APPENDIX Q

HYDROLOGY & HYDRAULICS REPORT AND LID PLAN

APPENDIX Q-1

PRELIMINARY HYDROLOGY & HYDRAULICS REPORT

Chadwick Ranch Estates (TTM No. 82349)
Preliminary Hydrology & Hydraulics Report
City of Bradbury, CA

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JN 20.038.000

Prepared: September 26, 2019

Table of Contents

1. INTRODUCTION ____ 1
1.1 Goals and Objectives ____ *1*
1.2 Criteria, methodology, standards, and procedures ____ *4*
2. EXISTING (PRE-PROJECT) CONDTIONS ____ 5
2.1 Land Use, Soil Type, and Rainfall Data ____ *5*
2.2 Existing Condition Hydrology Results ____ *6*
2.3 Sediment Production ____ *7*
3. PROPOSED (POST-PROJECT) CONDITIONS ____ 9
3.1 Land Use, Soil Type, and Rainfall Data ____ *9*
3.2 Proposed Condition Hydrology Results ____ *10*
3.3 Sediment Production ____ *12*
3.4 Storm Water Runoff and Debris Production Impacts ____ *12*
3.5 Detention Basin Sizing ____ *13*
4. LID PLAN ____ 15
5. REFERENCES ____ 16

Figures

Figure 1-1: Vicinity Map
Figure 1-2: Site Plan

Exhibits

Exhibit A – Existing Condition Hydrology Map (Map pocket)
Exhibit B – Proposed Condition Hydrology Map (Map pocket)

Technical Appendices

Appendix A: Existing Condition Hydrology
Appendix B: Proposed Condition Hydrology
Appendix C: Detention Basin Stage-Storage and Stage-Discharge Calculations
Appendix D: LID Plan

1. INTRODUCTION

The Chadwick Ranch Estates, Tentative Tract Map (TTM) No. 82349 is located in the San Gabriel River watershed in the City of Bradbury. The property is approximately 111 acres and is located on the foothills of the San Gabriel Mountains, with elevations ranging from approximately 1,790 feet above mean sea level (amsl) to 790 feet amsl. The site is currently undeveloped and drains to the Bradbury and Spinks Debris Basins. The debris basins are owned and maintained by the Los Angeles County Flood Control District (LACFCD).

The Chadwick Ranch Estates Project area will create 14 estate residential parcels with trails on the property. The development will include the installation of a water tank, a booster station, and debris and water quality basins. The residential estates would allow a primary home and a guest house, and other ancillary structures including but not limited to garages and stables. For analysis purposes, the allowable buildable areas range from a minimum of 11,000 square feet to a maximum of 31,000 square feet. The undisturbed open space will be dedicated to a conservancy and will ensure that 51% of the site remains undisturbed in perpetuity. All common areas within the project and areas that require ongoing maintenance will be maintained through a Homeowner's Association.

The location of the site is shown on Figure 1-1, Vicinity Map. The preliminary site plan is illustrated on Figure 1-2, Site Plan.

This report includes hydrologic and hydraulic analysis completed for the preliminary design of the Chadwick Ranch development. This drainage report evaluates the hydrologic conditions for the onsite and offsite drainage areas for the existing and project conditions of the watershed, and provides the criteria for the design and preliminary analysis of proposed drainage improvements to be installed with the development.

1.1 GOALS AND OBJECTIVES

The primary objectives of this report are as follows:

1. Delineate the tributary drainage areas through the project site for the existing condition of the on- and off-site watersheds.
2. Based on the existing drainage patterns, ground slope, land use and soil type, perform hydrologic calculations of the existing condition for the 50-year (Capital Flood) storm event.
3. Identify the design hydrology for the onsite and offsite areas for the proposed condition of the surrounding watersheds. The 50-year storm event will be used to size the storm drain and debris and detention facilities
4. Based on the hydrology results, and physical site requirements, develop a preliminary design for debris, detention, and storm drain facilities to collect and convey the design discharges.
5. Evaluate impacts associated with the proposed development and identify mitigation measures to address adverse impacts.

The proposed improvements will be designed in accordance with the City of Bradbury requirements and using the criteria in the Los Angeles County Hydrology Manual and City and County design guidelines.

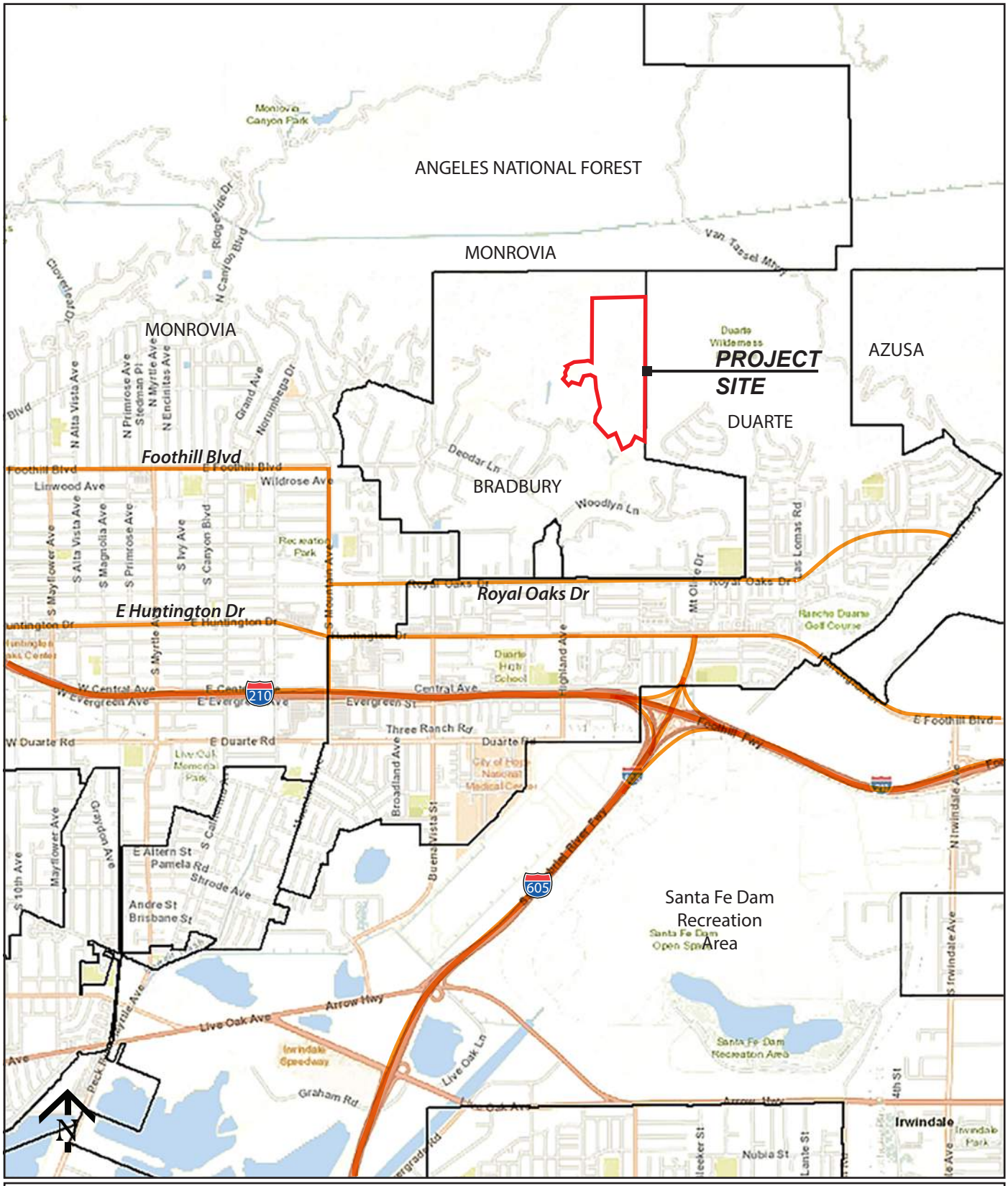


Figure 1-1

Vicinity Map

CHADWICK RANCH ESTATES



Figure 1-2
SITE PLAN

Nevis Capital LLC

JUNE 12, 2019

0 100 200 400

Consultants:
TRG Land, Inc.
PROACTIVE Engineer Consultants

CHADWICK RANCH ESTATE - TRACT 82349
BRADBURY, CA

1.2 CRITERIA, METHODOLOGY, STANDARDS, AND PROCEDURES

1.2.1 Los Angeles County Modified Rational Method (MODRAT)

All hydrologic analyses were performed in accordance with the Los Angeles County Department of Public Works (LACDPW) Hydrology Manual (2006).

The Los Angeles County MODRAT computer program was used to model both the existing and proposed condition hydrologic models. MODRAT was implemented using the Watershed Modeling System (WMS) computer program as the user interface.

MODRAT is a modified rational method computer program developed by the LACDPW to compute peak runoff rates under a variety of conditions common to the County. The objective of the interface developed in WMS for MODRAT is to provide graphical representation of MODRAT data, as well as automate the definition of many of the required parameters.

The time of concentrations for the subareas were computed using the HydroCalc computer program developed by the LACDPW.

1.2.2 Detention Basin Routing Analysis

The modified-Puls routing method was used to analyze the functional adequacy of the proposed detention basin facility. A stage-storage curve and a stage-discharge curve is required for the facility to be modeled.

A stage-storage curve was computed for the proposed detention facility based on the conceptual grading plan. Applicable nomograph charts from the Federal Highway Administration publication, HDS-5 (2005), were used to develop the outlet structure performance curve for the basin (i.e., stage versus discharge).

The detention basin was sized to mitigate the downstream impacts based on burned flow conditions.

1.2.3 Storm Drain Hydraulics

The backbone storm drain system shall be designed and constructed in accordance with LACDPW requirements and standards to convey the 50-year storm event. The detailed analysis of the backbone storm drain system is deferred to the final design phase of the Project. All storm drains proposed downstream of the proposed debris control facilities shall be designed based on clear flow conditions.

1.2.4 Debris and Sediment Production, Delivery, and Control

All sediment retention facilities shall be designed and constructed in accordance with the LACDPW Sedimentation Manual (2006) and Debris Dams and Basins Design Manual (1979).

The Capital Flood level of protection applies to facilities designed to intercept sediment-laden floodwaters. Sediment retention facilities must be designed to mitigate the design sediment volume.

The type of structure depends on the sediment delivery volume, which is dependent on the Debris Potential Area (DPA) zone for the particular drainage area. Those facility locations expected to receive between 1,000 and 4,999 cubic yards shall have either a debris basin or elevated inlet constructed. A debris basin shall be constructed for those locations estimated to receive 5,000+ cubic yards. The use of an elevated inlet in DPA zone 1 will only be approved by the LACDPW in special circumstances, otherwise, a debris basin is required.

The design sediment volume for each proposed facility is less than 15 acre-feet and thus, all facilities are not subject to state jurisdiction under the Division of Safety of Dams.

2. EXISTING (PRE-PROJECT) CONDTIONS

The existing condition of the project site and offsite tributary area is made up a native vegetation with little impervious cover. On the southwest side, the property boundary surrounds a debris stockpile area which is the only disturbed area in the watershed's tributary to the two debris basins. Runoff from the site currently drains to both the Bradbury and Spinks Debris Basins. However, the vast majority of the area proposed for development drains to the Spinks Debris Basin.

In the proposed project condition, the tributary drainage area to the Bradbury Debris Basin will be reduced, and no development area will drain to the Bradbury Basin. Therefore, there will not be any adverse impacts to the basin and the watershed tributary was not studied in any greater detail.

The existing condition hydrology was completed for the watershed area tributary to the Spinks Debris Basin.

2.1 LAND USE, SOIL TYPE, AND RAINFALL DATA

Hydrologic calculations for the existing condition were performed in accordance to the methods described in the Los Angeles County Hydrology Manual. The land use cover, soil type, and rainfall data were developed using the guidelines in the manual.

2.1.1 Land Use

The existing land uses in the on- and off-site areas consist of natural, undeveloped mountain areas. In accordance with the criteria in the hydrology manual, the natural land use cover was assigned an impervious value of 1 percent.

The land use definitions for each drainage subarea are defined in Table 2-1, Existing Condition Land Use Characteristics.

Table 2-1, Existing Condition Land Use Characteristics

MODRAT Basin ID	Area (acres)	Land Use		Percent Impervious
		Type	Percent Coverage	
1A	15.87	Undeveloped/Mountain	100	1
3A	32.55	Undeveloped/Mountain	100	1
4A	18.23	Undeveloped/Mountain	100	1
5B	14.28	Undeveloped/Mountain	100	1
7B	10.71	Undeveloped/Mountain	100	1

2.1.2 Hydrologic Soil Type

Soil Types 78 and 88 were used in accordance with the Los Angeles County Hydrology Map Website. Only one soil type can be used per subarea, and the predominate soil type was used.

2.1.3 Rainfall Data

The 50-year rainfall data varied across the site from 8.1 inches in the lower elevations up to 9.0 inches at the higher elevations. The rainfall data for each subarea was obtained by identifying the rainfall at the centroid of each subarea.

2.1.4 Flow Paths and Effective Slopes

The slope lengths for each subarea were determined from the longest flow path taken from the existing condition topographic mapping. The elevations at the top and bottom of the flow path were identified to determine the map slope of the flow path. The project is located in a mountainous area and the map slope was corrected to determine an effective slope based on Figure 7.3.10 in the County Hydrology Manual.

2.1.5 Fire Factor and Bulking Factor

The project site is located within the San Gabriel River Watershed. The Los Angeles County Hydrology Manual has assigned this watershed a fire factor of 0.71 (Table 6.3.3 of the manual). Only undeveloped areas with 15% or less impervious cover require the use of a fire factor.

Fires increase runoff and debris production. Higher runoff entrains more debris and burned watersheds have more debris available for transport.

Peak flow rates from burned watershed are bulked in accordance will County criteria to account for the volume changes caused by the debris entrainment. Bulking factors are used to design drainage facilities (channels and storm drain pipes) in sediment producing areas where a debris basin does not exist. No facilities are proposed in the existing condition and bulking factors were not incorporated into the analysis.

2.2 EXISTING CONDITION HYDROLOGY RESULTS

The hydrology analysis for the existing condition was prepared for the 50-year (Capital Flood) storm event. The watershed subarea boundaries were based on the existing topographic mapping and delineated for the drainages tributary to the Spinks Debris Basin. The flow rates were determined for the clear water and burned conditions. A bulked flow rate was not required since no facilities are proposed to be constructed upstream of the debris basin.

The time of concentration and peak flow rates for each subarea were determined using the County's HydroCalc computer program. The watersheds were routed and combined using the MODRAT hydrologic modeling module within the WMS computer program. The subarea parameters are provided in Table 2-2, Existing Condition Subarea Parameters, and the results of the analysis are summarized in Table 2-3, Existing Condition Peak Discharges.

The watershed boundaries and flow paths are shown on Exhibit A – Existing Condition Hydrology Map. The hydrology calculations are provided in Appendix A.

Table 2-2, Existing Condition Subarea Parameters							
Basin ID	**Area (acres)**	**Flow Path Length (ft)**	**Effective Slope (ft/ft)**	**50-Year Rainfall Depth (in)**	**% Impervious**	**Soil Type**	**Fire Factor**
1A	15.87	1561	0.17	8.4	1	88	0.71
3A	32.55	2527	0.16	8.4	1	88	0.71
4A	14.28	2569	0.16	8.4	1	88	0.71
5B	18.23	1982	0.22	8.6	1	78	0.71
7B	10.71	1647	0.09	8.3	1	88	0.71

Table 2-3, Existing Condition Peak Discharges					
Basin ID	**Outfall**	**Downstream System/ Conveyance Type**	**Drainage Area (ac)**	**Q50 [clear] (cfs)**	**Q50b [burned] (cfs)**
1A	2A	Natural Valley Channel	15.87	47.3	52.1
3A	8AB	Spinks Debris Basin	32.55	78.8	88.5
4A	8AB	Spinks Debris Basin	14.28	34.6	38.8
5B	6B	Natural Valley Channel	18.23	47.7	54.4
7B	8AB	Spinks Debris Basin	10.71	29.0	32.2
	8AB	***Confluence Totals at Spinks Basin***	***91.64***	***218.5***	***247.9***

2.3 SEDIMENT PRODUCTION

The project site is location in Debris Potential Area (DPA) Zone 1. The zone has the highest potential for debris production with a maximum production rate of 120,000 cubic yards per square mile. An evaluation of the debris production from the project site and tributary watershed was prepared. Debris production is only calculated for the natural, undeveloped portions of the subarea watersheds. The debris production rate determined from Figure B-1 in the LACDPW Sedimentation Manual.

For the project site and tributary watersheds the entire drainage area is in an undeveloped condition and will produce sediment and debris. The results of the debris production calculations are summarized in Table 2-4, Existing Condition Debris Volumes.

Table 2-4, Existing Condition Debris Volumes						
Basin ID	**Area (Sq Mi.)**	**Undeveloped Area (Sq. Mi.)**	**Developed Area (Sq. Mi.)**	**DPA Zone**	**Production Rate [1] (cy/sq mi)**	**Debris Volume (cy)**
1A	0.025	0.025	0.0	1	240,000	6,000
3A	0.051	0.051	0.0	1	240,000	12,240
4A	0.023	0.023	0.0	1	240,000	5,520
5B	0.028	0.028	0.0	1	240,000	6,720
7B	0.017	0.017	0.0	1	240,000	4,080
Total Debris Production Volume at Spinks Debris Basin						***34,560***

Notes: 1. Debris production rate from Figure B-1 of LACDPW Sedimentation Manual, Appendix B

3. PROPOSED (POST-PROJECT) CONDITIONS

The proposed project improvements will include the grading of 14 residential estate lots along with construction of the associated infrastructure including roadways, utilities, water tank, and detention and debris basins. The proposed improvements are illustrated on Figure 1-2, Site Plan.

The watershed subareas were revised from the existing condition analysis as needed based on the proposed grading and location of drainage facilities such as the debris and detention basins.

In the proposed project condition, the tributary drainage area to the Bradbury Debris Basin will be reduced by 2.9 acres. Therefore, there will not be any adverse impacts to the basin and the watershed tributary was not studied in any greater detail. The proposed condition hydrology was completed for the watershed area tributary to the Spinks Debris Basin.

3.1 LAND USE, SOIL TYPE, AND RAINFALL DATA

Hydrologic calculations for the proposed condition were performed in accordance to the methods described in the Los Angeles County Hydrology Manual. The land use cover, soil type, and rainfall data were developed using the guidelines in the manual.

3.1.1 Land Use

The proposed condition land uses for the onsite areas consist of low-density residential areas, roadways, and graded slopes. The maximum buildable area (impervious area) for each of the residential pads was assumed to be 50% of the pad area. A composite impervious area for each subarea was calculated based on the percentage of the various land uses within the subarea. The natural offsite areas remain the same as the existing condition and were assigned an impervious value of 1 percent.

The land use definitions for each drainage subarea are defined in Table 3-1, Proposed Condition Land Use Characteristics.

Table 3-1, Proposed Condition Land Use Characteristics

MODRAT Basin ID	Area (acres)	Land Use		Percent Impervious
		Type	Percent Coverage	
1A	9.08	Undeveloped/Mountain	100	1
3A	4.22	Undeveloped/Mountain	100	1
5B	14.53	Undeveloped/Mountain	10	30.6
		Low Density Residential	90	
7B	26.74	Low Density Residential	100	32.2
10A	11.60	Undeveloped/Mountain	100	1
11C	20.67	Undeveloped/Mountain	100	1
13C	7.70	Undeveloped/Mountain	100	1

3.1.2 Hydrologic Soil Type

Soil Types 78 and 88 were used in accordance with the Los Angeles County Hydrology Map Website. Only one soil type can be used per subarea, and the predominate soil type was used.

3.1.3 Rainfall Data

The 50-year rainfall data varied across the site from 8.1 inches in the lower elevations up to 9.0 inches at the higher elevations. The rainfall data for each subarea was obtained by identifying the rainfall at the centroid of each subarea.

3.1.4 Flow Paths and Effective Slopes

The slope lengths for each subarea were determined from the longest flow path taken from the existing condition topographic mapping or the proposed grading pad. The elevations at the top and bottom of the flow path were identified to determine the map slope of the flow path. For the proposed condition, only the offsite subareas located in the mountainous areas and the map slope were corrected to determine an effective slope.

3.1.5 Fire Factor and Bulking Factor

The fire factor of 0.71 is only used on undeveloped areas with 15% or less impervious cover. This includes subareas 1A, 3A, 10A, 11C, and 13C.

Peak flow rates from burned watershed are bulked in accordance will County criteria to account for the volume changes caused by the debris entrainment. Bulking factors are used to design drainage facilities (channels and storm drain pipes) in sediment producing areas where a debris basin does not exist. No facilities are proposed that would require the use of bulking factors.

3.2 PROPOSED CONDITION HYDROLOGY RESULTS

The hydrology analysis for the proposed condition was prepared for the 50-year (Capital Flood) storm event. The watershed subarea boundaries were based on the existing topographic mapping for the offsite areas and the proposed grading plan for the onsite areas, and delineated for the drainages tributary to the Spinks Debris Basin. The flow rates were determined for the clear water and burned conditions. A bulked flow rate was not required since no facilities are proposed to be constructed upstream of the debris basins in debris producing areas.

The time of concentration and peak flow rates for each subarea were determined using the County's HydroCalc computer program. The watersheds were routed and combined using the MODRAT hydrologic modeling module within the WMS computer program. The subarea parameters are provided in Table 3-2, Proposed Condition Subarea Parameters, and the results of the analysis are summarized in Table 3-3, Proposed Condition Peak Discharges.

The watershed boundaries and flow paths are shown on Exhibit B – Proposed Condition Hydrology Map. The hydrology calculations are provided in Appendix B.

Table 3-2, Proposed Condition Subarea Parameters							
Basin ID	**Area (acres)**	**Flow Path Length (ft)**	**Effective Slope (ft/ft)**	**50-Year Rainfall Depth (in)**	**% Impervious**	**Soil Type**	**Fire Factor**
1A	9.08	1460	0.11	8.4	1	88	0.71
3A	4.22	510	0.17	8.3	1	88	0.71
5B	14.53	3292	0.11	8.5	31	88	N/A
7B	26.74	2838	0.10	8.3	32	88	N/A
10A	11.60	810	0.15	8.1	1	88	0.71
11C	20.67	1895	0.20	8.6	1	78	0.71
13C	7.70	1390	0.18	8.4	1	78	0.71

Table 3-3, Proposed Condition Peak Discharges					
Basin ID	**Outfall**	**Downstream System/ Conveyance Type**	**Drainage Area (ac)**	**Q50 [clear] (cfs)**	**Q50b [burned] (cfs)**
1A	2A	V-Ditch	9.08	27.1	31.1
3A	4A	Basin	4.22	16.6	18.4
	4A	*Confluence*	*13.30*	*41.5*	*47.4*
5B	6B	Storm Drain Pipe	14.53	*34.8*	*34.8*
7B	8B	Stormwater Detention Basin	26.74	*62.3*	*62.3*
	8B	*Confluence*	*41.27*	*95.9*	*95.9*
	9AB	*Confluence of 4A & 8B*	*54.57*	*136.2*	*142.0*
10A	16AC	Spinks Debris Basin	11.60	44.5	49.5
11C	12C	Debris Basin/Storm Drain Pipe	20.67	54.3	65.2
13C	14C	Debris Basin/Storm Drain Pipe	7.70	22.8	27.0
	14C	*Confluence*	*28.37*	*76.6*	*91.1*
	16AC	***Confluence Totals at Spinks Basin***	***94.54***	***241.3***	***267.7***

3.3 SEDIMENT PRODUCTION

Two debris basins are proposed to be constructed with the site improvements. The basins will capture debris from the undeveloped watersheds upstream of the site development area. An evaluation of the debris production from these watersheds was prepared to size the basins. The debris production rate determined from Figure B-1 in the LACDPW Sedimentation Manual.

In additional, the overall debris production from the watershed tributary to the Spinks Debris Basin were calculated to determine the change as a result of the proposed development. Debris production is only calculated for the natural, undeveloped portions of the subarea watersheds.

The results of the debris production calculations are summarized in Table 3-4, Proposed Condition Debris Volumes.

Table 3-4, Proposed Condition Debris Volumes

Basin ID	Area (Sq Mi.)	Undeveloped Area (Sq. Mi.)	Developed Area (Sq. Mi.)	DPA Zone	Production Rate (1) (cy/sq mi)	Debris Volume (cy)
1A	0.014	0.014	0.0	1	240,000	3,360
3A	0.007	0.007	0.0	1	240,000	1,680
5B	0.023	0.0	0.023	1	240,000	0
7B	0.042	0.0	0.042	1	240,000	0
10A	0.018	0.018	0.0	1	240,000	4,320
11C	0.032	0.032	0.0	1	240,000	7,680
13C	0.012	0.012	0.0	1	240,000	2,880
Total Debris Production Volume at Spinks Debris Basin						***19,920***

Notes: 1. Debris production rate from Figure B-1 of LACDPW Sedimentation Manual, Appendix B

3.4 STORM WATER RUNOFF AND DEBRIS PRODUCTION IMPACTS

Bradbury Debris Basin

The proposed project will reduce the drainage area to this basin by 2.9 acres. This diversion will reduce the runoff and debris to the basin and will not adversely affect the facility. The diverted area is along a natural ridge line between the Bradbury and Spinks basins and is not anticipated to have a significant impact on the sediment production to the Bradbury Debris Basin.

Spinks Debris Basin

The estimated peak discharges between the existing and proposed conditions were compared at the outfall to the Spinks Debris Basin. This location is at Node 8AB in the existing condition and Node 16AC in the proposed condition. The comparison reveals that the proposed project will increase the peak flow rate to the existing basin by 19.8 cfs in the 50-year storm event (burned).

A comparison of the debris production volume from the watershed tributary to the Spinks basin indicates that the proposed project will significantly reduce the amount of debris that gets to the facility. This is a result of proposed improvements which reduce the amount of undeveloped area and its associated debris production. In addition, two debris basins are proposed onsite which will further reduce the amount of debris that gets to the Spinks basin.

The debris basins are proposed at Nodes 12C (Basin ID 11C) and 14C (Basin ID 13C) as shown on the Proposed Conditions Hydrology Map. The required storage volumes are listed in Table 3-4, Proposed Condition Debris Volumes

To mitigate the impacts associated with the increased storm water runoff to the basin, an onsite detention basin is proposed to be constructed. The detention basin will be sized to reduce the proposed condition peak discharge (burned condition) in a 50-year storm event to less than the existing condition.

3.5 DETENTION BASIN SIZING

A storm water detention basin is proposed to reduce the post-project flow rates leaving the site to less than the existing condition. The proposed detention basin is located at Node 8B. The basin is designed for peak flow detention only, water quality treatment of the site runoff will be provided before flow is discharged to the basin. The basin is designed to reduce the peak flow from the developed areas such that the total peak flow at the Spinks Basin (Node 16AC) is less than the existing condition.

The proposed detention basin is designed as flow-through type basin. The proposed detention basin is designed to temporarily store less than 15 acre-feet of storm water runoff volume and is therefore not subject to state jurisdiction.

Pipe Culvert Analysis program version 1.7 (1984-1986) by Dodson & Associates Inc. which applies nomograph charts from Federal Highway Administration publications, HDS-5 (2001/2005) was used to develop the outlet structure performance curve for the basin. The preliminary outflow was determined based on inlet control for a 42-inch diameter RCP culvert (FHWA chart 1A, Scale 2). The analysis was used to develop the stage versus discharge curve for the outflow from the basin.

The stage versus storage curve was developed for the detention basin from the proposed grading plans. A storage volume in the basin was identified for various depths in the basin corresponding with the same elevations used in the stage versus discharge curve. The values used in the analysis are summarized in Table 3-5, Detention Basin Stage-Storage-Discharge Curves. The detention basin stage-storage-discharge calculations are included in Appendix C.

A mitigated condition hydrology analysis was prepared to determine the impact of the detention basin on the peak flow reduction for the project condition. The storm water runoff at Node 8B was routed through the basin by added the basin stage-storage-discharge curves to the WMS hydrology model. The results of the analysis are summarized in Table 3-6, Proposed Condition Mitigated Peak Discharges. The WMS hydrology results are also included in Appendix C.

The results of the analysis indicate that the proposed detention basin will reduce the peak discharge to the Spinks Basin to less than the existing condition with the project site development.

Table 3-5, Detention Basin Stage-Storage-Discharge Curves			
Elevation	**Depth (feet)**	**Volume (acre-feet)**	**Discharge (cfs)**
834	0	0	0
835	1	0.32	6.1
836	2	0.69	21.6
837	3	1.10	42.2
838	4	1.56	63.4
838.2	4.2	1.66	68
840	6	2.62	104

Table 3-6, Proposed Condition Mitigated Peak Discharges					
Basin ID	**Outfall**	**Downstream System/ Conveyance Type**	**Drainage Area (ac)**	**Q50 [burned] (cfs)**	**Mitigated Q50b [burned] (cfs)**
1A	2A	V-Ditch	9.08	31.1	31.0
3A	4A	Basin	4.22	18.4	18.4
	4A	*Confluence*	*13.30*	*47.4*	*47.4*
5B	6B	Storm Drain Pipe	14.53	*34.8*	34.8
7B	8B	Stormwater Detention Basin	26.74	*62.3*	62.3
	8B	*Confluence and Basin Routing*	*41.27*	*95.9*	*95.9*
	9AB	*Confluence of 4A & 8B*	*54.57*	*142.0*	*84.3*
10A	16AC	Spinks Debris Basin	11.60	49.5	49.5
11C	12C	Debris Basin/Storm Drain Pipe	20.67	65.2	65.2
13C	14C	Debris Basin/Storm Drain Pipe	7.70	27.0	27.0
	14C	*Confluence*	*28.37*	*91.1*	*91.1*
	16AC	***Confluence Totals at Spinks Basin***	***94.54***	***267.7***	***209.7***

4. LID PLAN

A LID Plan was prepared to demonstrate the proposed project's stormwater quality compliance with the local NPDES Stormwater Program. The plan conforms to the requirements of the Los Angeles County Department of Public Works LID Standards Manual and the County's LID Ordinance.

See Appendix D for the full LID Plan.

5. REFERENCES

Federal Highway Administration (FHWA), 2001. Urban Drainage Design Manual, HEC-22, U.S. Department of Transportation.

FHWA, 2005. Hydraulic Design of Highway Culverts, HDS-5, U. S. Department of Transportation.

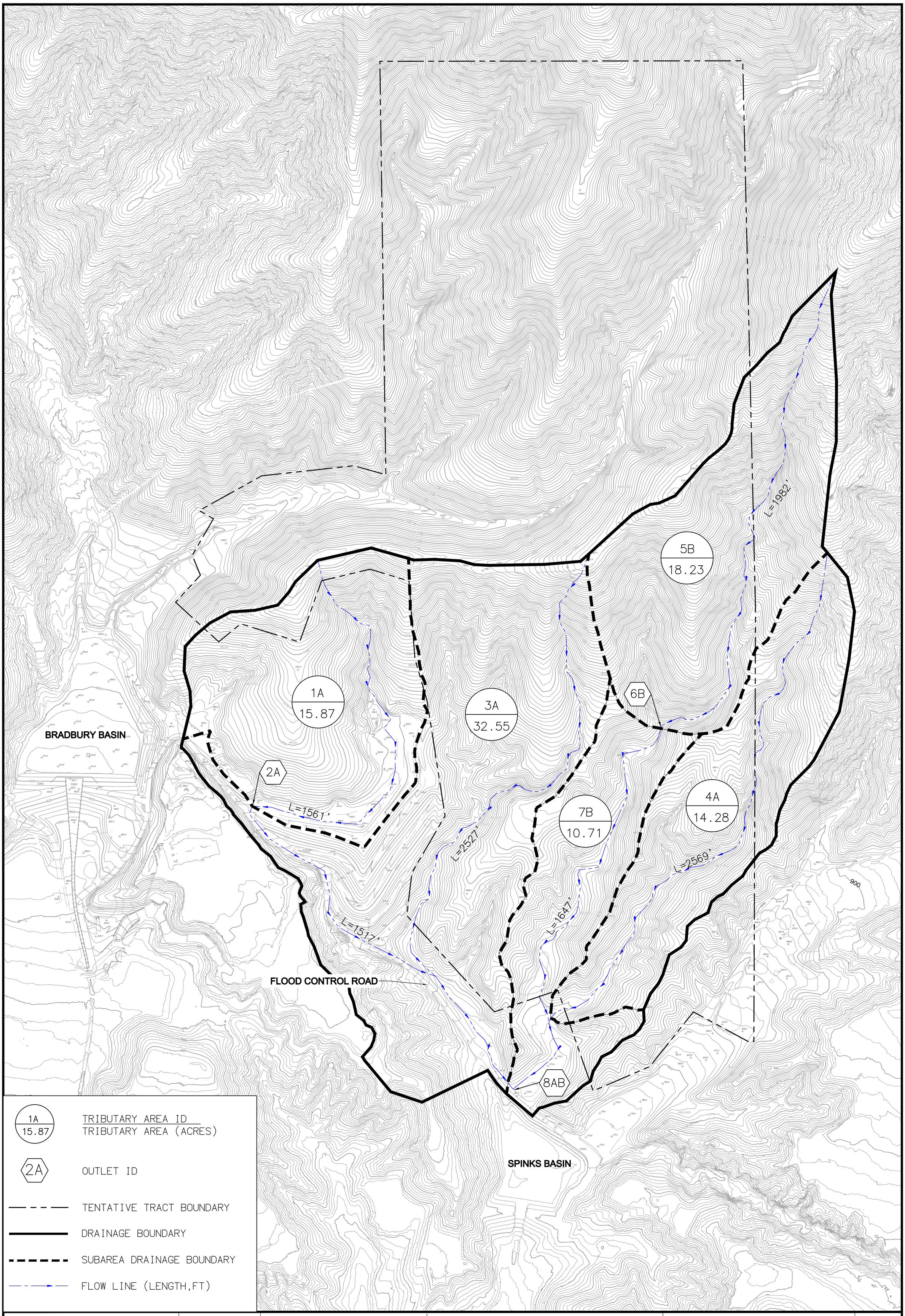
Los Angeles County Department of Public Works (LACDPW), 2006. Hydrology Manual. January.

LACDPW, 2006. Sedimentation Manual. March.

LACDPW, 2002a. Development Planning for Storm Water Management: A Manual for the Standard Urban Storm Water Mitigation Plan (SUSMP).

Los Angeles County Flood Control District (LACFCD), 1979. Debris Dams and Basins Design Manual, Revised, Design Division.

EXHIBITS



SEAL

REGISTERED PROFESSIONAL ENGINEER
JOHN A. MCCARTHY
No. 47583
Exp. 12/31/19
CIVIL
STATE OF CALIFORNIA

PREPARED UNDER THE
DIRECT SUPERVISION OF:

JOHN A. MCCARTHY — XXXX DATE
R.C.E. No. 47583 EXP. DATE: 12/31/19

SCALE: 1"=150'
ONE INCH ON ORIGINAL

Q3 Consulting
27042 Towne Centre Drive, Suite 110
Foothill Ranch, CA 92610
949.259.6770

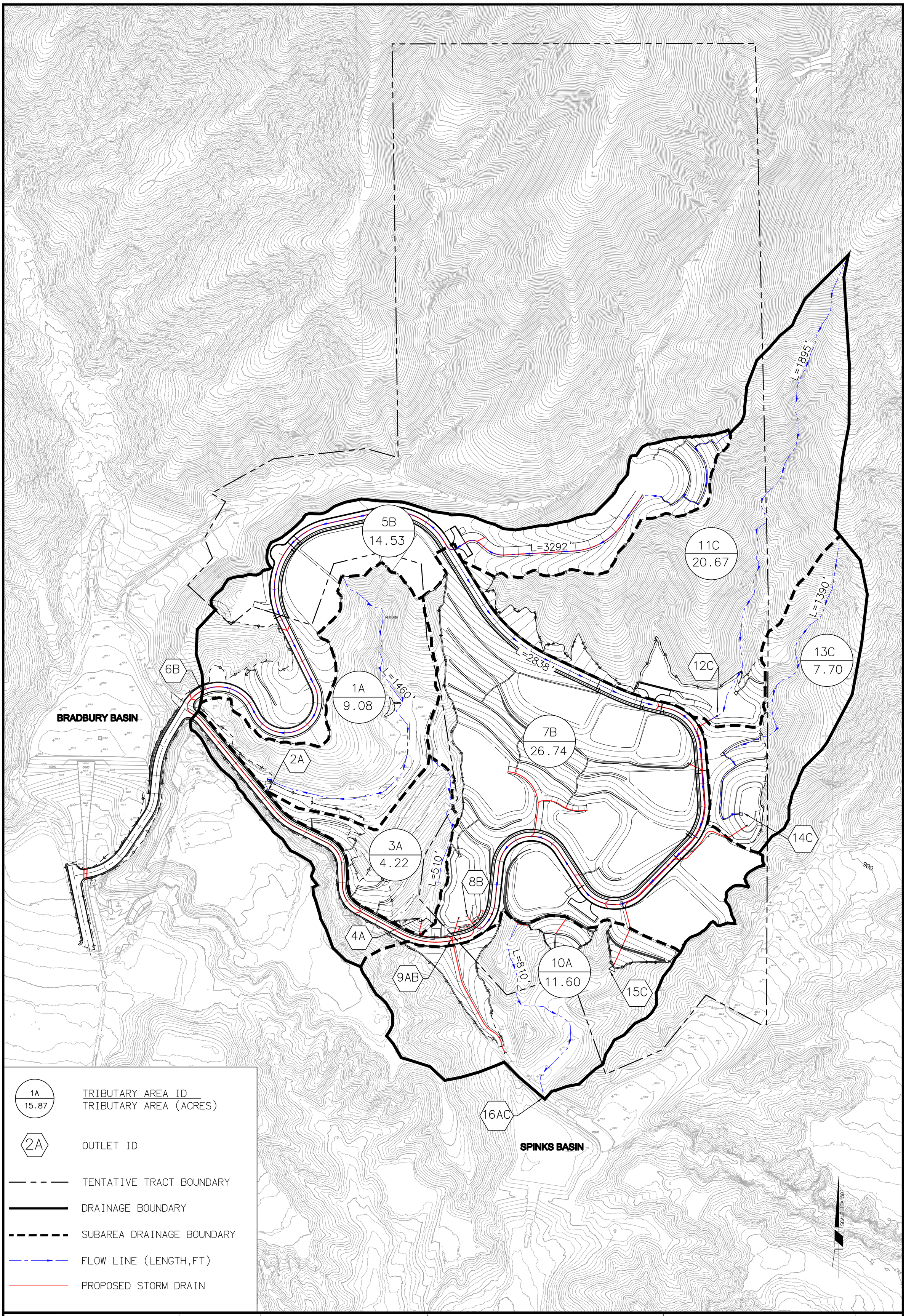
CHADWICK RANCH ESTATES

EXISTING CONDITION HYDROLOGY MAP

FOR NEVIS CAPITAL, LLC

SHEET No. 1 OF 1 SHTS.
DRAWING NO. -
W.O.

N:\20.038.000\DLV\REPORTS\H&H\Hydrology Map\2038-HYD Existing PLOTTED: 9/19/2019 12:19:57 PM



SEAL

REGISTERED PROFESSIONAL ENGINEER
JOHN A. MCCARTHY
No. 47583
Exp. 12/31/19
CIVIL
STATE OF CALIFORNIA

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DIRECT SUPERVISION OF:

JOHN A. MCCARTHY
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XXXX
DATE

Q3 Consulting
27042 Towne Centre Drive, Suite 110
Foothill Ranch, CA 92610
949.259.6770

SCALE:
1"=150'
ONE INCH ON ORIGINAL

CHADWICK RANCH ESTATES

PROPOSED CONDITION HYDROLOGY MAP

FOR NEVIS CAPITAL, LLC

SHEET No. 1 OF 1 SHTS.
DRAWING NO. -
W.O.

N:\20.038.000\DLV\REPORTS\H&H\Hydrology Map\2038-HYD Proposed PLOTTED: 9/26/2019 12:31:12 PM

TECHNICAL APPENDIX

APPENDIX A
Existing Condition Hydrology

Chadwick Ranch - Existing Condition Hydrology
HydroCalc Subarea Input Parameters

project	subarea	area	length	slope	depth	imperviousness	soil	frequency	fire
Bradbury	1A	15.87	1560.852	0.17	8.4	0.01	88	50-yr	0.71
Bradbury	3A	32.55	2527.13	0.16	8.4	0.01	88	50-yr	0.71
Bradbury	5B	18.23	1981.832	0.22	8.6	0.01	78	50-yr	0.71
Bradbury	7B	10.71	1646.658	0.087	8.3	0.01	88	50-yr	0.71
Bradbury	4A	14.28	2569.282	0.16	8.4	0.01	88	50-yr	0.71

Chadwick Ranch - Existing Condition Hydrology
HydroCalc Subarea Output Results

Subarea ID	Area (ac)	Flow Path Length (ft)	Flow Path Slope (vft/hft)	50-yr Rainfall Depth (in)	Percent Impervious	Soil Type	Design Storm Frequency	Fire Factor
1A	15.87	1560.85	0.17	8.4	0.01	88	50-yr	0.71
3A	32.55	2527.13	0.16	8.4	0.01	88	50-yr	0.71
4A	14.28	2569.28	0.16	8.4	0.01	88	50-yr	0.71
5B	18.23	1981.83	0.22	8.6	0.01	78	50-yr	0.71
7B	10.71	1646.66	0.087	8.3	0.01	88	50-yr	0.71

Outputs: Bradbury								
Area (ac)	Modeled (50-yr) Rainfall Depth (in)	Time of Concentration (min)	Clear Peak Flow Rate (cfs)	24-Hr Clear Runoff Volume (ac-ft)	Burned Peak Flow Rate (cfs)	Peak Intensity (in/hr)	Undeveloped Runoff Coefficient (Cu)	Developed Runoff Coefficient (Cd)
1A	8.4	8	47.34	1.90	52.16	4.02	0.74	0.74
3A	8.4	11	78.64	3.87	88.37	3.46	0.70	0.70
4A	8.4	11	34.50	1.70	38.77	3.46	0.70	0.70
5B	8.6	9	47.82	2.38	54.56	3.89	0.67	0.67
7B	8.3	9	29.06	1.26	32.30	3.76	0.72	0.72

File name: Bradbury50yrExistMOD23.lac Run date: Thu Jun 27 14:29:04 2019

Los Angeles County Flood Control District

Modified Rational Method Hydrology

CLEAR WATER ANALYSIS

Storm Day 1 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	15.9	47.32	15.9	47.32	1.900	0	0	0.00000	0.00	0.00	0	88	8	8.40	0.01
1	2A	0.0	0.00	15.9	47.32	1.900	2	1517	0.09800	0.00	0.00	0	88	0	8.40	0.00
1	3A	32.6	78.76	48.5	117.79	5.566	0	0	0.00000	0.00	0.00	0	88	11	8.40	0.01
1	4A	14.3	34.55	62.8	151.46	7.263	0	0	0.00000	0.00	0.00	0	88	11	8.40	0.01
1	5B	18.2	47.74	18.2	47.74	2.375	0	0	0.00000	0.00	0.00	0	78	9	8.60	0.01
1	6B	0.0	0.00	18.2	47.74	2.375	2	1647	0.08000	0.00	0.00	0	78	0	8.60	0.00
1	7B	10.7	29.03	28.9	68.49	3.426	0	0	0.00000	0.00	0.00	0	88	9	8.30	0.01
1	8AB	28.9	68.49	91.7	218.51	10.689	0	0	0.00000	0.00	0.00	0	88	0	8.30	0.00

Storm Day 2 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	15.9	0.32	15.9	0.32	0.002	0	0	0.00000	0.00	0.00	0	88	8	8.40	0.01
1	2A	0.0	0.00	15.9	0.32	0.002	2	1517	0.09800	0.00	0.00	0	88	0	8.40	0.00
1	3A	32.6	0.66	48.5	0.89	0.009	0	0	0.00000	0.00	0.00	0	88	11	8.40	0.01
1	4A	14.3	0.29	62.8	1.18	0.011	0	0	0.00000	0.00	0.00	0	88	11	8.40	0.01
1	5B	18.2	0.38	18.2	0.38	0.002	0	0	0.00000	0.00	0.00	0	78	9	8.60	0.01
1	6B	0.0	0.00	18.2	0.38	0.002	2	1647	0.08000	0.00	0.00	0	78	0	8.60	0.00
1	7B	10.7	0.21	28.9	0.50	0.007	0	0	0.00000	0.00	0.00	0	88	9	8.30	0.01
1	8AB	28.9	0.50	91.7	1.67	0.019	0	0	0.00000	0.00	0.00	0	88	0	8.30	0.00

Storm Day 3 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	15.9	0.00	15.9	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	8	8.40	0.01
1	2A	0.0	0.00	15.9	0.00	0.000	2	1517	0.09800	0.00	0.00	0	88	0	8.40	0.00
1	3A	32.6	0.00	48.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	11	8.40	0.01
1	4A	14.3	0.00	62.8	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	11	8.40	0.01
1	5B	18.2	0.00	18.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	78	9	8.60	0.01
1	6B	0.0	0.00	18.2	0.00	0.000	2	1647	0.08000	0.00	0.00	0	78	0	8.60	0.00
1	7B	10.7	0.00	28.9	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	9	8.30	0.01
1	8AB	28.9	0.00	91.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	0	8.30	0.00

Storm Day 4 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	15.9	0.00	15.9	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	8	8.40	0.01
1	2A	0.0	0.00	15.9	0.00	0.000	2	1517	0.09800	0.00	0.00	0	88	0	8.40	0.00
1	3A	32.6	0.00	48.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	11	8.40	0.01
1	4A	14.3	0.00	62.8	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	11	8.40	0.01
1	5B	18.2	0.00	18.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	78	9	8.60	0.01
1	6B	0.0	0.00	18.2	0.00	0.000	2	1647	0.08000	0.00	0.00	0	78	0	8.60	0.00
1	7B	10.7	0.00	28.9	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	9	8.30	0.01
1	8AB	28.9	0.00	91.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	0	8.30	0.00

Normal End of MODRAT

File name: Bradbury50yrExistMODBurned.lac Run date: Thu Jun 27 10:47:03 2019

Los Angeles County Flood Control District

Modified Rational Method Hydrology

BURNED WATER ANALYSIS

Storm Day 1 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	15.9	52.11	15.9	52.11	3.015	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	15.9	52.11	3.015	2	1517	0.09800	0.00	0.00	0	288	0	8.40	0.00
1	3A	32.6	88.48	48.5	132.93	8.974	0	0	0.00000	0.00	0.00	0	288	11	8.40	0.01
1	4A	14.3	38.81	62.8	170.86	11.677	0	0	0.00000	0.00	0.00	0	288	11	8.40	0.01
1	5B	18.2	54.44	18.2	54.44	3.793	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	6B	0.0	0.00	18.2	54.44	3.793	2	1647	0.08000	0.00	0.00	0	278	0	8.60	0.00
1	7B	10.7	32.25	28.9	78.70	5.578	0	0	0.00000	0.00	0.00	0	288	9	8.30	0.01
1	8AB	28.9	78.70	91.7	247.92	17.255	0	0	0.00000	0.00	0.00	0	288	0	8.30	0.00

Storm Day 2 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	15.9	0.47	15.9	0.47	0.002	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	15.9	0.47	0.002	2	1517	0.09800	0.00	0.00	0	288	0	8.40	0.00
1	3A	32.6	0.97	48.5	1.35	0.013	0	0	0.00000	0.00	0.00	0	288	11	8.40	0.01
1	4A	14.3	0.42	62.8	1.77	0.016	0	0	0.00000	0.00	0.00	0	288	11	8.40	0.01
1	5B	18.2	0.58	18.2	0.58	0.003	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	6B	0.0	0.00	18.2	0.58	0.003	2	1647	0.08000	0.00	0.00	0	278	0	8.60	0.00
1	7B	10.7	0.31	28.9	0.81	0.012	0	0	0.00000	0.00	0.00	0	288	9	8.30	0.01
1	8AB	28.9	0.81	91.7	2.58	0.028	0	0	0.00000	0.00	0.00	0	288	0	8.30	0.00

Storm Day 3 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	15.9	0.00	15.9	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	15.9	0.00	0.000	2	1517	0.09800	0.00	0.00	0	288	0	8.40	0.00
1	3A	32.6	0.00	48.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	11	8.40	0.01
1	4A	14.3	0.00	62.8	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	11	8.40	0.01
1	5B	18.2	0.00	18.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	6B	0.0	0.00	18.2	0.00	0.000	2	1647	0.08000	0.00	0.00	0	278	0	8.60	0.00
1	7B	10.7	0.00	28.9	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	9	8.30	0.01
1	8AB	28.9	0.00	91.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	0	8.30	0.00

Storm Day 4 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	15.9	0.00	15.9	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	15.9	0.00	0.000	2	1517	0.09800	0.00	0.00	0	288	0	8.40	0.00
1	3A	32.6	0.00	48.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	11	8.40	0.01
1	4A	14.3	0.00	62.8	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	11	8.40	0.01
1	5B	18.2	0.00	18.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	6B	0.0	0.00	18.2	0.00	0.000	2	1647	0.08000	0.00	0.00	0	278	0	8.60	0.00
1	7B	10.7	0.00	28.9	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	9	8.30	0.01
1	8AB	28.9	0.00	91.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	0	8.30	0.00

Normal End of MODRAT

APPENDIX B
Proposed Condition Hydrology

Chadwick Ranch - Project Condition Hydrology
HydroCalc Subarea Input Parameters

project	subarea	area	length	slope	depth	imperviousness	soil	frequency	fire
Bradbury	10A	11.6	810	0.151	8.1	0.01	88	50-yr	0.71
Bradbury	11C	20.67	1895.057	0.205	8.6	0.01	78	50-yr	0.71
Bradbury	13C	7.7	1390.36	0.185	8.4	0.01	78	50-yr	0.71
Bradbury	1A	9.08	1460.657	0.108	8.4	0.01	88	50-yr	0.71
Bradbury	3A	4.22	510.208	0.173	8.3	0.01	88	50-yr	0.71
Bradbury	5B	14.53	3292.065	0.1139	8.5	0.3055	88	50-yr	0
Bradbury	7B	26.74	2837.624	0.0952	8.3	0.322	88	50-yr	0

Chadwick Ranch - Project Condition Hydrology
HydroCalc Subarea Output Results

Subarea ID	Area (ac)	Flow Path Length (ft)	Flow Path Slope (vft/hft)	50-yr Rainfall Depth (in)	Percent Impervious	Soil Type	Design Storm Frequency	Fire Factor
1A	9.08	1460.66	0.108	8.4	0.01	88	50-yr	0.71
3A	4.22	510.21	0.173	8.3	0.01	88	50-yr	0.71
5B	14.53	3292.07	0.1139	8.5	0.3055	88	50-yr	0
7B	26.74	2837.62	0.0952	8.3	0.322	88	50-yr	0
10A	11.6	810.00	0.151	8.1	0.01	88	50-yr	0.71
11C	20.67	1895.06	0.205	8.6	0.01	78	50-yr	0.71
13C	7.7	1390.36	0.185	8.4	0.01	78	50-yr	0.71

Outputs: Bradbury								
Area (ac)	Modeled (50-yr) Rainfall Depth (in)	Time of Concentration (min)	Clear Peak Flow Rate (cfs)	24-Hr Clear Runoff Volume (ac-ft)	Burned Peak Flow Rate (cfs)	Peak Intensity (in/hr)	Undeveloped Runoff Coefficient (Cu)	Developed Runoff Coefficient (Cd)
1A	8.4	8	27.09	1.09	29.84	4.02	0.74	0.74
3A	8.3	5	16.71	0.50	17.97	4.95	0.80	0.80
5B	8.5	13	34.87	3.97	34.87	3.24	0.67	0.74
7B	8.3	13	62.51	7.33	62.51	3.16	0.66	0.74
10A	8.1	5	44.52	1.33	47.99	4.83	0.79	0.79
11C	8.6	9	54.22	2.70	61.87	3.89	0.67	0.67
13C	8.4	7	22.85	0.97	25.84	4.28	0.69	0.69

File name: BradburyProp50yr.lac Run date: Thu Jun 27 16:52:19 2019

Los Angeles County Flood Control District

Modified Rational Method Hydrology

CLEAR WATER ANALYSIS - Project Condition – No Routing

Storm Day 1 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	27.08	9.1	27.08	1.087	0	0	0.00000	0.00	0.00	0	88	8	8.40	0.01
1	2A	0.0	0.00	9.1	27.08	1.087	4	966	0.10767	4.00	0.00	0	88	0	8.40	0.00
1	3A	4.2	16.63	13.3	41.49	1.385	0	0	0.00000	0.00	0.00	0	88	5	8.30	0.01
1	4A	0.0	0.00	13.3	41.49	1.385	4	177	0.02820	4.00	0.00	0	88	0	8.30	0.00
1	5B	14.5	34.82	14.5	34.82	3.979	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	34.82	3.979	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	62.32	41.2	95.87	11.044	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	95.87	11.044	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	136.24	12.034	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	44.52	66.1	171.29	13.154	0	0	0.00000	0.00	0.00	0	88	5	8.10	0.01
1	11C	20.7	54.30	20.7	54.30	2.701	0	0	0.00000	0.00	0.00	0	78	9	8.60	0.01
1	12C	0.0	0.00	20.7	54.30	2.701	4	563	0.11720	4.00	0.00	0	78	0	8.60	0.00
1	13C	7.7	22.77	28.4	76.62	3.478	0	0	0.00000	0.00	0.00	0	78	7	8.40	0.01
1	14C	0.0	0.00	28.4	76.62	3.478	4	819	0.13310	4.00	0.00	0	78	0	8.40	0.00
1	15C	0.0	0.00	28.4	75.93	3.281	2	620	0.05650	0.00	0.00	0	78	0	8.40	0.00
1	16AC	28.4	0.00	94.5	241.31	16.233	0	0	0.00000	0.00	0.00	0	78	0	8.40	0.00

Storm Day 2 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.18	9.1	0.18	0.001	0	0	0.00000	0.00	0.00	0	88	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.18	0.001	4	966	0.10767	4.00	0.00	0	88	0	8.40	0.00
1	3A	4.2	0.08	13.3	0.17	0.001	0	0	0.00000	0.00	0.00	0	88	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.17	0.001	4	177	0.02820	4.00	0.00	0	88	0	8.30	0.00
1	5B	14.5	0.96	14.5	0.96	0.009	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.96	0.009	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	1.76	41.2	2.63	0.027	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	2.63	0.027	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	2.60	0.026	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.23	66.1	2.73	0.033	0	0	0.00000	0.00	0.00	0	88	5	8.10	0.01
1	11C	20.7	0.43	20.7	0.43	0.003	0	0	0.00000	0.00	0.00	0	78	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.43	0.003	4	563	0.11720	4.00	0.00	0	78	0	8.60	0.00
1	13C	7.7	0.16	28.4	0.48	0.003	0	0	0.00000	0.00	0.00	0	78	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.48	0.003	4	819	0.13310	4.00	0.00	0	78	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.39	0.002	2	620	0.05650	0.00	0.00	0	78	0	8.40	0.00
1	16AC	28.4	0.00	94.5	3.03	0.036	0	0	0.00000	0.00	0.00	0	78	0	8.40	0.00

Storm Day 3 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.00	9.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.00	0.000	4	966	0.10767	4.00	0.00	0	88	0	8.40	0.00
1	3A	4.2	0.00	13.3	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.00	0.000	4	177	0.02820	4.00	0.00	0	88	0	8.30	0.00
1	5B	14.5	0.00	14.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.00	0.000	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	0.00	41.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	0.00	0.000	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	0.00	0.000	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.00	66.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	5	8.10	0.01
1	11C	20.7	0.00	20.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	78	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.00	0.000	4	563	0.11720	4.00	0.00	0	78	0	8.60	0.00
1	13C	7.7	0.00	28.4	0.00	0.000	0	0	0.00000	0.00	0.00	0	78	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.00	0.000	4	819	0.13310	4.00	0.00	0	78	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.00	0.000	2	620	0.05650	0.00	0.00	0	78	0	8.40	0.00
1	16AC	28.4	0.00	94.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	78	0	8.40	0.00

Storm Day 4 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.00	9.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.00	0.000	4	966	0.10767	4.00	0.00	0	88	0	8.40	0.00
1	3A	4.2	0.00	13.3	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.00	0.000	4	177	0.02820	4.00	0.00	0	88	0	8.30	0.00
1	5B	14.5	0.00	14.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.00	0.000	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	0.00	41.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	0.00	0.000	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	0.00	0.000	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.00	66.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	5	8.10	0.01
1	11C	20.7	0.00	20.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	78	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.00	0.000	4	563	0.11720	4.00	0.00	0	78	0	8.60	0.00
1	13C	7.7	0.00	28.4	0.00	0.000	0	0	0.00000	0.00	0.00	0	78	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.00	0.000	4	819	0.13310	4.00	0.00	0	78	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.00	0.000	2	620	0.05650	0.00	0.00	0	78	0	8.40	0.00
1	16AC	28.4	0.00	94.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	78	0	8.40	0.00

Normal End of MODRAT

File name: BradburyProp50yr_Burned.lac Run date: Thu Sep 26 07:55:59 2019

Los Angeles County Flood Control District

Modified Rational Method Hydrology

BURNED WATER ANALYSIS - Project Condition – No Routing

Storm Day 1 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	31.01	9.1	31.01	2.022	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	9.1	31.01	2.022	4	966	0.10767	4.00	0.00	0	288	0	8.40	0.00
1	3A	4.2	18.42	13.3	47.38	2.742	0	0	0.00000	0.00	0.00	0	288	5	8.30	0.01
1	4A	0.0	0.00	13.3	47.38	2.742	4	177	0.02820	4.00	0.00	0	288	0	8.30	0.00
1	5B	14.5	34.82	14.5	34.82	3.979	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	34.82	3.979	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	62.32	41.2	95.87	11.044	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	95.87	11.044	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	142.02	13.390	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	49.46	66.1	182.22	15.632	0	0	0.00000	0.00	0.00	0	288	5	8.10	0.01
1	11C	20.7	65.25	20.7	65.25	5.065	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	12C	0.0	0.00	20.7	65.25	5.065	4	563	0.11720	4.00	0.00	0	278	0	8.60	0.00
1	13C	7.7	27.03	28.4	91.86	6.689	0	0	0.00000	0.00	0.00	0	278	7	8.40	0.01
1	14C	0.0	0.00	28.4	91.86	6.689	4	819	0.13310	4.00	0.00	0	278	0	8.40	0.00
1	15C	0.0	0.00	28.4	91.06	6.491	2	620	0.05650	0.00	0.00	0	278	0	8.40	0.00
1	16AC	28.4	0.00	94.5	267.69	21.918	0	0	0.00000	0.00	0.00	0	278	0	8.40	0.00

Storm Day 2 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.31	9.1	0.31	0.001	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.31	0.001	4	966	0.10767	4.00	0.00	0	288	0	8.40	0.00
1	3A	4.2	0.14	13.3	0.35	0.001	0	0	0.00000	0.00	0.00	0	288	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.35	0.001	4	177	0.02820	4.00	0.00	0	288	0	8.30	0.00
1	5B	14.5	0.96	14.5	0.96	0.009	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.96	0.009	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	1.76	41.2	2.63	0.027	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	2.63	0.027	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	2.78	0.027	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.37	66.1	3.07	0.034	0	0	0.00000	0.00	0.00	0	288	5	8.10	0.01
1	11C	20.7	0.77	20.7	0.77	0.004	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.77	0.004	4	563	0.11720	4.00	0.00	0	278	0	8.60	0.00
1	13C	7.7	0.28	28.4	0.95	0.005	0	0	0.00000	0.00	0.00	0	278	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.95	0.005	4	819	0.13310	4.00	0.00	0	278	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.86	0.005	2	620	0.05650	0.00	0.00	0	278	0	8.40	0.00
1	16AC	28.4	0.00	94.5	3.84	0.044	0	0	0.00000	0.00	0.00	0	278	0	8.40	0.00

Storm Day 3 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.00	9.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.00	0.000	4	966	0.10767	4.00	0.00	0	288	0	8.40	0.00
1	3A	4.2	0.00	13.3	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.00	0.000	4	177	0.02820	4.00	0.00	0	288	0	8.30	0.00
1	5B	14.5	0.00	14.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.00	0.000	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	0.00	41.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	0.00	0.000	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	0.00	0.000	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.00	66.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	5	8.10	0.01
1	11C	20.7	0.00	20.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.00	0.000	4	563	0.11720	4.00	0.00	0	278	0	8.60	0.00
1	13C	7.7	0.00	28.4	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.00	0.000	4	819	0.13310	4.00	0.00	0	278	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.00	0.000	2	620	0.05650	0.00	0.00	0	278	0	8.40	0.00
1	16AC	28.4	0.00	94.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	0	8.40	0.00

Storm Day 4 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.00	9.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.00	0.000	4	966	0.10767	4.00	0.00	0	288	0	8.40	0.00
1	3A	4.2	0.00	13.3	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.00	0.000	4	177	0.02820	4.00	0.00	0	288	0	8.30	0.00
1	5B	14.5	0.00	14.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.00	0.000	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	0.00	41.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	0.00	0.000	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	0.00	0.000	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.00	66.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	5	8.10	0.01
1	11C	20.7	0.00	20.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.00	0.000	4	563	0.11720	4.00	0.00	0	278	0	8.60	0.00
1	13C	7.7	0.00	28.4	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.00	0.000	4	819	0.13310	4.00	0.00	0	278	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.00	0.000	2	620	0.05650	0.00	0.00	0	278	0	8.40	0.00
1	16AC	28.4	0.00	94.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	0	8.40	0.00

Normal End of MODRAT

File name: BradburyProp_3.5ft-burned.lac Run date: Thu Sep 26 07:43:15 2019

Los Angeles County Flood Control District

Modified Rational Method Hydrology

BURNED WATER ANALYSIS - Project Condition – With Basin Routing (Mitigated)

Storm Day 1 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	31.01	9.1	31.01	2.022	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	9.1	31.01	2.022	4	966	0.10767	4.00	0.00	0	288	0	8.40	0.00
1	3A	4.2	18.42	13.3	47.38	2.742	0	0	0.00000	0.00	0.00	0	288	5	8.30	0.01
1	4A	0.0	0.00	13.3	47.38	2.742	4	177	0.02820	4.00	0.00	0	288	0	8.30	0.00
1	5B	14.5	34.82	14.5	34.82	3.979	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	34.82	3.979	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	62.32	41.2	95.87	11.044	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	95.87	11.044	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	84.26	13.187	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	49.46	66.1	123.81	15.427	0	0	0.00000	0.00	0.00	0	288	5	8.10	0.01
1	11C	20.7	65.25	20.7	65.25	5.065	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	12C	0.0	0.00	20.7	65.25	5.065	4	563	0.11720	4.00	0.00	0	278	0	8.60	0.00
1	13C	7.7	27.03	28.4	91.86	6.689	0	0	0.00000	0.00	0.00	0	278	7	8.40	0.01
1	14C	0.0	0.00	28.4	91.86	6.689	4	819	0.13310	4.00	0.00	0	278	0	8.40	0.00
1	15C	0.0	0.00	28.4	91.06	6.491	2	620	0.05650	0.00	0.00	0	278	0	8.40	0.00
1	16AC	28.4	0.00	94.5	209.69	21.713	0	0	0.00000	0.00	0.00	0	278	0	8.40	0.00

Storm Day 2 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.31	9.1	0.31	0.001	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.31	0.001	4	966	0.10767	4.00	0.00	0	288	0	8.40	0.00
1	3A	4.2	0.14	13.3	0.35	0.001	0	0	0.00000	0.00	0.00	0	288	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.35	0.001	4	177	0.02820	4.00	0.00	0	288	0	8.30	0.00
1	5B	14.5	0.96	14.5	0.96	0.009	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.96	0.009	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	1.76	41.2	2.63	0.027	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	2.63	0.027	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	3.14	0.202	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.37	66.1	3.42	0.190	0	0	0.00000	0.00	0.00	0	288	5	8.10	0.01
1	11C	20.7	0.77	20.7	0.77	0.004	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.77	0.004	4	563	0.11720	4.00	0.00	0	278	0	8.60	0.00
1	13C	7.7	0.28	28.4	0.95	0.005	0	0	0.00000	0.00	0.00	0	278	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.95	0.005	4	819	0.13310	4.00	0.00	0	278	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.86	0.005	2	620	0.05650	0.00	0.00	0	278	0	8.40	0.00
1	16AC	28.4	0.00	94.5	4.20	0.200	0	0	0.00000	0.00	0.00	0	278	0	8.40	0.00

Storm Day 3 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.00	9.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.00	0.000	4	966	0.10767	4.00	0.00	0	288	0	8.40	0.00
1	3A	4.2	0.00	13.3	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.00	0.000	4	177	0.02820	4.00	0.00	0	288	0	8.30	0.00
1	5B	14.5	0.00	14.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.00	0.000	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	0.00	41.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	0.00	0.000	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	0.00	0.000	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.00	66.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	5	8.10	0.01
1	11C	20.7	0.00	20.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.00	0.000	4	563	0.11720	4.00	0.00	0	278	0	8.60	0.00
1	13C	7.7	0.00	28.4	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.00	0.000	4	819	0.13310	4.00	0.00	0	278	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.00	0.000	2	620	0.05650	0.00	0.00	0	278	0	8.40	0.00
1	16AC	28.4	0.00	94.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	0	8.40	0.00

Storm Day 4 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	9.1	0.00	9.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	8	8.40	0.01
1	2A	0.0	0.00	9.1	0.00	0.000	4	966	0.10767	4.00	0.00	0	288	0	8.40	0.00
1	3A	4.2	0.00	13.3	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	5	8.30	0.01
1	4A	0.0	0.00	13.3	0.00	0.000	4	177	0.02820	4.00	0.00	0	288	0	8.30	0.00
1	5B	14.5	0.00	14.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.50	0.31
1	6B	0.0	0.00	14.5	0.00	0.000	4	1612	0.08683	4.00	0.00	0	88	0	8.50	0.00
1	7B	26.7	0.00	41.2	0.00	0.000	0	0	0.00000	0.00	0.00	0	88	13	8.30	0.32
1	8B	0.0	0.00	41.2	0.00	0.000	4	135	0.06640	4.00	0.00	0	88	0	8.30	0.00
1	9AB	41.2	0.00	54.5	0.00	0.000	4	691	0.05790	4.00	0.00	0	88	0	8.30	0.00
1	10A	11.6	0.00	66.1	0.00	0.000	0	0	0.00000	0.00	0.00	0	288	5	8.10	0.01
1	11C	20.7	0.00	20.7	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	9	8.60	0.01
1	12C	0.0	0.00	20.7	0.00	0.000	4	563	0.11720	4.00	0.00	0	278	0	8.60	0.00
1	13C	7.7	0.00	28.4	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	7	8.40	0.01
1	14C	0.0	0.00	28.4	0.00	0.000	4	819	0.13310	4.00	0.00	0	278	0	8.40	0.00
1	15C	0.0	0.00	28.4	0.00	0.000	2	620	0.05650	0.00	0.00	0	278	0	8.40	0.00
1	16AC	28.4	0.00	94.5	0.00	0.000	0	0	0.00000	0.00	0.00	0	278	0	8.40	0.00

Normal End of MODRAT

APPENDIX C
Detention Basin Routing Calculations

Detention Basin 8B

Elevation	Surface Area (ft^2)	Volume (ft^3)	Incremental Volume (ac-ft)	Cum Vol (ac-ft)	Discharges (cfs)
834	13007	0	0	0	0
835	15021	14014	0.3217	0.3217	6.1
836	17035.00	16028	0.3680	0.6897	21.6
837	19049	18042	0.4142	1.1039	42.2
838	21063	20056	0.4604	1.5643	63.4
838.19	21466	4040.255	0.0928	1.6570	68
840	25091	42134.085	0.9673	2.6243	104

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 27, 2019
Chadwick_Bradbury
Stage Discharge 8B
EPearson 06-27-19

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet)	3.50
FHWA Chart Number (1,2 or 3)	1
Scale Number on Chart (Type of Culvert Entrance)	2
Manning`s Roughness Coefficient (n-value)	0.0130
Entrance Loss Coefficient of Culvert Opening	0.50
Culvert Length (feet)	200.0
Culvert Slope (feet per foot)	0.0500

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
68.0	1.00	4.19	-4.89	1.32	2.58	1.32	20.42
6.1	0.10	1.00	-7.86	0.39	0.74	0.39	10.41
21.6	1.00	2.00	-7.33	0.73	1.43	0.73	14.77
42.2	1.00	3.00	-6.44	1.03	2.02	1.03	17.95
63.4	1.00	4.00	-5.20	1.26	2.50	1.26	20.23
104.0	1.00	6.00	-1.85	1.67	3.11	1.67	22.90

==========

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APPENDIX D
LID Plan

Chadwick Ranch Estates (TTM No. 82349)
LID Plan
City of Bradbury, CA

Prepared for:

Nevis Capital, LLC
335 N. Berry Street
Brea, CA 92821

Prepared by:

Q3 Consulting
27042 Towne Centre Drive, Suite 110
Foothill Ranch, CA 92610

In association with:
Proactive Engineering Consultants, Inc.

JN 20.038.000

Prepared: September 27, 2019

PROACTIVE ENGINEERING CONSULTANTS | Q3 Consulting

Table of Contents

1. INTRODUCTION ____ 1
2. STORMWATER QUALITY ____ 1
2.1 Infiltration Infeasibility ____ *1*
2.2 Source Control Measures ____ *2*
2.3 Stormwater Quality Design Volume (SWQDv) ____ *3*
2.4 Stormwater Runoff Harvest and Use Feasibility ____ *4*
2.5 Alternative Compliance On-Site Biofiltration ____ *4*
3. HYDRMODIFICATION EXEMPTION ____ 6
4. MAINTENANCE PLAN ____ 7
5. REFERENCES ____ 8

Exhibits

Exhibit A –BMP Exhibit

Technical Appendices

Appendix A: HydroCalc SWQDv Calculations

1. INTRODUCTION

The Chadwick Ranch Estates, Tentative Tract Map (TTM) No. 82349 is located in the San Gabriel River watershed in the City of Bradbury. The property is approximately 111 acres and is located on the foothills of the San Gabriel Mountains, with elevations ranging from approximately 1,790 feet above mean sea level (amsl) to 790 feet amsl. The site is currently undeveloped and drains to the Bradbury and Spinks Debris Basins. The debris basins are owned and maintained by the Los Angeles County Flood Control District (LACFCD).

The Chadwick Ranch Estates Project area will create 14 estate residential parcels with trails on the property. The development will include the installation of a water tank, a booster station, and debris and detention basins. The residential estates would allow a primary home and a guest house, and other ancillary structures including but not limited to garages and stables. The undisturbed open space will be dedicated to a conservancy and will ensure that 51% of the site remains undisturbed in perpetuity. Flow runoff from the project site is proposed to outlet at Spinks Basin.

This plan summarizes the project's stormwater quality methodology and results in order to demonstrate compliance with the County's LID Ordinance and LID Standards Manual.

2. STORMWATER QUALITY

The Chadwick Ranch Estates Project is a Designated Project. The proposed development will generate more than 1 acre of disturbed area and adds more than 10,000 square feet of impervious surface area.

2.1 INFILTRATION INFEASIBILITY

Based on preliminary engineering evaluation and site investigation, the geotechnical consultant Petra Geosciences, Inc. does not recommend infiltration for the project site due to the site's rock/soil characteristics. The infiltration of surface waters would have an adverse impact on the stability of the proposed and existing slopes.

Therefore, the project will meet stormwater quality mitigation requirements through biofiltration, which is further discussed in Section 2.5.

2.2 SOURCE CONTROL MEASURES

The table below summarizes the source control measures to be implemented.

Table 1 : Source Control Measures

Source Control Measure	Included	Not Applicable	Reason Source Control is Not Applicable
Storm Drain Message and Signage (S-1)	✕		
Outdoor Material Storage Area (S-2)		✕	No outdoor storage areas proposed
Outdoor Trash Storage and Waste Handling Area (S-3)		✕	No designated trash enclosures proposed
Outdoor Loading/Unloading Dock Area (S-4)		✕	No loading docks proposed
Outdoor Vehicle/Equipment Repair /Maintenance Area (S-5)		✕	No outdoor vehicle repair and maintenance area proposed
Outdoor Vehicle/Equipment /Accessory Wash Area (S-6)		✕	No outdoor vehicle wash areas proposed
Fuel & Maintenance Area (S-7)		✕	No vehicle/equipment fueling areas proposed
Landscape Irrigation Practices (S-8)	✕		
Building Materials (S-9)	✕		
Animal Care and Handling Facilities (S-10)	✕		
Outdoor Horticulture Areas (S-11)		✕	No horticulture areas proposed

2.3 STORMWATER QUALITY DESIGN VOLUME (SWQDV)

Per the LID Standards Manual, HydroCalc was used to calculate the SWQDv for each subarea of the watershed. The soil type was developed using the guidelines set in the Los Angeles County Hydrology Manual. The storm frequency was selected per LID Standards Manual guidelines.

Subareas 5B and 7B encompass the residential development area while the rest of the subareas are primarily undisturbed or include minimal slope grading whose runoff does not confluence with the primary runoff from the residential areas. Therefore, the SWQDv was only calculated subareas 5B and 7B.

Subarea 7B encompasses undisturbed slope area on its western boundary. The runoff from this area, which amounts to approximately 1.79 ac, is captured by an existing ditch along the street which joins a proposed v-ditch and ultimately outlets to Spinks Basin. The flows from the undisturbed area do not confluence with the proposed project storm drain and is therefore not included in the area for SWQDv calculations. Thus the area used to calculate SWQDv for subarea 7B is 26.74 – 1.79 = 24.95 ac.

Table 2 : HydroCalc Input Parameters

Subarea	Area (ac)	Length (ft)	Slope (ft/ft)	Depth (in)	Imperv	Soil Type	Frequency	Fire Factor
5B	14.53	3,292	0.11	1.3	0.31	88	85th percentile storm	0
7B	24.95	2,838	0.10	1.3	0.32	88	85th percentile storm	0

Table 3 : Total SWQDv

Subarea	Total Area (ac)	SWQDv (cf)
5B	14.53	23,421.4
7B	24.95	41,758.6
Total	**39.48**	**65,180**

2.4 STORMWATER RUNOFF HARVEST AND USE FEASIBILITY

The irrigation demands for the project site are not expected to be enough for harvest and use to be feasible.

The project site's stormwater runoff will be treated with biofiltration per the LID Manual standards and is further discussed in the section below.

2.5 ALTERNATIVE COMPLIANCE ON-SITE BIOFILTRATION

Since the SQWDv is unable to be fully retained on the project site due to the site's infiltration infeasibility, the project will meet stormwater quality requirements through biofiltration.

Per Section 7.4 of the LID Standards Manual, the biofiltration volume (V_b) is calculated by the equation below:

$$V_b = 1.5 \times (SWQDv - V_r)$$

Since there is no on-site retention proposed for this project, the equation is simplified to the following:

$$V_b = 1.5 \times SWQDv$$

Subareas 5B and 7B encompass the residential development area while the rest of the subareas are primarily undisturbed or include minimal slope grading. Therefore, only the runoff from the proposed developed areas of subareas 5B and 7B will be treated for water quality.

A total of 4 Modular Wetland System (MWS) units are proposed in order to treat the biofiltration volume.

As shown in Exhibit A, subarea 5B and the west side of 7B are treated at BMPs M3& M4. The SWQDv for the west side of 7B was calculated by prorating the SWQDv for the entire developed 7B subarea. The remaining area of 7B on the east side is treated at BMPs M1 & M2.

Table 4 summarizes the V_b calculations and MWS sizing.

Table 4 : MWS Units						
BMP	**MWS Model #**	**MWS Unit Capacity (cf)**	**Tributary Subarea**	**Tributary Area (ac)**	**SWQDv (cf)**	**V_b (cf)**
M1	L-8-24	30,216	East side of 7B	24.95 – 1.34 =23.61	41,758.6 – 2,238.5 = 39,520.1	59,280.2
M2	L-8-24	30,216				
M3	L-8-16	20,145	5B & West side of 7B	14.53+1.34 = 15.87	*West side of 7B*: $1.34\ ac \times \frac{41{,}758.6\ cf}{24.95\ ac}$ = 2,238.5 *5B + West side of 7B:* 23,421.4 + 2,238.5 = 25,659.9	38,489.7
M4	L-8-16	20,145				
Total		**100,722**		**39.48**	**65,180**	**97,769.9**

3. HYDRMODIFICATION EXEMPTION

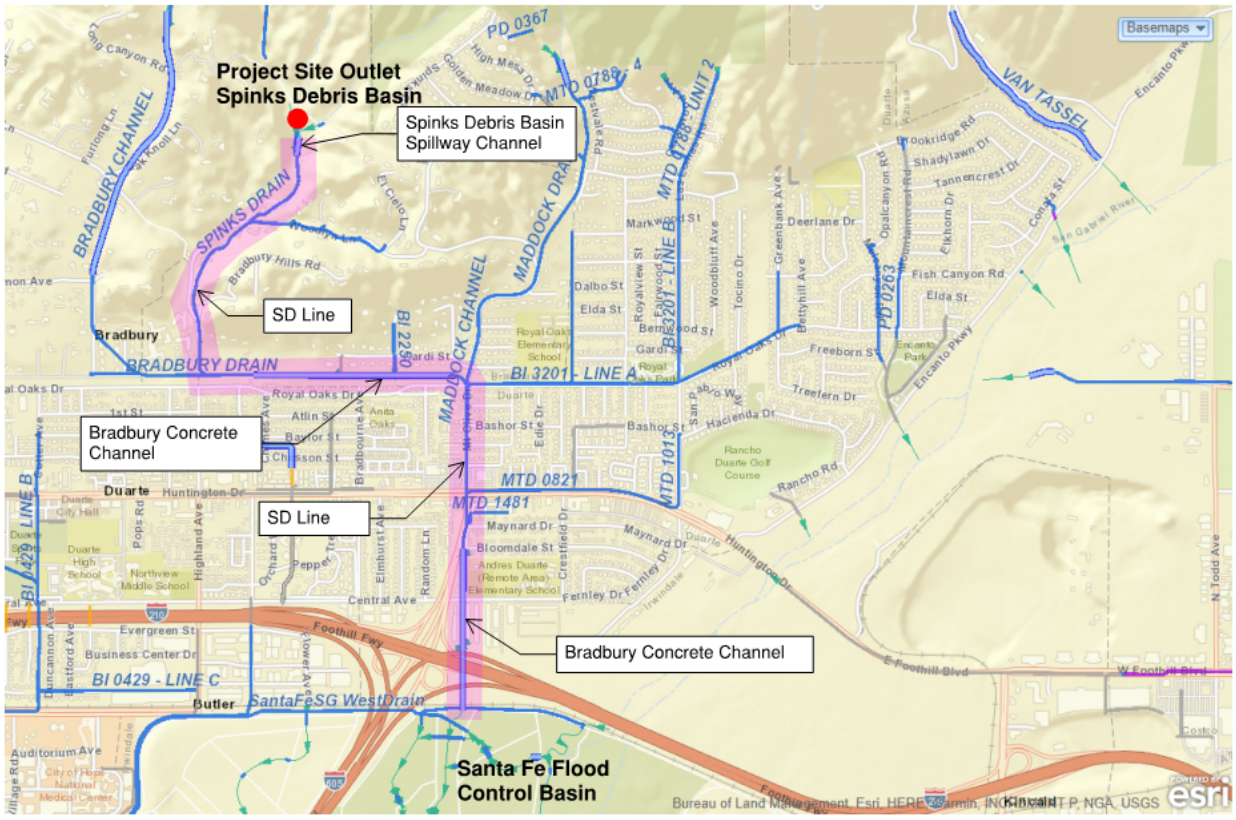
The proposed project meets the following hydromodification exemption requirements per the LID Standards Manual :

1. The project discharges directly or through a storm drain into an engineered channel and discharges into a receiving water that is not susceptible to hydromodification impacts.
2. The project is single family residence developments that incorporate LID BMPs in accordance with the LID Standards Manual

Figure 1 was generated from the web-based Los Angeles County Storm Drain System. The total runoff from the project site outlets into the Spinks Debris Basin. From the Spinks Debris Basin, flows are conveyed through storm drain lines and engineered concrete channels until they are ultimately discharged into the Santa Fe Flood Control Basin.

In the worst case scenario of a burned watershed, the proposed project's 50-year peak discharge of 259.7 cfs is not a significant contribution of flow to cause hydromodification to the Santa Fe Flood Control Basin.

Figure 1 : Project Downstream Flow Path



In addition, the project proposes 14 single family residential estates and incorporates LID BMPs per the LID Standards Manual and therefore meets the hydromodification exemption per the LID Standards Manual.

4. MAINTENANCE PLAN

All common areas within the project and areas that require ongoing maintenance will be maintained through a Homeowner's Association.

A Maintenance Plan and Maintenance Agreement will be submitted during the final design phase.

5. REFERENCES

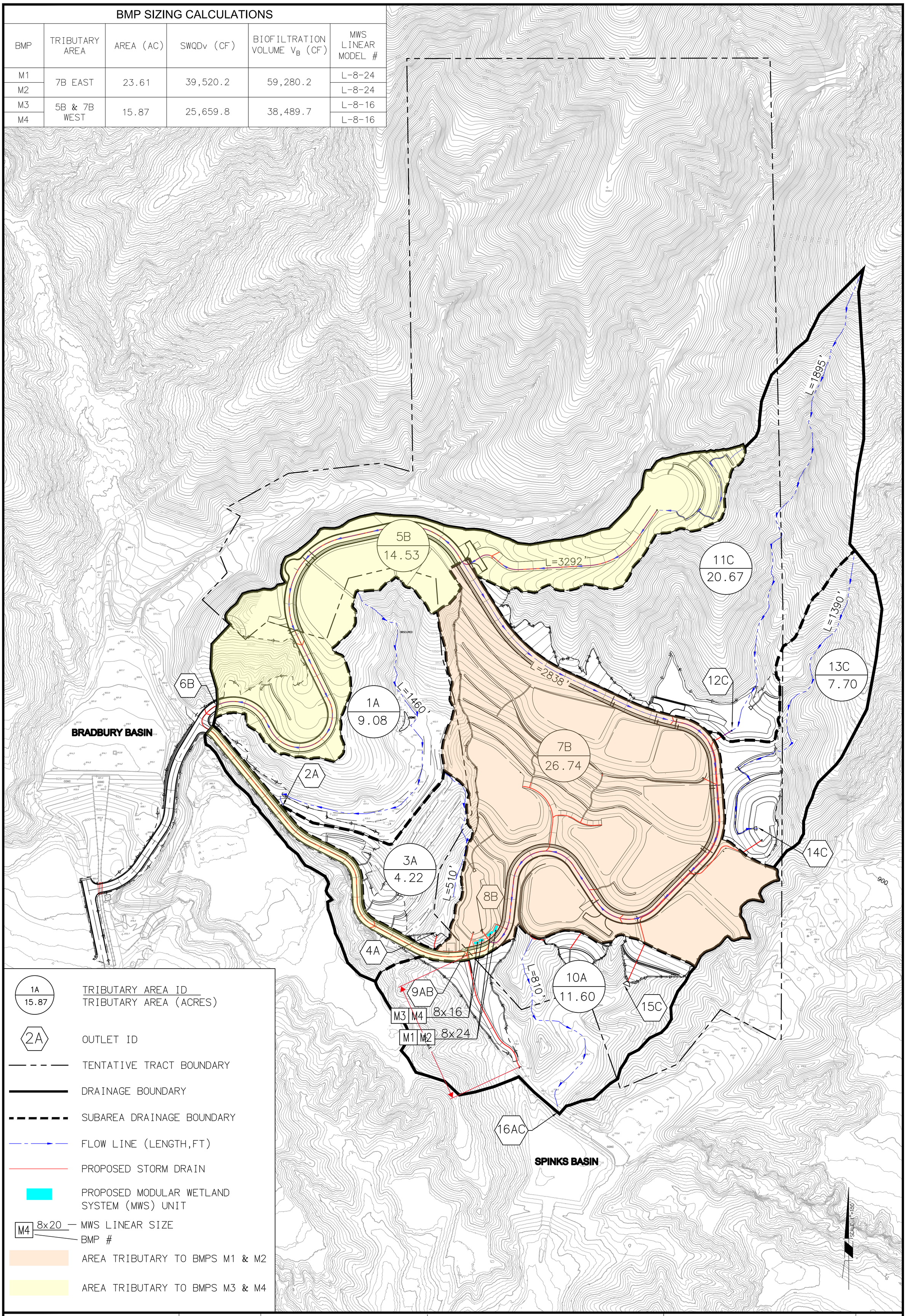
Los Angeles County Department of Public Works (LACDPW), 2014. LID Standards Design Manual. February.

Los Angeles County Department of Public Works (LACDPW), 2006. Hydrology Manual. January.

EXHIBITS

BMP SIZING CALCULATIONS

BMP	TRIBUTARY AREA	AREA (AC)	SWQDv (CF)	BIOFILTRATION VOLUME V_B (CF)	MWS LINEAR MODEL #
M1	7B EAST	23.61	39,520.2	59,280.2	L-8-24
M2					L-8-24
M3	5B & 7B WEST	15.87	25,659.8	38,489.7	L-8-16
M4					L-8-16



1A / 15.87 — TRIBUTARY AREA ID / TRIBUTARY AREA (ACRES)

2A — OUTLET ID

TENTATIVE TRACT BOUNDARY

DRAINAGE BOUNDARY

SUBAREA DRAINAGE BOUNDARY

FLOW LINE (LENGTH,FT)

PROPOSED STORM DRAIN

PROPOSED MODULAR WETLAND SYSTEM (MWS) UNIT

M4 / 8x20 — MWS LINEAR SIZE / BMP #

AREA TRIBUTARY TO BMPS M1 & M2

AREA TRIBUTARY TO BMPS M3 & M4

SEAL

REGISTERED PROFESSIONAL ENGINEER — JOHN A. MCCARTHY — No. 47583 — Exp. 12/31/19 — CIVIL — STATE OF CALIFORNIA

PREPARED UNDER THE DIRECT SUPERVISION OF:

JOHN A. MCCARTHY — XXXX DATE

R.C.E. No. 47583 EXP. DATE: 12/31/19

Q3 Consulting
27042 Towne Centre Drive, Suite 110
Foothill Ranch, CA 92610
949.259.6770

SCALE: 1"=150'

ONE INCH ON ORIGINAL

CHADWICK RANCH ESTATES

BMP EXHIBIT

FOR NEVIS CAPITAL, LLC

SHEET No. 1 OF 1 SHTS.

DRAWING NO. -

W.O.

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TECHNICAL APPENDIX

APPENDIX A
HydroCalc SWQDv Calculations

Peak Flow Hydrologic Analysis

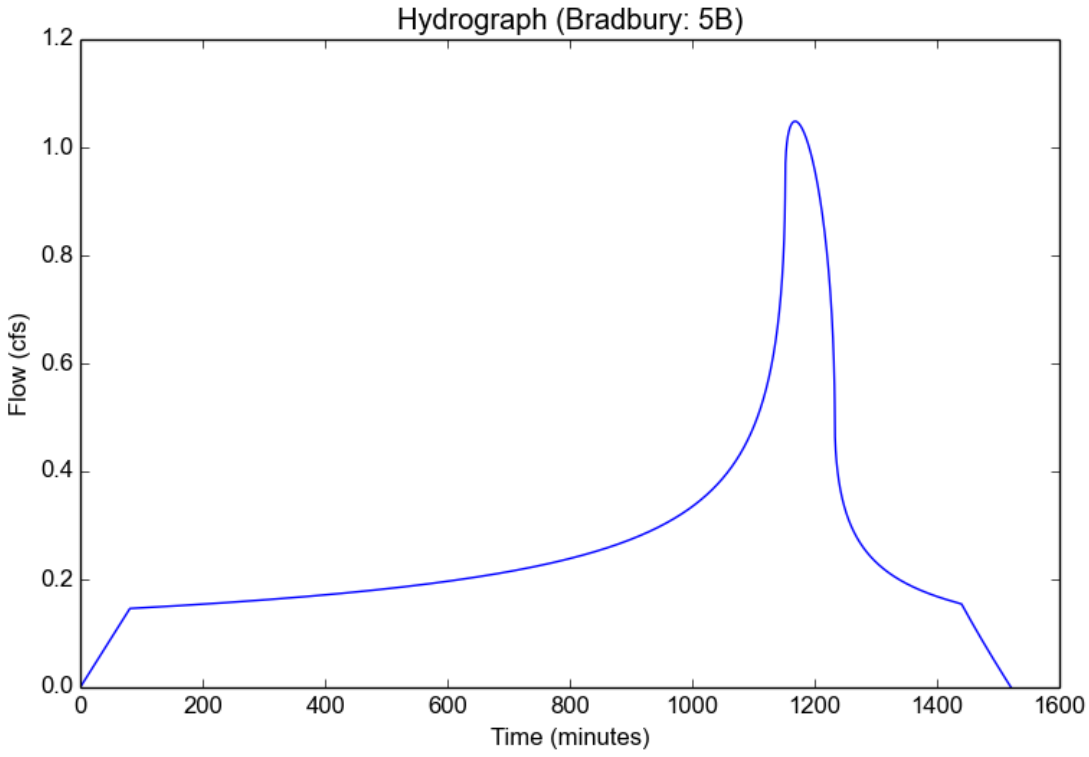
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	Bradbury
Subarea ID	5B
Area (ac)	14.53
Flow Path Length (ft)	3292.065
Flow Path Slope (vft/hft)	0.1139
85th Percentile Rainfall Depth (in)	1.3
Percent Impervious	0.3055
Soil Type	88
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.3
Peak Intensity (in/hr)	0.2095
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.3444
Time of Concentration (min)	81.0
Clear Peak Flow Rate (cfs)	1.0483
Burned Peak Flow Rate (cfs)	1.0483
24-Hr Clear Runoff Volume (ac-ft)	0.5377
24-Hr Clear Runoff Volume (cu-ft)	23421.3653



Peak Flow Hydrologic Analysis

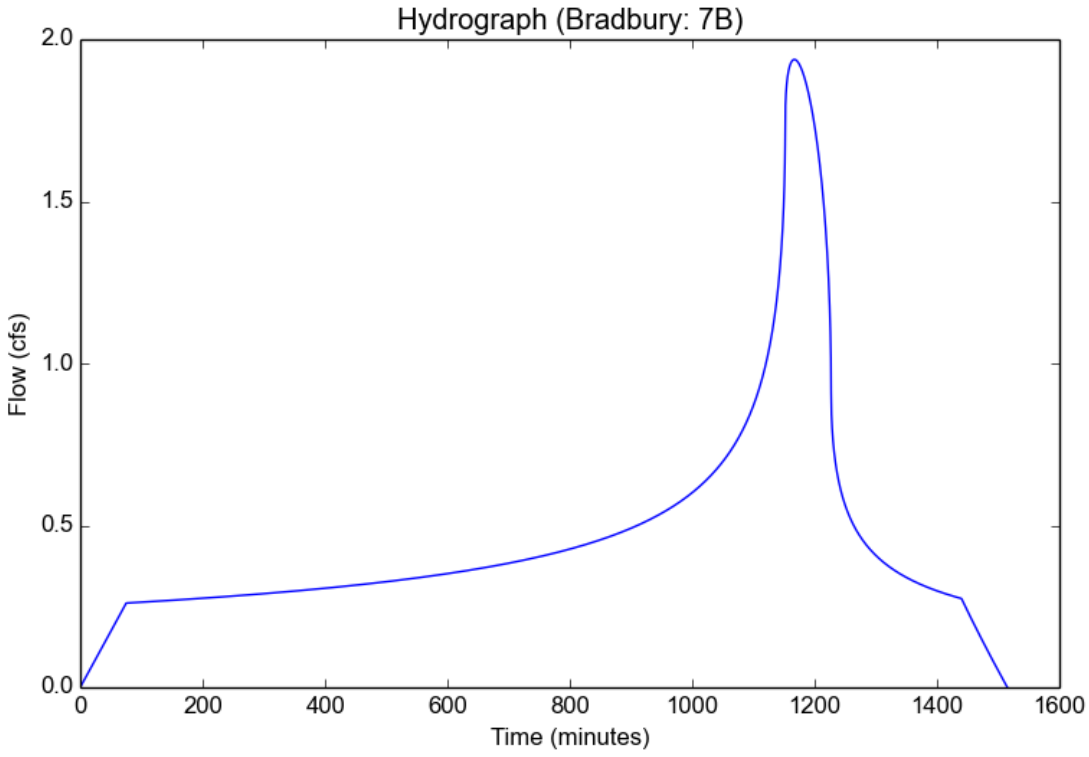
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Input Parameters

Project Name	Bradbury
Subarea ID	7B
Area (ac)	24.95
Flow Path Length (ft)	2837.624
Flow Path Slope (vft/hft)	0.0952
85th Percentile Rainfall Depth (in)	1.3
Percent Impervious	0.322
Soil Type	88
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.3
Peak Intensity (in/hr)	0.2172
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.3576
Time of Concentration (min)	75.0
Clear Peak Flow Rate (cfs)	1.938
Burned Peak Flow Rate (cfs)	1.938
24-Hr Clear Runoff Volume (ac-ft)	0.9586
24-Hr Clear Runoff Volume (cu-ft)	41758.6085



APPENDIX Q-2

LID PLAN

Chadwick Ranch Estates (TTM No. 82349)
LID Plan
City of Bradbury, CA

Prepared for:

Nevis Capital, LLC
335 N. Berry Street
Brea, CA 92821

Prepared by:

Q3 Consulting
27042 Towne Centre Drive, Suite 110
Foothill Ranch, CA 92610

In association with:
Proactive Engineering Consultants, Inc.

JN 20.038.000

Prepared: September 27, 2019

PROACTIVE ENGINEERING CONSULTANTS | Q3 Consulting

Table of Contents

1. INTRODUCTION ____ 1
2. STORMWATER QUALITY ____ 1
2.1 Infiltration Infeasibility ____ *1*
2.2 Source Control Measures ____ *2*
2.3 Stormwater Quality Design Volume (SWQDv) ____ *3*
2.4 Stormwater Runoff Harvest and Use Feasibility ____ *4*
2.5 Alternative Compliance On-Site Biofiltration ____ *4*
3. HYDRMODIFICATION EXEMPTION ____ 6
4. MAINTENANCE PLAN ____ 7
5. REFERENCES ____ 8

Exhibits

Exhibit A –BMP Exhibit

Technical Appendices

Appendix A: HydroCalc SWQDv Calculations

1. INTRODUCTION

The Chadwick Ranch Estates, Tentative Tract Map (TTM) No. 82349 is located in the San Gabriel River watershed in the City of Bradbury. The property is approximately 111 acres and is located on the foothills of the San Gabriel Mountains, with elevations ranging from approximately 1,790 feet above mean sea level (amsl) to 790 feet amsl. The site is currently undeveloped and drains to the Bradbury and Spinks Debris Basins. The debris basins are owned and maintained by the Los Angeles County Flood Control District (LACFCD).

The Chadwick Ranch Estates Project area will create 14 estate residential parcels with trails on the property. The development will include the installation of a water tank, a booster station, and debris and detention basins. The residential estates would allow a primary home and a guest house, and other ancillary structures including but not limited to garages and stables. The undisturbed open space will be dedicated to a conservancy and will ensure that 51% of the site remains undisturbed in perpetuity. Flow runoff from the project site is proposed to outlet at Spinks Basin.

This plan summarizes the project's stormwater quality methodology and results in order to demonstrate compliance with the County's LID Ordinance and LID Standards Manual.

2. STORMWATER QUALITY

The Chadwick Ranch Estates Project is a Designated Project. The proposed development will generate more than 1 acre of disturbed area and adds more than 10,000 square feet of impervious surface area.

2.1 INFILTRATION INFEASIBILITY

Based on preliminary engineering evaluation and site investigation, the geotechnical consultant Petra Geosciences, Inc. does not recommend infiltration for the project site due to the site's rock/soil characteristics. The infiltration of surface waters would have an adverse impact on the stability of the proposed and existing slopes.

Therefore, the project will meet stormwater quality mitigation requirements through biofiltration, which is further discussed in Section 2.5.

2.2 SOURCE CONTROL MEASURES

The table below summarizes the source control measures to be implemented.

Table 1 : Source Control Measures

Source Control Measure	Included	Not Applicable	Reason Source Control is Not Applicable
Storm Drain Message and Signage (S-1)	✕		
Outdoor Material Storage Area (S-2)		✕	No outdoor storage areas proposed
Outdoor Trash Storage and Waste Handling Area (S-3)		✕	No designated trash enclosures proposed
Outdoor Loading/Unloading Dock Area (S-4)		✕	No loading docks proposed
Outdoor Vehicle/Equipment Repair /Maintenance Area (S-5)		✕	No outdoor vehicle repair and maintenance area proposed
Outdoor Vehicle/Equipment /Accessory Wash Area (S-6)		✕	No outdoor vehicle wash areas proposed
Fuel & Maintenance Area (S-7)		✕	No vehicle/equipment fueling areas proposed
Landscape Irrigation Practices (S-8)	✕		
Building Materials (S-9)	✕		
Animal Care and Handling Facilities (S-10)	✕		
Outdoor Horticulture Areas (S-11)		✕	No horticulture areas proposed

2.3 STORMWATER QUALITY DESIGN VOLUME (SWQDV)

Per the LID Standards Manual, HydroCalc was used to calculate the SWQDv for each subarea of the watershed. The soil type was developed using the guidelines set in the Los Angeles County Hydrology Manual. The storm frequency was selected per LID Standards Manual guidelines.

Subareas 5B and 7B encompass the residential development area while the rest of the subareas are primarily undisturbed or include minimal slope grading whose runoff does not confluence with the primary runoff from the residential areas. Therefore, the SWQDv was only calculated subareas 5B and 7B.

Subarea 7B encompasses undisturbed slope area on its western boundary. The runoff from this area, which amounts to approximately 1.79 ac, is captured by an existing ditch along the street which joins a proposed v-ditch and ultimately outlets to Spinks Basin. The flows from the undisturbed area do not confluence with the proposed project storm drain and is therefore not included in the area for SWQDv calculations. Thus the area used to calculate SWQDv for subarea 7B is 26.74 – 1.79 = 24.95 ac.

Table 2 : HydroCalc Input Parameters

Subarea	Area (ac)	Length (ft)	Slope (ft/ft)	Depth (in)	Imperv	Soil Type	Frequency	Fire Factor
5B	14.53	3,292	0.11	1.3	0.31	88	85th percentile storm	0
7B	24.95	2,838	0.10	1.3	0.32	88	85th percentile storm	0

Table 3 : Total SWQDv

Subarea	Total Area (ac)	SWQDv (cf)
5B	14.53	23,421.4
7B	24.95	41,758.6
Total	**39.48**	**65,180**

2.4 STORMWATER RUNOFF HARVEST AND USE FEASIBILITY

The irrigation demands for the project site are not expected to be enough for harvest and use to be feasible.

The project site's stormwater runoff will be treated with biofiltration per the LID Manual standards and is further discussed in the section below.

2.5 ALTERNATIVE COMPLIANCE ON-SITE BIOFILTRATION

Since the SQWDv is unable to be fully retained on the project site due to the site's infiltration infeasibility, the project will meet stormwater quality requirements through biofiltration.

Per Section 7.4 of the LID Standards Manual, the biofiltration volume (V_b) is calculated by the equation below:

$$V_b = 1.5 \times (SWQDv - V_r)$$

Since there is no on-site retention proposed for this project, the equation is simplified to the following:

$$V_b = 1.5 \times SWQDv$$

Subareas 5B and 7B encompass the residential development area while the rest of the subareas are primarily undisturbed or include minimal slope grading. Therefore, only the runoff from the proposed developed areas of subareas 5B and 7B will be treated for water quality.

A total of 4 Modular Wetland System (MWS) units are proposed in order to treat the biofiltration volume.

As shown in Exhibit A, subarea 5B and the west side of 7B are treated at BMPs M3& M4. The SWQDv for the west side of 7B was calculated by prorating the SWQDv for the entire developed 7B subarea. The remaining area of 7B on the east side is treated at BMPs M1 & M2.

Table 4 summarizes the V_b calculations and MWS sizing.

Table 4 : MWS Units						
BMP	**MWS Model #**	**MWS Unit Capacity (cf)**	**Tributary Subarea**	**Tributary Area (ac)**	**SWQDv (cf)**	**V_b (cf)**
M1	L-8-24	30,216	East side of 7B	24.95 – 1.34 =23.61	41,758.6 – 2,238.5 = 39,520.1	59,280.2
M2	L-8-24	30,216				
M3	L-8-16	20,145	5B & West side of 7B	14.53+1.34 = 15.87	*West side of 7B*: $1.34\ ac \times \frac{41{,}758.6\ cf}{24.95\ ac}$ = 2,238.5 *5B + West side of 7B:* 23,421.4 + 2,238.5 = 25,659.9	38,489.7
M4	L-8-16	20,145				
Total		**100,722**		**39.48**	**65,180**	**97,769.9**

3. HYDRMODIFICATION EXEMPTION

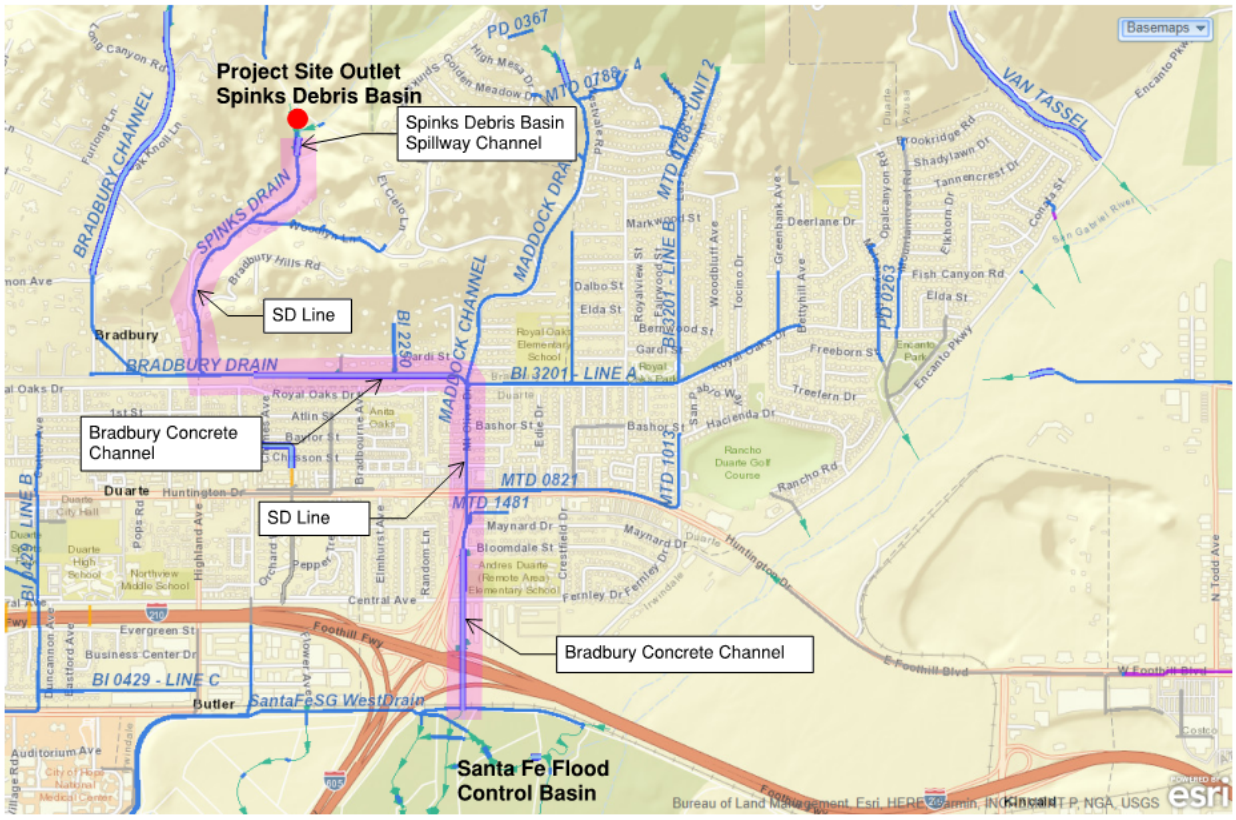
The proposed project meets the following hydromodification exemption requirements per the LID Standards Manual :

1. The project discharges directly or through a storm drain into an engineered channel and discharges into a receiving water that is not susceptible to hydromodification impacts.
2. The project is single family residence developments that incorporate LID BMPs in accordance with the LID Standards Manual

Figure 1 was generated from the web-based Los Angeles County Storm Drain System. The total runoff from the project site outlets into the Spinks Debris Basin. From the Spinks Debris Basin, flows are conveyed through storm drain lines and engineered concrete channels until they are ultimately discharged into the Santa Fe Flood Control Basin.

In the worst case scenario of a burned watershed, the proposed project's 50-year peak discharge of 259.7 cfs is not a significant contribution of flow to cause hydromodification to the Santa Fe Flood Control Basin.

Figure 1 : Project Downstream Flow Path



In addition, the project proposes 14 single family residential estates and incorporates LID BMPs per the LID Standards Manual and therefore meets the hydromodification exemption per the LID Standards Manual.

4. MAINTENANCE PLAN

All common areas within the project and areas that require ongoing maintenance will be maintained through a Homeowner's Association.

A Maintenance Plan and Maintenance Agreement will be submitted during the final design phase.

5. REFERENCES

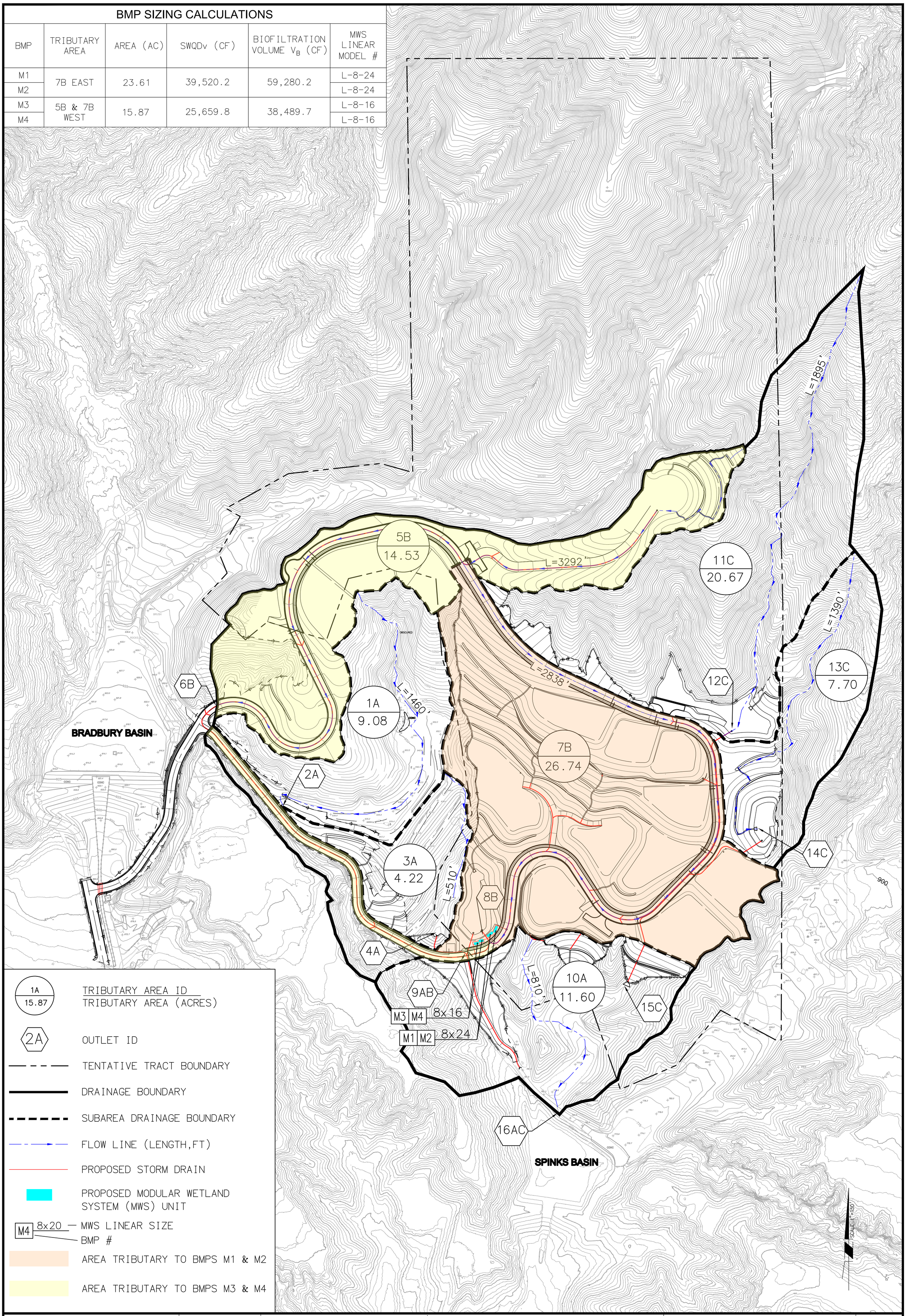
Los Angeles County Department of Public Works (LACDPW), 2014. LID Standards Design Manual. February.

Los Angeles County Department of Public Works (LACDPW), 2006. Hydrology Manual. January.

EXHIBITS

BMP SIZING CALCULATIONS

BMP	TRIBUTARY AREA	AREA (AC)	SWQDv (CF)	BIOFILTRATION VOLUME V_B (CF)	MWS LINEAR MODEL #
M1	7B EAST	23.61	39,520.2	59,280.2	L-8-24
M2					L-8-24
M3	5B & 7B WEST	15.87	25,659.8	38,489.7	L-8-16
M4					L-8-16



1A / 15.87 — TRIBUTARY AREA ID / TRIBUTARY AREA (ACRES)

2A — OUTLET ID

TENTATIVE TRACT BOUNDARY

DRAINAGE BOUNDARY

SUBAREA DRAINAGE BOUNDARY

FLOW LINE (LENGTH,FT)

PROPOSED STORM DRAIN

PROPOSED MODULAR WETLAND SYSTEM (MWS) UNIT

M4 / 8x20 — MWS LINEAR SIZE / BMP #

AREA TRIBUTARY TO BMPS M1 & M2

AREA TRIBUTARY TO BMPS M3 & M4

SEAL

REGISTERED PROFESSIONAL ENGINEER — JOHN A. MCCARTHY — No. 47583 — Exp. 12/31/19 — CIVIL — STATE OF CALIFORNIA

PREPARED UNDER THE DIRECT SUPERVISION OF:

JOHN A. MCCARTHY — XXXX DATE

R.C.E. No. 47583 EXP. DATE: 12/31/19

Q3 Consulting
27042 Towne Centre Drive, Suite 110
Foothill Ranch, CA 92610
949.259.6770

SCALE: 1"=150'

ONE INCH ON ORIGINAL

CHADWICK RANCH ESTATES

BMP EXHIBIT

FOR NEVIS CAPITAL, LLC

SHEET No. 1 OF 1 SHTS.

DRAWING NO. -

W.O.

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TECHNICAL APPENDIX

APPENDIX A
HydroCalc SWQDv Calculations

Peak Flow Hydrologic Analysis

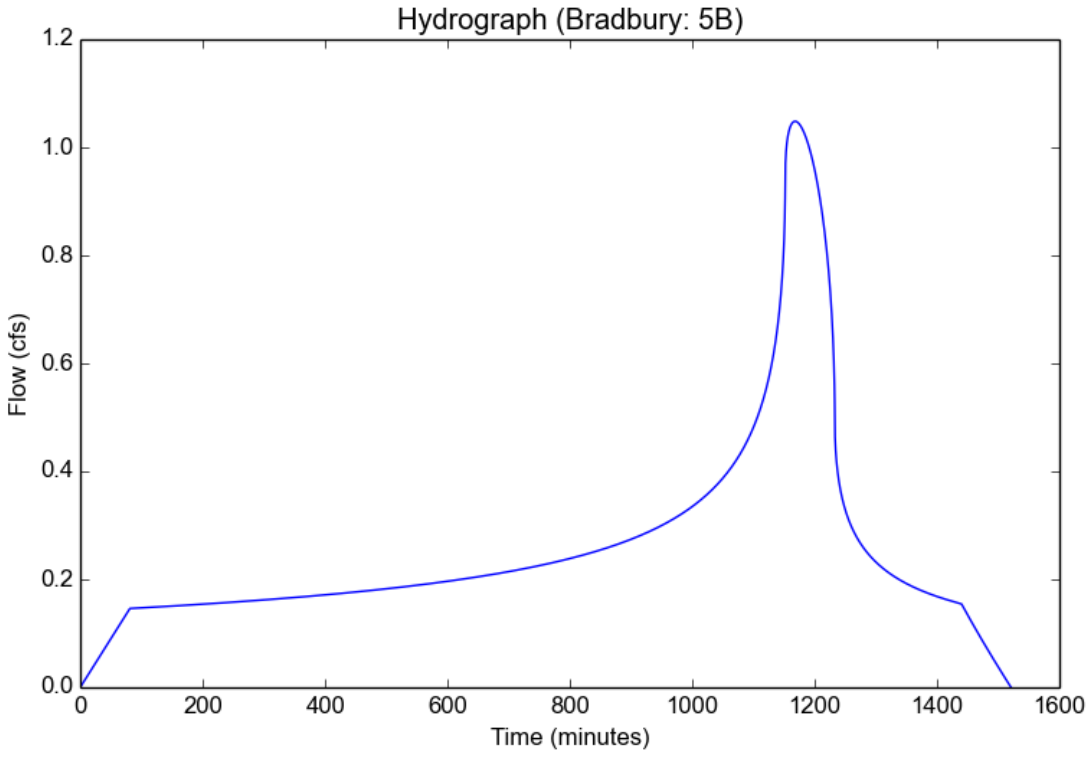
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Soil Type	88
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

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Developed Runoff Coefficient (Cd)	0.3444
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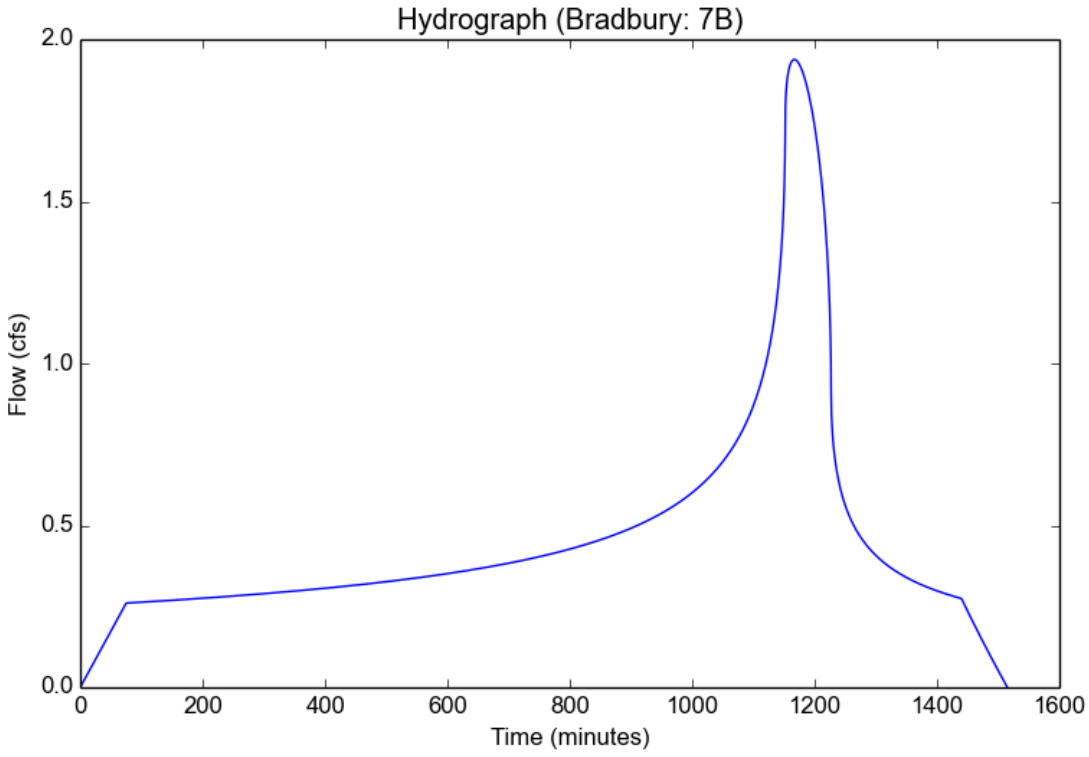
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Version: HydroCalc 1.0.3

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Soil Type	88
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Output Results

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Time of Concentration (min)	75.0
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24-Hr Clear Runoff Volume (ac-ft)	0.9586
24-Hr Clear Runoff Volume (cu-ft)	41758.6085



APPENDIX Q-3

WATER DEMANDS MEMO

PROACTIVE

MEMORANDUM

To: California American Water Company

From: Mark Anderson

Date: 10/28/2019

Subject: Chadwick Ranch – Water Demands

Chadwick Ranch, Tentative Tract No. 82349, is a proposed residential development located within the City of Bradbury. The project site is located north of the intersection of Long Canyon Rd and Bliss Canyon Rd and east of the Bradbury Debris Basin. The entire project site is 111.1 acres but includes a large 63.3 acre open space area that will be left untouched and non-irrigated. The net development area is 48.5 acres, 15 acres of residential lot area and 33.5 acres of open space.

The project is distinct within Southern California as it encompasses 15 residential lots ranging from 0.6 to 2.1 acres in size. Each lot will likely include a large single-family residence (ranging from approximately 6,000 to 10,000 sf) as well as a guest house facility (approximately up to 2,500 sf). The open space area is primarily comprised of manufactured slopes and basins. These areas will be predominantly landscaped with native vegetation and irrigated for their initial five-year establishment period. After that time this water demand will be substantially reduced or completely eliminated. We have utilized multiple sources for water demands but given the unique nature of the project there were not many comparable projects or studies to base our analysis.

CHADWICK RANCH - WATER DEMAND

10/28/2019

Project Information:		
Total Area	111.8	acres
Open Space (Non-irrigated)	63.3	acres
Residential Lot Area	15	acres
Slope Area	33.5	acres
Development Area	48.5	acres
Number of Units	15	units

Conversion Factors:	
Gallons per ac-ft	325,851
Minutes per year	525,600
Minutes per day	1,440

Method 1		
Assumptions (1)	2.4	ac-ft/year/acre
Demand Factor (Dev. Area)	2,143	gpd/acre
Development Area	48.5	acres
Total Demand	103,915	gpd
Average Daily Demand	72	gpm
Peaking Factor (1)	1.6	
Max Daily Demand	115	gpm

Method 2		
Assumptions	8	people/lot
	80	gpd/person
	50%	landscape on lot
Demand Factor (Indoor)	640	gpd/lot
Demand Factor (Outdoor) (2)	2,850	gpd/acre
Demand Factor (Open Space) (2)	2,850	gpd/acre
Demand (Indoor)	9,600	gpd
Demand (Outdoor)	21,375	gpd
Demand (Open Space)	95,475	gpd
Total Demand	126,450	gpd
Average Daily Demand	88	gpm
Peaking Factor (2)	1.8	
Max Daily Demand	158	gpm

Method 3		
Demand Factor (Res. Low Density) (2)	2,060	gpd/acre
Demand Factor (Slopes) (2)	3,400	gpd/acre
Demand (Res. Low Density)	30,900	gpd
Demand (Slopes)	113,900	gpd
Total Demand	144,800	gpd
Average Daily Demand	101	gpm
Peaking Factor (2)	1.8	
Max Daily Demand	181	gpm

Notes:

(1) From study prepared for Oak View Estates TTM 73567 by Civiltec Engineering, Inc.

(2) East Valley Water District Study