

Preliminary Drainage Study

At Dublin

City of Dublin, Alameda County, California



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TABLE OF CONTENTS

I.	INTROUDCTION	1
A.	Purpose of Study	1
B.	Project Description	1
C.	Existing Condition	1
II.	EXISTING DRAINAGE SYSTEM AND ALLOCATED FLOWS	3
A.	Existing Drainage System	3
B.	Allocated Peak Flows	4
III.	CRITERIA AND METHODOLOGY.....	5
IV.	PROPOSED DRAINAGE CALCULATIONS.....	6
A.	Watershed PA-1	6
B.	Watershed PA-2A & 2B	6
C.	Watershed PA-2C.....	7
D.	Watershed PA-3	7
E.	Watershed PA-4	8
F.	Tassajara	8

APPENDICIES

Appendix A – Vicinity Map

Appendix B – Topographic and Boundary Map

Appendix C – Dublin Ranch Development Master Drainage Watershed Map

Appendix D – Allocated Flow per Dublin Ranch – West Side Storm Drain Benefit District

Appendix E – Flood Insurance Rate Map

Appendix F – Run Coefficient Calculations

Appendix G – Post Development Drainage Area and System Map

I. **INTRODUCTION**

A. **Purpose of Study**

The purpose of this study is to demonstrate that the peak post development flow from the At Dublin project would not exceed the peak allocated flow per the Dublin Ranch West Side Storm Drain Benefit District adopted March 18, 2008.

B. **Project Description**

The overall project gross area is approximately 77 +/- acres and consists of 4 separate legal parcels. For the purpose of this study, the parcels are identified as PA-1, PA-2, PA-3 and PA-4. For parcel PA-2, the proposed project will further subdivide this parcel into 3 different lots (PA-2A, PA-2B and PA-2C). The proposed project is a mixed use development consisting of 337,060 SF of retail/commercial spaces, 200 units of townhome, 280 apartment units and 180 units of single family residential homes. Described below is a breakdown of the development by parcel:

1. PA-1: 258,530 SF of Retail/Commercial
2. PA-2: 480 units and 78,530 SF of retail/commercial
 - a. PA-2A: 72,050 SF of retail/commercial
 - b. PA-2B: 280 apartment units and 6,480 SF of retail
 - c. PA-2C: 200 townhome units
3. PA-3: 165 single family residential units
4. PA-4: 15 single family residential units

C. **Existing Condition**

The project site is currently vacant and generally sloping between 1%-20% in the North/South direction. It is bounded by existing residential development and public streets (Gleason Drive, Central Parkway, Dublin Boulevard, Tassajara Road, Brannigan Street, Northside Drive, and Interstate 580 Freeway). Surrounding land uses are a mix of residential, retail and commercial development. A Vicinity Map, Appendix A, and a Topographic and Boundary Map, Appendix B, are included for reference.

Majority of the project site (parcels PA-1, PA-2 and PA-3) is within the larger “Dublin Ranch” development boundary and the overall Dublin Ranch Master Drainage Watershed. Most drainage from the project site is discharged into the existing underground storm drain system in the public streets surrounding the properties. A Dublin Ranch Development Master Drainage Watershed Map, Appendix C, is included for reference.

According to the Flood Insurance Rate Map (FIRM), Number 06001C0328G, effective date August 3, 2009, majority of the project site is within Zone X (areas of the 0.2% annual chance flood; areas of 1% annual chance flood with average depth of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood), except the southerly portion of parcel PA-1, which lies within zone AH (flood depth of 1 to 3 feet) with a base flood elevation of 349.0 NAVD88 (Elevation of 346.3 NGVD 29). A copy of the FIRM, Appendix E, is included for reference.

II. EXISTING DRAINAGE SYSTEM AND ALLOCATED FLOWS

A. Existing Drainage System

As mentioned in Section I above, majority of the project site is within the Dublin Ranch master drainage boundary and the existing drainage system surrounding the site have been previously constructed by the Dublin Ranch infrastructure improvements. Therefore, the watersheds and drainage connection points for each development parcel and surrounding public streets have been previously defined. A Drainage Area and System Map, Appendix F, is included for reference.

For parcel PA-1 watershed, a 42" storm drain in Northside Drive was constructed to the southeast corner of the parcel to provide drainage connection for the PA-1 watershed and new storm drains. The existing 42" storm drain is directly connected to an existing 3-9'x14' box culverts crossing under I-580 freeway connecting to the Alameda County Line G-3 and eventually discharges into Arroyo Mocho.

For parcel PA-2A and PA-2B watershed (including Dublin Boulevard and Brannigan Street south of Finnian Way), an existing 48" storm drain in Brannigan Street and an 18" storm drain in Dublin Boulevard were constructed previously. Watershed PA-2A and 2B would discharge storm runoff to the intersection of Dublin Blvd and Brannigan Street. The existing 48" storm drain and 18" storm drains are connected to a 60" storm drain in Dublin Boulevard east of Brannigan Street and a 96" storm drain in Grafton Street south of Dublin Boulevard. The 96" storm drain (connected to the water quality/detention basin with a 30" storm drain) eventually discharge into the 3-9'x14' box culverts under I-580.

For parcel PA-2C watershed, a 42" storm drain exists in Brannigan Street between Central Parkway and Finnian Way. This 42" storm drain conveys Brannigan Street runoff to the existing 48" storm drain south of Finnian Way. Storm runoff from parcel PA-2c will be discharged into the same 48" storm drain south of Finnian Way, which eventually discharge into the water quality/detention basin and the 3-9'x14' box culverts under I-580 also.

For parcel PA-3 watershed (including Central Parkway and a portion of Brannigan Street), this watershed will discharge into the existing 42" storm drain in Brannigan Street south of Central Parkway. Similarly, the 42" storm drain conveys storm runoff to the water quality/detention basin and the 3-9'x14' box culverts.

For parcel PA-4 watershed (including Gleason Drive), this watershed does not discharge into the Dublin Ranch master drainage watershed. Gleason Drive

currently slopes in a westerly direction towards Tassajara Road into two existing drainage inlets just east of Tassajara Road intersection.

Watershed "Tassajara," similar to watershed PA-4, does not convey storm runoff to the Dublin Ranch Master Drainage Watershed. Tassajara Road street runoff is currently discharged into the existing storm drains on west side of Tassajara Road.

B. Allocated Peak Flows

The Dublin Ranch West Side Storm Drain Benefit District, adopted March 18, 2008, allocated flow "Q" from watershed PA-1, PA-2 and PA-3 for design of the storm drain system described in Section II.A. above. These allocated 15 year peak Q's are shown on the Drainage Area and System Map in Appendix F. Below is a summary of the allocated Q's for each parcel:

1. Watershed PA-1 = 24.52 cfs
2. Watershed PA-2A & 2B = 26.21 cfs
3. Watershed PA-2C = 25.19 cfs
4. Watershed PA-3 = 19.60 cfs
5. Watershed PA-4 = (not a part of the Dublin ranch Master Drainage Watershed)
6. Watershed "Tassajara" = (not a part of the Dublin ranch Master Drainage Watershed)

III. CRITERIA AND METHODOLOGY

Criteria based on "The District's Rational Method", Chapter Two, in accordance with the Alameda County Flood Control and Water Conservation District (ACFC) Manual, dated 2016, is used to determine the post development flow for each watershed.

a. Peak Flow $Q = C'IA$

C' = Runoff Coefficient

I = Rainfall Intensity

A = Drainage Area

b. Runoff Coefficient (C') is ACFC's Runoff Coefficient per above Manual.

$C' = C + C_s + C_i$

C = basic runoff coefficient per Table 2 of ACFC Manual

C_s = ground slope adjustment factor per Equation 8 of ACFC Manual

C_i = rainfall intensity factor per Equation 9 of ACFC Manual

c. Time of Concentration (T_c) = 5 min (roof to gutter) + overland/conduit time.

d. Rainfall intensity (I) is based on Time of Concentration (T_c) and 18" Mean Annual Precipitation and Attachment 7 of the Alameda County Flood Control and Water Conservation District Manual.

IV. PROPOSED DRAINAGE CALCULATIONS

Using the criteria and methodology described in Section III above, flows from each watershed were determined below and compared to the allocated flows per Section II.B.

A. Watershed PA-1

PA-1 Watershed

	Allocated Drainage Area (Ac)	Post Development Drainage Area (Ac)	Allocated Runoff Coefficients	Post Development Runoff Coefficients	Intensity (I ₁₅)	Post Development Q ₁₅ (cfs)	Allocated Q ₁₅ (cfs)
PA-1	22.21	22.21	0.80	0.84	1.60	29.84	24.52
Brannigan Street*		0.21		0.87	1.60	0.29	
Total:	22.21	22.42	-	-	-	30.13	24.52

I₁₅ based on Tc of 19 min.

*Allocated Drainage Area for Brannigan Street included in PA-1 allocated Drainage Area as shown in Appendix D. Post Development Area for Brannigan Street is the Area within Project Boundary.

Q₁₅ of 30.13 cfs is higher than the Allocated Q₁₅ of 24.52 cfs. This watershed does not discharge any runoff into the existing water quality/detention basin. As a result, it was determined on-site hydromodification storage is needed to meet the C.3 requirements. BAHM calculations for the proposed hydromodification vault are included in the project Storm Water Management Plan. The hydromodification storage will also act as on site detention system which will meter the flow less than the “allocated Q₁₅” and would not create downstream impact to the existing drainage system.

B. Watershed PA-2A & 2B

PA-2A-2B Watershed

	Allocated Drainage Area (Ac)	Post Development Drainage Area (Ac)	Allocated Runoff Coefficients	Post Development Runoff Coefficients	Intensity (I ₁₅)	Post Development Q ₁₅ (cfs)	Allocated Q ₁₅ (cfs)
PA-2A-2B	13.19	14.66	0.80	0.84	1.71	21.07	20.59
Dublin Blvd	3.20	3.53	0.90	0.87	1.71	5.24	5.62
Brannigan Street*		0.36		0.87	1.71	0.54	
Total:	16.39	18.55	-	-	-	26.85	26.21

I₁₅ based on Tc of 17 min.

*Allocated Drainage Area for Brannigan Street included in PA-2A-2B allocated Drainage Area as shown in Appendix D. Post Development Area for Brannigan Street is the Area within Project Boundary.

The downstream water quality/detention basin provides storage capacity for this watershed. Hydromodification storage is not required. Based on the calculation above $Q_{15}=26.85$ cfs is discharged from this watershed to node 2A&2B, which is slightly higher than the previously allocated Q_{15} of 26.21 cfs. The proposed combined Q_{15} for PA-2A, PA-2B and PA-2C is 40.73 cfs is still less than the allocated Q_{15} for PA-2A, PA-2B and PA-2C of 51.40 cfs. Therefore on-site peak flow mitigation will not be used for PA-2A and 2B.

C. Watershed PA-2C

PA-2C Watershed

	Allocated Drainage Area (Ac)	Post Development Drainage Area (Ac)	Allocated Runoff Coefficients	Post Development Runoff Coefficients	Intensity (I_{15})	Post Development Q_{15} (cfs)	Allocated Q_{15} (cfs)
PA-2C	15.35	12.80	0.80	0.62	1.71	13.57	25.19
Brannigan Street*		0.21		0.87	1.71	0.31	
Total:	15.35	13.01	-		-	13.88	25.19

I_{15} based on Tc of 17 min.

*Allocated Drainage Area for Brannigan Street included in PA-2C allocated Drainage Area as shown in Appendix D. Post Development Area for Brannigan Street is the Area within Project Boundary.

The downstream water quality/detention basin provides storage capacity for this watershed. Hydromodification storage is not required. Based on the calculation above $Q_{15}=13.88$ cfs is discharged from this watershed to node 2C, which is less than the previously allocated Q_{15} .

D. Watershed PA-3

PA-3 Watershed

	Allocated Drainage Area (Ac)	Post Development Drainage Area (Ac)	Allocated Runoff Coefficients	Post Development Runoff Coefficients	Intensity (I_{15})	Post Development Q_{15} (cfs)	Allocated Q_{15} (cfs)
PA-3	20.35	18.53	0.65	0.53	1.60	15.71	19.60
Central Parkway*		2.24		0.87	1.60	3.12	
Brannigan Street*		0.34		0.87	1.60	0.47	
Total:	20.35	21.11	-	-	-	19.30	19.60

I_{15} based on Tc of 19 min.

*Allocated Drainage Area for Central Parkway & Brannigan Street included in PA-3 allocated Drainage Area as shown in Appendix D. Post Development Area for Brannigan Street is the Area within Project Boundary.

The downstream water quality/detention basin provides storage capacity for this watershed. Hydromodification storage is not required. Based on the calculation above $Q_{15}=19.30$ cfs is discharged from this watershed to node 3, which is less than the previously allocated Q_{15} .

E. Watershed PA-4

PA-4 Watershed

	Allocated Drainage Area (Ac)	Post Development Drainage Area (Ac)	Allocated Runoff Coefficients	Post Development Runoff Coefficients	Intensity (I_{15})	Post Development Q_{15} (cfs)	Allocated Q_{15} (cfs)
PA-4	-	2.27	-	0.55	2.08	2.60	-
Gleason Drive		2.25		0.87	2.08	4.07	
Brannigan Street*		0.12		0.87	2.08	0.22	
Total:	0.00	4.64	-	-	-	6.89	0.00

I_{15} based on T_c of 12 min.

*Post Development Area for Brannigan Street is the Area within Project Boundary.

As mentioned previously, this watershed is not a part of the Dublin Ranch Master Watershed. Runoff from this watershed should be conveyed to the Tassajara Road storm drain system. Based on this assumption, it is determined on-site hydromodification storage should be provided for this watershed. A 630 cf underground vault and storage is included in the preliminary design and calculations to mimic the pre-development flow condition.

F. Watershed "Tassajara"

Similar to Watershed PA-4, this watershed is not a part of Dublin Ranch Master Watershed. Runoff from this watershed will continue to be captured and conveyed to the existing storm drains on the west side of Tassajara Road.

Appendix A

Vicinity Map

Appendix B
Topographic and Boundary Map

Appendix C
Dublin Ranch Development Master Drainage Watershed Map

Appendix D
Allocated Flow per Dublin Ranch – West Side Storm Drain Benefit
District

Appendix E
Flood Insurance Rate Map

Appendix F

Runoff Coefficient Calculations

Appendix G
Post Development Drainage Area and System Map