Appendix D

Placer Ranch Water Conservation Final Reports

PLACER Ranch

Water Conservation Final Reports

- Technical Memorandum, dated October 29, 2018
- Water Conservation Plan, dated May 19, 2017

TECHNICAL MEMORANDUM

DATE: October 29, 2018

TO: County of Placer

FROM: Curtis Lam, PE
HydroScience Engineers

SUBJECT: Addendum #1 to the Potable Water, Recycled Water, and Water Conservation Master Plans for the Placer Ranch Specific Plan

Introduction

This Technical Memorandum functions as an Addendum to the Potable Water, Recycled Water, and Water Conservation Master Plans (Master Plans), dated July 2017, prepared for the Placer Ranch Specific Plan. Its purpose is to evaluate the differences between the Original Project and the Revised Project (based on an updated Land Use Plan, dated October 17, 2018). Together, this Addendum and its associated Master Plan provide the appropriate technical data and analysis to guide buildout of Placer Ranch's backbone infrastructure as depicted on the Revised Project's Land Use Plan.

Background

The Master Plan evaluated the infrastructure requirements for the Original Project, however in October 2018, several refinements were made to the land use plan, which resulted in the Revised Project.

These refinements generally included the following revisions to the land use plan:

- In the area west of Fiddyment Road and north of Sunset Boulevard, several land use parcels were reconfigured to shift residential and school uses outside a 2,000' buffer from the Western Regional Sanitary Landfill's properties. This resulted in the enlargement of Park parcel PR-102, a southerly shift of school parcel PR-92, the conversion of GC and HDR (parcels PR-61 and PR-42) to a Campus Park use.
- Along Maple Park Drive, MDR and HDR uses (parcels PR-32 and PR-42) were converted to LDR and MDR.
- Along Campus Park Boulevard, the PF site for a water tank (parcel PR-100) was enlarged.
- Paseo's have been adjusted in response to land plan refinements in order to maintain the east/west connectivity.
- The alignments of C Street and Maple Park Drive were shifted slightly in response to the land use adjustments described above, while maintaining the prior street pattern and connections.
- Along Fiddyment Road, Campus Park parcel PR-70 was converted to MDR.
- Within the Town Center district south of Sunset Boulevard, HDR parcels PR-50 & 51 were converted to MDR, and MDR parcels PR-35-38 were converted to LDR.
- The allocation of "floating" reserve units in the Town Center district was increased from 150 units to 300 units. These units continue to be factored as HDR units.
- South of Sunset Boulevard, the alignment of Foothills Boulevard has been shifted in an eastward direction to align with the existing Duluth Avenue corridor south of the Plan Area. As a result of this shift, LDR parcel PR-24, CP parcel PR-88, and MDR parcel PR-38 have been slightly enlarged.
- In the area south of Sunset Boulevard and east of Foothills Boulevard, MDR parcel PR-38 was enlarged to provide vehicular access to Sunset Boulevard, per the Foothill Boulevard realignment noted above. This adjustment also resulted in a portion of OS parcel PR-134 being converted to MDR.
- In the area north of Sunset Boulevard and east of Foothills Boulevard, Campus Park parcels PR-86-89 were converted to a low-density, active-adult, residential use (LDR-A), and Campus Park parcels PR-84 and 85 were reduced in size.

- A private park site was added within the active adult community north of Sunset Boulevard and east of Foothills Boulevard.
- A 100'-wide paseo has been added along the east edge of the plan area as a buffer between the active adult residential parcels and offsite industrial uses located in the Sunset Area Plan.
- East of Foothills Boulevard, Campus Park Boulevard was slightly realigned in response to the land use adjustments described above, while maintaining the east/west connectivity to the Sunset Area Plan.
- Park sites were added and/or enlarged (as described above) to increase the plan-wide park acreage in a manner that meet the General Plan's active parkland requirement of 5 ac./1,000 population.

The table below summarizes the differences between the Original Project and the Revised Project.

Table 1: Comparison of Original and Revised Land Uses and Development Assumptions

		Acreage			Dwelling Units/ Square Footage		
Land Use Designation		**Revised Project**	**Original Project**	**Difference**	**Revised Project**	**Original Project**	**Difference**
Residential Uses							
LDR	Low Density Residential	446.0 ac	407.9 ac	38.2 ac	2,210 du	2,039 du	171 du
LDR-A	Low Density Res. - Age-Restricted	183.1 ac	131.0 ac	52.1 ac	1,050 du	720 du	330 du
MDR	Medium Density Residential	112.3 ac	132.3 ac	-20.0 ac	872 du	1,057 du	-185 du
HDR	High Density Residential*	60.0 ac	93.0 ac	-33.0 ac	1,504 du	2,011 du	-507 du
Subtotal		801.4 ac	764.2 ac	37.3 ac	5,636 du	5,827 du	-191 du
Commercial and Employment Uses							
GC	General Commercial	22.7 ac	25.6 ac	-2.9 ac	296,513 sf	334,933 sf	-38,420 sf
CMU	Commercial Mixed Use	48.8 ac	48.8 ac	0.0 ac	637,718 sf	637,718 sf	0 sf
CP	Campus Park	335.0 ac	395.5 ac	-60.6 ac	4,506,282 sf	5,384,152 sf	-877,870 sf
UZ	University	301.3 ac	301.3 ac	0.0 ac	3,000,000 sf	3,000,000 sf	0 sf
Subtotal		*707.7 ac*	*771.2 ac*	-63.5 ac	*8,440,513 sf*	*9,356,803 sf*	-916,290 sf
Open Space and Public Uses							
PF	Public Facilities (Schools)	32.7 ac	32.0 ac	0.7 ac			
PF	Public Facilities (County Facilities)	10.3 ac	5.5 ac	4.8 ac			
PR	Parks and Recreation	69.8 ac	50.7 ac	19.1 ac			
OS	Open Space (Preserves/Paseos)	264.8 ac	272.8 ac	-8.0 ac			
Subtotal		*377.5 ac*	*360.9 ac*	*16.6 ac*			
Other							
ROW	Placer Parkway	158.5 ac	158.5 ac	0.0 ac			
ROW	Major Roadways & Landscape	168.1 ac	158.5 ac	9.6 ac			
Subtotal		*326.6 ac*	*317.0 ac*	*9.6 ac*			
Total		**2,213.3 ac**	**2,213.3 ac**	**0.0 ac**	**5,636 du** **8,440,513 sf**	**5,827 du** **9,356,803 sf**	**-191 du** **-916,290 sf**

* includes 300 reserve units within the Town Center district

Analysis

An evaluation of the differences between the Original Project and the Revised Project, as described in the Background section above, was conducted to determine if changes in overall project demands occurred. If warranted, additional adjustments to the Master Plan will be made when the project's first Small Lot Tentative Subdivision Map is processed by Placer County. The Original Project potable water and recycled water demands are shown in Table 2, both with and without water conservation. The potable water and recycled water demands for the Revised Project is presented in Table 3, both with and without water conservation. The difference between the values in Tables 2 and 3 is presented in Table 4.

Table 2: Potable and Recycled Water Demands – Original Project

Land Use Designation	Abbrev.	Total Area (acres)	Dwelling Units	Water Use Factor (gpd/DU-acre)	Total Demand (AFY)	Potable Demand (AFY)[1]	Potable w/ cons. (AFY)[2]	RW Demand (AFY)[3,4]	RW w/ cons. (AFY)[3,4]
Residential									
Low Density Residential	LDR	407.9	2,039	429	980	980	755	0	0
Low Density Residential - Age-Restricted	LDR-A	131.0	720	429	346	346	267	0	0
Medium Density Residential	MDR	132.3	1,057	312	369	369	285	0	0
High Density Residential	HDR	93.0	2,011	143	322	262	245	60	33
Non-Residential									
General Commercial	GC	25.6	0	1,116	32	20	20	12	6
Commercial Mixed Use	CMU	48.8	0	1,116	61	37	37	24	11
Campus Park	CP	395.5	0	1,482	657	464	464	192	87
University (CSU Campus)	UZ	301.3	0	Varies	1,398	1,154	1,154	244	110
Public Facilities (Schools)	PF	32.0	0	1,785	64	48	48	16	7
Public Facilities (County Facilities)	PF	5.5	0	1,785	11	8	8	3	1
Parks and Recreation	PR	72.6	0	1,071	87	9	9	188	85
Open Space Preserves	OS	250.9	0	0	0	0	0	0	0
Placer Parkway	ROW	158.5	0	0	0	0	0	0	0
Major Roadways & Landscape Corridors	ROW	158.5	0	1,116	29	0	0	77	35
Totals		**2,213.3**	**5,827**		**4,355**	**3,698**	**3,292**	**816**	**373**

Notes:
1. Demand removes recycled water.
2. Demands include total water demand minus water conservation measures for all water sources, as outlined in the Placer Ranch WCP (HydroScience, 2016).
3. A detailed summary of Recycled Water demand and Recycled Water conservation efforts are elaborated upon in the Placer Ranch Recycled Water Master Plan and Placer Ranch Water Conservation Plan. (HydroScience, 2016).
4. Recycled water demands are calculated as outlined in the DRAFT Placer Ranch Recycled Water Master Plan and differ from the methods employed in the calculation of potable water demands.
5. HDR land uses include 150 units that are a density bonus but not physically assigned to a specific parcel. These units were distributed amongst the Village Center parcels for modeling purposes.
6. Parks and Recreation includes the total acreage for this land use, not the credited acreage

Table 3: Potable and Recycled Water Demands – Revised Project

Land Use Designation	Abbrev.	Total Area (acres)	Dwelling Units	Water Use Factor (gpd/DU-acre)	Total Demand (AFY)	Potable Demand (AFY)[1]	Potable w/ cons. (AFY)[2]	RW Demand (AFY)[3,4]	RW w/ cons. (AFY)[3,4]
Residential									
Low Density Residential	LDR	442.1	2,210	429	1,062	1,062	940	0	0
Low Density Residential - Age-Restricted	LDR-A	187.0	1,050	429	505	505	267	0	0
Medium Density Residential	MDR	112.2	872	312	305	305	235	0	0
High Density Residential	HDR	60.2	1,504	143	241	202	189	39	21
Non-Residential									
General Commercial	GC	22.7	0	1,116	28	17	17	11	5
Commercial Mixed Use	CMU	48.8	0	1,116	61	37	37	24	11
Campus Park	CP	331.0	0	1,482	556	393	393	163	73
University (CSU Campus)	UZ	301.3	0	Varies	1,398	1,154	1,154	244	110
Public Facilities (Schools)	PF	32.7	0	1,785	65	49	49	16	7
Public Facilities (County Facilities)	PF	10.3	0	1,785	21	16	16	5	2
Paseo/Greenbelt	PASEO/GB	25.9	0	1,785	31	3	3	67	30
Parks and Recreation	PR	69.8	0	1,071	84	8	8	181	81
Open Space Preserves	OS	250.7	0	0	0	0	0	0	0
Placer Parkway	ROW	158.5	0	0	0	0	0	0	0
Major Roadways & Landscape Corridors	ROW	160.1	0	1,071	30	0	0	82	37
Totals		**2213.3**	**5636**		**4,386**	**3,752**	**3,309**	**831**	**378**

Notes:
1. Demand removes recycled water.
2. Demands include total water demand minus water conservation measures for all water sources, as outlined in the Placer Ranch WCP (HydroScience, 2016).
3. A detailed summary of Recycled Water demand and Recycled Water conservation efforts are elaborated upon in the Placer Ranch Recycled Water Master Plan and Placer Ranch Water Conservation Plan. (HydroScience, 2016).
4. Recycled water demands are calculated as outlined in the DRAFT Placer Ranch Recycled Water Master Plan and differ from the methods employed in the calculation of potable water demands.
5. HDR land uses include 150 units that are a density bonus but not physically assigned to a specific parcel. These units were distributed amongst the Village Center parcels for modeling purposes.
6. Parks and Recreation includes the total acreage for this land use, not the credited acreage

Table 4: Potable and Recycled Water Demands – Comparison of Revised and Original Project

Land Use Designation	Abbrev.	Total Area (acres)	Dwelling Units	Water Use Factor (gpd/DU-acre)	Total Demand (AFY)	Potable Demand (AFY)[1]	Potable w/ cons. (AFY)[2]	RW Demand (AFY)[3,4]	RW w/ cons. (AFY)[3,4]
Low Density Residential	LDR	34.2	171	0	82	82	185	0	0
Low Density Residential - Age-Restricted	LDR-A	56	330	0	159	159	0	0	0
Medium Density Residential	MDR	-20.1	-185	0	-64	-64	-50	0	0
High Density Residential	HDR	-32.8	-507	0	-81	-60	-56	-21	-12
Non-Residential					0	0	0	0	0
General Commercial	GC	-2.9	0	0	-4	-3	-3	-1	-1
Commercial Mixed Use	CMU	0	0	0	0	0	0	0	0
Campus Park	CP	-64.5	0	0	-101	-71	-71	-29	-14
University (CSU Campus)	UZ	0	0	Varies	0	0	0	0	0
Public Facilities (Schools)	PF	0.7	0	0	1	1	1	0	0
Public Facilities (County Facilities)	PF	4.8	0	0	10	8	8	2	1
Paseo/Greenbelt	PASEO/GB	25.9	0	1785	31	3	3	67	30
Parks and Recreation	PR	-2.8	0	0	-3	-1	-1	-7	-4
Open Space Preserves	OS	-0.2	0	0	0	0	0	0	0
Placer Parkway	ROW	0	0	0	0	0	0	0	0
Major Roadways & Landscape Corridors	ROW	1.6	0	-45	1	0	0	5	2
Totals			**-191**		**31**	**54**	**17**	**15**	**5**

Notes:

1. Demand removes recycled water.
2. Demands include total water demand minus water conservation measures for all water sources, as outlined in the Placer Ranch WCP (HydroScience, 2016).
3. A detailed summary of Recycled Water demand and Recycled Water conservation efforts are elaborated upon in the Placer Ranch Recycled Water Master Plan and Placer Ranch Water Conservation Plan. (HydroScience, 2016).
4. Recycled water demands are calculated as outlined in the DRAFT Placer Ranch Recycled Water Master Plan and differ from the methods employed in the calculation of potable water demands.
5. HDR land uses include 150 units that are a density bonus but not physically assigned to a specific parcel. These units were distributed amongst the Village Center parcels for modeling purposes.
6. Parks and Recreation includes the total acreage for this land use, not the credited acreage

Conclusions

Based on the analysis above, it was determined that, after water conservation, potable demands increased by approximately 0.52% when comparing the Revised Project to the Original Project. Recycled water demands increased by 1.3% after water conservation when comparing the Revised Project to the Original Project. The impact of the change in land use within Placer Ranch is negligible. There are no expected impacts for the ability to supply either potable water or recycled water to the project. The total demand is also less than the demand allocated in the updated SB610 Water Supply Assessment issued by the Placer County Water Agency on August 2, 2017.

In summary, the analysis demonstrates that the changes in potable water and recycled water demand between the Original Project and the Revised Project are not significant.

PR PLACER RANCH
SPECIFIC PLAN

Water Conservation Plan

May 19, 2017

FINAL

Prepared for

Placer County
Community Development Resource Agency
3091 County Center Drive
Auburn, California 95603

Prepared by

MacKay & Somps
ENGINEERS PLANNERS SURVEYORS
1552 Eureka Road
Roseville, California 95661

Technical Memorandum

HydroScience
Strategic Water Solutions

Sacramento • Berkeley • San Jose • Concord

To: Mark Sauer, P.E. - Mackay and Somps Civil Engineers

From: Jonathan Machorro, P.E.

Reviewed by: Kyle Horn, P.E.

Subject: Placer Ranch Water Conservation Plan

Date: May 11, 2017

Introduction

HydroScience Engineers was retained by Mackay and Somps Civil Engineers (M&S), to prepare a Water Conservation Plan (WCP) for the Placer Ranch Project. M&S will incorporate these water conservation measures into the design of Placer Ranch to reduce the overall water demand for the project.

This technical memorandum identifies potentially feasible efforts and planning approaches to reduce water usage within Placer Ranch. The potential reduction for demand and the methods for calculating the reductions are presented in this memorandum. Specifically, this TM:

- Develops a baseline water use inventory for the project
- Identifies and describe methods for reducing water consumption
- Estimates the reduction in water demand using the recommended measures
- Analyzes additional demand reductions using New Construction Demand factors and BMP's

Baseline Water Use

The baseline water use for the project was established using PCWA's new construction water use factors. These water use factors can be found in the 2015 PCWA Urban Water Management Plan (PCWA, 2016). The baseline water use for the project is presented in **Table 1.** It was noted that these water demands include both potable and recycled water usage. Throughout this document, we have identified if the water conservation measure applies to either potable water or recycled water usage. A full breakdown of water demands by parcel can be found in the DRAFT - Placer Ranch Potable Water Master Plan created in September 2016.

Table 1: Placer Ranch Water Demands

Land Use Designation	Abbrevi-ation	Total Area (ac)	Dwelling Units	Water Use Factor[1] (gpd/DU-ac)	Annual Demand (AFY)	Annual Demand (MGD)
Residential						
Low Density Residential	LDR	407.9	2,039	429	980	0.87
Low Density Residential/ Age restricted	LDR-A	131.0	720	429	346	0.31
Medium Density Residential	MDR	132.3	1,057	312	369	0.33
High Density Residential	HDR	93.0	2,011	143	322	0.29
Non-Residential						
General Commercial	GC	25.6	-	1,116	32	0.03
Commercial Mixed Used	CMU	48.8	-	1,116	61	0.05
Campus Park	CP	395.5	-	1,482	657	0.59
University (CSU Campus)	UZ	301.3	-	Varies	1,398	1.25
Public Facilities (Schools)	PF	32.0	-	1,785	64	0.06
Public Facilities (County Facilities)	PF	5.5	-	1,785	11	0.01
Parks and Recreation	PR	72.62	-	1,071	87	0.08
Open Space Preserves	OS	250.9	-	-	-	0.00
Placer Parkway	ROW	158.5	-	-	0	0.00
Major Roadways & Landscape Corridors	ROW	158.5	-	1,116	29	0.03
Totals		**2,213.3**	**5,827**		**4,355**	**3.89**

Notes:
1. Based on values from the DRAFT - Placer Ranch Water Master Plan (HydroScience, September 2016).

For single-family residential areas, the annual water demands shown in **Table 1** were subdivided based upon an approximated residential water usage distribution for Placer Ranch as presented in **Table 2.** This estimate was used to quantify the impact the various conservation measures would have on the Project's water demand.

Table 2: Typical Residential Water Usage

Use	Percent of Total Use[1]
Landscaping	51%
Toilets	13%
Faucets, cooking, cleaning	10%
Shower	9%
Clothes washer	8%
Bath	6%
Toilet leaks	2%
Dishwasher	1%

Notes:
1. Typical water usage based on information in the City of Roseville FAQs regarding water conservation - http://www.roseville.ca.us/faqs/categoryqna.asp?id=7#790

Water demands for the front and back yards of LDR, and MDR parcels were separated to allow different water conservation measures to be applied in each yard. Water conservation measures that are feasible to implement in front yards may be more difficult to implement in back yards, which led to the segregation of these demands. LDR and MDR properties typically have a driveway in the front of the house, resulting in a slightly larger area in the back yard requiring irrigation. This resulted in an estimate of 60% of the total landscape demand applied to the back yard and 40% for the front yard.

The base front yard demand is 40% of the total landscape demand of 51% **(Table 2)**, or 20.4% of total residential water usage. The base backyard demand is 60% of the total landscape demand of 51% **(Table 2),** or 30.6% of total residential water usage. The estimated baseline water use is shown in **Table 3.**

High-density residential (HDR) properties do not distinguish between front and back yards, therefore the reductions will be applied over the entire landscape area. For HDR land usage, exterior irrigation demands were calculated based on the calculations contained in the Placer Ranch Recycled Water Master Plan, since that area would be irrigated with recycled water.

Table 3: Residential Base Water Use

Land Use Designation	Annual Demand (AFY)	Annual Front Yard Demand (AFY)	Annual Back Yard Demand (AFY)	Total Annual Irrigation Demand (AFY)
Low Density Residential	980	200	300	500
Low Density Residential – Age Restricted	346	71	106	177
Medium Density Residential	369	75	113	188
High Density Residential[1]	322	60	-	60
Total	**2,017**	**406**	**519**	**925**

Notes:
1. Demand for HDR parcels was calculated differently from LDR and MDR parcels, as described above. Demand for HDR parcels was not separated into front and back yard demands since HDR parcels do not traditional have typical front and back yards.

Methods for Reducing Water Consumption

The potentially feasible methods identified in this report can be used either in combination or independently to reduce water consumption among the Placer Ranch land use types. Each method of water conservation considered is discussed below.

Limiting the amount of turf in front yards and replacing turf with low water use plantings: One of the simplest and most effective ways to conserve water is to limit the area of turf being irrigated or exchanging higher water use plant materials such as turf for lower water using plant materials. Planting varieties are available that dramatically reduce water demand when used to replace turf while maintaining view shed quality. The actual demand for these plantings will depend on the individual species planted.

Residential: It was assumed that replacing turf with low water use plantings could be accomplished on all types of residential property, including low, medium, and high density residential parcels. In order to assess the potential impact of this change on residential parcels, the following assumptions were made:

- When accounting for driveways and hardscape areas, the landscaped area in the front yard for low and medium density residential properties represents 75% of the front yard area. Of this landscaped area, it was initially assumed that 70% of the front yard area was turf and 5% was low water use plantings. The turf area would be reduced to 42% of the front yard.
- Planting the remaining 28% of the front yard landscaped area with low water using materials results in:
  - 25% hardscape (driveway, paths)
  - 42% turf
  - 33% low water use plantings
- Low water use plantings can use 30% of the water used on turf (a 70% water savings). This estimate is based on data collected by the Fair Oaks Horticultural Center that low water use plantings use between 65-75% less water than an average turf lawn (Garden Notes, June 2008).
- Low water use plantings use low volume systems like a drip or micro spray system designed to achieve uniformity of 90% rather than an overhead spray irrigation system. This also assumes that landscaping is irrigated properly (no over- or under-watering).

Table 4 presents the base and new residential landscaped areas.

Table 4: Reduced Landscape Turf Areas

Land Use Designation	Front Yard Irrigated Area[1,3]	Base Condition		Base Condition with Water Conservation	
		Turf Area	Low Water Use Area	Turf Area	Low Water Use Area[2]
Low Density Residential	75%	70%	5%	42%	33%
Low Density Residential – Age Restricted	75%	70%	5%	42%	33%
Medium Density Residential	75%	70%	5%	42%	33%
High Density Residential	75%	70%	5%	42%	33%

Notes:
1. As a percentage of the front yard
2. Includes 5% existing low water use plantings + 28% new water use plantings.
3. Represents the percentage of the entire exterior area for HDRs.

Table 5 presents the results of the residential water savings for replacing landscape turf.

Table 5: Reduced Landscape Turf Water Savings – Residential

Land Use Designation	Annual Front Yard Demand[1,2]	Annual Front Yard Turf Demand	Reduced Turf Annual Front Yard Demand	Water Savings for Reduced Turf	Water System Savings
	(AFY)	(AFY)	(AFY)	(AFY)	
Low Density Residential	200	196	145	**55**	Potable
Low Density Residential – Age Restricted	71	70	51	**20**	Potable
Medium Density Residential	75	73	55	**20**	Potable
High Density Residential	60	59	44	**16**	Recycled
Total	**406**	**398**	**295**	**111**	

Notes:
1. From Table 3.
2. Demands for High Density Residential parcels represent full irrigation demand since there is no distinction between front yard and back yard
3. Value rounded to nearest whole number.

As an example of how these values were calculated, the calculation for the annual front yard turf demand and the reduced annual front yard demand are presented below.

For the annual front yard turf demand, as calculated for low-density residential land-uses, 75% of the front yard area is landscaped; 70% turf and 5% low water use plantings. Since low water use plantings use 30% of the water required for turf, this 5% area is equal to 1.5% turf area. This resulted in the following annual front yard demands.

Turf: $200\,AFY * \left(\frac{70\%}{71.5\%}\right) = 196\,AFY$ Low Water Use: $200\,AFY * \left(\frac{1.5\%}{71.5\%}\right) = 4\,AFY$

For the reduced annual front yard demand, as calculated for low-density residential land uses, reducing the base turf area in the front yards from 70% to 42% and replacing that area (28%) with low water use plantings resulted in the following annual demands.

$$200\,AFY * \left(\frac{42\%}{70\%} + \frac{28\% * 30\%}{70\%} \right) + 4\,AFY = 145\,AFY$$

Non-Residential: Turf reduction on non-residential parcels within Placer Ranch was assumed to be employed in all land uses including parks, commercial and business professional properties, multi-use landscape corridors, schools, roadways, and the university. The assumptions used to estimate water conservation in these areas are as follows:

- The parks were assumed to use 98% of all water for landscape irrigation.
- The parks were estimated to irrigate approximately 80% of their parcel area. It was assumed the 80% turf would be reduced to 60%, with the remaining 20% turf being converted to low water use plantings.
- Low water usage plantings were assumed to use 30% of the water used on turf (a 70% water savings).
- Low volume irrigation systems like a drip or micro spray system design will be used for low water use areas to achieve uniformity of 90% rather than an overhead spray irrigation system.
- All commercial properties were assumed have approximately 15% of the irrigated area as turf, of which 10% would be converted to low water use plantings.
- Schools were assumed to use 40% of their water demand for landscape irrigation.
- Schools were assumed to have approximately 70% of their parcels irrigated area as turf. The overall turf area was reduced to 40% turf and 30% low water use plantings.
- Roadway demand was limited to 15% of the theoretical base demand after water conservation. To achieve this, it was assumed that the irrigated area for turfgrass would be limited to 5% of the overall landscaped area, and that the remaining area would be irrigated with lower water use plantings.
- The university was assumed to have approximately 70% of the irrigated area as turf. The overall turf area was reduced to 40% turf and 30% low water use plantings.

Table 6 presents the results of the water savings for replacing landscape turf for non-residential parcels.

Table 6: Reduced Landscape Turf Water Savings – Non-Residential

Land Use Designation	Annual Irrigation Demand[2] (AFY)	Annual Turf Demand (AFY)	Base Turf Area[1]	New Turf Area[1]	Low Water Use Area[1]	Reduced Irrigation Demand (AFY)	Reduced Turf Water Savings (AFY)	Water System Savings
General Commercial	12	5	15%	5%	10%	10	2	Recycled
Commercial Mixed Use	24	9	15%	5%	10%	20	4	Recycled
Campus Park	192	71	15%	5%	10%	159	33	Recycled
University (CSU Campus)	244	90	15%	5%	10%	202	42	Recycled
Public Facilities (Schools)	16	14	70%	40%	30%	12	4	Recycled
Public Facilities (County Facilities)	3	1	15%	5%	10%	3	0	Recycled
Parks and Recreation	188	175	80%	60%	20%	157	31	Recycled
Open Space Preserves	-	-	-	-	-	-	-	-
Placer Parkway	-	-	-	-	-	-	-	-
Major Roadways & Landscape Corridors	77	29	15%	5%	10%	63	14	Recycled
Total	**756**	**394**				**626**	**130**	

Notes:
1. As a percentage of the irrigated area.
2. As calculated in the Placer Ranch DRAFT – RWMP (HydroScience 2016)

Smart Irrigation Controller: A smart irrigation controller restricts irrigation to only the times and water application rates that are really needed. Demand for water varies greatly with weather patterns and time of year. Standard irrigation schedules do not account for actual weather conditions during the day, week, or month that could vary significantly from normal weather patterns. This deviation can result in significant water waste. A smart irrigation controller can account for these variations by using information for both weather and soil moisture conditions.

Fourteen studies estimating the percentage of water conservation associated with the use of smart irrigation controllers were summarized in a paper published by the US Bureau of Reclamation (USBR, April 2008). These studies estimated the range of water savings associated with their use to be between 7 to 41%.

It was noted that the references estimated water savings when going from one type of controller to the smart irrigation controller. However, not all houses have controllers for both the front and back yards. Some existing houses use impact heads connected to a hose to irrigate their front or back yards. This irrigation method is less efficient and results in higher water waste. Additionally, the developer will educate the homeowner on how to use the smart irrigation controller. Considering these issues, the percent of water savings for this measure using smart irrigation controllers was estimated to be 20%.

The additional savings expected with the use of a smart irrigation controller are presented in **Table 7**. It is assumed that all irrigated area, including the land using turf reduction measures, will employ smart irrigation controllers. These calculations assume that the area of turf is reduced as described above.

Table 7: Smart Irrigation Controller Water Savings

Land Use Designation	Original Demand (AFY)	Reduced Demand (AFY)	Water Savings (AFY)	Water System Savings
Low Density Residential				
Front Yard	145	116	**29**	Potable
Back Yard	300	240	**60**	Potable
Low Density Residential- Age-Restricted				
Front Yard	51	41	**10**	Potable
Back Yard	106	85	**21**	Potable
Medium Density Residential				
Front Yard	55	44	**11**	Potable
Back Yard	113	90	**23**	Potable
High Density Residential	44	35	**9**	Recycled
Non-Residential				
General Commercial	10	8	**2**	Recycled
Commercial Mixed Use	20	16	**4**	Recycled
Campus Park	159	127	**32**	Recycled
University (CSU Campus)	202	162	**40**	Recycled
Public Facilities (Schools)	12	9	**2**	Recycled
Public Facilities (County Facilities)	3	2	**1**	Recycled
Parks and Recreation	157	126	**31**	Recycled
Open Space Preserves	0	0	**0**	Recycled
Placer Parkway	0	0	**0**	Recycled
Major Roadways & Landscape Corridors	63	50	**13**	Recycled
Total	**1,440**	**1,151**	**288**	

Notes:
1. Original demand includes the turf reduction water conservation measures that were previously described.

Recirculating hot water: Recirculating hot water systems use a pump to keep the water in the hot water lines circulating back to the water heater to keep the water in the hot water lines hot. This provides hot water at the tap immediately and prevents having to let cold water flow until the water heats up. These systems can be operated in a number of different ways but all conserve water in the same manner. For this study, it was estimated that each draw for hot water would waste approximately 1.25 gallons per day per dwelling unit. This is equivalent to

drawing water through 50 ft of ¾-inch pipe with each draw, and drawing hot water in this manner six times per day per dwelling unit. The expected savings are presented in **Table 8.**

Table 8: Re-circulating Hot Water Savings

Land Use Designation	Dwelling Units (DU)	Water Savings (AFY)	Water System Savings
Low Density Residential	2,039	**17**	Potable
Low Density Residential – Age Restricted	720	**6**	Potable
Medium Density Residential	1,057	**9**	Potable
High Density Residential	2,011	**17**	Potable
Total	**5,827**	**49**	

As an example of how these values were calculated, for the low-density residential land use, the total number of dwelling units is 2,039. The reduced water demand would be estimated to be:

$$2{,}039\,DU * 7.5\frac{gal}{dayDU} * \frac{AF}{325{,}851\,gal} * 365\,day/yr = 17\,AFY$$

Model Water Efficient Landscape Ordinance: This ordinance was recently adopted by the California Water Commission, and became effective on December 1, 2015 for all landscape projects adding a landscape area of 500 square feet or more, or all modifications to landscaping equal to or greater than 2,500 square feet requiring a building or landscape permit, plan check, or design review. Components of this ordinance include turf reduction and the use of smart irrigation controllers, both of which have already been accounted for in the water conservation calculations listed above.

The key outcome with regards to quantifying water conservation for new landscapes is that the estimated total water use of the new landscape must be below the Maximum Applied Water Allowance for the property. The evapotranspiration (ET) adjustment factor was set to be a maximum of 0.55 for residential areas, and 0.45 for non-residential areas. It was assumed in previous water conservation plans that the landscaped areas had an ET adjustment factor that averaged 1.0. Thus, compliance with the Modified WELO has the net effect of reducing the allowed water available for irrigation of residential areas by 45%, and 55% for non-residential areas. This reduction in exterior irrigation demands is inclusive of previously accounted for water reductions. To calculate the additional water conservation per the Modified WELO, the following formula was utilized.

> ***Total additional water conservation per Modified WELO = (Total Annual Irrigation Demand – Maximum Water Demand per WELO – Already accounted for reductions)***

The net effect of this requirement is detailed in **Tables 9 and 10** for each type of land use. Water conservation was assumed to be potable for LDR and MDR land use designations. For all other land use designations, water conservation would be on recycled water.

Table 9: Additional Residential Water Conservation per Modified WELO

Land Use Designation	Total Annual Irrigation Demand (AFY)	Maximum water demand per WELO (AFY)	Already accounted for reductions (AFY)[1]	Additional Water Conservation per Modified WELO (AFY)
Low Density Residential	500	275	161	64
Low Density Residential – Age Restricted	177	97	57	23
Medium Density Residential	188	103	63	22
High Density Residential	60	33	25	2
Total	**925**	**508**	**306**	**111**

Notes:
1. Calculated as the sum of the turf reduction water savings and the smart controller water savings.

Table 10: Additional Non-Residential Water Conservation per Modified WELO

Land Use Designation	Total Annual Irrigation Demand (AFY)	Maximum water demand per WELO (AFY)	Already accounted for reductions (AFY)[1]	Additional Water conservation per Modified WELO (AFY)
General Commercial	12	6	4	2
Commercial Mixed Use	24	11	8	5
Campus Park	192	87	65	41
University (CSU Campus)	244	110	82	52
Public Facilities (Schools)	16	7	6	2
Public Facilities (County Facilities)	3	1	1	1
Parks and Recreation	188	85	62	41
Open Space Preserves	0	0	0	0
Placer Parkway	0	0	0	0
Major Roadways & Landscape Corridors	77	35	27	16
Total	**756**	**340**	**255**	**160**

Notes:
1. Calculated as the sum of the turf reduction water savings and the smart controller water savings.

Summary and Conclusions

The water conservation measures identified for Placer Ranch are similar to the water conservation measures recently included in other local Water Conservation Plans. These measures were selected based on their ability to cost-effectively achieve the necessary water savings.

The total estimated volumes of water conserved for each of these water conservation measures for Placer Ranch land use plan are summarized in **Table 11**.

Table 11: Placer Ranch Water Conservation Estimates

Method	Original Total Water Demand (AFY)	Potable Water Savings (AFY)	Recycled Water Savings (AFY)	Total Volume of Water Savings (AFY)	Total Percentage of Water Savings [1]
Reduced landscape turf – residential	4,355	95	16	111	**2.6%**
Reduced landscape turf – non-residential		-	130	130	**3.0%**
Smart irrigation controllers – all types of land uses		154	134	288	**6.6%**
Re-circulating hot water – residential		49	-	49	**1.1%**
Modified WELO - Residential		109	2	111	**2.5%**
Modified WELO - Non-Residential		-	160	160	**3.7%**
Total		**407**	**443**	**850**	**19.5%**

Notes:
1. Percentages rounded to the nearest tenth of a percent, and represent overall water conservation percentages for both potable and recycled water.

If the water conservation measures described in this memorandum were implemented for Placer Ranch, it is estimated that the Placer Ranch overall water demand (potable + recycled water) would be reduced by 850 AFY yielding an adjusted water demand of 3,505 AFY. This represents a 19.5% reduction from the original water demand without conservation measures for Placer Ranch of 4,355 AFY.

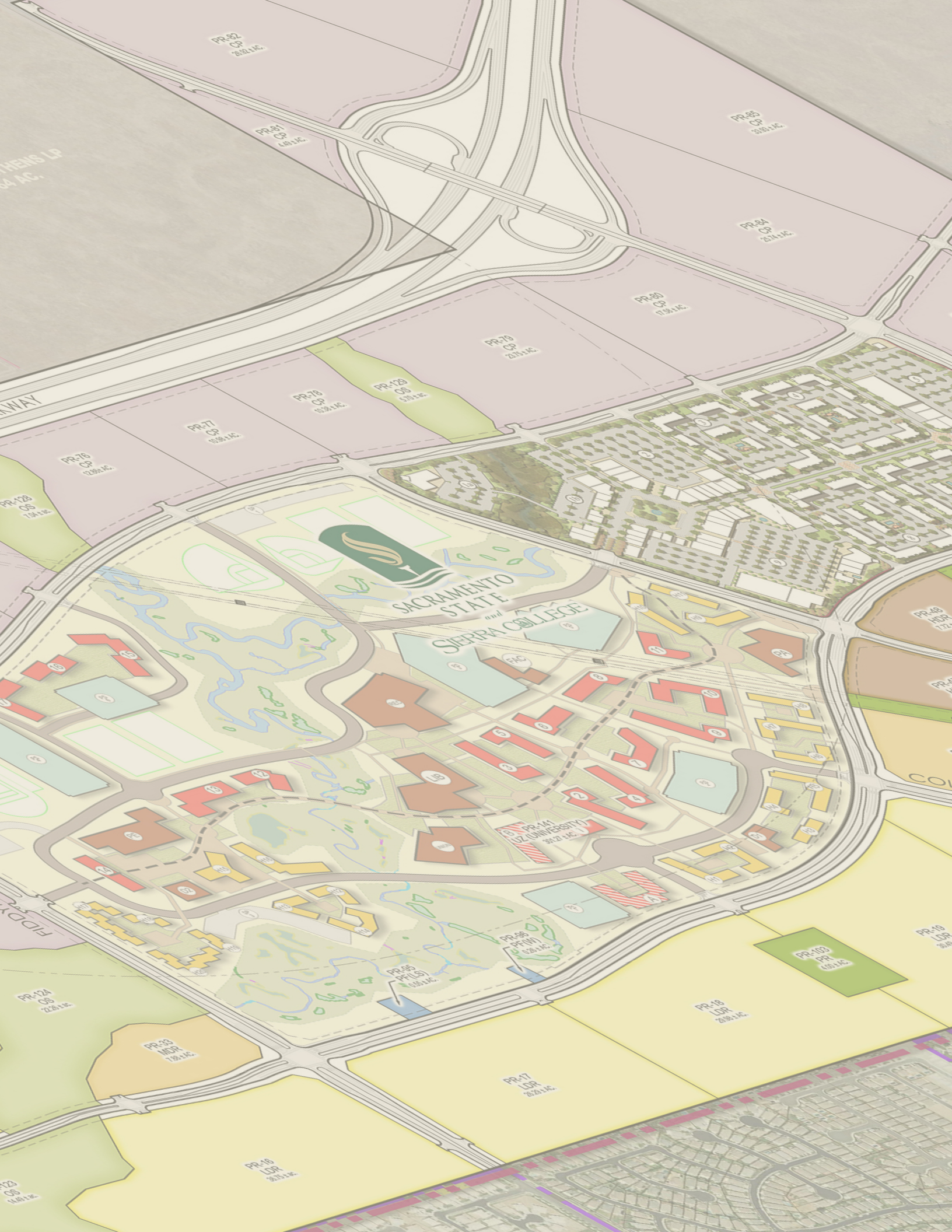
Though the actual water conservation realized will depend, in part, on the participation of the homeowners or tenants of the affected parcels, it is expected that these measures could be implemented and maintained in the end by employing the following measures:

- Constructing the parcels with these water conservation measures in place. By simply having an available smart irrigation controller with the capacity to run the front and back yard systems pre-wired and in place, using this controller is a financially sound decision for the land owner versus replacing the controller with a different one.
- Landscape areas for non-single family land uses will be maintained by the County, the applicable school district, commercial owners, or a homeowners association. It is expected that these professionals will be able to maintain these water savings through the professional management of these landscapes and required adherence to the water budget.

- For single-family residences, it is expected that a two-fold measure will be required to realize long-term water savings.
    1. Restrictions in the codes, covenants and restrictions for each parcel that would limit the types and/or locations of landscape in the front yards of each residence.
    2. Ongoing outreach to remind and reinforce the need for water conservation. This can include attachments to the water bill, water audits that can be made available to landowners, the promotion of the water conservation on the County and/or PCWA website, and the availability of water conservation staff to respond to specific questions.
    3. Educating homeowners on how to incorporate their backyard irrigation system into the controller and provide education materials.

References

1. HydroScience Engineers, *Placer Ranch DRAFT Recycled Water Master Plan*, September 2016.
2. HydroScience Engineers, *Placer Ranch DRAFT Potable Water Master Plan,* September 2016.
3. Placer County Water Agency, *2015 Urban Water Management Plan*, June 2016.
4. University of California Cooperative Extension, Sacramento County Agriculture and Natural Resources, Garden Notes, June 2008.
5. US Bureau of Reclamation, Summary of Smart Controller Water Savings Studies, April 2008.


PR-82
CP
26.65 ± AC.
PR-81
CP
4.49 ± AC.
PR-85
CP
19.00 ± AC.
PR-84
CP
26.74 ± AC.
PR-80
CP
17.94 ± AC.
PR-79
CP
23.75 ± AC.
PR-129
OS
1.01 ± ac.
PR-78
CP
10.84 ± AC.
PR-17
CP
10.98 ± AC.
PR-76
CP
12.89 ± AC.
PR-128
OS
1.04 ± ac.
SACRAMENTO STATE
and
SIERRA COLLEGE
PR-48
HDR
17.2 ± AC.
PR-141
UZ (UNIVERSITY)
30.12 ± AC.
PR-96
PFMP
0.58 ± AC.
PR-95
PF(LSP)
1.65 ± AC.
PR-19
LDR
30.48 ± AC.
PR-103
PF
4.00 ± AC.
PR-124
OS
22.26 ± ac.
PR-18
LDR
28.98 ± AC.
PR-33
MDR
7.59 ± AC.
PR-17
LDR
28.26 ± AC.
PR-16
LDR
28.15 ± AC.
PR-123
OS
14.80 ± ac.