VILLAGE PLACE APARTMENTS
521 16TH Street
Ramona, CA 92105

Record ID: PDS2015-STP-15-026

HYDROLOGY & HYDRAULIC CALCULATIONS

May 30, 2017
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4/2/2018
DATE

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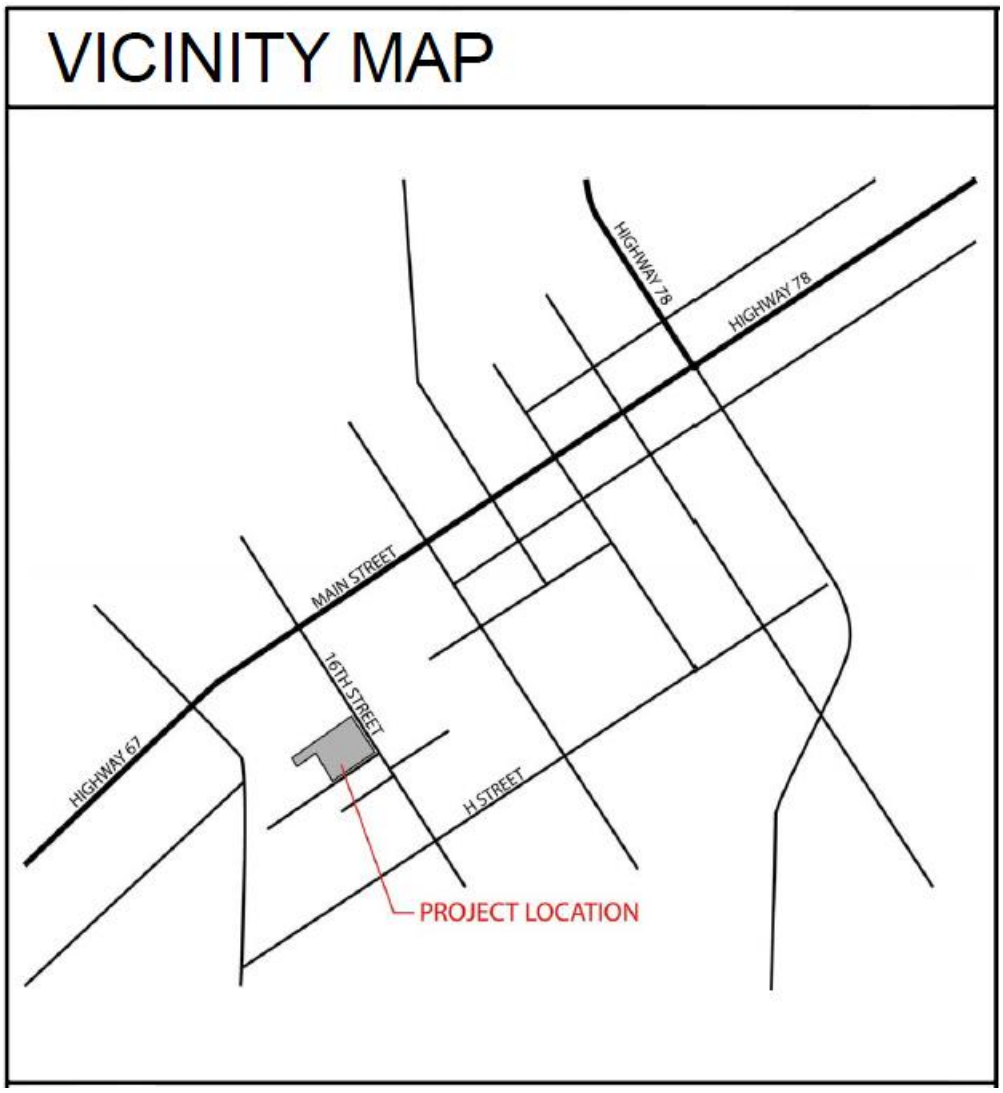
I. VICINITY MAP



II. SCOPE OF WORK

The scope of this study is to provide the hydrology and hydraulic calculations for the Village Place Apartments project. This study includes analysis of the existing hydrologic conditions and the proposed development hydrologic conditions consisting of a multi-family residential development.

III. PROJECT DESCRIPTION

The Village Place Apartments site is on the west side of 16th Street approximately 800 feet south of Highway 67 / Main street in Ramona, California. The project area is 3.41 acres and proposes the construction of multi-family residential development.

IV. ENGINEER'S QUALIFICATIONS

BDS Engineering Inc. (BDS) has over 40 years of experience in water resources management including:

- Hydrology / Hydraulic Studies and Reports
- Storm Drain Design
- Drainage feasibility Studies and Reports

V. HYDROLOGIC ANALYSIS

A hydrologic analysis was made to estimate peak flood flows for return of 100 years.

This hydrologic analysis was made by the use of an aerial survey by San Lo Surveys in July, 2013, SanGis topographic data (for the larger drainage basin) and supplemented with a topographic survey by BDS Engineering Inc., August 2015. The hydrology for post development was made by the use of the proposed grading plan by BDS Engineering Inc.

The rational method of runoff computation as described in the County of San Diego Hydrology Manual was used to determine the quantity of storm water runoff. County of San Diego Hydrology reference material is included in Appendix A.

The basic rational formula is Q=CIA where:

"Q" is the peak rate of flow in cubic feet per second (CFS).
"C" is a runoff coefficient expressed as that percentage of rainfall, which becomes surface runoff. We are using soil group 'D'.
"I" is the average rainfall intensity in inches per hour for a storm duration equal to the time of concentration (t_c) of the contributing drainage area.
"A" is the drainage area in acres tributary to design point.
"t_c" is the time of concentration required for runoff to flow from the most remote part of the watershed to the outlet point under consideration.

VI. EXISTING HYDROLOGIC CONDITIONS

The existing site is 3.41 acres of undeveloped land covered with natural vegetation. The site drains from east to west with a natural drainage channel that runs parallel to the northern property line and outlets on the adjacent parcel before connecting to an underground storm drain system at Ramona Street. The storm is then conveyed to the Santa Maria creek that joins the San Dieguito River and outlets at the Pacific Ocean in Del Mar. The total drainage area for the drainage basin is 54.69 acres. This area is comprised of General Commercial, Medium Density Residential, High Density Residential and Natural area. The pre-development drainage areas exhibit H-1 and hydrologic calculations are in included in Appendix B.

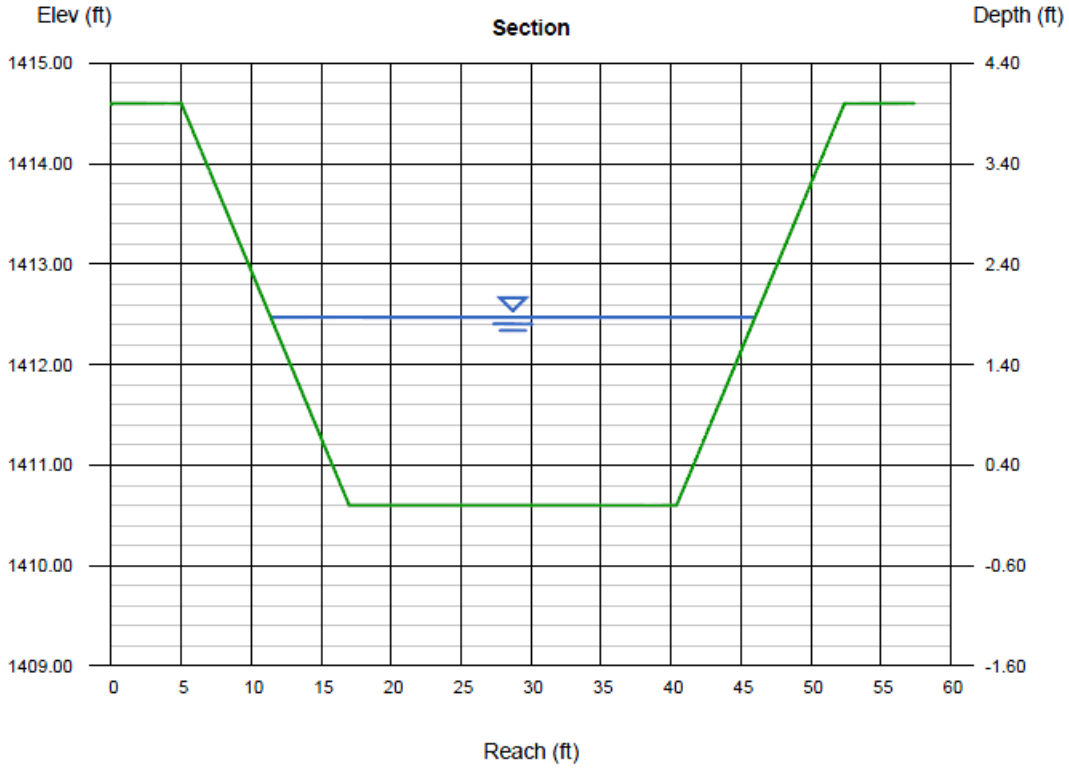
VII. PROPOSED HYDROLOGIC CONDITIONS

The majority of the proposed site, 2.41 acres, will drain to a bio-filtration pond with partial retention and with hydromodification capacity, the pond will outlet at the north end of the site into an improved and widened drainage channel. The remainder of the site, 1.0 acres, has drainage areas are self-mitigating, including the drainage channel, or de minimis. The proposed bio-filtration pond meets the required water quality requirements, hydromodification requirements as well as detention of the increased 100 year flow from the proposed development. There are no known PCCSYAs with the project site per the WMAA mapping method. The proposed disturbance area is 3.41 acres. The hydromodification calculations are included in the SWQMP in Attachment 2a. The proposed housing for the site does not place housing within a 100-year flood hazard area according to FEMA and the County of San Diego Flood Maps, see Appendix C. The post-development drainage areas exhibit H2-1 and H2-2, the hydrologic calculations and the bio-filtration pond detail are included in Appendix B. A summary is provided in the table below.

Summary of Modified Rational Method						
Drainage Area	Downstream Node	Area (acre)	Tc (min)	I (in/hr)	C	Q (cfs)
Pre-Development	100	54.69	21.1	3.33	0.66	119.8
Post-Development	100	54.69	20.7	3.36	0.67	123.8
Difference:		0	-0.40	+0.03	+.01	+4.0
	Volume (CF)	Surface Area (SF)	Detention Depth (ft)			Q (cfs)
Detention Basin Required	4882					
Detention Basin Provided	5650	8,433	0.67			
Difference:						0

VIII. CONCLUSION

As seen in the table above, Node 100 will not see an increase in flow due to the detention pond. The new channel will be widened to approximately 23 feet, will have a slope of 0.2%, and will be vegetated with native grass and meadow seed mix and. As seen in the channel section below, the 100-year water level is adequately contained within the channel and has an additional 2 feet of freeboard; therefore no flooding will occur on-site. The velocity within the channel will be 2.2 fps which is well below an erosive velocity 5.0 fps, per the San Diego County Hydraulic Design Manual Table 5-1.


Section
Elev (ft)
Depth (ft)
1415.00
1414.00
1413.00
1412.00
1411.00
1410.00
1409.00
4.40
3.40
2.40
1.40
0.40
-0.60
-1.60
0
5
10
15
20
25
30
35
40
45
50
55
60
Reach (ft)

IX. DECLARATION OF RESPONSIBLE CHARGE

I, HEREBY DECLARE THAT I AM THE CIVIL ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUISNESS AND PROFRESSIONS CODE, AND THAT THE DESIGN IS CONSITENT WITH CURRENT DESIGN.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUTNY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN

Thomas A. Jones
R.C.E. 34867
EXP. 9-30-19

4/2/2018
Date