

APPENDIX B

Water Shortage Allocation Methodology

**Description of Model that Calculates the
Allocation of Water Available to Sonoma County Water Agency for its Customers*
During a Water Supply Deficiency Taking Demand Hardening into Account**

April 4, 2006 Version

This EXCEL workbook (040406 Allocation Model.xls) presents two models that calculate allocations to Sonoma County Water Agency (SCWA) Customers during a shortage of water supply in the Russian River. The calculations meet all of the requirements of the Restructured Agreement for Water Supply (Agreement). See **Contents** sheet for layout of sheets in the workbook. Another EXCEL workbook (040406 Customer Water Use.xls) supports this workbook and contains data compiled for the 2005 Urban Water Management Plan.

* "SCWA Customers" or "Customer" is defined as any of the following:

Regular Customers

Water Contractors (sometimes referred to as "Primes"): Cotati, Petaluma, Rohnert Park, Santa Rosa, Sonoma, Windsor (Airport Service Area), North Marin Water District, Valley of the Moon Water District

Other Agency Customers: SCWA, County of Sonoma, Larkfield Water District, Forestville Water District, Lawndale Mutual Water Co., Kenwood Village Water Co., Penngrove Water Co., City of Sebastopol, State of California, and Santa Rosa Jr. College)

Marin Municipal Water District (MMWD)

Russian River Customers (Customers of SCWA that divert water directly from the Russian River or via wells adjacent to the River).

Where to Find Results:

Results for allocating water during a shortage given varying assumed amounts of water available to SCWA in the Russian River are modeled for two cases.

- The **Current Model** is to be employed during a real drought. Inputs to this model must be updated to then current conditions. For current conditions, results are shown on the **Current Recap** sheet.
- The **Future Model** is a "planning" model whose purpose is to predict allocations for various levels of deficiency in the future when all Customers are assumed to have reached there entitlement limits – generally about 20 years from now for most Customers. (Note: This was the type of model prepared by West, Yost & Associates for the City of Santa Rosa and is also the type prepared by Petaluma.) Results are shown on the **Future Recap** sheet.

Required Allocation Methodology:

Section 3.5(a)(3) of the Agreement provides for allocation of water in the event of a water supply deficiency as follows:

- **"First"**, Allocation of quantities of water required by each Customer* for human consumption, sanitation and fire protection (HC, S & FP) after taking into consideration all other sources of potable water then available to said customer. (Section 3.5(a)(3)(i)) (Often referred to as Tier 1.)
- **"Second"**, Allocation of any additional water available to the SCWA proportionately to its Customers* as follows (Section 3.5(a)(3)(ii)) (Often referred to as Tier 2 allocation.):

Regular Customers (Water Contractors and Other Agency Customers): Deliveries from aqueduct based on respective average daily rate of flow during any month entitlements. These entitlements are set forth as million gallon per day (mgd) rates in Sections 3.1(a) and 3.2 of the Agreement.

Russian River Customers: Authorized diversions or rediversions of water based on delivery limits set forth in agreements with the SCWA.

Marin Municipal Water District (MMWD): Deliveries based on Third Amended Offpeak Agreement and Agreement for Sale of Water (as amended on Jan 25, 1996), and amendments or subsequent agreements between the SCWA and MMWD that have been approved by the Water Advisory Committee.

- **Sum of Two:** The Agreement further requires that the sum of the "First" plus "Second" allocation for a given SCWA Customer not exceed the Reasonable Requirement or entitlement limit/contracted amount, whichever is less (Section 3.5(a)(3)(iii)).

"Human Consumption, Sanitation and Fire Protection" Definition:

In determining HC, S & FP amounts, the Agreement provides that SCWA shall take into account the level of water conservation achieved by the Customer and the resulting decrease in end user ability to reduce water use (the hardening of demand) resulting from such conservation. The allocation shall be determined using a methodology which rewards and encourages water conservation; avoids cutbacks based upon a percentage of historic consumption, and, among other things, bases the amounts necessary for HC, S & FP upon no greater than average indoor per capita water use determined from recent retail billing records for winter water use by all of the Water Contractors; and, if necessary or appropriate for equitable purposes, considers commercial, industrial and institutional water uses separately and determines that element of the allocation based on winter water use from recent retail billing records for commercial, industrial and institutional uses. (Section 3.5(c)(1))

"Reasonable Requirements" Definition:

The Agreement states that the fundamental purpose of the Reasonable Requirements limitation is to ensure that no Customer receives more water during a shortage than that Customer reasonably needs. In determining reasonable requirements, the SCWA may take into account the hardening of demand resulting from the level of conservation achieved by the Customer; the extent to which the Customer has developed recycled water projects and local supply projects, and the extent to which the Customer has implemented water conservation programs. The Agreement further states that it is the intention of the

parties that the SCWA make its Reasonable Requirements determinations so as to encourage Customers to implement water conservation, recycled water, and local supply projects. (Section 3.5(c)(2))

Description of Models:

Two models are presented.

- **Current Model:** The Current Allocation Model determines annual allocations based on the assumption the water supply deficiency occurs now and impacts current conditions and levels of use. This is the model that would be used in the event of an actual deficiency in water supply available from the Russian River. It employs estimates of HC, S & FP needs, Reasonable Requirements, and Local supply. In the event of a real perceived water supply deficiency, inputs to the model must be updated to then currently available data. If the shortage persists longer than one year the inputs must again be updated – particularly local supply estimates which should be updated every year of the drought. Customers relying on surface water for local supply, such as North Main Water District, and MMWD, can be expected to have reduced local supply available.
- **Future Model:** The second model is hypothetical and predicts future allocations at a point in time that assumes that all customers of the SCWA have reached their annual entitlement limits. It sets the Reasonable Requirement for each SCWA Customer to that customer's annual entitlement limit (cap). The Future Allocation Model is useful for planning purposes to predict allocations from the SCWA for various assumed water supply deficiencies.

Model Assumptions and Inputs:

1. **Entitlements:** Entitlements (Regular Customers) and contracted amounts (MMWD and Russian River Customers) for both models are as set forth in the Agreement and existing agreements between the SCWA and MMWD and its Russian River Customers. (See **Entitlements** and **RR Cust** sheets.)
2. **Local Supplies:** The estimates of safe yield of local supplies are the same for both models and are based on estimates reported by Water Contractors to West, Yost & Associates in a September 23, 2004 Tech. Memo to the City of Santa Rosa and are generally average local supply that was available for the period 2000 through 2003. A contingency factor is applied by John Olaf Nelson Water Resources Management (JONWRM) to each local supply to account for equipment/maintenance issues or other potential problems. This factor was assumed to be 10% for each Water Contractor for lack of better data. The safe yield value for MMWD was supplied by MMWD. Local supply estimates for Other Agency Customers were not available and was assumed to be "0". Information on Local supplies needs to be accurately determined and updated by the SCWA. (See **Local** and **TM Data** sheets.)
3. **Water for Human Consumption, Sanitation and Fire Protection:** Water needed to meet HC, S & FP needs for both models is assumed to be equal to total winter level demand of customers served by Customers of the SCWA and is based on metered water sales (billings) for calendar 2004, the base year analyzed in the 2005 Urban Water Management Plan. Winter level demands are then extrapolated to a full year to determine the annual HC, S & FP need. Water available

from local supplies is then determined and net HC, S & FP needs determined in order to calculate the "First" allocation. In determining the "First" allocation, demand hardening is accounted for using winter level per capita demand. (See **GPCD** and **Human** sheets and the footnotes on the Current Model for details.)

4. Reasonable Requirements:

- For the Current Model, Reasonable Requirements were assumed to equal average annual aqueduct deliveries to SCWA's Regular Customers and MMWD for FY 2003-04 and FY 2004-05. For Russian River Customers, the average for Water Years 2004 and 2005 was used, as that was the format the data was available in. (Use of a three or four year average would normally be a better choice for calculating Reasonable Requirements, however, this was not done as at least one SCWA customer made a significant policy change in aqueduct usage which would not have been fairly reflected if years prior to FY 2003-04 were used. Also in subsequent analyses, the data should be normalized to common annual periods.) (See **Reasonable** sheet.) Pursuant to Section 3.5(c)(2), Reasonable Requirements were adjusted with a demand hardening factor to account for differing levels of conservation achieved by Customers. The demand hardening factor is derived from total per capita demand (residential, non-residential and unaccounted for water) as determined for the base year (cal. 2004) of the 2005 Urban Water Management Plan. (See **DH Factor** sheet.)
- In the Future Model, Reasonable Requirements are set equal to annual entitlement limits (caps) or contract limits as applicable, it being assumed that each Customer has reached its annual entitlement limit (the same approach taken in the Santa Rosa and Petaluma models). **THIS IS THE ONLY INPUT DIFFERENCE BETWEEN THE "CURRENT" AND "FUTURE" MODEL.**

Model Design and Workbook Layout:

The two model sheets are totally independent and are designed to automatically calculate water shortage allocations for any SCWA available supply bounded by a low value equal to the sum of water required for HC, S & FP and an upper value equal to the sum of Reasonable Requirements or sum of annual entitlement limits, whichever is less. Cells in both models are linked to the various supporting data sheets.

To operate a model, simply input the assumed available supply in Cell H:4 of the model you are working with. The results – the sum of the "First" (Tier 1) plus "Second" (Tier 2) allocation appear to the far right (Column 42 of the Current Model and Column 39 of the Future Model).

The Current Model sheet is followed by a sheet entitled "Current Recap" that shows the resulting allocations (both in tabular and graph form) for each Customer for various assumed levels of available supply. This recap and the graphs are automatically populated by running the Macro entitled "CurRecap".

Likewise, following the Future Model sheet is a sheet entitled "Future Recap" which shows the tabular and graph results for the Future Model. This recap and the graphs are automatically populated by running the Macro entitled "FutRecap".

Caution Concerning Data Collection and Maintenance:

With the allocation methodology introduced in the Agreement, it is essential that the SCWA develop and maintain a data base containing information collected from all of its Customers based on application of uniform standards, and containing data on water service area population, portion of population served by private wells (none of the models correct for private well water use by service area population), winter level water consumption, annual consumption, local supplies, unaccounted for water, conservation, recycled water use, etc. Good regional data on evapotranspiration differences may also be needed to modify the Reasonable Requirement demand hardening adjustment factor. A fair and uniform way to determine the safe yield of local supply capacity is especially important. It may be useful to categorize local supply into: (1) normally available and used capacity, and (2) strictly standby capacity that is more expensive to use than aqueduct water or has some non-threatening quality issues, i.e. taste and odor that make it undesirable to use under normal water supply conditions.

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Contents of this EXCEL Workbook
Water Shortage Allocation Model w. Demand Hardening Factor (a)
April 4, 2006 Version

Models (Current and Future)

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- 1 **Contents**
- 2, 3 **Current Model** (To be used in case of imminent drought.)
- 3, 4 **Current Recap** (Recap of Current Allocation Model)
- 5, 6 **Future Model** (To be used for long range planning purposes.)
- 7, 8 **Future Recap** (Recap of Future Allocation Model)

Input Data for Models

- 9 **Entitlements ***
- 10 **RR Cust** (Russian River Customer demand) *
- 11 **Human** (Human Consumption, Sanitation and Fire Protection demand) *
- 12 **Reasonable** ("Reasonable Requirements" are recent (non-drought) aqueduct deliveries and Russian River diversions of SCWA Customers) **
- 13 **Local** (Local Supply expected to be available in a drought) *
- 14 **Pop** (Service Area population data) *
- 15 **GPCD (Winter level per capita demand (b))**
- 16 **DH Factor** Demand Hardening Factor - used for adjusting "Reasonable Requirements" in Current Model
- 17 **TM Date** Data compiled by West, Yost & Associates for Santa Rosa Planning Allocation Model

* Same data used in both Current and Future Model.

** Based on aqueduct sales and Russian River diversions in recent non-drought years. In the Future Model, reasonable requirements are set equal to annual entitlement limits (caps) or contract delivery limits as applicable in order to estimate allocations at that time in the future when demand has grown to equal the annual entitlement limits.

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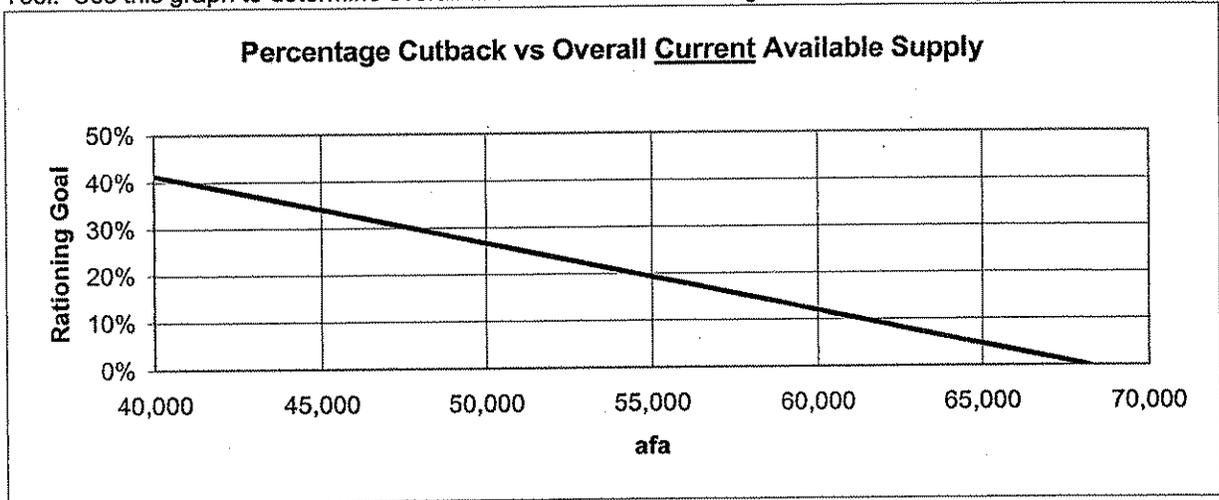
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Results for Current Allocation Model vs. Assumed Available Supply

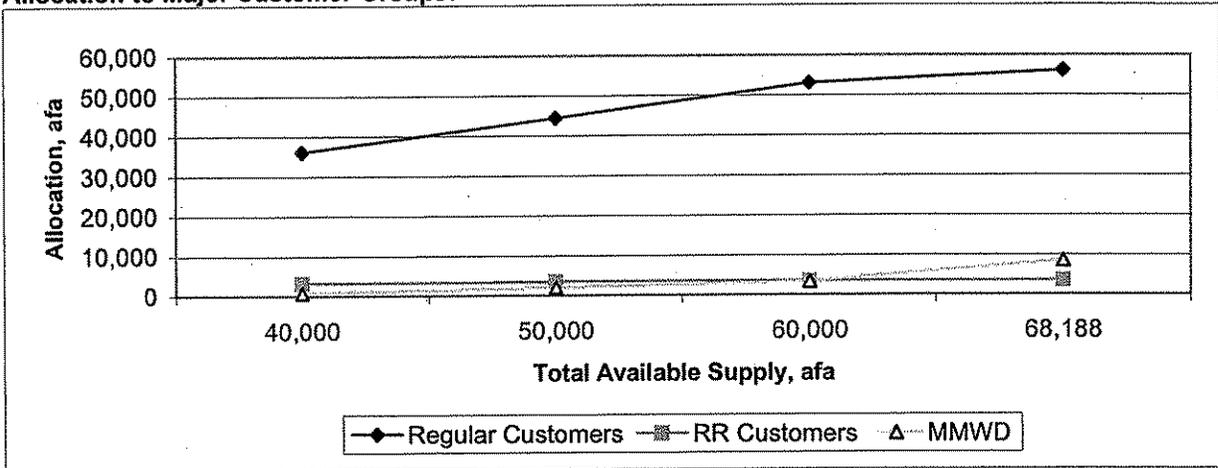
Available RR SCWA Supply, afa >	40,000	50,000	60,000	68,188 *
Equivalent Cutback in Deliveries >	41.3%	26.7%	12.0%	0.0%
Regular Customers				
Cotati	694	928	1,095	1,095
Petaluma	6,155	7,501	8,952	9,735
Rohnert Park	2,924	3,850	4,849	5,246
Sonoma	1,261	1,650	2,069	2,200
Windsor	317	409	410	410
NMWD	4,775	6,004	7,328	8,459
Santa Rosa	16,856	20,351	24,118	24,737
VOM	2,157	2,682	3,086	3,086
Other Agency	949	1,116	1,207	1,207
Sub-Total	36,088	44,491	53,114	56,173
MMWD	737	2,014	3,391	8,520
Russian River Cust's	3,175	3,495	3,495	3,495
Total	40,000	50,000	60,000	68,188

* Note: Max. Value is capped at 68,188 afa as this satisfies sum of Reasonable Requirements.

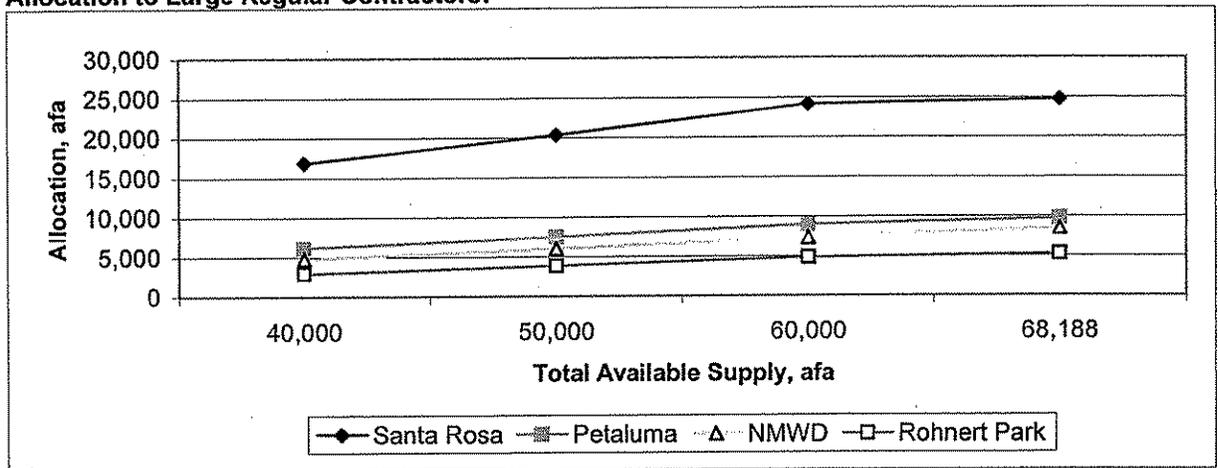
Tool: Use this graph to determine overall allocation available for a given overall rationing (%) goal.



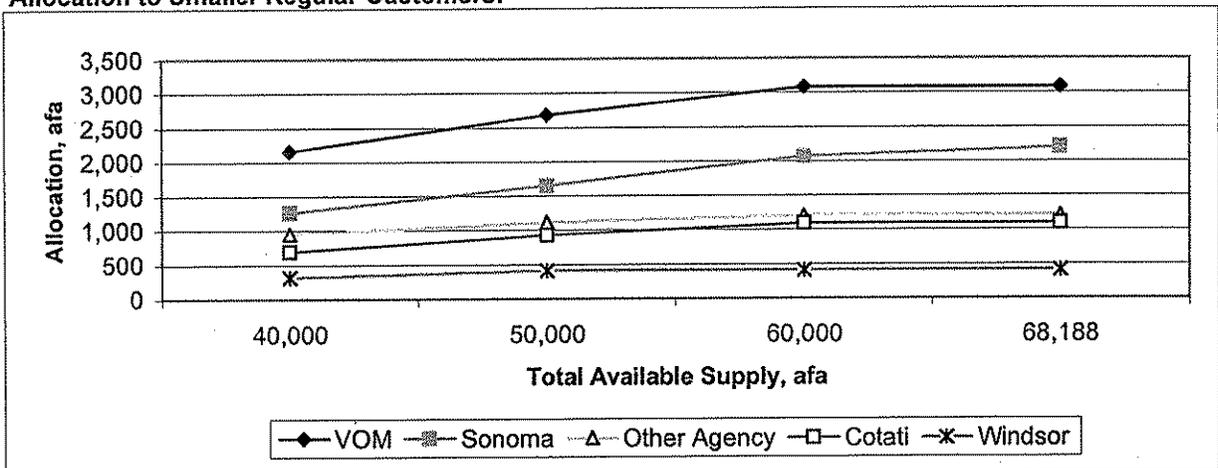
Allocation to Major Customer Groups:



Allocation to Large Regular Contractors:

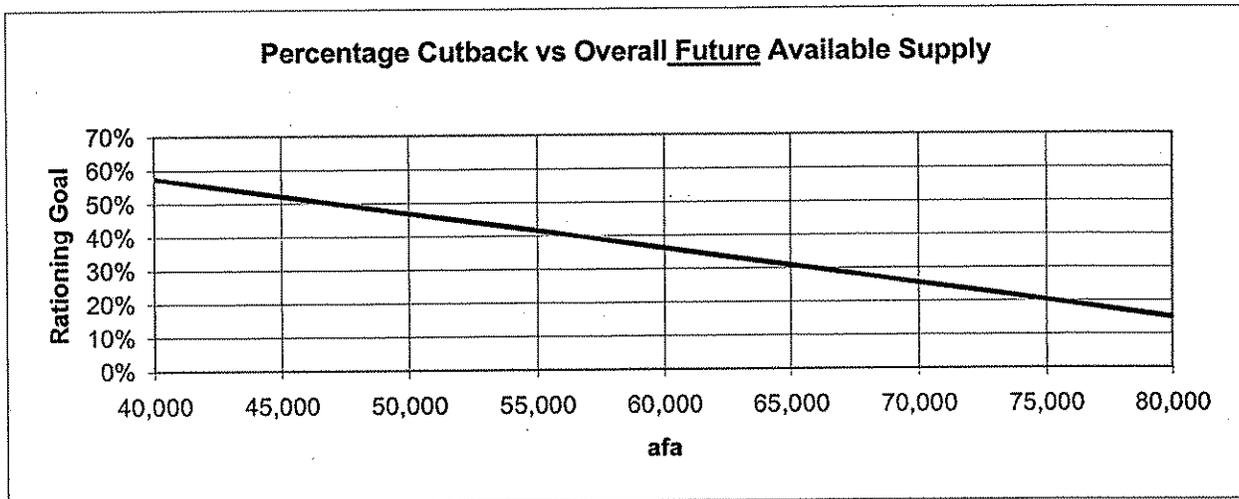


Allocation to Smaller Regular Customers:

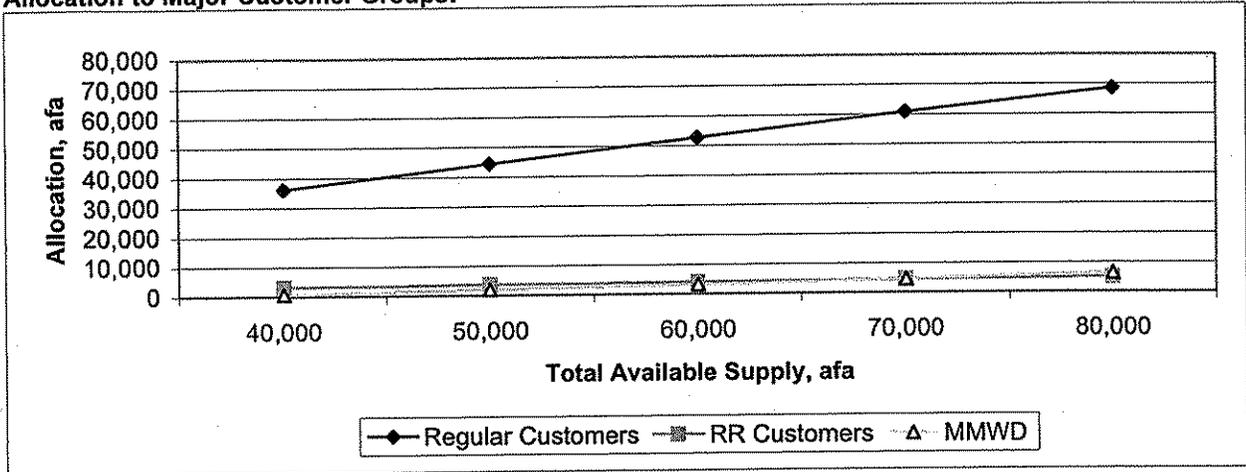


Results for Future Allocation Model vs. Assumed Available Supply

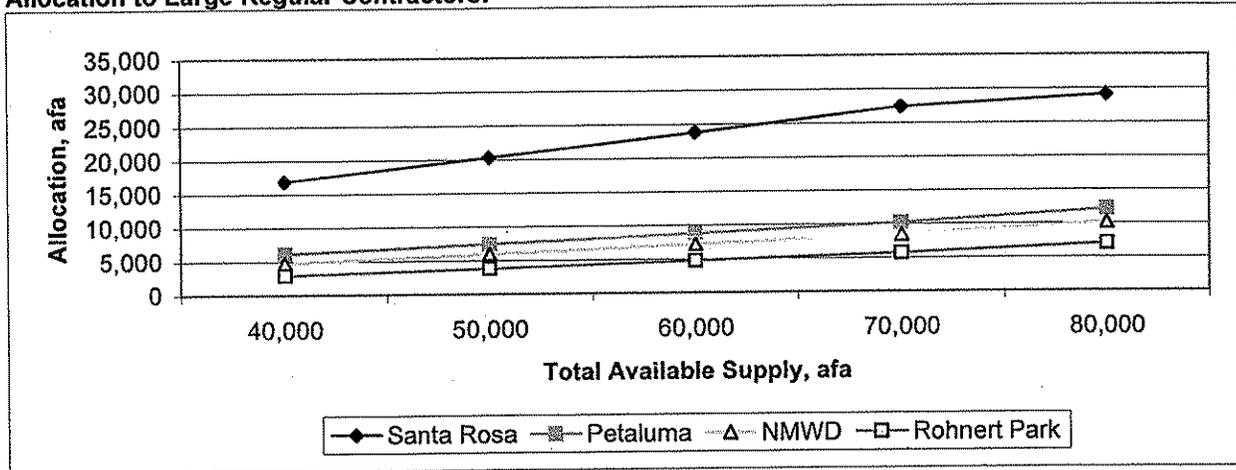
	40,000	50,000	60,000	70,000	80,000
Available RR SCWA Supply, afa >	40,000	50,000	60,000	70,000	80,000
Equivalent Cutback in Deliveries >	57.5%	46.9%	36.2%	25.6%	15.0%
Regular Customers					
Cotati	694	925	1,157	1,401	1,520
Petaluma	6,155	7,484	8,813	10,214	12,118
Rohnert Park	2,924	3,838	4,753	5,716	7,027
Sonoma	1,261	1,645	2,029	2,433	2,984
Windsor	317	408	500	596	727
NMWD	4,775	5,988	7,201	8,480	10,218
Santa Rosa	16,856	20,306	23,756	27,393	29,100
VOM	2,157	2,675	3,193	3,200	3,200
Other Agency	949	1,113	1,278	1,451	1,687
Sub-Total	36,088	44,384	52,680	60,884	68,581
MMWD	737	1,998	3,259	4,587	6,394
Russian River Cust's	3,175	3,618	4,061	4,528	5,025
Total	40,000	50,000	60,000	70,000	80,000



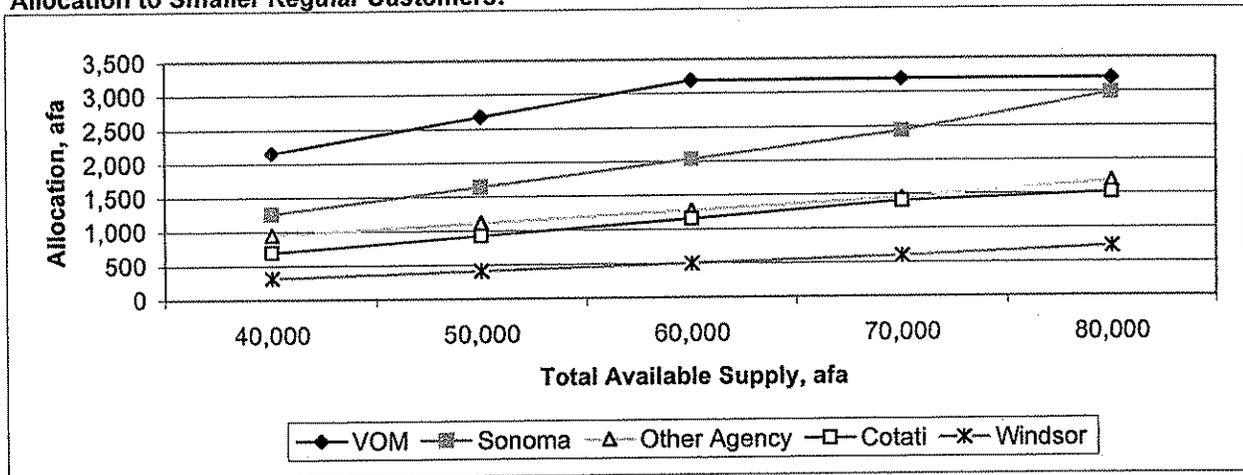
Allocation to Major Customer Groups:



Allocation to Large Regular Contractors:



Allocation to Smaller Regular Customers:



Entitlements of SCWA Customers

SCWA Customer:	Source	Entitlement mgd (any month)	Annual Limit afa
Regular Customers			
Cotati	a	3.8	1,520
Petaluma	a	21.8	13,400
Rohnert Park	a	15	7,500
Sonoma	a	6.3	3,000
Windsor (Airport Service Area)	b	1.5	900
North Marin WD	a	19.9	14,100
Santa Rosa	a	56.6	29,100
Valley of the Moon WD	a	8.5	3,200
Other Agency Cust (Includes FWD)	c	2.7	2,048
Sub-Total		136.1	74,768
Marin Muni. WD	d	0	14,300
Russian River Customers	e	0	5,025
Total		136.1	94,093

Notes:

- a Eleventh Amended WS Agree. (Proposed Restructured WS Agree is same)
- b Proposed Restructured WS Agree. Applies only to Airport Service Area served from SCWA Aqueduct. Windsor's direct diversions from the RR are covered by an Agreement with the SCWA and potentially via its pending application to the State for Water Rights
- c "mgd any month" limit is per Eleventh Amended WS Agree. (Proposed Restructured WS Agree is same). Annual limit is estimated based on avg. annual Other Agency Customer demand (as defined in Restructured Agree) for FY's 2003 and 2004 (1,356 af) projected through 2020 assuming a 2% per year increase for anticipated growth plus a 10% contingency.
- d Second Amended WS Agree and Agree for Sale of Water as Amended by The Supplemental WS Agree dated Jan 25, 1996. Note: Annual deliveries are subject to certain prior year minimum purchase provisions. Deliveries are subordinate to Regular Customer Entitlements.
- e Various Agreements between SCWA and each of its RR Customers (refer "RR Cust" sheet)

Russian River Customers of SCWA

Entitlements of RR Customers

Source: Chris Murray, SCWA, 3/3/05

Contractor	Date	Max Diversion Limit, afa	Comments
Currently Approved Points of Diversion *:			
Town of Windsor **	1/8/1991	4,725	Windsor has application pending for its own water rights
Russian River Co. WD	3/14/1991	300	
Sub-total		5,025	
No Points of Diversion Approved*			
City of Healdsburg	11/17/1992	4,440	Healdsburg holds own water rights for other points of diversion
Camp Meeker Parks & Rec. Dist.	7/9/1996	90	
Occidental CSD	4/23/2002	65	
Redwood Valley Co. WD	Pending	?	Agreement pending
Sub-total		4,595	
Potential Total		9,620	

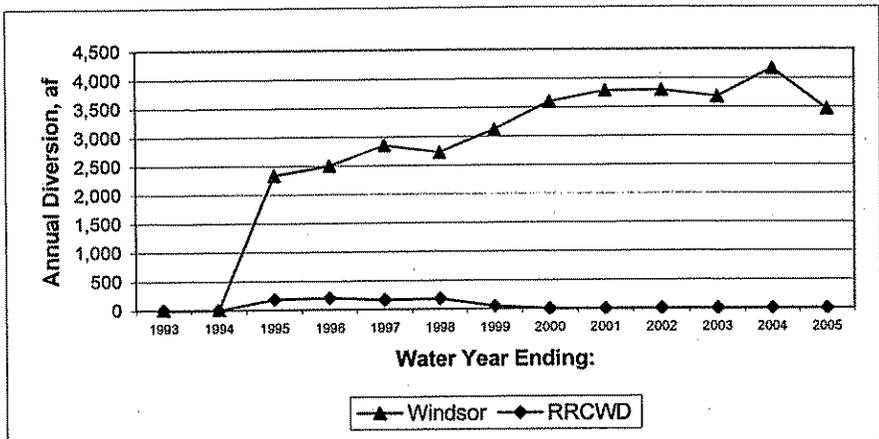
* As pertains to SCWA's water rights.

** Direct diversions via wells situated near the Russian River.

Historic Diversions from the RR, af

Source: Chris Murray, SCWA, 2/15/06 (SCWANTS.xls)

W Yr	RRCWD	Windsor	Total
1993	0	0	0
1994	0	0	0
1995	182	2,337	2,519
1996	203	2,496	2,699
1997	166	2,848	3,013
1998	183	2,728	2,911
1999	47	3,124	3,171
2000	0	3,596	3,596
2001	0	3,786	3,786
2002	0	3,789	3,789
2003	0	3,684	3,684
2004	0	4,173	4,173
2005	0	3,465	3,465



Avg of W Yr's 2004 & 05 **3,819**
 Avg of last 3 W Yrs 3,882

Note: Water Yr extends from Oct 1 through Sept 30 of subsequent yr.

Water Needed for Human Consumption, Sanitation and Fire Protection (a)

	TM Data (b)	6/15/05 Model	2005 UWMP (c)	4/4/06 Model
SCWA Customer:				
Regular Customers				
Cotati	0.62	0.62		0.64 f
Petaluma	5.83	5.83	6.15	6.15
Rohnert Park	4.23	4.23	3.74	3.74
Sonoma	1.45	1.45	0.92	0.92
Windsor (Airport Service Area)		0.13 d		0.24 g
North Marin WD	5.80	5.80	6.04	6.04
Santa Rosa	13.74	13.74	13.48	13.48
Valley of the Moon WD	2.01	2.01	2.14	2.14
Other Agency Cust (Includes FWD)		0.45 d		0.48 g
Sub-Total				
Marin Muni. WD			17.1 e	18.4 h
Russian River Customers			unknown	unknown
Total				

Notes:

- a Water needed for HC, S & FP is assumed to be equal to "inside" use for all retail customers. Inside use in turn is estimated by examining retail sales in the Winter months (generally Jan. and Feb).
- b Estimate by West/Yost contained in Allocation Table prepared for City of Santa Rosa (Sept 23 Tech Memo).
- c Total demand including UFW as determined by Maddaus for base year (Cal. 2004) of the 2005 UWMP. Indoor use is based on average of 2 lowest consecutive months in the winter if meters read bimonthly, or single lowest month if meters read monthly. Winter level use for Cotati supplied by Toni Bertolero (see Note f).
- d Avg Jan and Feb Aqueduct Sales* as

	Windsor	Other Ag Cust
Avg af/mo (2000->03, SCWA, Kiergan Pegg)	11.5	40.6
Avg mgd	0.13	0.45
- * In the case of Windsor (ASA only) and Other Agency Customers, winter level demand is unknown and is therefore estimated from Aqueduct sales, it being assumed that all Winter demand is met from the Aqueduct.
- e MMWD customer Avg per capita use in Jan and Feb for (2000 - 03), mgd, Dana Roxon.
- f Avg. Jan and Feb Aq plus Local use FY 2003 -> FY 2005, Tony Bertolero via Matthew Damos.
- g Avg. Jan and Feb Aq Sales w. Billing Days for FY 2003 -> FY 2005 from Kiergan Pegg.
- h From MMWD Water Watch Reports, avg demand for period noted, mgd

Week Ending:	For same	
	For period noted to left	week one yr earlier
2/26/2006	17.6	17.6
2/19/2006	18.4	18.3
2/12/2006	18.8	19.1
2/5/2006	18.2	18.6
1/29/2006	18.4	18.5
1/22/2006	18.5	18.7
1/15/2006	17.9	18.6
1/8/2006	18.5	18.8
1/1/2006	18.1	18.5
Avg Winter	18.3	18.5
Avg for both yrs	18.4	

Reasonable Annual Need, afa (a)
(Avg. Aq. Sales or RR Diversions for FY's Indicated)

	6/15/05 Model	4/4/06 Model
		Avg for FY 03-04 and FY 04-05
Regular Customers	FY 03-04	
Cotati	1,071	1,045
Petaluma	11,294	10,636
Rohnert Park	4,710	4,835
Sonoma	2,611	2,403
Windsor (Airport Service Area)	474	448
North Marin WD	9,498	9,242
Santa Rosa	24,421	23,584
Valley of the Moon WD	3,157	3,036
Other Agency Cust (Includes FWD) (b)	1,326	1,318
Sub-Total	58,561	56,547
Marin Muni. WD	7,792	7,823
Russian River Customers (c)	3,928	3,819
Total	70,281	68,188

Notes:

- a SCWA Aqueduct Sales Records, Kiergan Pegg, SCWA. Note that Surplus sales are not included.
- b SCWA Aq. Sales Records. Excludes Windsor and includes FWD as proposed in Restructured WS Agree.
- c Average of Water Yr Diversions for 2003 and 2004 was used for 6/15/05 Model and avg. of 2004 and 2005 was used for 4/4/06 Model. (see RR Cust sheet).

Local Potable Water Supply Available to SCWA Customers, afa

	Local Supply (a)	Contingency Factor (b)	Est'd Safe Yield (c)
Regular Customers			
Cotati	240	10%	216
Petaluma	831	10%	748
Rohnert Park	2308	10%	2,077
Sonoma	80	10%	72
Windsor (Airport Service Area)	0	10%	0
North Marin WD	2000	10%	1,800
Santa Rosa	1700	10%	1,530
Valley of the Moon WD	595	10%	536
Other Agency Cust (Includes FWD) (d)	0		0
Sub-Total	7754		6,979
Marin Muni. WD Local Sys. Safe Yield (e)			20,500
Russian River Customers (d)	0		0
Total			27,479

Notes:

- a Based on 4-yr avg: 2000-2003 as reported in Sept 33, 2004 Tech. Memo to Santa Rosa
- b To account for well equipment problems/maintenance down-time, etc. Estimated by JONWRM
- c It is recognized that the quality of Local Supply varies. Presented here is the yield (safe yield) that is expected to be available in the first year of a water supply deficiency based on Local Water Supply capacities..
- d Unknown and therefore assumed to be "0" for the purposes of this model. Needs to be determined by SCWA.
- e Safe Yield of Local Supply System provided by MMWD. Source: Dana Roxon, 5/31/05.

Most Recent Service Area Population

SCWA Customer:	TM Data for Yr 2003	6/15/05 Model	2005 UWMP	4/4/06 Model
Regular Customers				
Cotati	6,825	6,825		7,337 e
Petaluma	57,050	57,050	58,057	58,057
Rohnert Park	42,300	42,300	42,329	42,329
Sonoma	10,252	10,252	10,502	10,502
Windsor (Airport Service Area)		1,338 d		2,495 f
North Marin WD	56,000	56,000	55,587	55,587
Santa Rosa	153,400	153,400	155,121	155,121
Valley of the Moon WD	23,000	23,000	22,646	22,646
Other Agency Cust (Includes FWD)	8,000 a	8,000		8,080 g
Sub-Total		358,165		362,154
Marin Muni. WD	184,999 b	184,999		189,945 h
Russian River Customers	27360 c	27,360		27,634 g
Total		570,524		579,733

Notes:

- a Estimate by West/Yost contained in Allocation Table prepared for City of Santa Rosa (Sept 23 Tech Memo).
- b Estimate provided by MMWD to West/Yost and contained in Allocation Table prepared for City of Santa Rosa (Sept 23 Tech Memo).
- c Estimate by West/Yost contained in Allocation Table prepared for City of Santa Rosa (Sept 23 Tech Memo). Includes 24,350 (2003 Department of Finance estimate for the Town of Windsor) and an estimate of 3,000 for the RRCWD service area.
- d Windsor Airport Service Area is primarily Commercial and Institutional use. An equivalent population is estimated by dividing avg Winter use by 95 gpcd, the wt'd avg. per capita use determined by West/Yost.
- e Cotati pop. per Dept of Finance data as of 1/1/2005, Cristina Goulart, Winzler & Kelly
- f Windsor Airport Service Area is primarily Commercial and Institutional use. An equivalent population is estimated by dividing avg Winter use by 94 gpcd, the wt'd avg. per capita use determined in the 2005 UWMP.
- g Population estimated for 6/15/05 Model increased by an assumed growth rate of 1%.
- h MMWD 2004 Pop., provided by Dana Roxon, MMWD, Mar. 2006.

Other Data:

From 2005 UWMP, population for 2004:

FWD population	2,201
Windsor RR Service Area	24,899

Winter Level Per Capita Demand, gpcd

	TM Data (a)	6/15/05 Model	2005 UWMP (b)	4/4/06 Model
Regular Customers				
Cotati	89	89		88 c
Petaluma	101	101	106	106
Rohnert Park	96	96	88	88
Sonoma	136	136	88	88
Windsor (Airport Service Area)		95		94
North Marin Water Dist.	99	99	109	109
Santa Rosa	87	87	87	87
Valley of the Moon Water Dist.	87	87	94	94
Other Agency Cust (Includes FWD)		unknown		94
Sub-Total				
Marin Muni. Water Dist.		92		97 c
Russian River Customers				
Wt'd Avg	95			94 d

Notes:

- a Source: TM Data sheet by West Yost and Assoc. Winter level use is based on avg. use in Jan, and Feb. of 2000 through and including 2003.
- b Source: Bill Maddaus Tech. Memos - Includes Unaccounted For Water (UFW). Inside use is calculated from calendar 2004 retail sales records and is based on average of 2 lowest consecutive months in the winter if meters are read bimonthly, or single lowest month if meters read monthly.
- c Calc'd from Winter level demand (See Human sheet) and est'd pop. (See Pop Sheet)
- d Data for 11th Amend. Agree. Primes:

	gpcd	pop
Cotati	88	7,337
Petaluma	106	58,057
Rohnert Park	88	42,329
Sonoma	88	10,502
NMWD	109	55,587
Santa Rosa	87	155,121
VOM	94	22,646
FWD	99	2,201
Wt'd Avg. (using pop. as weighting factor)	94	

Other Data:

From 2005 UWMP, Winter Level Use, gpcd:
 FWD 99

Demand Hardening Factor - Used for Adjusting Reasonable Need in Current Allocation

	Total Demand mgd 1	Total gpcd 2	Use in 3/27/06 Model 3	Lesser of Col. 3 or Average 4	Demand Hardening Adj Factor (Avg / Col. 4) 5
Regular Customers					
Cotati	1.07 b	146 d	146	146	1.14
Petaluma	10.19 c	176 d	176	167	1.00
Rohnert Park	5.95 c	141 d	141	141	1.19
Sonoma	2.25 c	214 d	214	167	1.00
Windsor (Airport Service Area)		172 e	172	167	1.00
North Marin Water Dist.	10.58 c	190 d	190	167	1.00
Santa Rosa	22.57 c	146 d	146	146	1.15
Valley of the Moon Water Dist.	3.40 c	150 d	150	150	1.11
Other Agency Cust (Includes FWD)			167 f	167	1.00
Sub-Total					
Marin Muni. Water Dist.			140 g	140	1.19
Russian River Customers			167 f	167	1.00
Average for Water Contractors (h)		167			

Notes:

- a Sec 3.5(c)(2) provides that in determining "reasonable requirements" the SCWA may take into account hardening of demand resulting from the level of conservation achieved by a given customer of the SCWA.
- b From Toni Bertolero. Avg of RR Purchases and Ground Water Production for FY 2003->05, mgc
- c Total demand including UFW as determined by Maddaus for base year (2004) 2005 UWMP.
- d Col 1 divided by population. See Pop sheet.
- e There are no residents in Windsor ASA therefore per capita demand set equal to Windsor RR Service Area average value as determined for base year (2004) of 2005 UWMP.
- f No data available so assumed equal to average value for Water Contractors.
- g From MMWD 2005 Fact Sheet - avg demand for 10 yrs ending 2005, rr 26.6 divided by population (See Pop sheet).

Other Data from 2005 UWMP for Base Yr 2004:

	mgd	gpcd
Forestville Water Dist.	0.48	219
Windsor RR Service Area	4.29	172

**SUPPORT TABLES
For Tech Memo**

Table A-1. Average Monthly Retail Sales (acre-feet) for SCWA Water Contractors in January & February^(a)

Contractor	2000	2001	2002	2003	4-Year Average ^(b)
Santa Rosa	1,263	1,316	1,265	1,154	1,249
Petaluma	553	538	515	514	530
North Marin	563	554	525	468	528
City of Rohnert Park	406	406	356	373	385
Cotati	45	73	58	50	57
Forestville ^(c)	22	23	24	21	22
City of Sonoma	136	135	133	122	131
Valley of the Moon	182	189	187	174	183

Table A-2. Historical Population^(d)

Contractor	2000	2001	2002	2003
Santa Rosa	147,595	149,300	151,700	153,400
Petaluma	53,710	54,510	55,850	57,050
North Marin	55,000	56,000	56,000	56,000
Rohnert Park	42,236	42,200	42,150	42,300
Cotati	6,471	6,600	6,861	6,825
Forestville ^(e)	1,973	Not Available	Not Available	Not Available
Sonoma	10,091	10,131	10,172	10,252
Valley of the Moon	20,512	21,996	22,923	23,000

Table A-3. Per Capita Demand (gpcd) for SCWA Water Prime Contractor in Winter (January & February)^(a,f)

Contractor	2000	2001	2002	2003	4-Year Average ^(b)
Santa Rosa	90	93	88	79	87
Petaluma	108	104	97	95	101
North Marin	108	104	99	88	99
Rohnert Park	101	101	89	93	96
Cotati ^(g)	72	116	89	78	89
Forestville	115	123	126	113	119
Sonoma	142	140	138	125	136
Valley of the Moon	93	90	86	80	87
Simple Average ^(h)	104	109	101	94	102
Weighted Average ⁽ⁱ⁾	99	100	93	87	95

^(a) Data obtained from water sales data from the Prime Contractor

^(b) Simple average of the last 4 years. Using Santa Rosa in Table A-1: $(1,263+...+1,154)/4 = 1,249$ acre-feet

^(c) Data for Forestville obtained from the SCWA

^(d) Data obtained from the Prime Contractor, California Department of Finance Website, or the 2000 UWMP for Sonoma County unless specified otherwise

^(e) Population for Forestville obtained from the 2000 SCWA UWMP

^(f) Based on populations from Table A-2, if population for particular year was not available, then population for year 2000 was used

^(g) For 2001 & 2002, based on Dec/Jan instead of Jan/Feb because Cotati did not provide Feb; 2003 is based on Jan/Feb

^(h) Simple average of the eight individual gpcds. Using 2000 of Table A-3: $(90+...+93)/8 = 102$ gpcd

⁽ⁱ⁾ Weighted average for population. Using 2000 of Table A-3: $(90*147,595+...+93*20,512)/(147,595+...+20,512) = 98$ gpcd

- 8 Sec 3.5(c)(2) provides that in determining "reasonable requirements" the SCWA may take into account hardening of demand resulting from the level of conservation achieved by a given customer of the SCWA. This column contains a Demand Hardening adjustment factor derived from annual per capita demand taking into account all uses and including UFW. Information compiled for the base year (2004) for the 2005 UWMP was used. See DH Factor sheet for details.
- 9 Col 8 x Col 7.
- 10 Col 10 "normalizes" Col 9 such that sum of all adjusted reasonable requirements is equal to original sum of Reasonable Requirements. Col 9 x (sum of Col 7 / sum of Col 9). This column is then used to define the "Reasonable Requirement" that is referred to in Sec. 3.5(a)(3)(iii) of the Restructured Agreement.
- 11 Lesser value comparing Reasonable Requirement to Annual Entitlement Limit as stipulated in Section 3.5 (2) (3) (ii). This is the value used for testing to see that the total of the "First" and "Second" allocation of water to a given customer is reasonable.
- 12 Local supplies are based on an estimate by JONWRM of "safe yield" of same. For Water Contractors, the data reported to WestYost is the basis for the estimate. See Local sheet for details. The "safe yield" used for MMWD was provided by MMWD. It is noted that data is missing for Other Agency Customers and Russian River Customers. It is important that SCWA develop an on-going data collection system to at all times know potential local supply yield in order to achieve accuracy necessary for the allocation calculation
- 13 Detailed population estimates from Census tract data compiled by Maddaus for the base year (cal. 2004) used in the 2005 UWMP. See Pop sheet for details and explanation of exceptions.
- 14 Winter level per capita demand determined by Maddaus for the base year (cal. 2004) used in the 2005 UWMP. See GPCD sheet for detailed explanation.
- 15 Weighted avg. of per capita winter level demand for existing Prime contractors. See GPCD sheet.
- 16 Sale yield of Local Supply expressed as a per capita value using population data shown i.e. Col 12 * 7.48 * 43,560 / (.365 * Col 13).
- 17 HC, S & FP demand not met by Local Supplies and calculated as follows: If WTD average per capita demand (Col 15) is greater than the portion of per capita demand met by Local Supply (Col 16), the difference of the two is entered in this column, if not, "0" is entered.
- 18 "First" allocation calculated as follows: If Local Supply sale yield (Col 12) is greater than Winter level demand extrapolated for the full year (Col 6), then "0" is allotted, if not the portion of per capita demand not met by Local Supply (Col 17) is calculated for the year for the entire population, expressed in a/c and entered here. In the case of consecutive drought years, it is important that Col 12 values (safe yield of local supplies) be updated in order for this calculation to be accurate. This is especially true for contractors relying on surface water supplies such as NMWD and MMWD whose surface supplies drop sharply when faced with consecutive drought years.
- 19 Test to see that "First" allocation does not exceed respective Entitlement Limits as required by Section 3.5 (a)(3)(i).
- 20-22 These three columns combine the entitlements of the Regular Customers (which pursuant to Sec. 3.5(a)(3)(i) must be derived from the avg. daily rate during any month - mgd values contained in Sec. 3.1) and the contractual entitlements of MMWD and RR Customers which are expressed in ac-ft per year values contained in their contracts. These relative entitlements are first converted to %, then added together.
- 24 This column "normalizes" the combined entitlement shares such that the sum of all entitlement shares adds to 100%. The resulting % are then used to distribute the "Second" allocation of water called for by Sec. 3.5(a)(3)(ii).
- 25-40 This column contains the iterative trials necessary to arrive at the "Second" allocation of water. The process is iterative as the Test of whether the "Second" allocation is valid or not is set forth in Section 3.5 (b) (3) (iii) and requires that (in addition to not exceeding the Entitlement Limit) the sum of the "First" allocation (Col 18) and the "Second" allocation not exceed the "Reasonable Requirement" (Col 10)

Future Allocation Model
Allocation of Water During a Period of Deficiency Pursuant to Sec. 3.5 (a) of the Restructured Agreement for Water Supply
Based on FUTURE Level Demands and Water Available from the SCWA of 60,000 gpd
 This equates to an overall cutback in Russian River water supply of: 36.2%

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	20	38	39	40	41	
	Entitlement Limits		Minimum Needs		Reasonable Requirement		Local Supply		HC, S & FP Per Capita Demand		Per Capita Demand		First Allocation & Test		Second Allocation		Results					
	Entitlement (Maximum Daily Rate of Flow Available During any Monthly Supply)	Limit (Cap)	Water Needed for Human Consumption, Sanitation and Fire Protection	Reasonable Requirement	Lesser of Reasonable Requirement vs Annual Cap	Safe Yield of Local Supply	Pop. persons	Avg. Winter Level Per Capita Demand	Weighted Avg Demand of Water Contractors	Portion of Demand that can be served by Local Supply	Per Capita Demand that is not met by Local Supply	"First" req'd for HC, S & FP	TEST Less Than Annual Entitlement Limit?	Normalized Entitlements ("Second" Allocation Parameter) %	"Second" Allocation	"First" plus "Second" Allocations	TEST Less Than Reasonable Req't?	Amount Falling Short (-) of Reasonable Req't				
Regular Customers																						
Cotati*	3.8	1,520	0.64	720	1,520	216	7,337	88	94	26	68	558	Yes	2%	589	1,157	Yes	-363				
Petaluma*	21.8	13,400	6.15	6,893	13,400	748	58,057	106	94	11	83	5,379	Yes	13%	3,434	8,613	Yes	-4,587				
Rehobeth Park*	15	7,500	3.74	4,188	7,500	2,077	42,329	88	94	44	50	2,390	Yes	9%	2,363	4,753	Yes	-2,747				
Sonoma*	6.3	3,000	0.92	1,029	3,000	72	10,502	88	94	6	6	1,036	Yes	4%	992	2,029	Yes	-871				
Windor (Airport Service Area) (ASA)*	1.5	800	0.24	263	800	0	2,485	94	94	-	94	263	Yes	1%	236	500	Yes	-400				
North Marin Water Dist. (MMWD)*	19.9	14,100	6.04	6,767	14,100	1,800	55,587	109	94	29	65	4,066	Yes	12%	3,135	7,201	Yes	-6,898				
Santa Rosa*	56.6	29,100	13.48	15,084	29,100	1,530	155,121	87	94	9	85	14,840	Yes	35%	8,917	23,756	Yes	-5,344				
Valley of the Moon Water Dist.*	8.3	3,200	2.14	2,397	3,200	536	22,646	94	94	21	73	1,854	Yes	5%	1,339	3,193	Yes	-7				
Other Agency Cust (Includes FWD)**	2.7	2,048	0.48	594	2,048	-	8,080	94	94	-	94	853	Yes	2%	425	1,278	Yes	-770				
Sub-Total	136.1	74,768	33.82	37,884	74,768	6,979	362,154	94	94	-	0	31,239	Yes	2%	52,680	52,680	Yes	-22,087				
Main Muni. Water Dist.	0	14,300	18.39	20,605	14,300	20,500	189,945	97	94	96	0	0	Yes	13%	3,259	3,259	Yes	-11,041				
Russian River Customers***	0	5,025	unknown	2,916	5,025	-	27,634	unknown	94	-	94	2,916	Yes	4%	1,145	4,061	Yes	-864				
Total	136.1	94,093	61,404	94,093	94,093	27,479	579,733	94	94	-	94	34,155	Yes	100%	25,845	60,000	Yes	-34,093				
Reasonable Need Remaining Unmet																						
Water Available for Allocation		60,000																				

Definitions:
 * Defined in Restructured Water Supply Agreement as "Water Contractors" and often referred to as "Primes"
 ** FWD = Forestville Water Dist.
 *** SCWA Russian River Contractors whose direct diversions and points of diversion have been approved and come under the auspices of the SCWA's Water Rights (Town of Windsor and Russian River County Water Dist.)
 TM Data = information set forth in Tech Memo prepared by West, Yost & Associates (WestYost) dated Sept 23, 2004, "Methodology for Implementation of Water Shortage Provisions in Eleventh Amended Agreement for Water Supply"
 UJWWP = Urban Water Management Plan
 URW = unaccounted for water (ie water due to losses, leakage, theft and unmetered deliveries, meter inaccuracies, fire hydrant flows, pipeline flushing, etc.)
 af = ac-ft
 af = ac-ft per annum (year)
 mgd = millions of gallons per day
 gpcd = gallons per capita per day
 Column Explanations:
 All are same as shown on Current Model sheet except for below:
 7 Reasonable Requirement is set equal to the Annual Entitlement limit (cap) in order to estimate the allocation in the future when SCWA Customers reach (or exceed) their Annual Entitlement (or contract) Limits.

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