

# DRAFT Technical Memorandum



## City of Malibu Wastewater Collection and Treatment System Design

**Subject:** Wastewater Flow Assumptions  
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**Date:** April 23, 2014  
**Reference:** 0127-006

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The purpose of this Technical Memorandum (TM) is to document the wastewater flows for City of Malibu’s (City) parcels within the Regional Water Quality Control Board (RWQCB) Prohibition Zone.

## 1 Sources of Information

Information regarding wastewater flows were obtained from the following sources:

- RWQCB Waste Discharge Requirements Permits
- Water Reuse Analysis for Whole Foods in the Park; EPD Consultants, September 2011 (attached in Appendix B)
- Rancho Malibu Hotel Flow and Waste Strength Calculations; Ensitu Engineering, Inc. March 2008 (attached in Appendix C)
- Proposed Wastewater Treatment System Design Intent for Malibu Crummer Site, Ensitu Engineering, Inc. March 2011 (attached in Appendix D)
- City of Malibu, Planning Department (attached in Appendix E):
  - Selected Inventory of Commercial Shopping Centers in Civic Center, February 2012
  - Civic Center Vacant Commercial Land Inventory, February 2012
  - Correspondence with City of Malibu regarding future developments
  - Malibu Country Mart I, II, and III 2012 annual flow rates, February 2013
  - Malibu Community Facilities District Map
  - La Paz Development Summary; October 22, 2007
  - The Courtyard Plans; May 31, 2012
  - Square footage of existing and planned buildings based on building permit application
  - Santa Monica College – Malibu Campus Proposed Plan Site
- Reference Materials:
  - EPA 625/R-00/008 Chapter 3: Establishing Treatment System Performance Requirements; Jan 5, 2012 (attached in Appendix F):
  - WEF, ASCE, EWRI Design of Municipal Wastewater Treatment Plants, 5<sup>th</sup> Edition, Wastewater Unit Flows (attached in Appendix G)
  - MWH Comprehensive Water and Wastewater Treatment Plant Hydraulics Handbook for Engineers and Operators, 5<sup>th</sup> Edition, MWH Soft, Wastewater Unit Flows (attached in Appendix H)
- Hydrology Study of Cumulative Impacts for the Civic Center Area, Malibu, California; Stone Environmental, August 2010 (Appendix I)
- RWQCB MOU Prohibition Map (2011) and City of Malibu RWQCB Prohibition Map (October 28, 2013) (Appendix J)

Several meetings were held from 2011 through 2013 with the City to review each individual parcel average day wastewater flow.

## 2 Basis of Flow Estimate

### Development of RWQCB Phase

ArcGIS parcel shapefile for the entire City of Malibu was obtained from the City. Parcels within the RWQCB Prohibition Zone were extracted and is the base of the Master Flow List. Each parcel was then identified with RWQCB Implementation Phase (Phase 1, 2, or 3) and by Type (Residential, Commercial, or Public Open Space).

In December 2013, the City provided the “Civic Center Wastewater Treatment Facility Phases” Map which identified a RWQCB Phase for each parcel (Appendix J). This map, along with the original RWQCB MOU map issued in April 2011, was compared and the following criterion was used to determine the RWQCB Implementation Phase:

- If a parcel was identified as vacant per the City’s meeting on October 8, 2012 and a RWQCB Phase was associated with it (either on the MOU or the City map), then that Phase was assigned to that parcel.
- If a parcel had no Phase associated with it (either on the MOU or the City map) however, the City provided additional information for future plans, then the Phase indicated by the City or by nearby parcels determined the Phase assigned to it.

### Development of Average Day Wastewater Flows

The following criterion was used to determine the wastewater flow generated by each existing and future parcel:

1. Developer Flow Estimates – If a developer calculated flow estimates for a specific parcel and was provided to the City, the future development flow estimate was used. This method was used for future residential and commercial parcels. For example, detail wastewater flow estimates for Whole Food and the Rancho Malibu Hotel were obtained from the developer and those flow estimates were used for those specific parcels. Additional information is provided in Section 3.4.
2. Square Footage for Commercial parcels - If the City provided square footage of an existing or planned commercial development (where no developer flow estimate was provided), then the square footage was used to determine the flow estimate. If the City did not have the square footage of an existing development, the building square footage was obtain from the Los Angeles County Assessor website, if the information was available.
3. RWQCB permit – If an RWQCB permit was issued for the parcel, and the square footage information was unavailable, the capacity stated in the permit was used.
4. Existing or Future Commercial Parcel – If none of the above information was provided or known, the Floor-To-Parcel Area Ratio (FAR) of 0.15 was used on the existing or future commercial parcel to estimate a building square footage. The building square footage was multiplied by the flow factor of 0.15 gallons/day/sq foot to derive the flow from the parcel. Derivation of the flow unit is further described in Section 3.3.
5. Existing or Future Residential Parcel – If there were no developer plans for a future residential parcel, then the same flow unit of 366 gpd/parcel was applied for future residential parcel. This is the same flow unit for an existing residential home parcel. A residential-condo parcel has the flow unit of 200gpd/parcel. Derivation of the flow unit is further described in Sections 3.1 and 3.2.
6. Water use records on developed parcels were reviewed to cross check whether the flow assumptions compared favorably. Malibu Country Mart 1, 2, 3 were used for this comparison and were found to closely match the flow assumptions described in #2 above.

All existing and future parcels in commercial and residential areas were included into the Master Flow List and assigned to a specific RWQCB Implementation Phase. The Master Flow List, **Appendix A**, identifies the wastewater flow generated by individual parcel. The basis of the generated flow is documented in the Notes column of the Master Flow List. Details on the assumptions that were used are described in the following section.

### 3 Assumptions Used for Flow Calculations

Average day wastewater flows were calculated depending on the type of land use. Parcels were categorized into four land use types:

- Residential
- Residential-Condo
- Commercial
- Public Open Space

Assumptions, calculations and references used to compute the average day wastewater flow for each of land type are described in more detail in the following subsections. If additional information was provided for a specific parcel, that information is documented in the Master Flow List.

#### 3.1 Average Residential Flows

Residential parcels vary in sizes across the City and one residential unit, unless otherwise noted in the Master Flow List, was assumed for each residential parcel. In calculating average flowrates, it was assumed 5.2 people resided in each residential parcel, independent of the lot size. This assumption was used for both developed and undeveloped residential parcels, with the resultant flow being assigned to the parcel consistent with the RWQCB phasing.

Based on EPA 625/R-00/008 Chapter 3, the mean daily per capita indoor use for 12 study sites is 69 gallons per day (gpd). Therefore, 359 gpd per residence was used. An infiltration allowance of two percent was added, resulting in an average flowrate of 366 gpd/residence. This calculation is presented in **Table 1**. This resultant flowrate is approximately 90 percent of the flowrate calculated by Stone Environmental in their 2010 report, ‘Hydrology Study of the Cumulative Impacts for the Civic Center Area, Malibu, California’ (Appendix I). The report assumed that 100 percent of the winter time water use in the densely developed Colony Road area was indoor use. However, even in the winter, water is used for irrigation and outdoor washdown. RMC typically assumes that 90 percent of the winter time water use at a Californian residence becomes wastewater flow.

**Table 1: Residential Wastewater Flow Generation Assumptions and Calculations**

Unit		Reference/Assumption
5.2	people/residence	Average occupancy of residence is higher than 2010 US Census of Malibu (Wikipedia). This includes domestic/maid/vistor.
69	gal per person per day	EPA 625/R-00/008 Chapter 3 Table 3-2 (12 study sites)
359	gpd/residence	Calculation: 5.2 pers/res * 69 gpd/pers
1.02	Infiltration Rate	2% of Infiltration
<b>366</b>	<b>gpd/residence</b>	Calculation: 359 gpd/res * 1.02 infiltration

### 3.2 Average Residential-Condo Flows

Residential-Condo parcels were identified from the City of Malibu planned land use data. Because Malibu's condominium development is close to Pepperdine University, an occupant density consistent with student housing was used. It was assumed there are two people per bedroom and two bedrooms per average condominium, resulting in an average occupancy of four people/condominium. Each condominium resident was assumed to generate 50 gpd (per EPA 625/R-00/008 Chapter 3) and therefore each residential-condo parcel was assumed to generate 200 gpd. This calculation is presented in **Table 2**.

**Table 2: Residential-Condo Wastewater Flow Generation Assumptions and Calculations**

Unit		Reference
2	people/bedroom	RMC Assumption
2	bedrooms/condominium	RMC Assumption
50	gpd/condominium	EPA 625/R-00/008 Chapter 3 Table 3-4 (Apartment House)
<b>200</b>	<b>gpd/condo</b>	Calculation: 2 people/bedroom * 2 bedrooms/condominium * 50 gpd/condominium

### 3.3 Average Commercial Flows

Most of the commercial parcels are located in the center of Malibu. The floor-to-parcel area ratio (FAR) of **0.15** was used as the basis of calculating average flows from commercial parcels. This ratio is consistent with that used by Malibu's land use planning department. **Table 3** shows the derivation of average flow using the FAR.

**Table 3: Commercial Wastewater Flow Generation Assumptions and Calculations**

Unit		Reference
0.02	gpd/sf (retail)	Average of Retail Calculation; See calculation in Table 5
0.675	gpd/sf (restaurant)	See Coogies Restaurant calculation in Table 6
20%	Percentage of Restaurant	See calculation in Table 7; used 20% (rounded)
80%	Percentage of Retail	See calculation in Table 7; used 80% for (rounded)
<b>0.150</b>	<b>gpd/sf</b>	Calculation: 0.20 * 0.675 gpd/sf + 0.80 * 0.02 gpd/sf

Subsequent to the derivation, RMC obtained annual 2012 water flow rates for Malibu Country Mart I, II and III from the City. Assuming the Country Marts are open for 365 days per year, the total water usage of the combined Country Marts is 12,212 gpd. This matches RMC's wastewater flow estimate of 12,180 gpd, using the commercial wastewater flow estimate derived. The wastewater flows are compared in **Table 4**, which validates RMC's approach for commercial wastewater flow.

**Table 4: Malibu Country Mart Commercial Wastewater Flow Comparison**

Malibu Country Mart	Address	Total leasable sqft	2012 Annual Water Usage		RMC Estimate (gpd)
			gpy	gpd*	
I	3835 Cross Creek Rd	29,068	1,364,798	3,739	4,360
II	3900 Cross Creek Rd	13,061	489,868	1,342	1,960
III	23410 Civic Center Wy	39,076	2,602,874	7,131	5,861
<b>Total</b>				<b>12,212</b>	<b>12,180</b>

\*Assumed Country Marts are open for 365 days per year.

### Retail Flow Calculation

For retail area, 0.02 gallons per day per square foot was derived using RMC's assumptions as shown in **Table 5**.

**Table 5: Retail Wastewater Flow Generation Assumptions and Calculations**

Unit		Reference
2,500	sf retail store	RMC Assumption
4	employees	RMC Assumption
10	gpd/employee	Design of Municipal WWTP, 5th Ed, Table 2-8
40	gpd employee flow	Calculation: 4 employees * 10 gpd/employee
4	customer parking spaces	RMC Assumption
2	gpd/parking space	Design of Municipal WWTP, 5th Ed, Table 2-8
8	gpd customer flow	Calculation: 4 parking space * 2 gpd/parking space
48	gpd (customer + employee)	Calculation: 40 gpd + 8 gpd
0.02	gpd/sf	Calculation: 48 gpd / 2,500 sf

### Coogies Restaurant Flow Calculation

For restaurant area, 0.675 gallons per day per square foot was calculated using Coogies Restaurant, located in the Malibu Colony Plaza, as a reference. Information from Coogies was obtained on May 22, 2012 which was used to derive the calculations shown in **Table 6**.

**Table 6: Restaurant Wastewater Flow Generation Assumptions and Calculations**

Unit		Reference
300	customers on average per day	Information from Coogies (JT called on 5/22/12) <sup>1</sup>
9	gal per customer per day	EPA 625/R-00/008 Chapter 3, conventional restaurant
2,700	gpd	Calculation: 300 cust/day * 9 gpd/cust
4,000	sf (includes kitchen)	Information from Coogies (JT called on 5/22/12) <sup>2</sup>
0.675	gpd/sf	Calculation: 2,700 gpd / 4,000 sf

Notes:

1. A representative from Coogies mentioned they serve on average 300 customers per day; but customers vary widely and can reach up to 600 customers on the weekend. 300 customers was used for average per day.
2. A representative from Coogies estimated that the total restaurant square footage including the kitchen is between 4,000 and 5,000 square feet. For this Study, 4,000 square feet was assumed for conservative measures.

### Percentage of Restaurant and Retail Space

On February 13, 2012, City of Malibu provided a summary of shopping center data and distribution, included in **Appendix E**. The percentage of food service (restaurants) versus total leasable square feet was calculated for the Malibu Country Mart and for the Malibu Village, shown in

**Table 7.**

**Table 7: Percentage of Retail and Restaurant Calculations**

Unit		Reference
81,205	Total sf	City of Malibu "Summary of Shopping Center Data and Distribution"
17,970	Food Service	City of Malibu "Summary of Shopping Center Data and Distribution"
22%	Percentage of Restaurant	Calculation: 17,970 sf / 81,205 sf; use 20% for rounding
78%	Percentage of Retail	Calculation: (81,205-17,970) sf / 81,205 sf; use 80% for rounding

For the purposes of this Study, 20% and 80% for food service and retail, respectively, was used.

### 3.4 Flows from Future Development per City Plan

Since March 2012 through December 2013, future developments and vacant parcels within the RWQCB Prohibition Zone were clarified with the City. The following future developments were added to the Master Flow List along with the information provided from the City:

- Crummer Residential Site – Future wastewater flow estimate was provided from Ensitu Engineering’s “Proposed Wastewater Treatment System Design Intent for Malibu Crummer Site” (March 2012). More detail information for Malibu Crummer Site is described in the following section. The flow estimate of 700 gpd per home was also used for the future development on two adjacent resident parcels. It was assumed that these two properties would have a house size similar to Crummer’s Residential site.
- La Paz – Square footage was provided by the La Paz Proposed Development Summary Plans. The unit flow of 0.15 gpd/sf was used to estimate the wastewater flow generated by the future development.
- Rancho Malibu Hotel – Future wastewater flow estimate was provided from Ensitu Engineering’s “Rancho Malibu Hotel Flow and Waste Strength Calculations” (March 2008). More detail information for Rancho Malibu Hotel is described in the following section.
- Santa Monica College – Square footage was provided by the Santa Monica College – Malibu Campus Proposed Site Plan. The unit flow of 0.15 gpd/sf was used to estimate the wastewater flow generated by the future development.
- Whole Foods – Whole Foods future wastewater flow estimate was provided from EDP Consultant’s “Water Reuse Analysis for Whole Foods in the Park” (September 2011). See Appendix B for additional detail.

#### Basis for Crummer’s Residential Site

The Crummer’s Residential Development assumptions are based on Ensitu Engineering’s Proposed Wastewater Treatment System Design Intent for Malibu Crummer Site calculated in March of 2012.

**Table 8** shows the information provided from the consultant and the calculations that were used to estimate an average flow of 3,560 gpd from this proposed development. Additional detail is included in Appendix D.

Table 8: Crummer's Residential Site Flow Calculations

Unit	Reference
200 gpd/first bedroom	Ensitu's Report; March 2012
100 gpd/additional bedroom	Ensitu's Report; March 2012
6 bedrooms	Ensitu's Report; March 2012
700 gpd/home	Calculation: 200 gpd + 100 gpd * 5 additional bedrooms
5 homes	Ensitu's Report; March 2012
<b>3,500 gpd</b>	Calculation: 700 gpd * 5 homes
20 gpd/employee	For Gate house; Ensitu's Report; March 2012
3 employee	For Gate house; Ensitu's Report; March 2012
60 gpd	At Gate house; Calculation: 20 gpd/employee & 3 employee
<b>3,560 gpd</b>	Total Flow for Crummer's property; Calculation: 3,500 gpd + 60 gpd

### Basis for Rancho Malibu Hotel

The Rancho Malibu Hotel assumptions are based on Ensitu Engineering's Rancho Malibu Hotel Flow and Waste Strength Calculations calculated in March of 2008. **Table 9** shows the information provided from the consultant and the calculations that were used to estimate an average flow of 26,030 gpd from this proposed development. The developer's units account for peak flows and used a peaking factor of 1.5. The average flows were derived from the peak flows.

Table 9: Rancho Malibu Hotel Flow Calculations

Hotel Area	Unit		Number		Peak Flows (gpd)	Avg Flows (Peak Flows /1.5) (gpd)
<b>Rooms</b>						
Bed Spaces	70	gal/bed	141	beds	9,870	6,580
Bed Spaces with Kitchen	85	gal/bed	53	beds	4,505	3,003
Residential Unit	600	gal/bed	1	beds	600	400
Hotel Employees	20	gal/employee	40	employees	800	533
<b>Restaurant</b>						
Restaurant and Terrace	50	gal/seat	132	seats	6,600	4,400
Bar, Lounge, Library	50	gal/seat	98	seats	4,900	3,267
Swimming Pool Food Service	50	gal/seat	30	seats	1,500	1,000
Employees	20	gal/employee	30	employees	600	400
<b>Convention Facilities</b>						
Meeting Rooms	10	gal/seat	350	seats	3,500	2,333
Employees	20	gal/employee	30	employees	600	400
Spa	0.07	gal/sf	31,000	sf	2,170	1,447
Employees (misc)	20	gal/employee	50	employees	1,000	667
<b>Retail</b>						
Retail (with public restroom)	0.1	gal/sf	20,000	sf	2,000	1,333
Retail Employees (misc)	20	gal/employee	20	employees	400	267
<b>Total</b>					<b>39,045</b>	<b>26,030</b>

Based on conversation with the developer, the hotel will have an onsite treatment plant with a disposal system using evapotranspiration. If that system is implemented, the flows will not be discharged into the ground by percolation or injection. Thus, the hotel will not use a portion of the Winter Canyon percolation capacity. As of this date, the hotel has not decided whether to implement this system or discharge into the groundwater. Despite this ambiguity, the average flows shown in Table 9 have been included in the Master Flow List as Phase 2. Before Phase 2 facilities are designed, the disposal method for the hotel needs to be confirmed.

### 3.5 Flows from Open Space

From March 2012 to December 2013, vacant parcels within the RWQCB Prohibition Zone were also clarified with the City. Vacant parcels include parcels with no future development planned or are a public open space. All the vacant parcels, except two parcels, were assumed to generate zero wastewater flow. The vacant parcels were identified as Public Open Space and some have a RWQCB Phase associated with them, based on the RWQCB MOU map or the City's RWQCB Phase Map.

The two public open space parcels with flow associated with them are:

- Bluff's Park – The baseball field parcel is a Public Open Space which has a wastewater flow and a RWQCB Implementation Phase associated with it. It is assumed there are restrooms at the fields which contribute 220 gpd of wastewater flow and will be connected during the RWQCB Implementation Phase 1.
- Beach Strip – The strip of beach on the east side of the Malibu pier is identified as a Public Open Space and was identified with a RWQCB Implementation Phase 2 based on the RWQCB MOU map and the City's RWQCB Phase Map. It is assumed there will be future public restrooms on the beach which will contribute 200 gpd of wastewater flow.

## 4 Summary of Findings

The Master Flow List (Appendix A) is a comprehensive tabulation of the build-out flowrates for the entire Prohibition Zone. Individual flowrates for each parcel can be found in the Master Flow List, including parcels with no flows allocated to them. The build-out flowrate for average dry weather flow (ADWF) is **469,330** gallon per day (gpd).

The build-out flowrate for all the parcels can be grouped based on:

- RWQCB Phase (Phase 1, 2, and 3)
- Type (Residential, Commercial, and Public Open Space)
- Communities Facility District

Summary wastewater flow tables are shown in the following sections.

### Estimated Flows by RWQCB Phase

The Regional Board Resolutions defined the geographic extent of what has become known as "The Prohibition Zone". The Prohibition Zone is grouped into three Phases based on the timeframe of connection. The three Phases are as follow:

- Phase 1 – connect by 2015
- Phase 2 – connect by 2019
- Phase 3 – connect 2020 and beyond

**Table 10** separates the existing and future parcels and their wastewater flows by Phase. Two parcels in Phase 1 have both existing and future flows associated with them but are only counted once under “existing” in Table 10.

Within the RWQCB Prohibition Zone, there are a total of 708 parcels; of which 34 parcels are not associated with any wastewater flow. These parcels are either Public Open Space or very small residential and commercial parcels with no anticipation of development and are part of another larger parcel (e.g. driveway of residential home). These parcels are shown in the “Not Applicable” column and some of are associated with a RWQCB Implementation Phase.

**Table 10: Estimated Flows by RWQCB Phase**

Phase	Existing Flows		Additional Future Flows		Not Applicable	Total Flows	
	No. of Parcels	Flow (gpd)	No. of Parcels	Flow (gpd)		No. of Parcels	Flow (gpd)
Phase 1	27 <sup>a</sup>	92,490	22	91,790	2	49	<b>184,280</b>
Phase 2	386	132,670	15	30,260	10	401	<b>162,930</b>
Phase 3	196	99,200	28	22,970	7	224	<b>122,120</b>
Public Open Space Parcels		0		0	15 <sup>b</sup>	15	<b>0</b>
<b>Total</b>	<b>609</b>	<b>324,360</b>	<b>65</b>	<b>144,970</b>	<b>34</b>	<b>708</b>	<b>469,330</b>

Notes:

- Includes three parcels with both existing and future flows but are only counted once under existing parcels.
- Does not include two Public Open Space parcels with wastewater flow for baseball fields and beach restrooms. Those parcels are included under Phase 1 and 2, respectively.

### Estimated Flows by Type

The build-out flowrate for all the parcels can be grouped based by Type: residential, residential –condo, commercial, and public open space.

**Table 10** summarizes the number of parcels and wastewater flow by type. The 420 gpd for public open space is the assumed wastewater flow generated at the restrooms of the baseball fields and at the beach. They are included in the RWQCB Phase 1 and Phase 2, respectively.

**Table 11: Estimated Flows by Type**

Type	Number	gpd
Residential	444	165,222
Residential-Condo	163	32,600
Commercial	73	271,087
Public Open Space	28	420
<b>Total</b>	<b>708</b>	<b>469,329</b>

### Estimated Flows by RWQCB Phase and Type

The build-out flowrate for all the parcels can be grouped based by the RWQCB Phase and by type. **Table 12** summarizes the number of parcels and wastewater flow by type and by RWQCB Implementation Phase.

**Table 12: Estimated Flows by RWQCB Phase and Type**

Type	Number	gpd
<b>Phase 1</b>	<b>51</b>	<b>184,279</b>
Residential	5	7,120
Residential-Condo	0	0
Commercial	43	176,939
Public Open Space	3	220
<b>Phase 2</b>	<b>411</b>	<b>162,925</b>
Residential	235	83,443
Residential-Condo	163	32,600
Commercial	9	46,682
Public Open Space	4	200
<b>Phase 3</b>	<b>231</b>	<b>122,125</b>
Residential	204	74,659
Residential-Condo	0	0
Commercial	21	47,466
Public Open Space	6	0
<b>Other</b>		
Public Open Space	15	0
<b>Total</b>	<b>708</b>	<b>469,329</b>

### Flows from Community Facilities District

Connection of parcels within the recently formed Community Facilities District (CFD). The CFD consists of 13 commercial, 5 residential and one public open space parcel. The residential parcels are included in the RWQCB Phase1 since connection to them would occur earlier. The estimated flows from these parcels are presented in **Table 13**.

**Table 13: Community Facilities District Wastewater Flow Summary**

	Existing	Future	Total
<b>Number</b>	9	11	<b>19</b>
<b>Flow (gpd)</b>	54,426	31,592	<b>86,018</b>

## **Appendix A – Master Flow List**

## **Appendix B – Whole Food Water Reuse Analysis**

## **Appendix C - Rancho Malibu Hotel Flow and Waste Strength Calculations**

## **Appendix D – Crummer Site Proposed Wastewater Treatment System Design**

## **Appendix E – City of Malibu Information**

## **Appendix F – EPA 625/R-00/008 Chapter 3**

## **Appendix G – WEF ASCE, EWRI Design of Municipal Wastewater Treatment Plants**

## **Appendix H – MWH Comprehensive Water and Wastewater Treatment Plant Hydraulics Handbook for Engineers and Operators**

## **Appendix I – Hydrology Study of Cumulative Impacts for the Civic Center Area, Malibu, California**

## **Appendix J – Civic Center Wastewater Treatment Facility Phases Map and the RWQCB MOU Prohibition Map**