JENSEN DESIGN & SURVEY, INC.
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RDC01.6030
April 9, 2020

City of Moorpark Engineering Division
Daniel Kim
799 Moorpark Avenue
Moorpark, CA 93021

Subject: 6000 Condor Drive Re-Development, MS4 Preliminary Drainage Report

Dear Mr. Kim,

Amazon is proposing parking improvements at 6000 Condor Drive in the City of Moorpark. The project consists of redeveloping and expanding the parking lot on the existing 11.8-acre site, as well as merging an adjacent, currently undeveloped 2.5-acre parcel to provide additional parking. The two parcels are bounded on the north by Highway 118, on the east and south by the Arroyo Simi, and on the west by existing industrial development. The project will include 11.2 acres of total altered or added impervious area. This letter serves to identify the existing and proposed hydrologic conditions and the proposed improvements, including stormwater treatment and detention.

Project Drainage Patterns

Existing Condition

Currently, the 11.8-acre parcel is developed with a warehouse surrounded by parking and is 73% impervious. Runoff from the northerly and westerly sides of the existing structure flow to a concrete ribbon gutter in the middle of the drive aisle, and a curb and gutter collects runoff on the southerly side of the building. The gutters lead to three grated inlets across the site. One is in the ribbon gutter near the southwesterly building corner, and it connects to a 36” onsite storm drain owned by the City of Moorpark. The other two are located on the curb near the southeasterly building corner and in the ribbon gutter at the northeasterly building corner (across from the existing loading dock). These catch basins outlet directly to the Arroyo Simi.

The easterly 2 acres of this parcel are currently undeveloped and slope at 1.3% to the east. A 12” corrugated metal pipe collects the runoff and outlets to the Arroyo.

The 2.55-acre adjacent parcel is currently undeveloped and slopes at 3% to the southeast. There is a concrete v-ditch along the southerly property line which collects runoff and discharges to the Arroyo.

Proposed Condition

In the developed condition, the 11.8-acre parcel imperviousness will increase from 73% to 78%, since additional parking is proposed on the undeveloped easterly 2 acres. The 2.5-acre parcel will be 77% impervious. Runoff will be collected in catch basins throughout the site, and an onsite storm drain system will convey runoff to one of four proposed underground infiltration/detention systems located onsite (see the attached Preliminary Hydrology Exhibit for locations). Outlets from the retention/detention areas will follow existing drainage patterns and outlet to the Arroyo Simi.

Detention and MS4 Retention/Treatment

This project will be served by four underground combined infiltration/detention structures. For preliminary calculation purposes, it is assumed that Contech ChamberMaxx units (corrugated, open-bottom arch chamber systems) will be installed as underground combined detention/infiltration structures. The site has been divided into drainage subareas, as shown on the attached Preliminary Hydrology Exhibit. Each structure is sized for its tributary area as discussed below.

MS4 Requirements

The Stormwater Quality Design Volume (SQDV) has been calculated using "Method 3: 0.75-Inch Design Storm Approach" defined in the 2011 Ventura County Technical Guidance Manual (TGM). SQDV calculations for each subarea are attached for reference. Stormwater BMPs for the site have been designed to retain the calculated SQDV. Therefore, the proposed development complies with the 2010 Ventura County MS4 Permit (Order No. 09-0057, NPDES Permit No. CAS004002).

Because the ChamberMaxx units are underlain by 6" of gravel, the units would function as a 6" deep infiltration trench. To size each trench for its specific tributary drainage area, the Ventura County Design Worksheet INF-2: Infiltration Trench has been used (found in Appendix E of the TGM). Preliminary calculations indicate that the SQDV that needs to be retained for both parcels is 18,800 cubic feet. Ventura County Soil Types 5, 6, and 7 are mapped across the site, so a conservative infiltration rate of 0.5 inches/hour was assumed. Additional percolation testing will be done prior to final design to verify, and possibly reduce, the required retention section. The TGM design worksheets indicate a minimum combined infiltrating surface area of approximately 31,300 square feet. The total infiltration trench surface area proposed for the site is approximately 47,500 square feet, which is more than required. For Subareas C and D, the footprint of the detention/infiltration structures was governed by detention requirements. MS4 treatment sizing calculations are attached for reference and are summarized in Table 1.

Table 1. Retention Summary

Drainage Subarea	Required Treatment Area (SF)	Proposed Treatment Area (SF)
A	7,000	7,280
B	14,300	14,500
C	4,400	10,000
D	5,600	15,730
TOTAL	31,300	47,510

Detention Requirements

The ChamberMaxx units will also provide stormwater detention. The Simplified Basin Design Procedure from the 2017 Ventura County Hydrology Manual was used to calculate preliminary detention volumes for each drainage subarea. Preliminary calculations show that the required storage volume is 45,325 cubic feet. The total proposed detention volume across the entire site is 47,000 cubic feet, which is more than required. The underground storage chambers will be sized to limit runoff leaving the site to existing flows for all storm events, up to a 100-year storm. Preliminary storage volume calculations are attached for reference and are summarized in Table 2 below.

Table 2. Detention Summary

Drainage Subarea	Required Detention Volume (CF)	Proposed Detention Volume (CF)
A	800	1,240
B	1,625	2,460
C	15,900	16,100
D	27,000	27,200
TOTAL	45,325	47,000

Flooding Potential

The existing structure, along with most of the site, is within FEMA FIRM Zone X (500-year flood zone). However, the northerly and southeasterly property boundaries are Zone AE (100-year flood zone). The Zone AE boundary is approximately 40 feet minimum from the existing building. During final design, the site will be analyzed to ensure that the existing structure is protected from a 100-year storm event.

Conclusion

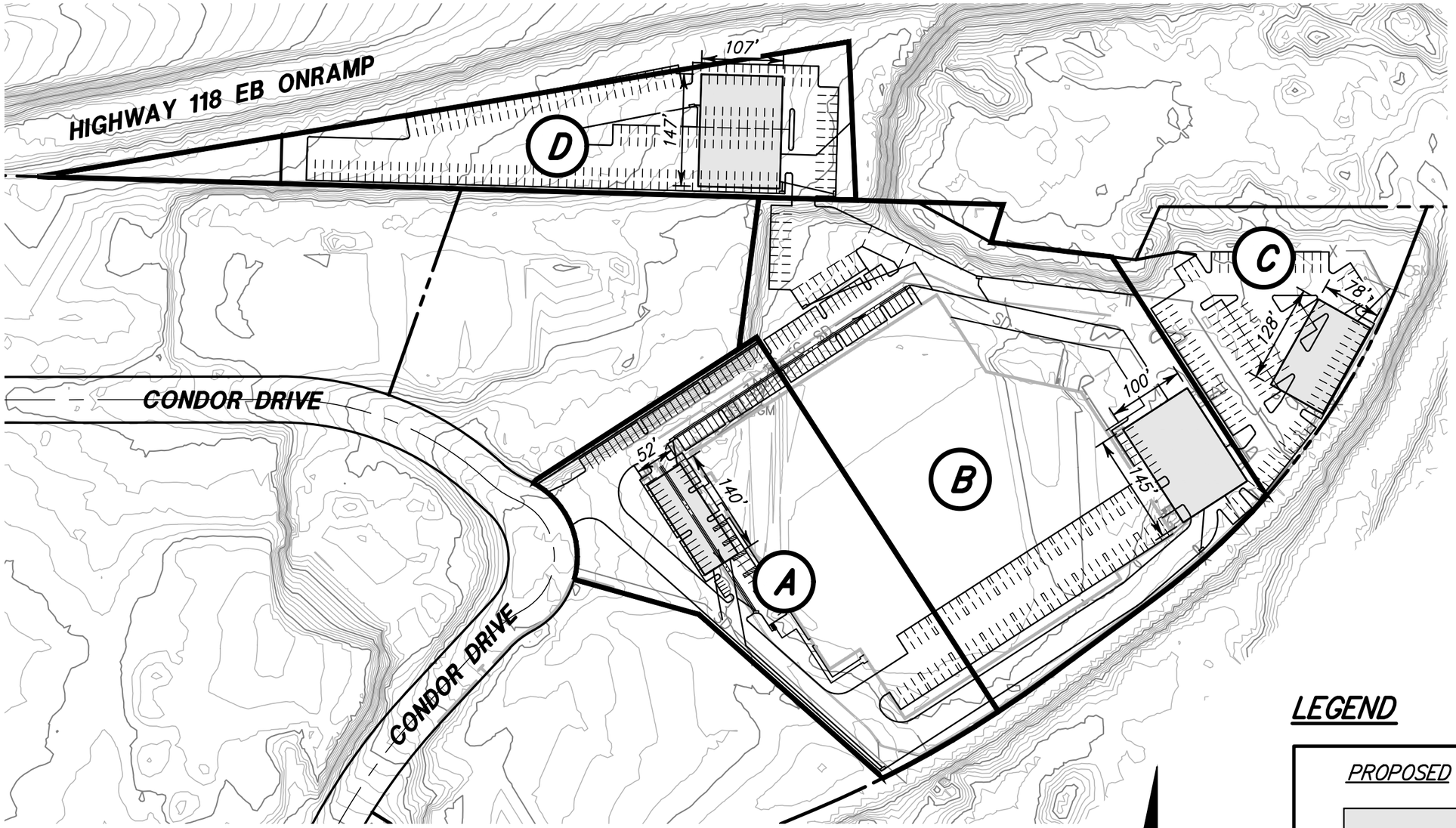
This preliminary analysis for proposed improvements at 6000 Condor Drive and the adjacent parcel indicates that the site has adequate area to meet retention and detention requirements. Finished floor elevations will be protected against the Q100 water surface elevation, and overflow points will be provided onsite.

Sincerely,
Jensen Design & Survey, Inc.

4.9.2020

Susanne Cooper, P.E.
President

Enclosures
Preliminary Drainage Exhibit
Infiltration Facility Safety Factor Determination Worksheet
SQDV Calculations – Subareas A, B, C, and D
Detention Volume Calculations—Subareas A, B, C, and D



LEGEND

PROPOSED

- DETENTION/INFILTRATION AREA (UNDERGROUND BASIN)
- # — DRAINAGE SUBAREA NAME
- DRAINAGE SUBAREA BOUNDARY

75' 0' 150'

SCALE: 1"=150'

PRELIMINARY HYDROLOGY

SUBAREA	TRIBUTARY AREA (AC)	REQ'D TREATMENT AREA (SF)	PROPOSED TREATMENT AREA (SF)	REQ'D DETENTION VOLUME (CF)	PROPOSED DETENTION VOLUME (CF)
A	3.21	7000	7280	800	1240
B	6.55	14300	14500	1625	2460
C	2.02	4400	10000	15900	16100
D	2.55	5600	15730	27000	27200
TOTALS	14.33	31300	47510	45325	47000

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PRELIM. HYDROLOGY EXHIBIT

HARBOR & SEAWARD

SHEET 1 OF 1

Apr 07, 2020

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Table 6.4 - Infiltration Facility Safety Factor Determination Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w*v
A	Suitability Assessment	Soil Assessment Method	0.25	2	0.5
		Predominant Soil texture	0.25	2	0.5
		Soil Variability	0.25	2	0.5
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor S_A =			**2**
B	Design	Tributary Area Size	0.25	1	0.25
		Level of pre-treatment / expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	2	0.5
		Design Safety Factor S_B =			**2.25**

Combined Safety Factor = S_A * S_B = 4.5

INF-2 - Infiltration Trench / INF-4 - Dry Well

Designer:	Jensen Design & Survey, Inc.
Project Proponent:	Amazon
Date:	3/24/2020
Project:	6000 Condor Drive
Location:	Subarea A

Type of Vegetation: (Check type used or describe "Other"		Native Grass
		Irrigated Turf Grass
	x	Other

Step 2: Determine the design percolation rate

2-1	Enter measured soil percolation rate (in/hr) 0.5 in/hr minimum. $P_{measured}$	$P_{measured}$=	0.5	in/hr
2-2	Determine percolation rate correction factor, S_A based on suitability assessment (see Section 6 INF-1, Table 6-2)	S_A =	2	
2-3	Determine percolation rate correction factor, S_B based on design (see Section 6 INF-1)	S_B =	2.25	
2-4	Calculate Combine safety factor, $S = S_A * S_B$	S =	4.5	
2-5	Calculate the design percolation rate (in/hr) $P_{design} = P_{measured}/S$	P_{design} =	0.111	in/hr

Step 3: Calculate the surface area

3-1	Enter required drain time (hours, 72 hours max, t	t =	72	hr
3-2	within the t (ft), dmax = Pdesign*t/12	d_{max} =	0.667	ft
3-3	For trenches, enter trench fill aggregate porosity, n_t	n_t =	0.2	ft
3-4	For trenches, enter depth of trench fill (ft), dt	d_t =	0.5	ft
3-5	For trenches, select ponding depth d_p such that $d_p <= d_{max} - n_t*d_t$	d_p =	0.567	ft
3-6	Enter the time to fill infiltration trench with water (use 2 hours for most designs), T	T =	2	hrs
3-7	Calculate Infiltrating surface area for infiltration trenches At = SQDV/(TPdesign/12+ntdt+dp)	A_t =	6990.8	sf

Designer:	Jensen Design & Survey, Inc.
Project Proponent:	Amazon
Date:	3/24/2020
Project:	6000 Condor Drive
Location:	Subarea A

Type of Vegetation: (Check type used or describe "Other"		Native Grass
		Irrigated Turf Grass
	X	Other

Step 1: Determine Water Quality Design Volume

1-1	Enter Project Area	$A_{project}$=	3.21	ac
1-2	Enter the maximum allowable percent of the Project area that may be effective impervious area (%)(refer to permit), ranges from 5-30% allowable	%allowable=	5	%
1-3	Determine the maximum allowable effective impervious area (ac), $EIA_{allowable} = (A_{project})*(\%allowable)$	$EIA_{allowable}$=	0.16	ac
1-4	Enter Project Impervious fraction, IMP	IMP =	0.78	
1-5	Determine the Project Total Impervious Area (ac) $TIA = A_{project}*IMP$	TIA =	2.50	ac
1-6	Determine the total area from which runoff must be retained (ac), $A_{retain}=TIA-EIA_{allowable}$	A_{retain} =	2.34	ac
1-7	Determine pervious runoff coefficient using Table E-1, C_p	C_p =	0.050	
1-8	Calculate runoff coefficient $C=0.95*IMP + C_p(1-IMP)$	C =	0.7520	
1-9	Enter design rainfall depth of the storm (in), P_i	P_i =	0.75	in
1-10	Calculate rainfall depth (ft), $P = P_i/12$	P =	0.0625	ft
1-11	Calculate Water Quality Design Volume (CF) $SQDV = 43560*C*P*A_{retain}$	SQDV =	4790.01	cf

INF-2 - Infiltration Trench / INF-4 - Dry Well

Designer:	Jensen Design & Survey, Inc.
Project Proponent:	Amazon
Date:	3/24/2020
Project:	6000 Condor Drive
Location:	Subarea B

Type of Vegetation: (Check type used or describe "Other"		Native Grass
		Irrigated Turf Grass
	x	Other

Step 2: Determine the design percolation rate				
2-1	Enter measured soil percolation rate (in/hr) 0.5 in/hr minimum. $P_{measured}$	$P_{measured}$=	0.5	in/hr
2-2	Determine percolation rate correction factor, S_A based on suitability assessment (see Section 6 INF-1, Table 6-2)	S_A =	2	
2-3	Determine percolation rate correction factor, S_B based on design (see Section 6 INF-1)	S_B =	2.25	
2-4	Calculate Combine safety factor, $S = S_A * S_B$	S =	4.5	
2-5	Calculate the design percolation rate (in/hr) $P_{design} = P_{measured}/S$	P_{design} =	0.111	in/hr

Step 3: Calculate the surface area				
3-1	Enter required drain time (hours, 72 hours max, t	t =	72	hr
3-2	within the t (ft), dmax = Pdesign*t/12	d_{max} =	0.667	ft
3-3	For trenches, enter trench fill aggregate porosity, n_t	n_t =	0.2	ft
3-4	For trenches, enter depth of trench fill (ft), dt	d_t =	0.5	ft
3-5	For trenches, select ponding depth d_p such that $d_p <= d_{max} - n_t*d_t$	d_p =	0.567	ft
3-6	Enter the time to fill infiltration trench with water (use 2 hours for most designs), T	T =	2	hrs
3-7	Calculate Infiltrating surface area for infiltration trenches At = SQDV/(TPdesign/12+ntdt+dp)	A_t =	14287.0	sf

Designer:	Jensen Design & Survey, Inc.
Project Proponent:	Amazon
Date:	3/24/2020
Project:	6000 Condor Drive
Location:	Subarea B

Type of Vegetation: (Check type used or describe "Other"		Native Grass
		Irrigated Turf Grass
	X	Other

Step 1: Determine Water Quality Design Volume

1-1	Enter Project Area	$A_{project}$=	6.55	ac
1-2	Enter the maximum allowable percent of the Project area that may be effective impervious area (%)(refer to permit), ranges from 5-30% allowable	$\%_{allowable}$=	5	%
1-3	Determine the maximum allowable effective impervious area (ac), $EIA_{allowable} = (A_{project})*(\%allowable)$	$EIA_{allowable}$=	0.33	ac
1-4	Enter Project Impervious fraction, IMP	IMP =	0.78	
1-5	Determine the Project Total Impervious Area (ac) $TIA = A_{project}*IMP$	TIA =	5.11	ac
1-6	Determine the total area from which runoff must be retained (ac), $A_{retain}=TIA-EIA_{allowable}$	A_{retain} =	4.78	ac
1-7	Determine pervious runoff coefficient using Table E-1, C_p	C_p =	0.050	
1-8	Calculate runoff coefficient $C=0.95*IMP + C_p(1-IMP)$	C =	0.7520	
1-9	Enter design rainfall depth of the storm (in), P_i	P_i =	0.75	in
1-10	Calculate rainfall depth (ft), $P = P_i/12$	P =	0.0625	ft
1-11	Calculate Water Quality Design Volume (CF) $SQDV = 43560*C*P*A_{retain}$	SQDV =	9789.26	cf

INF-2 - Infiltration Trench / INF-4 - Dry Well

Designer:	Jensen Design & Survey, Inc.
Project Proponent:	Amazon
Date:	3/24/2020
Project:	6000 Condor Drive
Location:	Subarea C

Type of Vegetation: (Check type used or describe "Other"		Native Grass
		Irrigated Turf Grass
	x	Other

Step 2: Determine the design percolation rate				
2-1	Enter measured soil percolation rate (in/hr) 0.5 in/hr minimum. $P_{measured}$	$P_{measured}$=	0.5	in/hr
2-2	Determine percolation rate correction factor, S_A based on suitability assessment (see Section 6 INF-1, Table 6-2)	S_A =	2	
2-3	Determine percolation rate correction factor, S_B based on design (see Section 6 INF-1)	S_B =	2.25	
2-4	Calculate Combine safety factor, $S = S_A * S_B$	S =	4.5	
2-5	Calculate the design percolation rate (in/hr) $P_{design} = P_{measured}/S$	P_{design} =	0.111	in/hr
Step 3: Calculate the surface area				
3-1	Enter required drain time (hours, 72 hours max, t	t =	72	hr
3-2	within the t (ft), dmax = Pdesign*t/12	d_{max} =	0.667	ft
3-3	For trenches, enter trench fill aggregate porosity, n_t	n_t =	0.2	ft
3-4	For trenches, enter depth of trench fill (ft), dt	d_t =	0.5	ft
3-5	For trenches, select ponding depth d_p such that $d_p <= d_{max} - n_t*d_t$	d_p =	0.567	ft
3-6	Enter the time to fill infiltration trench with water (use 2 hours for most designs), T	T =	2	hrs
3-7	Calculate Infiltrating surface area for infiltration trenches At = SQDV/(TPdesign/12+ntdt+dp)	A_t =	4395.2	sf

Designer:	Jensen Design & Survey, Inc.
Project Proponent:	Amazon
Date:	3/24/2020
Project:	6000 Condor Drive
Location:	Subarea C

Type of Vegetation: (Check type used or describe "Other"		Native Grass
		Irrigated Turf Grass
	X	Other

Step 1: Determine Water Quality Design Volume

1-1	Enter Project Area	$A_{project}$=	2.02	ac
1-2	Enter the maximum allowable percent of the Project area that may be effective impervious area (%)(refer to permit), ranges from 5-30% allowable	%allowable=	5	%
1-3	Determine the maximum allowable effective impervious area (ac), $EIA_{allowable} = (A_{project})*(\%allowable)$	$EIA_{allowable}$=	0.10	ac
1-4	Enter Project Impervious fraction, IMP	IMP =	0.78	
1-5	Determine the Project Total Impervious Area (ac) $TIA = A_{project}*IMP$	TIA =	1.57	ac
1-6	Determine the total area from which runoff must be retained (ac), $A_{retain}=TIA-EIA_{allowable}$	A_{retain} =	1.47	ac
1-7	Determine pervious runoff coefficient using Table E-1, C_p	C_p =	0.050	
1-8	Calculate runoff coefficient $C=0.95*IMP + C_p(1-IMP)$	C =	0.7520	
1-9	Enter design rainfall depth of the storm (in), P_i	P_i =	0.75	in
1-10	Calculate rainfall depth (ft), $P = P_i/12$	P =	0.0625	ft
1-11	Calculate Water Quality Design Volume (CF) $SQDV = 43560*C*P*A_{retain}$	SQDV =	3011.51	cf

INF-2 - Infiltration Trench / INF-4 - Dry Well

Designer:	Jensen Design & Survey, Inc.
Project Proponent:	Amazon
Date:	3/24/2020
Project:	6000 Condor Drive
Location:	Subarea D

Type of Vegetation: (Check type used or describe "Other"		Native Grass
		Irrigated Turf Grass
	x	Other

Step 2: Determine the design percolation rate				
2-1	Enter measured soil percolation rate (in/hr) 0.5 in/hr minimum. $P_{measured}$	$P_{measured}$=	0.5	in/hr
2-2	Determine percolation rate correction factor, S_A based on suitability assessment (see Section 6 INF-1, Table 6-2)	S_A =	2	
2-3	Determine percolation rate correction factor, S_B based on design (see Section 6 INF-1)	S_B =	2.25	
2-4	Calculate Combine safety factor, $S = S_A * S_B$	S =	4.5	
2-5	Calculate the design percolation rate (in/hr) $P_{design} = P_{measured}/S$	P_{design} =	0.111	in/hr
Step 3: Calculate the surface area				
3-1	Enter required drain time (hours, 72 hours max, t	t =	72	hr
3-2	within the t (ft), dmax = Pdesign*t/12	d_{max} =	0.667	ft
3-3	For trenches, enter trench fill aggregate porosity, n_t	n_t =	0.2	ft
3-4	For trenches, enter depth of trench fill (ft), dt	d_t =	0.5	ft
3-5	For trenches, select ponding depth d_p such that $d_p <= d_{max} - n_t*d_t$	d_p =	0.567	ft
3-6	Enter the time to fill infiltration trench with water (use 2 hours for most designs), T	T =	2	hrs
3-7	Calculate Infiltrating surface area for infiltration trenches At = SQDV/(TPdesign/12+ntdt+dp)	A_t =	5562.1	sf

Designer:	Jensen Design & Survey, Inc.
Project Proponent:	Amazon
Date:	3/24/2020
Project:	6000 Condor Drive
Location:	Subarea D

Type of Vegetation: (Check type used or describe "Other"		Native Grass
		Irrigated Turf Grass
	X	Other

Step 1: Determine Water Quality Design Volume

1-1	Enter Project Area	$A_{project}$=	2.55	ac
1-2	Enter the maximum allowable percent of the Project area that may be effective impervious area (%)(refer to permit), ranges from 5-30% allowable	$\%_{allowable}$=	5	%
1-3	Determine the maximum allowable effective impervious area (ac), $EIA_{allowable} = (A_{project})*(\%allowable)$	$EIA_{allowable}$=	0.13	ac
1-4	Enter Project Impervious fraction, IMP	IMP =	0.78	
1-5	Determine the Project Total Impervious Area (ac) TIA = $A_{project}$*IMP	TIA =	1.99	ac
1-6	Determine the total area from which runoff must be retained (ac), A_{retain}=TIA-$EIA_{allowable}$	A_{retain} =	1.86	ac
1-7	Determine pervious runoff coefficient using Table E-1, C_p	C_p =	0.050	
1-8	Calculate runoff coefficient C=0.95*IMP + C_p(1-IMP)	C =	0.7520	
1-9	Enter design rainfall depth of the storm (in), P_i	P_i =	0.75	in
1-10	Calculate rainfall depth (ft), P = P_i/12	P =	0.0625	ft
1-11	Calculate Water Quality Design Volume (CF) SQDV = 43560*C*P*A_{retain}	SQDV =	3811.09	cf

Detention Volume for Attenuating Peak Runoff from Small Developed Areas

SUBAREA A		
	Pre-Development	**Post-Development**
100-yr 1-d Rain (in)	6.7	6.7
Soil Type	5	5
Land Use	Commercial	Commercial
CN Exhibit 14	86	89
S = 1000/CN-10	1.63	1.24
Yield (in)	5.08	5.42
Volume Calculation		
Yield Difference (in)		0.34
Depression Storage (in)		0.25
Net Yield		0.09
Impervious Area (ac)		2.50
Vol Increase (CF)- Max Basin Size Req'd		797.29

SUBAREA B		
	Pre-Development	**Post-Development**
100-yr 1-d Rain (in)	6.7	6.7
Soil Type	5	5
Land Use	Commercial	Commercial
CN Exhibit 14	86	89
S = 1000/CN-10	1.63	1.24
Yield (in)	5.08	5.42
Volume Calculation		
Yield Difference (in)		0.34
Depression Storage (in)		0.25
Net Yield		0.09
Impervious Area (ac)		5.10
Vol Increase (CF)- Max Basin Size Req'd		1626.48

Detention Volume for Attenuating Peak Runoff from Small Developed Areas

SUBAREA C		
	Pre-Development	**Post-Development**
100-yr 1-d Rain (in)	6.7	6.7
Soil Type	5	5
Land Use	Open Space	Commercial
CN Exhibit 14	60	89
S = 1000/CN-10	6.67	1.24
Yield (in)	2.39	5.42
Volume Calculation		
Yield Difference (in)		3.02
Depression Storage (in)		0.25
Net Yield		2.77
Impervious Area (ac)		1.58
Vol Increase (CF)- Max Basin Size Req'd		15899.03

SUBAREA D		
	Pre-Development	**Post-Development**
100-yr 1-d Rain (in)	6.7	6.7
Soil Type	5	5
Land Use	Open Space	Commercial
CN Exhibit 14	47	88
S = 1000/CN-10	11.28	1.36
Yield (in)	1.26	5.30
Volume Calculation		
Yield Difference (in)		4.05
Depression Storage (in)		0.25
Net Yield		3.80
Impervious Area (ac)		1.96
Vol Increase (CF)- Max Basin Size Req'd		26950.70