CHAPTER 3
SOURCES OF SUPPLY

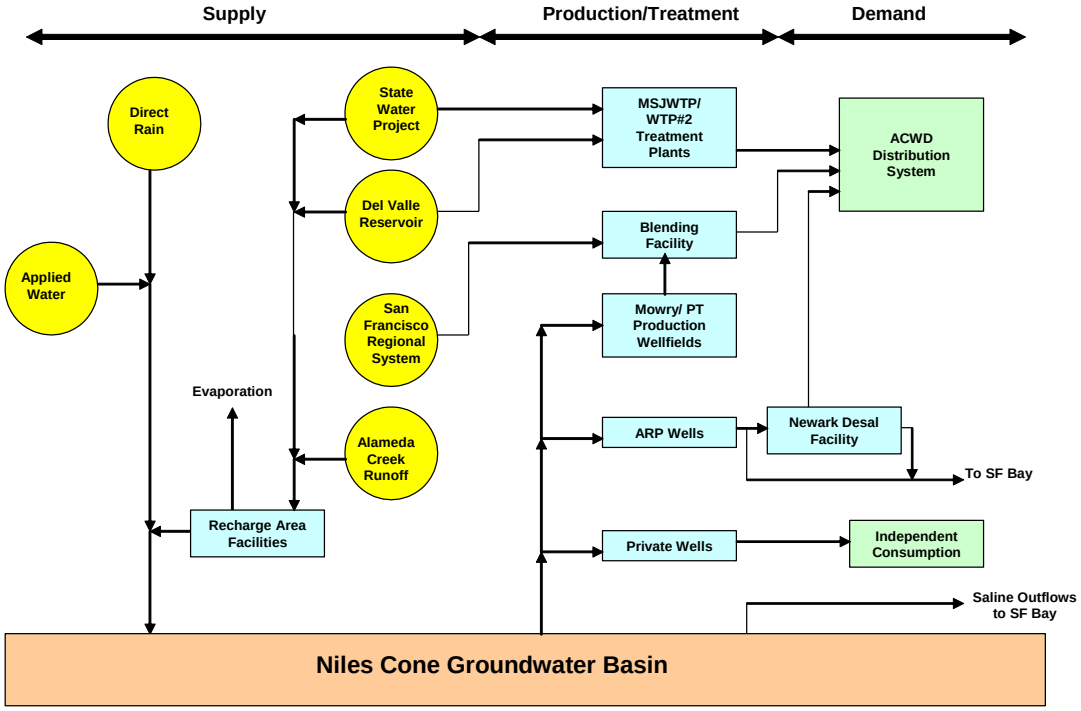
This chapter provides a summary of the District's sources of supply and their availability, as well as an overview of the management of these supplies and how water quality may impact future water supply reliability. A summary of ACWD's water supply strategy is provided in Chapter 9 – Water Supply Strategy.

3.1 SOURCES OF SUPPLY AND SUPPLY AVAILABILITY

ACWD currently has three primary sources of water supply: (1) the State Water Project (SWP), (2) San Francisco's Regional Water System and (3) local supplies. The SWP and San Francisco Regional Water Supplies are imported into the District service area through the South Bay Aqueduct and Hetch-Hetchy Aqueduct, respectively. Local supplies include fresh groundwater from the Niles Cone Groundwater Basin (underlying the District service area), desalinated brackish groundwater from portions of the groundwater basin previously impacted by seawater intrusion, and surface water from the Del Valle Reservoir. The primary source of recharge for the Niles Cone Groundwater Basin is from percolation of runoff from the Alameda Creek watershed. To a lesser degree, a portion of ACWD's SWP supplies are also used for local groundwater percolation. Infiltration of rainfall and applied water also contribute to local groundwater recharge.

Before being supplied to ACWD's customers, the source water supplies are treated to meet and surpass all state and federal drinking water standards. ACWD operates two surface water treatment plants that treat SWP and local surface water from Del Valle Reservoir. The Newark Desalination Facility treats brackish groundwater to remove salts and other impurities, and the Blending Facility blends San Francisco water with local fresh groundwater (with higher hardness) to provide a blended supply with lower overall hardness. Figure 3-1 provides a schematic of the District's sources of supply and production facilities.

Figure 3-1
ACWD Water Supply and Production Schematic



Over the FY1999/00-FY2009/10 period, 27% of the total in-District water demands (distribution system and groundwater system demands) have been met by State Water Project supplies, 19% from San Francisco Regional supplies and 54% from local supplies. When considering only the distribution system demands (potable water), over the same time period, about 36% of the District's distribution system water supply was from the State Water Project. This water was either treated at one of ACWD's two water treatment plants or used to recharge local aquifers. Water from the San Francisco Regional System provided approximately 25% of the distribution system water supply and local supplies accounted for the balance (about 39%) of the distribution system supplies. Figures 3-2 and 3-3 provide a summary of the District's sources of supply. Table 3-1 provides a summary of ACWD's historical use of each supply source.

Figure 3-2
Average Sources of Supply (FY99/00-09/10)
Distribution and Groundwater System Demands

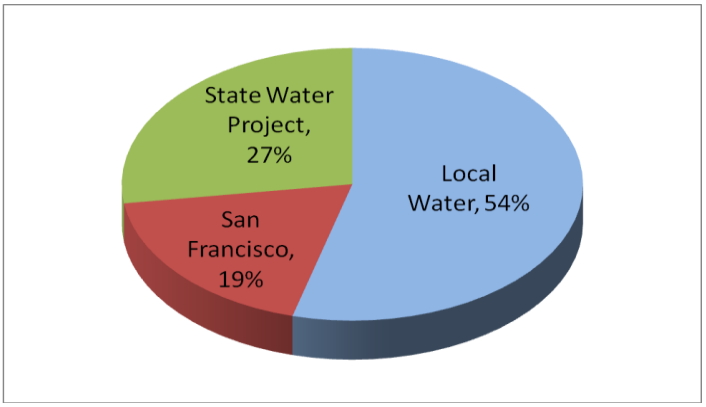
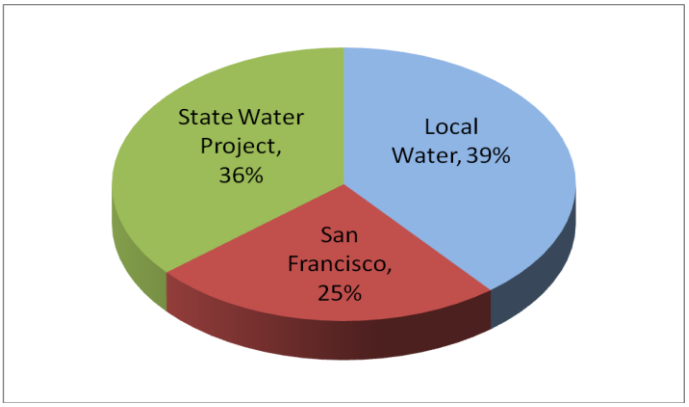


Figure 3-3
Average Sources of Supply (FY99/00-09/10)
Distribution System Demands Only



Each of the District's water supply sources is discussed in greater detail below. Table 3-2 provides a summary of the estimated availability of each of these supplies. Tables 3-3 and 3-4 provide a summary of the availability of wholesale water supplies from the SWP and San Francisco Regional System.

Table 3-1
Historical Water Supply Utilization by ACWD (AF/Yr)

FISCAL YEAR	SWP supplies used at ACWD facilities	Del Valle	San Francisco Regional Water	Newark Desal Facility[2]	Net Local Groundwater Recharge[3]	Recovered from Semitropic GW bank	Total In-District Water Supply	SWP Supply delivered to Semitropic GW bank
93-94	21,600	5,000	12,200	0	28,500	0	67,300	0
94-95	16,100	4,200	13,000	0	35,900	0	69,200	0
95-96	18,600	5,300	12,200	0	27,600	0	63,700	0
96-97	7,700	15,900	14,700	0	25,300	0	63,600	6,200
97-98	12,900	10,600	13,700	0	58,000	0	95,200	10,000
98-99	20,800	5,300	13,600	0	33,200	0	72,900	18,780
99-00	25,200	3,800	13,800	0	26,900	0	69,700	7,230
00-01	26,400	200	13,000	0	31,000	0	70,600	7,250
01-02	21,900	4,600	13,500	0	32,100	0	72,100	83
02-03	17,600	7,400	14,000	0	31,400	0	70,400	20,800
03-04	18,500	6,700	13,700	2,600	30,700	0	72,200	4,000
04-05	18,800	6,000	11,800	3,900	38,700	0	79,200	9,300
05-06	15,600	7,700	11,700	3,900	38,200	0	77,100	41,540
06-07	13,800	11,000	15,300	2,800	26,000	0	68,900	11,936
07-08	22,600	500	15,000	3,600	24,600	5,500	71,800	0
08-09	10,400	4,200	12,600	3,200	24,100	10,600	65,100	0
09-10	18,100	2,500	11,700	1100	30,800	0	64,200	0

Notes:
1. All values rounded to the nearest 100. Total values may not equal sum of individual components due to rounding errors.
2. Newark Desal Facility supply represents total blended flow. In 2009/10 the facility was operated for only two months due to the Phase 2 construction activities.
3. Recharge figures do not include Del Valle Reservoir or imported supplies used for recharge, and are less evaporation and other losses.

Table 3-2
Summary of Water Supply Availability for Existing Supplies (AF/Yr)

SUPPLY COMPONENT	Estimated Water Supply Availability			
	Median Year[1] (1936 Hydrologic Conditions)	Long-Term Average[2]	Maximum Availability[3]	Minimum Availability[4]
Imported Supplies				
State Water Project	27,500	25,500	42,000	4,000
San Francisco Regional	15,400	15,000	15,400	8,500
Local Supplies				
Groundwater Recharge[5]	24,500	23,300	44,400	7,500
Groundwater Storage	N/A	N/A	10,000	0
Del Valle	5,800	7,100	18,500	0
Desalination[6]	5,100	5,100	5,600	5,100
Banking/Transfers				
Semitropic Banking[7]	N/A	N/A	33,500	13,500
TOTAL SUPPLY	***78,300***	***76,000***	***N/A***	***N/A***

Notes:
1. Median Year values represent the median projected supply availability considering the sum of all of ACWD existing supplies and are based on the 1922-2003 historical hydrologic conditions (assuming 2010 operating conditions). The water supply availability under the year 1936 hydrologic conditions is utilized for the Median Year. Local Groundwater Storage and Semitropic Banking are not included in the Median Year because these supply components are used solely for dry year supplies and not under Median Year conditions.
2. Long-term Average values represent the average water supply availability based on the 1922-2003 historical hydrologic conditions. Local Groundwater Storage and Semitropic Banking are not included in the Long-term Average because these supply components only provide dry year supplies and are based on a balanced "put" and "take" over the long-term.
3. Maximum Availability represents the maximum quantity of supply from each supply component. For the imported supplies, these quantities represent the maximum contractual amount that ACWD can receive from these sources. For local supplies, the maximum quantities represent the maximum amount projected to be available based on the 1922-2003 historical hydrologic conditions. For Groundwater Storage, the maximum assumes that the groundwater basin is within normal operating levels in the beginning of the year. For Semitropic Banking, the maximum amount is based on maximum contractual return capacity to ACWD assuming 100% SWP allocation. The Maximum supply quantities listed above are not additive because the availability of these individual supplies may not occur under the same year/hydrologic condition.
4. Minimum Availability represents the minimum quantity of supply from each supply component. These quantities represent the minimum projected supply availability based on the 1922-2003 historical hydrologic conditions. San Francisco Regional minimum estimated by ACWD based on Tier Two drought allocation formula and SFPUC reliability data. For Groundwater Storage, the minimum quantity assumes that the groundwater basin was at the minimum operating groundwater elevation in the beginning of the year and there is no usable groundwater storage available. For Semitropic Banking, the minimum quantity assumes that only Semitropic "pumpback" capacity is available to return banked water to ACWD. The Minimum Availability quantities are not additive because the availability of these individual supplies may not occur under the same year/hydrologic condition.
5. Groundwater Recharge is calculated as recharge from deep percolation of rainfall and applied water plus recharge at ACWD's groundwater percolation facilities (with local runoff from the Alameda Creek Watershed) less "Other Outflows" (as described in ACWD's annual Groundwater Survey Reports). Groundwater Recharge values in Table 3-1 do not include recharge from State Water Project or Del Valle Reservoir supplies.
6. Maximum Availability of Desalination based on 5 mgd annual average permeate production capacity. Peak month permeate capacity may be up to 10 mgd. Median Year availability is based on 10% outage. Minimum Availability based on modeling analyses with 2010 supply/demand conditions and long-term hydrologic conditions (1922-2003).
7. Mitigation Measure CUM PU-1 of the Patterson Ranch Planned District Final EIR, requires the project proponent to secure up to 300 AF of additional recovery capacity from the Semitropic Groundwater Banking (or equivalent mitigation measure). As of March 2011 this additional recovery capacity has not been secured. Because of uncertainties regarding timing of this mitigation (or potential implementation of an alternate equivalent mitigation measure), this additional recovery capacity is not included in this UWMP.

Table 3-3
ACWD Supply Request and Projected Availability of SWP Supplies (AF/Yr)

Supply Request and Projected Availability	Year					
	2010	2015	2020	2025	2030	2035
ACWD Forecast Delivery Request	42,000	42,000	42,000	42,000	42,000	42,000
DWR Projected Supply Availability						
Maximum Contractual Amount	42,000	42,000	42,000	42,000	42,000	42,000
Median Value	26,700	26,700	26,700	26,700	26,700	26,700
Single Dry Year	4,000	4,000	4,000	4,000	4,000	4,000
Multiple Dry Year						
-Year 1	11,000	11,000	11,000	11,000	11,000	11,000
-Year 2	12,400	12,400	12,400	12,400	12,400	12,400
-Year 3	24,900	24,900	24,900	24,900	24,900	24,900
-Year 4	8,200	8,200	8,200	8,200	8,200	8,200
-Year 5	11,800	11,800	11,800	11,800	11,800	11,800

Source: California Department of Water Resources, 2009 Final State Water Project Reliability Report

Notes:
1. SWP availability assumptions are based on DWR's 2029 Scenario in the 2009 Final State Water Project Reliability Report

Table 3-4
ACWD Supply Request and Projected Availability of San Francisco Regional Supplies (AF/Yr)

Supply Request and Projected Availability	Year					
	2010	2015	2020	2025	2030	2035
ACWD Forecast Delivery Request	15,400	15,400	15,400	15,400	15,400	15,400
SFPUC Projected Supply Availability						
Maximum	15,400	15,400	15,400	15,400	15,400	15,400
Median Value	15,400	15,400	15,400	15,400	15,400	15,400
Single Dry Year	8,500	8,500	8,500	8,500	8,500	8,500
Multiple Dry Year						
-Year 1	14,100	14,100	14,300	14,600	14,900	15,100
-Year 2	11,100	13,400	13,300	13,200	13,100	13,000
-Year 3	8,500	8,500	9,200	9,800	10,500	11,100
-Year 4	8,500	8,500	8,900	9,200	9,600	9,900
-Year 5	8,500	8,500	9,000	9,500	10,000	10,600

Source: San Francisco Public Utilities Commission, Transmittal to BAWSCA, March 31, 2011 (with application of Tier 2 drought allocation formula)

State Water Project

In 1961, the District signed a contract with the State Department of Water Resources (DWR) for a maximum annual amount of 42,000 acre-feet from the State Water Project (SWP). The SWP, managed by the DWR, is the largest state-built, multi-purpose water project in the country. The SWP facilities include 28 dams and reservoirs, 26 pumping and generating plants, and approximately 660 miles of aqueducts. The water stored in the SWP storage facilities originates from rainfall and snowmelt runoff in Northern and Central California watersheds. The SWP's primary storage facility is Lake Oroville in the Feather River Watershed. Releases from Lake Oroville flow down the Feather River to the Sacramento River, which subsequently flows to the Sacramento-San Joaquin Delta. The SWP diverts water from the Delta through the Banks Pumping Plant which lifts water from the Clifton Court Forebay (in the Delta) to the California Aqueduct and Bethany Reservoir. From Bethany Reservoir, the South Bay Pumping Plant lifts water into the South Bay Aqueduct, which delivers State Water Project supplies to ACWD and other Bay Area water agencies in Alameda and Santa Clara Counties.

State Water Project Availability

In September 2010, DWR released its Final 2009 SWP Delivery Reliability Report. In this biennial report DWR provides two reliability analyses, one assuming the current year's level of demand (2009) and one twenty years in the future (2029). The future scenario conservatively assumes full demand of State water resources by all contracting agencies. ACWD elects to assume the more conservative 2029 projection for all years as it better reflects the full stress on the SWP. According to the DWR, the long-term average delivery of contractual SWP supply ("Table A") is projected to be 60 percent of full contract, ranging from a minimum of 10 percent (single dry year) to 100 percent (single wet year). Contractual amounts are projected to range from 19 to 59 percent during multiple-dry year periods, and from 68 to 100 percent during multiple-wet year periods.

To ensure a conservative analysis, the 2009 SWP Delivery Reliability Report expressly assumes and accounts for the institutional, environmental, regulatory, and legal factors affecting SWP supplies, including but not limited to: water quality constraints, fishery protections, and other operational requirements imposed by regulatory agencies. The report also considers the potential effects of Delta levee failures and other seismic or flood events. Notably, the report assumes that all of these restrictions and limitations will remain in place over the next 20-year period and that no actions to improve the Delta will occur, even though numerous legal challenges, various Delta restoration processes, and new legal requirements for Delta improvements are currently underway (i.e., Bay Delta Conservation Plan, Delta Vision, Delta Plan, etc.). Finally, DWR's long-term SWP delivery reliability analyses incorporate assumptions intended to account for potential supply shortfalls related to global climate change.

A summary of the projected SWP supply availability is provided in Table 3-3.

In order to assist the DWR in its water supply planning, on an annual basis ACWD submits its forecasted use (through the year 2035) of its SWP supplies to the DWR. For planning purposes, ACWD requests the full delivery of its maximum contractual amount of 42,000 acre-feet. Currently, SWP water that is not directly used by ACWD within the service area (to meet distribution and/or groundwater system demands) is stored within the local groundwater basin or at the Semitropic Groundwater Bank for later dry year use (see discussion below). Alternatively, ACWD's SWP water may also be stored as carryover water at the SWP's San Luis Reservoir.

Semitropic Banking of ACWD's SWP Supplies

Because of the variability in the SWP supply availability, ACWD's 1995 IRP identified the need to secure storage to improve the dry year reliability of the District's SWP supplies. Based on this IRP recommendation, ACWD has contracted with Semitropic Water Storage District for participation in the Semitropic Groundwater Banking Program. ACWD has secured 150,000 AF of groundwater storage capacity at Semitropic under this program. In wet years, ACWD delivers its unused (excess) SWP supplies to Semitropic for storage in their groundwater basin. In dry years, ACWD can recover these supplies through: (1) an "in-lieu" exchange whereby ACWD will

receive a portion of Semitropic's SWP supplies (and Semitropic will utilize groundwater previously stored by ACWD in its basin); and (2) a "pumpback" program where Semitropic directly pumps stored groundwater into the California Aqueduct. As with local groundwater storage in the Niles Cone Groundwater Basin, the Semitropic Groundwater Banking Program does not provide a new source of supply for the District. Rather, it provides a means to store the District's unused SWP supplies in wet years for use during dry years when the delivery of SWP supplies may be significantly curtailed.

San Francisco's Regional Water System

ACWD receives water from the City and County of San Francisco's Regional Water System (RWS), operated by the San Francisco Public Utilities Commission (SFPUC). This supply is predominantly from the Sierra Nevada, delivered through the Hetch Hetchy aqueducts, but also includes treated water produced by the SFPUC from its local watersheds and facilities in Alameda and San Mateo Counties. The amount of imported water available to the SFPUC's retail and wholesale customers is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River. Due to these constraints, the SFPUC is very dependent on reservoir storage to firm-up its water supplies.

In order to enhance the ability of the SFPUC water supply system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply, the SFPUC has undertaken the Water System Improvement Program (WSIP), approved October 31, 2008. The WSIP will deliver capital improvements aimed at enhancing the SFPUC's ability to meet its water service mission of providing high quality water to customers in a reliable, affordable and environmentally sustainable manner. Many of the water supply and reliability projects evaluated in the WSIP were originally put forth in the SFPUC's Water Supply Master Plan (2000).

A Program Environmental Impact Report (PEIR) was prepared in accordance with the California Environmental Quality Act for the WSIP. The PEIR, certified in 2008, analyzed the broad environmental effects of the projects in the WSIP at a program level and the water supply impacts of various alternative supplies at a project level. Individual WSIP projects are also undergoing individual project specific environmental review as required.

In approving the WSIP, the Commission adopted a Phased WSIP Variant for water supply that was analyzed in the PEIR. This Phased WSIP Variant established a mid-term water supply planning milestone in 2018 when the Commission would reevaluate water demands through 2030. At the same meeting, the Commission also imposed the Interim Supply Limitation which limits the volume of water that the member agencies and San Francisco can collectively purchase from RWS to 265 million gallons per day (mgd) until at least 2018. Although the Phased WSIP Variant included a mid-term water supply planning milestone, it did include full implementation of all proposed WSIP facility improvement projects to insure that the public health, seismic safety, and delivery reliability goals were achieved as soon as possible. As of July 1, 2010, the WSIP was 27% complete overall and is scheduled to be completed in December 2015.

San Francisco Regional Water Supply Availability

Water supplies from the San Francisco Regional Water System are subject to variability depending on hydrologic conditions and other factors. A summary of the projected availability of supplies from this source is provided in Table 3-4. The following provides a description of ACWD's contractual supply for San Francisco Regional Water supplies, and how this supply would be allocated among San Francisco and its wholesale customers in the event of a water supply shortage.

2009 Water Supply Agreement The business relationship between San Francisco and its wholesale customers is largely defined by the "Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County and Santa Clara County" entered into in July 2009 (WSA). The new WSA replaced the Settlement Agreement and Master Water Sales Contract that expired June 2009. The WSA addresses the rate-making methodology used by the City in setting wholesale water rates for its wholesale customers in addition to addressing water supply and water shortages for the RWS. The WSA has a 25 year term.

In terms of water supply, the WSA provides for a 184 mgd (expressed on an annual average basis) "Supply Assurance" to the SFPUC's wholesale customers, subject to reduction, to the extent and for the period made necessary by reason of water shortage, due to drought, emergencies, or by malfunctioning or rehabilitation of the regional water system. The WSA does not guarantee that San Francisco will meet peak daily or hourly customer demands when their annual usage exceeds the Supply Assurance. The SFPUC's wholesale customers have agreed to the allocation of the 184 mgd Supply Assurance among themselves, with each entity's share of the Supply Assurance set forth on Attachment C to the WSA. The Supply Assurance survives termination or expiration of the WSA and this agency's Individual Water Sales Contract with San Francisco.

The Water Shortage Allocation Plan between the SFPUC and its wholesale customers, adopted as part of the WSA in July 2009, addresses shortages of up to 20% of system-wide use. The Tier 1 Shortage Plan allocates water from the RWS between San Francisco Retail and the wholesale customers during system-wide shortages of 20% or less. The WSA also anticipated a Tier 2 Shortage Plan adopted by the wholesale customers which would allocate the available water from the RWS among the wholesale customers.

Individual Supply Guarantee In 2009, ACWD, along with 25 other Bay Area water suppliers signed a Water Supply Agreement (WSA) with San Francisco, supplemented by an individual Water Supply Contract. These contracts, which expire in 25 years, provide for a 184 mgd Supply Assurance to the SFPUC's wholesale customers collectively. ACWD's Individual Supply Guarantee (ISG) is 13.76 mgd (or approximately 15,410 acre feet per year). Although the WSA and accompanying Water Supply Contract expire in 2034, the Supply Assurance (which quantifies San Francisco's obligation to supply water to its individual wholesale customers) survives their expiration and continues indefinitely.

Tier One Drought Allocations In July 2009, in connection with the WSA, the wholesale customers and San Francisco adopted a Water Shortage Allocation Plan (WSAP) to allocate water from the regional water system to retail and wholesale customers during system-wide shortages of 20% or less (the "Tier One Plan"). The Tier One Plan replaced the prior Interim Water Shortage Allocation Plan, adopted in 2000, which also allocated water for shortages up to 20%. The Tier One Plan also allows for voluntary transfers of shortage allocations between the SFPUC and any wholesale customer and between wholesale customers themselves. In addition, water "banked" by a wholesale customer, through reductions in usage greater than required, may also be transferred.

The Tier One Plan, which allocates water between San Francisco and the wholesale customers collectively, distributes water based on the level of shortage:

Level of System Wide Reduction in Water Use Required	***Share of Available Water***	
	SFPUC Share	***Wholesale Customer Share***
5% or less	35.5%	64.5%
6% through 10%	36.0%	64.0%
11% through 15%	37.0%	63.0%
16% through 20%	37.5%	62.5%

The Tier One Plan will expire at the end of the term of the Water Supply Agreement, unless extended by San Francisco and the wholesale customers.

Tier Two Drought Allocations The wholesale customers have negotiated, and adopted, the "Tier Two Plan," the second component of the WSAP which allocates the collective wholesale customer share among each of the 26 wholesale customers. This Tier Two allocation is based on a formula that takes multiple factors for each

wholesale customer into account, including: 1) the Individual Supply Guarantee; 2) seasonal use of all available water supplies; and 3) residential per capita use.

The water made available to the wholesale customers collectively will be allocated among them in proportion to each wholesale customer's Allocation Basis, expressed in mgd, which in turn is the weighted average of two components. The first component is the wholesale customer's Individual Supply Guarantee, as stated in the WSA, and is fixed. The second component, the Base/Seasonal Component, is variable and is calculated using the monthly water use for three consecutive years prior to the onset of the drought for each of the wholesale customers for all available water supplies. The second component is accorded twice the weight of the first, fixed component in calculating the Allocation Basis. Minor adjustments to the Allocation Basis are then made to ensure a minimum cutback level, a maximum cutback level, and a sufficient supply for certain wholesale customers.

The Allocation Basis is used in a fraction, as numerator, over the sum of all wholesale customers' Allocation Bases to determine each wholesale customer's Allocation Factor. The final shortage allocation for each wholesale customer is determined by multiplying the amount of water available to the wholesale customers' collectively under the Tier One Plan, by the wholesale customer's Allocation Factor.

The Tier Two Plan requires that the Allocation Factors be calculated by BAWSCA each year in preparation for a potential water shortage emergency. As the wholesale customers change their water use characteristics (e.g., increases or decreases in SFPUC purchases and use of other water sources, changes in monthly water use patterns, or changes in residential per capita water use), the Allocation Factor for each wholesale customer will also change. However, for long-term planning purposes, each wholesale customer shall use as its Allocation Factor, the value identified in the Tier Two Plan when adopted. The Tier Two Plan will expire in 2018 unless extended by the wholesale customers.

2018 Interim Supply Limitation As part of its adoption of the Water System Improvement Program (WSIP) in October 2008, discussed separately herein, the Commission adopted a water supply element, the Interim Supply Limitation (ISL), to limit sales from San Francisco Regional Water System (RWS) watersheds to an average annual amount of 265 million gallons per day (mgd) through 2018. The wholesale customers' collective allocation under the ISL is 184 mgd and San Francisco's is 81 mgd. Although the wholesale customers did not agree to the ISL, the WSA provides a framework for administering the ISL.

Interim Supply Allocations The Interim Supply Allocations (ISAs) refers to each individual wholesale customer's share of the Interim Supply Limitation (ISL). On December 14, 2010, the Commission established each agency's ISA through 2018. In general, the Commission based the allocations on the lesser of the projected fiscal year 2017-18 purchase projections or Individual Supply Guarantees. The ISAs are effective only until December 31, 2018 and do not affect the Supply Assurance or the Individual Supply Guarantees, both discussed separately herein. San Francisco's Interim Supply Allocation is 81 mgd. ACWD's ISA is 13.76 mgd, the same as the Individual Supply Guarantee.

As stated in the Water Supply Agreement, the wholesale customers do not concede the legality of the Commission's establishment of the ISAs and Environmental Enhancement Surcharge, discussed below, and expressly retain the right to challenge either or both, if and when imposed, in a court of competent jurisdiction.

Environmental Enhancement Surcharge The Commission plans to establish the Environmental Enhancement Surcharge concurrently with the budget-coordinated rate process. This surcharge will be unilaterally imposed by SFPUC on individual wholesale customers, and SFPUC retail customers, when each agency's use exceeds their Interim Supply Allocation and when sales of water to the wholesale customers and San Francisco retail customers, collectively, exceeds the Interim Supply Limitation of 265 mgd.

The SFPUC anticipates that the Environmental Enhancement Surcharge program will become effective beginning FY 2011/12.

Local Sources

As described above, ACWD's local sources include fresh groundwater from the Niles Cone Groundwater Basin, brackish groundwater desalination, and surface water supplies from the Del Valle Reservoir. Each of these supplies is described in greater detail below.

Niles Cone Groundwater Basin: The principal source of local supply for the District is the local aquifer system known as the Niles Cone Groundwater Basin. The primary source of recharge for the Niles Cone Groundwater Basin is local runoff from the Alameda Creek Watershed, which is captured, diverted and recharged at the District's groundwater recharge facilities. Alameda Creek annual runoff at the USGS Alameda Creek near Niles stream gage (located near ACWD's recharge facilities) has varied from a recorded minimum of 650 AF/Yr in 1960-1961, to a recorded maximum in 1982-1983 of 360,000 AF/Yr. Typically, ACWD diverts only a small portion of the local runoff flowing in Alameda Creek. The majority of local runoff flows downstream through the Alameda Creek Flood Control Channel to San Francisco Bay. To a lesser extent, infiltration of rainfall and applied water also provide a local source of recharge for the groundwater basin. ACWD also uses a portion of its imported State Water Project supplies for groundwater recharge.

The water quality in the groundwater system is characterized by fresh groundwater in the eastern portion of the groundwater basin transitioning into brackish groundwater in the western portion of the basin. The brackish groundwater is a result of historical seawater intrusion from the adjacent San Francisco Bay. Since the 1960's ACWD has managed the groundwater basin to prevent any additional seawater intrusion and has pumped the trapped brackish groundwater back to San Francisco Bay through the District's Aquifer Reclamation Program.

The Niles Cone Groundwater Basin has capacity to store water from year to year ("local groundwater storage"). However, the usable storage capacity of the groundwater basin is significantly limited by the potential for seawater intrusion if groundwater levels are maintained too low. Although local groundwater storage (i.e. groundwater supplies in excess of recharge) provides a short term source of supply during dry years, it is not a supply that is available every year because the groundwater system will require replenishment from freshwater sources, without which seawater intrusion would occur.

Brackish Groundwater Desalination: In 2003, ACWD commissioned the Newark Desalination Facility, with a capacity of 5 mgd (permeate, or treated water, production capacity). In 2010, ACWD expanded this capacity to 10 mgd. This facility utilizes the reverse osmosis process to remove salts and other impurities from the brackish groundwater pumped at ACWD's Aquifer Reclamation Program wells. Treated water (permeate) from the Newark Desalination Facility is blended with local groundwater and provides a supply for the distribution system demands. Chapter 6 provides additional information on ACWD's desalination program.

Del Valle Reservoir: The District and Zone 7 Water Agency of the Alameda County Flood Control and Water Conservation District (hereafter referred to as "Zone 7"), have equal rights on Arroyo Del Valle to divert water to storage. When the California Department of Water Resources (DWR) constructed Del Valle Dam in the upper Alameda Creek Watershed, those rights were recognized in an agreement between DWR, the District, and Zone 7. Consequently, DWR typically makes a total of 15,000 AF of storage available annually in Del Valle Reservoir for use by ACWD and Zone 7. ACWD and Zone 7 equally share this storage capacity, thereby providing up to 7,500 AF of storage capacity annually to ACWD.

Local Water Supply Availability

A summary of the estimated water supply availability from ACWD's local supplies is provided in Table 3-2. As indicated in these tables, the amount of local water supplies available to ACWD from Del Valle Reservoir and fresh groundwater sources varies widely from year to year, depending primarily on hydrologic conditions and availability of local runoff. In general, desalination of brackish groundwater provides a more reliable water source than other local supplies. However, there may be limitations to this source if groundwater levels are lowered to the extent that a reduction in Aquifer Reclamation Program pumping is required to prevent new

seawater intrusion.

In addition, ACWD has initiated informal discussions with the National Marine Fisheries Service (NMFS) and California Department of Fish and Game (DFG) regarding the permitting for fish passage facilities at ACWD's inflatable rubber dams in the Alameda Creek Flood Control Channel. A key element of these discussions has been the minimum bypass flows needed at these facilities to support steelhead migration through the Flood Control Channel. As of March 2011, ACWD, NMFS and DFG have developed a preliminary agreement on a minimum bypass flow schedule and it is anticipated that this bypass flow schedule will be incorporated into the permitting for this project. Therefore, for the purpose of this UWMP, the March 2011 bypass flow schedule has been incorporated into the modeling analyses of local water supply availability.

3.2 WATER SUPPLY UNCERTAINTIES

The purpose of this section is to identify factors which may impact current planning assumptions, the significance and magnitude of which are currently unknown. As described below, the potential impacts of global warming are a key uncertainty which may impact all of ACWD supplies. In addition, each of ACWD's supplies face uncertainties which may be unique to the source of supply. A summary of water supply uncertainties facing ACWD's supplies is provided in Table 3-5 and discussed in greater detail below. This includes a discussion of how climate change may impact ACWD's supplies, followed by a discussion of additional sources of uncertainty for each source of supply.

Climate Change

Climate change may result in a long term trend characterized by less snowfall, more local rainfall and rising sea-levels. Under current conditions, much of ACWD's imported water supplies is held in "storage" in winter and spring snowpack in the Sierra Nevada Mountains. With a diminished snowpack, the yield of the State Water Project and San Francisco Regional System may be significantly impacted. The magnitude of the impact of climate change on water supplies is not known. However, the following provides an overview of recent studies that have evaluated potential impacts on surface water and groundwater supplies in California.

State Water Project: In 2006 DWR's Climate Action Team (CAT) released a report on climate change and its potential impact on California's water resources. Entitled *Progress on Incorporating Climate Change into Management of California's Water Resources* (*2006 Climate Change Repor*t), the report summarizes recent research into change in precipitation, air temperatures, snow levels, and snowmelt runoff. The report also evaluates possible future impact on California water supply through model simulations reflecting multiple climate change scenarios, weather conditions and geopolitical conditions.

The main results of the *2006 Climate Change Report* related to climate change's estimated impacts on the State Water Project around the year 2050:

- Estimated changes in annual average SWP south-of-Delta Table A deliveries range from a slight increase of about 1 percent for a wetter scenario to about a 10 percent reduction for one of the drier climate change scenarios.

Table 3-5
Summary of Potential Future Factors that may Influence ACWD Water Supply Reliability

SUPPLY	Factor		
	Legal & Environmental	Water Quality	Climatic
Imported Supplies			
- State Water Project	ESA* requirements may constrain Delta pumping	Potential seawater intrusion impacts if Delta Levees fail.	Supply is dependent on hydrologic conditions
- San Francisco Regional Supply	ESA and other permitting requirements may require additional reservoir releases	None anticipated	Supply is dependent on hydrologic conditions
Local Supplies			
- Groundwater Recharge	ESA requirements may impact groundwater recharge operations Upstream water management activities and/or agreements with upstream agencies may impact supply availability	Upstream water management activities and/or land use activities may impact water quality	Supply is dependent on hydrologic conditions
- Groundwater Storage	None anticipated	None anticipated	Supply is dependent on availability of water to store in wet years
- Del Valle	ESA requirements may require downstream flow releases	None anticipated	Supply is dependent on hydrologic conditions
- Desalination	None anticipated	None anticipated	Supply is dependent on local groundwater conditions
- Recycled Water	None anticipated	None anticipated	None anticipated
Banking/Transfers			
- Semitropic Banking	Delta pumping constraints may impact ability to recover water through SWP exchanges	Banked groundwater may require treatment	Supply is dependent on availability of water to store in wet years

* Endangered Species Act

- Estimated increased winter runoff and lower Table A allocations resulting in slightly higher average annual Article 21 deliveries in the three drier climate change scenarios[1]. However, the increases in Article 21 deliveries do not offset the losses to Table A. The wetter scenario with higher Table A allocations results in fewer Article 21 delivery opportunities and slightly lower annual Article 21 deliveries.

- Estimated SWP carryover storage is reduced in the drier climate change scenario and is somewhat increased in the wetter climate change scenario.

The 2009 Biennial Report of the CAT includes updates to the findings of the 2006 study. The update expands the number of future climate scenarios, methods for estimating sea-level rise, estimates for irrigation demands, reservoir inflows, and restrictions in Delta operations anticipated with sea-level rise and resultant salt-intrusion. The updated study qualitatively reports that SWP reliability will be further diminished from previous findings, however, as determined in 2006, those impacts do not become significant until the latter half of the 21st century. Therefore, while included in this analysis, the water supply impacts anticipated from climate change are minimal during the 20-year purview of the UWMP. The 2009 SWP Delivery Reliability Report includes these revised climate change assumptions, the impacts of which are reflected in the reliability data used in this UWMP.

San Francisco Regional Supplies: The issue of climate change has become an important factor in water resources planning in the State, and is frequently being considered in urban water management planning purposes, though the extent and precise effects of climate change remain uncertain. As described by the SFPUC in its Final Water Supply Availability Study for the City and County of San Francisco, dated October 2009, there is evidence that increasing concentrations of greenhouse gasses have caused and will continue to cause a rise in temperatures around the world, which will result in a wide range of changes in climate patterns. Moreover, there is evidence that a warming trend occurred during the latter part of the 20th century and will likely continue through the 21st century. These changes will have a direct effect on water resources in California, and numerous studies have been conducted to determine the potential impacts to water resources. Based on these studies, climate change could result in the following types of water resource impacts, including impacts on the watersheds in the Bay Area:

- Reductions in the average annual snowpack due to a rise in the snowline and a shallower snowpack in the low and medium elevation zones, such as in the Tuolumne River basin, and a shift in snowmelt runoff to earlier in the year;
- Changes in the timing, intensity and variability of precipitation, and an increased amount of precipitation falling as rain instead of as snow;
- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality;
- Sea level rise and an increase in saltwater intrusion;
- Increased water temperatures with accompanying potential adverse effects on some fisheries and water quality;
- Increases in evaporation and concomitant increased irrigation need; and
- Changes in urban and agricultural water demand.

[1] Article 21 deliveries refer to Article 21 of the SWP contracts which allows for contractors to receive additional water deliveries only under specific conditions. These conditions include: 1) Article 21 water is available only when excess water is available in the Delta, and 2) Article 21water is available only when conveyance capacity through the SWP facilities is available. Due to the uncertainties regarding the availability of Article 21 water, ACWD does not include this supply in its water supply planning and Urban Water Management Plan.

According to the SFPUC (2009), other than the general trends listed above, there is no clear scientific consensus on exactly how climate change will quantitatively affect the state's water supplies, and current models of water systems in California generally do not reflect the potential effects of climate change.

Initial climate change modeling completed by the SFPUC indicates that about seven percent of runoff currently draining into Hetch Hetchy Reservoir will shift from the spring and summer seasons to the fall and winter seasons in the Hetch Hetchy basin by 2025. This percentage is within the current interannual variation in runoff and is within the range accounted for during normal runoff forecasting and existing reservoir management practices. The predicted shift in runoff timing is similar to the results found by other researchers modeling water resource impacts in the Sierra Nevada due to warming trends associated with climate change.

The SFPUC has stated that based on this preliminary analysis, the potential impacts of climate change are not expected to affect the water supply available from the San Francisco Regional Water System (RWS) or the overall operation of the RWS through 2030.

The SFPUC views assessment of the effects of climate change as an ongoing project requiring regular updating to reflect improvements in climate science, atmospheric/ocean modeling, and human response to the threat of greenhouse gas emissions. To refine its climate change analysis and expand the range of climate parameters being evaluated, as well as expand the timeframes being considered, the SFPUC is currently undertaking two additional studies. The first utilizes a newly calibrated hydrologic model of the Hetch Hetchy watershed to explore sensitivities of inflow to different climate change scenarios involving changes in air temperature and precipitation. The second study will seek to utilize state-of-the-art climate modeling techniques in conjunction with water system modeling tools to more fully explore potential effects of climate change on the SFPUC water system as a whole. Both analyses will consider potential effects through the year 2100.

Groundwater: In 2003, and then again in an update prepared in August of 2005, the Pacific Institute for Studies in Development, Environment and Security prepared a literature search report for DWR, which summarized recommendations for coping with and adapting to climate change from key peer-reviewed publications and specifically considered the potential impacts of climate change on groundwater. The Pacific Institute's report is entitled, *Climate Change and California Water Resources: A Survey and Summary of the Literature,* by Michael Diparsky and Peter H. Gleick, Pacific Institute (*Climate Change and Water Resources*).

Climate Change and Water Resources found that little work has been done on the impacts of climate change for specific groundwater basins, or for general groundwater recharge characteristics or water quality. As the following conclusions from the report illustrate, the potential impacts of climate change on groundwater resources are divided, with some potentially resulting in increased availability of groundwater and others potentially resulting in less.

- Changes in recharge will result from change in effective rainfall as well as a change in the timing of the recharge season. Increased winter rainfall could lead to increased groundwater recharge.

- Higher evaporation or shorter rainfall seasons could mean that soil deficits persist for longer periods of time, shortening recharge seasons.

- Because a significant portion of winter recharge comes from deep percolation of precipitation below the rooting zone, warmer winter temperatures between storms would be expected to increase and dry out the soil between storms. A greater amount of rain in subsequent storms would then be required to wet the root zone and provide water for deep percolation.

- Sea-level rise could affect coastal aquifers through saltwater intrusion.

- Warmer, wetter winters would increase the amount of runoff available for groundwater recharge. However this additional runoff would be occurring at a time when some basins are either being recharged at their maximum capacity or are already full.

- Reductions in spring runoff and higher evapotranspiration because of higher temperatures could reduce the amount of water available for recharge.

State Water Project Supplies

The reliability of ACWD's State Water Project supplies will continue to remain uncertain due to the on-going concerns regarding the sustainability of the Delta. These concerns include the Delta ecosystem and potential future environmental regulations, levee stability and the potential for catastrophic failure of these levees, urban encroachment within the Delta, and water quality within the Delta due to urban and agricultural discharges.

Most notably, successive actions to protect endangered species within the Delta have resulted in reductions in long term reliability from 69% to 60% of Maximum Table A allocation over the past four years. Beginning in December of 2007, Federal District Court Judge Oliver Wanger issued a final court order ("Wanger Decision") which put into place an operational plan requiring the State Water Project and Central Valley Project (CVP) to reduce Delta export pumping operations in order to protect the Delta smelt. This court action was replaced by a biological opinion in December of 2008, which largely upheld the operating restrictions imposed by the Wanger Decision. In June of 2009 a revised biological opinion for salmonids was published which further restricted the State's ability to deliver supplies presently and for the foreseeable future.

On July 20, 2010, the State Water Resources Control Board (State Water Board) released a report titled "Draft Report on the Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem". Development of these criteria was required under SBX7 1, passed in November of 2009, which sought to protect the public trust resources of the Delta ecosystem. The purpose for developing the criteria is to inform planning decisions for the Delta Plan and the Bay Delta Conservation Plan (BDCP), a multiagency effort with the goal of providing long-term Federal and State Endangered Species Act compliance for Delta export operations. At this point, the extent to which these criteria will be implemented and what effect they may have on the State's ability to deliver water supplies is as of yet unknown.

Additional information on potential factors affecting SWP reliability is provided in Appendix B.

Semitropic Banking Program

ACWD faces several uncertainties with regard to recovery of water from the Semitropic Banking Program. These uncertainties include: 1) water quality concerns with regard to groundwater from Semitropic that is pumped back into the California Aqueduct; and 2) the ability to make the upstream exchanges needed to deliver the recovered water to the ACWD service area. With regards to the water quality issues, Semitropic has initiated a pilot water treatment plant which has treated the groundwater to meet the required criteria for pumping this water into the California Aqueduct. Semitropic has indicated that this pilot treatment plant may form the basis for a future permanent treatment facility. With regards to the exchange capacity needed to recover dry year supplies from Semitropic, ACWD has coordinated with Semitropic, DWR, and other Semitropic Banking partners to ensure coordination of the planned use of the Semitropic recovery capacity and the needed exchanges. However, the risk remains that under certain critical dry year conditions ACWD may not be able to recover 100% of the District's contractual recovery capacity from Semitropic. Potential mitigation measures to minimize the risk associated with the constraints in Semitropic dry year recovery. These measures may include: 1) re-operation of local and other storage available to ACWD (i.e. Niles Cone Groundwater Basin, Del Valle Reservoir, San Luis Reservoir) in coordination with recovery from Semitropic and/or: 2) alternative dry year supply programs.

San Francisco Regional Water System

In order to enhance the ability of the SFPUC water supply system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply, the SFPUC is undertaking a Water System Improvement Program (WSIP). Completion of the projects in the WSIP is critical to ensuring the reliability of the San Francisco Regional supplies. However, it is currently uncertain if the SFPUC will be successful in fully implementing this program, and if it will be accomplished in a timely manner. Other factors that may impact the reliability of San Francisco Regional supplies include environmental regulations and permitting requirements for its Hetch-Hetchy and local watershed facilities and operations.

Additional information on potential factors affecting San Francisco Regional Water System reliability is provided in Appendix B.

Local Supplies

In addition to potential climate change impacts, the availability of ACWD's local supplies may be influenced by a variety of other factors including additional operational and facility modifications to accommodate on-going Alameda Creek fishery restoration efforts (beyond those included in the March 2011 preliminary agreement with NMFS/DFG). Upstream land use, flood control and water supply projects in the Alameda Creek Watershed may also impact the supply and quality of water available at ACWD's groundwater recharge facilities. There also may be uncertainties regarding future releases from the major reservoirs in the Alameda Creek Watershed, including Calaveras and San Antonio Reservoirs (SFPUC) and Del Valle Reservoir (DWR), as required for environmental purposes and/or operational agreements. This includes a previous agreement between ACWD and the SFPUC to provide water to ACWD for groundwater recharge during a period when the Niles Cone Groundwater Basin was in overdraft condition and threatened by seawater intrusion. Similarly, efforts to develop groundwater supplies by entities in the South East Bay Plain (north of ACWD) may also impact ACWD's groundwater supply availability. ACWD is currently working to address these items. However, it is not clear whether or not these issues will ultimately impact ACWD's local supplies.

3.3 MANAGEMENT AND DISTRIBUTION OF WATER SUPPLIES

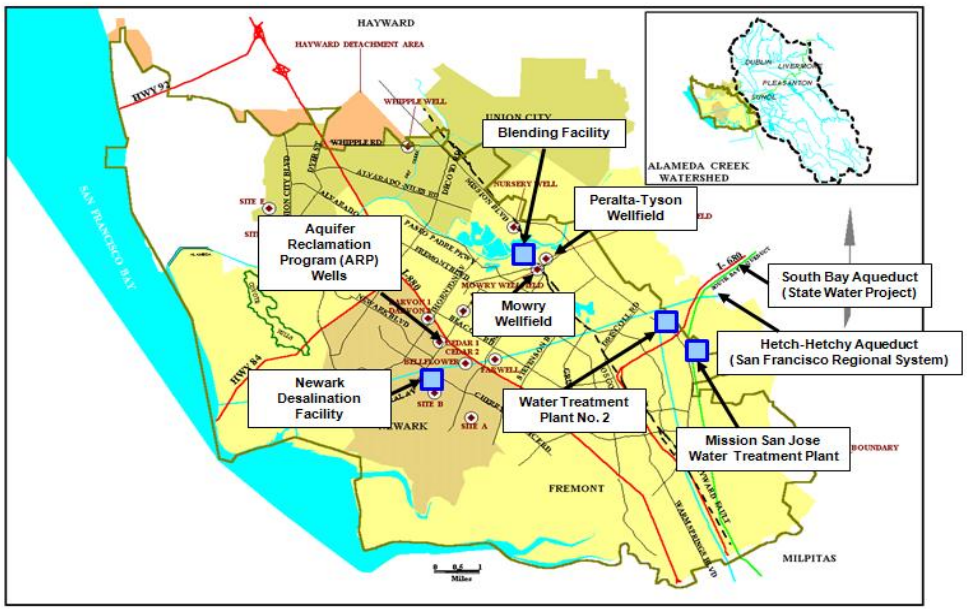
With local water and two sources of imported water, the District has the flexibility to change the timing and use of supplies to best meet its water management objectives, which include:

- Maximizing total usable supply
- Maximizing water quality/providing uniform water quality
- Protecting groundwater resources from degradation due to previously intruded seawater
- Protecting groundwater resources from further seawater intrusion

District customers receive water from one or more production sources: the San Francisco Regional Water System, the District's Mission San Jose Water Treatment Plant (MSWTP), the District's Water Treatment Plant Number 2 (WTP 2), the District's Blending Facility which blends local groundwater (from the Mowry and Peralta-Tyson Wellfields) with San Francisco Regional supplies, and the Newark Desalination Facility (see Figure 3-4).

Flow from the SBA and releases from Del Valle Reservoir may be diverted into either of the two treatment plants, diverted into Alameda Creek, or both. Depending on the water quality and flow in Alameda Creek, water can also be diverted into percolation ponds for groundwater recharge. San Francisco Regional Water System supplies are either routed to the Blending Facility for blending with local groundwater supplies or, under certain conditions, directly supplied to users.

Figure 3-4 ACWD Water Supply Sources and Production Facilities



Groundwater Management and Protection

Groundwater is an important component of the District's supply, as demonstrated in Tables 3-1 and 3-2. ACWD has had a Groundwater Management Policy in place since 1989. This management policy outlines the District's protection and management activities for the Niles Cone Groundwater Basin to ensure a reliable supply of high quality water that satisfies current and future water needs in the ACWD service area. Chapter 4 in this UWMP describes the District's groundwater management and protection policy in more detail.

Groundwater Recharge

During wet periods, local runoff from the Alameda Creek Watershed is diverted into the groundwater percolation ponds. When local runoff is not available, water may be released from either Del Valle Reservoir or from the SBA for groundwater recharge. Currently, the District operates two inflatable dams to capture and divert Alameda Creek flow into the percolation ponds. The dams are deflated for protection from debris when creek flow is above 700 cfs and no off-stream diversions occur during these high flow conditions.

Del Valle Supplies

Typically, ACWD's water stored at Del Valle is used by the fall to maximize the capture of local runoff during the winter and spring seasons. In decreasing order of priority, Del Valle water is delivered to ACWD:

- Via the SBA to the District's treatment facilities (MSJWTP and WTP2).
- Via the SBA and released into Alameda Creek at Vallecitos Takeoff for groundwater recharge.
- Into Arroyo Del Valle Creek, where it flows to Arroyo de la Laguna and eventually into Alameda Creek for groundwater recharge.

State Water Project Water

Water from the SWP (delivered via the SBA) can either be taken at Vallecitos Takeoff and discharged to Alameda Creek for groundwater basin recharge or taken at the Alameda-Bayside Takeoffs for delivery to the treatment plants. By October 1 of every year, the District must submit its anticipated requests for monthly water deliveries for the upcoming year. The State confirms the District's request or provides the District with the anticipated percentage allocation by December 1. The estimated percentage delivery is then adjusted during the spring based on estimated runoff.

Blending of San Francisco Regional System Water with Groundwater

San Francisco Regional Water System supplies can be taken at any of nine takeoffs throughout the District's distribution system. This water supply is significantly lower in hardness than ACWD's local groundwater supplies. The District blends the San Francisco Regional water with higher hardness groundwater at ACWD's Blending Facility with the objective of providing a uniform water quality with hardness levels similar to those of other sources of supply. Since the Blending Facility has come on-line, most of the San Francisco Regional System water has been taken at the Fremont connection for direct delivery to the Blending Facility.

3.4 SOURCE WATER QUALITY

As required by law, Drinking Water Source Assessments are conducted to determine the vulnerability of ACWD's drinking water sources to contamination. As described below, assessments have been completed for all of ACWD's water sources:

- The San Francisco Public Utilities Commission, which administers the San Francisco Regional Water System, completed its assessment in 2000. It was found that the SFPUC's watersheds are vulnerable to contaminants associated with wildlife and, to a limited extent, human recreational activity. Historically, the levels of contamination have been very low in the watersheds.

- The South Bay Aqueduct Source Assessment was completed in 2002 to evaluate potential vulnerabilities to ACWD's State Water Project supplies. This source is most vulnerable to agricultural drainage, wastewater treatment plant discharges, urban runoff, recreational usage of the water, and cattle grazing. In addition, seawater intrusion in the Delta contributes salt and bromide to the water supply.

- ACWD's assessment of local groundwater sources was also completed in 2002. This assessment concluded that local groundwater is most vulnerable to gas stations, known contaminant plumes, confirmed leaking underground storage tanks, dry cleaners, metal plate/finishing/fabricating, and sewer collection. The potential for saltwater intrusion into the aquifer system is also of concern to ACWD.

Although ACWD raw water sources are vulnerable to potentially contaminating activities, ACWD treatment and blending facilities ensure that all potable water delivered by ACWD meets the strict standards set by state and federal regulatory agencies. In addition, ACWD's groundwater management program (see Chapter 4) has been developed to protect the local groundwater supplies from contamination. As such, under most future scenarios, it is not anticipated that future changes to source water quality will adversely impact the long-term availability or reliability of these supplies. However, catastrophic events (i.e., levee failures in the Delta resulting in seawater intrusion impacts on Delta supplies) or other unforeseen circumstances may impact ACWD supplies and their reliability, resulting in water supply shortages. Chapter 10 (Water Shortage Contingency Plan) addresses potential future shortages.