



# WEST BAY SANITARY DISTRICT SEWER RATE STUDY



April 22, 2015 – FINAL REPORT



HF&H Consultants, LLC



# WEST BAY SANITARY DISTRICT

500 Laurel Street  
Menlo Park, CA 94025



## SEWER RATE STUDY

FINAL REPORT

*April 22, 2015*

### HF&H CONSULTANTS, LLC

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Walnut Creek, CA 94596



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April 22, 2015

Mr. Phil Scott  
District Manager  
West Bay Sanitary District  
500 Laurel Street  
Menlo Park, CA 94025

**Subject: Sewer Rate Study – Final Report**

Dear Mr. Scott:

HF&H is pleased to submit this sewer rate update of the District's FY 2015-16 rates. The report summarizes the analysis that was conducted to develop the recommended rates. The analysis updates last year's projections to reflect the District's and SVCW's current operating and capital costs. The results are consistent with last year, which indicates the need for a 9.0% revenue increase in FY 2015-16 rates. A copy of the rate model is included in the appendix.

Very truly yours,

HF&H CONSULTANTS, LLC

John W. Farnkopf, P.E.  
Senior Vice President



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## ACRONYMS

FY	Fiscal Year
CCF or HCF	Hundred cubic feet of metered water sold; 748 gallons; a cube of water 4.6 feet on edge
EDU	Equivalent dwelling unit
GPD	Gallons Per Day
O&M	Operations and Maintenance
PAYGo	Pay-As-You-Go, in reference to funding capital improvements from cash rather than from borrowed sources of revenue
SVCW	Silicon Valley Clean Water, a Joint Powers Authority that is responsible for regional conveyance and wastewater treatment for West Bay Sanitary District and the cities of Redwood City, San Carlos and Belmont.
STEP	Septic Tank Effluent Pumping systems



## **ACKNOWLEDGEMENTS**

### District Board

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Fran Dehn, Secretary  
Ron Shepherd, Treasurer  
David Walker, Member  
Roy Thiele-Sardina, Member

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# SEWER RATE STUDY



## 1. EXECUTIVE SUMMARY

The District's rates for FY 2015-16 have been set to fund its expense projections for FY 2015-16. Rates for subsequent years have been projected in this financial plan that are based on a number of assumptions and information that will require review prior to adopting any future rate increases. For present purposes, the rate increases in subsequent years provide a preview of the increases that may eventually be required. Prior to adopting rate increases in subsequent years, the District is advised to update the financial planning model in conjunction with an update to its capital improvement program and associated O&M. A critical area for consideration is SVCW's capital costs, which are dependent on the pace with which SVCW makes progress with its capital improvement program.

### 1.1 FINDINGS AND RECOMMENDATIONS

#### 1.1.1 Projected Revenue Increases

A 9% revenue increase for FY 2014-15 was approved and adopted in the District's rate-setting process last year. The increases indicated below reflect updated assumptions and currently available information. Multi-year revenue requirement projections indicate the need to increase rate revenue as follows:

**Figure 1-1. Projected Revenue Increases**

Fiscal Year	Revenue Increase
2015-16	9%
2016-17	8%
2017-18	8%
2018-19	5%
2019-20	1%

The forecasted increases are lower than last year's projections due to unanticipated connection fee revenue generated by new commercial and large residential projects that materialized since the previous update. The increases for FY 2015-16 through FY 2019-20 are due to the need to fund the District's share of SVCW's debt service as well as to maintain the District's reserves. Because the SVCW debt service projection continues to change over time, prior to adopting future rate increases, it is recommended that the District update these assumptions to reflect the most current information available from SVCW.

#### 1.1.2 Projected Rates

The following table shows the current FY 2014-15 rates and the projected FY 2015-16 rates, which reflect a 9% across-the-board increase.

**Figure 1-2. Projected Rates**

	Current FY 2014-15	Projected FY 2015-16
<b><u>Residential (charge per DU)</u></b>		
Single Family, Multi Family	\$893	\$973
On-site Wastewater Disposal Zone	\$1,136	\$1,238
<b><u>Non-Residential (charge per CCF)</u></b>		
Retail/Commercial	\$8.23	\$8.97
Institution/Public	\$8.11	\$8.84
Restaurants	\$10.26	\$11.18
Supermarkets with Grinders	\$10.32	\$11.26
Hospitals	\$8.28	\$9.02
Hotels with Dining Facilities	\$9.54	\$10.40
Industrial	Measured	Measured

Of the 9% overall rate increase in FY 2014-15, approximately 7.35% is attributable to increases in SVCW's treatment costs and 1.65% is attributable to increases in the District's local operations and capital expenses.

Residential customers are charged per dwelling unit. Approximately 60 homes in the Portola Valley area (located within the On-Site Wastewater Disposal Zone) pay higher charges for the maintenance of the STEP or Grinder Sewer Collection Systems that they require.

Non-residential customers pay charges based on their metered water use from the prior calendar year (measured in CCF or hundred cubic feet). Each non-residential charge is the product of the customer's flow multiplied by the rate corresponding to the customer's class.

Industrial customers are billed based on each customer's prior annual flow and the strength of the customer's wastewater based on sampling data.

### 1.1.3 Cost of Service and Rate Structure Analysis

The District strives to charge equitable rates that are proportionate to cost of providing service. Toward that end, a cost of service analysis should be performed periodically to ensure that each customer class is paying its proportionate share of the cost of service. Cost of service analysis relies on accurate data for flow, BOD, and TSS for all of its customers. There are two areas concerning residential and non-residential rates that are pending further analysis.

For residential customers, the District has conducted flow studies during the last two years to evaluate the difference between single and multi family flows. This difference might warrant a change in the cost of service allocations and the rate structure for residential customers. The results of these studies are inconclusive. The District plans to conduct a third flow study next year.

For non-residential customers, there have been significant changes in the District's customer base, which has experienced conversions of certain industrial customers to commercial customers. As a result, BOD and TSS data for these customers also needs to be updated.

It is recommended that the District continue to collect flow data so that it can calculate a multi-year average for purposes of allocating costs. An average of at least three years is recommended to smooth out any anomalies. It is also recommended that the District update its sampling data for its industrial customers.

The data that is needed for cost of service analysis can also be used for adjusting residential and non-residential rate structures to reflect the current cost of service. Again, the District has conducted preliminary flow studies that yielded inconsistent results. As the District collects flow data for cost of service analysis, it should be possible to resolve the inconsistencies and make any rate structure modifications that are appropriate.

## 2. BACKGROUND

This report presents a financial plan for the District that incorporates the capital improvements identified in the District's 2011 Master Plan, as well as the March 25, 2014 SVCW Financial Plan Update (the latest available version). The District's financial plan comprises projected operating and capital expenses, including its share of SVCW costs, projected revenues from the District's sewer service charges, and projected District reserves for the period from FY 2014-15 to FY 2019-20. The results of the financial plan indicate the annual increases in sewer service charges that are projected to fund the District's expenses and maintain adequate reserves. Detailed spreadsheets comprising the rate model are included in Appendix A.

### 2.1 REGIONAL CONTEXT

The District provides wastewater collection and conveyance services to approximately 32,000 residential and non-residential EDUs through a system of pipelines and pump stations that transport their wastewater to the SVCW for treatment and discharge into San Francisco Bay. SVCW is a Joint Powers Authority (JPA) that provides wastewater treatment services to the Cities of Redwood City, San Carlos, and Belmont as well as the District.

The District owns and operates wastewater collection system facilities serving portions of Menlo Park, Atherton, and Portola Valley. Wastewater from these communities is treated at the Silicon Valley Clean Water (SVCW) treatment plant, the cost for which is billed to the District and included in the District's sewer service charges. Most recently, the District took over the wastewater collection system operations for the Towns of Los Altos Hills and Woodside under a new services contract. Wastewater from these communities is treated at the Palo Alto Regional Water Quality Control plant. Under the services contract, the District is fully compensated by the towns. The towns are responsible for setting rates for their customers, which will cover the District's cost as well as the cost of treatment.

### 2.2 EXISTING SEWER RATES

The District charges sewer customers annually on the tax rolls, which is a common practice for billing for sewer service. Billing on the tax rolls is less expensive than it would be if the District issued its own bills while allowing the County to easily levy liens for nonpayment. Even though the District bills through the tax rolls, its sewer service charges are not a tax or assessment. Unlike taxes or assessments, which are based on land-related characteristics such as assessed value or parcel size, the District's sewer charges are a form of service fee or charge that is proportionate to the cost of providing sewer service.



The District's sewer service charges have recently increased primarily in response to increases in SVCW's treatment charges, as well as to maintain the level of service required to safely and reliably meet the sewer service needs of the District ratepayers. The District has also been faced with additional recent capital improvements to renew and replace aging District infrastructure, in addition to significant increases in SVCW capital improvement needs.

### 2.3 RECENT RATE INCREASES

During the last five years, the District's rates have increased as shown in Figure 2-1.

**Figure 2-1. Recent Rates and Rate Increases**

	2010/11	2011/12	2012/13	2013/14	2014/15
Sewer Service Charge per EDU	\$650	\$690	\$752	\$820	\$893
Annual Increase in Charge		\$40	\$62	\$68	\$73
Annual Increase		6%	9%	9%	9%

The 37% cumulative increase during this period is primarily attributable to SVCW's increasing debt service allocation to the District and, secondarily, to increase in the District's reserves that was necessitated to bring them to the target levels.

### 3. REVENUE REQUIREMENT PROJECTIONS

A spreadsheet model was developed to derive revenue requirements for FY 2015-16 through FY 2019-20. The revenue requirements represent the costs that must be covered by revenue from rates and other sources. The District's O&M budget for FY 2014-15 served as the starting point for projecting the District's expenses and revenues. The escalation factors summarized in Figure 3-1 were incorporated in the model for projecting expense and revenues.

**Figure 3-1. Key Modeling Assumptions**

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	Source
General Inflation	Per Budget	3.0%	3.0%	4.0%	4.0%	4.0%	WBSD Budget
Utilities	Per Budget	5.0%	5.0%	5.0%	5.0%	5.0%	Estimate
Salaries & Benefits	Per Budget	2.0%	2.0%	2.0%	2.0%	2.0%	Estimate
SVCW O&M Increase	Per Budget	4.6%	4.5%	3.8%	4.5%	4.5%	SVCW Budget
Interest on Earnings	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	WBSD Budget
Non-rate Revenues	Per Budget	1.0%	1.0%	1.0%	1.0%	1.0%	Estimate
Growth in Accounts & Demand	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	Estimate

The application of these assumptions to the O&M and capital expenses is described below and summarized in Figure 3-3.

#### 3.1 DISTRICT O&M EXPENSES

The District's O&M expenses are projected to increase by a few percent per year from approximately \$6.0 million to \$7.1 million over the planning period. Annual increases are generally no greater than the estimated rate of inflation or cost escalation for most recurring expenses. The District has added two staff positions that are needed to staff the crews that clean the collection system. This requirement has grown because the District started cleaning the collection systems at Los Altos Hills and Woodside in August 2014.

#### 3.2 DISTRICT CAPITAL EXPENSES

The District's capital expenses are summarized by category in Figure 3-2. Annual costs range from \$4.8 million to \$7.9 million during the modeling period; FY 2014-15 appears higher than subsequent years due to capital projects that were deferred from prior years. On average, the District expects to spend approximately \$5.6 million annually on these projects, the majority of which (approximately \$4.0 million per year with construction cost inflation) funds Master Plan projects. The remaining capital expenses comprise various ongoing administrative and other capital expenditures.

**Figure 3-2. CIP Summary**

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Administration	\$345,000	\$345,000	\$351,900	\$358,938	\$366,117	\$373,439
Collection Facilities	\$722,500	\$722,500	\$744,175	\$766,500	\$797,160	\$829,047
Subsurface Lines						
Proposed (Master Plan)	\$6,659,500	\$4,847,500	\$5,118,925	\$4,089,562	\$4,051,723	\$3,459,800
Other	\$0	\$0	\$0	\$0	\$0	\$0
Construction Proj. Environ Review	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Manhole Raising	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Allow. For Unanticipated Cap Ex	<u>\$75,000</u>	<u>\$75,000</u>	<u>\$75,000</u>	<u>\$75,000</u>	<u>\$75,000</u>	<u>\$75,000</u>
Total Capital Expenses	\$7,912,000	\$6,100,000	\$6,400,000	\$5,400,000	\$5,400,000	\$4,847,286

The District plans to fund these capital improvements on a pay-as-you-go (PAYGo) basis without issuing debt, which continues the District's historical practice. The District's rates do not directly fund each year's capital improvements. Instead, the funding for the District's capital expenses takes the form of smooth annual contributions of rate revenue to the Capital Reserve equal to the average projected annual expenditures. Capital projects are funded in varying amounts each year from the Capital reserves. In this way, rates can be modulated smoothly by using the Capital Reserve as a buffer. These contributions are in effect the capital expenses.

### 3.3 RESERVE EXPENSES

In addition to covering annual expenses, sewer service charges need to generate revenue to maintain adequate operations and capital reserves. To determine what constitutes adequate reserve amounts, the reserve balance was subdivided into Operations, Capital, and Emergency Reserves. In this way, it is possible to set recommended target balances for each purpose.

#### 3.3.1 Operations Reserve Minimum Balance

The Operations Reserve provides working capital for monthly O&M expenses. Because of the nine-month lag between sewer service charge payments from the County tax assessor, the minimum Operations Reserve balance is set equal to five months of O&M expenses to provide adequate cash flow. If this minimum balance is maintained, the District should be able to fund its monthly operations cash flow over this extended period without relying on the Capital Reserve for a short-term loan.

Maintaining the minimum balance for the Operations Reserve is recommended as the highest priority for the District's three reserves.

#### 3.3.2 Emergency Reserve Target Balance

The target balances for the Operations and Capital Reserves are sufficient to provide working capital on an ongoing basis, but do not provide for unforeseen contingencies such as emergencies. Should an emergency strike (e.g. earthquake), the District cannot

suddenly raise rates to generate additional funds due to state law requirements for such rate increases (i.e., Proposition 218). Moreover, the District bills annually on the tax rolls. Therefore, the District has set a target for the Emergency Reserve of \$5.0 million. With such a reserve, the District would have funds on hand to take immediate remedial steps without waiting to procure a loan or issue bonds.

Maintaining the target balance for the Emergency Reserve is recommended as the second highest priority after meeting the minimum balance for the Operations Reserve. The Emergency Reserve can be used for funding capital projects at times when the Capital Reserve is not fully funded.

### 3.3.3 Capital Reserve Target Balance

The Capital Reserve provides liquidity to fund construction for projects that are funded on a PAYGo basis (as opposed to those that are funded from debt). With adequate capital reserves, the District is able to pay contractors without encroaching on the Operations or Emergency Reserves. The target balance for the Capital Reserve depends on the level of construction. A minimum balance equal to the average annual construction costs (approximately \$3.5 million) was used for determining an appropriate and reasonable target balance.

Maintaining the target balance for the Capital Reserve is recommended after meeting the minimum balances for the Operations and Emergency Reserves.

### 3.3.4 Vehicle and Equipment Replacement Fund

The vehicle and equipment replacement reserve provides funding to cover the replacement of vehicles and major equipment. Using the vehicle and equipment inventory developed by District staff, it was calculated that annual target funding of \$215,000 plus 3% inflation would provide adequate funding to replace vehicles and equipment as their useful lives expire. By funding the reserve on an annual basis, the District is also able to smooth out the year-over-year impact of vehicle and equipment replacement costs, which vary from year to year.

As of December 2014, the Emergency Capital and Capital Reserves target balances were achieved. The District plans on discontinuing the use of a line of credit, which was intended to provide additional protection until all reserves are fully funded. The cost of a line of credit was included in the revenue recommendations for FY 2014-15 only.

## 3.4 SVCW EXPENSES

SVCW's treatment charge currently is 45% of the District's total revenue requirement, and is the District's single largest expense. The District's charge is allocated in proportion to the number of its EDUs compared with the other SVCW member agencies. SVCW's cost has recently increased significantly to fund the debt service on

the series of bonds that have been issued to fund the rehabilitation of its interceptors, pump stations, and wastewater treatment plant. By the projected completion of the project, SVCW's total debt service allocation to the District will equal \$13.4 million, an increase of \$10.3 million over the current debt service.

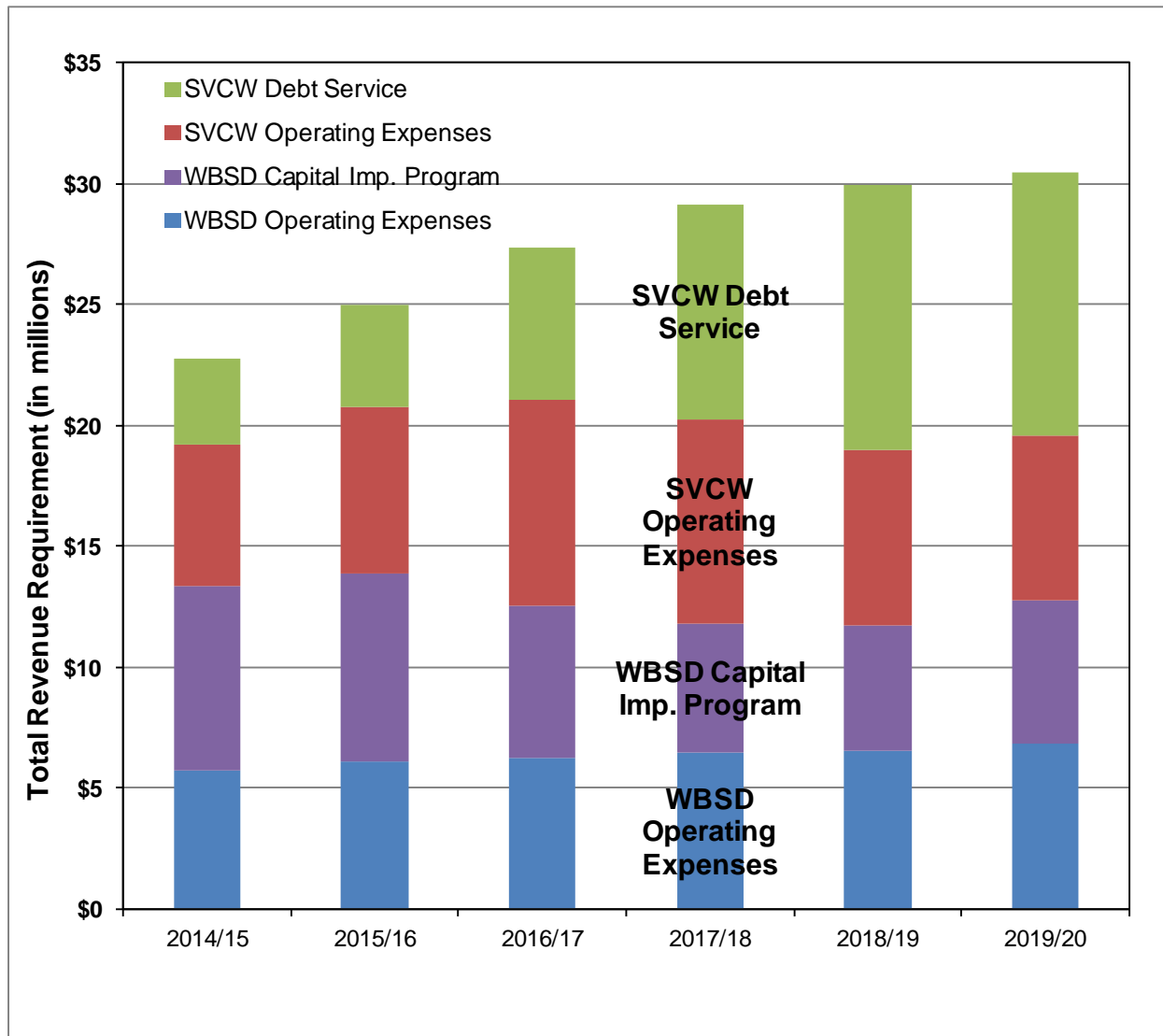
### 3.5 TOTAL REVENUE REQUIREMENTS

The foregoing modeling assumptions lead to the projected revenue requirements shown in Figure 3-3 and Figure 3-4. Figure 3-3 shows that:

- There will be very little increase projected in the District's own O&M expenses.
- The District's funding need for capital improvements will be higher initially but will remain fairly constant in the out years.
- The projected SVCW O&M expenses increase gradually; although current estimates may not reflect future O&M after SVCW completes its capital improvement program.
- SVCW's capital costs increase significantly as SVCW issues bonds to construct its capital improvement program.

Unlike the District's local costs, SVCW costs are largely beyond the District's control. Figure 3-4 contains the same data as Figure 3-3 in tabular form.

**Figure 3-3. Projected Revenue Requirements**



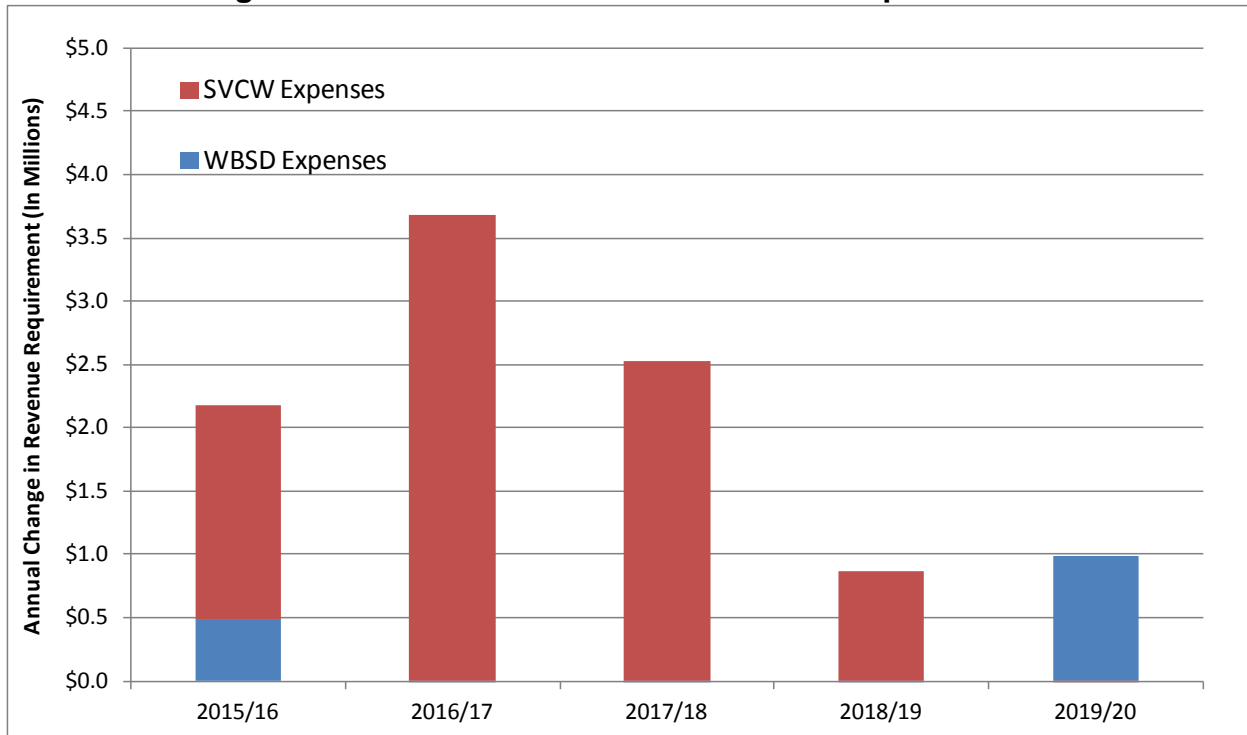
**Figure 3-4. Projected Revenue Requirements**

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
SVCW Debt Service	\$3,599,464	\$4,242,953	\$6,314,459	\$8,875,156	\$10,967,598	\$10,947,188
SVCW Operating Expenses	\$5,821,000	\$6,870,000	\$8,479,000	\$8,441,000	\$7,217,105	\$6,797,500
WBSD Capital Imp. Program	\$7,652,422	\$7,755,070	\$6,343,804	\$5,388,654	\$5,177,722	\$5,937,939
WBSD Operating Expenses	\$5,718,847	\$6,099,181	\$6,213,017	\$6,431,538	\$6,575,398	\$6,804,704
Total Projected Revenue Req't.	\$22,791,733	\$24,967,204	\$27,350,281	\$29,136,348	\$29,937,822	\$30,487,332

Figure 3-5 shows the annual revenue requirement increases attributable to the District and SVCW. SVCW's share of the increases is greatest in the first four years because of the issuance of bonds for its capital improvement program. The District's share of the revenue requirement increases appears in FY 2015-16 due to an increase in capital

improvement program funding, and is virtually non-existent until FY 2019-20 at which point the SVCW expenses grow at an inflationary pace

**Figure 3-5. Annual Increases in Revenue Requirements**



## 4. PROJECTED RATE INCREASES

### 4.2 REVENUE AND RATE INCREASES

Current rates cannot support the projected revenue requirements shown in Figure 3-4. The revenue increases and corresponding sewer service charges that are recommended are summarized in Figure 4-1. The revenue increase represents how much more revenue is needed compared to existing rates.

**Figure 4-1. Projected Revenue and Rate Increase**

	ADOPTED					
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Sewer Service Charge per EDU	\$893	\$973	\$1,051	\$1,135	\$1,192	\$1,204
Annual Increase in Charge	\$0	\$80	\$78	\$84	\$57	\$12
Annual Increase	9.0%	9.0%	8.0%	8.0%	5.0%	1.0%
Cumulative Increase		19%	28%	39%	46%	47%

#### 4.2.1 STEP/Grinder Charges

The District has approximately 60 single family residential customers located in the On-Site Wastewater Disposal Zone who require either Septic Tank Effluent Pumping systems (STEP) or Grinder Pumping systems. These customers are currently charged an additional \$243 annually for the services the District provides these customers to service and replace their pumps and appurtenances; it has been the District's practice to charge the same amount for either a STEP or grinder pump.

Before FY 2013-14, the District had not updated the STEP/grinder charge for several years, at which time cost analyses were prepared and verified by HF&H which indicated that the District's current cost to maintain STEP and grinder pumping systems is greater than the District's charge. Going forward, the Board elected to increase the STEP/Grinder charges by the same percentage as the sewer service charges in order to continue to recover the majority of the costs associated with providing this service. Figure 4-2 outlines the projected rate increases:



**Figure 4-2. Projected STEP/Grinder Charges**

	ADOPTED					
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
STEP/Grinder Charge per EDU	\$243	\$265	\$286	\$309	\$324	\$328
Annual Increase in Charge	\$0	\$22	\$21	\$23	\$15	\$3
Annual Increase	9.0%	9.0%	8.0%	8.0%	5.0%	1.0%

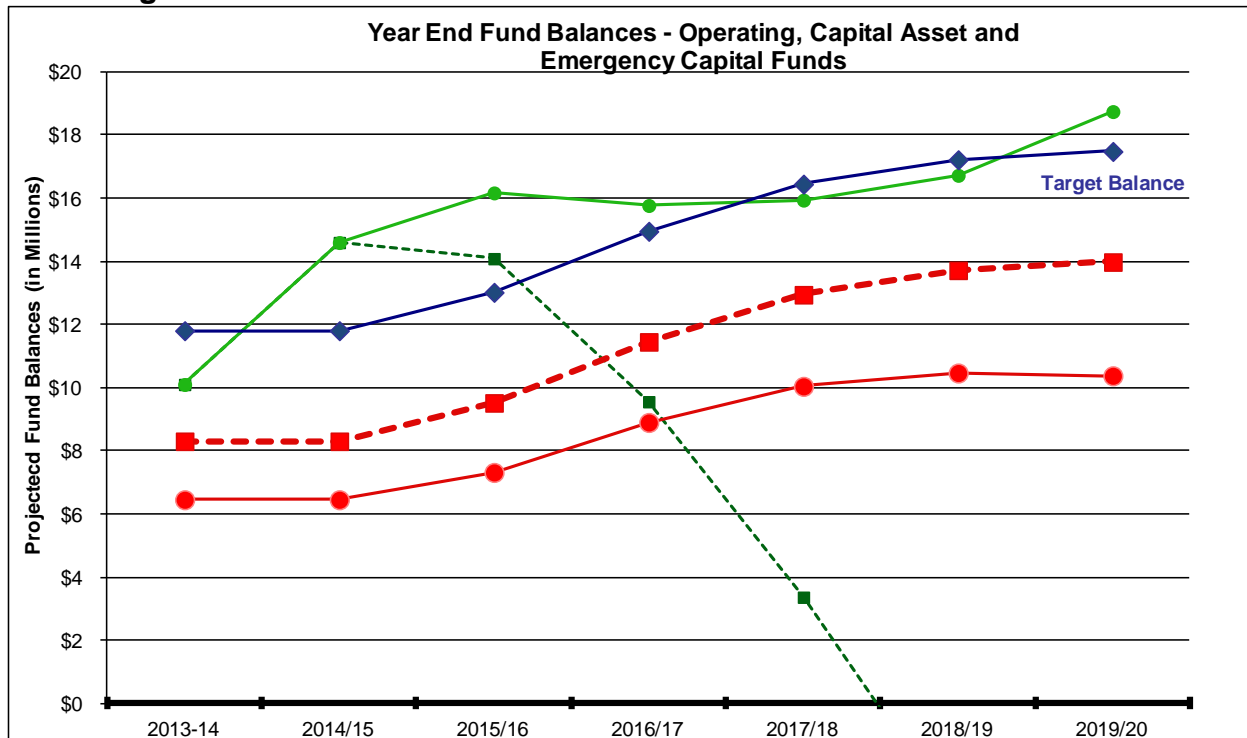
### 4.3 FUND BALANCE

Figure 4-3 shows the projected annual fund balances with the rate increases (solid green line) and without the rate increases (dashed green line). Although the projections show straight lines between years, the fund balance will fluctuate down substantially during each year. In other words, the reserves are actively drawn on at all times during the year but only periodically added to when payments are received from the County. The reserves are not simply accumulated without being used.

By June 30, 2018, the projected fund balance would be nearly zero without future rate increases, assuming that the District did not to reduce expenditures. Clearly, the District would not be able to continue expenditures that would result in a negative fund balance. The District would have to severely curtail expenditures if rates were not increased.

The recommended sewer service charges are increased so that the resulting fund balance meets the target balance (blue line). Once the target balance is met, the District will have sufficient liquidity to fund operating and capital needs, but should not be regarded as being amply endowed. Additional funding that can be accumulated above the target balance will provide the District with a contingency for emergencies or other unanticipated events.

**Figure 4-3. Fund Balance With and Without Increased Rate Revenue**

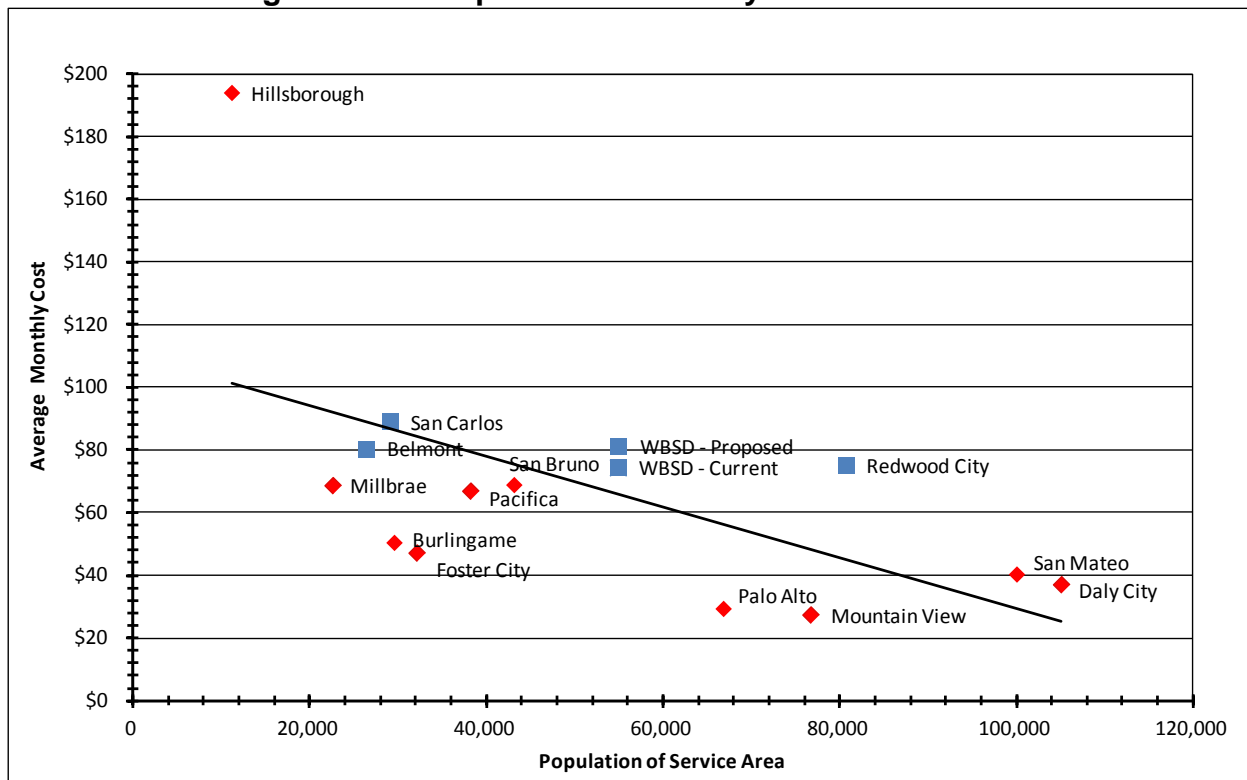


#### 4.4 COMPARISON OF RECENT AND PROPOSED SEWER COSTS

Based on available sources, Figure 4-4 shows the recent charges<sup>1</sup> for sewer service among various San Mateo and Santa Clara County agencies. Larger agencies tend to have lower rates because they can take advantage of economies of scale and have a larger base of customers over which to distribute fixed costs. Figure 4-4 indicates that the District’s current sewer rates track the trend line along with the other SVCW member agencies (identified with blue squares in Figure 4-4). It should be noted that the other SVCW member agencies are also faced with similar additional costs as the District. It is expected that these agencies will be required to increase their rates substantially to cover their share of SVCW costs. Even with the projected rate increases, we would not expect the District’s relative position among its neighbors to change significantly.

<sup>1</sup> In most cases, the proposed increases in sewer service charges are already adopted. In some cases, the final charge is pending adoption at the respective agency’s public hearing.

Figure 4-4. Comparison of Monthly Residential Bills



## 5. CUSTOMER LOADING AND FLOW ANALYSIS

### 5.1 COST OF SERVICE ANALYSIS

In recent years, the District's rate-setting process focused on ensuring that revenue from rates is sufficient to cover its revenue requirements. As a result of the magnitude of the increases in the District's share of SVCW's debt service, the District's rates have increased 9% per year over the last three years. These percentage increases have been applied across the board to the rates charged to all the District's customers.

By applying the same percentage increase to all rates, the District has maintained the current proportionality among its residential and non-residential customers. In other words, each class has continued to pay the same proportionate share of the overall costs. The amount that each class pays as a proportion of the total represents its share of the cost of service. The cost of service is determined by allocating costs in proportion to the services that each class requires to treat its share of the flow and the amount of BOD and TSS that it contributes.

It is appropriate for the District to undertake a new cost of service analysis in the near future. Cost of service analysis requires the best available data on customer class flows and on BOD and TSS strength concentrations. Customer class flows are typically derived from billing data from the local water supplier. Strength concentrations are based on State guidelines<sup>2</sup> for most customer classes and from sampling data for industrial customers.

The acquisition of metered water billing data can complicate conducting a cost of service analysis. In the District's case, its customers are served potable water by six different water suppliers. Each of these water suppliers collects its own meter readings using its own customer billing systems. This data is currently compiled for the District's non-residential customers, which are billed based on flow. Because the number of residential accounts is much greater, the process of collecting this data for individual single and multi family accounts would be significantly more complicated. The District does not currently collect residential meter reading data because its residential customers are not billed based on their individual flow; they are billed per EDU.

### 5.2 RATE DESIGN

Cost of service analysis is also a precursor for evaluating rate structures. In the District's case, its residential flat charges per EDU and its volumetric non-residential rates should be set so that they generate each class' share of the cost of service. The

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<sup>2</sup> Revenue Program Guidelines. State Water Resources Control Board.

District should evaluate its rate structure at the same time it updates its cost of service analysis.

Recently, some the District's multi family customers expressed concerns about the multi-family rates, which currently are the same charge per EDU as the single family rate. These customers pointed out that multi family customers can have lower flow per dwelling unit than single family customers because multi family dwellings may have fewer bedrooms and, hence, fewer occupants; lower occupancy can also occur among single family customers.

To account for lower flows per dwelling unit in setting rates, other rate structures are used in the industry for multi-family customers. The District's existing rate structure charges the same flat rate per dwelling unit for single and multi family customers, which is the most common residential rate structure. The District's non-residential commercial and industrial customers are based on their individual flow data and estimated BOD and TSS concentrations.

Some wastewater agencies are able to charge different flat rates for single and multi family dwelling units based on differences in flow when flow data is available. In this case, flow data for the single family and multi family classes is used to establish different flat rates for single and multi family customers. Typically, flow is evaluated periodically and used to establish the differential between single and multi family customers that will apply for several years; annual flow analysis is not warranted because the differential does not vary greatly.

Designing accurate rates and calculating fair customer bills depends on the best available flow data. Because of the difficulty the District has in compiling flow data from disparate sources, it is difficult for the District to design sophisticated residential rates. Its current residential rates are flat, unvarying amounts for both its single and multi family customers, which can be calculated without knowing each customer's water use data.

The District's flat residential rates are the most common structure in California. Approximately two-thirds of wastewater agencies charge flat residential rates. The one-third that charge volumetric residential rates do so to improve rate-payer equity. By using flow, these agencies are reflecting proportionate differences among each customer's flow. The majority of agencies that charge volumetric residential rates are also the local water supplier, which gives them ready access to the metered water use data. These agencies also issue their own monthly or bimonthly bills for both water and wastewater service, rather than bill annually on the tax rolls. The District has neither of these advantages. The District does not provide water service and bills its customers on the tax rolls.

### 5.3 RECENT FLOW STUDIES

Based on the concerns expressed by the District's multi family customers, District staff conducted a flow monitoring study during September 10, 2013 through October 14, 2013 to determine the gallon per day flow rate for multi-family and single family customers discharging into the District's conveyance system, and to determine if the daily loadings are higher in concentration for single family versus multi family. The District selected two neighborhoods that included either single or multi family dwelling units exclusively. The study determined that the average daily flow from the single and multi family dwelling units was 203 GPD and 201 GPD, respectively. It was also found that the single family BOD and TSS concentrations were 50% higher than the multi family concentrations.

Based on the results produced from this study, the District determined further analysis of flow was required before any conclusions could be drawn on the difference in flow between single and multi family flows, and as such, another similar study was conducted in 2014.

The District selected an additional two neighborhoods that included either single or multi family dwelling units exclusively. The SVCW performed the initial analysis from August 6, 2014 through September 5, 2014 and Accutest Laboratories performed the analysis from September 6, 2014 through September 30, 2014. This time, the study determined that the average daily flow from the single and multi family dwelling units was 73 GPD and 327 GPD, respectively, which results in multi family average daily flows that were 4.48 times higher per dwelling unit when compared to single family average daily flows. Potential causes that were identified for the higher flows at the multi family sampling site included leaking flapper valves in toilet tanks as well as leaking sewer pipes. It was also found that the single family BOD and TSS concentrations were even with the multi family concentrations, but approximately 40% greater than the District's base limit of 150 mg/L.

The details of the District's 2013 and 2014 analysis can be found in Appendix B.

This illustrates the difficulty the District is faced with in determining the difference in flow between single and multi family customers for purposes of designing rates. Further analysis of flow is required before the District can draw any conclusions on the difference in flow between single and multi family flows.

### 5.4 FURTHER ANALYSIS

Because the District has not conducted a recent cost of service analysis, we recommend that it do so based on the best available data. Recent flow studies presented discrepancies that underscore the difficulty the District is faced with in analyzing flow data from a number of water suppliers.

We recommend that the District collect metered water use data from its water suppliers for as many of its customers as feasible for a period of at least three years. This data can be used for calculation flows by customer class, which can be used for the cost of service analysis as well as for evaluating the rate structure.

We further recommend that the District compile loading data for BOD and TSS for its flow to the SVCW treatment plant as well as for its industrial customers for the next three years. This loading data can also be used for determining each customer class' share of the cost of service but also for designing rates.

With three years of data, the District should calculate the variance from year to year for each class. If the variances are significant (e.g., greater than  $\pm 5\%$  per year from the three-year average), we recommend collecting additional flow and loading data, for a total of five years.

The District should be able to determine with five years of flow data whether there is sufficient difference in flow between single and multi family customers to adjust its flats rates. Alternatively, the District could elect to convert its multi family accounts to commercial accounts, which would be billed on flow rather than per dwelling unit.

With multiple years of industrial sampling data, coupled with multiple years of flow data, the District should also be able to adjust its non-residential rates so that they reflect the current cost of service.

In adjusting either multi family or non-residential rates, we recommend a gradual transition from the current rate structure to a new rate structure. The transition will avoid "rate shock" in which sudden hardships are experienced.





## **APPENDIX A. SEWER RATE MODEL**



	A	B	C	D	E	F	G	H	I
1	West Bay Sanitary District								
2	Sewer Rate Study								
3	Table 1A. Summary								
4									
5									
6	<i>Fiscal Year:</i>	<b>Adopted 2013/14</b>	<b>Adopted 2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>	<b>Notes</b>
7	<b>Revenue Increases</b>	9%	9%	9.0%	8.0%	8.0%	5.0%	1.0%	To Tables 3, 4
8	<i>Cumulative Increase</i>			18.8%	28.3%	38.6%	45.5%	47.0%	From Table 3
9									
10	<i>Average Residential Bill</i>	\$820	\$893	\$973	\$1,051	\$1,135	\$1,192	\$1,204	
11	<i>Average Residential Bill Increase</i>			\$80	\$78	\$84	\$57	\$12	
12									
13									
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**Year End Fund Balances - Operating, Capital Asset and  
Emergency Capital Funds**

Fiscal Year	Operating	Capital Asset	Emergency	Total	Target Balance
2013-14	\$10.0	\$11.8	\$8.2	\$6.5	
2014/15	\$14.5	\$11.8	\$8.2	\$6.5	
2015/16	\$16.2	\$13.0	\$9.5	\$7.5	
2016/17	\$15.8	\$15.0	\$11.5	\$9.0	
2017/18	\$16.0	\$16.5	\$13.0	\$10.0	\$16.5
2018/19	\$16.8	\$17.2	\$13.8	\$10.5	
2019/20	\$19.0	\$17.5	\$14.0	\$10.5	\$17.5

	A	B	C	D	E	F	G	H	I	J
1	<b>West Bay Sanitary District</b>									
2	<b>Sewer Rate Study</b>									
3	<b>Table 1B. General</b>									
4										
5	<b>List of Model Worksheets</b>									
6	Table 1A. Summary									
7	Table 1B. General									
8	Table 2. Revenue Requirement									
9	Table 3. Revenue Increases									
10	Table 4. Reserves									
11	Table 5. Capital Projects									
12	Table 6. Debt Service Schedule									
13	Table 7. Single-Family Rate Comparison									
14										
15										
16	<b>Assumptions</b>		<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>	<b>Source</b>	<b>Notes</b>
17										
18	(1)	General Inflation	Per Budget	3.0%	3.0%	4.0%	4.0%	4.0%	WBSD Budget	To Table 2
19	(2)	Utilities	Per Budget	5.0%	5.0%	5.0%	5.0%	5.0%	Estimate	To Table 2
20	(3)	Salaries & Benefits	Per Budget	2.0%	2.0%	2.0%	2.0%	2.0%	Estimate	To Table 2
21	(5)	SVCW O&M Increase %	Per Budget	4.6%	4.5%	3.8%	4.5%	4.5%	SVCW Fin. Plan 3/25/2014	To Table 2
22	(7)	Interest on Earnings		0.5%	0.5%	0.5%	0.5%	0.5%	WBSD Budget	To Table 4
23	(8)	Non-rate Revenues	Per Budget	1.0%	1.0%	1.0%	1.0%	1.0%	Estimate	To Table 2
24	(9)	% Growth in Accounts & Demand		0.5%	0.5%	0.5%	0.5%	0.5%	Estimate	To Tables 2,3
25	(10)	Cost of Grinder Maintenance	Per Budget	9.0%	8.0%	8.0%	5.0%	1.0%	Based on Table 1A	To Table 2
26	(11)	Construction Cost Inflation	Per Budget	0.0%	0.0%	0.0%	0.0%	0.0%		To Table 5
27										
28	<b>Target Fund Balances</b>									
29	<u>Operating Fund</u>									
30	Purpose		For O&M cash flow during the year							
31	Minimum balance		Cannot go negative							
32	Target balance		Five months of operating expenses							
33										
34	<u>Capital Asset Fund</u>									
35	Purpose		To be used for replacement of Equipment/ Facilities							
36	Minimum balance		Cannot go negative							
37	Target balance		\$3,500,000							
38										
39	<u>Emergency Capital Fund</u>									
40	Purpose		To be used for sewer emergencies							
41	Minimum balance		Cannot go negative							
42	Target balance		\$5,000,000							

	A	B	C	D	E	F	G	H	I
1	<b>West Bay Sanitary District</b>								
2	<b>Sewer Rate Study</b>								
3	<b>Table 2. Revenue Requirement</b>								
4									
5		<b>Tbl.</b>	<b>Budgeted</b>	<b>Projected</b>					
6		<b>1B</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>	<b>Notes</b>
7	<b>SVCW Projected Expenses</b>								
8	Contrib. to Operations	(5)	\$5,350,000	\$5,594,000	\$5,845,000	\$6,069,000	\$6,342,105	\$6,627,500	WBSD Cash Flow FCST 12/12/2015
9	SVCW Capital Outlay/Repairs		\$0	\$268,000	\$268,000	\$268,000	\$805,000	\$100,000	SVCW Financial Plan 3/25/2014
10	Contrib. to SRF Reserve		\$401,000	\$938,000	\$2,296,000	\$2,034,000	\$0	\$0	SVCW Financial Plan 3/25/2014
11	Line of Credit Expense		\$70,000	\$70,000	\$70,000	\$70,000	\$70,000	\$70,000	SVCW Financial Plan 3/25/2014
12	2008 SVCW Bond (\$10 million)		\$203,378	\$204,378	\$205,178	\$200,778	\$201,378	\$201,490	From Table 6
13	2009 SVCW Bond (\$55 million)		\$1,298,882	\$1,294,981	\$1,284,356	\$1,281,924	\$1,272,780	\$1,262,048	From Table 6
14	2014 SVCW Bond (\$65 million)		\$989,284	\$1,145,508	\$1,144,323	\$1,144,173	\$1,144,768	\$1,144,886	From Table 6; Bartle Wells Report
15	2015 SVCW Bond (\$60 million)		\$500,000	\$708,000	\$915,000	\$992,000	\$992,000	\$992,000	SVCW Financial Plan 3/25/2014;
17	Future SVCW Bonds		\$0	\$0	\$1,232,000	\$1,436,000	\$1,512,000	\$1,512,000	SVCW Financial Plan 3/25/2014
18	2011 SRF Loan (\$7 million)		\$206,921	\$204,530	\$202,065	\$199,524	\$196,904	\$194,202	From Table 6 - Estimated
19	2012 SRF Loan - WWTP Projects		\$0	\$284,557	\$562,538	\$555,758	\$548,769	\$541,562	SVCW Fin Plan 3/25/2014; From
20	Future SVCW SRF Loan		\$401,000	\$401,000	\$769,000	\$3,065,000	\$5,099,000	\$5,099,000	SVCW Fin Plan 3/25/2014; 2021/
21		<b>Subtotal, SVCW</b>	\$9,420,464	\$11,112,953	\$14,793,459	\$17,316,156	\$18,184,703	\$17,744,688	
22		<i>Annual Change</i>		18.0%	33.1%	17.1%	5.0%	-2.4%	
23									
24	<b>Operating Expenses</b>								
25	Salaries	(3)	\$2,814,271	\$2,870,556	\$2,927,968	\$2,986,527	\$3,046,257	\$3,107,183	
26	Additional Positions	(3)	\$0	\$210,000	\$214,200	\$218,484	\$222,854	\$227,311	Per email dated 1/15/2015
27	Employee Benefits	(3)	\$1,204,077	\$1,228,159	\$1,252,722	\$1,277,776	\$1,303,332	\$1,329,398	
28	Director's Fees	(1)	\$34,404	\$35,436	\$36,499	\$37,959	\$39,478	\$41,057	
29	Election Expense		\$0	\$40,000	\$0	\$40,000	\$0	\$40,000	Per Board's Direction
30	Gasoline, Oil and Fuel	(1)	\$65,000	\$66,950	\$68,959	\$71,717	\$74,586	\$77,569	
31	Insurance	(1)	\$92,000	\$94,760	\$97,603	\$101,507	\$105,567	\$109,790	
32	Memberships	(1)	\$23,350	\$24,051	\$24,772	\$25,763	\$26,793	\$27,865	
33	Office Expense	(1)	\$33,000	\$33,990	\$35,010	\$36,410	\$37,866	\$39,381	
34	Operating Supplies	(1)	\$323,395	\$333,097	\$343,090	\$356,813	\$371,086	\$385,929	
35	Contractual Services	(1)	\$388,000	\$399,640	\$411,629	\$428,094	\$445,218	\$463,027	
36	Professional Services	(1)	\$425,350	\$438,111	\$451,254	\$469,304	\$488,076	\$507,599	
37	Printing and Publications	(1)	\$62,500	\$64,375	\$66,306	\$68,959	\$71,717	\$74,586	
38	Rents and Leases	(1)	\$34,080	\$35,102	\$36,155	\$37,602	\$39,106	\$40,670	
39	Repairs and Maintenance	(1)	\$252,825	\$260,410	\$268,222	\$278,951	\$290,109	\$301,713	
40	Research and Monitoring	(1)	\$8,000	\$8,240	\$8,487	\$8,827	\$9,180	\$9,547	
41	Travel and Meetings	(1)	\$55,500	\$57,165	\$58,880	\$61,235	\$63,685	\$66,232	
42	Utilities	(2)	\$140,500	\$147,525	\$154,901	\$162,646	\$170,779	\$179,318	
43	Other Operating Expense	(1)	\$153,000	\$157,590	\$162,318	\$168,810	\$175,563	\$182,585	
44	Transf. to Solid Waste Fund		(\$65,000)	(\$65,000)	(\$65,000)	(\$65,000)	(\$65,000)	(\$65,000)	
45	WBSD Emer. Reserve LOC fee		\$15,600	\$0	\$0	\$0	\$0	\$0	WBSD Cash Flow FCST 12/12/2015
46		<b>Subtotal, Operating Expenses</b>	\$6,059,852	\$6,440,156	\$6,553,974	\$6,772,384	\$6,916,250	\$7,145,759	
47		<i>Annual Change</i>		6.3%	1.8%	3.3%	2.1%	3.3%	
48	<b>Non-Operating Expenditures</b>								

	A	B	C	D	E	F	G	H	I
1	<b>West Bay Sanitary District</b>								
2	<b>Sewer Rate Study</b>								
3	<b>Table 2. Revenue Requirement</b>								
4									
5		<b>Tbl.</b>	<b>Budgeted</b>	<b>Projected</b>					
6		<b>1B</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>	<b>Notes</b>
49	Other Non-Operating Expense	(1)	\$6,000	\$6,180	\$6,365	\$6,620	\$6,885	\$7,160	
50	Contrib. to LAFCo		\$12,500	\$13,625	\$14,715	\$15,892	\$16,687	\$16,854	Incr. by Rate % on Table 1A
51	<b>Subtotal, Non-Operating Expenditures</b>		\$18,500	\$19,805	\$21,080	\$22,512	\$23,572	\$24,014	
52	<i>Annual Change</i>			7.1%	6.4%	6.8%	4.7%	1.9%	
53									
54	<b>Total Expenses</b>		\$15,498,816	\$17,572,914	\$21,368,514	\$24,111,053	\$25,124,525	\$24,914,461	
55	<i>Annual Change</i>								
56									
57	<b>Non-Operating Revenues</b>								
58	Flow Eq. Cost Sharing		(\$300,000)	(\$300,000)	(\$300,000)	(\$300,000)	(\$300,000)	(\$300,000)	From LB's email - Rates were inc
59	Permit & Inspection Fees	(8)	(\$50,000)	(\$50,500)	(\$51,005)	(\$51,515)	(\$52,030)	(\$52,551)	
60	Franchises		\$0	\$0	\$0	\$0	\$0	\$0	
61	Grinder Maintenance	(10)	(\$8,505)	(\$9,270)	(\$10,012)	(\$10,813)	(\$11,354)	(\$11,467)	Incr. by Rate % on Table 1A
62	Other Non-Operating Income	(8)	(\$1,000)	(\$1,010)	(\$1,020)	(\$1,030)	(\$1,041)	(\$1,051)	
63	<b>Subtotal, Non-Operating Income</b>		(\$359,505)	(\$360,780)	(\$362,037)	(\$363,358)	(\$364,425)	(\$365,069)	
64									
65	<b>Other Transfers to/(from)</b>								
66	Operating (General) Fund		\$6,952,422	\$7,540,070	\$6,122,354	\$5,160,560	\$4,942,786	\$5,695,955	From Table 4
67	Vehicle & Equipment Replacement Fund		\$0	\$215,000	\$221,450	\$228,094	\$234,936	\$241,984	To Table 4; 3% annual increase
68	Capital Projects Fund		\$350,000	\$0	\$0	\$0	\$0	\$0	From Table 4
69	Emergency Capital Reserves		\$350,000	\$0	\$0	\$0	\$0	\$0	From Table 4
70	<b>Total Transfers</b>		\$7,652,422	\$7,755,070	\$6,343,804	\$5,388,654	\$5,177,722	\$5,937,939	
71									
72	<b>Total Revenue Requirement</b>		\$22,791,733	\$24,967,204	\$27,350,281	\$29,136,348	\$29,937,822	\$30,487,332	To Table 3
73	<i>Annual Change</i>			9.5%	9.5%	6.5%	2.8%	1.8%	
74	<i>Cumulative Change</i>			9.5%	20.0%	27.8%	31.4%	33.8%	
75									
76	Source: West Bay Sanitary District FY 2014/15 Budget								

	A	B	C	D	E	F	G	H
1	<b>West Bay Sanitary District</b>							
2	<b>Sewer Rate Study</b>							
3	<b>Table 3. Revenue Increases</b>							
4								
5								
6		<b>Estimated</b>			<b>Projected</b>			
7		<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>	<b>Notes</b>
8	<b>Current Rate Revenue</b>							
9	Sewer Service Charges	\$20,909,847	\$21,014,396	\$21,119,468	\$21,225,066	\$21,331,191	\$21,437,847	
10	Revenue Requirement	(\$22,791,733)	(\$24,967,204)	(\$27,350,281)	(\$29,136,348)	(\$29,937,822)	(\$30,487,332)	From Table 2
11	<b>To/(From) operations before Rate Incr.</b>	(\$1,881,886)	(\$3,952,807)	(\$6,230,812)	(\$7,911,282)	(\$8,606,632)	(\$9,049,485)	To Table 4
12								
13								
14	<b>Increase in Rate Revenue</b>	<b>9%</b>	<b>9%</b>	<b>8%</b>	<b>8%</b>	<b>5%</b>	<b>1%</b>	From Table 1B
15	Cumulative Increase in Rate Revenue	9%	18.81%	28.31%	38.58%	45.51%	46.96%	To Table 1A
16	<b>Revenue from Rate Increases</b>							
17	FY 2013-14 (eff. July 1, 2013)	\$1,881,886	\$1,891,296	\$1,900,752	\$1,910,256	\$1,919,807	\$1,929,406	
18	FY 2014-15 (eff. July 1, 2014)		\$2,061,512	\$2,071,820	\$2,082,179	\$2,092,590	\$2,103,053	
19	FY 2015-16 (eff. July 1, 2015)			\$2,007,363	\$2,017,400	\$2,027,487	\$2,037,624	
20	FY 2016-17 (eff. July 1, 2016)				\$2,178,792	\$2,189,686	\$2,200,634	
21	FY 2017-18 (eff. July 1, 2017)					\$1,478,038	\$1,485,428	
22	FY 2018-19 (eff. July 1, 2018)						\$311,940	
23	FY 2019-20 (eff. July 1, 2019)							
24	FY 2020-21 (eff. July 1, 2020)							
25	FY 2021-22 (eff. July 1, 2021)							
26	<b>Total Revenue from Rate Increases</b>	\$1,881,886	\$3,952,808	\$5,979,935	\$8,188,627	\$9,707,608	\$10,068,086	
27	<b>Total Current Revenue</b>	\$20,909,847	\$21,014,396	\$21,119,468	\$21,225,066	\$21,331,191	\$21,437,847	From above
28	<b>Total Revenue</b>	\$22,791,733	\$24,967,204	\$27,099,403	\$29,413,692	\$31,038,799	\$31,505,933	
29	<b>Revenue Requirement</b>	(\$22,791,733)	(\$24,967,204)	(\$27,350,281)	(\$29,136,348)	(\$29,937,822)	(\$30,487,332)	From above
30	<b>To/(From) operations after Rate Incr.</b>	<b>\$0</b>	<b>\$0</b>	<b>(\$250,877)</b>	<b>\$277,344</b>	<b>\$1,100,977</b>	<b>\$1,018,601</b>	To Table 4

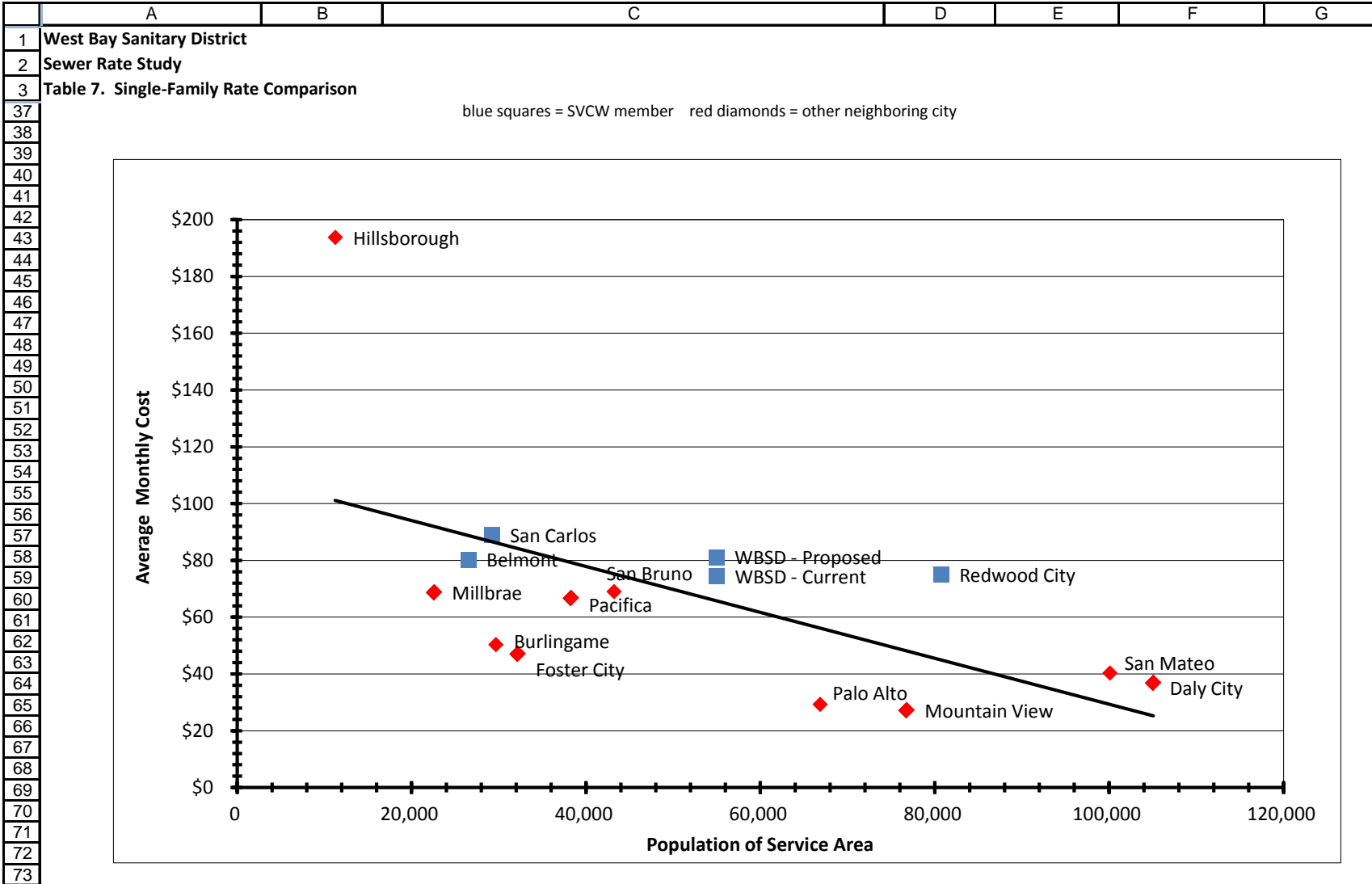
	A	B	C	D	E	F	G	H	I	J	K
1	West Bay Sanitary District										
2	Sewer Rate Study										
3	Table 4. Reserves										
4											
5			Tbl.	Actual	Budgeted						
6			1B	2013-14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	Notes
7											
8	<b>OPERATING (GENERAL) FUND</b>										
9	Revenue Increases										
10	Beginning Balance										
11	Surplus/Deficit										
12	Settlement Agreement										
13	Transfers (To)/From										
14	Revenue Requirement										
15	Emergency Capital Reserves										
16	Capital Asset Fund										
17	Fund Subtotal										
18	Estimated Interest Earnings (7)										
19	Ending Balance										
20	Minimum Balance (5 mo. operations)										
21											
22	<b>CAPITAL ASSET FUND (includes Capital Project Reserve)</b>										
23	Beginning Balance										
24	Revenues										
25	Connection Charges (8)										
26	Capital Projects										
27	Administration (3)										
28	Collection Facilities (1)										
29	Subsurface Lines										
30	Proposed (Master Plan)										
31	Other (11)										
32	Construction Proj. Environ Review (11)										
33	Manhole Raising (11)										
34	Allow. For Unanticipated Cap Ex										
35	Subtotal Expenses										
36	Transfers (To)/From										
37	Revenue Requirements										
38	Operating Fund										
39	Emergency Capital Reserve										
40	Subtotal Transfers										
41	Fund Subtotal										
42	Estimated Interest Earnings (7)										
43	Ending Balance										
44	Target Balance (Ava Annual CIP)										
45											
46	<b>EMERGENCY CAPITAL RESERVES</b>										
47	Beginning Balance										
48	Transfers (To)/From										
49	Revenue Requirements										
50	Operating Fund										
51	Capital Asset Fund										
52	Subtotal Transfers										
53	Fund Subtotal										
54	Estimated Interest Earnings (7)										
55	Ending Balance										
56	Minimum Balance										
57	Target Balance (SSM by 2015-16)										
58											
59	<b>Vehicle &amp; Equipment Replacement Fund</b>										
60	Beginning Balance										
61	Vehicle & Equipment Replacement Cost										
62	Transfers (To)/From										
63	Revenue Requirement										
64	Fund Subtotal										
65	Estimated Interest Earnings (7)										
66	Ending Balance										
67											
68	<b>OPERATING FUND (without rate increases)</b>										
69	Beginning Balance										
70	Surplus/Deficit										
71	Settlement Agreement										
72	Transfers (To)/From										
73	Revenue Requirement										
74	Emergency Capital Reserves										
75	Capital Asset Fund										
76	Fund Subtotal										
77	Estimated Interest Earnings (7)										
78	Ending Balance										
79	Minimum Balance (5 mo. operations)										
80											



	A	B	C	D	E	F	G	H
1	<b>West Bay Sanitary District</b>							
2	<b>Sewer Rate Study</b>							
3	<b>Table 5. Capital Projects</b>							
4								
5					<b>Projected</b>			
6		<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>	<b>Notes</b>
7	<b>R&amp;R Priority</b>							
8	Sausal Vista PS and Forcemain	\$ 1,000,000						
9	North Palo Alto Concrete	\$ -						
10	Fair Oaks							
11	Santa Cruz					\$ 1,004,000		
12	Roble				\$ 1,000,000	\$ 1,630,000		
13	Stevenson				\$ 1,155,000			
14	Elena						\$ 1,621,800	
15	Carlton-Madera Easements			\$ 1,150,000	\$ 1,354,000			
16	College Park North							
17	Oak Grove							
18	Encinal A							
19	Oak Knoll					\$ 845,000		
20	Encinal B							
21	Lucky/Campo Bello/Alameda&Atherton	\$ 400,000						
22	Menalto Easements						\$ 788,000	
23	Stowe Lane PS xcrossing SFPUC sag			\$ 150,000				
24	Berkeley							
25	Camino Al Lago			\$ 100,000				
26	MacBain				\$ 400,000			
27	Stowe Lane Pump Station			\$ 1,003,000				
28	Marsh Road/Burns Easement CIPP			\$ 2,000,000				
29	Belle Haven (frmly. Eastside Triangle)	\$ 2,250,000	\$ 4,490,000					
30	Pump Stations (miscellaneous)		\$ 150,000	\$ 150,000		\$ 75,000		
31	Point Repairs (miscellaneous)	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	
32	Future R&R							Per Pscott (phonec
33	<b>Subtotal - R&amp;R</b>	<b>\$3,700,000</b>	<b>\$4,690,000</b>	<b>\$4,603,000</b>	<b>\$3,959,000</b>	<b>\$3,604,000</b>	<b>\$2,459,800</b>	
34	<b>Capacity Priority</b>							
35	James Avenue Diversion							
36	Lower Ringwood							
37	Valparaiso							
38	Willow Gravity Main							
39	Upper Ringwood							
40	Santa Cruz Avy							
41	Cambridge Laurel							
42	Middlefield at Fair Oaks							
43	Future Capacity Projects	\$ 2,959,500	\$ 157,500	\$ 515,925	\$ 130,562	\$ 447,723	\$ 1,000,000	Placeholder - From
44	<b>Subtotal - Capacity</b>	<b>\$2,959,500</b>	<b>\$157,500</b>	<b>\$515,925</b>	<b>\$130,562</b>	<b>\$447,723</b>	<b>\$1,000,000</b>	
45								
46	Total CIP	\$6,659,500	\$4,847,500	\$5,118,925	\$4,089,562	\$4,051,723	\$3,459,800	
47	Inflationary Index		0.00%	0.00%	0.00%	0.00%	0.00%	From Table 1B
48	Total Inflated CIP	\$6,659,500	\$4,847,500	\$5,118,925	\$4,089,562	\$4,051,723	\$3,459,800	To Table 4
49								
50								
51								
52	Source: West Bay Sanitary District CIP Updated 12-22-14							

	A	B	C	D	E	F	G	H
1	<b>West Bay Sanitary District</b>							
2	<b>Sewer Rate Study</b>							
3	<b>Table 6. Debt Service Schedule</b>							
4								
5					<b>Projected</b>			
6		<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>	<b>Notes</b>
7	<b>SVCW 2009 Wastewater Revenue Bonds (\$55M)</b>							
8	Principal	\$285,000	\$295,000	\$300,000	\$315,000	\$325,000	\$335,000	From Schedule
9	Interest	\$1,013,882	\$999,981	\$984,356	\$966,924	\$947,780	\$927,048	From Schedule
10		\$1,298,882	\$1,294,981	\$1,284,356	\$1,281,924	\$1,272,780	\$1,262,048	To Table 2
11								
12	<b>SVCW 2008 Wastewater Revenue Bonds (\$10M) - Maturity Date 8/1/2029</b>							
13	Principal	\$100,000	\$105,000	\$110,000	\$110,000	\$115,000	\$120,000	From Schedule
14	Interest	\$103,378	\$99,378	\$95,178	\$90,778	\$86,378	\$81,490	From Schedule
15		\$203,378	\$204,378	\$205,178	\$200,778	\$201,378	\$201,490	To Table 2
16								
17	<b>SVCW 2014 Wastewater Revenue Bonds (\$65M) - Matures 2044</b>							
18	Principal	\$243,057	\$289,000	\$299,375	\$314,195	\$330,498	\$343,836	From Schedule
19	Interest	\$746,227	\$856,508	\$844,948	\$829,978	\$814,270	\$801,050	From Schedule
20		\$989,284	\$1,145,508	\$1,144,323	\$1,144,173	\$1,144,768	\$1,144,886	To Table 2
21								
22	<b>SVCW 2015 Wastewater Revenue Bonds (\$60M) - Matures</b>							
23	Principal							From Schedule
24	Interest							From Schedule
25		\$0	\$0	\$0	\$0	\$0	\$0	To Table 2
26								
27	<b>SVCW SRF Loan (\$7M)</b>	\$ 7,800,000 Par Amount						
28		3.10% Interest						
29		20 Years						
30								
31		1	2	3	4	5	6	
32	Principal	\$529,142	\$529,142	\$529,142	\$529,142	\$529,142	\$529,142	
33	Interest	\$241,800	\$232,892	\$223,709	\$214,240	\$204,478	\$194,414	
34		\$770,942	\$762,034	\$752,850	\$743,382	\$733,620	\$723,555	To Table 2
35	WBSD's Share	\$206,921	\$204,530	\$202,065	\$199,524	\$196,904	\$194,202	To Table 2; From SVCW Fin Plan 3/25/2014
36								
37	<b>SVCW SRF Loan (\$23M)</b>	\$ 23,032,005 Par Amount						
38		3.10% Interest						
39		20 Years						
40								
41		1	2	3	4	5		
42	Principal	\$0	\$1,562,461	\$1,562,461	\$1,562,461	\$1,562,461	\$1,562,461	
43	Interest	\$0	\$713,992	\$687,690	\$660,572	\$632,613	\$603,788	
44		\$0	\$2,276,453	\$2,250,151	\$2,223,033	\$2,195,074	\$2,166,249	
45	WBSD's Share	\$0	\$284,557	\$562,538	\$555,758	\$548,769	\$541,562	To Table 2; From SVCW Fin Plan 3/25/2014
46								

	A	B	C	D	E	F	G
1	<b>West Bay Sanitary District</b>						
2	<b>Sewer Rate Study</b>						
3	<b>Table 7. Single-Family Rate Comparison</b>						
4							
5	<b>Assumption: For flow-based rates, average consumption is 5.49 HCF per month (Menlo Park Winter Average)</b>						
6							
7	<b>City</b>	<b>Population</b>	<b>Basis</b>	<b>Monthly</b>	<b>Annual Rate</b>	<b>As of</b>	
8	Hillsborough	11,260	Fixed - Burlingame/San Mateo Treatment	\$193.75	\$2,325.00	7/1/2015	
9	San Bruno	43,223	Fixed + Flow - Annualized Winter	\$68.99	\$827.90	7/1/2014	
10	Millbrae	22,605	Fixed + Flow - Annualized Winter	\$68.66	\$823.87	7/1/2013*	
11	Belmont	26,559	Fixed + Flow - Annualized Winter, SVCW Treatment	\$80.21	\$962.57	7/1/2015	
12	West Bay SD (15-16)	55,000	Fixed - Full Service, Gravity Line, SVCW Treatment	\$81.11	\$973.37	7/1/2015	
13	West Bay SD (14-15)	55,000	Fixed - Full Service, Gravity Line, SVCW Treatment	\$74.42	\$893.00	7/1/2014	
14	Burlingame	29,685	Annualized Winter Monthly Flow (per thousand gallons)	\$50.31	\$603.70	1/1/2013*	
15	Redwood City	80,768	Fixed - Full Service, SVCW Treatment	\$74.94	\$899.25	7/1/2015	825.24
16	San Carlos	29,219	Fixed - Full Service, SVCW Treatment	\$88.82	\$1,065.85	7/1/2015	
17	San Mateo	100,106	Flow - Annualized Winter Monthly Flow	\$40.35	\$484.15	7/1/2014	
18	Daly City	105,076	Flow - Annualized Winter Monthly Flow	\$36.78	\$441.36	7/1/2014	
19	Palo Alto	66,861	Fixed - Full Service	\$29.31	\$351.72	7/1/2012*	
20	Mountain View	76,781	Fixed - Full Service	\$27.15	\$325.80	7/1/2014	
21	Pacifica	38,292	Flow - Annualized Winter Monthly Flow	\$66.70	\$800.42	7/1/2014	
22	Foster City	32,168	Fixed - Full Service	\$47.00	\$564.00	7/1/2014	
23							
24	<i>Sources:</i>						
25	<i>Population - California Department of Finance, Demographic Research Unit, E-5 City/County Population &amp; Housing Estimates, 1/1/2014</i>						
26	<i>except West Bay Sanitary District (population estimate from district).</i>						
27	<i>Monthly Rates - online resources available on each respective agencies' website</i>						
28	<i>* = Most current rate increase based on rates available on website</i>						
29							
30	Volume Conversions	65.87109	Menlo Park 2011 Consumption Data Jan-Apr 2011 winter water use in HCF, annualized. Assumes return flow rate of 42%.				
31		5.49000	Monthly HCF				
32	1 CF =	7.48052	Gallons				
33	1 HCF =	748.05200	Gallons				
34	5.49 HCF =	4,106.80548	Gallons				
35	5.49 HCF =	4.10681	TGal				
36							



## **APPENDIX B. RESIDENTIAL FLOW AND LOADING ANALYSIS**



## 2014 West Bay Sanitary District Loadings Analysis & Report

### Introduction

The current assumed flow rates for Single Family Residences (SFR) and Multi-Family Residences (MFR) is estimated at approximately 220 gallons per day. The Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) loadings from the MFR's are currently thought to be higher in concentration and flow when compared to SFR's. The base loading rate is 150 mg/L for BOD and TSS for our residential customers.

The purpose of this study is; 1) To determine the gallon per day flow rate for Multi-Family and Single Family Residences discharging into the District's conveyance system and 2) Determine if the daily loadings discharged are higher in concentration for MFR's vs. Single Family Residences.

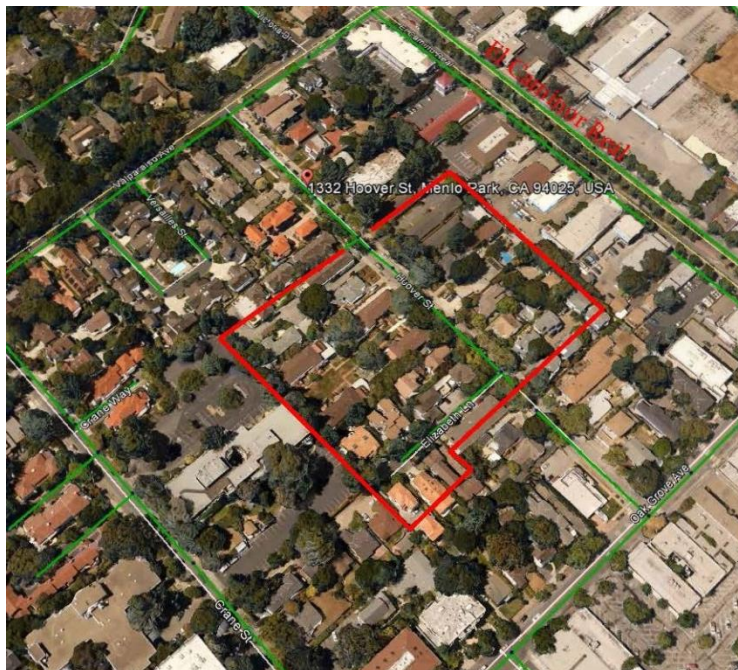
In 2013 WBSD and SVCW staff members met on several occasions to identify how this project could be developed and implemented. It was decided that flow monitoring must be performed first to identify when the peak and off peak flows occurred. The results of the flow monitoring would identify the timeframes for the sampling process. This would be the standard process implemented for this Monitoring Program.

### Sample Sites

Multi-Family Residences (MFR's)                      vs.                      Single Family Residences (SFR's)

Two areas within the District were identified to perform the above loading and flow analysis; these sites were selected based on ease of accessibility and equipment installation.

For 2014 the Multi Family Residence location is on Hoover Street in Menlo Park, between Oak Grove Avenue & Val Paraiso. The site area is in the map shown below and has 49 MFR's in the sample site (Originally Constructed in 1925)



The Single Family Residential Units are located off of Middle Avenue on portion of San Mateo Drive and Wallea Drive. There are 79 SFR's in the sample site shown in the picture below. (Originally constructed in 1945)



### **Site Characteristics**

Both sample sites flow into 6" inch clay pipe, the average velocity for the MFR site was 1.41 feet per second (fps) and 0.67 fps for the SFR site.

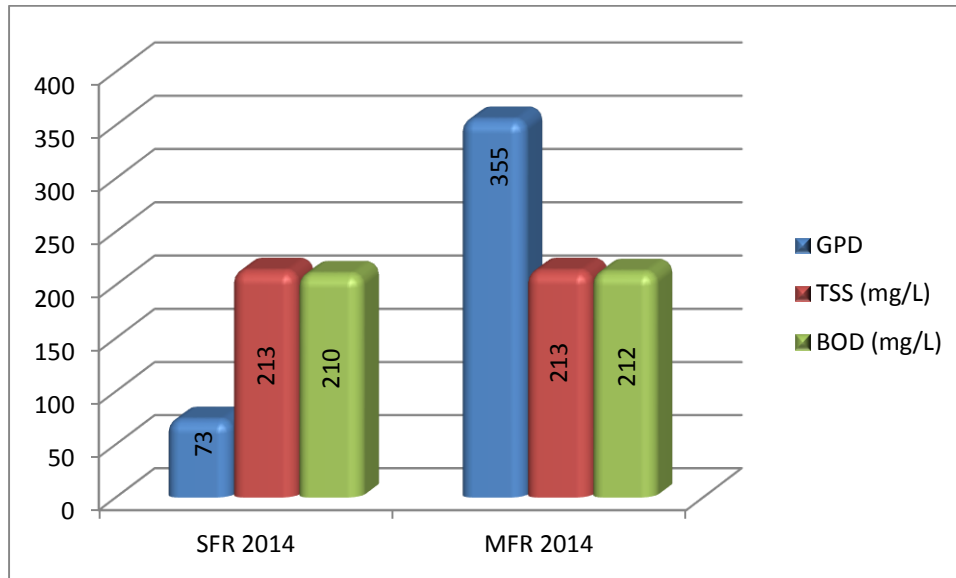
### **Sampling & Analysis**

The SVCW performed the initial analysis from August 6, 2014 through September 5, 2014 and Accutest Laboratories performed the analysis from September 6, 2014 through September 30, 2014. The results for sampling and monitoring period are located at Appendix A-MFR's , Appendix B-SFR's& Appendix C-2013 Flow chart comparisons – Flow Monitoring Set Up and Monitoring Process.



## **2014 Flow and Loadings SFR'S vs. MFR's**

The daily averages are depicted in the chart below. The loading concentrations from both sample sites are comparable and in excess of the baseline of 150 mg/L for TSS & BOD by 40 percent.



The average daily flow from the SFR Neighborhood was 5728 GPD and the MFR Neighborhood was 20993 GPD.

However, the average daily flow from the SFR's is well below the 220 GPD and the average daily flow of 355 GPD from the MFR's exceeds the base limit of 220 gpd by 61 percent.

The only significant factor is that we are currently in "Drought" and it appears the SFR's have voluntarily reduced their daily water consumption as recommended by the State.

### **Conclusion (Serious Drought, conserve water)**

This year the flow data confirms that the MFR average daily flow is 4.86 times HIGHER when compared with SFR average daily flow, and the loadings for both the SFR & MFR are approximately 40% greater than the District's base limit of 150 mg/L.

Potential causes for the higher flows at the MFR sampling site:

- Leaking flapper valves in toilet tanks, potential for up to 5500 gpd per building
- Leaking sewer pipes, irrigation flowing into the sewer system (minimal Landscaping for MFR's)

**APPENDIX A-Multi-Family Residences**

**2014 Flow Monitoring and Sample Results**

MFDs Hoover Street, Menlo Park, 49 Units

Sample Date	Day of Week	Measured Flow in GPD <b>MFR's</b>	Daily Avg - BOD mg/L	BOD Loadings in lbs./day tpo SS	Daily Avg. TSS mg/L	TSS Loadings in lbs./day to SS
*8/6/2014	Sat	20932	1504	263	2125	371
*8/10/2014	Wed	20932	289.67	51	256.33	45
*8/12/2014	Fri	20932	175	31	119	21
8/14/2014	Sun	18317	153.33	23	102.67	16
8/17/2014	Wed	19169	182.83	29	146	23
8/20/2014	Sat	23075	174.33	34	155.33	30
8/24/2014	Wed	28318	451.67	107	209.33	49
8/26/2014	Fri	24391	140.33	29	95.67	19
8/28/2014	Sun	21702	189.33	34	151.67	27
9/1/2014	Thurs	20607	132	23	134.27	23
9/3/2014	Sat	26322	168.33	37	160.67	35
9/5/2014	Mon	14640	126	15	303	37
9/7/2014	Wed	18960	127	20	79	12
9/9/2014	Fri	19564	82.6	13	131	21
9/11/2014	Sun	19577		0		0
9/14/2014	Wed	23346	213	41	129	25
9/17/2014	Sat	19822		0		0
9/22/2014	Thurs	18800	100	16	101	16
9/24/2014	Sat	19572	243	40	78	13
9/28/2014	Wed	20888		0		0
9/30/2014	Fri	19720		0		0
21 Sample Days						
	<b>AVERAGES</b>	20933	212	38	213	37
	<b>MFR-AVG</b>	<b>355</b>	<b>212</b>	<b>0.63</b>	<b>213</b>	<b>0.63</b>

Average Velocity was 1.41 Ft/Sec

The formula for loadings to sewer is "Flow in MGD x Concentration in mg/L x 8.34 pounds per gallon = pounds"

**APPENDIX B-Single-Family Residences**

**2014 Flow Monitoring and Sample Results**

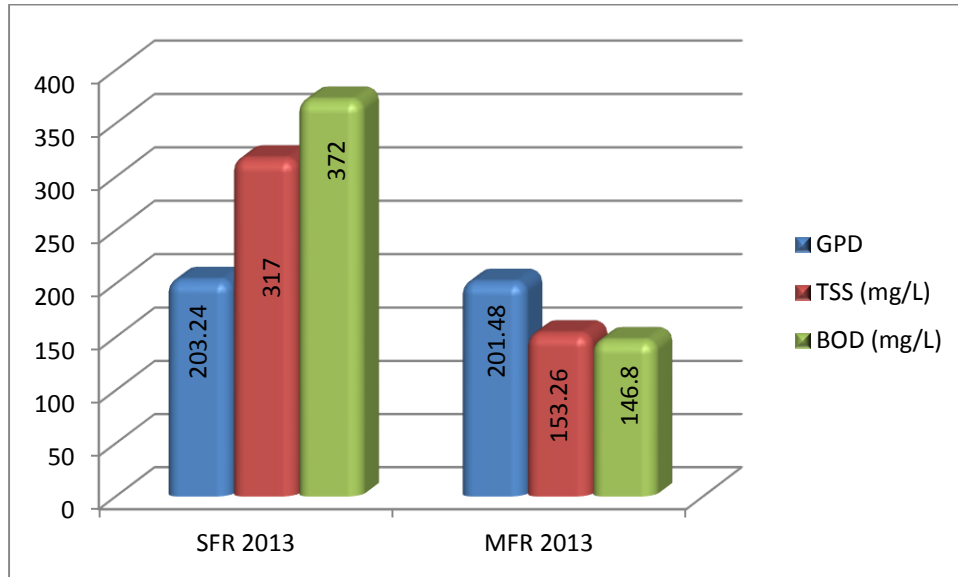
SFR's San Mateo Drive and Wallea Drive, 79 residences

Sample Date	Day of Week	Measured Flow in GPD <b>SFR's</b>	Daily Avg - BOD mg/L	BOD Loadings in lbs./day tpo SS	Daily Avg. TSS mg/L	TSS Loadings in lbs./day to SS
*8/6/2014	Sat	5756	544	26.11	378	18.15
*8/10/2014	Wed	5756	178.33	8.56	126.67	6.08
8/12/2014	Fri	5756	86	4.13	116.33	5.58
8/14/2014	Sun	5870	221.67	10.85	183.67	8.99
8/17/2014	Wed	7446	288	17.88	223	13.85
*8/20/2014	Sat	6486		0.00		0.00
8/24/2014	Wed	5715	306	14.58	406	19.35
8/26/2014	Fri	5988	353	17.63	363.67	18.16
8/28/2014	Sun	4443	270.67	10.03	290.33	10.76
9/1/2014	Thurs	4974	241.67	10.03	237.67	9.86
9/3/2014	Sat	5160	367.33	15.81	404.33	17.40
9/5/2014	Mon	5368	2	0.09	388	17.37
9/7/2014	Wed	9429	240	18.87	278	21.86
9/9/2014	Fri	5082	178	7.54	330	13.99
9/11/2014	Sun	4367		0.00		0.00
9/14/2014	Wed	5095	260	11.05	338	14.36
9/17/2014	Sat	5790		0.00		0.00
9/22/2014	Thurs	9283	258	19.97	81	6.27
9/24/2014	Sat	7630	606	38.56	332	21.13
9/28/2014	Wed	5378		0.00		0.00
9/30/2014	Fri	5247		0.00		0.00
21 Sample Days	<b>AVERAGES</b>	5728	210	11	213	11
<b>SFR - AVG</b>		<b>73</b>	<b>210</b>	<b>0.127</b>	<b>213</b>	<b>0.129</b>

Average Velocity 0.67 Ft/Sec

## APPENDIX C

### 2013 Flow and Loadings SFR'S vs. MFR's



The average daily flow from the SFR's was 203.2 GPD and MFR's was 201.4 GPD well within the estimated 220 gallons per day limit.

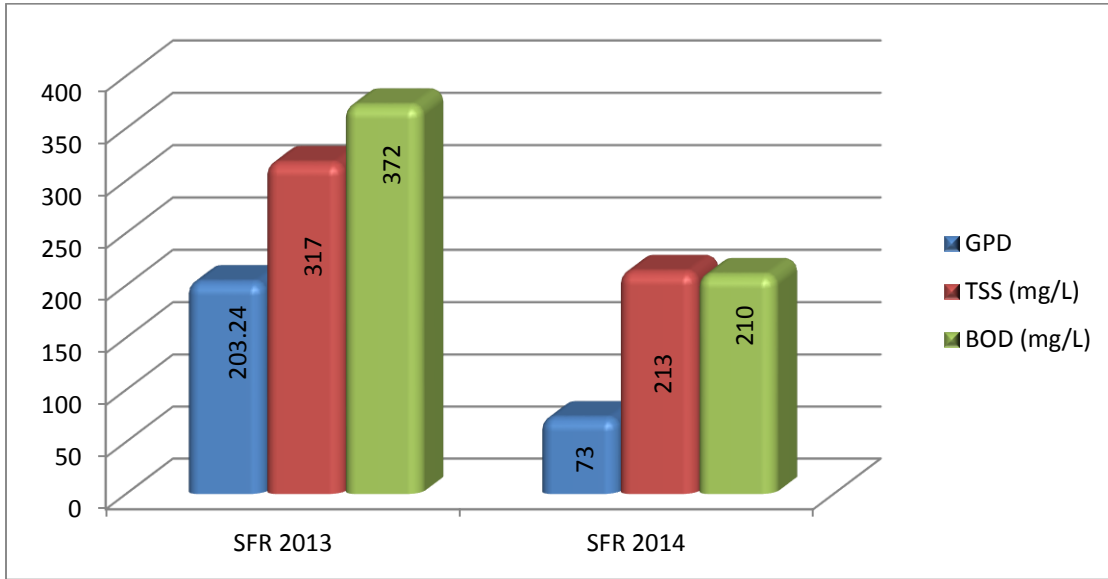
The average daily loadings to sanitary sewer were 50% higher for the Single Family Residential group when compared to the Multi Family Residences.

Potential causes for the higher loadings at the SFR sampling site:

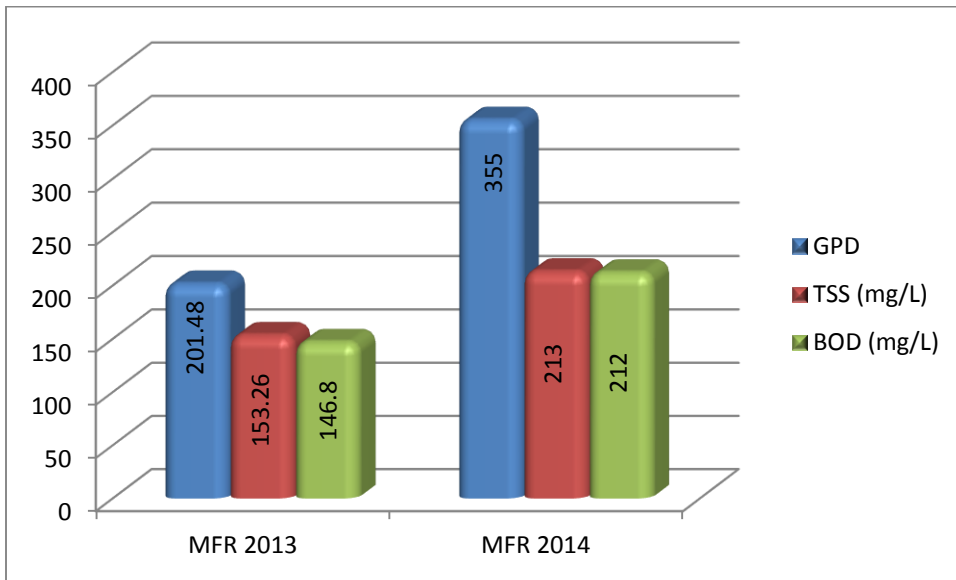
- Significantly Lower velocity (5 x)
- Significantly Longer detention time in pipe
- Maintenance schedule, the cleaning schedule for this section of pipe is every 3 years. Last cleaned in August of 2011

Though flow data confirms that the MFR average daily flow is comparable with SFR average daily flow, further analysis using neighborhoods with similar pipe variations would be required in order to draw any valid conclusions regarding MFR vs. SFR loadings.

### Two Year Trend for Single Family Residences



### Two Year Trend for Multi-Family Residences



### Flow Monitoring (Installation of equipment by WBSD staff)

The District utilized Non-Contact Flow Meters, manufactured by Marsh McBirney which uses Radar technology (referred to as Flo-Dar) the flow meter is suspended above the flow (Picture at left). Flow



Monitoring was performed first to determine the Peak Flow cycles for each sample group. Once the flow cycles were determined, sampling protocols were developed and implemented.

The standard used for the peak flow timeframes were 00:00 hours to 0800 hours, 0800 hours to 1600 hours, and 1600 hours to Midnight, Three 8-hour increments for one 24-hour day.

The flow monitoring period of the project was from August 12, 2014 through September 30, 2014.

### Sampling Process



24 hour composite sampling was performed over the course of two weeks. WBSD staff members Jed Beyer and Mark Praturlon deployed two 3700 series ISCO samplers, each with 12-1,000ml bottles. Each bottle received 4-180ml per sample aliquots every 30 minutes.

Three sampling timeframes were used to identify specific house hold activities;

- Midnight to 0800 hours, sleeping, bathing and breakfast off to work and school (Bottles 1-4),
- 0800 hours to 1600 hours, laundry, lunch (Bottles 5-8) and
- 1600 hours to midnight, dinner, bathing (Bottles 9-12).

The collected sample timeframes were blended separately into three composite timeframes as noted above to determine loadings to sewer per time frame, and then the analytical results of the three samples were totaled and averaged for daily loadings to sewer per Multi Family Residence(s) and Single Family Residence(s).

### Sample Analysis & Reports

SVCW performed the sample analysis and reporting from August 6 through September 5, 2014, and Accutest Laboratories performed the analyses on samples through September 30, 2014. The wastewater generated from each sample site was tested for Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD).

**Biochemical oxygen demand** or **B.O.D** is the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period. The BOD value is most commonly expressed in milligrams of oxygen consumed per liter of sample during 5 days of incubation at 20 °C.

**Total Suspended Solids of T.S.S.** includes all particles suspended in water which will not pass through a filter.



October 29, 2013

## **West Bay Sanitary District Loadings Analysis & Report**

By John Simonetti, Regulatory Compliance Coordinator

### **Introduction**

The purpose of this study is; 1) To determine the gallon per day flow rate for Multi-Family and Single Family Residences discharging into the District's conveyance system and 2) Determine if the daily loadings discharged are higher in concentration for MFR's vs. Single Family Residences.

WBSD Staff member John Simonetti and SBSA staff members Dr. Bob Wandro and Norman Domingo met on several occasions to identify how this project could be developed and implemented. It was decided that flow monitoring must be performed first to identify when the peak and off peak flows occurred. The results of the flow monitoring would identify the timeframes for the sampling process.

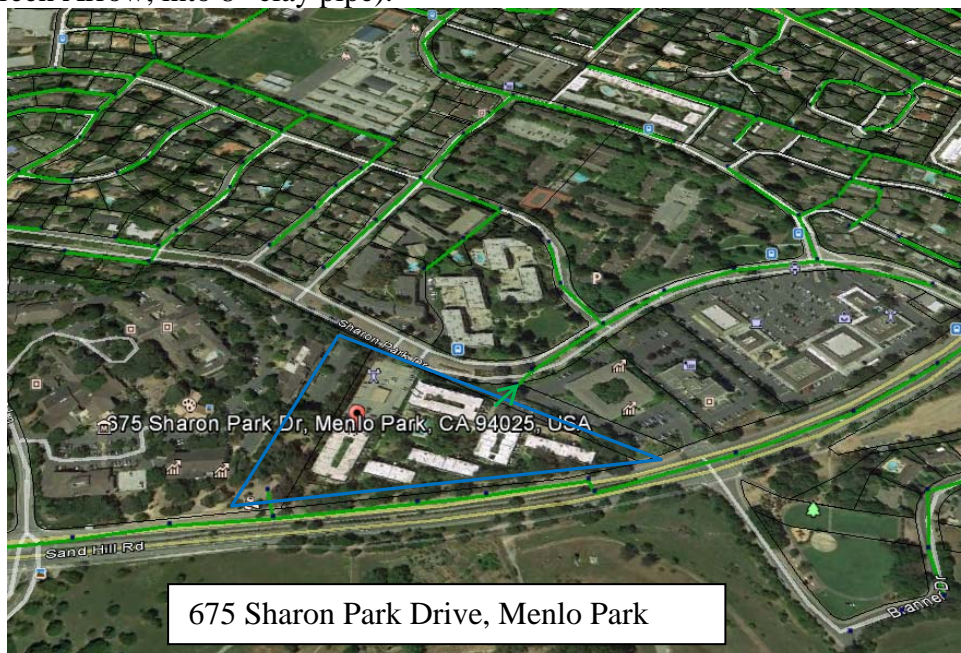
Assumptions: The current assumed flow rates for Single Family (SFR) and Multi-Family Residences (MFR) is estimated at approximately 220 gallons per day. The Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) loadings from the MFR's are currently thought to be higher in concentration and flow when compared to SFR's. The base loading rate is 150 mg/L for BOD and TSS.

### **Sample Sites**

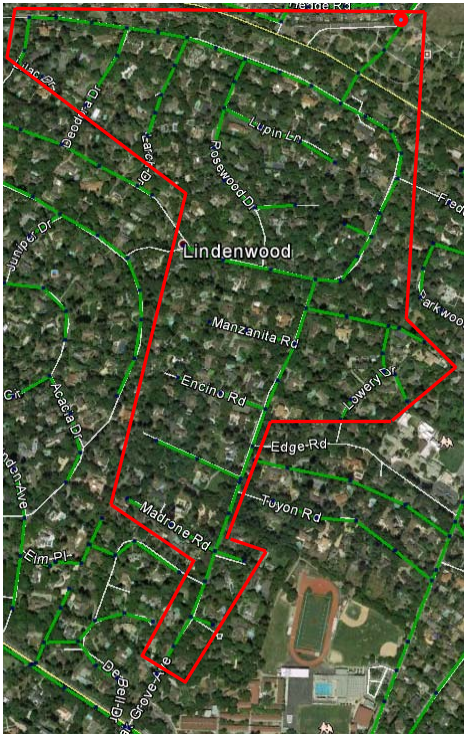
Multi-Family Residences (MFR's) vs. Single Family Residences (SFR's)

Two areas within the District were identified to perform the above loading and flow analysis; these sites were selected based on ease of accessibility and equipment installation.

The Multi Family Residence location is at 675 Sharon Park Drive in Menlo Park, which has 120 MFR's, (this is Site WBSD 1, located in the picture below within the blue lines. All sanitary sewer flows from this site exit at the Green Arrow, into 8" clay pipe).



The Single Family Residential Units are located within Atherton which is within the “Red Lines” of the picture below.



The sample location is located at the top right of the picture “Red Bull’s-eye”, 10” clay pipe. There are 157 Single Family residences and 1-Elementary School, upon further review of the number of connections within the sample group Laurel school was confirmed connected within the sample site. The school entitlement is 3205 GPD with an actual usage of 1500 GPD, equivalent to 7-SFR’s. The adjusted number of SFR’s =164.

### **Flow Monitoring (Installation of equipment by WBSD staff)**

The District utilized Non-Contact Flow Meters, manufactured by Marsh McBirney which uses Radar technology (referred to as Flo-Dar) the flow meter is suspended above the flow (Picture at left). Flow



Monitoring was performed first to determine the Peak Flow cycles for each sample group. Once the flow cycles were determined, sampling protocols were developed and implemented. The standard used for the peak flow timeframes were 00:00 hours to 0800 hours, 0800 hours to 1600 hours, and 1600 hours to Midnight, Three 8-hour increments for one 24-hour day. Equipment provided by Oratech Controls, Anton Loof.

The flow monitoring period of the project was from September 10, 2013 through October 14, 2013.



## Sampling Process



24 hour composite sampling was performed over the course of two weeks. WBSD staff members Jed Beyer and Mark Pratulon deployed two 3700 series ISCO samplers, each with 12-1,000ml bottles. Each bottle received 4-180ml per sample aliquots every 30 minutes.

Three sampling timeframes were used to identify specific house hold activities;

- Midnight to 0800 hours, sleeping, bathing and breakfast off to work and school (Bottles 1-4),
- 0800 hours to 1600 hours, laundry, lunch and
- 1600 hours to midnight, dinner, bathing.

The collected sample timeframes were blended separately into three composite timeframes as noted above to determine loadings to sewer per time frame, then the analytical results of the three samples were totaled and averaged for daily loadings to sewer per Multi Family Residence(s) and

Single Family Residence(s).

## Sample Analysis & Reports

SBSA performed the sample analysis and reporting to WBSD. The wastewater generated from each sample site was tested for Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD).

**Biochemical oxygen demand** or **B.O.D** is the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period. The BOD value is most commonly expressed in milligrams of oxygen consumed per liter of sample during 5 days of incubation at 20 °C.

**Total Suspended Solids of T.S.S.** includes all particles suspended in water which will not pass through a filter.

**Flow Monitoring and Sample Results**

MFDs WBSD-1 Sharon Park Drive, 120-MFD's

Sample Date	Day of the Week	Measured Flow in GPD	Daily AVG BOD mg/L	BOD Loadings in lbs./day to SS	Daily AVG TSS mg/L	TSS Loadings in lbs./day to SS
10-6-2013	Sunday	25,228.89	180	37.87	87.33	18.38
10-14-2013	Monday	20,662.51				
9-24-2013	Tuesday	24,911.30	115	23.89	96	19.94
10-2-2013	Wednesday	24,003.63	154	30.83	119	23.82
9-26-2013	Thursday	25,811.22	122	26.26	223	48.0
10-4-2013	Friday	24,021.55				
9-28-2013	Saturday	24,602.87	163	33.45	241	49.45
	<b>AVERAGES</b>	<b>24,177.42</b>	<b>146.8</b>	<b>38.08</b>	<b>153.26</b>	<b>39.90</b>
<b>MFR-AVG</b>	<b>GPD</b>	<b>201.48</b>	<b>183.5</b>	<b>0.25</b>	<b>153.26</b>	<b>0.26</b>

**Average Velocity was 2.5 Ft/Sec**

The formula for loadings to sewer is “Flow in MGD x Concentration in mg/L x 8.34 pounds per gallon = pounds”

SFR's WBSD-2 Flood Park, 164 SFR's

Sample Date	Day of the Week	Measured Flow in GPD	Daily AVG BOD mg/L	BOD Loadings in lbs./day to SS	Daily AVG TSS mg/L	TSS Loadings in lbs./day to SS
10-6-2013	Sunday	24,025.87	300	60.11	255.66	51.23
10-14-2013	Monday	32,669.97				
9-24-2013	Tuesday	36,680.34	213	65.16	171	52.31
10-2-2013	Wednesday	46,306.00	236	91.14	208	80.33
9-26-2013	Thursday	29,041.05	283	68.54	513	124.25
10-4-2013	Friday	33,701.51				
9-28-2013	Saturday	30,889.89	236	60.80	341	87.85
	<b>AVERAGES</b>	<b>33,330.66</b>	<b>317</b>	<b>86.44</b>	<b>372.16</b>	<b>98.99</b>
<b>SFR-AVG</b>		<b>203.24</b>	<b>317</b>	<b>0.53</b>	<b>341</b>	<b>0.63</b>

**Average Velocity 0.5 Ft/Sec**

B.O.D. Ranges over each 24-hour sampling periods for the MFR's were from 47 mg/L to 290 mg/L. The ranges for the SFR's were 130 mg/L to 800 mg/L.

T.S.S. Ranges over each 24-hour sampling periods for the MFR's were from 48 mg/L to 290 mg/L. The range for the SFR's was 29 mg/L to 1060 mg/L.

## **Conclusion**

The average daily flow from the SFR's was 203.2 GPD and MFR's was 201.4 GPD well within the estimated 220 gallons per day limit.

The average daily loadings to sanitary sewer were 50% higher for the Single Family Residential group when compared to the Multi Family Residences.

Potential causes for the higher loadings at the SFR sampling site:

- Significantly Lower velocity (5 x)
- Significantly Longer detention time in pipe
- Maintenance schedule, the cleaning schedule for this section of pipe is every 3 years. Last cleaned in August of 2011

Though flow data confirms that the MFR average daily flow is comparable with SFR average daily flow, further analysis using neighborhoods with similar pipe variations would be required in order to draw any valid conclusions regarding MFR vs. SFR loadings.

Since flow comparisons of MFR and SFR show flows are essentially the same there is no basis for staff to recommend any change in Multi-Family Residential sewer service charges.