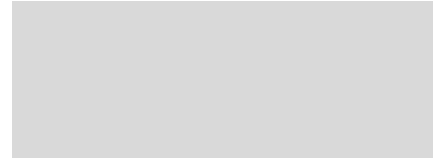


PRELIMINARY HYDROLOGY REPORT

CAJALCO COMMERCIAL CENTER County of Riverside, California



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INTRODUCTION

1.1 PURPOSE OF STUDY

The Cajalco Commercial Center project is located within the Sphere of Influence for the County of Riverside, California. The 3.1 acres of vacant land situated in the Mead Valley area is located west of the I-215 Freeway (See Figure 1).

The purpose of this study is to hydrologically model the project site's onsite and offsite tributary watersheds and to determine the existing and proposed peak runoffs and volumes in order to analyze stormwater mitigation. The hydrologic analysis was prepared using the Rational Method as specified in the Riverside County Hydrology Manual (RCHM). The flows determined in this report were used to size the above and below ground drainage facilities to support the Cajalco Commercial Center project.

1.2 PROJECT DESCRIPTION

The Cajalco Commercial Center project is comprised of 3.1 gross acres of vacant land situated in the Mead Valley area of the unincorporated area of Riverside County, adjacent to the I-215 Freeway. Carroll Street borders the eastern portion of the project and Cajalco Road on the northern side of the project that provides the primary access to the site. **Figure 1 in Appendix A** shows a vicinity map of the area.

The project site is located within the Santa Ana River Watershed. The project site consists of sparsely vegetated, a few trees and otherwise undeveloped land. The site is characterized by gentle topography, generally increasing in elevation from the west to the east. Being undeveloped, there are no major drainage improvements on-site. The proposed commercial development will consist of three new buildings including a car wash and gas station, landscaped areas, paved parking areas and drive aisles.

The project hydrology and storm drain system will be designed in accordance with the Riverside County Flood Control and Water Conservation District (RCFC & WCD) design requirements. The onsite runoff from the site will be conveyed in a safe and nondestructive manner into proposed onsite inlets and culverts as shown on the hydrology key maps. The onsite storm drain pipes, laterals, catch basins, and inlet and outlet structures are to be privately maintained.

1.3 FLOODPLAIN MAPPING

The National Flood Insurance Act (1968) established the National Flood Insurance Program, which is based on the minimal requirements for floodplain management and is designed to minimize flood damage within Special Flood Hazard Areas. The Federal Emergency Management Agency (FEMA) is the agency which administrates the National Flood Insurance Program. Special Flood Hazard Areas (SFHA) are defined as areas that have a 1% chance of flooding within a given year. This is also referred to as the 100-year flood. Flood Insurance Rate Maps (FIRMs) were developed to identify areas of flood hazards within a community.

According to the Flood Insurance Rate Map (FIRM) catalog, there are FIRMs produced by FEMA for the project site:

MAP Number: 06065C1410G

MAP Revised: August 28, 2008

FEMA FIRM Panel (**Figure 4**) is attached in **Appendix G** shows the floodplain limits and mapped flood zones for the Cajalco Commercial Center project area. The project is located within Zone X, which is an area inside the 0.2% annual chance of flood (500-year).

1.4 DESIGN CRITERIA

The following are design criteria for this project, based on the Riverside County Flood Control and Water Conservation District Hydrology Manual.

Protection Levels:

1. The 100-year flood shall be contained with the street right-of-way limits.
2. The 10-year flood shall be contained within the top of curbs.
3. Catch Basins and storm drain system shall be designed to convey 100-year flow.

HYDROLOGIC DATA AND MODEL DEVELOPMENT

2.1 EXISTING CONDITION

The project site is comprised of one drainage area to describe the site's existing drainage conditions. Refer to the Existing Condition Hydrology Key Map **Figure 2** in **Appendix C** for locations of the drainage sub-areas and peak flows. Hydrologic calculations to evaluate surface water runoff associated with the 10-year and 100-year storm frequency were performed for the site's drainage area. The Riverside County Rational Method Hydrologic calculations (as described in the RCHM) were performed using the CivilDesign Hydrology / Hydraulics computer program package 2005 by Bonadiman and Associates, Inc.

The existing condition watershed boundaries were delineated using aerial topography. Hydrologic soil data was retrieved from the Steele Peak Plate (C-1.29) from the RCFC&WCD Hydrology Manual (see **Appendix B**). Precipitation point values for the 10-year and 100-year 1-hour durations were obtained from the data built into the CivilDesign Hydrology / Hydraulics computer program.

The existing watershed is characterized by vacant land that increases in elevation from the northwest corner to the southeast corner. The site drains to the southeast corner of the site where it continues west along Cajalco Road. Hydrologic land cover for the site was assumed as natural undeveloped land with fair cover.

Table 1. Existing Condition Peak Flow Summary

Drainage Area	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
A	3.73	5.04	8.28

Table 1. summarizes the existing condition 10- and 100-year rational method results. Existing condition rational method calculations can be found in **Appendix C** of the report.

2.2 PROPOSED CONDITION MODEL

Similar to the existing condition, the developed site consists of one major drainage area. The ultimate developed condition will include three new buildings including a car wash and gas station, landscaped areas, paved parking areas and drive aisles. The project site runoff will be picked up by a system of gutters and inlets that will discharge through a parkway culvert onto Cajalco Road. Refer to the Proposed Condition Hydrology Key Map **Figure 2** in **Appendix C**

for locations of the drainage sub-areas and peak flows. Hydrologic calculations to evaluate surface water runoff associated with the 10-year and 100-year storm frequency were performed for the site’s drainage area. The proposed condition watershed boundaries were delineated using the project’s conceptual grading plan. The proposed site will continue to drain from southeast to northwest, as it did in the existing condition. Hydrologic land cover for the developed site was assumed as commercial.

Table 2. Proposed Condition Peak Flow Summary

Drainage Area	Area (acres)	Q₁₀ (cfs)	Q₁₀₀ (cfs)
A	3.49	6.92	11.00

Table 2. summarizes the proposed condition 10- and 100-year rational method results. Proposed condition rational method calculations can be found in **Appendix D** of the report.

Table 3. Existing vs Proposed Condition Peak Flow Comparison

Drainage Area	Existing Condition			Proposed Condition			Difference (Prop – Exist)	
	Area (acres)	Q₁₀ (cfs)	Q₁₀₀ (cfs)	Area (acres)	Q₁₀ (cfs)	Q₁₀₀ (cfs)	Q₁₀ (cfs)	Q₁₀₀ (cfs)
A	3.73	5.04	8.28	3.49	6.92	11.00	1.88	2.72

Table 3 is a comparison between the existing and proposed condition rational method of the 10- and 100-year storm event hydrology results. The difference in peak flow will be mitigated in the proposed underground infiltration chamber.

2.3 ONSITE DRAINAGE FACILITIES

Preliminary onsite drainage facilities for the project were calculated utilizing the rational method hydrology program and are presented on the Proposed Condition Hydrology Key Maps (see **Appendix D**). The estimated sizes of these facilities and their approximate locations are preliminary and will be refined in the design review and final engineering process. Pipe sizes are based on the design criteria presented in Section 1.4. Pipes were designed as HDPE, with a roughness coefficient of 0.013. Final hydraulic calculations using the computer program WSPG (Water Surface and Pressure Gradient) will be performed in the Final Engineering phase.

Onsite drainage facilities for the Cajalco Commercial Center project were sized for the 100-year flow rates utilizing the WSPG (Water Surface and Pressure Gradient) computer program. (see **Appendix D**). Pipe sizes are based on the design criteria presented in Section 1.4. Pipes were designed as HDPE, with a roughness coefficient of 0.013. Catch basins and storm drain laterals were placed at locations to keep the 10-year flow below the top of curb and the 100-year flow below the right of way.

DETENTION ANALYSIS

The developed tributary area at the most downstream point for each stream within the proposed project were analyzed for both the existing and proposed conditions. The 2-year, 5-year, and 10-year storms, for the 1-hour, 3-hour, 6-hour and 24-hour events were analyzed using the Riverside County Unit Hydrograph Method. The difference in peak flow and volume were compared to determine if and how much mitigation would be necessary. Table 4. summarizes the results of the Detention Analysis. Refer to the Unit Hydrograph Method Maps for the area delineation, centroids, length and difference in elevation calculation (see **Appendix E & F**).

The project proposes an underground infiltration chamber for the site tributary area. Refer to the Hydrology Maps and Conceptual Grading Plan for location and details of this system.

Table 4. Detention Analysis Summary

Storm Frequency	Duration (hours)	Existing Condition Volume (Ac. ft)	Proposed Condition Volume (Ac. ft)	Difference (Prop – Exist)
2	1	0.0630	0.1166	0.0536
	3	0.0617	0.1544	0.0927
	6	0.0663	0.1929	0.1266
	24	0.0622	0.3263	0.2641
5	1	0.1135	0.1738	0.0603
	3	0.1083	0.2395	0.1312
	6	0.1238	0.2906	0.1668
	24	0.1034	0.5665	0.4631
10	1	0.2103	0.2282	0.0179
	3	0.2596	0.3350	0.0754
	6	0.2919	0.4437	0.1518
	24	0.4256	0.7568	0.3312
100	1	0.3640	0.3720	0.0080
	3	0.4871	0.5489	0.0618
	6	0.6040	0.7489	0.1449
	24	0.9956	1.3841	0.3885

CONCLUSIONS

This preliminary hydrology report has evaluated the potential effects of runoff on the proposed project. In addition, the report has addressed the methodology used to analyze the existing and proposed conditions, which was based on the Riverside County Hydrology Manual. This section provides a summary discussion that evaluates the potential effects of the proposed project.

- ❖ The proposed project drainage pattern is consistent with existing drainage pattern.
- ❖ Preliminary alignment and pipe sizes of storm drain lines were presented.

REFERENCES

Riverside County Flood Control and Water Conservation District. *Hydrology Manual*. April 1978

Appendix

A

VICINITY MAP

Appendix

B

RCFC&WCD HYDROLOGIC SOIL DATA & PRECIPITATION MAPS

Appendix

C

**EXISTING CONDITION HYDROLOGY
RATIONAL METHOD & KEY MAP**

10 YEAR EXISTING CONDITION

100 YEAR EXISTING CONDITION

Appendix

D

**PROPOSED CONDITION HYDROLOGY
RATIONAL METHOD & KEY MAP**

10 YEAR PROPOSED CONDITION

100 YEAR PROPOSED CONDITION

Appendix

E

**EXISTING CONDITION HYDROLOGY
UNIT HYDROGRAPH & KEY MAP**

Appendix

F

**PROPOSED CONDITION HYDROLOGY
UNIT HYDROGRAPH & KEY MAP**

Appendix

G

FEMA FLOOD INSURANCE RATE MAP

Appendix

H

**PROPOSED DRAINAGE FACILITY SIZING
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Appendix

I

STORMTECH CALCULATIONS

Appendix

J

REFERENCE PLANS
