Movement, Approach, & Intersection Results

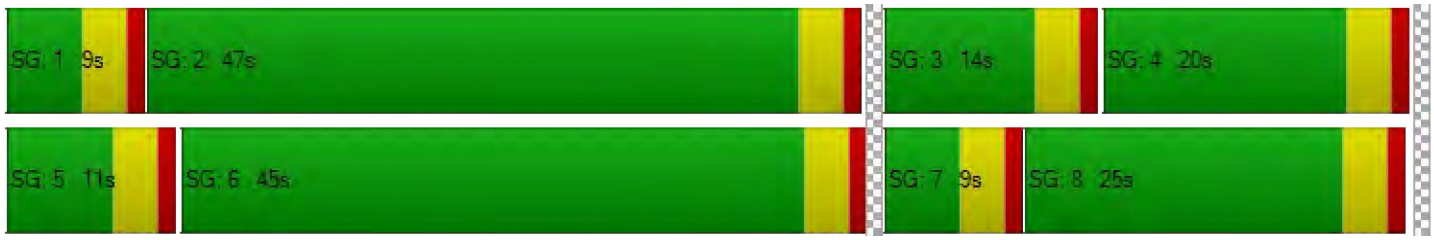
d_M, Delay for Movement [s/veh]	29.12	41.31	41.31	28.12	46.01	46.01	8.44	9.02	7.73	5.01	14.63	14.63
Movement LOS	C	D	D	C	D	D	A	A	A	A	B	B
d_A, Approach Delay [s/veh]	37.31			42.01			8.73			13.93		
Approach LOS	D			D			A			B		
d_I, Intersection Delay [s/veh]	20.92											
Intersection LOS	C											
Intersection V/C	0.527											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	467	356	956	911
d_b, Bicycle Delay [s]	26.45	30.42	12.27	13.34
I_b,int, Bicycle LOS Score for Intersection	2.058	1.929	2.197	2.733
Bicycle LOS	B	A	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	Signalized	Delay (sec / veh):	20.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.460

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	40	39	28	78	143	71	55	414	52	19	301	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	2	2	0	1	1	22	26	1	1	0	2	2
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	46	45	31	86	157	100	86	453	58	21	331	32
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	13	9	24	44	28	24	126	16	6	92	9
Total Analysis Volume [veh/h]	51	50	34	96	174	111	96	503	64	23	368	36
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	3	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	9	19	0	13	23	0	13	49	0	9	45	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	R	L	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	24	15	24	17	58	52	52	58	49
g / C, Green / Cycle	0.27	0.17	0.27	0.19	0.64	0.57	0.57	0.64	0.55
(v / s)_i Volume / Saturation Flow Rate	0.04	0.05	0.07	0.16	0.09	0.27	0.04	0.03	0.22
s, saturation flow rate [veh/h]	1253	1745	1454	1750	1073	1870	1589	913	1841
c, Capacity [veh/h]	286	291	457	324	676	1070	909	567	1004
d1, Uniform Delay [s]	25.85	32.84	25.44	35.69	7.02	11.28	8.59	7.10	11.91
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.29	0.54	0.23	7.67	0.44	1.49	0.15	0.03	1.20
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.18	0.29	0.21	0.88	0.14	0.47	0.07	0.04	0.40
d, Delay for Lane Group [s/veh]	26.15	33.39	25.66	43.35	7.46	12.76	8.74	7.13	13.11
Lane Group LOS	C	C	C	D	A	B	A	A	B
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.83	1.63	1.61	6.72	0.70	5.81	0.56	0.14	4.60
50th-Percentile Queue Length [ft/ln]	20.76	40.70	40.28	168.01	17.50	145.33	13.96	3.53	114.99
95th-Percentile Queue Length [veh/ln]	1.49	2.93	2.90	10.97	1.26	9.77	1.01	0.25	8.12
95th-Percentile Queue Length [ft/ln]	37.37	73.26	72.51	274.29	31.49	244.18	25.13	6.35	202.93

Movement, Approach, & Intersection Results

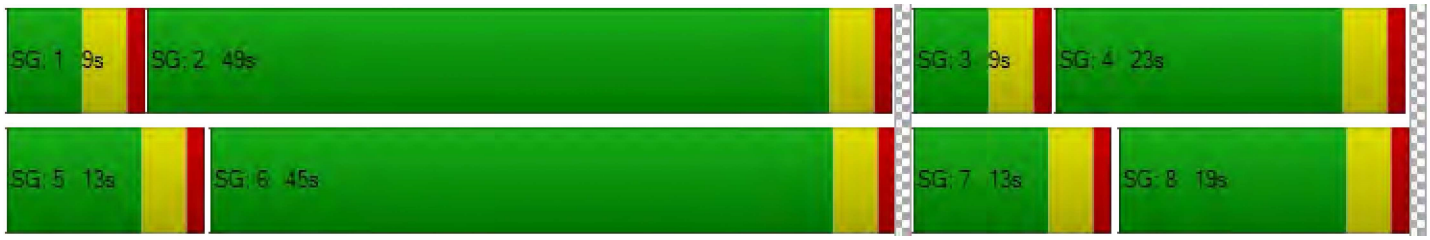
d_M, Delay for Movement [s/veh]	26.15	33.39	33.39	25.66	43.35	43.35	7.46	12.76	8.74	7.13	13.11	13.11
Movement LOS	C	C	C	C	D	D	A	B	A	A	B	B
d_A, Approach Delay [s/veh]	30.65			38.89			11.61			12.79		
Approach LOS	C			D			B			B		
d_I, Intersection Delay [s/veh]	20.00											
Intersection LOS	B											
Intersection V/C	0.460											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	333	422	1000	911
d_b, Bicycle Delay [s]	31.25	28.01	11.25	13.34
I_b,int, Bicycle LOS Score for Intersection	1.782	2.188	2.654	2.264
Bicycle LOS	A	B	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	All-way stop	Delay (sec / veh):	92.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.380

Intersection Setup

Name	Kenworthy Road			Kenworthy Road			Ocotillo Road			Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road			Ocotillo Road			Ocotillo Road		
Base Volume Input [veh/h]	81	141	26	39	69	51	54	208	39	43	475	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	1	1	0	2	0	1	3	3	5	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	1	0	2	2	23	15	2	2	0	0	1
Total Hourly Volume [veh/h]	94	156	29	45	79	79	75	232	48	52	519	74
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	43	8	13	22	22	21	64	13	14	144	21
Total Analysis Volume [veh/h]	104	173	32	50	88	88	83	258	53	58	577	82
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	413	443	406	446	414	439	479	444	659
Degree of Utilization, x	0.25	0.46	0.12	0.39	0.20	0.59	0.11	0.13	1.38

Movement, Approach, & Intersection Results

95th-Percentile Queue Length [veh]	0.98	2.40	0.42	1.85	0.74	3.68	0.37	0.45	30.71
95th-Percentile Queue Length [ft]	24.59	59.89	10.43	46.33	18.47	92.03	9.27	11.18	767.76
Approach Delay [s/veh]	16.54		15.24		18.73			189.43	
Approach LOS	C		C		C			F	
Intersection Delay [s/veh]	92.20								
Intersection LOS	F								

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	Signalized	Delay (sec / veh):	21.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.531

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	81	141	26	39	69	51	54	208	39	43	475	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	1	1	0	2	0	1	3	3	5	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	1	0	2	2	23	15	2	2	0	0	1
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	94	156	29	45	79	79	75	232	48	52	519	74
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	43	8	13	22	22	21	64	13	14	144	21
Total Analysis Volume [veh/h]	104	173	32	50	88	88	83	258	53	58	577	82
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	3	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	14	25	0	9	20	0	11	47	0	9	45	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	R	L	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	21	14	21	11	61	53	53	61	53
g / C, Green / Cycle	0.23	0.15	0.23	0.12	0.68	0.59	0.59	0.68	0.58
(v / s)_i Volume / Saturation Flow Rate	0.07	0.11	0.04	0.10	0.09	0.14	0.03	0.05	0.36
s, saturation flow rate [veh/h]	1422	1820	1337	1718	881	1870	1589	1137	1830
c, Capacity [veh/h]	336	274	311	215	525	1102	936	812	1067
d1, Uniform Delay [s]	28.45	36.60	27.62	38.40	7.98	8.81	7.86	5.12	12.24
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.52	4.09	0.24	7.57	0.64	0.50	0.12	0.04	2.69
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.31	0.75	0.16	0.82	0.16	0.23	0.06	0.07	0.62
d, Delay for Lane Group [s/veh]	28.97	40.69	27.86	45.96	8.62	9.31	7.97	5.15	14.92
Lane Group LOS	C	D	C	D	A	A	A	A	B
Critical Lane Group	Yes	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.84	4.55	0.87	4.22	0.55	2.36	0.43	0.31	8.32
50th-Percentile Queue Length [ft/ln]	46.10	113.82	21.71	105.52	13.65	58.99	10.86	7.66	207.92
95th-Percentile Queue Length [veh/ln]	3.32	8.05	1.56	7.59	0.98	4.25	0.78	0.55	13.05
95th-Percentile Queue Length [ft/ln]	82.97	201.30	39.09	189.75	24.58	106.19	19.54	13.78	326.16

Movement, Approach, & Intersection Results

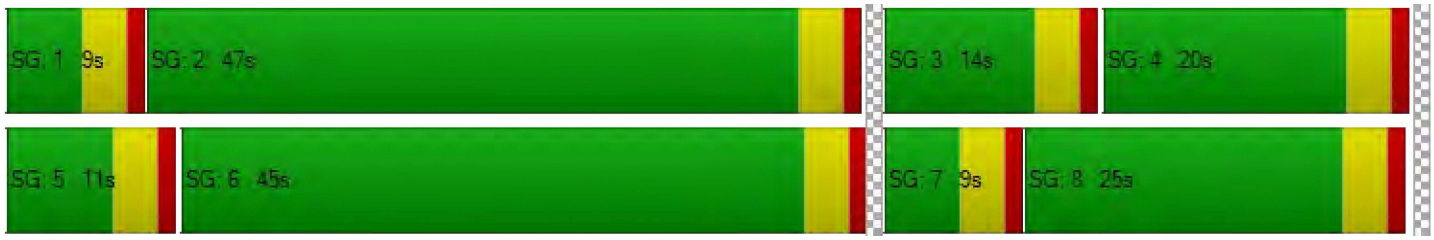
d_M, Delay for Movement [s/veh]	28.97	40.69	40.69	27.86	45.96	45.96	8.62	9.31	7.97	5.15	14.92	14.92
Movement LOS	C	D	D	C	D	D	A	A	A	A	B	B
d_A, Approach Delay [s/veh]	36.74			41.96			8.98			14.13		
Approach LOS	D			D			A			B		
d_I, Intersection Delay [s/veh]	20.97											
Intersection LOS	C											
Intersection V/C	0.531											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	467	356	956	911
d_b, Bicycle Delay [s]	26.45	30.42	12.27	13.34
l_b,int, Bicycle LOS Score for Intersection	2.069	1.933	2.210	2.743
Bicycle LOS	B	A	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Access A & Ocotillo Road

Control Type:	Two-way stop	Delay (sec / veh):	10.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.009

Intersection Setup

Name						
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name						
Base Volume Input [veh/h]	0	0	301	0	0	607
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0927	1.0000	1.0000	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	2	6	0	5
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	5	331	6	0	668
Peak Hour Factor	1.0000	0.9000	0.9000	0.9000	1.0000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	1	92	2	0	186
Total Analysis Volume [veh/h]	0	6	368	7	0	742
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.00	0.00	0.00	0.01
d_M, Delay for Movement [s/veh]	0.00	10.36	0.00	0.00	0.00	0.00
Movement LOS		B	A	A		A
95th-Percentile Queue Length [veh/ln]	0.00	0.03	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.67	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	10.36		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.06					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 3: Kenworthy Road & Access B

Control Type:	Two-way stop	Delay (sec / veh):	11.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.015

Intersection Setup

Name	Kenworthy Road		Kenworthy Road		Access B	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Kenworthy Road		Kenworthy Road		Access B	
Base Volume Input [veh/h]	0	248	151	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0927	1.0927	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	0	1	9	7	3
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	271	166	9	7	3
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	75	46	3	2	1
Total Analysis Volume [veh/h]	6	301	184	10	8	3
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.02	0.00
d_M, Delay for Movement [s/veh]	7.62	0.00	0.00	0.00	11.91	9.31
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.01	0.00	0.00	0.00	0.06	0.06
95th-Percentile Queue Length [ft/ln]	0.33	0.00	0.00	0.00	1.42	1.42
d_A, Approach Delay [s/veh]	0.15		0.00		11.20	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.33					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	All-way stop	Delay (sec / veh):	65.3
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.208

Intersection Setup

Name	Kenworthy Road			Kenworthy Road			Ocotillo Road			Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road			Ocotillo Road			Ocotillo Road		
Base Volume Input [veh/h]	40	39	28	78	143	71	55	414	52	19	301	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	22	3	5	0	6	0	3	11	11	15	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	2	2	0	1	1	22	26	1	1	0	2	2
Total Hourly Volume [veh/h]	68	48	36	86	163	100	89	464	69	36	331	32
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	13	10	24	45	28	25	129	19	10	92	9
Total Analysis Volume [veh/h]	76	53	40	96	181	111	99	516	77	40	368	36
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	365	396	392	426	403	516	466	406	432
Degree of Utilization, x	0.21	0.24	0.24	0.69	0.25	1.21	0.17	0.10	0.94

Movement, Approach, & Intersection Results

95th-Percentile Queue Length [veh]	0.77	0.90	0.95	5.03	0.95	20.54	0.59	0.33	10.70
95th-Percentile Queue Length [ft]	19.29	22.51	23.72	125.76	23.84	513.38	14.65	8.15	267.57
Approach Delay [s/veh]	14.82		24.49		108.00			53.58	
Approach LOS	B		C		F			F	
Intersection Delay [s/veh]	65.29								
Intersection LOS	F								

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	Signalized	Delay (sec / veh):	20.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.486

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	40	39	28	78	143	71	55	414	52	19	301	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	22	3	5	0	6	0	3	11	11	15	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	2	2	0	1	1	22	26	1	1	0	2	2
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	68	48	36	86	163	100	89	464	69	36	331	32
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	13	10	24	45	28	25	129	19	10	92	9
Total Analysis Volume [veh/h]	76	53	40	96	181	111	99	516	77	40	368	36
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	3	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	9	19	0	13	23	0	13	49	0	9	45	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	R	L	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	25	16	25	17	57	50	50	57	48
g / C, Green / Cycle	0.28	0.18	0.28	0.19	0.63	0.55	0.55	0.63	0.53
(v / s)_i Volume / Saturation Flow Rate	0.06	0.05	0.07	0.17	0.09	0.28	0.05	0.04	0.22
s, saturation flow rate [veh/h]	1260	1738	1442	1752	1076	1870	1589	912	1841
c, Capacity [veh/h]	300	307	462	330	661	1030	875	548	983
d1, Uniform Delay [s]	25.57	32.22	24.74	35.57	7.48	12.55	9.55	7.77	12.52
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.44	0.55	0.22	7.84	0.48	1.74	0.20	0.06	1.27
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.25	0.30	0.21	0.88	0.15	0.50	0.09	0.07	0.41
d, Delay for Lane Group [s/veh]	26.01	32.77	24.97	43.41	7.96	14.30	9.75	7.82	13.79
Lane Group LOS	C	C	C	D	A	B	A	A	B
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.24	1.78	1.58	6.90	0.75	6.44	0.72	0.26	4.75
50th-Percentile Queue Length [ft/ln]	30.91	44.62	39.62	172.46	18.81	160.99	18.07	6.47	118.87
95th-Percentile Queue Length [veh/ln]	2.23	3.21	2.85	11.21	1.35	10.60	1.30	0.47	8.33
95th-Percentile Queue Length [ft/ln]	55.64	80.32	71.32	280.15	33.87	265.04	32.53	11.64	208.27

Movement, Approach, & Intersection Results

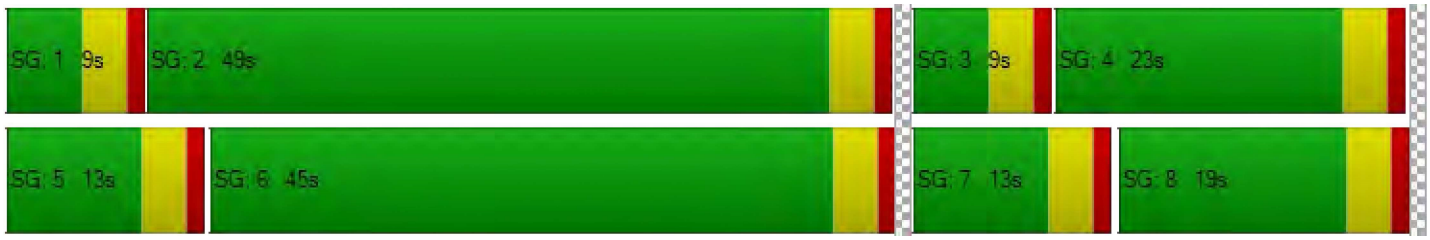
d_M, Delay for Movement [s/veh]	26.01	32.77	32.77	24.97	43.41	43.41	7.96	14.30	9.75	7.82	13.79	13.79
Movement LOS	C	C	C	C	D	D	A	B	A	A	B	B
d_A, Approach Delay [s/veh]	29.73			38.85			12.88			13.26		
Approach LOS	C			D			B			B		
d_I, Intersection Delay [s/veh]	20.61											
Intersection LOS	C											
Intersection V/C	0.486											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	333	422	1000	911
d_b, Bicycle Delay [s]	31.25	28.01	11.25	13.34
l_b,int, Bicycle LOS Score for Intersection	1.838	2.200	2.701	2.292
Bicycle LOS	A	B	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Access A & Ocotillo Road

Control Type:	Two-way stop	Delay (sec / veh):	12.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.042

Intersection Setup

Name						
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name						
Base Volume Input [veh/h]	0	0	521	0	0	412
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0927	1.0000	1.0000	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	18	6	18	0	22
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	18	575	18	0	472
Peak Hour Factor	1.0000	0.9000	0.9000	0.9000	1.0000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	5	160	5	0	131
Total Analysis Volume [veh/h]	0	20	639	20	0	524
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop		Free		Free	
Flared Lane						
Storage Area [veh]	0		0		0	
Two-Stage Gap Acceptance	No					
Number of Storage Spaces in Median	0		0		0	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.04	0.01	0.00	0.00	0.01
d_M, Delay for Movement [s/veh]	0.00	12.90	0.00	0.00	0.00	0.00
Movement LOS		B	A	A		A
95th-Percentile Queue Length [veh/ln]	0.00	0.13	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.00	3.28	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	12.90		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.21					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 3: Kenworthy Road & Access B

Control Type:	Two-way stop	Delay (sec / veh):	11.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.057

Intersection Setup

Name	Kenworthy Road		Kenworthy Road		Access B	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Kenworthy Road		Kenworthy Road		Access B	
Base Volume Input [veh/h]	0	107	214	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0927	1.0927	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	15	0	5	27	30	11
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	15	117	239	27	30	11
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	33	66	8	8	3
Total Analysis Volume [veh/h]	17	130	266	30	33	12
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.00	0.06	0.02
d_M, Delay for Movement [s/veh]	7.88	0.00	0.00	0.00	11.73	10.12
Movement LOS	A	A	A	A	B	B
95th-Percentile Queue Length [veh/ln]	0.04	0.00	0.00	0.00	0.24	0.24
95th-Percentile Queue Length [ft/ln]	1.02	0.00	0.00	0.00	5.89	5.89
d_A, Approach Delay [s/veh]	0.91		0.00		11.30	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	1.32					
Intersection LOS	B					

Appendix C

TRAFFIC IMPACT ANALYSIS

Elux at Ocotillo

Northwest Corner of Kenworthy Road & Ocotillo Road
Pinal County, Arizona

June 20, 2022

UCG Project Number: TR22068

PREPARED FOR
Snowdon Residential, LLC
7114 East Stetson Drive, Suite 400
Scottsdale, Arizona 85251

PREPARED BY
United Civil Group
2803 N. 7th Avenue
Phoenix, Arizona 85007
602-265-6155

CONDUCTED BY



Sarah Simpson, PhD, PE
President

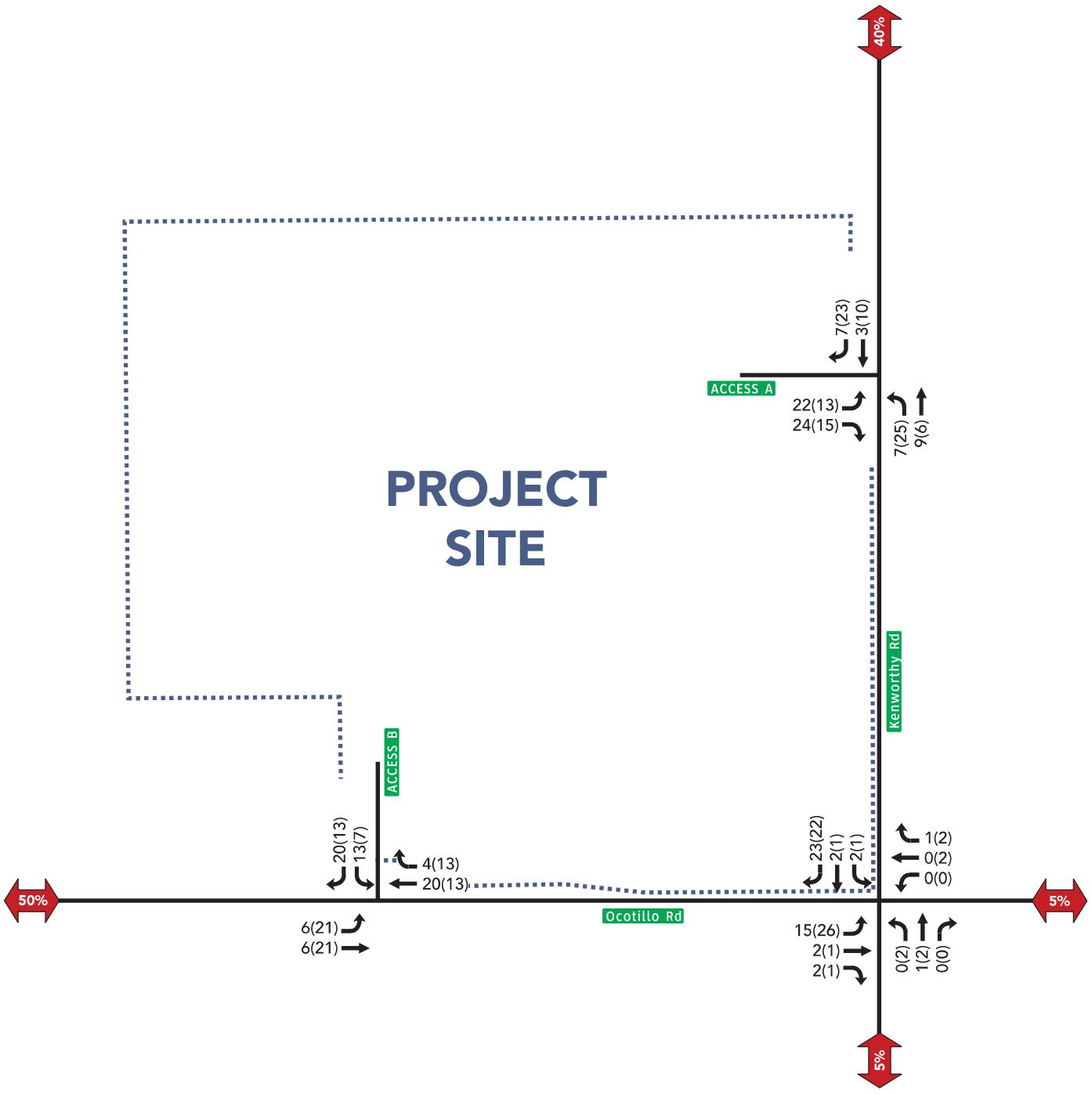


N

not to scale

Figure 3: Site Plan

UCG
United Civil Group



LEGEND

XX(XX) AM(PM) Peak Hour Traffic Volume

X% Trip Distribution Percentage

N

not to scale

UCG United Civil Group

Figure 5: Site Generated Traffic

TRAFFIC IMPACT ANALYSIS
Amendment #1

Wales Ranches
Pinal County, Arizona

March 28, 2022

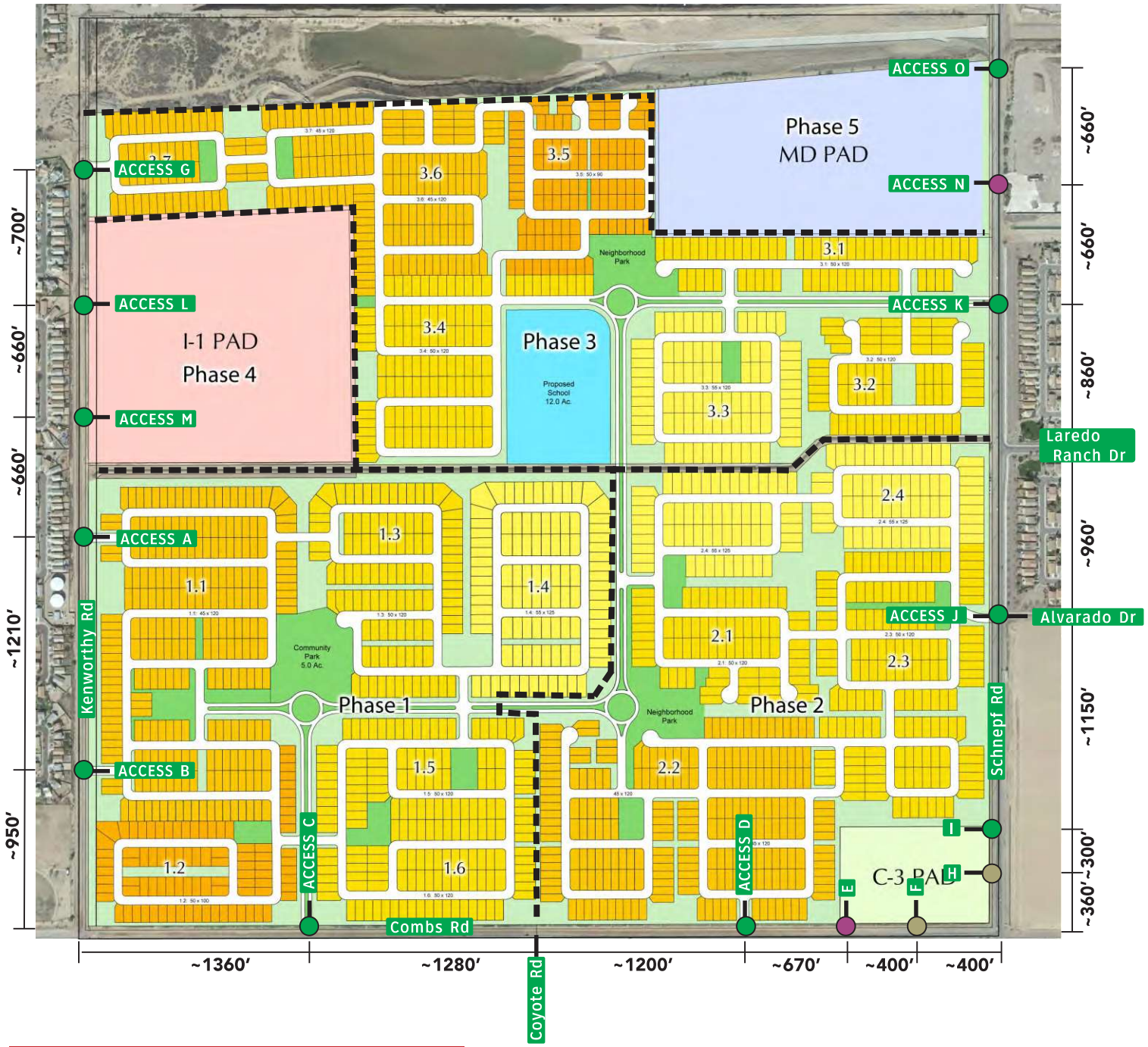
UCG Project Number: TR21135
Original Project Number: TR18089

PREPARED FOR
CVL Consultants
4550 North 12th Street
Phoenix, Arizona 85014

PREPARED BY
United Civil Group
2803 N. 7th Avenue
Phoenix, Arizona 85007
602-265-6155



CONDUCTED BY _____
Sarah Simpson, PhD, PE
President



LEGEND

- Full Access
- Right in/Right out/Left in Access
- Right in/Right out Access

not to scale

Figure 3: Approved Site Plan

United Civil Group

Ocotillo Road is also listed as a RSR Principal Arterial. Ocotillo Road is one mile north of the Wales Ranches northern boundary and provides regional travel throughout the area. Ocotillo Road is constructed as a three-lane section within the study area and includes one lane in each direction separated by a two-way left turn lane within the study area. The posted speed on Ocotillo Road is 35 mph.

Coyote Road is a ½ mile north-south collector roadway located between Kenworthy Road and Schnepf Road. At Combs Road, Coyote Road traverses south only for approximately 550 feet where it terminates as a dead end with barricading. At this location, Coyote Road provides access to a church on the west side of the roadway and a meat processing facility on the east side of the roadway. Coyote Road is developed as a 24-foot ½ street with one lane in each direction and no posted speed limit.

SITE TRAFFIC GENERATION REDUCTION

Estimates of the traffic volumes that will be generated by the proposed single-family development for Phase 3 were determined from transportation planning data taken from the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th Edition, 2017*. **Table 1** presents the trip generation for Land Use Code 210-Single Family Detached Housing and the reduction in trips with the reduced lot count. The fitted curve equations were used to calculate the trip ends for each time period.

TABLE 1: TRIP GENERATION

Land Use	Units	Size	Daily	AM Peak			PM Peak		
				total	in	out	total	in	out
210 Single Family	Dwelling Units	633	5,678	454	113	341	597	376	221
210 Single Family	Dwelling Units	268	2,527	188	49	139	252	159	93
Reduction of 365 dwelling units			**-3,151**	**-266**	**-64**	**-202**	**-345**	**-217**	**-128**
Trips forecasted to use Access G				*69*	*17*	*52*	*91*	*57*	*34*
Remaining trips to be eliminated from other accesses in peak periods				*-197*	*-47*	*-150*	*-254*	*-160*	*-94*

The proposed reduction in single family homes is anticipated to decrease the trips in Phase 3 by 3,151 daily trips with 266 less trips occurring in the morning peak hour and 345 less trips occurring in the evening peak hour, per the ITE *Trip Generation Manual*, than originally assumed in the approved TIA.

Appendix D

MUTCD Signal Warrant Analysis

Horizon Year	**2022 Existing Traffic**			
Community Type	Commmunity with greater than 10,000 people			
Street Name	Kenworthy Road		Ocotillo Road	
Posted Speed (mph)	25		35	
Direction	NB	SB	EB	WB
Number of Lanes	1		2 or more	
	Minor Street		Major Street	
Morning Volume	194	189	308	495
Evening Volume	101	269	449	366

8 Highest Hours	Hourly Factors*	Major Street *(both directions)*	Minor Street *(higher one direction)*
1	0.0771	815	254
2	0.0730	772	240
3	0.0688	727	227
4	0.0656	693	216
5	0.0618	653	204
6	0.0612	647	202
7	0.0573	606	189
8	0.0572	605	188

** Source: Pignataro Traffic Engineering Theory and Practice, 1973*

100% Warrant Criteria	Major Street	Minor Street
Condition A	500	200
Condition B	750	100
80% Condition for A and B	600	160

8 Highest Hours	Met? Warrant 1 Condition A	Warrant 1 Condition B	80% Warrant for Conditions A and B**
1	YES	YES	YES
2	YES	YES	YES
3	YES	NO	YES
4	YES	NO	YES
5	YES	NO	YES
6	YES	NO	YES
7	NO	NO	YES
8	NO	NO	YES

***80% Condition for Warrants A and B is intended for application at locations where Condition A is not satisfied and Condition B is not satisfied and should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.*

Appendix E

Andrew Smith
Public Works Director

Joe Ortiz
Deputy Director

Christopher Wanamaker
County Engineer

PINAL COUNTY
WIDE OPEN OPPORTUNITY

Leo Lew
County Manager

Public Works Traffic Engineering Review Comment Letter

Project Name:		San Tan 3 aka (New Retail Development and Indoor Batting Cages)			
Engineering Firm:		United Civil Group		**Reviewed by:**	John Kraft Christopher Wanamaker
Engineer:		Sarah Simpson, #32850 Sealed 10/12/2022			
Case #:	PZ-PD-001-23	**Review Status:**	1st Review 2nd Review	**Date:**	06/01/2023

Sheet #	**Comment #**	**RESPOND TO ALL COMMENTS AND REDLINES:**
	1	Ensure that the name used the cover of the report is the same as what is used in other documents related to this project. If multiple names are desired, please include all names on all documents. This will help to alleviate confusion.
Page 6	2	In the section by other, please clarify who the "Others" are. For example, please specify that according to the TIA for Elux, that development will contribute 25% towards the cost of the future Traffic Signal at Kenworthy & Ocotillo. You should also state that it is anticipated that Pinal County would fund the remaining 50% of the signal and install it since no development is planned for the NE or SE corners.
Page 24	3	Page 24 notes that Access B is planned to be a right-in,right-out. While we tend to favor limiting access, this does present a problem with any patron to the development who wishes to leave in the NB or WB directions. To promote good traffic circulation a design alteration should be considered to allow for movements in these directions? Can access be provided onto Quarter Horse? If, for some reason, this is not an option, we may consider a waiver for greater access onto Kenworthy to facilitate good onsite traffic circulations. Please review.
Figure	4	Since the report proposes at limited access (right-in, right-out) condition for both access A and B, how are there 10 AM vehicles and 37 PM vehicles heading NB on Kenworthy and WB on Ocotillo? See also previous comment. Moreover, the 10AM/37PM traffic shown on figure 5 does not appear to be actually entering or existing at access A or B. Is this a valid conclusion?
	5	All TIA's shall provide Average Daily Traffic (ADT) values for all study roadways for both existing and future traffic conditions in addition to the Peak Hour traffic Volumes in the report. Provide this information on the figures that show the AM/PM peak hour traffic volumes
	6	Because the traffic signal will not likely be installed anytime soon, please include a LOS analysis of the intersection for the unsignalized condition with your traffic generated from this site. Next, provide table comparing the unsignalized LOS for background traffic with the unsignalized LOS with the additional traffic from this site.
Part VI.B	7	The half street improvements should include a raised median to ensure that the right-in, right-out condition is met. Please update the report.
	8	Provide an overall traffic circulation map that includes the following items on a single figure: Proposed improvements resulting from this project (turn lanes, half street, signal contribution, etc), all access locations and access types (full, ¾, Right-in-right-out), ADT values (existing and proposed) for adjacent roadways, AND distances between intersections and Access Points. This figure is very important because it will be used at the presentation to the P&Z commission as well as the BOS in the future.
General	9	Review comments made to the Traffic Impact Analysis may require revisions be made to the projects Paving Plan and/or the Signing & Striping Plan. It is the applicant's and engineer's responsibility to ensure that both the plans and report reflect the same design/information.

PINAL COUNTY
WIDE OPEN OPPORTUNITY

General	10	Based on the information being requested, additional comments may be forth coming.
General	11	This report is not approved and a **2nd review** will be required. Please resubmit a revised traffic report, accompanying figures/exhibits and supporting calculations, along with written responses to the comments.

August 16, 2023

Project: San Tan 3 (New Retail Development and Indoor Batting Cages)
UCG Project Number: TR22095
Reviewing Agency: Pinal County
Revision: 1st Review Comments
Date Reviewed: June 1, 2023
Case # PZ-PD-001-23

Sheet #	Comment #	Response
General	1	The name has been changed to **San Tan 3** (New Retail Development and Indoor Batting Cages)
Page 6	2	Rephrased to add: Per the approved TIA for Elux Multifamily Development, the developer of the property is to contribute 25% toward the cost of the signal at the intersection of Kenworthy Road/Ocotillo Road. It is anticipated that Pinal County will contribute the remaining 50% of the signal cost because no known development is planned for the northeast or southeast corners of the intersection, at this time.
Page 24	3	Agreed, Access B on Kenworthy is proposed as a full movement access to allow exiting traffic access to the west and north. This change also allows ingress into the site from the south. Consideration was given to providing access on Quarter Horse Trail from the development. However, because this is a local residential road, is approximately 16 feet in width and terminates to the west as a dead end with no cul-de-sac, this option is not viable or recommended.
Figure 5	4	Vehicles were proposed to be making U-turns on Kenworthy Road and Ocotillo Road. The in and out volumes to and from the site are correct. However, with access changing, the trip distribution has been reallocated because Access B is proposed as a full turning movement access. Therefore, U-turns have been eliminated from the traffic modeling.
General	5	ADTs are added to the figures.
Page 29	6	Added LOS for Kenworth/Ocotillo controlled by all way stop and the comparison table for all way stop and signalized.
	7	Report updated to include the half street improvements and the raised median within the site boundary to limit Access A to right in/right out only

Sheet #	Comment #	Response
General	8	Recommendations figure included in report
General	9	Report provided to engineer for incorporation of recommendations into plans.
General	10	Agreed
General	11	Agreed

3275 West Ina Road, Suite 220
Tucson, AZ 85741
Phone: (520) 463-3200
www.bowman.com

PRELIMINARY DRAINAGE REPORT:

SAN TAN COMMERCIAL 3

SWC of E. Ocotillo Road and N. Kenworthy Road
San Tan Valley, AZ 85140
SECTION 20, T02S, R08E, G&SRM, Pinal County, Arizona

PREPARED FOR
UPFRONT PLANNING & ENTITLEMENTS, LLC
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JULY 2023

TABLE OF CONTENTS

LIST OF FIGURES iii

LIST OF TABLES iii

LIST OF APPENDICES iii

1. INTRODUCTION 1
- **1.1 Site Location and Project Description** 1
- **1.2 Purpose and Objectives** 2
- **1.3 Development Requirements and Procedures** 3

2. HYDROLOGIC INFORMATION 4

3. HYDRAULICS INFORMATION 5

4. CONCLUSIONS 9

5. REFERENCES 10



LIST OF FIGURES

FIGURE 1: LOCATION MAP
FIGURE 2: FIRMETTE
FIGURE 3: DRAINAGE MAP

LIST OF TABLES

TABLE 1: SUMMARY OF MC-4500 UNDERGROUND CHAMBERS

LIST OF APPENDICES

APPENDIX A: HYDROLOGY DOCUMENTATION
APPENDIX B: HYDRAULICS DOCUMENTATION



Section
1

INTRODUCTION

The parcel/project site examined in this report is referred to as "San Tan Commercial 3", and refers to Parcels 104-22-041A and 205-22-041B. These parcels had previously featured agriculture, and later some minor development activity, but this development has since been removed, leaving a roughly level vacant area. The proposed parcel area of development for San Tan Commercial 3 is approximately 2.65 acres. Currently at the site of San Tan Commercial 3, there is a vacant area in the interior of the site. There are some utilities, including irrigation infrastructure and easements around the north and east perimeters of the site – along E. Ocotillo and N. Kenworthy Roads respectively. The entire site has been previously graded, and is currently earthen. The current intent is to regrade the site, and place multiple commercial buildings on the site along with parking, utilities, landscape, and drainage features. The site will take its access from both E. Ocotillo Road and N. Kenworthy Road. This report will support the Rezone and Planned Area Development for San Tan Commercial 3, and is preliminary in nature – only to establish the feasibility of a viable drainage solution on the site.

1.1 Off-Site Drainage

The overall drainage pattern in the area of San Tan Commercial 3 is characterized by sheet flow over mildly sloping terrain (0.5% +/-) from east to west. As such, storm water run-on to the project site would occur after being conveyed over Kenworthy Road. It is unlikely that any significant volume of storm water would enter the project site from Kenworthy Road. This is because Kenworthy Road itself, as a former agricultural service road, is elevated slightly above the surrounding terrain in this location, thereby serving as a de-facto impediment to overland flow. This is also because there is an earthen berm on the east side of Kenworthy Road which currently holds back storm water generated on the vacant parcel on the southeast corner of Kenworthy/Ocotillo, and only 640 feet to the east of Kenworthy is an existing residential subdivision (Moon Shadow) that features its own drainage system that does not outlet to the vacant parcel or to Kenworthy Road. On the west (San Tan Commercial 3) side of Kenworthy Road are vestiges of a now-abandoned irrigation canal that may further impeded storm water run-on.

Potential run-on from Ocotillo Road and Quarter Horse Trail (the residential street on the south border of San Tan Commercial 3) are unlikely to be significant due to the factors already stated, and because

Ocotillo Road features a crowned cross section. There is a small area of significant vegetation on the project site concentrated along the northern boundary of the parcels. This is likely due to onsite runoff ending up there, and possibly some contribution from the irrigation infrastructure along that alignment. Because of all this, it can reasonably be said that offsite storm water does not enter the project site in any significant quantity, and that San Tan Commercial 3 can be considered to be self-contained with its storm water.

The project site is mapped entirely outside any Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas (SFHAs), and is identified as Zone X, being outside of the 0.2% Annual Chance Flood Hazard, on the Flood Insurance Rate Map Panel 04021C0745E (effective 12/04/2007). Please see Figure 2 – FIRMette. There is also no SFHA near the project site.

Section
2

HYDROLOGIC INFORMATION

A preliminary site grading scheme was developed for the proposed site improvements, and was highly influenced by the existing topography on the site. Basically, the eastern half of the site will drain overland to the proposed underground retention chambers in the western half of the parcel. The preliminary grading plan would maintain the prevailing drainage pattern, whereby the onsite storm water would concentrate at two grate inlets proposed near the northwest and southwest corners of the property, and enter into separate underground storage chamber systems. Flow conveyance is expected to entirely overland flow off of the roof and landscape areas, then over the paved parking and drive aisle areas to one of two concentration points CPNW and CPSW. Channelization is not anticipated, although one or more valley gutters may be necessary.

Peak discharges were determined for the 1% annual chance (100-year) event on the site. To do this, the rational method was utilized per Volume 2, Chapter 2 of the Pinal County Drainage Manual (PCDM), and with the help of the NOAA 14 Atlas information found at https://hdsc.nws.noaa.gov/hdsc/pfds, as there was no intensity-duration information in the PCDM in the vicinity of the project site. It is important to note that the drainage areas considered to be contributing to CPNW and CPSW include the existing utility and irrigation easements outside of the intended development area, and also include the ½ right-of-way (up to the surveyed centerlines) of Ocotillo Road, Kenworthy Road, and Quarter Horse Lane. This is due to the longstanding Pinal County policy compelling inclusion of these areas for the purpose of determining the required storm water volume to retain. Proposed conditions Rational C coefficients were calculated using Equation 2-2 (weighted average) in the Pinal County Drainage Manual (PCDM) with contributing C values chosen from Table 2-1 in the PCDM. The most conservative C values were chosen.

Results of the rational method analyses were that the NW chamber system should receive a 100-year, 1-hour peak discharge of approximately 3.8 cfs in existing conditions, and 12.6 cfs in proposed conditions from 1.78 acres. Similarly, the SW chamber system should receive a 100-year, 1-hour peak discharge of approximately 2.6 cfs in existing conditions, and 8.0 cfs in proposed conditions from 1.22 acres. Please see the hydrology summary in Appendix A.

Section
3

HYDRAULICS INFORMATION

Retention Volume

Contributing areas of 1.78 and 1.22 acres in size were delineated for the two proposed retention chamber systems, which includes the entire project site plus the ½ right-of-way (ROW) areas on Ocotillo Road, Kenworthy Road, and Quarter Horse Lane. The drainage from the ½ right-of-way does not actually enter the chamber systems, as doing so would likely prove infeasible due to the physical layouts of the basin and the right-of-way.

Along with the peak discharges for these areas, the design volumes of the two retention chamber systems were determined per Equation 2-4 in the Pinal County Drainage Manual using the 100-year, 2-hour rainfall depth, the weighted runoff coefficient, and the contributing drainage area. The retention goal (from the 100-year, 2-hour event) is 13,112 cubic feet (cf) for CPNW and 8,981 cf for CPSW. These volumes represent full retention of the entire onsite drainage areas during the 100-year, 2-hour event.

Underground Storage Chamber Sizing

In order to determine the feasibility of placing underground chambers on the project site of San Tan Commercial 3, a sizing exercise was performed using the StormTech underground chamber system. StormTech's online design tool at https://designtool.ads-pipe.com was used to select a chamber product and estimate the number of chambers, as well as the number of rows according to the available space. For both CPNW and CPSW, the MC-4500 product was chosen. It was found that smaller chambers would not provide enough storage within the available space. The number of chambers necessary at each location will depend on whether Pinal County will allow the void spaces within the rock fill to count as storage volume. Normally, StormTech/ADS encourages use of the stone-void volume surrounding the chambers to count as stored volume. Some jurisdictions also allow this volume to count toward the volume goal, and others do not. Pinal County staff has indicated that they normally do not allow this volume to count, but still

have on some occasions. Staff also indicated that when they do allow stone-void volume, they prefer using 30% of the stone-fill volume for the void space volume (StormTech/ADS recommends 40%), and that ideally the void space volume should represent a 'small percentage' of the overall volume. Bowman Consulting has found that the stone-void portion generally represents roughly one-third of the total volume in these underground chamber systems.

Given the uncertainty regarding whether the stone-void volume would count toward the stated volume goals, the aforementioned design tool was used two ways. One way is with the stone-void counting as 30% of the stone-fill, and the other way is with no stone voids counting. Table 1, below, indicates the number of MC-4500 chambers (which are 60-inches tall, and require a minimum 24-inches of cover) required at each location assuming with- and without stone void volume scenarios.

Table 1: Summary of MC-4500 Underground Chambers

Concentration Point	Number of MC-4500 Chambers Required (Integer)	Volume Required In Chambers (100-Year, 2-Hour Event) (ft^3)	Installed System Volume (ft^3)
CPNW			
With 30% Stone-Voids Volume	81	13,112	13,604
Without Stone Voids Volume	120	13,112	13,176
CPSW			
With 30% Stone-Voids Volume	55	8,981	9,461
Without Stone Voids Volume	82	8,981	9,050

There are several other factors to consider when installing underground chambers. One is that these chamber systems will be subject to the 36-hour draindown requirement by Pinal County. As such, there will need to be an infiltration test conducted - preferably at the infiltration depth (7 ft +/-). If draindown cannot be demonstrated within the 36-hour time limit, then a drywell will be necessary at one or both locations. Drywells could be placed within the landscape areas. Another factor is that there will need to be a bearing capacity test conducted either before or during installation, and in the case of a weaker soil, an additional depth of stone on the bottom layer will be required. One more factor is that inspection and maintenance of the underground system may be mandated by a covenant running with the land, which will require maintenance a

minimum of yearly, and likely at least inspection after significant rain events. Details of inspection and maintenance means and methods will be provided during design of the project site.

Section
5

CONCLUSIONS

This drainage report documents the hydrologic and hydraulic analyses performed for the determination of 100-year peak discharges and the full retention of storm water volumes for the planned San Tan Commercial 3 development. The general location is the southeast quarter of Section 20, Township 02 South, Range 08 East of the Gila and Salt River Meridian, within the unincorporated Pinal County, Arizona. More specifically, the project site is located on the west side of N. Kenworthy Road and the south side of E. Ocotillo Road.

To accomplish the tasks identified above, the hydrology procedure described in Volume 2, Chapter 2 of the Pinal County Drainage Manual (a version of the rational method), was used to determine 1% annual chance (100-year) peak discharges for the onsite drainage areas.

It was determined that full retention of the 100-year, 2-hour event will be necessary, and volumes for that were determined according to the conceptual grading plan, which splits the project site into two drainage areas. Underground storage chambers were sized volumetrically with and without counting the stone-void volume toward the volume goals. Accordingly, two chamber systems were determined using the StormTech/ADS MC-4500 chamber product. The underground chamber systems have no outlet. Percolation tests will be performed to determine whether there is a need for a drywell at one or both

locations. Maintenance of the chambers will occur by placing machinery through an access manhole from the ground surface.

The storage and conveyance of storm water through the project site has been shown to be feasible, and will not adversely impact the subject parcel itself, nor the other adjoining properties and right-of-way.

Section 6

REFERENCES

1. Pinal Drainage Organization, *Pinal County Drainage Manual, Volume II: Design Methodology and Procedures, Chapter 2: Hydrology*, August, 2004.

Disclaimer

The analysis presented in this Statement evaluates stormwater runoff resulting from a statistical evaluation of storm events of particular duration and frequency up to and including a 1% annual chance (100-year) frequency event. A storm event exceeding the 1% annual chance frequency may cause or create the risk of greater flood impact than is addressed and presented herein. The scope of this assessment does not include evaluation of stormwater runoff resulting from storm events exceeding the 1% annual chance frequency. BOWMAN CONSULTING assumes no responsibility for actual flood damage, increased risks of flood damage, or increased construction or development cost resulting from or related to any such events, nor shall BOWMAN CONSULTING be responsible for any changes in, or additions to, regulatory requirements which may result from, or be related to, any such events or changes in hydrologic or hydraulic conditions within the watershed.

FIGURES



Figure 1 - Location Map

Section 20, Township 02 South, Range 08 East G&SRM

UPFRONT
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National Flood Hazard Layer FIRMette

FEMA

111°33'6"W 33°15'11"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

111°32'28"W 33°14'41"N

Figure 2 - FIRMette

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 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 2/24/2023 at 4:20 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 map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

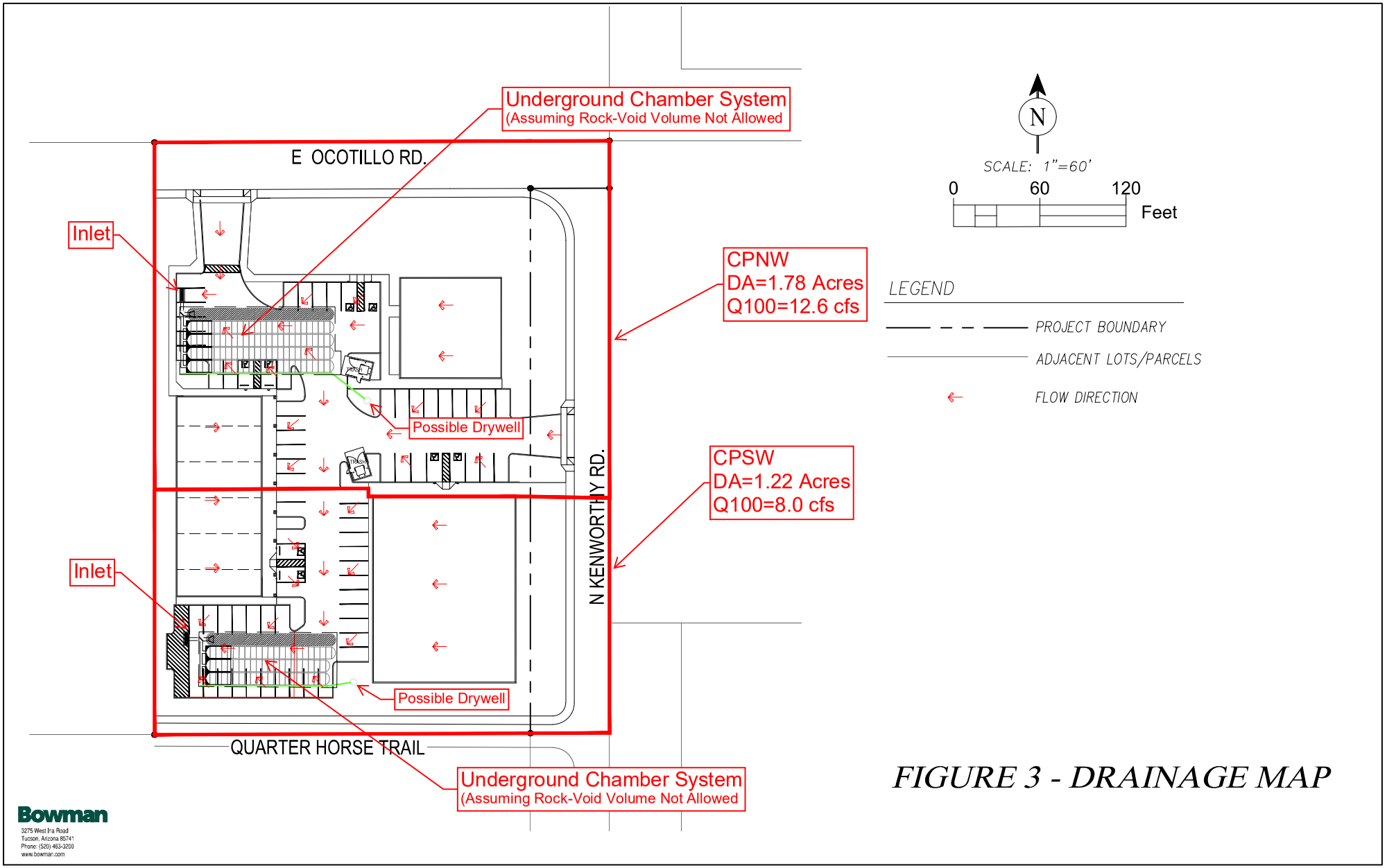


FIGURE 3 - DRAINAGE MAP

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3275 West Ina Road
Tucson, Arizona 85741
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APPENDIX A

HYDROLOGY DOCUMENTATION

For CPNW

Hydrologic Analyses for San Tan Commercial 3

Per Volume 2, Chapter 2 of Pinal County Drainage Manual

A = Drainage Area (acres)
P_1 = 1-Hour Rainfall Depth (From NOAA Atlas 14 - Median Value)
L_c = Length of the Watercourse to the Hydraulically Most Distant Point (mi)
K_b = Watershed Resistance Coefficient (dim), K_b = m log(A) + b
m and b = Empirical Equation Parameters (dim), From Table 2-2 in Pinal County Drainage Manual, Volume 2/Chapter 2
S = Slope of Longest Flow Path, L_c, (ft/mi)
T_c = Time of Concentration (hrs), $T_c = 11.4L_c^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$, Papadakis Equation
i = Average Rainfall Intensity for a Duration of Rainfall Equal to Tc (Minimum Tc is 5 minutes)
Use NOAA 14 Rainfall Intensities to build Intensity-Duration-Frequency Curves
C = Runoff Coefficient (Table 2-1 of Pinal County Drainage Manual
Q_{p100} = 100-Year Peak Discharge (ft^3/s), Q_{p100} = CiA

Onsite Hydrology

Existing Conditions for Contributing Onsite Area

Drainage Area Designation	Return Period (Years)	A (acres)	P_1 (in)	L_c (mi)	m (dim)	b (dim)	K_b	Relief (ft)	S (ft/mi)	i (in/hr)	T_c (hr)	T_c (min)	C	Q_{p100} (ft^3/s)	Notes
CPNW	100	1.78	2.05	0.047	-0.01375	0.08	0.077	1.0	21.1	6.80	0.122	7.3	0.31	3.8	
CPSW	100	1.22	2.05	0.047	-0.01375	0.08	0.079	1.0	21.1	6.80	0.124	7.4	0.31	2.6	

Rational C Per Equation 2-2 of Pinal County Drainage Manual

$C_w = (C_1A_1 + C_2A_2 + \ldots + C_nA_n) / (A_1 + A_2 + \ldots + A_n)$

Where C_i and A_i are the ith Runoff Coefficient (from PCDM Table 2-1) and ith Subarea respectively

Proposed Conditions

C_1= 0.25	For "Agricultural"
C_2= 0.88	For "Gravel Roadways and Shoulders"
A_1= 2.70	
A_2= 0.30	
C_w= 0.31	

For CPSW

Hydrologic Analyses for San Tan Commercial 3

Per Volume 2, Chapter 2 of Pinal County Drainage Manual

A = Drainage Area (acres)
P_1 = 1-Hour Rainfall Depth (From NOAA Atlas 14 - Median Value)
L_c = Length of the Watercourse to the Hydraulically Most Distant Point (mi)
K_b = Watershed Resistance Coefficient (dim), K_b = m log(A) + b
m and b = Empirical Equation Parameters (dim), From Table 2-2 in Pinal County Drainage Manual, Volume 2/Chapter 2
S = Slope of Longest Flow Path, L_c, (ft/mi)
T_c = Time of Concentration (hrs), $T_c = 11.4 L_c^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$, Papadakis Equation
i = Average Rainfall Intensity for a Duration of Rainfall Equal to Tc (Minimum Tc is 5 minutes)
Use NOAA 14 Rainfall Intensities to build Intensity-Duration-Frequency Curves
C = Runoff Coefficient (Table 2-1 of Pinal County Drainage Manual
Q_{p100} = 100-Year Peak Discharge (ft^3/s), Q_{p100} = CiA

Onsite Hydrology

Proposed Conditions for Contributing Onsite Area

Drainage Area Designation	Return Period (Years)	A (acres)	P_1 (in)	L_c (mi)	m (dim)	b (dim)	K_b	Relief (ft)	S (ft/mi)	i (in/hr)	T_c (hr)	T_c (min)	C	Q_{p100} (ft^3/s)	Notes
CPNW	100	1.78	2.05	0.045	-0.00625	0.04	0.038	1.0	22.0	7.84	0.078	5.0	0.91	12.6	Defaults to 5 Minutes
CPSW	100	1.22	2.05	0.063	-0.00625	0.04	0.039	1.0	16.0	7.25	0.106	6.4	0.91	8.0	

Rational C Per Equation 2-2 of Pinal County Drainage Manual

$C_w = (C_1A_1 + C_2A_2 + \ldots + C_nA_n) / (A_1 + A_2 + \ldots + A_n)$

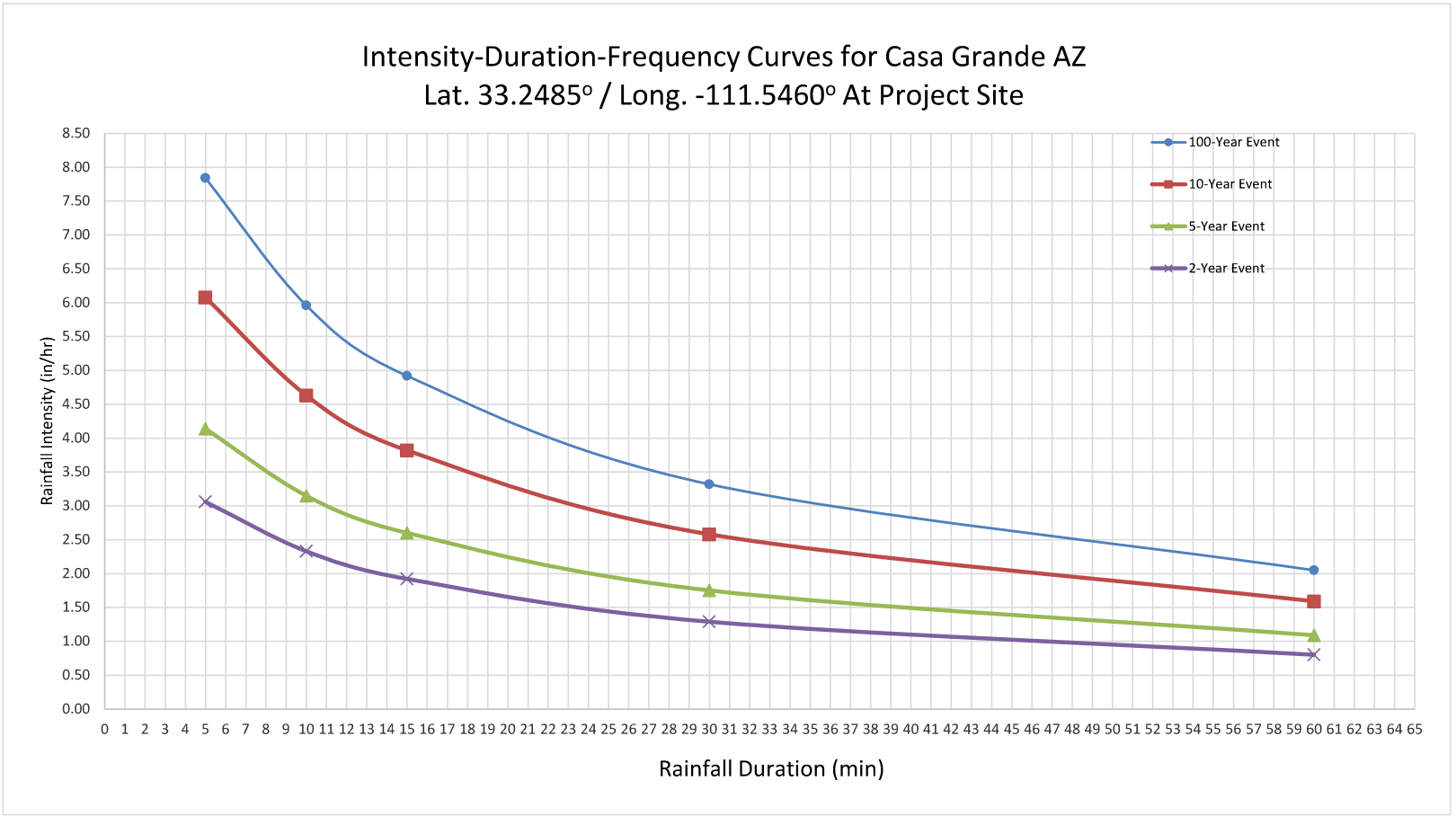
Where C_i and A_i are the ith Runoff Coefficient (from PCDM Table 2-1) and ith Subarea respectively

Proposed Conditions

C_1= 0.95	For "Pavement and Rooftops"
C_2= 0.88	For "Gravel Roadways and Shoulders"
C_3= 0.50	For "Desert Landscaping 2"
A_1= 2.34	
A_2= 0.24	
A_3= 0.24	
C_w= 0.91	

IDF Information for Casa Grande Project Site - Lat 33.2485 / Long -111.5460 - From NOAA Website

Duration (min)	100-Year Intensity (in/hr)	10-Year Intensity (in/hr)	5-Year Intensity (in/hr)	2-Year Intensity (in/hr)
5	7.84	6.08	4.14	3.06
10	5.96	4.63	3.15	2.33
15	4.92	3.82	2.60	1.92
30	3.32	2.58	1.75	1.29
60	2.05	1.59	1.09	0.80



APPENDIX B

HYDRAULICS DOCUMENTATION

Retention Storage Volume Goal and Retention Storage Arriving

Per Equations 2-2, 2-4 and 2-6 of Pinal County Drainage Manual

Retention Storage Volume Goal (100-Year, 2-Hour Event) - Northwest Drainage Area CPNW

$V = C (P_2/12) A$ Equation 2-4 of Pinal County Drainage Manual (Volume 2, Chapter 2)

Where:
C = Rational Coefficient from Equation 2-2
P_2 = 100-Year, 2-hour Median Rainfall Depth per NOAA 14 Atlas (inches)
A = Contributing Drainage Area (Acres)

Proposed Conditions

C=	0.91	Commercial 2 Land Use - See Below
P_2=	2.24	Inches
A=	1.78	Acres
V=	0.30102	Acre-Feet
=	13112	ft^3

Total Retention from Proposed Conditions Area = 13112 Cubic Feet

---

Retention Storage Volume Goal (100-Year, 2-Hour Event) - Southwest Drainage Area CPSW

$V = C (P_2/12) A$ Equation 2-4 of Pinal County Drainage Manual (Volume 2, Chapter 2)

Where:
C = Rational Coefficient from Equation 2-2
P_2 = 100-Year, 2-hour Median Rainfall Depth per NOAA 14 Atlas (inches)
A = Contributing Drainage Area (Acres)

Proposed Conditions

C=	0.91	Commercial 2 Land Use - See Below
P_2=	2.24	Inches
A=	1.22	Acres
V=	0.20617	Acre-Feet
=	8981	ft^3

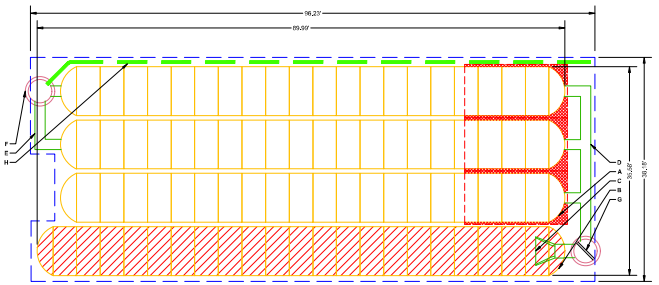
Total Retention from Proposed Conditions Area = 8981 Cubic Feet

Summary of Underground Chamber System for CPNW with Rock Counting

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
83	STORMTECH MC-4500 CHAMBERS	MINIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)	12.75
8	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)	8.25
12	STONE ABOVE (IN)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)	7.75
9	STONE BELOW (IN)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT)	7.25
30	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	7.05
13604	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-4500 CHAMBER:	5.75
	(COVER STONE INCLUDED)	MC ISOLATOR ROW PLUS INVERT:	0.42
	(BASE STONE INCLUDED)	18" x 18" BOTTOM MANIFOLD INVERT:	0.67
2626	SYSTEM AREA (SF)	18" x 18" BOTTOM MANIFOLD2 INVERT:	0.67
2763	SYSTEM PERIMETER (ft)	18" BOTTOM CONNECTION INVERT:	0.67
		BOTTOM OF MC-4500 CHAMBER:	0.42
		UNDERDRAIN INVERT:	0.42
		BOTTOM OF STONE:	0.00

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.37"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
CLAMP	C	INSTALL CLAMP ON 2" ACCESS PIPE / PART#: MCPLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37"	
MANIFOLD	E	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37"	
CONCRETE STRUCTURE	F	DCI (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		8.0 CFS OUT
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		16.5 CFS IN
UNDERDRAIN	H	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		

*INVERT ABOVE BASE OF CHAMBER



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADS/PLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

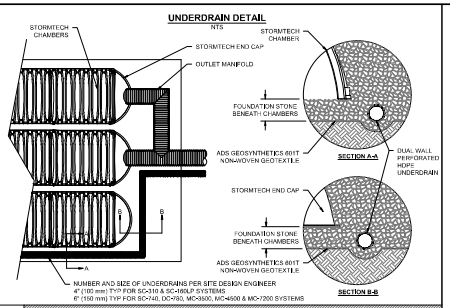
BED LIMITS

NOTES

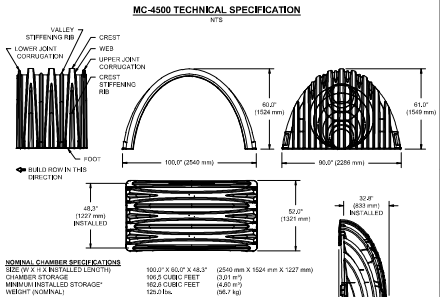
- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE 45.22 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

SPACE INTENTIONALLY LEFT BLANK

4 UNDERDRAIN DETAIL



2 MC-4500 TECHNICAL SPECIFICATION



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.8 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	129.0 lbs.	(58.7 kg)

NOMINAL END CAP SPECIFICATIONS

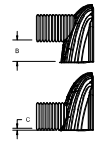
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.6"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS. 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

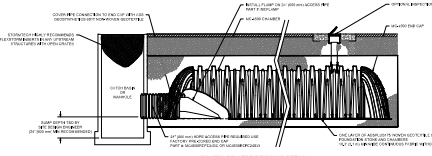
PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH A "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500EPP06T	6" (150 mm)	42.54" (1081 mm)	–
MC4500EPP06B		–	0.89" (22 mm)
MC4500EPP08T	8" (200 mm)	40.50" (1029 mm)	–
MC4500EPP08B		–	1.01" (26 mm)
MC4500EPP10T	10" (250 mm)	38.37" (975 mm)	–
MC4500EPP10B		–	1.33" (34 mm)
MC4500EPP12T	12" (300 mm)	35.69" (907 mm)	–
MC4500EPP12B		–	1.59" (39 mm)
MC4500EPP15T	15" (375 mm)	32.72" (831 mm)	–
MC4500EPP15B		–	1.70" (43 mm)
MC4500EPP18T	18" (450 mm)	29.39" (746 mm)	–
MC4500EPP18W			
MC4500EPP18B		–	1.97" (50 mm)
MC4500EPP18BW			
MC4500EPP24T	24" (600 mm)	23.05" (585 mm)	–
MC4500EPP24TW			
MC4500EPP24B		–	2.26" (57 mm)
MC4500EPP24BW			
MC4500EPP30BW	30" (750 mm)	–	2.95" (75 mm)
MC4500EPP36BW	36" (900 mm)	–	3.25" (83 mm)
MC4500EPP42BW	42" (1050 mm)	–	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12x24" (300x600 mm) SIDE ON SIDE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.



MC-4500 ISOLATOR ROW PLUS DETAIL

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2, IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON SIDES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2, IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

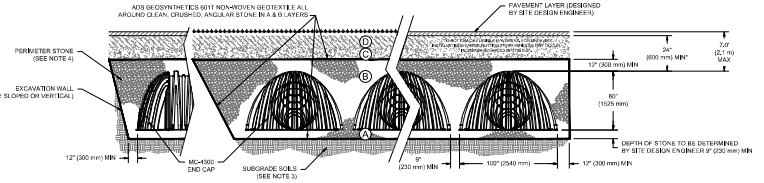
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

3 MC-4500 ISOLATOR ROW PLUS DETAIL

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS, CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS, PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE (B) LAYER TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145* A-1, A-2-4, A-3 OR AASHTO M43* 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43* 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE: FILL** BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43* 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #1 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 1 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

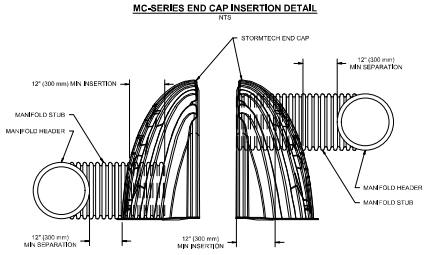


NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/F/IN., THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418, AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

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5 MC-SERIES END CAP INSERTION DETAIL



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

1 MC-4500 CROSS SECTION DETAIL

DRAWN: CL | DATE:
CHECKED: N/A | PROJECT #:
REV: | NOT TO SCALE

SAN TAN COMMERCIAL 3 - CPNW
QUEEN CREEK, AZ, USA

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

SHEET 1 OF 1

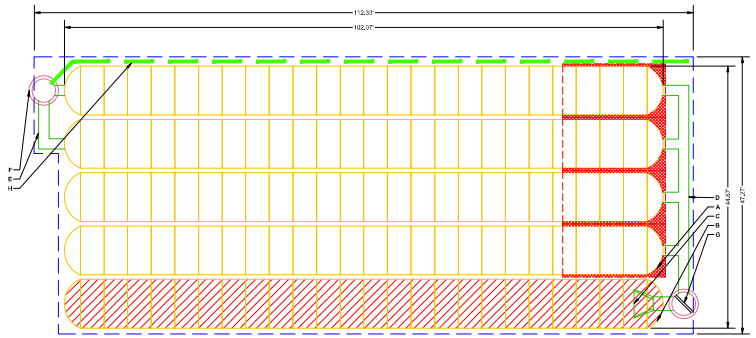
THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

Summary of Underground Chamber System for CPNW with Rock not Counting

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
120	STORMTECH MC-4500 CHAMBERS	MINIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)	12.75
10	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED W/ TRAFFIC)	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT)	7.25
0	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	7.25
13176	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)	TOP OF STONE	6.75
		TOP OF MC-4500 CHAMBER	5.75
		MC ISOLATOR ROW PLUS INVERT	0.25
3182	BASE STONE INCLUDED)	MANIFOLD INVERT	0.25
3182	SYSTEM AREA (SF)	18" x 18" BOTTOM MAIN CULVERT INVERT	0.25
312.2	SYSTEM PERIMETER (ft)	18" BOTTOM CONNECTION INVERT	0.25
		BOTTOM OF MC-4500 CHAMBER	0.00
		UNDISTURBED EARTH	0.00
		BOTTOM OF STONE	0.00

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
CLAMP	C	INSTALL CLAMP ON 2" ACCESS PIPE / PART#: MCPLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37"	
MANIFOLD	E	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37"	
CONCRETE STRUCTURE	F	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		8.0 CFS OUT
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		22.0 CFS IN
UNDERDRAIN	H	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		

*INVERT ABOVE BASE OF CHAMBER



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADS/FLO 175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

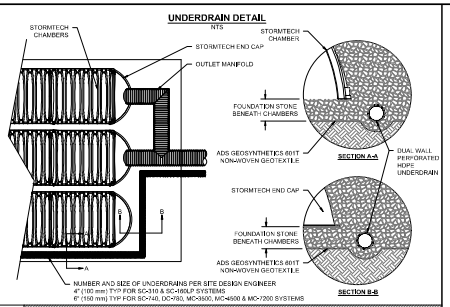
BED LIMITS

NOTES

1. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE 45.22 FOR MANIFOLD SIZING GUIDANCE.
2. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
3. THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
4. THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
5. **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

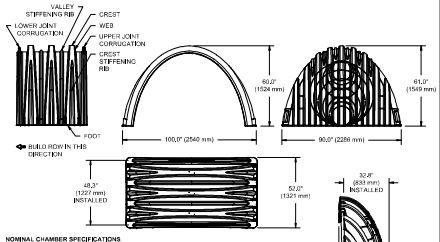
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UNDERDRAIN DETAIL
NTS



4 UNDERDRAIN DETAIL

MC-4500 TECHNICAL SPECIFICATION
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.8 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	129.0 lbs.	(58.7 kg)

NOMINAL END CAP SPECIFICATIONS

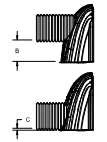
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PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH A "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

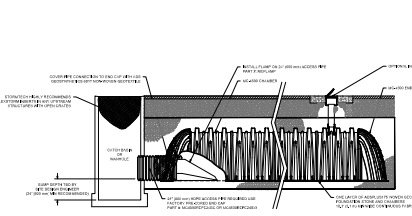
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2 MC-4500 TECHNICAL SPECIFICATION



INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
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  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (60 mm) PROCEED TO STEP 2, IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON SIDES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (60 mm) PROCEED TO STEP 2, IF NOT, PROCEED TO STEP 3.

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- C. VACUUM STRUCTURE SUMP AS REQUIRED

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NOTES

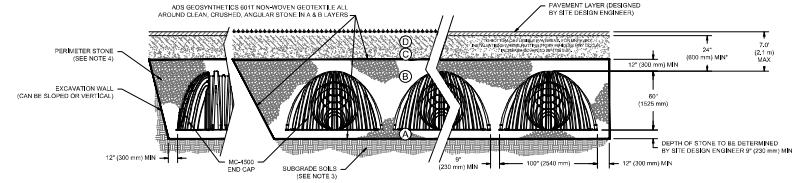
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3 MC-4500 ISOLATOR ROW PLUS DETAIL

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	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE (B) LAYER TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145* A-1, A-2-4, A-3 OR AASHTO M43* 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43* 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE: FILL** BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43* 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



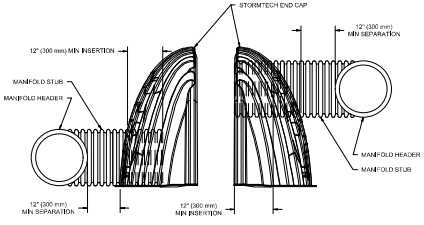
NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/F/IN., THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418, AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-4500 CROSS SECTION DETAIL

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MC-SERIES END CAP INSERTION DETAIL
NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

5 MC-SERIES END CAP INSERTION DETAIL

SAN TAN COMMERCIAL 3 - CPNW
QUEEN CREEK, AZ, USA

DRAWN: CL | DATE:
CHECKED: N/A | PROJECT #:
REV: | NOT TO SCALE

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

SHEET 1 OF 1

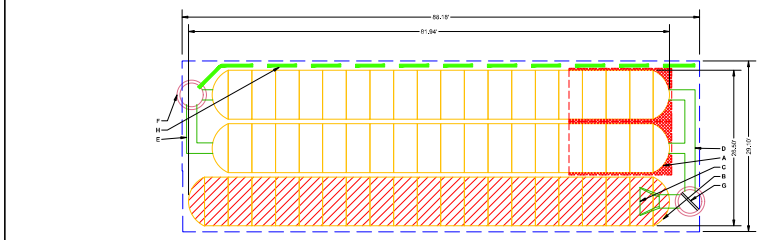
THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

Summary of Underground Chamber System for CPSW with Rock Counting

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
55	STORMTECH MC-4500 CHAMBERS	MINIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)	12.75
6	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT)	7.25
30	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	7.25
9461	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-4500 CHAMBER:	5.75
		MC ISOLATOR ROW PLUS INVERT:	5.25
2562	SYSTEM AREA (SF)	18" x 18" BOTTOM MANIFOLD INVERT:	5.17
2542	SYSTEM PERIMETER (ft)	18" BOTTOM CONNECTION INVERT:	5.01
		BOTTOM OF MC-4500 CHAMBER:	5.00
		UNDERDRAIN INVERT:	5.00
		BOTTOM OF STONE:	5.00

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97'	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26'	
CLAMP	C	INSTALL CLAMP ON 2" ACCESS PIPE / PART#: MCPLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37'	
MANIFOLD	E	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37'	
CONCRETE STRUCTURE	F	DCI (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		8.0 CFS OUT
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		11.0 CFS IN
UNDERDRAIN	H	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		

*INVERT ABOVE BASE OF CHAMBER



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADS/PLUS 175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

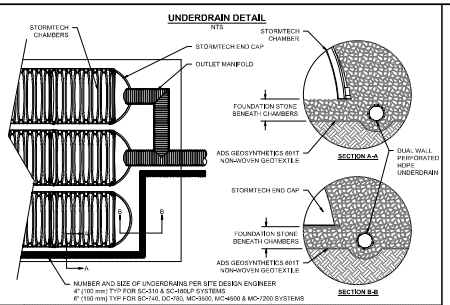
NOTES

1. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE 45.22 FOR MANIFOLD SIZING GUIDANCE.
2. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
3. THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IS NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
4. THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
5. **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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3 MC-4500 ISOLATOR ROW PLUS DETAIL

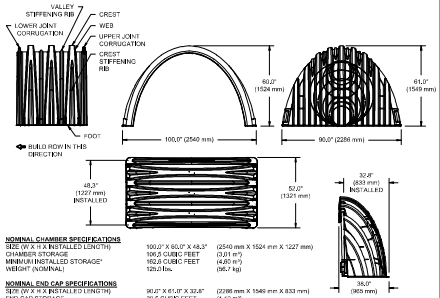
UNDERDRAIN DETAIL
NTS



4 UNDERDRAIN DETAIL

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MC-4500 TECHNICAL SPECIFICATION
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.8 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	129.0 lbs.	(58.7 kg)

NOMINAL END CAP SPECIFICATIONS

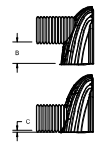
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.6"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS. 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH A "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500EPP06T	6" (150 mm)	42.54" (1081 mm)	–
MC4500EPP06B		–	0.89" (22 mm)
MC4500EPP08T	8" (200 mm)	40.50" (1029 mm)	–
MC4500EPP08B		–	1.01" (26 mm)
MC4500EPP10T	10" (250 mm)	38.37" (975 mm)	–
MC4500EPP10B		–	1.33" (34 mm)
MC4500EPP12T	12" (300 mm)	35.69" (907 mm)	–
MC4500EPP12B		–	1.59" (39 mm)
MC4500EPP15T	15" (375 mm)	32.72" (831 mm)	–
MC4500EPP15B		–	1.70" (43 mm)
MC4500EPP18T	18" (450 mm)	29.39" (746 mm)	–
MC4500EPP18W			
MC4500EPP18B		–	1.97" (50 mm)
MC4500EPP18BW			
MC4500EPP24T	24" (600 mm)	23.05" (585 mm)	–
MC4500EPP24TW			
MC4500EPP24B		–	2.26" (57 mm)
MC4500EPP24BW			
MC4500EPP30BW	30" (750 mm)	–	2.95" (75 mm)
MC4500EPP36BW	36" (900 mm)	–	3.05" (83 mm)
MC4500EPP42BW	42" (1050 mm)	–	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12x24" (300x600 mm) SIZE ON SIDE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-4500 TECHNICAL SPECIFICATION

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2, IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i. MIRRORS ON SIDES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii. FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2, IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

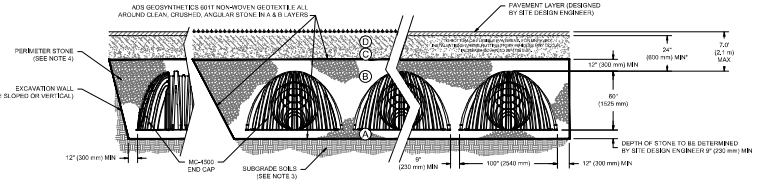
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

MC-4500 ISOLATOR ROW PLUS DETAIL
NTS

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS, CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS, PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE (B) LAYER TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145* A-1, A-2-4, A-3 OR AASHTO M431* 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43* 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE: FILL** BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43* 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #1 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

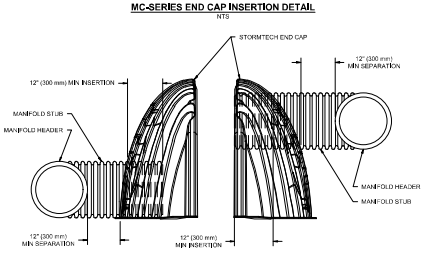


NOTES:

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5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%, THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418, AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-4500 CROSS SECTION DETAIL

MC-SERIES END CAP INSERTION DETAIL
NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

5 MC-SERIES END CAP INSERTION DETAIL

SAN TAN COMMERCIAL 3 - CPSW
QUEEN CREEK, AZ, USA

DRAWN: CL | DATE:
CHECKED: N/A | PROJECT #:
REV: | NOT TO SCALE

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ADS

SHEET 1 OF 1

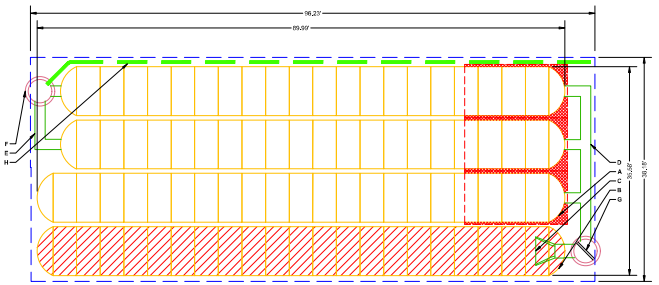
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Summary of Underground Chamber System for CPSW with Rock not Counting

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
92	STORMTECH MC-4500 CHAMBERS	MINIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)	12.75
8	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT)	7.25
0	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	7.25
9050	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-4500 CHAMBER:	5.75
	(COVER STONE INCLUDED)	MC ISOLATOR ROW PLUS INVERT:	5.75
	(BASE STONE INCLUDED)	18" x 18" BOTTOM MANIFOLD INVERT:	5.75
2572	SYSTEM AREA (SF)	18" x 18" BOTTOM MANIFOLD CLOSED INVERT:	5.75
2823	SYSTEM PERIMETER (ft)	18" BOTTOM CONNECTION INVERT:	5.75
		BOTTOM OF MC-4500 CHAMBER:	5.75
		UNDISTURBED INVERT:	5.50
		BOTTOM OF STONE:	5.50

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
CLAMP	C	INSTALL CLAMP ON 2" ACCESS PIPE / PART#: MCPLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37"	
MANIFOLD	E	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37"	
CONCRETE STRUCTURE	F	DCB (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		8.0 CFS OUT
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		16.5 CFS IN
UNDERDRAIN	H	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		

*INVERT ABOVE BASE OF CHAMBER



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADS/PLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

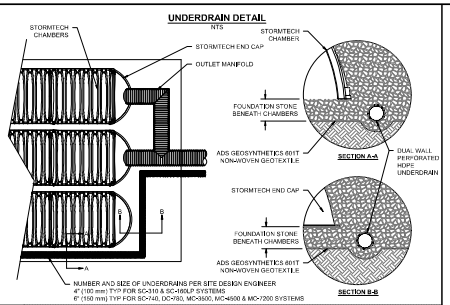
NOTES

1. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE 45.22 FOR MANIFOLD SIZING GUIDANCE.
2. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
   - THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IS NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
   - THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
   - **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

SPACE INTENTIONALLY LEFT BLANK

UNDERDRAIN DETAIL

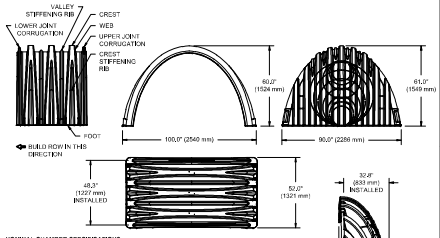
NTS



4 UNDERDRAIN DETAIL

MC-4500 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.8 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	129.0 lbs.	(58.7 kg)

NOMINAL END CAP SPECIFICATIONS

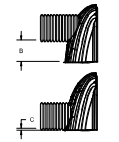
SIZE (W X H X INSTALLED LENGTH)	90.4" X 61.0" X 32.6"	(2296 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS. 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH A "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

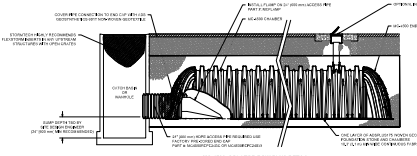
PART #	STUB	B	C
MC4500EPP06T	6" (150 mm)	42.54" (1081 mm)	–
MC4500EPP06B		–	0.89" (22 mm)
MC4500EPP08T	8" (200 mm)	40.50" (1029 mm)	–
MC4500EPP08B		–	1.01" (26 mm)
MC4500EPP10T	10" (250 mm)	38.37" (975 mm)	–
MC4500EPP10B		–	1.33" (34 mm)
MC4500EPP12T	12" (300 mm)	35.69" (907 mm)	–
MC4500EPP12B		–	1.59" (39 mm)
MC4500EPP15T	15" (375 mm)	32.72" (831 mm)	–
MC4500EPP15B		–	1.70" (43 mm)
MC4500EPP18T	18" (450 mm)	29.39" (746 mm)	–
MC4500EPP18W			
MC4500EPP18B		–	1.97" (50 mm)
MC4500EPP18BW			
MC4500EPP24T	24" (600 mm)	23.05" (585 mm)	–
MC4500EPP24TW			
MC4500EPP24B		–	2.26" (57 mm)
MC4500EPP24BW			
MC4500EPP30BW	30" (750 mm)	–	2.95" (75 mm)
MC4500EPP36BW	36" (900 mm)	–	3.25" (83 mm)
MC4500EPP42BW	42" (1050 mm)	–	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12x24" (300x600 mm) SIZE ON SIDE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-4500 TECHNICAL SPECIFICATION


COVER PER CONNECTION TO END CAP (4") (SEE GEOTEXTILE NOTES FOR NON-WOVEN GEOTEXTILE)
INSTALL PLUMB ON 12" (305 mm) ACCESS PIPE PART # MCPLAMP
OPTIONAL INSPECTION PORT
MC-4500 END CAP
STONE DEPTH AS REQUIRED (SEE GEOTEXTILE NOTES FOR NON-WOVEN GEOTEXTILE)
INSTALLATION NOTES FOR ISOLATOR ROW PLUS (SEE DETAIL)
CUT OUT BASE OR MANIFOLD
SUMP DEPTH TBD BY SITE DESIGN ENGINEER (4" (305 mm) MIN. RECOMMENDED)
12" (305 mm) MIN
12" (305 mm) MIN
12" (305 mm) MIN

Arizona Environmental Online Review Tool Report

Arizona Game and Fish Department Mission
To conserve Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations.

Project Name:
San Tan Commercial 3

User Project Number:
Upfront Planning

Project Description:
Proposing Indoor Batting Cages

Project Type:
Development Outside Municipalities (Rural Development), Commercial/industrial (mall) and associated infrastructure, New construction

Contact Person:
Amber Knapp

Organization:
Upfront Planning & Entitlements

On Behalf Of:
PINAL

Project ID:
HGIS-17396

Please review the entire report for project type and/or species recommendations for the location information entered. Please retain a copy for future reference.

Disclaimer:

1. This Environmental Review is based on the project study area that was entered. The report must be updated if the project study area, location, or the type of project changes.
2. This is a preliminary environmental screening tool. It is not a substitute for the potential knowledge gained by having a biologist conduct a field survey of the project area. This review is also not intended to replace environmental consultation (including federal consultation under the Endangered Species Act), land use permitting, or the Departments review of site-specific projects.
3. The Departments Heritage Data Management System (HDMS) data is not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. HDMS data contains information about species occurrences that have actually been reported to the Department. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity. Such surveys may reveal previously undocumented population of species of special concern.
4. HabiMap Arizona data, specifically Species of Greatest Conservation Need (SGCN) under our State Wildlife Action Plan (SWAP) and Species of Economic and Recreational Importance (SERI), represent potential species distribution models for the State of Arizona which are subject to ongoing change, modification and refinement. The status of a wildlife resource can change quickly, and the availability of new data will necessitate a refined assessment.

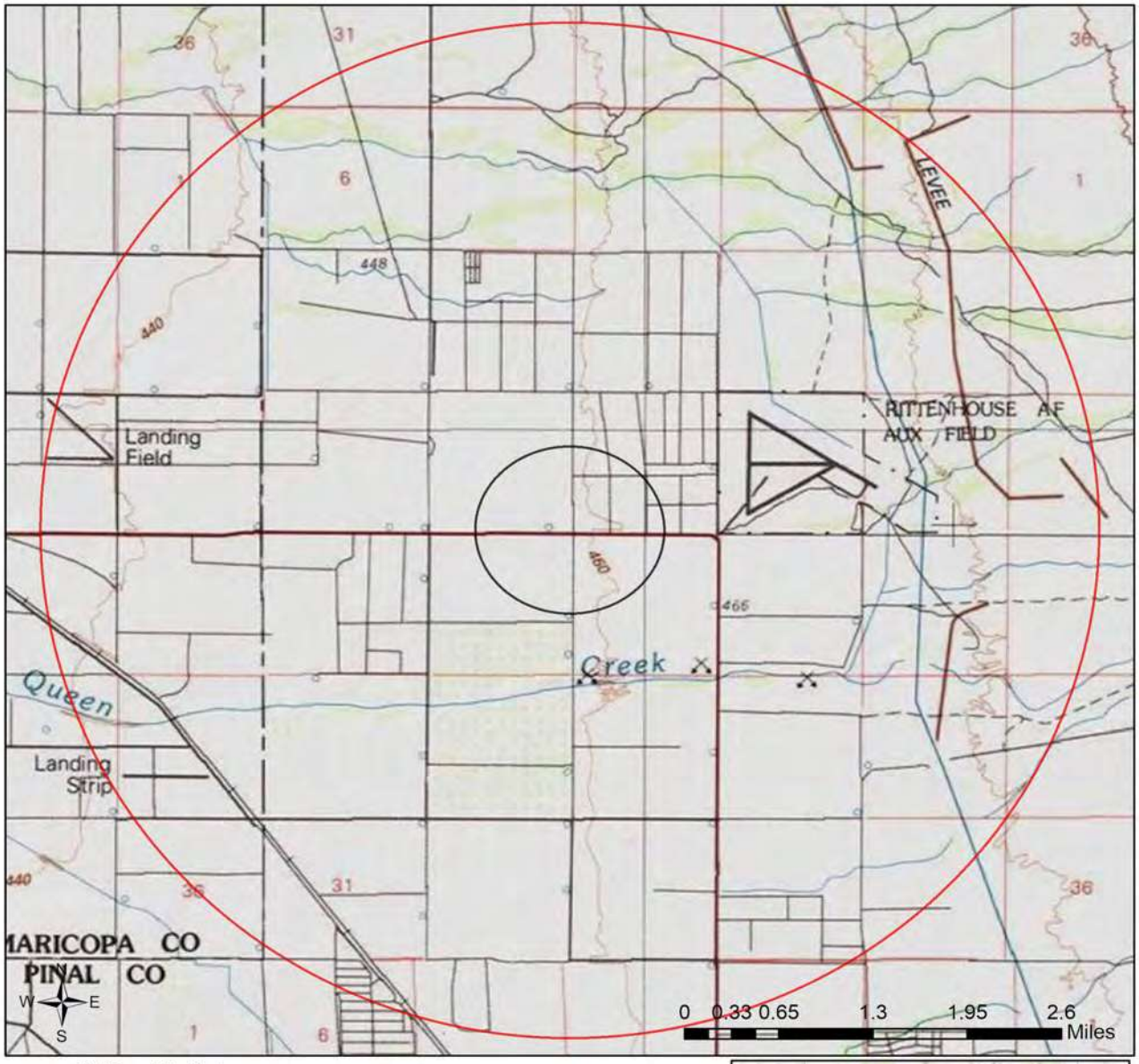
Locations Accuracy Disclaimer:
Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Report is solely responsible for the project location and thus the correctness of the Project Review Report content.

Recommendations Disclaimer:

1. The Department is interested in the conservation of all fish and wildlife resources, including those species listed in this report and those that may have not been documented within the project vicinity as well as other game and nongame wildlife.
2. Recommendations have been made by the Department, under authority of Arizona Revised Statutes Title 5 (Amusements and Sports), 17 (Game and Fish), and 28 (Transportation).
3. Potential impacts to fish and wildlife resources may be minimized or avoided by the recommendations generated from information submitted for your proposed project. These recommendations are preliminary in scope, designed to provide early considerations on all species of wildlife.
4. Making this information directly available does not substitute for the Department's review of project proposals, and should not decrease our opportunity to review and evaluate additional project information and/or new project proposals.
5. Further coordination with the Department requires the submittal of this Environmental Review Report with a cover letter and project plans or documentation that includes project narrative, acreage to be impacted, how construction or project activity(s) are to be accomplished, and project locality information (including site map). Once AGFD had received the information, please allow 30 days for completion of project reviews. Send requests to:
   Project Evaluation Program, Habitat Branch
   Arizona Game and Fish Department
   5000 West Carefree Highway
   Phoenix, Arizona 85086-5000
   Phone Number: (623) 236-7600
   Fax Number: (623) 236-7366
   Or
   PEP@azgfd.gov
6. Coordination may also be necessary under the National Environmental Policy Act (NEPA) and/or Endangered Species Act (ESA). Site specific recommendations may be proposed during further NEPA/ESA analysis or through coordination with affected agencies

San Tan Commercial 3

USA Topo Basemap With Locator Map



Buffered Project Boundary

Project Boundary

Project Size (acres): 775.63

Lat/Long (DD): 33.2490 / -111.5461

County(s): Pinal

AGFD Region(s): Mesa

Township/Range(s): T2S, R8E

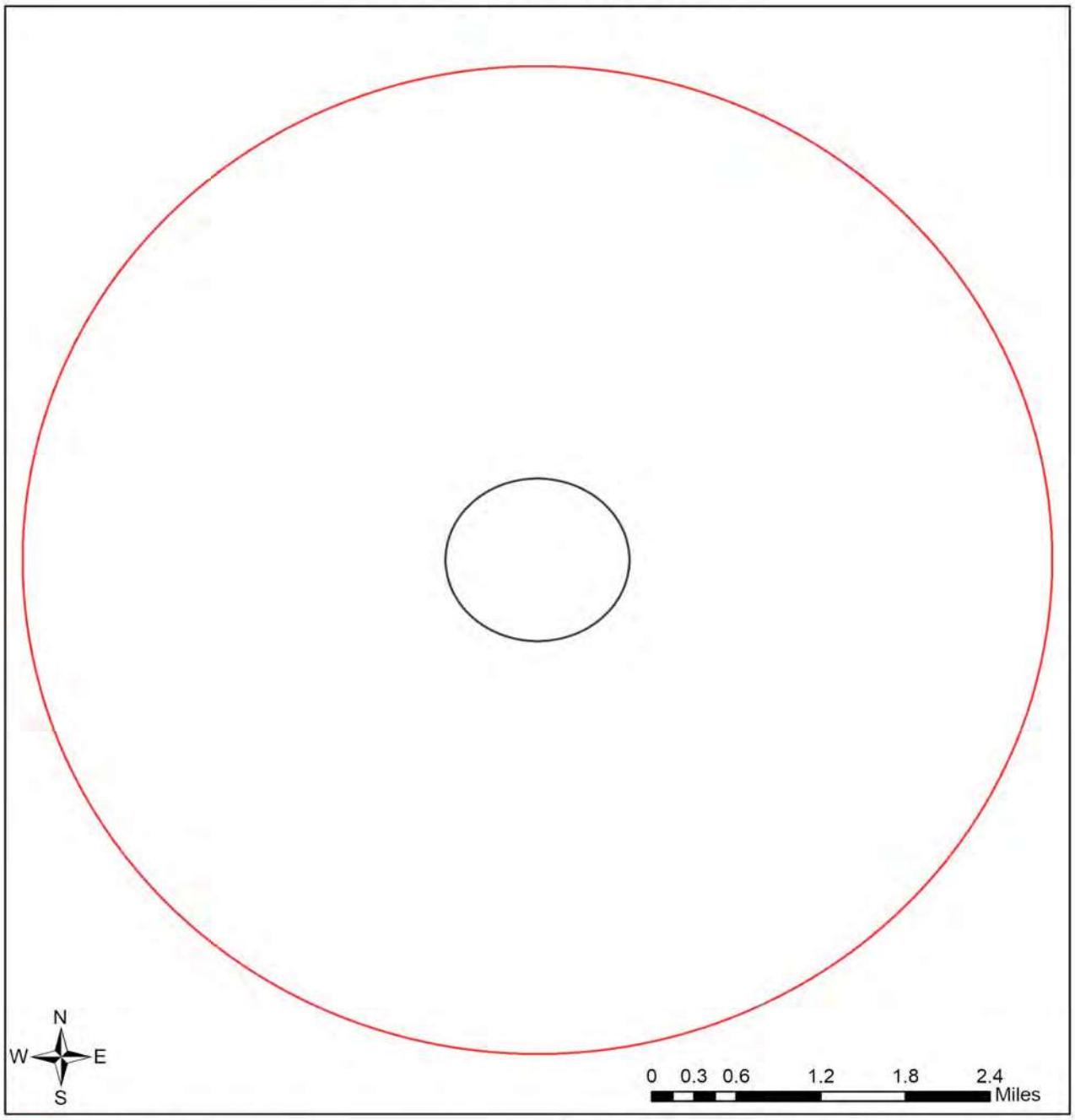
USGS Quad(s): DESERT WELL; SACATON NE



Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

San Tan Commercial 3

Web Map As Submitted By User

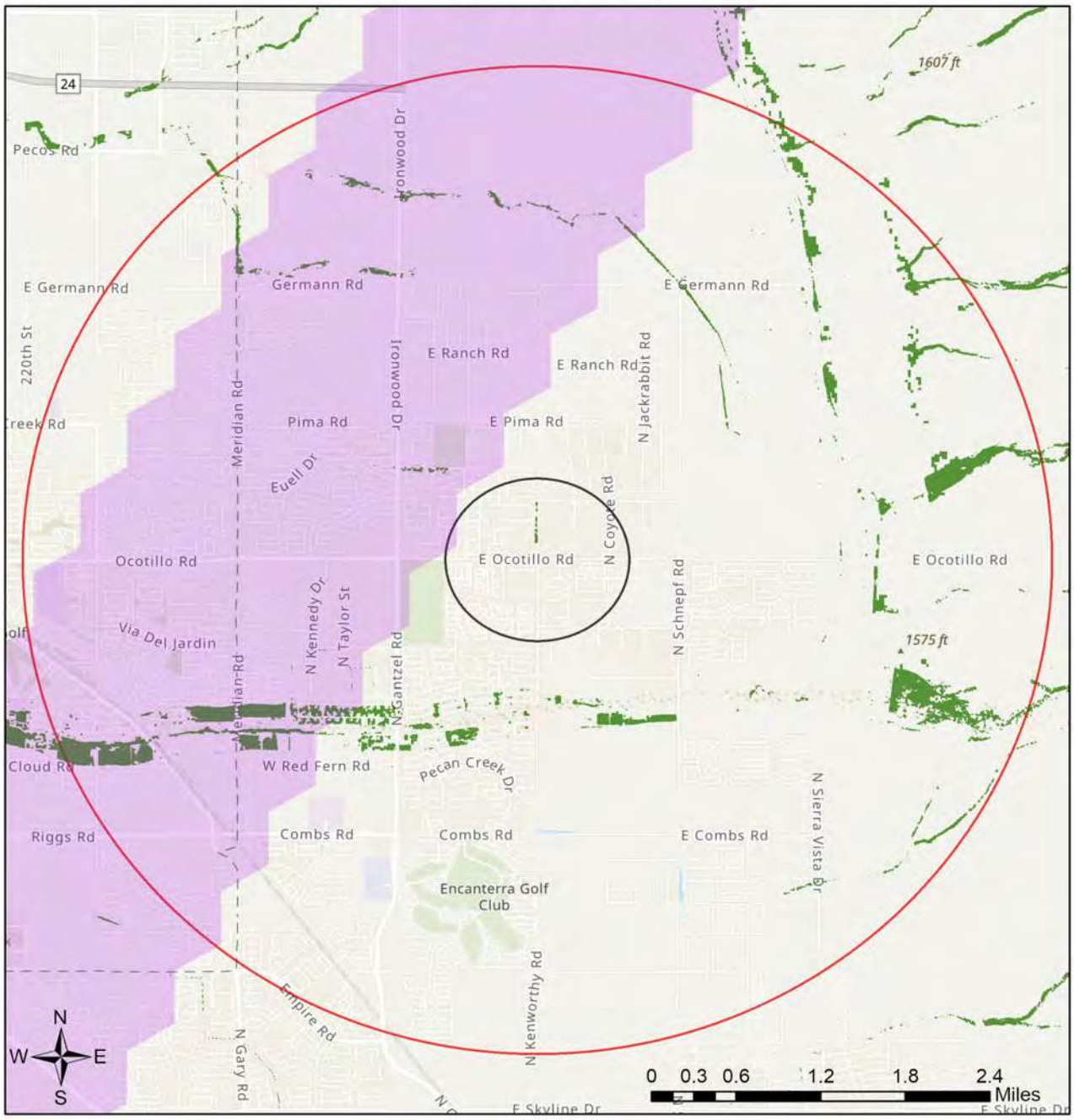


Buffered Project Boundary
Project Boundary

Project Size (acres): 775.63
Lat/Long (DD): 33.2490 / -111.5461
County(s): Pinal
AGFD Region(s): Mesa
Township/Range(s): T2S, R8E
USGS Quad(s): DESERT WELL; SACATON NE

San Tan Commercial 3

Important Areas



- Buffered Project Boundary
- Project Boundary
- Important Bird Areas
- Critical Habitat
- Pinal County Riparian
- Important Connectivity Zones
- Wildlife Connectivity

Project Size (acres): 775.63

Lat/Long (DD): 33.2490 / -111.5461

County(s): Pinal

AGFD Region(s): Mesa

Township/Range(s): T2S, R8E

USGS Quad(s): DESERT WELL; SACATON NE

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community
Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

San Tan Commercial 3

Township/Ranges and Land Ownership



- Buffered Project Boundary
- Project Boundary
- AZ Game & Fish Dept.
- BLM
- BOR
- Indian Res.
- Military
- Mixed/Other
- National Park/Mon.
- Private
- State & Regional Parks
- State Trust
- US Forest Service
- Wildlife Area/Refuge
- Township/Ranges

Project Size (acres): 775.63

Lat/Long (DD): 33.2490 / -111.5461

County(s): Pinal

AGFD Region(s): Mesa

Township/Range(s): T2S, R8E

USGS Quad(s): DESERT WELL; SACATON NE

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community
Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Special Status Species Documented within 3 Miles of Project Vicinity

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Athene cunicularia hypugaea	Western Burrowing Owl	SC	S	S		1B
Chionactis annulata	Resplendent Shovel-nosed Snake					1C
Lepus alleni	Antelope Jackrabbit					1B
Nyctinomops femorosaccus	Pocketed Free-tailed Bat					1B

Note: Status code definitions can be found at https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/
.

Special Areas Documented that Intersect with Project Footprint as Drawn

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Important Connectivity Zone	Wildlife Connectivity					
Queen Creek - Gila River Indian Community	Maricopa County Wildlife Movement Area - Riparian/Wash					
Queen Creek - Gila River Indian Community	Pinal County Wildlife Movement Area - Riparian/Wash					
Riparian Area	Riparian Area					

Note: Status code definitions can be found at https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/
.

Species of Greatest Conservation Need Predicted that Intersect with Project Footprint as Drawn, based on Predicted Range Models

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Aix sponsa	Wood Duck					1B
Ammospermophilus harrisii	Harris' Antelope Squirrel					1B
Athene cunicularia hypugaea	Western Burrowing Owl	SC	S	S		1B
Buteo regalis	Ferruginous Hawk	SC		S		1B
Calypte costae	Costa's Hummingbird					1C
Chilomeniscus stramineus	Variable Sandsnake					1B
Chionactis annulata	Resplendent Shovel-nosed Snake	SC				1C
Cistothorus palustris	Marsh Wren					1C
Colaptes chrysoides	Gilded Flicker			S		1B
Coluber bilineatus	Sonoran Whipsnake					1B
Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC	S	S		1B
Crotalus tigris	Tiger Rattlesnake					1B
Euderma maculatum	Spotted Bat	SC	S	S		1B
Eumops perotis californicus	Greater Western Bonneted Bat	SC		S		1B
Falco peregrinus anatum	American Peregrine Falcon	SC	S	S		1A
Gopherus morafkai	Sonoran Desert Tortoise	CCA	S	S		1A
Haliaeetus leucocephalus	Bald Eagle	SC, BGA	S	S		1A
Heloderma suspectum	Gila Monster					1A

Species of Greatest Conservation Need Predicted that Intersect with Project Footprint as Drawn, based on Predicted Range Models

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Lasiurus blossevillii	Western Red Bat		S			1B
Lasiurus xanthinus	Western Yellow Bat		S			1B
Leptonycteris yerbabuenae	Lesser Long-nosed Bat	SC				1A
Lepus alleni	Antelope Jackrabbit					1B
Macrotus californicus	California Leaf-nosed Bat	SC		S		1B
Melanerpes uropygialis	Gila Woodpecker					1B
Melospiza lincolnii	Lincoln's Sparrow					1B
Melozone aberti	Abert's Towhee		S			1B
Micrathene whitneyi	Elf Owl					1C
Micruroides euryxanthus	Sonoran Coralsnake					1B
Myiarchus tyrannulus	Brown-crested Flycatcher					1C
Myotis occultus	Arizona Myotis	SC		S		1B
Myotis velifer	Cave Myotis	SC		S		1B
Myotis yumanensis	Yuma Myotis	SC				1B
Nyctinomops femorosaccus	Pocketed Free-tailed Bat					1B
Oreoscoptes montanus	Sage Thrasher					1C
Oreothlypis luciae	Lucy's Warbler					1C
Panthera onca	Jaguar	LE				1A
Passerculus sandwichensis	Savannah Sparrow					1B
Phrynosoma solare	Regal Horned Lizard					1B
Phyllorhynchus browni	Saddled Leaf-nosed Snake					1B
Setophaga petechia	Yellow Warbler					1B
Sphyrapicus nuchalis	Red-naped Sapsucker					1C
Spizella breweri	Brewer's Sparrow					1C
Tadarida brasiliensis	Brazilian Free-tailed Bat					1B
Toxostoma lecontei	LeConte's Thrasher			S		1B
Vireo bellii arizonae	Arizona Bell's Vireo					1B
Vulpes macrotis	Kit Fox	No Status				1B

Species of Economic and Recreation Importance Predicted that Intersect with Project Footprint as Drawn

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Callipepla gambelii	Gambel's Quail					
Zenaida asiatica	White-winged Dove					
Zenaida macroura	Mourning Dove					

Project Type: Development Outside Municipalities (Rural Development), Commercial/industrial (mall) and associated infrastructure, New construction

Project Type Recommendations:
During the planning stages of your project, please consider the local or regional needs of wildlife in regards to movement, connectivity, and access to habitat needs. Loss of this permeability prevents wildlife from accessing resources, finding mates, reduces gene flow, prevents wildlife from re-colonizing areas where local extirpations may have occurred, and ultimately prevents wildlife from contributing to ecosystem functions, such as pollination, seed dispersal, control of prey numbers, and resistance to invasive species. In many cases, streams and washes provide natural movement corridors for wildlife and should be maintained in their natural state. Uplands also support a large diversity of species, and should be contained within important wildlife movement corridors. In addition, maintaining biodiversity and ecosystem functions can be facilitated through improving designs of structures, fences, roadways, and culverts to promote passage for a variety of wildlife. Guidelines for many of these can be found at: https://www.azgfd.com/wildlife/planning/wildlifeguidelines/.

Consider impacts of outdoor lighting on wildlife and develop measures or alternatives that can be taken to increase human safety while minimizing potential impacts to wildlife. Conduct wildlife surveys to determine species within project area, and evaluate proposed activities based on species biology and natural history to determine if artificial lighting may disrupt behavior patterns or habitat use. Use only the minimum amount of light needed for safety. Narrow spectrum bulbs should be used as often as possible to lower the range of species affected by lighting. All lighting should be shielded, canted, or cut to ensure that light reaches only areas needing illumination.

Minimize the potential introduction or spread of exotic invasive species, including aquatic and terrestrial plants, animals, insects and pathogens. Precautions should be taken to wash and/or decontaminate all equipment utilized in the project activities before entering and leaving the site. See the Arizona Department of Agriculture website for a list of prohibited and restricted noxious weeds at https://www.invasivespeciesinfo.gov/unitedstates/az.shtml and the Arizona Native Plant Society https://aznps.com/invas for recommendations on how to control. To view a list of documented invasive species or to report invasive species in or near your project area visit iMapInvasives - a national cloud-based application for tracking and managing invasive species at https://imap.natureserve.org/imap/services/page/map.html.

- To build a list: zoom to your area of interest, use the identify/measure tool to draw a polygon around your area of interest, and select “See What’s Here” for a list of reported species. To export the list, you must have an account and be logged in. You can then use the export tool to draw a boundary and export the records in a csv file.

Minimization and mitigation of impacts to wildlife and fish species due to changes in water quality, quantity, chemistry, temperature, and alteration to flow regimes (timing, magnitude, duration, and frequency of floods) should be evaluated. Minimize impacts to springs, in-stream flow, and consider irrigation improvements to decrease water use. If dredging is a project component, consider timing of the project in order to minimize impacts to spawning fish and other aquatic species (include spawning seasons), and to reduce spread of exotic invasive species. We recommend early direct coordination with Project Evaluation Program for projects that could impact water resources, wetlands, streams, springs, and/or riparian habitats.

The Department recommends that wildlife surveys are conducted to determine if noise-sensitive species occur within the project area. Avoidance or minimization measures could include conducting project activities outside of breeding seasons.

Based on the project type entered, coordination with State Historic Preservation Office may be required (https://azstateparks.com/).

Trenches should be covered or back-filled as soon as possible. Incorporate escape ramps in ditches or fencing along the perimeter to deter small mammals and herpetofauna (snakes, lizards, tortoise) from entering ditches.