

Golf and Nonpotable Water in the Coachella Valley

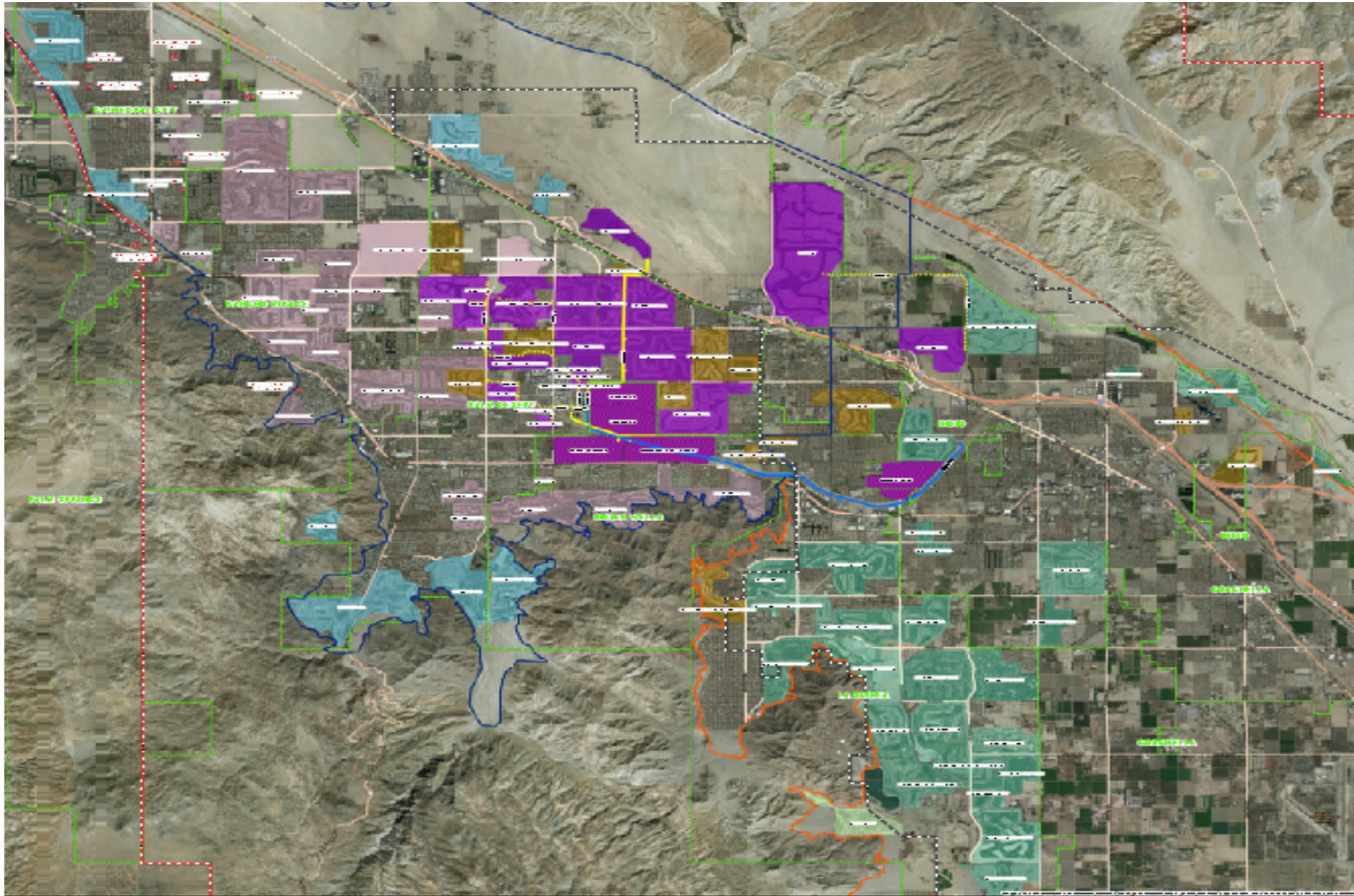


First golf course in the valley...

...was the O'Donnell in 1926, second was Indian Palms (used to be Cochran-Odlum) in 1947, third Thunderbird 1951...



Now, there are 121 golf courses in the valley!



106 of the golf courses are within CVWD's boundaries.

| | |
|--|------|
| Canal via Canal distribution system | 30.5 |
| Future Canal via Canal distribution system | 5 |
| Canal via Mid Valley Pipeline | 6 |
| Future Canal via Mid Valley Pipeline | 17 |
| Recycled water/canal | 17.5 |
| Future Recycled water/canal | 17 |
| Not planned for an Alternate Water Supply | 13 |
| Total Golf Courses: | 106 |
| Nonpotable Water Source: | 54 |
| Per Cent Using Nonpotable Water Source: | 51% |

Nonpotable Water

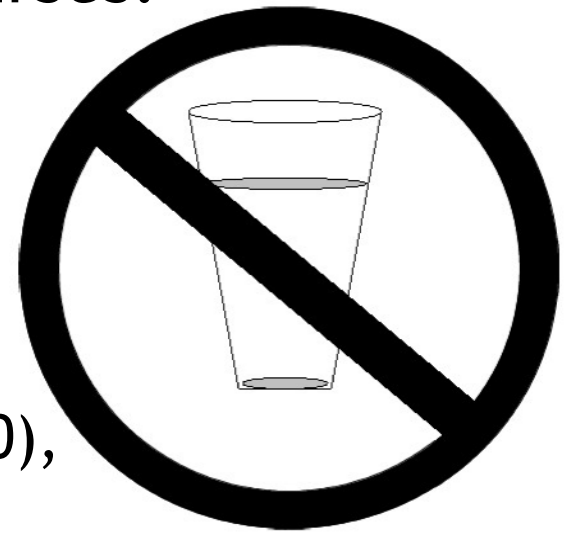
Types of nonpotable water for golf courses:

1. Canal Water (Colorado River)

- Mid-Valley Pipeline, and
- Canal water distribution system.

2. Recycled Water

- Water Reclamation Plant (WRP7 or WRP10),
- Tertiary Disinfected Recycled Water



Nonpotable customers irrigate with water that is not deemed safe for drinking. They no longer relying primarily on the groundwater, our potable water source, for nonpotable purposes.

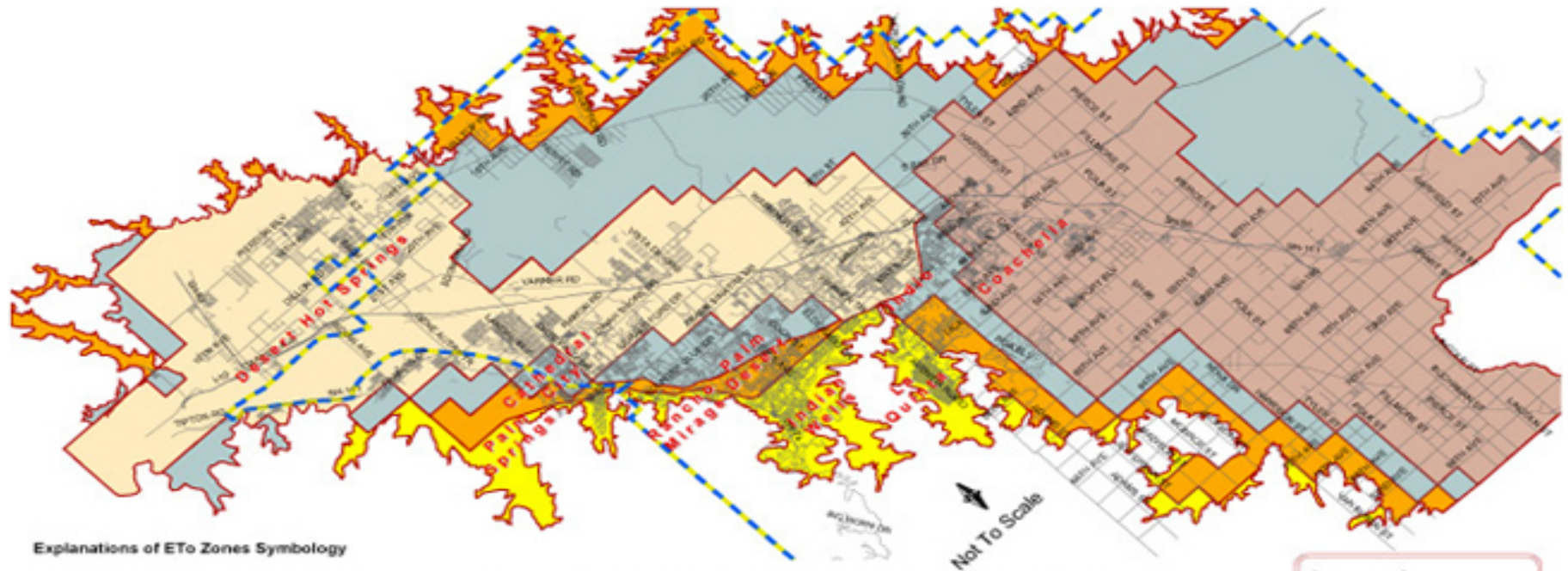
Other sources of golf course irrigation water:

- Groundwater
- Storm water



How much water is used by a golf course annually?

It depends primarily on the ETo zone, irrigated acreage and lake area. Anywhere from about 300 AF/Yr for our smaller courses in a protected area to about 1400 AF/Yr for our large courses in the windy areas. **Average of 942 AF/Yr.**



Explanations of ETo Zones Symbology

1. Zone #1: North-facing cove areas: Mountain shaded, sheltered from prevailing winds and higher elevations means lowest water consumption. Annual water consumption(ETo) = 57.01"
2. Zone #2: Transition zone area between the north-facing coves and the open desert or the south-facing cove areas of the north valley: The transition zones are somewhat sheltered from prevailing winds and with exposure to higher local humidity from irrigated landscapes means low water consumption. North valley coves are mountain shaded, sheltered from prevailing winds and higher elevations, but are south-facing and heat absorbing. Annual water consumption(ETo) = 66.82"
3. Zone #3: Upper valley open desert border zone, lower valley upper elevation zone or lower valley afternoon mountain shade zones with moderate prevailing winds and blowing sand. Annual water consumption(ETo) = 75.00"
4. Zone #4: Lower valley open desert agricultural zone with moderate prevailing winds and below sea level elevations. Annual water consumption(ETo) = 88.00"
5. Zone #5: Upper valley high wind and blowing sand zone. Annual water consumption = 93.90"

Legend

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Center Lines
- District Boundary

Average water use for a golf course

The average water use on a golf course is around 942 acft/yr.

To make it easy, we round up to say that “a typical golf course uses 1000 acft per year”.

Golf Courses in the valley use up to 121,000 acft of water per year.



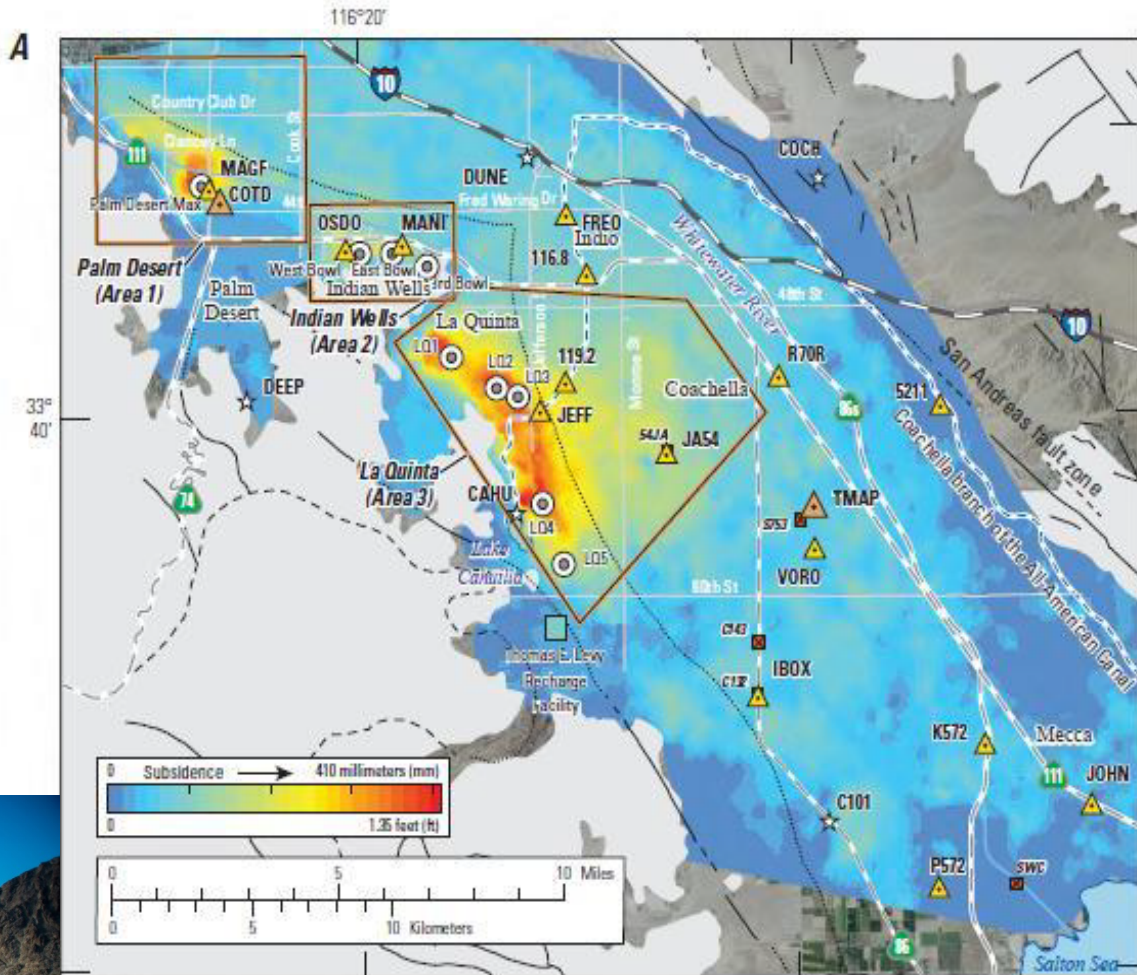
What's the big deal?

Final USGS report published in 2014.

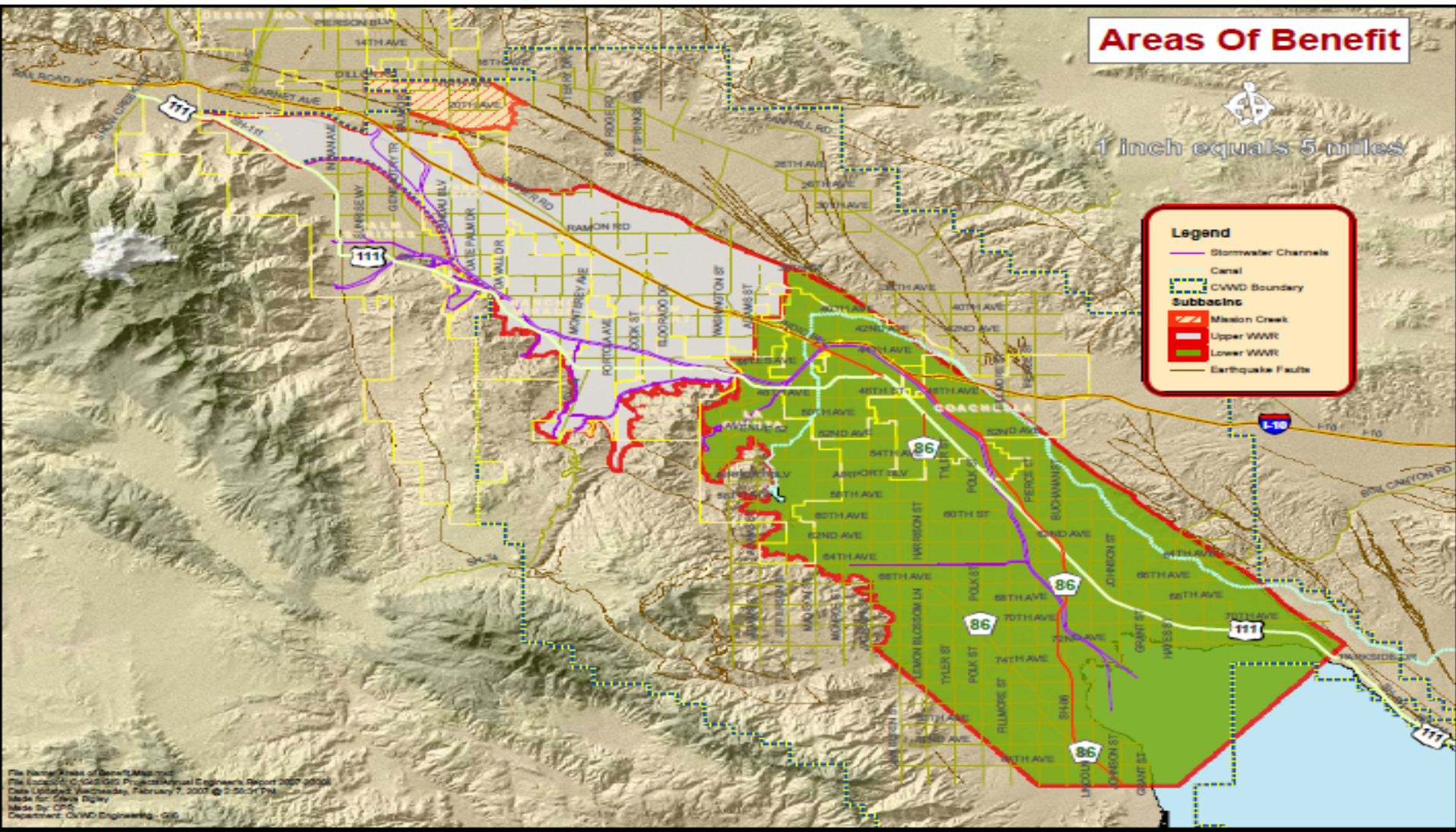
- CVWD and USGS study since 1996.
- Yellow and red show areas of most subsidence.
- Up to 410mm (1.35ft)



Overdraft and subsidence.



To minimize and eliminate further overdraft, the aquifer has been replenished with imported water.



34 golf courses in the mid-valley available for **in-lieu recharge** opportunities.



Instead of delivering an alternate water source to percolation ponds to replenish the aquifer, an alternate water source (nonpotable water) is delivered to golf courses for irrigation, leaving groundwater in the ground.

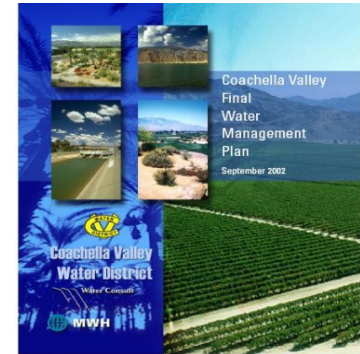
Coachella Valley Water Management Plan

(2002 and 2010 update and 2014 update)

The goal of the CVWMP is to reliably meet current and future water demands in a cost effective and sustainable manner.

1. Eliminate groundwater overdraft and its associated adverse impacts.

- Storage Loss
- Declining Groundwater Levels
- Land Subsidence
- Water Quality Degradation



2. Maximize conjunctive use opportunities (includes in-lieu recharge).

3. Minimize adverse economic impacts to Coachella Valley water customers.

4. Minimize environmental impacts.

CVWMP objectives for golf courses:

- Conservation with improved irrigation systems and techniques and technology. 10%.
- Utilize nonpotable water sources for golf courses. In-Lieu recharge projects.



Golf and Water Task Force

Mission Statement

To ensure a sustainable water supply for future generations, to meet if not exceed the goals of the Coachella Valley Water Management Plan, **to pursue all feasible water conservation measures, to promote and expedite the use of nonpotable water,** and to educate Valley residents regarding the importance of pursuing these goals for the environmental and economic quality of life in the Coachella Valley.

Nonpotable Water for golf courses

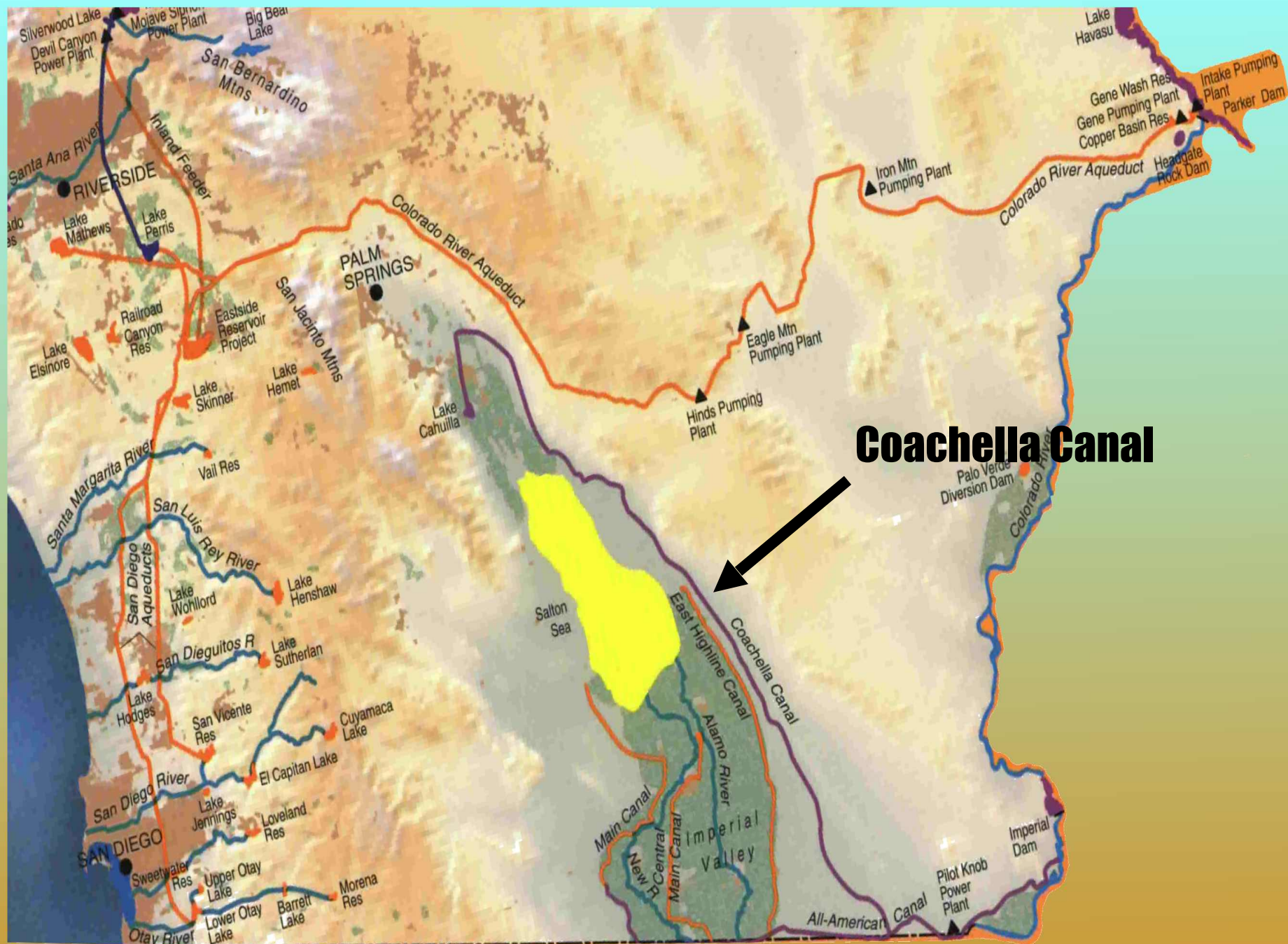


East Valley GC's to Colorado River water:

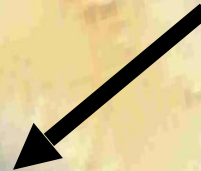
- Goal = 35,500 afy and in 2018 = 18,586 af

Mid Valley NPW connections:

- Goal = 52,000 afy and in 2018 = 23,139 af
 - NPW Master Plan underway



Coachella Canal



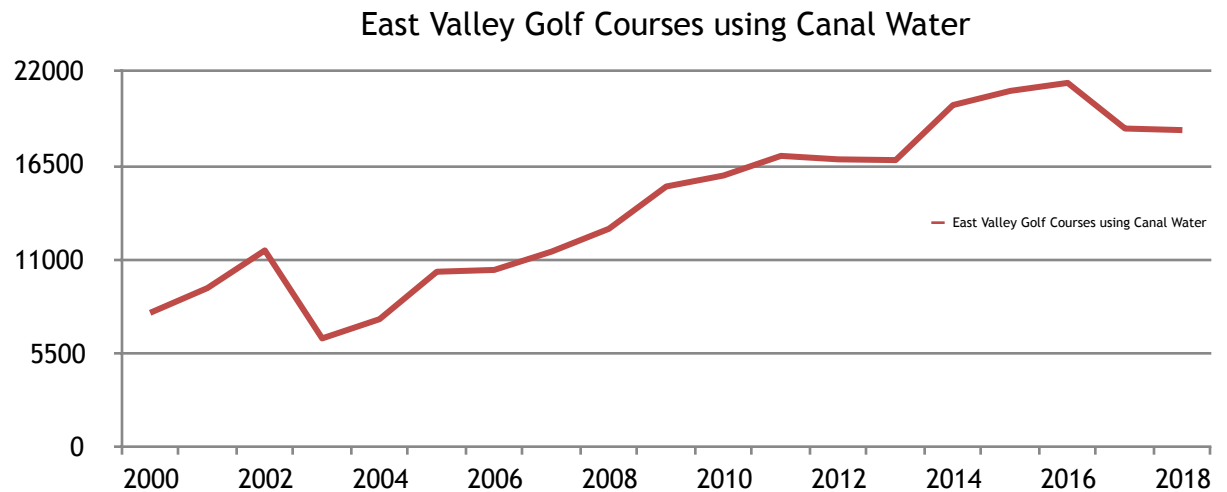
Conversion of golf courses to canal water



In the 2018, East Valley golf courses with access to canal water access, used 18,586 acft which was 66% of demand.

Conversion to canal water by East Valley golf courses will reduce groundwater use by approximately 35,500 AFY. The 5 remaining conversions are expected to be completed by 2021.

| Year | East Valley Golf Courses using Canal Water |
|------|--|
| 2000 | 7884.1 |
| 2001 | 9335.6 |
| 2002 | 11540.6 |
| 2003 | 6385.1 |
| 2004 | 7511.3 |
| 2005 | 10290.3 |
| 2006 | 10395.7 |
| 2007 | 11469.7 |
| 2008 | 12805.9 |
| 2009 | 15282.9 |
| 2010 | 15927.8 |
| 2011 | 17076.7 |
| 2012 | 16873.2 |
| 2013 | 16828.6 |
| 2014 | 20053.5 |
| 2015 | 20883.2 |
| 2016 | 21351.8 |
| 2017 | 18678 |
| 2018 | 18586 |



New Connections :

| | |
|------|--|
| 1988 | PGA West |
| 1994 | Indio Muni |
| 1996 | Plantation |
| 1997 | Traditions |
| 1998 | The Hills (Terra Lago) |
| 1999 | Heritage Palms |
| 2000 | The Palms |
| 2001 | Hideaway |
| 2002 | Trilogy, PGA West Weiskopf |
| 2005 | Silver Rock |
| 2006 | Outdoor Resort, PGA-Norman, Ranch La Quinta, Shadow Hills (front nine) |
| 2007 | Mountain View, Vineyards, Andalusia, Shadow Hills (back nine), Madison |
| 2010 | Indian Palms |
| 2014 | Indian Palms (2nd connection) |
| 2016 | La Quinta CC, La Quinta Resorts Dunes |

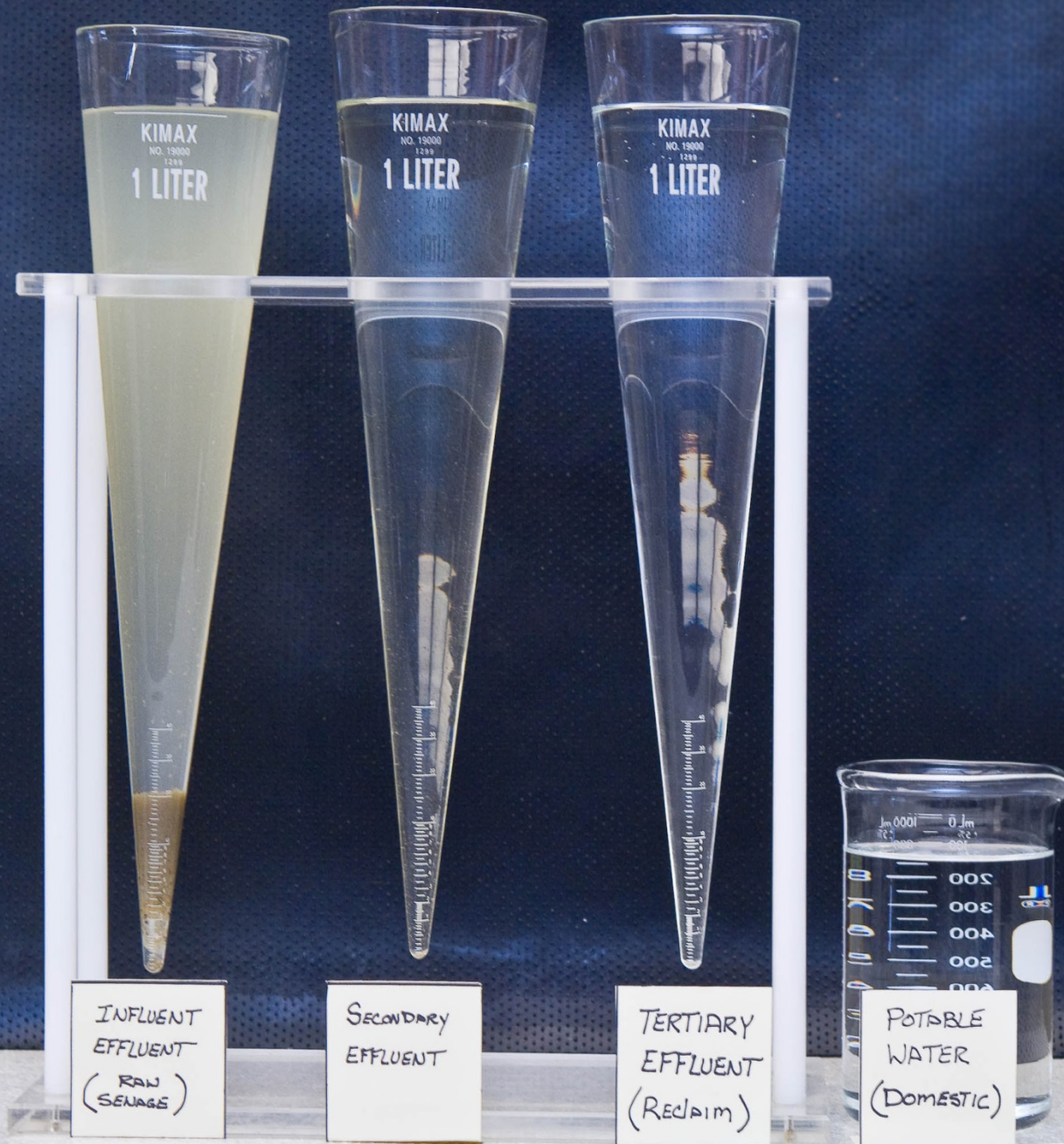


Recycled Water

- Recycled water has been a water supply source in the Valley since 1965 at Palm Desert Country Club. CVWD acquired this WRP in 1968.
- CVWD has 5 wastewater treatment plants, 2 that provide recycled water for golf course and landscape irrigation.
- CVWD delivers disinfected tertiary recycled water for golf course and landscape irrigation.

Municipal wastewater collected from homes and businesses that receives a high level of treatment at a water reclamation plant. It is monitored 24/7, water quality samples are collected and tested to ensure permit regulation limitations are met, so that it can safely be beneficially reused. It is no longer considered wastewater.







Why Do We Recycle Water in Coachella Valley?

- CVWD adopted and is implementing the CVWMP to eliminate overdraft, includes source substitution for golf courses.
- Irrigating with Recycled water saves groundwater.
- Treatment technology can produce a safe recycled water for any given use.
- Recycled water is a reliable local water supply for irrigation.
- RW is economical—counting all of its benefits.
- Recycled water percolation is highly regulated and will soon require significant upgrades to the WRP treatment process, unless we find a home for it elsewhere...golf courses.
- More affordable to connect golf courses to recycled water than to complete these significant upgrades at the WRP.

Recycled Water in California

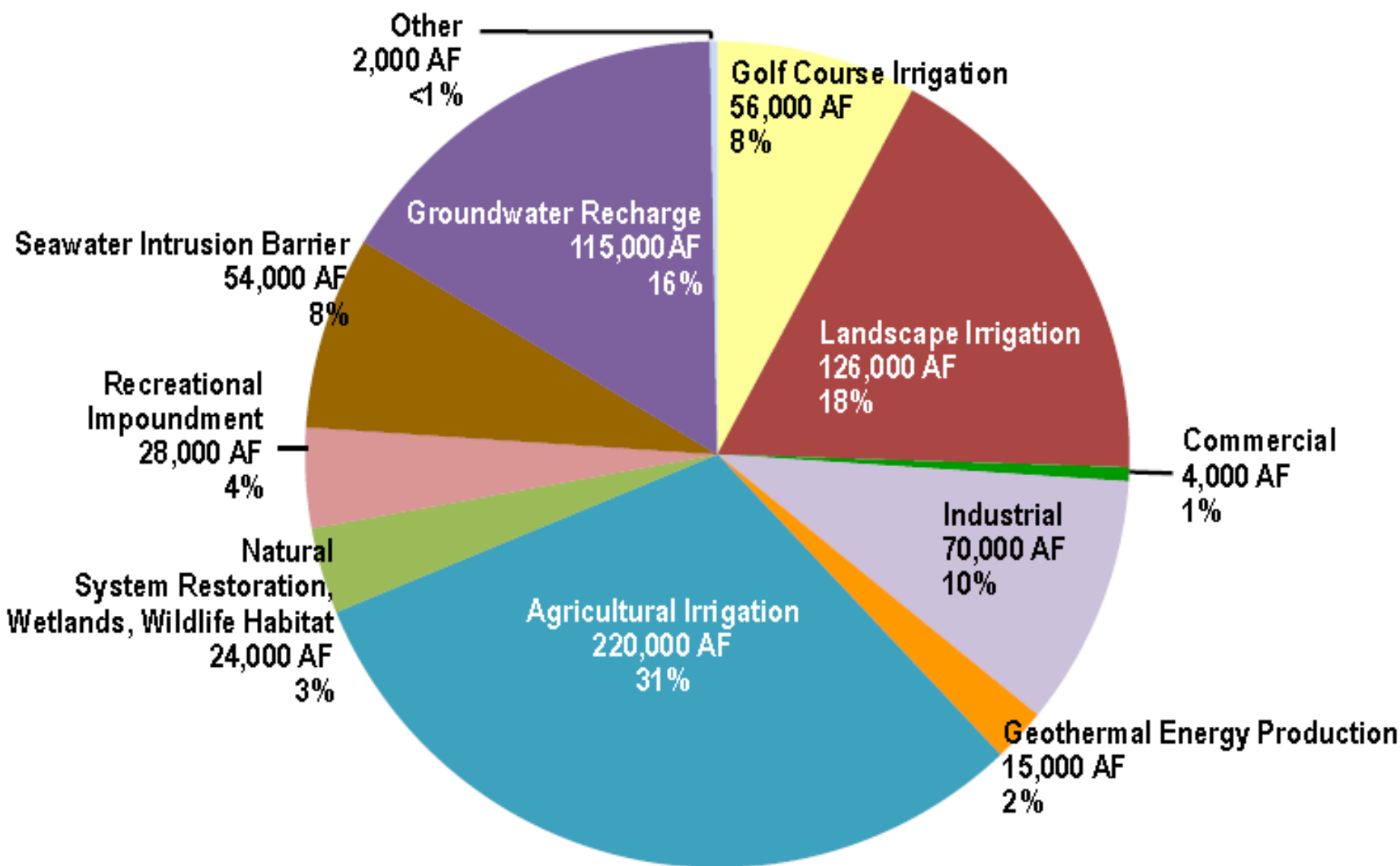
- First use of recycled water in California, 1903
- 300 Water Reclamation Plants
- 5,000 Sites using recycled water
- Over 700,000 acre-feet annually
- Legislative goal:
 - 1.0 MAFY More by 2020
 - 2.0 MAFY More by 2030
- Nearly all nonpotable uses can utilize recycled water
- 43 specific uses are allowed



Allowed Uses of Recycled Water

| Recycled Water Use | Treatment Level | | | |
|--|-------------------------------------|--|---|--|
| | Disinfected Tertiary Recycled Water | Disinfected Secondary 2.2 Recycled Water | Disinfected Secondary 23 Recycled Water | Undisinfected Secondary Recycled Water |
| Irrigation for: | | | | |
| Food crops where recycled water contacts the edible portion of the crop, including all root crops | ALLOWED | NOT ALLOWED | NOT ALLOWED | NOT ALLOWED |
| Parks and playgrounds | | | | |
| School grounds | | | | |
| Residential landscaping | | | | |
| Unrestricted-access golf courses | | | | |
| Any other irrigation uses not specifically prohibited by other provisions of the <i>California Code of Regulations</i> | | | | |
| Food crops, surface-irrigated, above-ground edible portion, not contacted by recycled water | | ALLOWED | | |
| Cemetaries | | | ALLOWED | |
| Freeway landscaping | | | | |
| Restricted-access golf courses | | | | |
| Ornamental nursery stock and sod farms with unrestricted public access | | | | |
| Pasture for milk animals for human consumption | | | | |
| Non-edible vegetation with access control to prevent use as animal feed | | | | |

2015 Recycled Water Use: 714,000 acre-feet/881M cubic meters



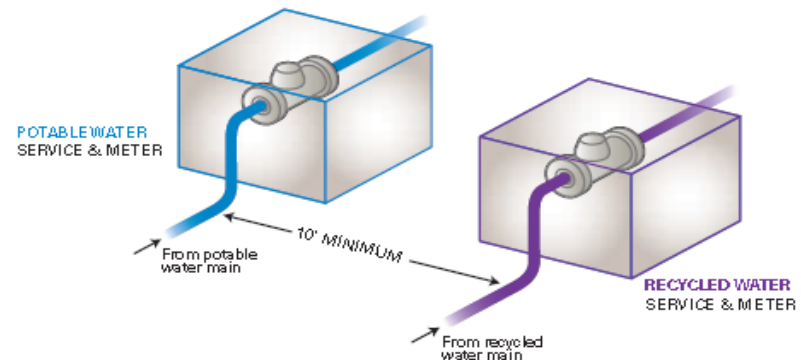
Recycled Water Use in Coachella Valley

Golf Course and landscape irrigation:

- Golf Courses
- Home-Owner Associations (HOAs)
- High-School Athletic Fields
- Landscaped areas at CVWD's Palm Desert offices and WRPs.

Rules and Regulations

- Dos and Don'ts
- Training
- Permit
- Agreement
- Purple
- Signs
- Public notification
- Cross-connection Test
- Annual Survey
- Monitoring and Reporting



Not enough recycled water



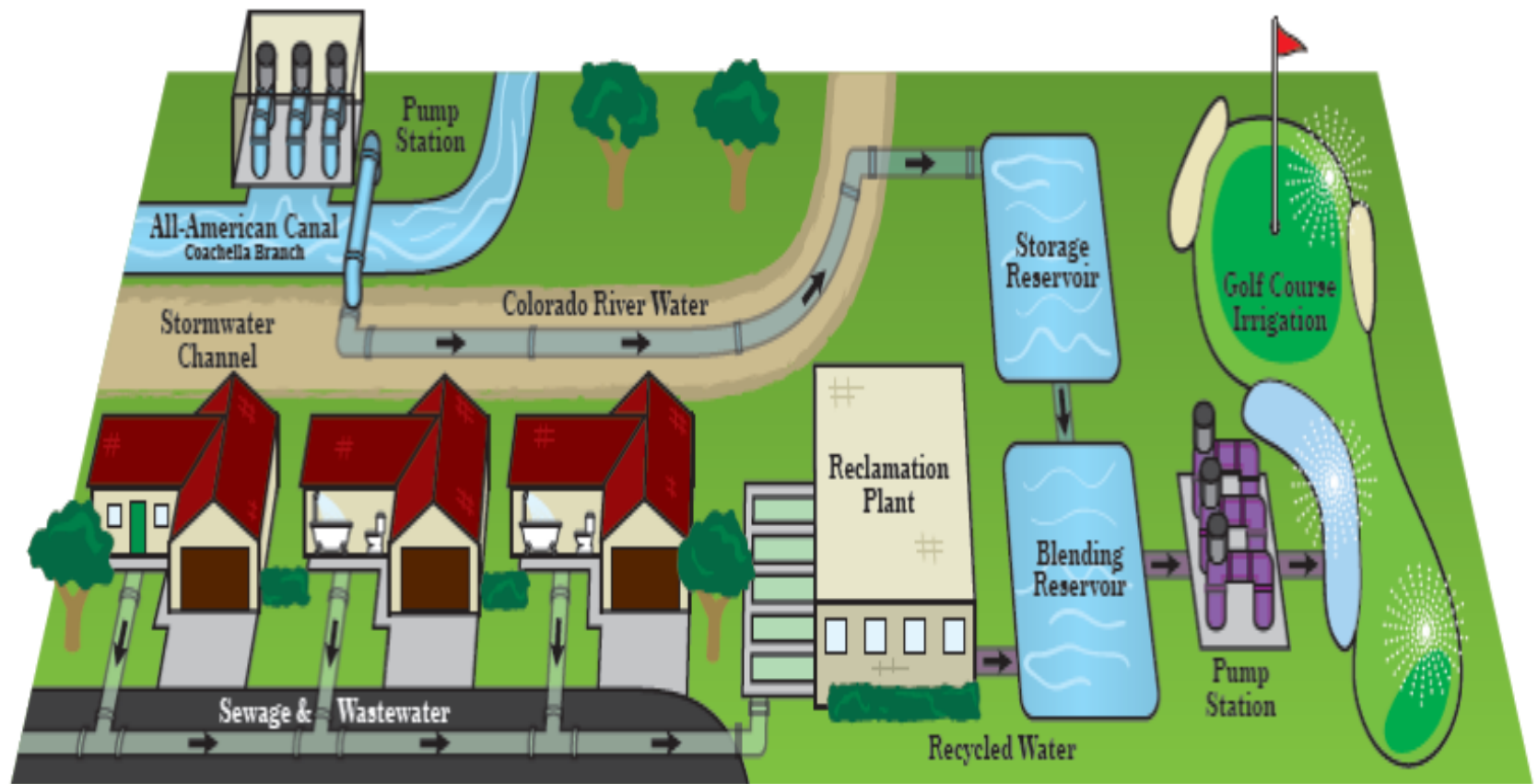
- Recycled water supply is not a sufficient water supply for all golf courses in the mid-valley area.
- Recycled water supply runs out in the summer and golf courses would supplement with groundwater.

Mid-Valley Pipeline In-Lieu Project



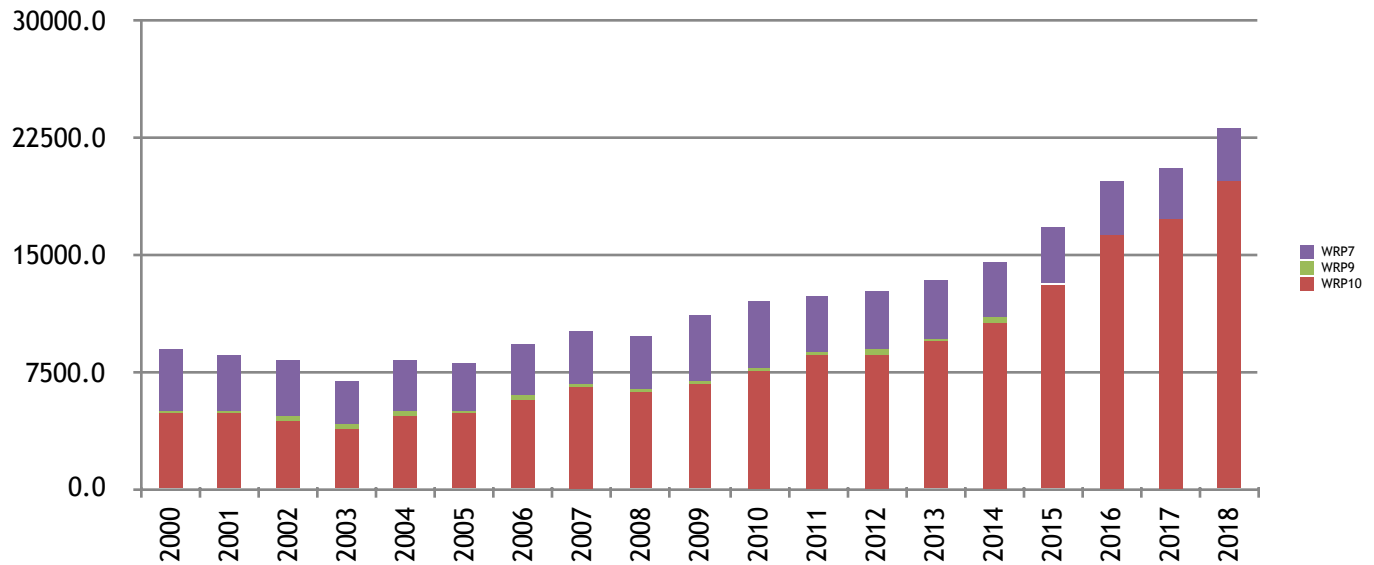
- The MVP delivers canal water to WRP10. Completed in 2009. 7 mile, 54" pipeline of welded steel with cement mortar lining in the wash.
- Canal water supplements the recycled water supply and provided to golf courses in lieu of their pumping groundwater.
- Completion of the MVP system after 2027 to provide up to 37,000 AFY of Canal water and 15,000 AFY of WRP10 recycled water to Mid- Valley golf courses.
- In 2018, CVWD provided 23,139 acft of nonpotable water (which includes 9,847 acft of recycled water) to golf courses in the mid-valley area. Meeting 88% of their demand.





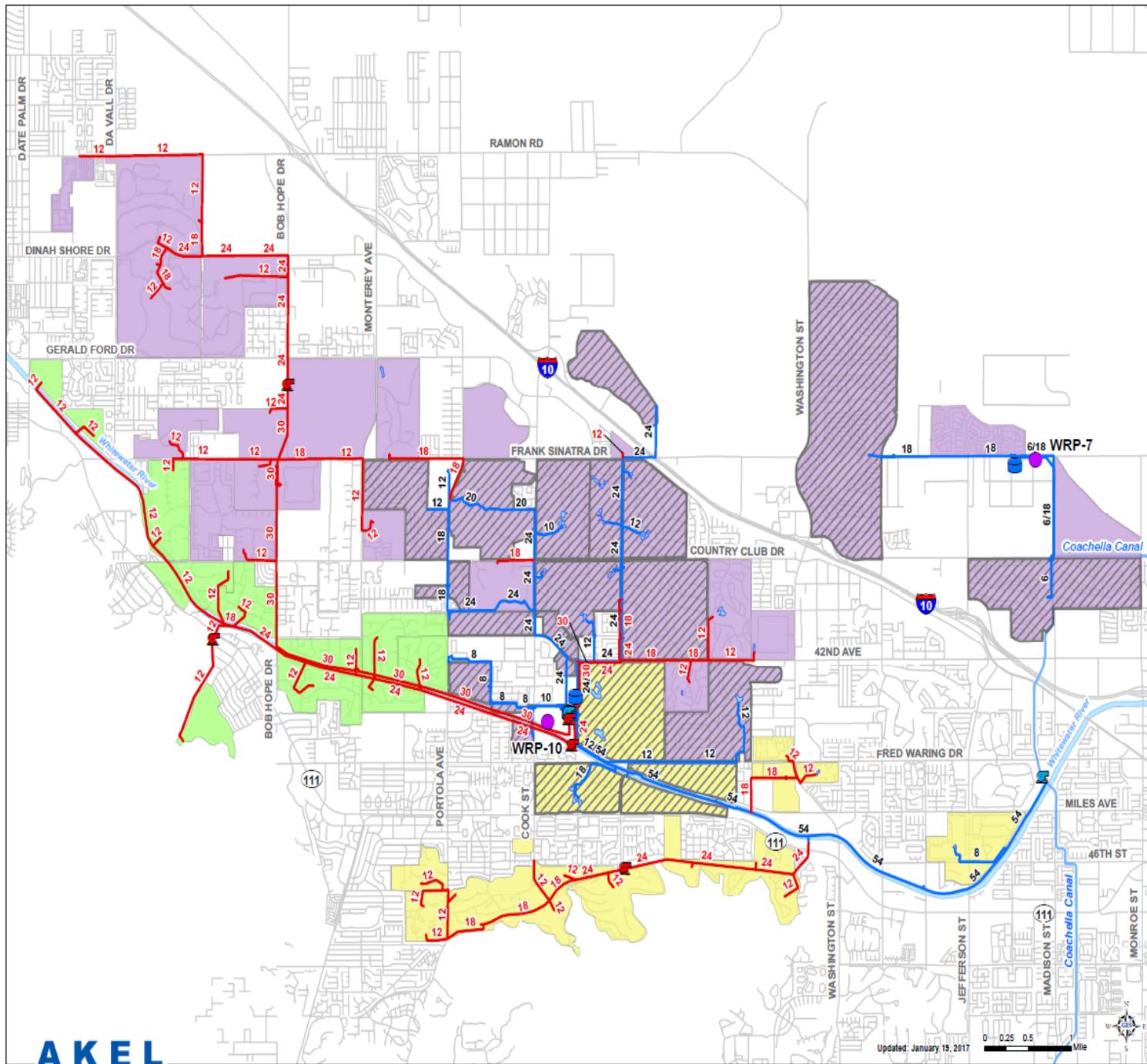
Nonpotable Water use in Mid-Valley

| Year | total |
|------|---------|
| 2000 | 8831.9 |
| 2001 | 8565.2 |
| 2002 | 8299.4 |
| 2003 | 6844.2 |
| 2004 | 8208.9 |
| 2005 | 8109.3 |
| 2006 | 9342.7 |
| 2007 | 10127.0 |
| 2008 | 9750.2 |
| 2009 | 11162.6 |
| 2010 | 11915.5 |
| 2011 | 12281.2 |
| 2012 | 12756 |
| 2013 | 13385 |
| 2014 | 14602 |
| 2015 | 16876 |
| 2016 | 19796 |
| 2017 | 20516 |
| 2018 | 23139 |



New Connections

| | |
|------|---|
| 1968 | Palm Desert Country Club |
| 1987 | Santa Rosa, Palm Desert Greens, Portola CC |
| | Golf Center, Marriott Desert Springs, Vista Del Montanas, Silver Sands, Casa Blanca |
| 1991 | |
| 1992 | West Coast Turf |
| 1993 | Sunrise |
| 1994 | Indian Ridge CC |
| 1996 | Palm Desert High School |
| 1997 | Sun City Palm Desert, Desert Willow |
| 1998 | Mountain View Falls |
| 2006 | Toscana, Shadow Hills |
| 2012 | CVWD's PDA & PDO, Indian Wells Golf Resort |
| 2014 | Classic Club, Palm Desert CC (remaining) |
| 2016 | Desert Horizons, Lakes CC, Avondale |
| 2017 | Desert Falls, Palm Valley Country Club, |
| 2018 | Indian Springs |



Legend

Future Improvements

- Pump Stations
- Non-Potable Pipelines

Future Users by Source

- Blended Water
- MVP
- MVP Extension

Existing System

- Water Reclamation Plant
- Bladder Reservoirs
- Pump Stations
- Non-Potable Pipelines

Existing Users by Source

- Blended Water
- MVP
- Street Centerlines
- Coachella Canal
- Whitewater River

PRELIMINARY

Figure 3
Existing and Future System
by Source
 Non-Potable Water System
 Master Plan
 Coachella Valley Water District

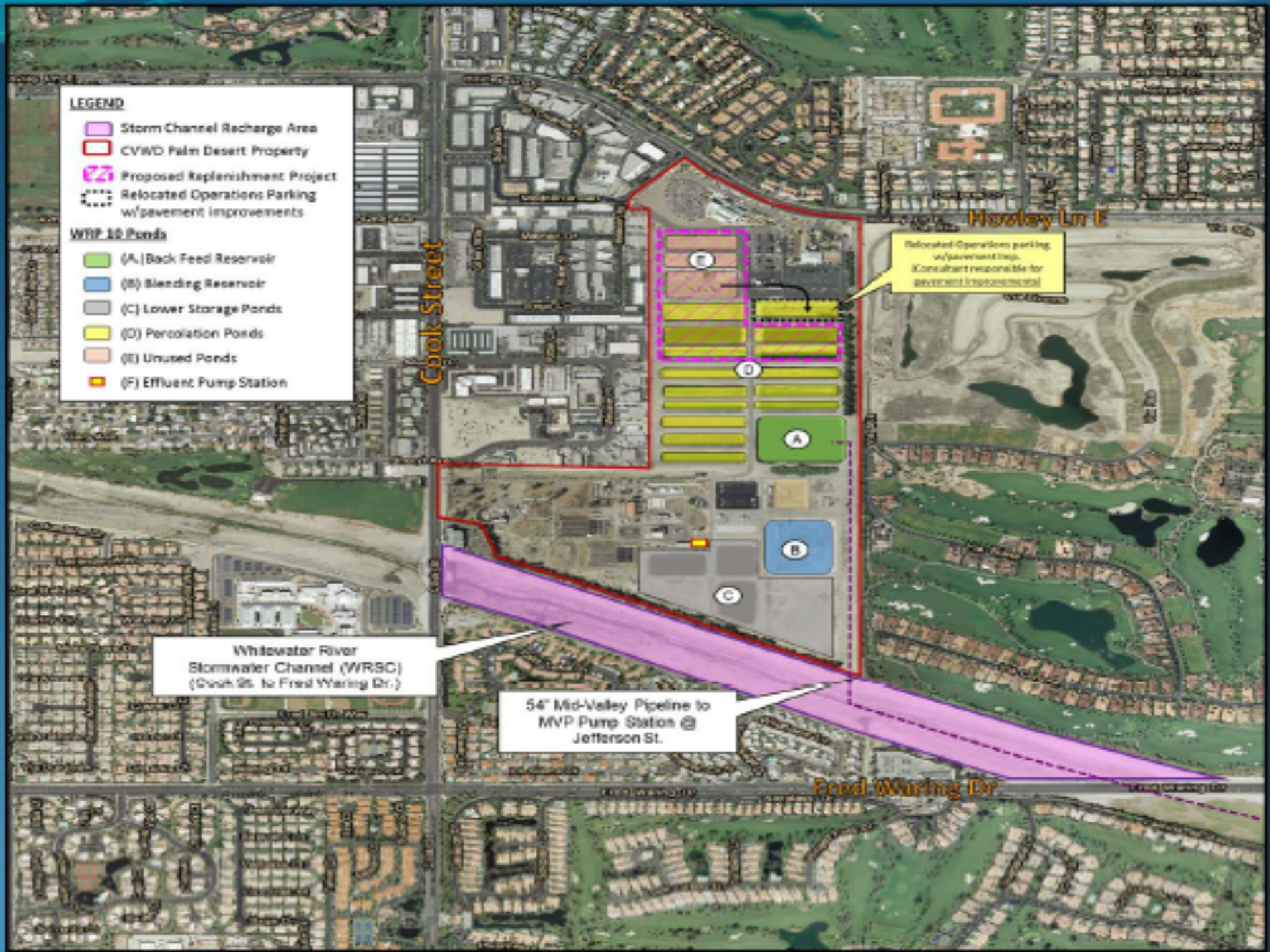


LEGEND

- Storm Channel Recharge Area
- CVWD Palm Desert Property
- Proposed Replenishment Project
- Relocated Operations Parking w/pavement improvements

WRP 10 Ponds

- (A) Back Feed Reservoir
- (B) Blending Reservoir
- (C) Lower Storage Ponds
- (D) Percolation Ponds
- (E) Unused Ponds
- (F) Effluent Pump Station



Whitewater River
Stormwater Channel (WRSC)
(Cook St. to Fred Waring Dr.)

54" Mid-Valley Pipeline to
MVP Pump Station @
Jefferson St.

Relocated Operations parking
w/pavement imp.
Consultant responsible for
pavement improvements

Fred Waring Dr

NPW Connections



Why would a golf course connect?

- There is no fiscal impact to irrigate with nonpotable water.
- Rate is equal to or less than their alternative water source. $(RAC + PC) \cdot 0.85 = NPWC$
- Cost difference is meant to go towards purple pipe and signs, water and soil amendments, sprinkler heads, lake management, etc.
- Nutrients serve as fertilizer.
- To be in line with the CVWM



Golf courses using nonpotable water will allow potable water to be available for potable uses.

Estimated annual use of water is 1000 acft / year per golf course

$$1000 \text{ AFY} \times 121 \text{ golf courses} = 121,000 \text{ AFY}$$

30.5 golf courses in the east valley have access to canal water and 5 are focused on for future canal water use.

$$1000 \text{ AFY} \times (30.5 \text{ golf courses} + 5 \text{ golf courses}) = 35,500 \text{ AFY}$$

23.5 golf courses in the mid-valley use nonpotable water.

$$1000 \text{ AFY} \times 23.5 \text{ golf courses} = 23,500 \text{ AFY}$$

6 golf courses in upper valley (DWA) use recycled water.

$$1000 \text{ AFY} \times 6 \text{ golf courses} = 6,000 \text{ AFY}$$

The future Mid-Valley Pipeline Project, includes 34 golf courses in mid-valley to use recycled/ canal water blend

$$1000 \text{ AFY} \times 34 \text{ golf courses} = 34,000 \text{ AFY}$$

$$121,000 \text{ AFY} - 35,500 \text{ AFY} - 23,500 \text{ AFY} - 6,000 \text{ AFY} - 34,000 \text{ AFY} = 22,000 \text{ AFY}$$

When NPW build out is complete...

| | |
|-------------------------------------|------|
| Canal via Canal distribution system | 35.5 |
|-------------------------------------|------|

| | |
|-------------------------------|----|
| Canal via Mid Valley Pipeline | 23 |
|-------------------------------|----|

| | |
|----------------------|------|
| Recycled Water/canal | 34.5 |
|----------------------|------|

| | |
|---|----|
| Not planned for an Alternate Water Supply | 13 |
|---|----|

| | |
|---------------------|-----|
| Total Golf Courses: | 106 |
|---------------------|-----|

| | |
|--------------------------|----|
| Nonpotable Water Source: | 93 |
|--------------------------|----|

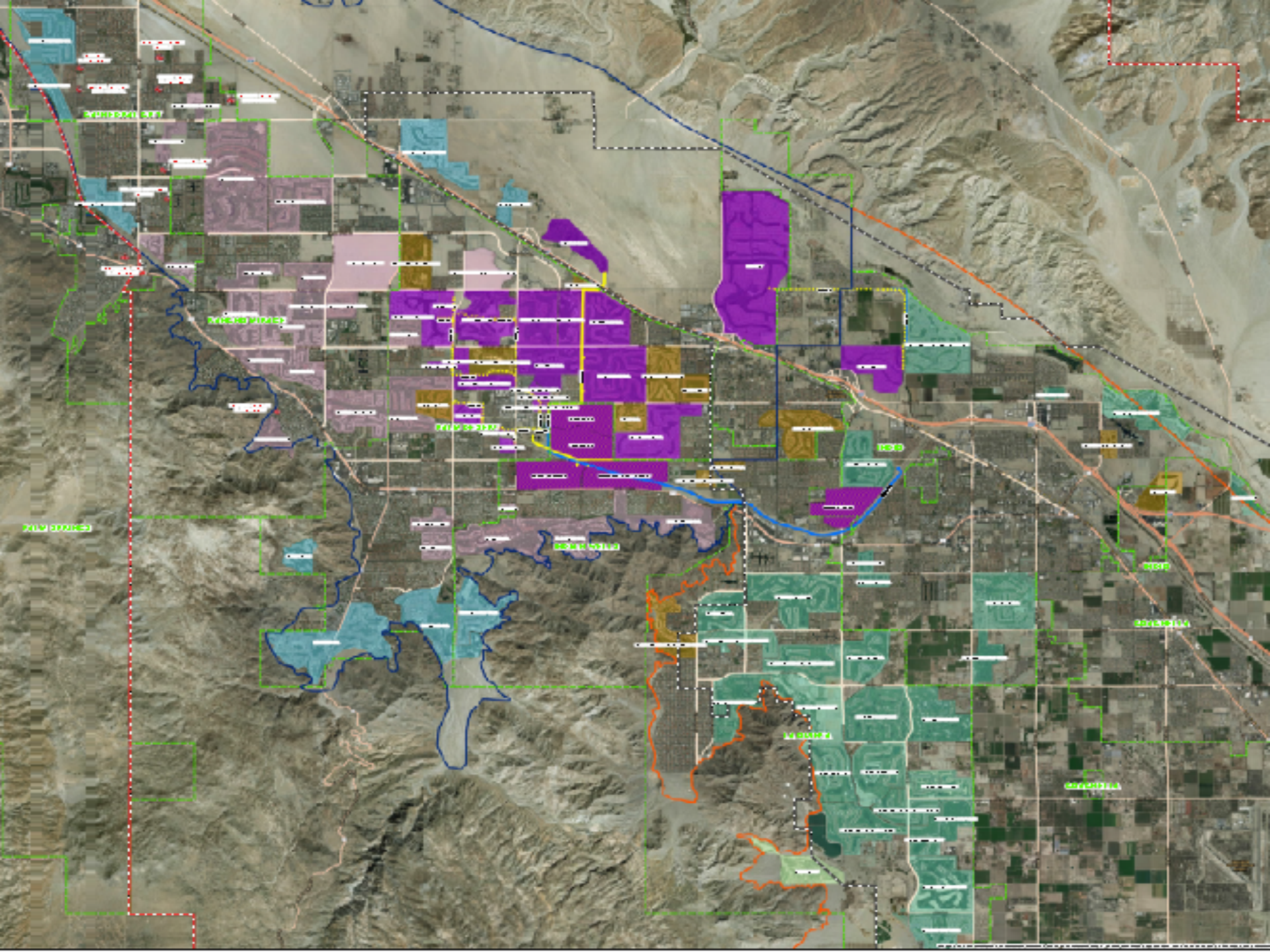
| | |
|---|-----|
| Per Cent Using Nonpotable Water Source: | 88% |
|---|-----|



Recycled Water
Program

Thank you
Olivia Bennett

Nonpotable Water Operations Manager



Recycled Water Quality Across California (in ppm)

| | CVWD Coachella Valley | MNWD Orange Co | SFPUD San Francisco | LADWP Los Angeles | OMWD San Diego County |
|-------------|--------------------------|-------------------|------------------------|----------------------|--------------------------|
| Chloride | 85 | 226 | 55 | 43 | 381 |
| Sodium | 81 | 190 | 68 | 91 | 231 |
| Calcium | 48 | 140 | 21 | 58 | 67 |
| Magnesium | 9 | 60 | 8 | 26 | 35 |
| Nitrogen | ≤15 | 42 | NR | 7 | 11 |
| Bicarbonate | 130 | 195 | 216 | 196 | 172 |
| EC | 0.70 | 1.8 | 0.7 | 0.9 | 1.5 |
| TDS | 445 | 1140 | 462 | 610 | 979 |
| SAR | 4.5 | 6.0 | 3.2 | 2.5 | 5.7 |

Relationship between TDS / EC: 640 PPM = 1.0 dS/m

Quality Range of Coachella Valley Irrigation Sources in PPM

| | Groundwater | Canal | Recycled Water |
|---------------------------------|-------------|---------|----------------|
| Chloride (Cl) | 8-203 | 110-120 | 84-110 |
| Sodium (Na) | 22-124 | 110-130 | 70-87 |
| Calcium (Ca) | 47-87 | 80-90 | 36-58 |
| Magnesium (Mg) | 23-197 | 29-33 | 9-12 |
| Nitrogen (N) | 0-27 | <2 | 8-22 |
| Phosphorous (P) | NA | 0 | <3 |
| Potassium (K) | NA | 3-7 | 10-20 |
| Bicarbonate (HCO ₃) | 34-172 | 170-188 | 83-150 |
| EC (dS/m) | 0.1 - 1.43 | 1.1-1.2 | 0.66-0.80 |
| TDS (PPM) | 120-915 | 690-830 | 420-480 |
| SAR | 1.3-5.2 | 2.9-6.4 | 4.1-5.1 |