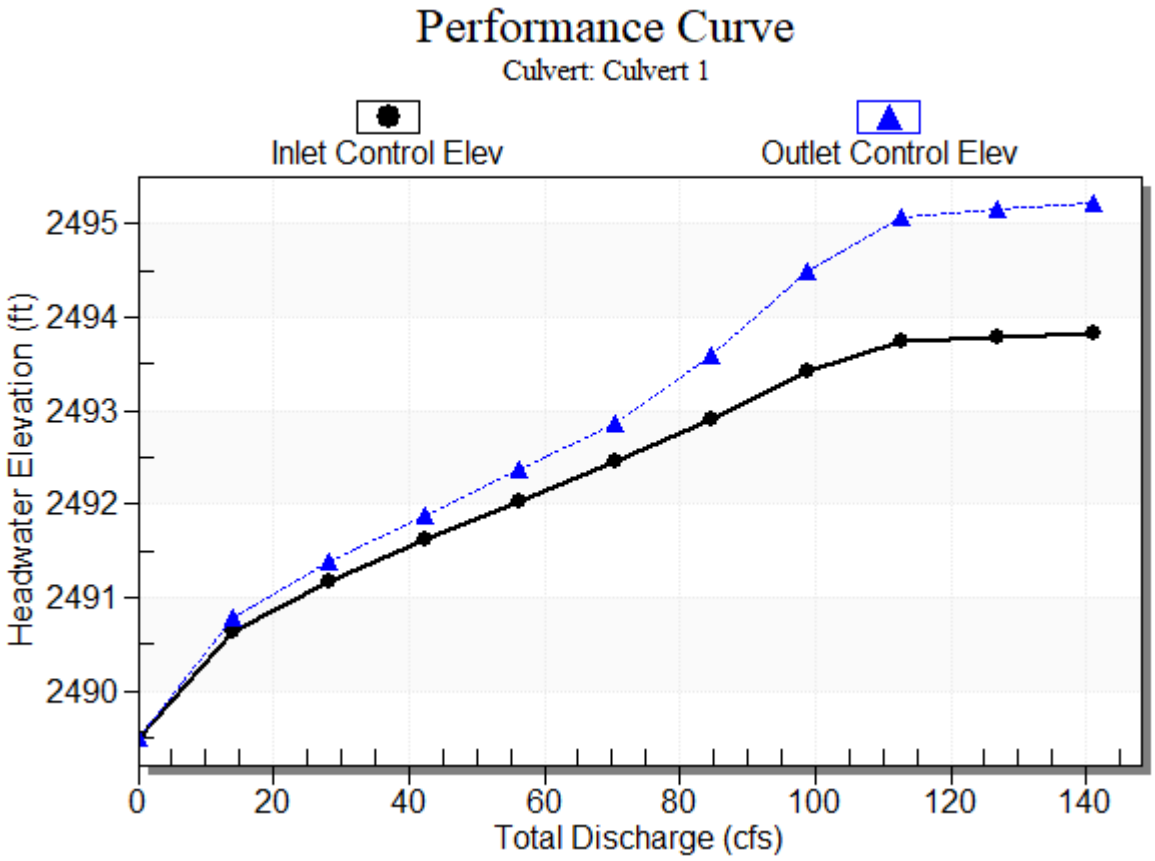
Straight Culvert

Inlet Elevation (invert): 2489.50 ft, Outlet Elevation (invert): 2489.00 ft

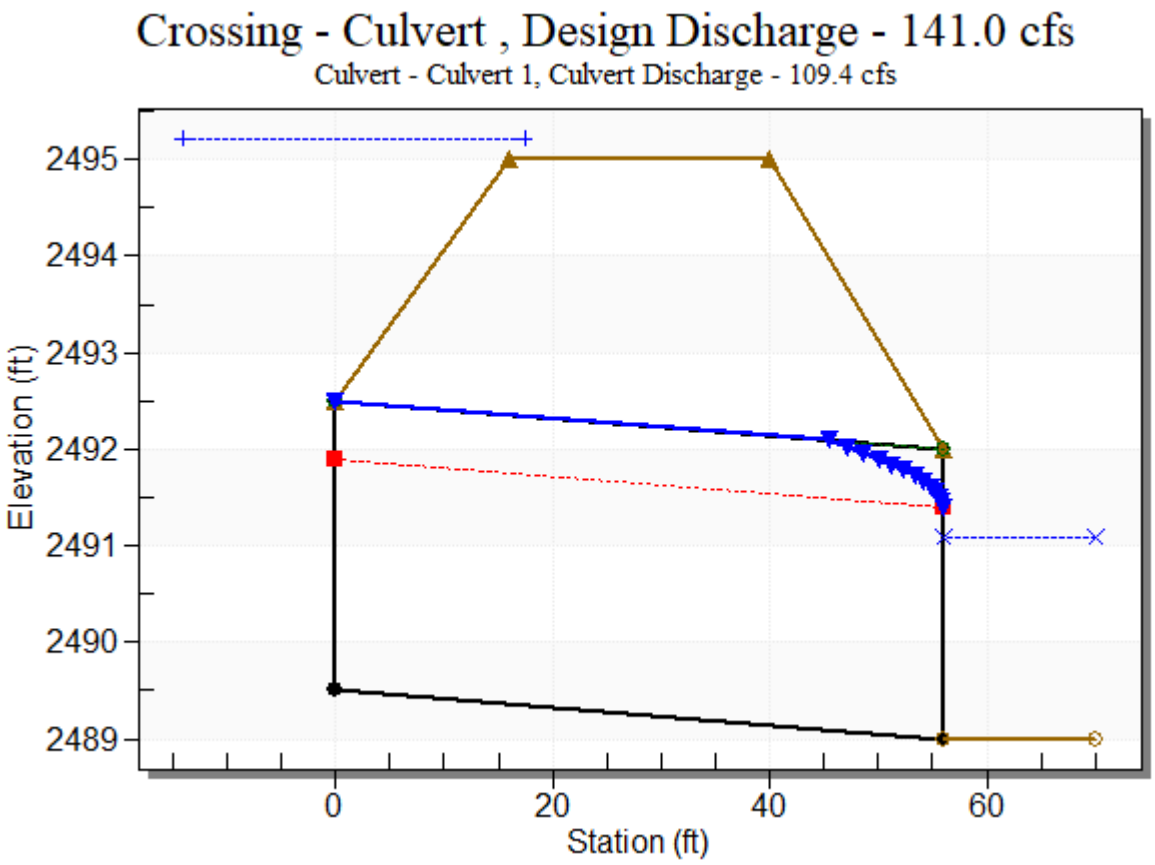
Culvert Length: 56.00 ft, Culvert Slope: 0.0089

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2489.50 ft

Outlet Station: 56.00 ft

Outlet Elevation: 2489.00 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Barrel Manning's n: 0.0310

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	2489.00	0.00	0.00	0.00	0.00
14.10	2489.47	0.47	2.99	0.59	0.77
28.20	2489.73	0.73	3.88	0.91	0.80
42.30	2489.94	0.94	4.50	1.17	0.82
56.40	2490.13	1.13	4.98	1.41	0.83
70.50	2490.31	1.31	5.38	1.63	0.83
84.60	2490.48	1.48	5.73	1.84	0.83
98.70	2490.63	1.63	6.04	2.04	0.83
112.80	2490.79	1.79	6.31	2.23	0.83
126.90	2490.93	1.93	6.56	2.41	0.83
141.00	2491.08	2.08	6.79	2.59	0.83

Tailwater Channel Data - Culvert

Tailwater Channel Option: Rectangular Channel

Bottom Width: 10.00 ft

Channel Slope: 0.0200

Channel Manning's n: 0.0400

Channel Invert Elevation: 2489.00 ft

Roadway Data for Crossing: Culvert

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 2495.00 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Aug 28 2019

Section A-A (Post-Development)

User-defined

Invert Elev (ft)	= 2496.27
Slope (%)	= 0.81
N-Value	= 0.040

Calculations

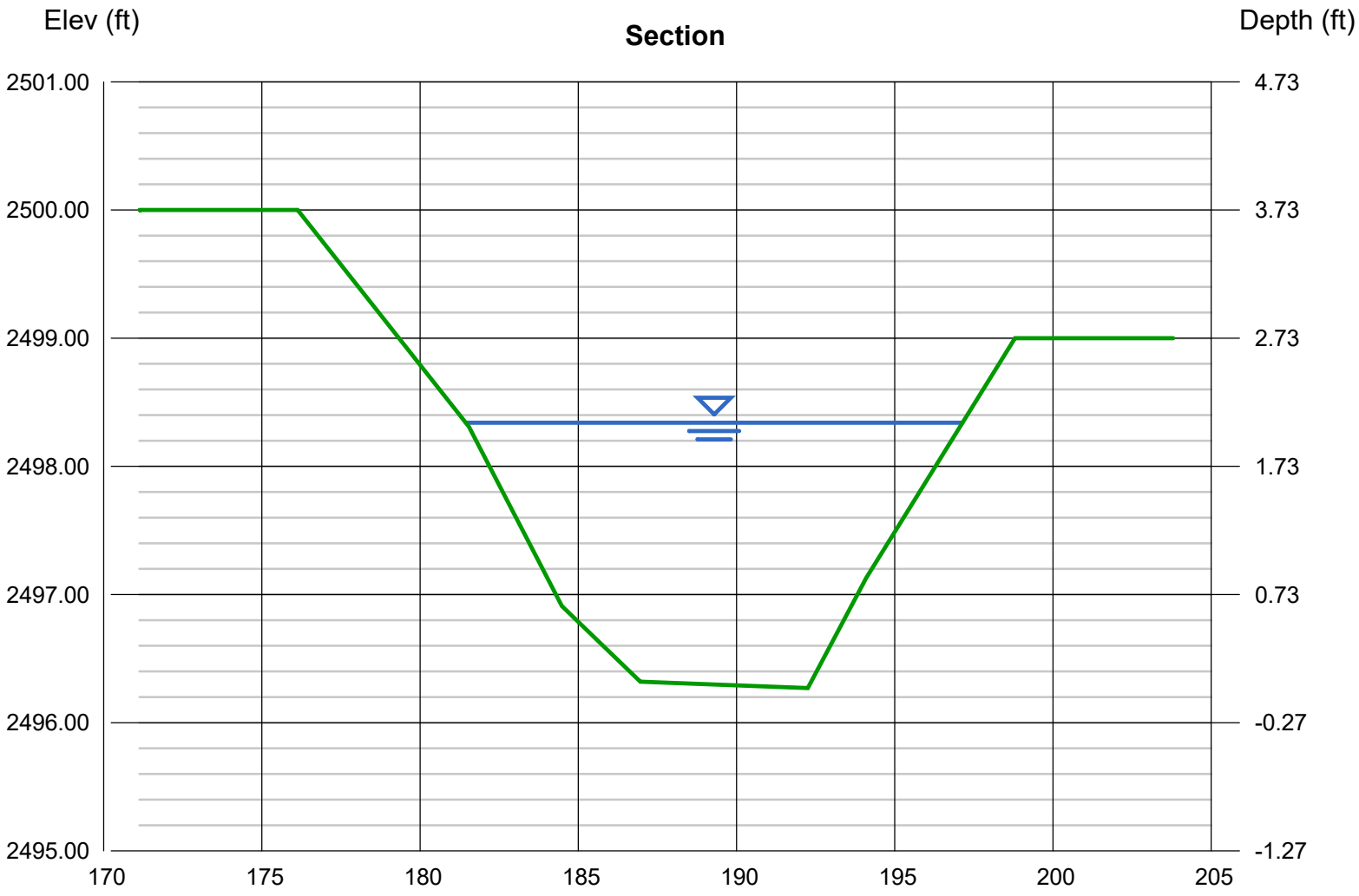
Compute by:	Known Q
Known Q (cfs)	= 90.00

Highlighted

Depth (ft)	= 2.07
Q (cfs)	= 90.00
Area (sqft)	= 22.12
Velocity (ft/s)	= 4.07
Wetted Perim (ft)	= 16.51
Crit Depth, Yc (ft)	= 1.59
Top Width (ft)	= 15.70
EGL (ft)	= 2.33

(Sta, El, n)-(Sta, El, n)...

(176.13, 2500.00)-(181.54, 2498.31, 0.040)-(184.48, 2496.91, 0.040)-(186.96, 2496.32, 0.040)-(192.25, 2496.27, 0.040)-(194.10, 2497.13, 0.040)-(198.80, 2499.00,



12-ZN-2019
12/17/2019

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Aug 28 2019

Section A-A (Pre-Development)

User-defined

Invert Elev (ft)	= 2496.27
Slope (%)	= 0.81
N-Value	= 0.040

Calculations

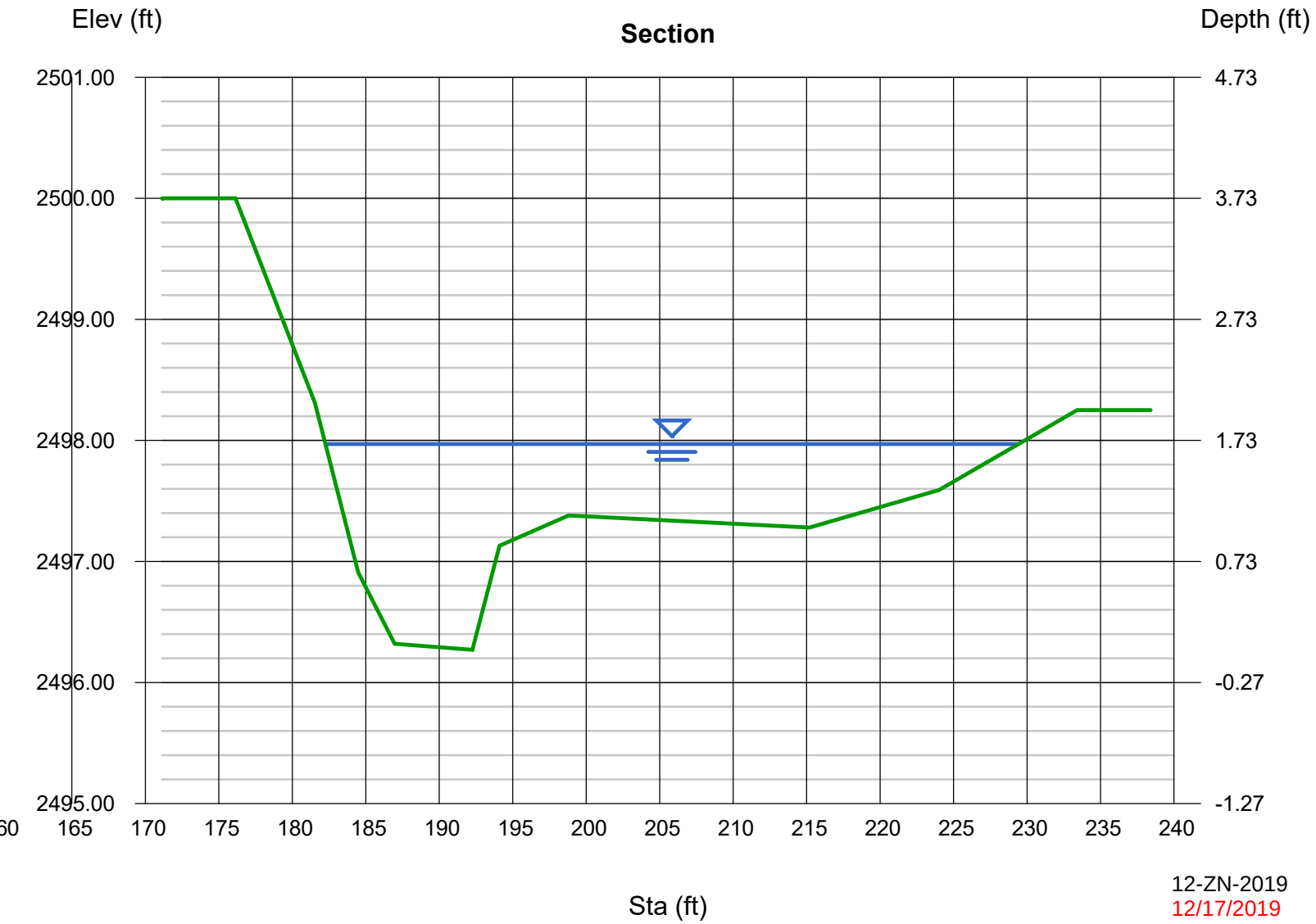
Compute by:	Known Q
Known Q (cfs)	= 96.00

Highlighted

Depth (ft)	= 1.70
Q (cfs)	= 96.00
Area (sqft)	= 35.35
Velocity (ft/s)	= 2.72
Wetted Perim (ft)	= 47.69
Crit Depth, Yc (ft)	= 1.43
Top Width (ft)	= 47.17
EGL (ft)	= 1.81

(Sta, El, n)-(Sta, El, n)...

(176.13, 2500.00)-(181.54, 2498.31, 0.040)-(184.48, 2496.91, 0.040)-(186.96, 2496.32, 0.040)-(192.25, 2496.27, 0.040)-(194.10, 2497.13, 0.040)-(198.80, 2497.38, -(215.19, 2497.28, 0.040)-(224.01, 2497.59, 0.040)-(233.41, 2498.25, 0.040)



12-ZN-2019
12/17/2019

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Aug 28 2019

Section C-C

User-defined

Invert Elev (ft)	= 2491.01
Slope (%)	= 1.39
N-Value	= 0.040

Calculations

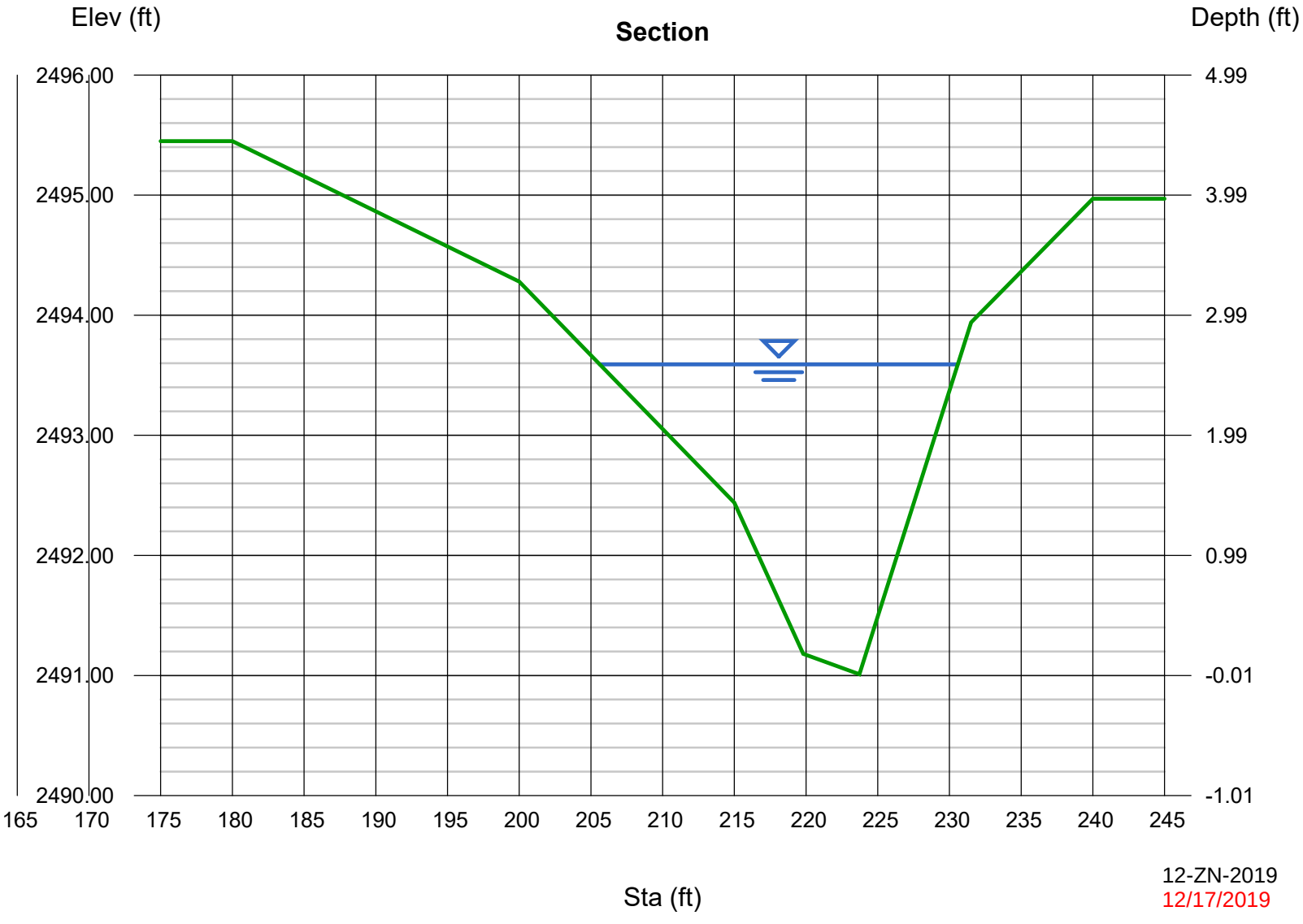
Compute by:	Known Q
Known Q (cfs)	= 167.00

Highlighted

Depth (ft)	= 2.58
Q (cfs)	= 167.00
Area (sqft)	= 32.57
Velocity (ft/s)	= 5.13
Wetted Perim (ft)	= 25.66
Crit Depth, Yc (ft)	= 2.34
Top Width (ft)	= 24.96
EGL (ft)	= 2.99

(Sta, El, n)-(Sta, El, n)...

(180.00, 2495.45)-(200.00, 2494.28, 0.040)-(215.00, 2492.44, 0.040)-(219.80, 2491.18, 0.040)-(223.72, 2491.01, 0.040)-(231.51, 2493.94, 0.040)-(240.00, 2494.97,



12-ZN-2019
12/17/2019

GUIDELINE 1

Lateral Migration Setback Allowance for Riverine Floodplains in Arizona

Procedure

General

Three levels of analysis procedures are presented for determination of recommended setback distances for development in areas adjacent to watercourses. The Level I procedure provides a reasonable estimate of safe setback distance under normal conditions, with minimal channel geometry and hydrologic information required in its application. The higher level procedures, Level II and Level III, are more rigorous means of determining lateral migration potential, requiring knowledge of site specific hydraulic and channel material characteristics. The Level II procedure is provided as a straightforward means of demonstrating the stability of channel banks, in cases where a developer or floodplain manager seeks to apply a lesser setback than may be computed through application of the Level I equations. A flowchart outlining the procedure is provided on the following page. The Level III approaches referenced may be used for this purpose as well, or may be required by the local regulating agency for analysis of areas of particular concern, such as the following situations where the Level I allowances or Level II evaluations may not fully demonstrate the lateral migration potential:

(i) areas where massive shifting of the river channel has been observed in the past;
(ii) areas undergoing channel filling (aggradation) to a significant degree;
or, (iii) areas where local river mining, channelization, or other modifications could result in flow redirection unanticipated in the development of the Level I or Level II approaches.

Level I

This level of analysis requires the following information:

Drainage area. The area of the watershed contributing to the site of interest. Drainage areas should be estimated conservatively to account for all possible sources of runoff. USGS topographic quadrangle maps usually provide sufficient detail for delineating watershed areas.

Peak discharge associated with the 100-year flood (Q_{100}). May be estimated using simplified methodologies such as ADWR State Standard #2 (SS 2-96), USGS regression equations, or other similar approximate method.

A Level I or Level II analysis should not be used on watercourses which have drainage areas greater than 30 square miles. If the watercourse has a drainage area greater than 30 square miles, a Level III analysis shall be performed.

For watercourses which have drainage areas of less than 30 square miles, the recommended setback allowances are as follows:

for straight channel reaches or reaches with minor curvature: setback $= 1.0(Q_{100})^{0.5}$

$= (163)^{0.5}$
$= 12.8$ ft

for channels with obvious curvature or channel bend: setback $= 2.5(Q_{100})^{0.5}$

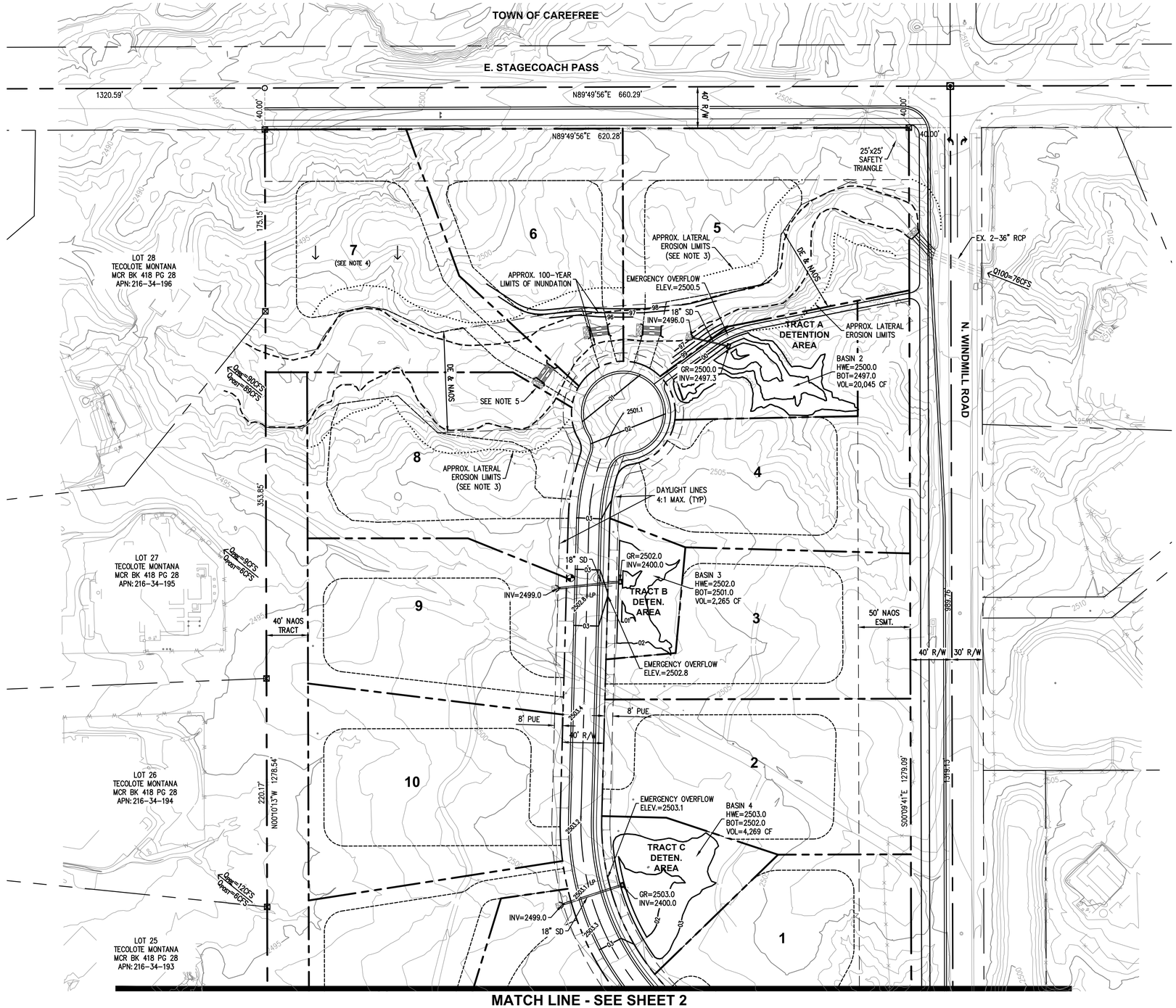
$= 2.5(163)^{0.5}$
$= 31.9$ ft

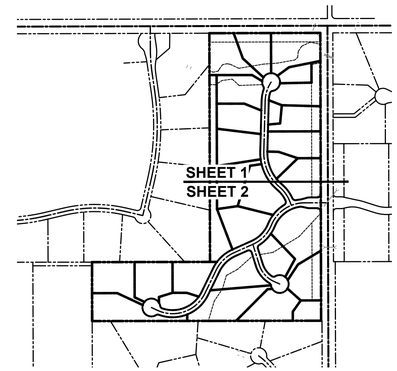
where setback is in feet and Q_{100} is in cubic feet per second.

APPENDIX D

PRELIMINARY GRADING PLAN

PRELIMINARY GRADING PLAN FOR STAGECOACH & WINDMILL





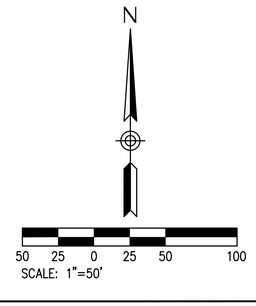
KEY MAP

LEGEND

	PROPERTY LINE
	LOT LINE
	ROADWAY CENTERLINE
	EASEMENT LINE
	BUILDING ENVELOPE
	CUT/FILL DAYLIGHT LINE
→	FLOW DIRECTION
LP	LOW POINT IN ROADWAY
DE	DRAINAGE EASEMENT
PUE	PUBLIC UTILITY EASEMENT
NAOS	NATURAL AREA OPEN SPACE EASEMENT
Q_{PRE}	PRE-DEVELOPMENT 100-YR FLOW RATE
Q_{POST}	POST-DEVELOPMENT 100-YR FLOW RATE
GR	GRATE ELEVATION
INV	INVERT ELEVATION
HWE	HIGH WATER ELEVATION

NOTES:

1. THIS PRELIMINARY GRADING & DRAINAGE PLAN IS FOR ROADWAY AND SUBDIVISION DRAINAGE IMPROVEMENTS ONLY. PAD GRADING IS NOT INCLUDED.
2. THE SUBDIVISION HOMEOWNER'S ASSOCIATION (HOA) SHALL BE RESPONSIBLE FOR MAINTENANCE AND HAVE LEGAL RIGHT TO ENTER ALL STORMWATER STORAGE FACILITIES WITHIN THIS SUBDIVISION.
3. LIVABLE STRUCTURES ARE PROHIBITED IN LATERAL EROSION LIMITS SHOWN WITHOUT APPROVED EROSION MITIGATION MEASURES.
4. FINAL GRADING & DRAINAGE FOR LOT 7 SHALL BE DESIGNED TO DIRECT RUNOFF FLOWS FROM THE BUILDING ENVELOPE TO THE SOUTH WASH.
5. DRIVEWAY CULVERTS SHALL BE DESIGNED AND CONSTRUCTED AS PART OF THE INDIVIDUAL LOT GRADING & DRAINAGE PLAN.
6. FINAL GRADING & DRAINAGE FOR LOTS 20 & 21 SHALL BE DESIGNED TO DIRECT RUNOFF FLOWS FROM THE BUILDING ENVELOPES TO DETENTION BASIN 6.



LANDCOR CONSULTING
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Mesa, AZ 85212
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landcorconsulting.com

STAGECOACH & WINDMILL

SHEET NO. 1 OF 3

JOB NO.: 1544 DATE: 12/6/19

12-ZN-2019
12/17/2019

MATCH LINE - SEE SHEET 1

E. TECOLOTE CT.

TECOLOTE CIR

N. WINDMILL ROAD

40' NAOS TRACT

239.89'

BASIN 5
HWE=2494.0
BOT=2492.0
VOL=6,490 CF

Q_{PRE}=5.2CFS
Q_{POST}=0CFS

INV=2492.3

INV=2492.5

LOT 24
TECOLOTE MONTANA
MCR BK 418 PG 28
APN:216-34-192

289.48'

NAOS TRACT

LOT 22
TECOLOTE MONTANA
MCR BK 418 PG 28
APN:216-34-190

EXCEPT NORTH 20'

LOT 23
TECOLOTE MONTANA
MCR BK 418 PG 28
APN:216-34-191

45.49'

154.34'

363.93'

N89°53'01"E 659.68'

141.41'

JAMES & JANE FISK
APN:216-34-009L
(VACANT)

20' WATER/SEWER ESMT.

329.51'

S00°10'42"E

12

13

14

15

16

17

18

19

20
(SEE NOTE 6)

21
(SEE NOTE 6)

22

50' NAOS ESMT.

25'x25' SAFETY TRIANGLE (TYP.)

INV=2498.5

18" SD

2501.4

INV=2497.0

INV=2496.97

30" SD

Q100=52CFS

DAYLIGHT LINES
4:1 MAX. (TYP)

APPROX. 100-YEAR LIMITS OF INUNDATION

DE & NAOS

8' PUE

40' R/W

30' R/W

INV=2489.41

INV=2488.82

2-36" SD

APPROX. LATERAL EROSION LIMITS (SEE NOTE 3)

Q100=45CFS

40.00'

328.38'

S00°09'41"E 2638.45'

APPROX. 100-YEAR LIMITS OF INUNDATION

APPROX. LATERAL EROSION LIMITS (SEE NOTE 3)

BASIN 6
HWE=2486.0
BOT=2483.0
VOL=28,967 CF

GR=2486.0
INV=2483.3

TRACT D DETENTION AREA

EMERGENCY OVERFLOW ELEV.=2494.5

18" SD

INV=2482.5

2489.0

2486.1

2486.4

NAOS TRACT

N89°54'31"E 659.40'

102.09'

490.07'

67.24'

308.13'

N89°54'31"E 620.25'

312.12'

40.00'

GR=2494.0
INV=2492.3

TRACT E DETENTION AREA

INV=2490.0

18" SD

EMERGENCY OVERFLOW ELEV.=2495.0

BASIN 8
HWE=2495.0
BOT=2492.0
VOL=5,489 CF

Q_{PRE}=18CFS
Q_{POST}=15CFS

Q_{PRE}=52CFS
Q_{POST}=48CFS

Q_{PRE}=14CFS
Q_{POST}=6CFS

UTILITIES EASEMENT

ROADWAY & UTILITIES EASEMENT

LOT 72
SAND FLOWER II
MCR BK 394 PG 43
APN:216-34-094

LOT 73
SAND FLOWER II
MCR BK 394 PG 43
APN:216-34-095

LOT 81
SAND FLOWER II
MCR BK 394 PG 43
APN:216-34-103

LOT 82
SAND FLOWER II
MCR BK 394 PG 43
APN:216-34-104

N

50 25 0 25 50 100

SCALE: 1"=50'

Registered Professional Engineer (Civil)
CERTIFICATE NO.
33981
WADE E. COOKE
Date Signed 12/6/19
ARIZONA, U.S.A.

LANDCOR CONSULTING
6859 E Rembrandt Ave, #124
Mesa, AZ 85212
Ph: (480) 223-8573
landcorconsulting.com

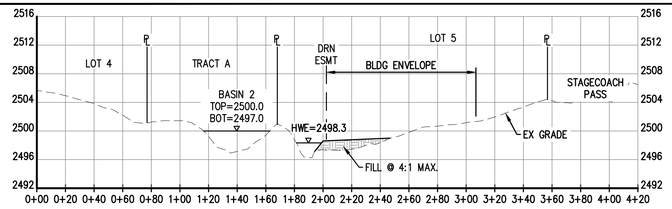
STAGECOACH & WINDMILL

SHEET NO. 2 OF 3

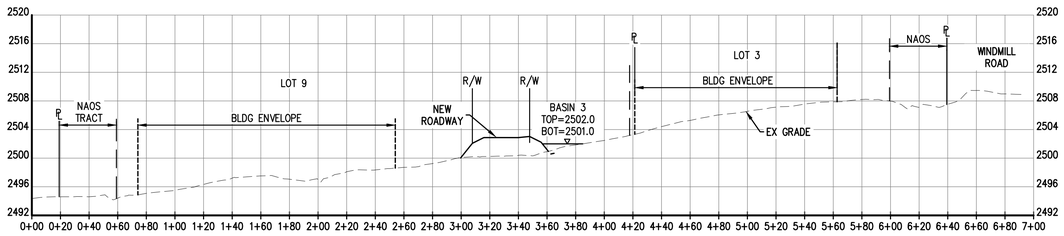
JOB NO.: 1544

DATE: 12/6/19

12-ZN-2019
12/17/2019



SECTION A-A



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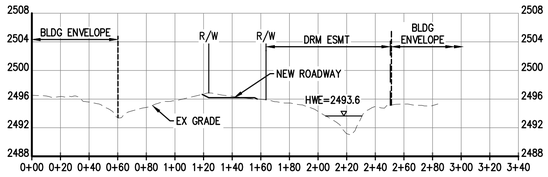

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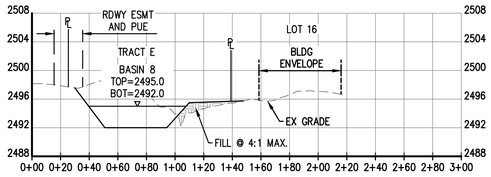

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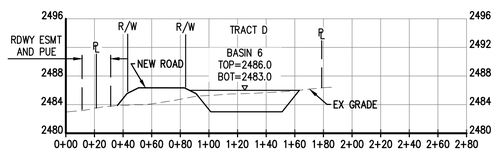
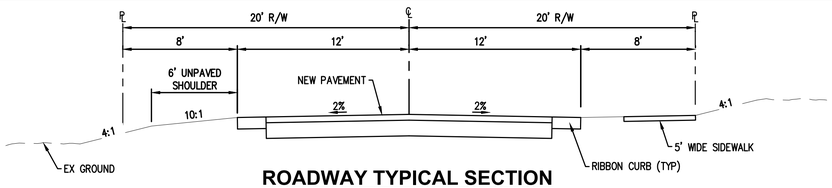
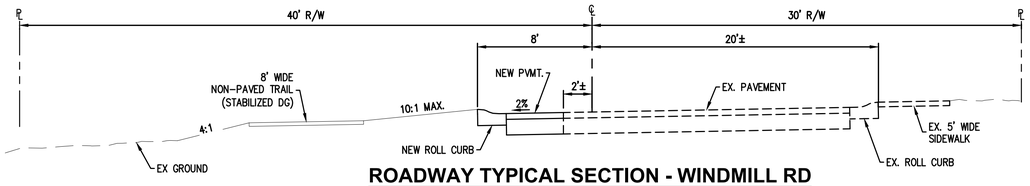


SECTION E-E



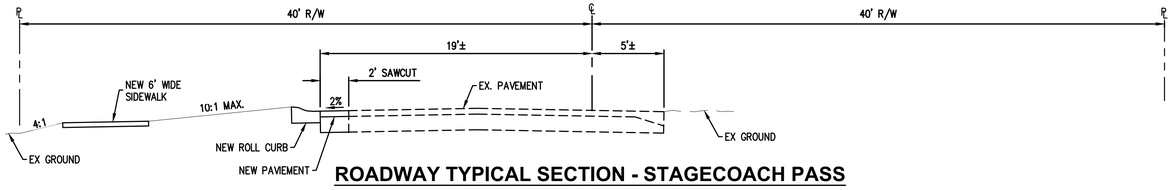
ROADWAY TYPICAL SECTION

INTERNAL STREET - LOCAL RESIDENTIAL (RURAL/ESL CHARACTER)



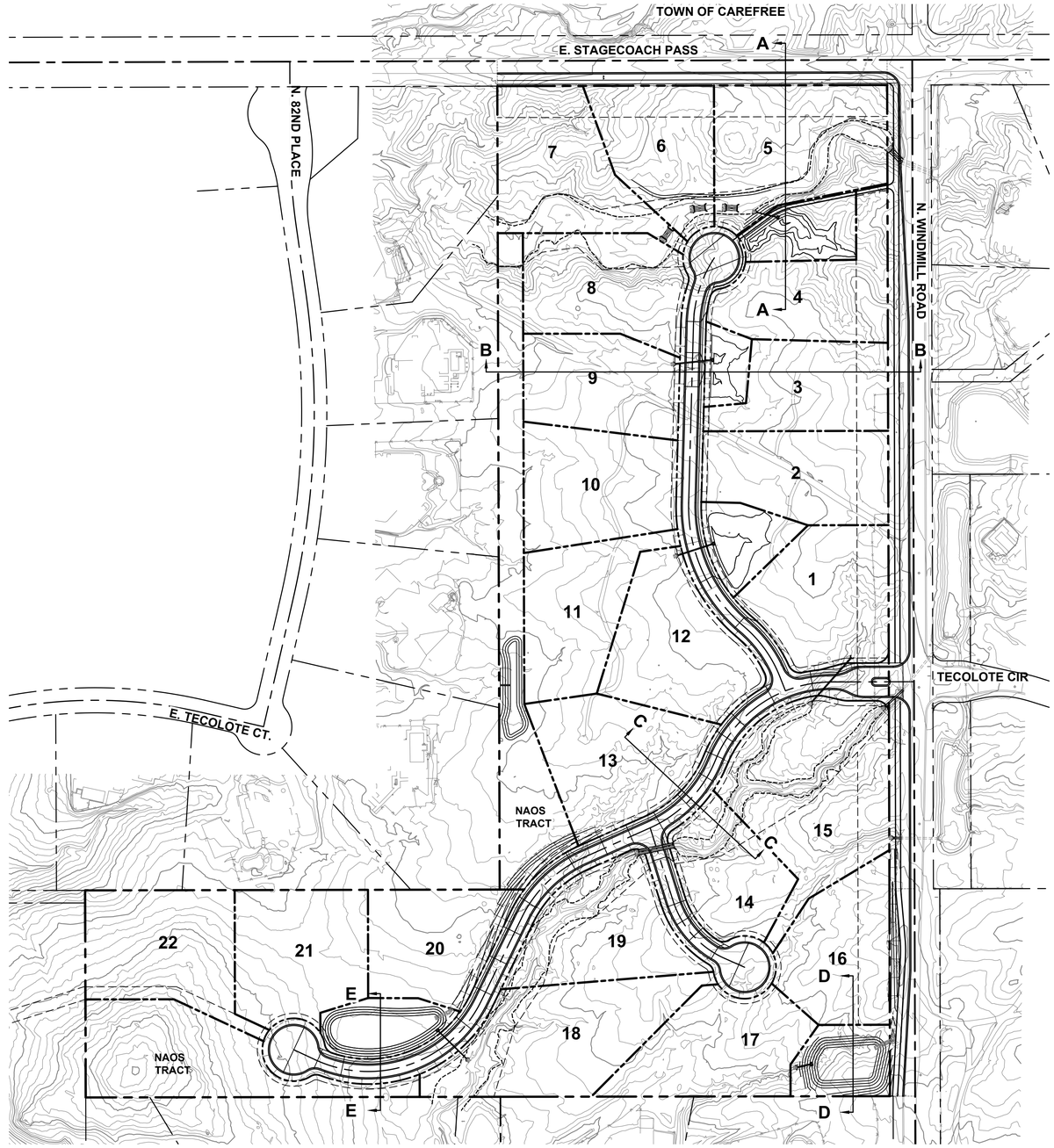
ROADWAY TYPICAL SECTION - WINDMILL RD

LOCAL COLLECTOR (RURAL/ESL CHARACTER WITH TRAILS)



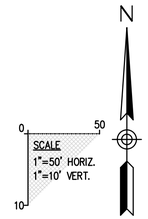
ROADWAY TYPICAL SECTION - STAGECOACH PASS

LOCAL COLLECTOR (RURAL/ESL CHARACTER)



CROSS SECTION KEY MAP

Registered Professional Engineer (Civil)
CERTIFICATE NO.
33981
WADE E.
COOKE
Date Signed 12/6/19
ARIZONA, U.S.A.



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STAGECOACH & WINDMILL

SHEET NO. 3 OF 3

JOB NO.: 1544 DATE: 12/6/19

12-ZN-2019
12/17/2019

APPENDIX E

WARNING & DISCLAIMER OF LIABILITY

Warning and Disclaimer of Liability

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "*Special flood hazard* area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22

"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by manmade or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

Plan Check No.	Owner or Agent	Date