INTRODUCTION TO THE ADAPTING TO RISING TIDES EXISTING CONDITIONS AND STRESSORS REPORT

The Adapting to Rising Tides (ART) project evaluated the current condition of shoreline and community assets, and the stressors affecting them, because understanding existing conditions and stressors can inform an understanding of individual asset resilience (or lack thereof) to projected climate impacts, including sea level rise and storm events. Stressors can also provide information on current and future trends and how those trends may affect resilience. The existing conditions and stressors were analyzed and summarized for each asset category included in the ART project assessment. This analysis served as a foundation for the ART vulnerability and risk assessment, which examined asset exposure to five potential climate impacts, sensitivity of assets to these impacts, and the ability of assets to accommodate or adjust to these impacts with little financial or structural intervention.

The following Existing Conditions and Stressors report chapter includes:

- a definition of the asset category;
- a synthesis of information about current conditions and stressors; and
- discussion of these conditions through the lenses of sustainability organized by society and equity, environment, economy and governance.

The complete ART Existing Conditions and Stressors Report is available at the ART Portfolio website.

WASTEWATER FACILITIES

I. Definition

Wastewater is water containing sewage and other wastes from residential, commercial, and industrial sources. It includes water from sinks, showers, washers and toilets, chlorinated pools, commercial car washes, and industrial processes. Wastewater requires treatment to remove pollutants prior to discharge.

Wastewater infrastructure includes collection and conveyance pipes, pump stations, treatment plants, storage and discharge facilities, monitoring stations, and overflow locations. Wastewater infrastructure is owned and operated by either limited purpose agencies (districts) or multipurpose agencies (cities) that provide either a single service—e.g., collection, treatment, or discharge—or a combination of services.

Most wastewater in Alameda County is treated and discharged by the public wastewater system; however, private on-site septic systems are allowed in Alameda County where no public sewer system is nearby. This report does not discuss private on-site septic systems, because the number of systems in Alameda County is relatively low (approximately 1%, or 5,000 households in 2005), with possibly only one system located in the ART project area (at the Monarch Bay Golf Course in San Leandro).

II. Overview of the Public Wastewater System

The wastewater system is an interconnected network of collection, treatment, and discharge infrastructure that is often owned and operated by separate service providers. In the ART project area, all wastewater is handled by at least two separate service providers (see Table 1).

Collection Systems

The wastewater collection systems convey wastewater to the various treatment facilities. The system includes both private sewer lines, known as laterals, and public sewer lines such as mains and interceptors. Laterals connect the plumbing of a home or business to the public system (generally located in the street), and are owned and maintained by individual property owners. The public collection system includes sewer mains, interceptors, and pump stations. Five cities and three districts provide wastewater collection services in the ART project area (see Table 2). EBMUD owns and operates a system of interceptor pipes and pump stations that conveys wastewater from some of the city-owned collection systems in the ART project area (those of Alameda, Emeryville, and Oakland) to EBMUD's treatment facilities. The EBMUD interceptors and pump stations are discussed together with the treatment facilities below.

Table 1. Wastewater Services Providers in the ART Project Area

Community Served	Collection Provider	Treatment Provider	Discharge Provider
Alameda	Alameda	EBMUD	EBMUD
Emeryville	Emeryville		
Oakland	Oakland		
Hayward	Hayward and OLSD	Hayward and OLSD	EBDA
San Leandro	San Leandro and OLSD	San Leandro and OLSD	
San Lorenzo	OLSD	OLSD	
Union City	USD	USD	EBDA and USD

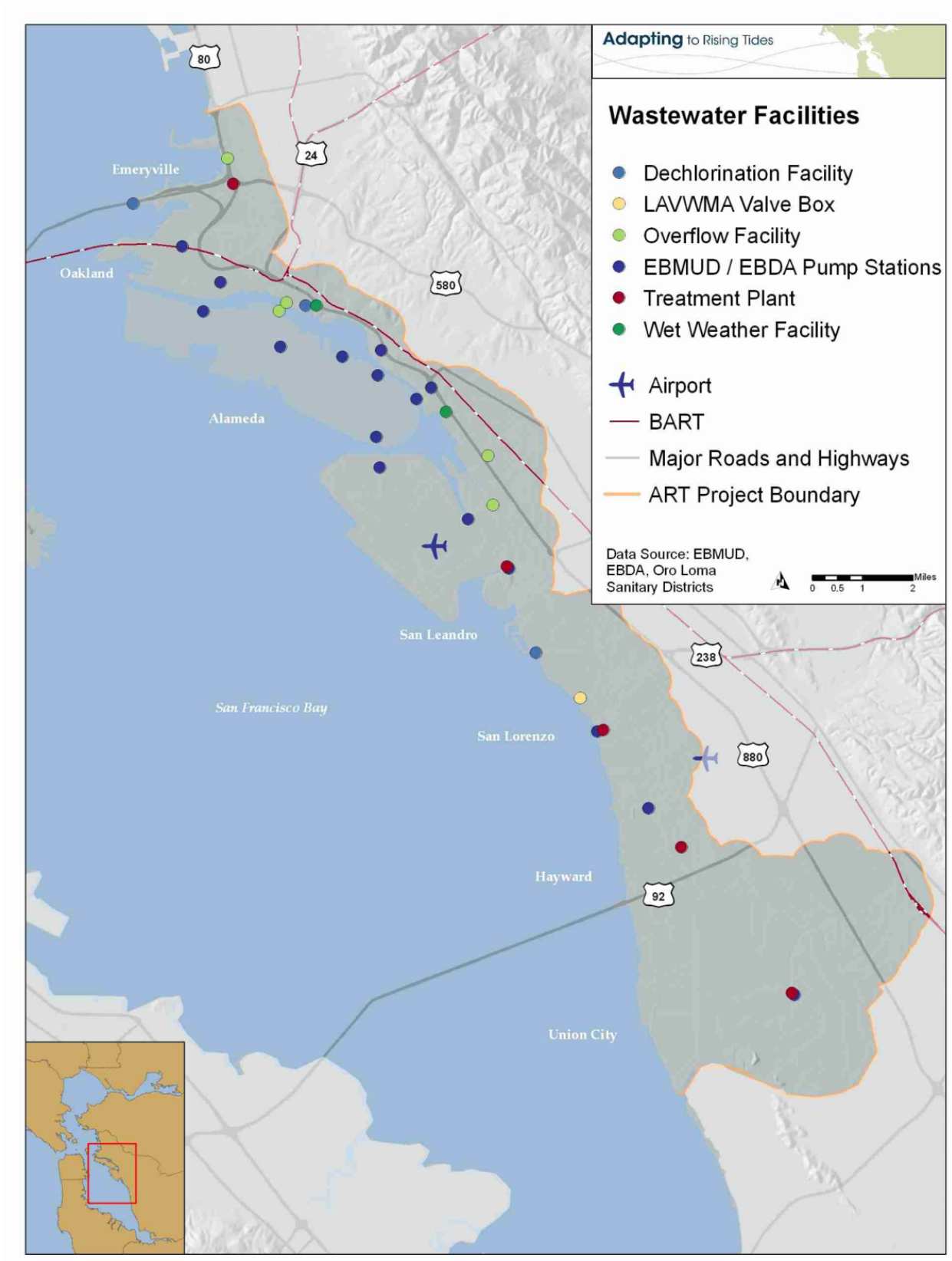
OLSD = Oro Loma Sanitary District
USD = Union Sanitary District

Table 2. Wastewater Collection Systems in the ART Project Area

Agency	Collection Area	Size of Collection Area (square miles)*	Total Connections	Pump Stations	Pipe Miles (public sewer)**
Alameda	Citywide	10.8	20,050	32	136
Emeryville	Citywide	1.2	1,000	1	14
Hayward	Most of city	62	33,000	8	375
Oakland	Citywide	56.1	100,000	7	1,069
San Leandro	Northern 2/3 of the city	8.5 (approx.)	18,500	13	130
OLSD	San Lorenzo, Ashland, Cherryland, and Fairview; portions of Castro Valley, Hayward, and San Leandro	13	46,000 households 11,000 businesses	14	300
USD	Union City, Freemont and Newark	60	110,524	3	760

Source: CIWQS, February 2011 and wastewater district websites (various).
* Square miles of public sewer do not include privately owned sewer laterals.
** Miles of public sewer do not include privately owned sewer laterals.

Figure 1. Map of Wastewater Facilities in the ART Project Area



Treatment Systems

Of the seven wastewater treatment plants in Alameda County, five are within the ART project area (see Figure 1 and Table 3). The two treatment plants outside of the ART project area, the Livermore Wastewater Treatment Plant and the Dublin San Ramon Services District (DSRSD) Wastewater Treatment Plant, both discharge via the Livermore-Amador Valley Water Management Agency (LAVWMA) export pipeline to the East Bay Dischargers Authority (EBDA) discharge system, which is located within the project area. Taken together, the EBDA agencies and LAVWMA serve 953,000 people.

Oro Loma Wastewater Treatment Plant

The Oro Loma Wastewater Treatment Plant is jointly owned by Oro Loma Sanitary District (OLSD, 75%) and Castro Valley Sanitary District (CVSD, 25%). It has a permitted average dry day design capacity of 20 million gallons per day (mgd), and treats an average dry weather flow of 10.95 mgd and a peak wet weather flow of 69.2 mgd. Wastewater is treated to a secondary level by physical, biological, and chemical processes, including screening, grit removal, primary sedimentation, activated sludge, secondary clarification, and chlorination. In wet weather conditions, excess flows can be diverted around the secondary treatment process.

An average of 1.7 million gallons of treated effluent from OLSD is reused monthly to irrigate the Skywest Golf Course. The remainder is transported to the EBDA system for dechlorination and discharge. Sludge is anaerobically digested, dewatered using a belt filter press, and dried in open drying beds. Approximately 11 dry tons of biosolids are recovered per day and safely processed for beneficial reuse.

Alvarado Wastewater Treatment Plant

The Alvarado Wastewater Treatment Plant is owned and operated by Union Sanitary District (USD). It has a design capacity of 33 mgd, and an average dry weather flow of approximately 24.9 mgd and peak wet weather flow of 42.9 mgd. The facility provides secondary treatment for all wastewater generated within the service area, including peak wet weather flows. Secondary treatment includes screening, primary sedimentation, activated sludge, secondary clarification, and chlorination.

Approximately 3 mgd of reclaimed effluent is delivered to the Hayward Marsh, operated by East Bay Regional Parks District. The remainder of treated effluent is transported to the EBDA system for dechlorination and discharge. If flows exceed the capacity of the EBDA pipeline, USD is authorized to discharge treated, dechlorinated effluent to Old Alameda Creek since they do not have a wet weather bypass or overflow. Sludge is anaerobically digested, dewatered using centrifuges, and disposed of at an authorized site.

Hayward Treatment Plant

The Hayward Water Pollution Control Facility is owned and operated by the City of Hayward. It has a permitted design capacity of 18.5 mgd, and peak wet weather flows of 35 mgd.

Secondary treatment is provided for all flows, and includes grit removal, primary sedimentation, flow equalization, trickling filter, solid contact stabilization, secondary clarification, and chlorination.

Treated effluent is transported to the EBDA system for dechlorination and discharge. The City has 240 acres of out-of-service oxidation ponds that can be used for effluent storage in an emergency. Sludge is anaerobically digested, air-dried, and disposed of at an authorized site.

San Leandro Water Pollution Control Plant

The San Leandro Water Pollution Control Plant, which serves the northern two-thirds of San Leandro, is owned and operated by the City. It has an average dry weather flow of 5.5 mgd and peak wet weather flow of 22.3 mgd. Secondary treatment is provided for all flows, and includes grinding, primary sedimentation, trickling filter, activated sludge, secondary clarification, and chlorination.

Approximately 200 million gallons of treated effluent are reclaimed annually for irrigation of municipal golf courses. The remainder is transported to the EBDA system for dechlorination and discharge. Sludge is anaerobically digested, dewatered using a belt filter press, and dried in open drying beds. An average of 4 dry tons of biosolids suitable for reuse are recovered annually.

Treatment and Discharge

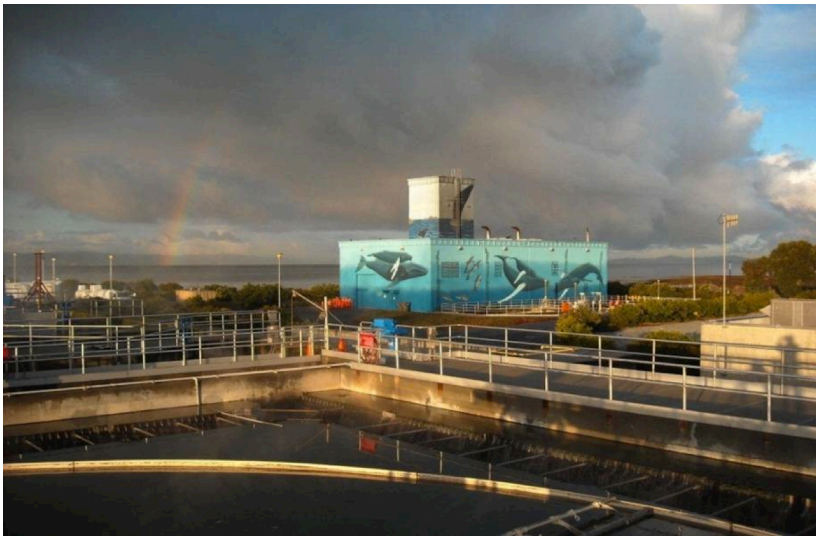
East Bay Municipal Utility District (EBMUD)

EBMUD serves an 88-square-mile area with a population of more 650,000. The district receives residential, commercial, and industrial wastewater from seven East Bay communities, including Alameda, Albany, Berkeley, Emeryville, Oakland, Piedmont, and the Stege Sanitary District (El Cerrito, Kensington, and a part of Richmond). The individual agencies that discharge to EBMUD's Interceptor System own, operate, and maintain their own approximately city-owned collection systems that serve approximately178,400 residential, commercial, industrial, and institutional users. EBMUD facilities include a wastewater treatment plant, three wet weather treatment facilities, 15 pumping stations, 29 miles of intercepting sewers, 8 miles of sewer force mains, and three overflow structures.

The EBMUD Main Wastewater Treatment Plant. Source: KQED QUEST. Source: www.flickr.com/photos/kqedquest.

The Main Wastewater Treatment Plant (MWWTP) permitted dry weather design capacity is 120 mgd. The permitted wet weather design flow capacity is 320 mgd, with 320 mgd receiving primary treatment and 168 receiving secondary treatment provides secondary treatment for up to 168 mgd, and primary treatment for up to 320 mgd. The plant treats an annual average dry weather flow of approximately 70 mgd. An on-site wet weather storage basin provides additional capacity for a short-term hydraulic peak wet weather flow of 194 mgd, and has a maximum wet weather capacity of 412 415 mgd. Secondary treatment is provided for all average dry weather flow. Treatment steps include odor control, grit removal, primary clarification, activated sludge, secondary clarification, disinfection, and dechlorination. Treated effluent is discharged through a submerged diffuser adjacent to the San Francisco-Oakland Bay Bridge, more than a mile offshore at a depth of 45 feet. Sludge is anaerobically digested, dewatered, and beneficially reused as a soil amendment through land application or as alternative daily cover at landfills. EBMUD produces Class B biosolids that are collected in an enclosed air-scrubbed hopper located next to the dewatering building at the MWWTP. In 2010, 76,780 wet tons of biosolids were produced and all were beneficially reused as either land-applied soil amendment or as alternative daily landfill cover.

EBMUD also operates three wet weather treatment facilities that provide storage and/or partial blending of primary and secondary effluent during wet weather periods when the flows exceed the secondary treatment capacity at the MWWTP. The Oakport, Point Isabel, and San Antonio Creek Wet Weather Facilities provide additional wet weather capacity of 158 mgd, 100 mgd, and 51 mgd, respectively. The flow to all three facilities undergoes screening, chlorination, and dechlorination. The Oakport and Point Isabel treatment plants also provide sedimentation, and the sedimentation basins at these two facilities allow



EBDA effluent pump station located at the Oro Loma Sanitary District wastewater treatment plant. Source: EBDA, www.ebda.org.

peak wet weather flows to be stored and returned via the interceptor system to the MWWTP for secondary treatment and discharge.

EBMUD also owns and operates three overflow structures within the interceptor system that prevent sanitary sewer overflows in the streets by discharging to the Oakland Inner Harbor or San Leandro Bay when flows exceed the conveyance capacity.

Discharge

East Bay Dischargers Authority (EBDA)

EBDA was formed in 1974 as a JPA. It has five member agencies: the Cities of San Leandro and Hayward, Union Sanitary District, Oro Loma Sanitary District, and Castro Valley Sanitary District. EBDA handles the discharge of wastewater from the communities served by its member agencies (San Leandro, Hayward, Union City, Newark, and Fremont) and from the communities of Pleasanton, Dublin, and Livermore through an agreement with LAVWMA. Overall, EBDA serves a population of approximately 800,000.

Wastewater from EBDA member agencies and LAVWMA are combined and treated at EBDA Dechlorination Facility and then discharged to the EBDA Joint Outfall. The Dechlorination Facility and Joint Outfall were built in 1978 with a design capacity of 189.1 mgd. The outfall pipeline is approximately 7 miles long, with the last 2,000 feet a diffuser section designed to ensure maximum dilution and mixing with deep Bay waters.

Table 3. Summary of Wastewater Treatment and Discharge Facilities in Alameda County

Operator	Facility	Capacity	Year Built
EBDA	EBDA Joint Outfall and Marina Dechlorination Facility	189.1 mgd	1978
LAVWMA*	LAVWMA Export Pipeline (New/Old)	20.2/21 mgd	2004/1979
DSRSD*	Wastewater Treatment Plant	17 mgd	2003
EBMUD	EBMUD Main WWTP	320 mgd	1950s
	San Antonio Creek Wet Weather Facility	51 mgd	1997
	Oakport Wet Weather Facility	158 mgd	1988
	Point Isabel Wet Weather Facility	100 mgd	1993
OLSD	Oro Loma WWTP	20 mgd	1969
San Leandro	San Leandro WWTP	13 mgd	1939
USD	Alvarado WWTP	33 mgd	1981
Hayward	Hayward WWTP	18.5 mgd	1954
Livermore*	Livermore Water Reclamation Plant	8.5 mgd	1958

* Not located within the ART project area.

III. Existing Stressors

There are a number of existing stressors on the wastewater system. Demand due to population and economic growth can stress the entire system if there is limited treatment capacity, lack of system redundancy, and aging infrastructure that requires ongoing operation and maintenance. There is also stress on the system from pollutants and organic loading factors that can reduce treatment efficiency.

Dry Weather Demand

During dry weather, the amount of wastewater conveyed, treated, and discharged generally depends on the amount of potable water consumed for indoor uses. Population and economic growth will increase average and peak flows. Water conservation measures can effectively reduce average dry weather flows but have limited impact on pollutant or organic loading factors. In fact, conservation can increase the organic strength of wastewater.

Wet Weather Demand

Although all of the wastewater collection systems in the ART project area are designed to be separate from the stormwater collection systems, wet weather causes increases in wastewater flows due to infiltration and inflow (I/I). Infiltration occurs when groundwater enters sewer pipes through cracks, pipe joints, and other system leaks. Inflow occurs when rainwater enters the system from improper drain connections (e.g., yard, patio, roof gutter, footing), uncapped cleanouts, cross-connections with the stormwater system, and manhole covers. Water conservation will not significantly reduce the impact of wet weather flows. Population and economic growth can increase wet weather flows to the extent that base flows increase, but in many cases the magnitude of I/I entering a sewer system can overshadow increases in base flow due to economic growth.

I/I is a stressor on all sewer systems, but is a much greater issue for older systems, and is highest during or just after heavy rainfall when the ground is saturated. Service providers can reduce I/I by investing in capital improvements such as pipeline rehabilitation, manhole cover replacement, and root eradication; however, I/I sources on private property must also be addressed to reduce the overall system impacts. Within the EBMUD service area, the impact of private sewer laterals on I/I is being addressed through a Regional Private Sewer Lateral (PSL) Ordinance that requires inspections and replacements of private sewer laterals with certain triggers (see www.eastbaypsl.com/eastbaypsl/).

Organic Loading and Pollutants

Organic loading levels depend on the amount of organic matter disposed of. Higher loading levels may add additional stress on primary and secondary treatment processes. In addition to organic matter, wastewater may contain metals; sediment; hazardous household materials such as motor oil, paint, household cleaners, and pesticides; and high-strength or toxic substances from industries and commercial enterprises. Pretreatment programs and industrial permits significantly reduce the concentration of these materials coming into the treatment system.

Wastewater discharge permits may limit the strength and contaminant levels in industrial and commercial wastewater; service providers may charge increased rates or surcharges on high-strength wastes; and there may be incentives for industrial and commercial water recycling and reuse.

Location in Relationship to the Current 100-Year FEMA Floodplain

Much of the wastewater infrastructure (including the treatment plants, pump stations, and wet weather facilities) is located along the Bay edge in proximity to the current 100-year FEMA floodplain. The facilities in the ART project area are currently either at an elevation above the existing base flood elevation or have structures protecting them from the flooding. However, the lack of redundancy in systems, and limited opportunity to hold or reroute wastewater if facilities are compromised due to flooding, is an existing stressor that could intensify with climate change.

IV. Existing Plans

All of the wastewater treatment providers in the ART project area prepare a Sewer System Management Plan (SSMP) that describes the activities used to effectively manage the wastewater collection system. In general, the goal of the SSMP is to maintain or improve the condition of the collection system infrastructure in order to provide reliable service into the future, cost-effectively minimize I/I and provide adequate sewer capacity to accommodate design storm flows, and minimize the number and impact of sanitary sewer overflows (SSOs). (Sewer System Management Plan (SSMP) Development Guide. San Francisco Bay Regional Water Quality Control Board in Cooperation with Bay Area Clean Water Agencies. July 2005)

Elements in an SSMP include:

- Collection system management goals
- Organization of personnel, including the chain of command and communications
- Overflow emergency response plan
- Fats, oils, and grease (FOG) control program
- Legal authority for permitting flows into the system; I/I control as well as enforcement of proper design, installation, and testing standards; and inspection requirements for new and rehabilitated sewers
- Measures and activities to maintain the wastewater collection system
- Design and construction standards
- Capacity management
- Monitoring plan for SSMP program effectiveness
- Periodic SSMP audits, periodic SSMP updates, and implementation of program improvements

Only some of the wastewater collection providers have master plans. For example, Alameda, Emeryville, and Oakland do not have wastewater collection plans, although each does have an I/I compliance plan (see Table 4).

Source: www.njfuture.org

Table 4. Status of the Existing Wastewater Facility Plans in the ART Project Area

Service Provider	Wastewater Master Plan	Wastewater Collection Plan	Wet Weather Flow Capacity	Sanitary Sewer Overflow	Other Plans
EBMUD	2000/10 years	Pump station (1998) Interceptor (2008)	Wet weather facilities plan	Included in sewer system management plan (current)	Biosolids (2004), land use (2011), odor control (2009), recycled water (1991)
OLSD	2001/20 years	2003/20 years	Included in WWMP	Included in WWMP	None
USD	1994/20 years	1997 20 years	1999	Included in WWMP	Area plans (1997, 2000, 2004)
Hayward	2001/20 years	2002/18 years	Included in WWMP	Included in WWMP	WPCF Facilities Plan (2001)
San Leandro	1995/5 years	Included in WWMP/5 years	Included in WWMP	Included in WWMP	WPCP facilities plan (2004)
Alameda	None	None	None	Addressed in compliance plan	Infiltration/inflow compliance plan (1985)
Emeryville	None	None	None	None	Infiltration/inflow compliance plan (1985); sanitary sewer inventory (FY 01-02)
Oakland	None	None	None	None	Infiltration/inflow compliance plan (1985)

V. Economics/Jobs

The primary source of revenue for wastewater service providers is service charges. Additional revenue sources include connection fees, property taxes, interest income, agency treatment charges, and miscellaneous fees and rents. Rates for service charges are generally based on the cost of service and are established by each agency's board. Rates are generally not subject to regulation by other agencies or entities, and are often revised annually. There are also opportunities to restructure rates and avoid costs through facility sharing and improved economies of scale.

There are approximately 600 jobs in wastewater in the ART project area. The number of employees varies depending on the size and scope of the services and service area. EBMUD and USD are the largest employers of the wastewater service providers in the ART project area. Approximately 275, or 15% of the EBMUD employees, work in wastewater services, and the EBDA agencies have more than 200 people working in their wastewater collection and treatment departments

VI. Equity

A number of factors can be used to determine if the wastewater service sector is adequately and equitably meeting the needs of the population served. These include the status of regulatory compliance, system integrity and effectiveness, response time to failures/overflows, and rates and connection fees.

Regulatory Compliance

Compliance with regulatory programs depends on a variety of factors, including system age, investment in capital improvements, and ongoing operations and maintenance levels. Much of the wastewater infrastructure in the ART project area is aging with deferred maintenance needs.

System Integrity/Effectiveness

Sanitary sewer overflows are discharges of untreated or partially treated wastewater from pipes, pumps, or manholes. Overflows can pollute surface and groundwater, threaten public health, and affect the recreational use of surface waters. Frequency of overflows generally reflects the capacity and condition of the collection system, as well as the effectiveness of ongoing maintenance.

To improve public access to sanitary sewer overflow information, the State Water Quality Control Board has a Web-based GIS mapping tool showing the sanitary sewer overflows and private lateral spills. The tool allows users to search for and view reported overflows or spills statewide. (For information about overflows, visit: www.waterboards.ca.gov/water_issues/programs/sso/sso_map/sso_pub.shtml; for information on lateral spills, visit: www.waterboards.ca.gov/water_issues/programs/sso/sso_map/sso_priv.shtml.)

Response Time to Failures/Overflows

Official notification is required within two hours of a failure or overflow that results in wastewater release to waters of the United States. Wastewater service providers also have sewer blockage response time policies. Response times are generally very good throughout all of Alameda County, with maintenance crews resolving problems on average within 2.5 hours.

Rates and Connection Fees

Service rates vary among the providers depending on the services, type of treatment, extent of service area, infrastructure age, and ongoing maintenance and capital improvement costs. For all service providers, ongoing operations and maintenance are generally the most significant costs, and these costs tend to be higher for collection providers as compared to treatment providers. Connection fees vary by provider, and are generally charged for expanding or extending infrastructure or accommodating new users. The US EPA defines "reasonable or affordable" rates as water and wastewater rates that are at or below 2% of the median household income for the service area. In 2009, EBMUD rates (including satellite-owned collection system charges) averaged 1.7% of the median household income in the EBMUD service area.

EBMUD has a Customer Assistance Program (CAP) that pays a portion of the water bill for qualified low-income residential customers and eligible homeless shelters. The CAP provides a 50% discount on water bills of households earning up to 214% of the federal poverty line.

VII. Governance/Environment

Governance Framework

EBMUD, OLSD, and USD are limited purpose agencies. Each is an independent special district governed by a publicly elected board. Board members are accessible to the public and open meetings are subject to State sunshine ordinances, including the Brown Act, and are noticed, held with agendas, minutes and staff reports available to the public.

EBDA and LAVWMA are JPAs. EBDA member agencies include the City of San Leandro, the City of Hayward, USD, OLSD, and CVSD. LAVWMA member agencies include the Cities of Livermore and Pleasanton and DSRSD. Each member agency owns an undivided portion of EDBDA equal to the share of the project construction costs paid, and has a discharge capacity allocation (not related to the ownership share). The EBDA Commission is composed of one member and an alternate appointed by each member agency.

All of the cities providing wastewater collection services in Alameda County are multipurpose agencies that hold open elections for their governing bodies, have open meetings subject to State sunshine ordinances, including the Brown Act, and are noticed with agendas and minutes available to the public, and make staff and local officials accessible to the public.

Regulatory Framework

The Clean Water Act (Federal Water Control Pollution Act of 1972) requires all point source wastewater dischargers to obtain and comply with NPDES, including specific wastewater discharge limits and required monitoring and reporting.

Pursuant to the Clean Water Act and California's Porter-Cologne Water Quality Control Act, the Regional Water Quality Control Board regulates wastewater discharges to surface waters, issues NPDES permits to wastewater dischargers, and enforces permit conditions and other requirements. The Regional Board has waste discharge requirements for discharges not subject to NPDES permits; for example, permits are required for wastewater recycled for reuse and wastewater discharged to land, including on-site treatment systems. Discharge permits contain specific requirements that limit pollutants and require monitoring of wastewater, maintenance of treatment facilities, and certification of treatment plant operators. Treatment facilities are routinely inspected and permit requirements enforced by the Regional Board.

The State Water Resources Control Board adopted "Statewide General Waste Discharge Requirements for Sanitary Sewer Systems," Water Quality Order 2006-0003, in May 2006. The order requires public agencies that own and operate more than one mile of pipe or sewer line to develop and implement Sewer System Management Plans and report sanitary sewer overflows. The Sewer System Management Plan documents the program providers use to properly operate and maintain the wastewater system.

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