Appendix G:
Hydrology and Water Quality Supporting Information

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G.1 - Preliminary Stormwater Control Plan

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PRELIMINARY STORMWATER CONTROL PLAN

FOR

Del Hombre Apartments

CONTRA COSTA COUNTY

Applicant:

3000 Del Hombre Holdings, LLC

156 Diablo Boulevard, Suite 220

Danville, CA 94526

925.406.4491

Prepared by:

BKF Engineers

150 California Street, Suite 600

San Francisco, CA 94111

415.930.7900

October 9, 2018

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TABLES

FIGURES

ATTACHMENTS

Stormwater Control Plan Exhibit

IMP Sizing Calculator Output

This Stormwater Control Plan was prepared using the template dated February 2018.

I. PROJECT DATA

Table 1. Project Data

Project Name/Number	Del Hombre Apartments, DP18-3031 and MS18-0010
Application Submittal Date	August 16, 2018
Project Location	Intersection of Del Hombre Lane and Roble Road, Contra Costa County APNs 148-170-042-03, 148-170-037-03, 148-170-041-05, 148-170-001-09, and 148-170-022-05
Name of Developer	3000 Del Hombre Holdings, LLC
Project Phase No.	NA
Project Type and Description	284 unit residential building with 5 levels of residential units over two levels of parking.
Project Watershed	Walnut Creek.
Total Project Site Area (acres)	2.37
Total Area of Land Disturbed (acres)	2.46
Total New Impervious Surface Area (SF)	85,310
Total Replaced Impervious Surface Area (SF)	4,908
Total Pre-Project Impervious Surface Area (SF)	4,908
Total Post-Project Impervious Surface Area (SF)	90,218
50% Rule[*]	Applies
Project Density	120 DU/acre
Applicable Special Project Categories [Complete even if all treatment is LID]	C: within ¼ mi of transit hub - 50% density > 100 DU/acre – 30% no surface parking – 20%
Percent LID and non-LID treatment	0.4% LID treatment 99.6% non-LID treatment
HM Compliance [†]	Applies

[*50% rule applies if:
Total Replaced Impervious Surface Area > 0.5 x Pre-Project Impervious Surface Area]

[†HM required (unless project meets one of the exemptions on *Guidebook* p. 9) if:
(Total New Impervious Surface Area + Total Replaced Impervious Surface Area) ≥ 1 acre]

II. SETTING

The site is located in Drainage Area 44, which is "unformed." The project is proposing to connect to the Drainage Area 44B storm drain system, via an existing 24-inch storm drain pipe which connects to the 84-inch storm drain line in the Iron Horse Trail.

II.A. Project Location and Description

The site is located in unincorporated Contra Costa County, near Walnut Creek. The Pleasant Hill BART station is located approximately 0.1 miles to the southwest, and the project site is adjacent to the Iron Horse Regional Trail. It is bounded by Roble Road to the north, Del Hombre Lane to the west, and Honey Trail to the south. See Figure 1. The existing 2.39-acre site comprises five separate lots, two of which contain small single family homes. The project proposed to construct one 5-story apartment building across all five parcels. The building will contain 284 residential units and two stories of parking, one of which will be subterranean.

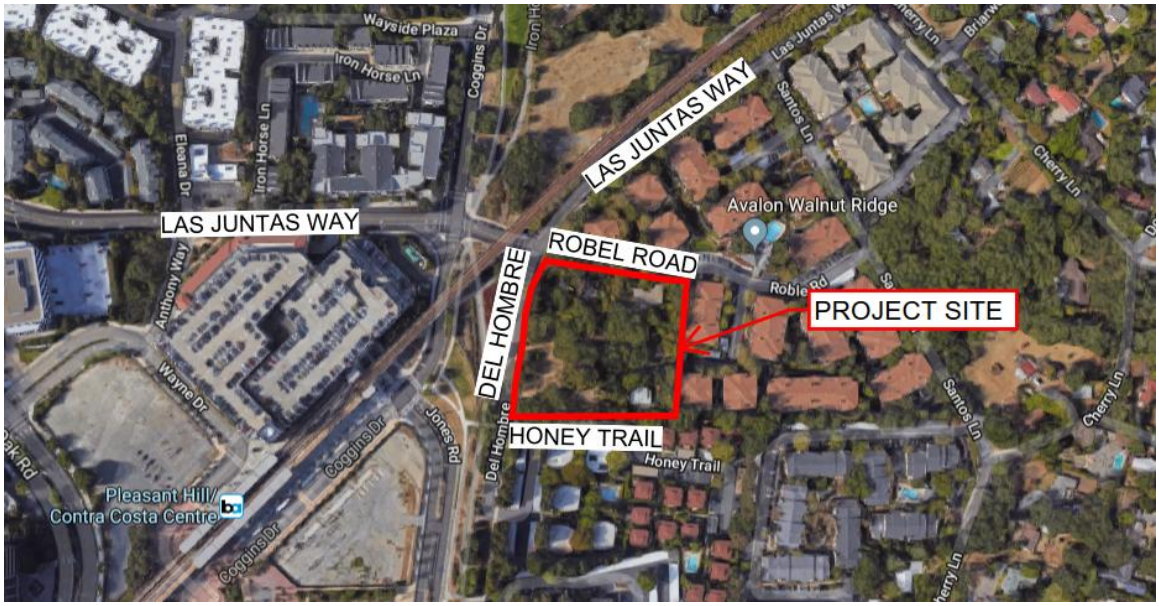

Figure 1. Vicinity Map

II.B. Existing Site Features and Conditions

The existing 2.39-acre site contains two small single family homes, one with a gravel driveway and one with an asphalt driveway. The site is otherwise undeveloped, with grass and tree cover. The site slopes at around 1.0% to the northwest. There are no swales or other natural drainage features, and there are no storm drains on site. A private storm drain exists in Robel Road bordering the site, and a public storm drain

exists in Del Hombre Lane bordering the site. Both storm drains connect to an 84-inch storm drain line in Iron Horse Trail.

II.C. Opportunities and Constraints for Stormwater Control

The majority of the site will be occupied by the proposed building, the proposed sidewalk along Roble Road, and a fire access lane along the west edge of the site. Therefore, space for LID treatment planters on the site is limited.

All on-site parking will be located within the building, eliminating the need for additional at-grade parking.

III. LOW IMPACT DEVELOPMENT DESIGN STRATEGIES

III.A. Optimization of Site Layout

In order to provide a high density residential building, the majority of the site will be utilized by the proposed building footprint. The project is not near any existing creeks or wetlands. Although many of the existing on-site trees will be removed to provide space for the development, existing trees along the south and east sides of the property will be preserved.

All on-site parking will be located within the building, eliminating the need for additional at-grade parking.

III.B. Use of Permeable Pavements

Conventional concrete and asphalt pavements are to be used to construct the street, sidewalks, and fire access lane. Since only a small proportion (less than 10%) of the site is paved, use of permeable pavements would not significantly decrease site runoff.

III.C. Dispersal of Runoff to Pervious Areas

Runoff from the pedestrian walkway along the south side of the building will be directed to the adjacent landscape area. This landscape area is depressed by approximately two inches to allow ponding and infliltration.

III.D. Bioretention or other Integrated Management Practices

One bioretention area will be located on the east side of the property. Runoff from the sloped portion of the roof will be collected and directed to the bioretention area for treatment. Water that overflows from the bioretention area and the remaining runoff from the roof will be directed to a network of 36-inch detention pipes. The water will flow through a vault-based high-flowrate media filter located in the northwest corner of the site, and then will be pumped into the existing storm drain

system at the corner of Del Hombre Lane and Robel Road. The pump will act as a flow control device, limiting the flowrate into the public storm drain to pre-project flowrates.

IV. DOCUMENTATION OF DRAINAGE DESIGN

IV.A. Descriptions of each Drainage Management Area

IV.A.1. Table of Drainage Management Areas

Table 2. Drainage Management Areas

DMA Name	*Area (SF)*	*Surface Type/Description*	*DMA Type/Drains to*
DMA-1	8,873	Pavement (160 SF) Roof/ Podium (6,573 SF) Landscape at grade (1,684 SF) Bioretention (456 SF)	Bioretention Area
DMA-2	74,972	Roof/ Podium (69,558 SF) Planter on podium (5,414 SF)	Vault-Based High-Flowrate Media Filter
DMA-3	889	Pool (889 SF)	Self-Treating
DMA-4	5,591	Pavement (5,343 SF) Landscape at grade (248 SF)	Vault-Based High-Flowrate Media Filter
DMA-5	1,908	Landscape at grade (1,908 SF)	Self-Retaining
DMA-6	8,366	Pavement (2,816 SF) Landscape at grade (5,550 SF)	Self-Retaining
DMA-7	2,695	Pavement (838 SF) Landscape at grade (1,857 SF)	Self-Retaining
DMA-8	4,041	Pavement (4,041 SF)	Vault-Based High-Flowrate Media Filter*
DMA-9	3,964	Pavement (3,964 SF)	Untreated*

*DMA-9 consists of a new sidewalk along Del Hombre Lane. It is not practical to treat this area, so DMA-8 is treated in-lieu of DMA-9. DMA-8 consists of the existing pavement on the southern half of Roble Road.

IV.A.2. Drainage Management Area Descriptions

DMA-1 composes a portion of the roof area and the landscape adjacent to the bioretention area. These areas drain to the bioretention area for treatment and flow

control. Additional roof area cannot be directed to the bioretention area due to limitations on the roof slopes and roof drain routing.

DMA-2 composes the majority of the roof area, including a 5,414 SF of green roof area. This area drains to detention pipes north and east of the building. The detention pipes provide flow-control and a high flowrate, vault based media filter is located at the end of the detention pipe prior to connection to the storm drain system for treatment.

DMA-3 is the pool located on the second story patio on the building. It will drain to the sanitary sewer, so it is considered self-treating.

DMA-4 is the sidewalk and landscape areas along Roble Road from the back of walk to the face of curb, on the north edge of the site. The area drains to catch basins along the curb on Roble Road. These catch basins will be connected to the detention pipe which is located along the sidewalk. The detention pipes provide flow-control and a high flowrate, vault based media filter is located at the end of the detention pipe prior to connection to the storm drain system for treatment.

DMA-5 is composed of the landscape area to the east of the fire lane on the east side of the building. The landscape will be to allow for ponding and infiltration, so will be self-retaining.

DMA-6 composes the path and landscape to the south and east of the building. This area is self-retaining, and the landscape area is depressed to allow for ponding and infiltration. Landscaping in this area cannot be used for LID treatment due to physical constraints preventing subdrains from reaching the storm drain system.

DMA-7 composes the landscape and pathways from stoops to sidewalk along north and west edges of the site, from the building to the back of walk. The stoop paths will be sloped to drain to the landscape areas, which will be depressed to allow for ponding and infiltration. This area will be self-retaining.

DMA-8 composes the pavement along the south half of Roble Road. The road is crowned, so the pavement will drain to the catch basins along the curb, which connect to the detention pipes and media filter. This area is not within the project site, and the pavement is not planned to be replaced, so is not required to be treated per C3 requirements. The project is treating this area in-lieu of the new sidewalk along Del Hombre Lane.

DMA-9 composes the proposed sidewalk along Del Hombre Lane. The sidewalks are planned to be cross-sloped towards the street, so it would not be practical to capture and treat this runoff. Therefore, the pavement on Roble Road, DMA-8, will be treated in-lieu of this area.

IV.B. Integrated Management Practice Descriptions

IV.B.1. Bioretention Areas

Runoff from a portion of the roof will be routed to a bioretention area on the west side of the building. The bioretention area will be designed and constructed according to the criteria in the *Stormwater C.3 Guidebook, 7th Edition*, including the following features:

- Bioretention area will be surrounded by a concrete curb.
- Each layer of material within the bioretention area will be level, and built using the depths and materials specified in the *Stormwater C.3 Guidebook*.
- A 4" perforated PVC subdrain with cleanout will be located with the invert at the top of the Class 2 permeable layer and will be connected to the overflow drain.
- An overflow drain will be located within the bioretention area and connected to the storm drain detention pipes.

IV.B.2. Self-Retaining Areas

Runoff from walkways will be directed via overland flow to self-retaining areas, which will be depressed by approximately 3 inches to allow retention of the first inch of rainfall. Run-on ratios will not exceed 1 part impervious area to 1 part pervious area. Overflow from high-intensity rain events will flow overland to catch basins within the adjacent streets.

IV.B.3. Areas Draining to Non-LID Treatment

Table 3. Areas Draining to Non-LID Treatment

DMA Name	*Area (SF)*	*Non-LID Treatment System*	*Minimum Design Criteria Referenced*
DMA-2, DMA-4, DMA-8	84,604	Vault-Based High-Flowrate Media Filter	-Replaceable cartridge filters. -Maximum design filter surface loading rate of 1 GPM/SF -Storage volume detains runoff and allows settling of coarse solids prior to filtration. -Flow through the cartridge filters is controlled by an orifice or other device so that the design surface loading rate is not exceeded.

IV.C. Tabulation and Sizing Calculations

For sizing of the bioretention area, see attached IMP Sizing Calculator Output.

V. SOURCE CONTROL MEASURES

V.A. Site activities and potential sources of pollutants

On-site activities and sources that could potentially produce stormwater pollutants include:

- On-site storm drain inlets
- Interior floor drains and elevator shaft sump pumps
- Interior parking garages
- Indoor and structural pest control
- Landscape / outdoor pesticide use
- Rooftop pool
- Refuse areas
- Loading docks
- Fire Sprinkler Test Water
- Miscellaneous Drain and Wash Water
- Plazas, sidewalks, and parking lots

V.B. Source Control Table

Table 4. Source Controls

Potential source	*Permanent source control BMPs*	*Operational source control BMPs*
On-site storm drain inlets	All inlets will be marked with the words "No Dumping! Flows to Bay" or similar	Inlet markings will be maintained and periodically repainted. Stormwater pollution prevention information will be provided to new site owners, lessees, or operators. The following will be included in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains." Operational BMPs in Fact Sheet SC-74 "Drainage System Maintenance" will be followed.

Interior floor drains and elevator shaft sump pumps	Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	Drains will be inspected and maintained to prevent blockages and overflow.
Interior parking garages	Parking garage floor drains will be plumbed to the sanitary sewer.	Drains will be inspected and maintained to prevent blockages and overflow.
Indoor & structural pest control	New construction minimizes potential for pest entry.	Integrated Pest Management information will be provided to owners, lessees, and operators.
Landscape/ outdoor pesticide use	Existing native trees, shrubs, and ground cover will be preserved to the maximum extent possible. Landscaping is designed to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides. Where landscaping areas are used to retain or detain stormwater, plants that are tolerant of saturated soil conditions are specified. Pest resistant plants are used where possible. Plants appropriate to the site conditions are used to ensure successful establishment.	Landscape will be maintained using minimal or no pesticides. IPM information will be provided to new owners, lessees, and operators. Operational BMPs in Fact Sheet SC-41 "Building and Grounds Maintenance" will be followed.
Rooftop pool	Pool connection to the sanitary sewer will be made according to local requirements	Operational BMPs in Fact Sheet SC-72 "Fountain and Pool Maintenance" will be followed.
Refuse areas	Refuse area will be covered and drains will be connected to a grease removal device before discharging to sanitary sewer.	A trash chute will be located on every floor, and an adequate number of receptacles will be provided. Receptacles will be inspected regularly and leaky receptacles will be repaired or replaced. Litter will be picked up daily and spills will be cleaned up immediately. "No hazardous materials" signs will be posted. Operational BMPs in Fact Sheet SC-34 "Waste Handling and Disposal" will be followed.

Loading docks		Loaded and uploaded items will be moved indoors as soon as possible. Operational BMPs in Fact Sheet SC-30 "Outdoor Loading and Unloading" will be followed.
Fire Sprinkler Test Water	Fire sprinkler test water will be drained to the sanitary sewer.	Operational BMPs in Fact Sheet SC-41 "Building and Grounds Maintenance" will be followed
Miscellaneous Drain and Wash Water	Boiler drain lines will be connected to the sanitary sewer system. Condensate drain lines will not discharge to the storm drain system. Rooftop equipment with potential to produce pollutants will be roofed and/or have secondary containment. Drainage sumps on-site will feature a sediment sump. Roofing, gutters, and trim made of copper or other unprotected metals will not be used.	
Plazas, sidewalks, and parking lots		Plazas, sidewalks, and parking lots will be swept regularly to prevent accumulation of litter and debris. Debris from pressure washing will be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser will be collected and discharged to the sanitary sewer.

VI. STORMWATER FACILITY MAINTENANCE

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

The applicant commits to execute any necessary agreements and/or annex into a fee mechanism per local requirements to ensure uninterrupted maintenance of the facilities. Applicant accepts responsibility for interim operation and maintenance of stormwater treatment and flow-control facilities until this responsibility is formally transferred to subsequent owners.

VI.B. Summary of Maintenance Requirements Bioretention Areas

These facilities remove pollutants primarily by filtering runoff slowly through an active layer of soil. Routine maintenance is needed to ensure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and are biologically active.

VI.B.1. General Maintenance Rules

At no time will synthetic pesticides or fertilizers be applied, nor will any soil amendments, other than aged compost mulch or sand/compost mix, be introduced. The top of soil surface will be maintained at or near the design elevation throughout. Irrigation systems will be maintained to conserve water while maintaining plant health.

Although it is unlikely to be needed, if plants are not thriving compost tea may be applied at a recommended rate of 5 gallons mixed with 15 gallons of water per acre, up to once per year between March and June. Compost tea will not be applied when temperatures are below 50°F or above 90°F or when rain is forecast within the next 48 hours.

The following may be applied for pest control if needed:

- Beneficial nematodes
- Safer® products
- Neem oil

If mosquito larvae are present and persistent, contact the Contra Costa Mosquito and Vector Control District for information and advice. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.

VI.B.2. Routine Maintenance

The facilities will be examined weekly for visible trash, and trash will be removed. Any graffiti, vandalism, or other damage will be noted and addressed within 48 hours.

The planted areas will be weeded by hand approximately monthly. At this time, plants will be inspected for health and the irrigation system will be turned on manually and checked for any leaks or broken lines, misdirected spray patterns etc. Any dead plants will be replaced.

VI.B.3. Following Significant Rain Events

A significant rain event is one that produces approximately a half-inch or more rainfall in a 24-hour period. Within 24 hours after each such event, the following will be conducted:

- The surface of the facility will be observed to confirm ponding is not prolonged.
- The surface of the mulch layer will be inspected for movement of material. Mulch will be replaced and raked smooth if needed.
- Inlets will be inspected, and any accumulations of trash or debris will be removed. Any erosion at inlets should be restored to grade.
- Side slopes, if any, will be inspected for evidence of instability or erosion, and corrections will be made as necessary.
- Check dams will be inspected for movement and corrections made as necessary.
- Outlet structures will be inspected for any obstructions.

VI.B.4. Prior to the Start of the Rainy Season

In September of each year, facility inlets and outlets, including flow-control orifices, will be inspected to confirm there is no accumulation of debris that would block flow. Stormwater should drain freely into the bioretention facilities.

If not previously addressed during monthly maintenance, any growth and spread of plantings that blocks inlets or the movement of runoff across the surface of the facility will be cut back or removed.

VI.B.5. Annually During Winter

Once, in December – February of each year, vegetation will be cut back as needed, debris removed, and plants and mulch replaced as needed. The concrete walls around the bioretention area will be inspected for damage. The elevation of the top of soil and mulch layer will be confirmed to be consistent with the 6-inch reservoir depth.

VII. CONSTRUCTION PLAN C.3 CHECKLIST

Table 5. Construction Plan C.3 Checklist

Stormwater Control Plan Page #	*BMP Description*	*See Plan Sheet #s*
4	Drainage from DMA-1 is directed to bioretention area	
4	Drainage from DMA-2 is detained for flow control in 36-inch storm drain pipes and treated in vault-based high-flowrate media filter	
4	Drainage from DMA-3 is directed to the sanitary sewer.	
4	Drainage from DMA-4 is detained for flow control in 36-inch storm drain pipes and treated in vault-based high-flowrate media filter	
4	Landscaping in DMA-5 is graded concave	
4	Landscaping in DMA-6 is graded concave	
4	Landscaping in DMA-7 is graded concave	
4	Drainage from DMA-8 is detained for flow control in 36-inch storm drain pipes and treated in vault-based high-flowrate media filter	
4, 5	Drainage from DMA-9 is not captured. Drainage from DMA-8 is treated in-lieu of DMA-9	

VIII. CERTIFICATIONS

The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan meet the requirements of Regional Water Quality Control Board Order R2-2015-0049.

By

Michael A. O'Connell

Print Name

LEGEND

- PAVEMENT
- ROOF/PODIUM
- POOL
- BIORETENTION AREA
- PLANTER ON PODIUM
- LANDSCAPE

STORMWATER COMPLIANCE DATA

PER THE MUNICIPAL REGIONAL STORMWATER PERMIT ORDER NO. R2-0074, TRANSIT-ORIENTED DEVELOPMENT PROJECTS ARE ELIGIBLE FOR LOW IMPACT DESIGN TREATMENT REDUCTION CREDITS. THE LID TREATMENT REDUCTION CREDIT IS THE MAXIMUM PERCENTAGE OF THE AMOUNT OF RUNOFF THAT MAY BE TREATED WITH EITHER TREE-BOX-TYPE HIGH FLOWRATE BIOFILTERS OR VAULT-BASED HIGH FLOWRATE MEDIA FILTERS. THIS PROJECT IS CLASSIFIED AS A CATEGORY C SPECIAL PROJECT (TRANSIT-ORIENTED DEVELOPMENT) AND QUALIFIES FOR A TOTAL LID TREATMENT REDUCTION CREDIT OF 100% AS DESCRIBED BELOW.

SPECIAL PROJECT CATEGORY "C"

a. IS THE PROJECT LOCATED WITHIN 1/4 OR 1/2 MILE OF AN EXISTING TRANSIT HUB?
YES, THE PROJECT IS WITHIN A 1/4 MILE OF THE PLEASANT HILL BART STATION.

b. IS THE PROJECT CHARACTERIZED AS A NON-AUTO-RELATED PROJECT?
YES, IS A RESIDENTIAL DEVELOPMENT.

c. DOES THE PROJECT HAVE A MINIMUM DENSITY OF 25 DWELLING UNITS PER ACRE?
YES, THE PROJECT HAS A DENSITY OF 284 DU/2.37 ACRES = 120 DU/ACRE.

LOCATION CREDIT
50% TREATMENT REDUCTION CREDIT WITHIN A 1/4 MILE OF A TRANSIT HUB.

DENSITY CREDIT
30% TREATMENT REDUCTION CREDIT FOR A DENSITY GREATER THAN 100 DWELLING UNITS PER ACRE.

MINIMIZED SURFACE PARKING CREDIT
20% TREATMENT REDUCTION CREDIT FOR NOT HAVING SURFACE PARKING.

STORMWATER TREATMENT AREA DATA

TOTAL LID TREATMENT REDUCTION CREDIT = 100%

TOTAL IMPERVIOUS AREA = 90,218 SF

AREA ALLOWED TO BE TREATED W/ NON-LID TREATMENT MEASURES (STORMFILTER MANHOLE)
IMPERVIOUS AREA = 90,218 SF

AREA REQUIRED TO BE TREATED W/ LID TREATMENT MEASURES (BIORETENTION AREA)
IMPERVIOUS AREA = 0 SF

4% AREA OF LID TREATMENT AREA – (0 SF)(0.04) = 0 SF
TOTAL BIORETENTION AREA PROVIDED = 456 SF

DMA SUMMARY TABLE:

DMA NAME	DESCRIPTION	DRAINS TO	CONVENTIONAL SURFACES (SF)				LIDs (SF)	TOTAL (SF)
			PAVEMENT	ROOF/ PODIUM	LS ON GRADE	PLANTER ON PODIUM	BIO-RETENTION	
DMA-1	EAST ROOF	IMP-1 BIORETENTION	160	6,573	1,684	–	456	8,873
DMA-2	MAIN ROOF AREA	IMP-2 MEDIA FILTER	–	69,558	–	5,414	–	74,972
DMA-3	POOL	SELF-TREATING	889	–	–	–	–	889
DMA-4	ROBLE SIDEWALK	IMP-2 MEDIA FILTER	5,343	–	248	–	–	5,591
DMA-5	EAST EDGE	SELF-RETAINING	–	–	1,908	–	–	1,908
DMA-6	SOUTH EDGE	SELF-RETAINING	2,816	–	5,550	–	–	8,366
DMA-7	NORTH&WEST EDGE	SELF-RETAINING	838	–	1,857	–	–	2,695
DMA-8	ROBLE PAVEMENT	IMP-2 MEDIA FILTER*	4,041	–	–	–	–	4,041
DMA-9	DEL HOMBRE S/W	UNTREATED*	3,964	–	–	–	–	3,964
TOTAL (SF)			14,087	76,131	11,247	5,414	456	107,335

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DEL HOMBRE APARTMENTS
STORMWATER CONTROL PLAN

CONTRA COSTA COUNTY CALIFORNIA

No.	Revisions

Date 10.9.2018
Scale 1" = 40'
Design JCW
Drawn JCW
Approved MAG
Job No. 20180503

Sheet Number: 1 OF 1

DRAWING NAME: K:\2018\180503_Del Hombre_Walnut Creek\ENG\EXHIBITS\SCP Exhibit\Stormwater Control Plan.dwg
PLOT DATE: 10-09-18 PLOTTED BY: wats

Project Name: Del Hombre
Project Type: Treatment and Flow Control
APN: 2010-0237333-00
Drainage Area: 107,204
Mean Annual Precipitation: 18.0

Self-Treating DMAs

DMA Name	Area (sq ft)
DMA-3	889.0

II. Self-Retaining Areas

Self-Retaining DMA	
DMA Name	**Area (sq ft)**
DMA-5	1,908
DMA-6-LS	5,550
DMA-7-LS	1,857

III. Areas Draining to Self-Retaining Areas

DMA Name	Area (sq ft)	Surface Type	Runoff Factor	Product (Area x Runoff Factor) [A]	Receiving Self Retaining DMA	Receiving Self-Retaing DMA Area (sq ft) [B]	Ratio [A]/[B]
DMA-6-PAVE	2816	Concrete or Asphalt	1.0	2,816.0	DMA-6-LS	5,550	0.51
DMA-7-PAVE	838	Concrete or Asphalt	1.0	838.0	DMA-7-LS	1,857	0.45

IV. Areas Draining to IMPs

IMP Name: IMP1
IMP Type: Bioretention Facility
Soil Group: IMP1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA-1-PAVE	160	Concrete or Asphalt	1.00	160
DMA-1-ROOF	6,573	Conventional Roof	1.00	6,573
DMA-1-LS	1,684	Landscape	0.70	1,179
			Total	7,912

IMP Sizing			
IMP Sizing Factor	**Rain Adjustment Factor**	**Minimum Area or Volume**	**Proposed Area or Volume**
0.050	1.097	434	456
0.042	1.097	364	382

Area
Surface Volume

Subsurface Volume	0.055	1.097	477	500
Maximum Underdrain Flow (cfs)				0.01
Orifice Diameter (in)				0.74

IMP Name: IMP2
IMP Type: Cistern + Bioretention Facility
Soil Group: IMP2

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA-2-ROOF	69,558	Conventional Roof	1.00	69,558
DMA-2-GR	5,414	Green Roof	0.00	0
DMA-4-PAVE	5,343	Concrete or Asphalt	1.00	5,343
DMA-4-LS	248	Landscape	0.70	174
DMA-8	4,041	Concrete or Asphalt	1.00	4,041
		Total		79,116

IMP Sizing			
IMP Sizing Factor	**Rain Adjustment Factor**	**Minimum Area or Volume**	**Proposed Area or Volume**
Area	0.017	0.855	1,150	1,151
Volume	0.063	1.097	5,467	5,500
Maximum Underdrain Flow (cfs)				0.13
Orifice Diameter (in)				1.77

Report generated on 10/9/2018 12:00:00 AM by the Contra Costa Clean Water Program IMP Sizing Tool software (version 1.3.1.0).

G.2 - Drainage Area Memorandum

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BkF
ENGINEERS / SURVEYORS / PLANNERS

SAN FRANCISCO OFFICE | 415.930.7900 **MEMORANDUM**

Date: October 10, 2018 **BKF Job Number:** 20180503

Deliver To: Jon Suemnick, Contra Costa County Public Works

From: Janine Watson, Project Engineer

Subject: Del Hombre Apartment Project – Annexation to Drainage Area 44B

The purpose of this memorandum is to provide calculations regarding our impact to the Drainage Area 44B storm drain system.

BACKGROUND

The site is located in unincorporated Contra Costa County near Walnut Creek, in Drainage Area 44 which is "unformed." The project is proposing to connect to the Drainage Area 44B storm drain system, via an existing 24-inch storm drain pipe which connects to the 84-inch storm drain line in the Iron Horse Trail.

The existing 2.37-acre site comprises five separate lots, two of which contain small single family homes. The project proposes to construct one 5-story apartment building, across all five parcels.

EXISTING STORM DRAIN FLOW

The existing HGL in the 84-inch storm drain line was provided to BKF by the Contra Costa County Flood Control District (Attachment A). The storm drain plan indicates the HGL in the pipe at the existing manhole is at elevation 75.6, and the flow rate is 270 CFS. We have calculated the flow rate based on the HGL and flow line elevations, and confirmed this flow rate, (Attachment B).

EXISTING AND PROPOSED PROJECT STORM DRAIN DEMAND

It is our understanding that the HGL provided to us by the Contra Costa County Flood Control District does not account for storm runoff flow from the site, though based on the existing grades and storm drain infrastructure in the vicinity, it does appear that the site currently drains to Drainage Area 44B.

Based on an analysis of the proposed site, using the Rational Method, we have determined that the unmitigated runoff flow will be approximately 6.00 CFS, see calculations on Tables 1 and 2.

Based on comments received from Contra Costa County Public Works, it is our understanding that detention pipes may not be used for "collect and convey" purposes,

only for compliance with C3 flow control requirements. Therefore, while the project does propose a series of detention pipes which will reduce the flow into the existing storm drain system, those are not considered in the calculations of runoff flow from the site.

CAPACITY OF EXISTING STORM DRAIN

Per the Contra Costa County design standards, the storm drain infrastructure must maintain 15 inches of freeboard below the top of any inlet grate or manhole. The existing 84-inch pipe has around 3 feet of cover, so the pipe is allowed to flow full during the design storm. Based on our calculations, when the pipe is full, the capacity is 310 CFS.

CONCLUSION

Comparing the existing flow rate (270 CFS) to the flow rate when full (310 CFS), it would indicate that the storm drain pipe can accept the additional flow from the site (6.00 CFS).

ATTACHMENTS

- Attachment A: Iron Horse Trail Storm Drain Plan with HGL
- Attachment B: Existing Pipe Flow Calculations

- Table 1 – Post-Development Hydrology Calculations
- Table 2 – Post-Development 10-Year Storm Intensity Calculations

Theresa M. Larson June 19, 1984
PROJECT ENGINEER C.E. 36,742

℄ Curve Data
R=200'
Δ=4°13'29"
L=14.75
T=7.38

Plug end of exist. pipe

Install 62 LF x 24" RCP @ S=0.0075

24" C.L.P.P.

See Sheet 4

130+38.22 DR 48 TP

B.C.=61+05.61

E.C.=61+20.36

Sta. 62+04± Construct Type IV M.H. with Top Slab & Grate. (Tie in 12" CMP from Bart Parking Lot.

~~63+00 "P" Const. Type III MH base~~

66+98± "P" - Remove & dispose of exist. 12" C.M.P as necessary & plug end w/minor conc.

~~70+05± "P" End Project~~ Sta. 69+75±

14.5' END PROJECT

137+25.96 DR 44 TP

N8°44'41"E

60+ N12°58'10"E 61+ 62+ 63+ 64+ N8°44'41"E 65+ 66+ 67+ "P" Line 68+ 69+ 70+

"OR" Line

Match Line

59+70 "P" (B) Const. ~~MH Structure~~ Mod. Type III M.H. with top slab and Grate

Install 4 LF x 48" RCP @ S=0.0065 (Stub out at 45° towards exist. street D.I.)

℄ Curve Data
R=200'
Δ=4°13'29"
L=14.75
T=7.38

B.C.=59+70

E.C.=59+84.75

234 Install ~~330~~ LF x 84" ~~C.P.~~ PIPE

494 Install ~~510~~ LF x 84" ~~C.P.~~ PIPE

COGGINS DR.

66+98 "P" Const. ~~Type IV~~ Mod. Type III MH base w/ Top slab and Circular grate

277 Install ~~307~~ LF x 84" ~~C.P.~~ PIPE

70+05± "P" Special Type III MH base w/ Top slab (To be constructed by others)

DIABLO GRANDE DR.

PLAN
Scale: 1"=40'

59+70 M.H. Rim = 76.8

59+00 ℄

64+00 ℄

Sta. 62+04± Construct Type III M.H. with Top Slab & Grate

63+00 M.H.

66+98 M.H. Grate = 80.3±

Sta. 69+75± END PROJECT

70+00

M.H. Rim = 81.4

EXISTING GROUND ELEV.

84" SPIRAL RIB PIPE ~~84" C.P.~~

E=70.32

65.00

E=66.94

S=0.0187

S=0.0002 ~~S=0.0041~~

E=63.80

Q=279

E outlet=63.94

E inlet=66.53

E=67.53

E=67.00

Tie in 12" CMP from Bart Parking Lot.

84" ~~C.P.~~ SPIRAL RIB PIPE

d_n=5.11

S=0.002 ~~S=0.0041~~

E=68.39

Q=270

E outlet=67.99

E inlet=69.96

84" ~~C.P.~~ SPIRAL RIB PIPE

S=0.0051

E=71.57

E=70.51 Sta. 69+75±

M.H. by Others

E=72.10

Q=270

80 70 60

59+00 60+00 61+00 62+00 63+00 64+00 65+00 66+00 67+00 68+00 69+00 70+00 71+00

PROFILE
Scale: Hor. 1"=40', Vert. 1"=4'

CONTRACT No. 7547-GD8443-83
DATE ACCEPTED 3-12-85
AS BUILT
RESIDENT ENGINEER J. Bechter
REVISIONS BY C. Limieco DATE 8-14-85

NO.	DESCRIPTION	BY	DATE
1	Realign ℄ & Raise E between 59~ & 66+98	TML	7-2-84

BASE MAP	EAST COORD.	NORTH COORD.
K-14	1553	529

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
CONTRA COSTA COUNTY FLOOD CONTROL and WATER CONSERVATION DISTRICT

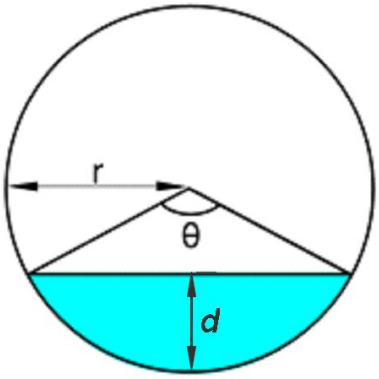
DRAINAGE AREA 44B
OUTFALL, LINE A, PHASE III

PLAN and PROFILE

DESIGNED: SWANSON | CHECKED: LARSON | SCALE: AS SHOWN
DRAWN: MOWBRAY | DATE: 5-84 | FLD. BK. 1576
FILE NO: D-12373A | SHEET 5A OF 7

Attachment B
Existing Pipe Flow Calculation

Existing Flow of 84-inch Storm Drain Pipe in Iron Horse Trail



$$A = Cross\ Sectional\ Area, ft^2 = \frac{r^2(\theta - \sin(\theta))}{2}$$

$$r = Radius = 42in = 3.5\ ft$$

$$d = Depth\ of\ Flow = HGL - inv = 75.6 - 70.51 = 5.09\ ft$$

$$\theta = 2 * \arccos\left(1 - \frac{d}{r}\right) = 2 * \arccos(1 - \frac{5.09}{3.5})$$

$$\theta = 4.08\ rad$$

$$A = \frac{r^2(\theta - \sin(\theta))}{2} = 29.98\ ft^2$$

$$P = Wetted\ Perimeter, ft = r\theta = 14.3ft$$

$$R = Hydraulic\ Radius, ft = \frac{A}{P} = \frac{29.98\ ft^2}{14.3\ ft} = 2.10\ ft$$

$$S = Slope = 0.002$$

$$Q = flow, cfs = \frac{1.49\text{A R}^{\frac{2}{3}}S^{\frac{1}{2}}}{n}$$

$$n = Manning\ Roughness\ Coefficient = 0.012\ \ (Spiral\ Rib\ Pipe)$$

$$Q = \frac{1.49(29.98\ \text{ft}^2)(2.10\ \text{ft})^{\frac{2}{3}}(0.002)^{\frac{1}{2}}}{0.012} = 273\ cfs$$

Capacity of 84-inch Storm Drain Pipe in Iron Horse Trail Flowing Full

$$d = Depth\ of\ Flow = 7.0\ ft$$

$$\theta = 2 * \arccos\left(1 - \frac{d}{r}\right) = 2 * \arccos(1 - \frac{7.0}{3.5})$$

$$\theta = 6.28\ rad$$

$$A = \frac{r^2(\theta - \sin(\theta))}{2} = 38.48\ ft^2$$

$$P = Wetted\ Perimeter, ft = r\theta = 21.99ft$$

$$R = Hydraulic\ Radius, ft = \frac{A}{P} = \frac{38.48\ ft^2}{21.99\ ft} = 1.75\ ft$$

$$Q = \frac{1.49(38.48\ \text{ft}^2)(1.75\ \text{ft})^{\frac{2}{3}}(0.002)^{\frac{1}{2}}}{0.012} = 310\ cfs$$

TABLE 1. POST-DEVELOPMENT HYDROLOGY (TOTAL SITE)			
Surface	**Area (sf)**	**Coeff.**	**C*A (sf)**
Building Roofs	77,020	1.00	77,020
Concrete/Asphalt Pavement	9,157	1.00	9,157
Landscape	17,117	0.50	8,559
Total	**103,294**	***0.92***	**94,736**
	Cpr =	0.92	
	I_{10} (see Table 4)=	2.76	in/hr
	A =	2.37	acres
	$Q_{pr} = C_{pr} * i * A$=	**6.00**	**cfs**

TABLE 4. POST-DEVELOPMENT 10-YEAR STORM INTENSITY (i)		
Time of Concentration, typical value for buildings (t_c)	5.0	minutes
Mean Seasonal Precipitation (per Contra Costa County Isoheytal Map)	18	inches
Precipitation Depth per Contra Costa County 10-year Duration-Frequency-Depth Curves	0.23	inches
Intensity (i) = Precipitation depth/t_c	**2.76**	**inches/hour**

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