Imperial Irrigation District

2016 Water Conservation Plan

Imperial Irrigation District
Water Resources Section

September 2018

IID's 2016 Water Conservation Plan is intended to document calendar years 2010 – 2014. Since this document was finalized in 2018, certain operating conditions, programs and policies reflected herein may have been modified, replaced, or rescinded and revised information for years 2015 – 2019 will be reflected in the 2021 update to IID's Water Conservation Plan.

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History

Imperial Irrigation District's rights to appropriate Colorado River water are long-standing. Beginning in 1885, a number of individuals, as well as the California Development Company, made a series of appropriations of Colorado River water under California law for use in the Imperial Valley. Pursuant to then-existing California laws, these appropriations were initiated by the posting of public notices for approximately 7 million acre-feet per year at the point of diversion and recording such notices in the office of the county recorder. The individual appropriations were subsequently assigned to the CDC, whose entire assets, including its water rights, were later bought by the Southern Pacific Company.

IID's predecessor water right holders made reasonable progress in putting their pre-1914 appropriative water rights to beneficial use. CDC first delivered Colorado River water on May 14, 1901. The first delivery of water to the United States occurred in June 1901, a year prior to the approval of the Reclamation Act in June 1902, to Calexico through the Boundary Canal. Some 1500 acres were put under crops in the fall of that year (Dowd, 1956, p 17-18).

By a decisive favorable vote at an election held on July 14, 1911, the people of the valley organized the IID. The vote was made effective by resolution of the Board of Supervisors of Imperial County on July 24, 1911. The district, which was organized under the California Irrigation District Act for the purpose of acquiring the rights and properties of the CDC and its two Mexican companies, included 513,368 acres within its boundaries (Dowd, 1956, p 49). On June 22, 1916, the Southern Pacific Company conveyed all of its water rights to IID.

By 1922, IID acquired 13 mutual water companies that developed and operated the distribution canals. In 1928, the Boulder Canyon Project Act authorized construction of Imperial Dam and the All-American Canal; and in 1942, the AAC became the only water source for Imperial Valley. The canal is approximately 80 miles long and delivers water from Imperial Dam on the Colorado River west to the agricultural fields, communities and industries of the Imperial Valley. By 1929, water was being delivered to 424,145 acres out of the Imperial Valley's approximately one million irrigable acres. **TABLE 1** provides IID formation details. For more on IID's history, visit the IID website.

Table 1. ***District History and Size***

	Formation Details
California Development Company	First delivery – June 1901
Imperial Irrigation District	July 24, 1911
Source of Water	Colorado River
Acreage at Formation	513,368 AC (IID)

Source: Dowd, 1956, p 49

Governance

IID is governed by a five-member Board of Directors. Directors serve a staggered four-year term. Critical functions of the IID are 1) diversion and delivery of Colorado River water, 2) operation and maintenance of the drainage canals and facilities; and 3) generation and distribution of electricity.

Historically elected by vote of all qualified voters, each member represented a separate geographical division of the district. However, in the November 2015 general elections, voters adopted a measure to require that IID conduct future elections for board members by division, with each board member being elected from the division in which he or she resides by the voters of that division.

On September 24, 2015, the board held a public workshop for the purpose of reviewing proposed new division boundaries that would affect election of IID directors starting in 2016. On November 17, 2015, the board approved new division boundaries that were applied to the demographics of the IID water service area to arrive at a model of legally compliant divisions.

Location

IID is located in Imperial County in southeastern California. The district is bounded to the south by Mexico. The East Highline and Westside Main canals generally form the two sides of the water service area while the Central Main runs up the middle. To the north is the Salton Sea, into which all drainage from the IID water service area flows. IID delivers water to a few users in the East Mesa via the Coachella Canal.

FIGURE 1 shows location and boundaries of the California Colorado contractors, in relation to the Lower Colorado River. The IID boundary shown in this figure includes the Imperial, West Mesa, East Mesa, and Pilot Knob units. For additional district location and other maps, see Water Service Maps.

Figure 1. ***IID and Other California Colorado River Contractor Boundaries***

Size

IID diverts water from the Colorado River, which it delivers to over 520,000 acres within its water service area. In 2014, around 95.5 percent of the delivered water was used for agricultural purposes on nearly 475,000 irrigated acres, making possible Imperial County's ranking as one of the top ten agricultural regions nationwide. The remaining 4.5 percent was delivered for municipal, commercial and industrial use, including rural homes and businesses, and some environmental and recreational uses.[1]

In 2014, growers planted over 320,000 acres in field crops, 101,000 acres in vegetable crops and 20,000 acres in permanent crops, for a total of 442,623 acres; of these, 37,447 acres were double-cropped, for 405,176 net acres in crops; while 70 acres were being leached, for net irrigated acreage of 405,246 acres. With over 69,000 acres fallowed or not farmed, total irrigated acreage was 474,259 acres.

Table 2. District Size and Crop Census (AC), 1994, 2004, 2014

	1994	2004	2014
Field Crops	418,749	390,999	320,662
Garden Crops	98,714	91,078	101,537
Permanent Crops	22,204	19,962	20,424
Total acres of crops	**539,667**	**502,039**	**442,623**
Total Multiple Cropped Area	83,627	66,436	37,447
Total net acres in crops	**456,040**	**435,603**	**405,176**
Area Being Reclaimed: Leached	2,860	169	70
Net acres irrigated	**458,900**	**435,772**	**405,246**
IID Fallowing Program (12-Month Average)	0	11,827	46,453
IID Solar Fallowing (12-Month Average)	0	0	6,912
Area Farmable but Not Farmed During Year	21,441	27,912	15,648
Total area farmable	**480,341**	**475,511**	**474,259**
Farm Area in Homes, Feed Lots, Corrals, Experimental Farms & Industrial Area	16,124	16,821	15,485
Area in Cities, Towns, Airports, Cemeteries, Fairgrounds, Golf Courses, Recreational, Parks, Lakes & Rural Schools	25,307	28,331	30,563
Total area receiving water	**521,772**	**520,663**	**520,307**
Area in Drains, Canals, Reservoirs, Rivers, Railroads & Roads	73,237	74,346	74,742
Area below -230 MSL Salton Sea Reserve Boundary Minus Area Receiving Water	40,150	40,150	40,150
Area in Imperial Unit Not Entitled To Water	63,933	63,933	63,893
Undeveloped Area: Imperial, E & W Mesa, Pilot Knob Units	277,629	277,629	277,629
Total acreage included – all units	**976,721**	**976,721**	**976,721**
Acreage within District Boundary Not Included in Units	84,916	84,916	84,916
Total gross acreage within district boundaries.	**1,061,637**	**1,061,637**	**1,061,637**

Source: 1992-1994 Annual Inventory of Area Receiving Water, 2002-2004 Annual Inventor of Area Receiving Water and 2012-2014 Annual Inventory of Area Receiving Water. Fallowing acres represent 12-month averages.

No change to the size of the district's water service area is anticipated. Farm operations remain stable while population and industrial activity are increasing as projected. An increase could require additional water resources if California's use of Colorado River water is limited to its legal entitlement.

[1] IID's water service area encompasses seven cities (Brawley, Calexico, El Centro, City of Imperial, Holtville, Westmorland, and Calipatria), three census-designated places (Niland, Seeley, and Heber), two state prisons (Calipatria and Centinela) and Naval Air Station El Centro. Each city operates its own water treatment plant: Niland, Calipatria, and Calipatria State Prison are served by Golden State Water Company, Heber by the Heber PUD, and Seeley the Seeley County Water Department.

Topography

District elevation at the Mexican border, which forms the southern edge of IID's water service area, is sea level. The northern edge of IID's water service area abuts the south rim of the Salton Sea, which on December 31, 2014, was 232.48 feet below mean sea level at IID's Fig Tree John 2 measurement site which is located off a pier at the end of Desert Shores Drive in Thermal, California.

The relatively flat topography of the IID water service area and surrounding areas, in conjunction with strong night and day temp differentials, particularly in the summer, produce moderate (10 mph) to strong (above 35 mph) winds and deep thermal circulation systems, which facilitate general dispersion of air and impact water use. The flat topography makes drainage difficult in some areas, see **TABLE 3**.

Table 3. Topography Impacts

Topography Characteristic	Impact on Water Operations
Nearly level, 0% to 2% gradient	Difficult to drain in some areas

Soils

Soils in the Imperial Valley consist of layers deposited over centuries by the Colorado River. The soils are formed in two principle landscapes. One is the lower Colorado River flood plain, the other the dry basin of old Lake Cahuilla. The other is the nearly level to gently sloping plain of the Imperial East and West mesas, which lie above the shoreline of the old lake.

The valley is a large bowl filled with a conglomerate of elements transported by Colorado River flood waters, with soils up to a full mile or more deep. Imperial Valley soil is naturally salty. As river floods left alluvial soils, they also left salt. Saline soils are often recognized by a white crust on the surface.

Beneath the surface is a maze of passages of aquifers and aquicludes of clay barriers and sand lenses. In general, there is no gravel and sand water-bearing stratum. Stratum of any one type of soil does not extend over a large area, but occurs more as a lens or pocket. For soil characteristics, see **TABLE 4**.

Table 4. Soil Characteristics

Soil Characteristic		Impact on Water Operations
Heavy Soils	**% of IID**	**Heavy Soils**
Imperial Silty Clay	44	Limit need for & economic feasibility of canal lining; canals silt up; fields require extensive surface and subsurface drainage
Glenbar Clay Loam	15	
Holtville Silty Clay	15	
Total Percent Heavy Soils	**74**	
Lighter Soils	**% of IID**	**Lighter Soils**
Indio Loam	6	Lining and/or seepage recovery (pumping) are economically feasible; higher seepage
Meloland Fine Sand	8	
Niland & Rositas Sand	4	
Antho Loamy Fine Sand	8	
Total Percent Lighter Soils	**26**	

For details and soils maps, visit Web Soil Survey (WSS) operated by the USDA Natural Resources Conservation Service.

Natural Environment

The IID water service area is located in the Sonoran Desert of southeastern California. Several vegetative/habitat types occur within and adjacent to the IID water service area.

Agricultural Area

The IID water service area is an important food producing area and a valuable wildlife habitat. During the winter migration, a significant portion of the entire population of the rare mountain plover relies on heavily grazed pasture or recently burned Bermuda grass in the IID water service area. It is believed that 70 percent of the burrowing owl population in California resides in the Imperial Valley. These owls live in burrows in the ground, usually along drain or irrigation ditches.

Mourning and white-winged dove, pheasant, ducks and geese all use agricultural fields and provide opportunities for sportsmen. White faced ibises, snowy and cattle egrets, stilts, sandhill cranes, meadowlarks, roadrunners, and many other birds are easily seen in agricultural fields. A number of terrestrial wildlife species also occupy the agricultural areas. Raccoons, skunks, snakes, coyotes and foxes are all common occupants of agricultural areas and the associated irrigation infrastructure.

Creosote Desert Scrub

This is the dominant natural vegetative/habitat type found in the IID water service area. This type is characterized by creosote bush, brittle brush, ocotillo and burrobrush interspersed with periodically flowing desert washes or arroyos. Inside these microphyll woodland washes, mesquite, smoke tree, ironwood, palo verde and cat claw acacia are common plant species.

Riparian/Marsh Areas

The IID water service area is dissected by the New and Alamo Rivers, which function primarily as agricultural drains. Common plant species in this vegetative community include arrow-weed, mesquite, cottonwood, salt-cedar, cattails, bulrush and phragmites. Some animals found in riparian areas include beaver, muskrat, and a wide variety of marsh birds and other waterfowl.

Salton Sea

The present-day Salton Sea is approximately 35 miles long and 15 miles wide, located in the lowest portion of the Salton Trough in Imperial and Riverside counties. The sea is a non-draining body of water – making it a sea and not a lake – sustained primarily by agricultural return flow water from the Imperial, Coachella and Mexicali valleys. The sea is relatively shallow with water depths of one to three feet extending thousands of feet from the shoreline. The deepest areas in the sea are less than 50 feet deep and are located in the north and south central portions of the sea.

History

The sea is located below mean sea level in the Sonoran Desert in an area known as the Salton Sink or Salton Trough. The Salton Trough was once an extension of the Gulf of California; however, over millions of years the Colorado River deposited large amounts of silt into the area filling much of the trough and forming a large river delta to the south of the present Salton Sea. Over the following thousands of years, the Colorado River periodically flowed into and out of the valley, resulting in cycles of freshwater lake, increasingly saline lake, sea and dry basin. Evidence of Lake Cahuilla, created by the last large-scale flooding of the valley, can be seen in its shoreline remnants along the lower edges of the mountains to the northwest of Desert Shores. For over a thousand years the area has been mostly dry, although occasional inflows did occur and portions of the sink area were periodically inundated or wet. Some historical evidence suggests the area was at least partially flooded as recently as the 1600s. Construction

of dams and reservoirs on the lower Colorado River now regulate the flows on the river, making another Lake Cahuilla an unlikely prospect.

The existing sea was formed in 1905 when the Colorado River breached an irrigation inlet and flowed unchecked into the area. In the spring of 1907 the channel breach was finally closed leaving an approximately 316,000 acre sea that had a water elevation of approximately 197 feet below mean sea level.[2] With the high evaporation rates in the region the sea shrank to approximately 165,000 acres by 1920 with an elevation of approximately 250 feet below mean sea level. As agricultural production increased in the Imperial, Coachella and Mexicali valleys the water level rose to around 230 feet below mean sea level. In response to the increasing elevations IID built a series of retaining berms around the southern end of the sea to prevent additional flooding of adjacent farm land. In the late 1990s, water levels began to drop in response to lower inflows and decreasing annual rainfall. Recent elevations and approximate surface area of the sea are provided in **TABLE 5** and **FIGURE 2**.

Table 5. Salton Sea Surface Elevation (FT) and Area Estimate (SQ MI, AC), 2013-2015

Date	Sea Elevation (Ft, NGVD 29)[3]	Sea Elevation (Ft, NAVD 88)[4]	Sea Surface Area (Square Miles)	Sea Surface Area (Acres)
12/31/2013	-232.9	-230.8	346.02	221,453
12/31/2014	-234.0	-231.9	341.03	218,259
12/31/2015	-234.9	-232.8	339.65	217,376

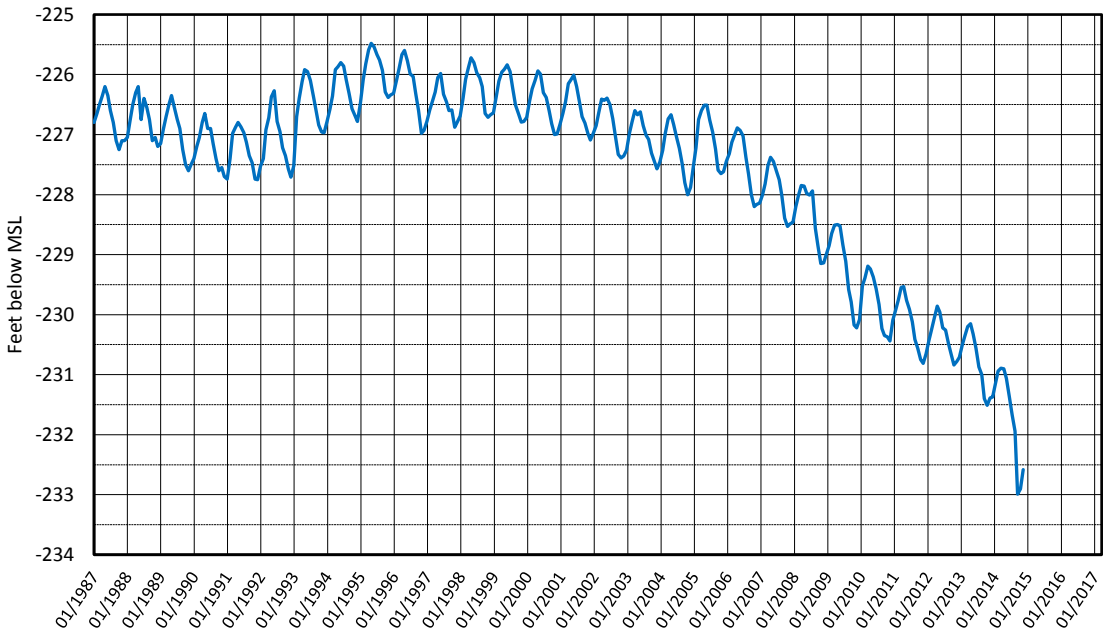

Figure 2.*Salton Sea Elevation, 1987-2015*

Salton Sea Challenges

In the 1980s and 1990s inflows to the sea ranged from 1.2 to 1.3 million acre-feet per year, with the majority from IID agricultural return flows augmented with inflows from Mexico and other sources. As

[2] Salton Sea State Recreation Area, California Department of Parks and Recreation, Accessed December 8, 2016.

[3] NGVD 29, the National Geodetic Vertical Datum of 1929 control datum established for vertical control surveying in the United States by the General Adjustment of 1929 was used to measure elevation above and depth below mean sea level (MSL).

[4] NAVD 88, the North American Vertical Datum of 1988 vertical control datum established for vertical control surveying in the United States based upon the General Adjustment of the North American Datum of 1988, replaced NGVD 29.

farmers became more efficient irrigators the return flows decreased, as have inflows from Mexico. Hydrologic projections suggest that after 2020, the sea will receive approximately 700,000 to 800,000 acre-feet of inflow annually; the result will be a sea that is approximately the same size as the sea in 1920 at 162,000 acres with an elevation of 254 feet below mean sea level.

Should this occur, upwards of 70,000 acres of previously inundated seabed (playa) will be exposed over the next 10 years. While the exact composition of the playa soils are unknown, current data suggests that the soils are highly saline and may be a source of particulate matter that will become airborne in windy conditions that could further deteriorate the compromised air quality in the Imperial and Coachella valleys.

While the decreased elevation and exposed playa are a risk to human and wildlife health, the level of salinity in the sea is of more concern to maintaining its wildlife ecosystem. As a terminal waterbody, the Salton Sea has no outlet to purge accumulated salts and nutrients and over the years since its formation, the water has become increasingly saline. Present day salinity concentrations are significantly higher than ocean water. With agricultural-to-urban water conservation and transfer programs further reducing inflows, the salinity concentration will continue to increase, accelerating significant changes to the sea's ecosystem.

The sea is also very high in nutrients. The high nutrient levels make for a very productive ecosystem, but also contribute to the deteriorating water quality of the sea. High nutrients contribute to large-scale algae blooms, high biological oxygen demand and ultimately lead to lower levels of dissolved oxygen in the water column. Coupling these conditions with the increase in salinity poses a significant stress on the existing ecosystem. Several fish die-offs and scattered avian mortality events have occurred at the sea. The fish population in the sea is primarily a Mozambique tilapia variant, a sub-tropical fresh water fish that is unlikely to survive the increasing salinity. With the projected decline in the fishery, so go the migratory and permanent piscivorous bird populations.

Despite deteriorating conditions at the sea, it remains a vital link on the Pacific Flyway, supporting over 400 species of birds and a myriad of invertebrates. The sea and surrounding brackish to fresh water habitat also support several federally or state listed endangered species, including the Ridgeway rail, the desert pupfish and the California black rail. With the loss of the majority of the aquatic habitat along this portion of the Pacific Flyway, preserving the sea is of critical importance.

Sand Dunes

The Imperial/Algodones Sand Dunes, a unique feature covering an area more than 40 by 5 miles, is the largest mass of sand dunes in California and the most popular recreational off road destination in the United States. Plant species found in the dunes include wiggin's croton, algodones dunes sunflower, giant spanish needle and pierson's milk-vetch. Common animals found in the desert include desert mule deer, desert and peninsular bighorn sheep, desert tortoise, bobcat, mountain lion and many kinds of birds and reptiles

Cultural Resources

No significant historic cultural resources are located within the IID water service area.

Climate

IID is located in the Northern Sonoran Desert, which has a subtropical desert climate with hot, dry summers and mostly mild winters. The 100-year average rainfall is 3 inches per year, most of which occurs from November through March. However, summer storms can be significant in some years. Clear and sunny conditions typically prevail, and frost is rare. The region receives 85 to 90 percent of possible sunshine each year, the highest value in the United States. Winter temperatures are mild, but summer temperatures are very hot, with more than 100 days over 100 degrees Fahrenheit (°F) each year.[5] Climate characteristics and area wide precipitation are provided in **TABLE 6** and **TABLE 7**.

Table 6. Climate Characteristics Imperial, CA 100-Year Record, 1915-2014

Climate Characteristic	Annual Value
Average Precipitation (100-year record, 1915-2014)	3.00 inches (In)
Minimum Temperature, Jan 1937	16 °F
Maximum Temperature, July 1995	121 °F
Average Minimum Temperature, 1915-2014	47.8 °F
Average Maximum Temperature, 1915-2014	98.2 °F
Average Temperature, 1915-2014	72.8 °F

Source: IID Imperial Headquarters Station Record

Table 7. IID Area Wide Annual Precipitation (IN), 1990-2014

1990	1991	1992	1993	1994	1995	1996
1.646	3.347	4.939	2.784	1.775	1.251	0.685
1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
1.328	2.604	1.399	0.612	0.516	0.266	2.402
2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
4.116	4.140	0.410	1.331	1.301	0.619	3.907
2011	**2012**	**2013**	**2014**			
2.261	2.752	2.772	1.103			

Computation based on polygon average of CIMIS and IID data as they came online in the WIS.[6]
Source: IID WIS

Notable from **TABLE 9** and **TABLE 8** is that while average annual rainfall measured at IID Headquarters in Imperial, CA, has been decreasing, monthly average temperatures are remarkably consistent.

Table 8. Monthly Mean Rainfall (IN) Imperial, CA 10-Year, 30-Year & 100-Year, 2005-2014, 1995-2014, 1915-2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
10-year	0.47	0.36	0.15	0.03	0.00	0.00	0.21	0.38	0.17	0.21	0.24	0.34	2.54
30-year	0.44	0.44	0.26	0.06	0.04	0.00	0.13	0.23	0.26	0.30	0.23	0.34	2.67
100-year	0.42	0.38	0.26	0.11	0.02	0.00	0.12	0.35	0.37	0.26	0.21	0.50	3.00

Source: IID Imperial Headquarters Station Record

[5] CDWR, CWP Update 2013, Volume 2, Colorado River Hydrologic Region, pp CR32-CR33, modified by IID 2014 record.

[6] From 1/1/1990-3/23/2004, three CIMIS stations: Seeley, Calipatria/Mulberry, Meloland. From 3/24/2004-7/5/2009, four CIMIS stations: added Westmorland North. From 7/6/2009-12/1/2009, three CIMIS stations: Westmorland North offline. From 12/2/2009-2/31/2009, four CIMIS stations, Westmorland North back online. From 1/1/2010-9/20/2010, four CIMIS and four IID stations; and from 9/21/2010-present four CIMIS and three IID stations: Calexico station was decommissioned, last data was 09/20/2010.

Table 9. Monthly Mean Temperature (°F) Imperial, CA 10-Year, 30-Year & 100-Year, 2005-2014, 1995-2014, 1915-2014

	Jan			Feb			Mar			Apr		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
10-year	81	31	56	84	36	59	94	40	66	99	45	71
30-year	80	33	56	84	36	60	92	41	65	100	47	71
100-year	80	31	55	84	35	59	91	40	64	98	45	71
	May			Jun			Jul			Aug		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
10-year	107	54	79	113	60	86	115	68	92	114	67	91
30-year	105	54	79	112	60	86	114	68	92	113	69	92
100-year	105	52	78	112	59	86	114	68	92	113	67	91
	Sep			Oct			Nov			Dec		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
10-year	107	54	79	84	36	59	94	40	66	99	45	71
30-year	105	54	79	84	36	60	92	41	65	100	47	71
100-year	105	52	78	84	35	59	91	40	64	98	45	71

Source: IID Imperial Headquarters Station Record

Water Entitlement and Supply

IID's extensive rights to the use of Colorado River water are based on historic state law appropriations.[7] In 1932 IID entered into a contract with the Secretary of the Interior to receive an annual entitlement to 3.85 million acre-feet (MAF) of water minus priorities one (Palo Verde Irrigation District) and two (Yuma Project) – as outlined in the 1931 California Seven-Party Agreement.

IID's Present Perfected Right to use of Colorado River consists of an annual diversion of 2.6 MAF from the mainstream or the quantity of mainstream water necessary to supply the consumptive use required for irrigation of 424,145 acres and the satisfaction of related uses, whichever is less, with a priority date of 1901. Additional determinations related to IID's PPR to use of Colorado River water include Section 6 of the Boulder Canyon Project Act of 1928; Article VI of the 1964 Supreme Court decree in Arizona v. California and the 1979 supplemental decree.

With completion of a large portion of the Central Arizona Project infrastructure in 1994, creation of the Arizona Water Banking Authority in 1996, and growth of Las Vegas in the 1990s, California encountered increasing pressure to live within its annual Priority 1-4 rights of 4.4 MAF under the Law of the River. After years of negotiating among Colorado River Compact States and affected California water delivery agencies, the Quantification Settlement Agreement and Related Agreements and associated documents were signed by the Secretary of Interior, IID, CVWD, Metropolitan Water District of Southern California, San Diego County Water Authority and other affected parties on October 10, 2003, enacting the nation's largest agriculture-to-urban water conservation and transfer program.

With execution of the QSA, IID's Priority 3(a) annual consumptive use was capped at 3.1 MAF for the 45-year term of the IID/SDCWA transfer agreement, with possible extension for an additional 30 years. Apportionment of Colorado River water to California signatories is documented in the Colorado River Water Delivery Agreement: Federal QSA (CRWDA) for purposes of Section 5(b) Interim Surplus Guidelines. The Secretary of the Interior, et al. adopted the Inadvertent Overrun Payback Policy

[7] IID holds legal title to all its water and water rights in trust for landowners within the district: California Water Code §20529 and §22437; and Bryant v. Yellen, 447 U.S. 352, 371 (1980), fn. 23.

contemporaneously with the execution of the CRWDA. The IOPP provides additional flexibility to manage Colorado River water and applies to entitlement holders in the Lower Basin States.[8] The IOPP defines an inadvertent overrun as "Colorado River water [that is] diverted, pumped, or received by an entitlement holder of the Lower Division States that is in excess of the water users' entitlement for the year, and provides a structure to pay back overruns should an overrun occur.[9]

In summary, IID's federal water entitlement has two components: 1) the PPR, and 2) the remaining contract volume, up to the maximum amount under the 1932 Contract and the Seven Party Agreement – both grounded in state law prior appropriations, as limited by the QSA, see **TABLE 10**.

Table 10. IID Water Rights

Instrument	Extent of Right	Date
Present Perfected Right (IID Water Rights)	2.6 MAF diversion annually from mainstream of Colorado River or quantity of mainstream water. PPR was set at 2.6 MAF per year because that was the quantity being diverted and used on the 424,145 acres under irrigation. These vested rights are not subject to reclamation law limitations and in times of shortage, PPRs must be satisfied first.	1964 Supreme Court decree in CA v. AZ; preempts 1902 Reclamation Law
Contract with Interior Secretary	3.85 MAFY minus priorities one (PVID) and two (Yuma Project)	1932
California Seven-Party Agreement	Same as Contract with Interior Secretary	1931
Colorado River Water Delivery Agreement: Federal QSA for purposes of Section 5(B) of Interim Surplus Guidelines (CRWDA)	Except as otherwise determined under the IOPP in Sec. 9 of the Agreement, the Secretary shall deliver Priority 3(a) Colorado River water to IID in an amount up to but not more than a consumptive use amount of 3.1 MAFY less the volume to be delivered by the Secretary for the benefit of CVWD, MWD, SDCWA, SLR, and Indian and miscellaneous PPRs as set forth in Exhibits A and B. Colorado River water acquired by IID after the Agreement date, and where necessary approved by the Secretary, shall not count against this cap. When the Lake Mead water level elevation is projected to be 1125 feet or less on Jan 1, the IOPP requires that overruns be paid back in the subsequent calendar year to when an overrun is decreed rather than over three years as allowed under normal conditions. Under 1075 feet, the IOPP is suspended and additional overruns are prohibited.	2003, to terminate Dec 31, 2037, if 1998 IID/SDCWA water transfer program terminates that year; or Dec. 31, 2047, unless extended by all parties until Dec 31, 2077, in which case to terminate Dec. 31, 2077.

Source: The Law of the River and 2012 Imperial IRWMP, Chapter 5, Section 5.2
For QSA - Water Transfer and related material documents, visit IID website: Library Water Conservation

IID's only source of water is its Colorado River entitlement. There are no district operated water wells, no groundwater recharge areas, and no conjunctive use programs to augment the district's water supply due to lack of rainfall and poor quality of the area's limited groundwater resources. **TABLE 11** shows IID's water supply for 1994, 2004, and 2014.

Table 11. IID Water Supply for Imperial Valley and Salton Sea Mitigation Deliveries (AF), 1994, 2004, 2014

Water Source	1994	2004	2014
Diversion at Imperial Dam	3,048,076	2,743,909	2,496,428
Delivery from Brock Reservoir	n/a	n/a	148,367
Total IID Consumptive Use, Volume at Imperial Dam	3,048,076	2,743,909	2,533,414
Delivered for Salton Sea Mitigation for the SDCWA Transfer	n/a	14,359	89,168

[8] CRWDA: Federal QSA Section 9, p 8.

[9] Discussion of 2003 Inadvertent Overrun Payback Policy from the CRWDA Record of Decision, Oct 2003.

Source: USBR Water Accounting (Decree) reports, 1994, 2004, 2014, volumes at Imperial Dam; IID WIS record

TABLE 12 shows IID's CRWDA quantified entitlement and net consumptive use schedule.

Table 12. IID Annual Entitlement & Net Consumptive Use Schedule (KAF), 2003-2077

IID Quantification and Transfers, as of 2014 (KAF) [1]										
Col 1	2	3	4	5	6	7	8	9	10	11
	IID Priority 3(a)									
		IID Reductions								IID Net Available for Consumptive Use (Col 2 - 10)
Year	IID Quantified Amount	1988 MWD Transfer [2]	SDCWA Transfer	AAC Lining SDCWA, IID, SLR	Salton Sea Mitigation SDCWA Transfer [3]	Intra-Priority 3 CVWD Transfer	MWD Transfer w\ Salton Sea Restoration [4]	Misc. PPRs	IID Total Reduction (Σ Cols 3-9) [5]	
2003	3,100	105.1	10.0	0.0	0.0	0.0	0.0	11.5	126.6	2978.2
2004	3,100	101.9	20.0	0.0	15.0	0.0	0.0	11.5	148.4	2.743.9
2005	3,100	101.9	30.0	0.0	15.0	0.0	0.0	11.5	158.4	2756.8
2006	3,100	101.2	40.0	0.0	20.0	0.0	0.0	11.5	172.7	2909.7
2007	3,100	105.0	50.0	0.0	25.0	0.0	0.0	11.5	191.5	2872.7
2008	3,100	105.0	50.0	8.9	26.0	4.0	0.0	11.5	205.4	2825.1
2009	3,100	105.0	60.0	65.5	30.2	8.0	0.0	11.5	280.2	2566.7
2010	3,100	105.0	70.0	67.7	33.7	12.0	0.0	11.5	299.9	2545.6
2011	3,100	103.9	63.3	67.7	0.0	16.0	0.0	11.5	246.4	2915.8
2012	3,100	104.1	106.7	67.7	15.2	21.0	0.0	11.5	326.2	2,903.2
2013	3,100	105.0	100.0	67.7	71.4	26.0	0.0	11.5	381.6	2,554.9
2014	3,100	104.1	100.0	67.7	89.2	31.0	0.0	11.5	403.5	2,533.4
2015	3,100	107.8	100	67.7	110	36	0	11.5	530.2	2,569.8
2016	3,100	105	100	67.7	130	41	0	11.5	555.2	2,544.8
2017	3,100	105	100	67.7	150	45	0	11.5	570.2	2,529.8
2018	3,100	105	130	67.7	0	63	0	11.5	377.2	2,722.8
2019	3,100	105	160	67.7	0	68	0	11.5	412.2	2,687.8
2020	3,100	105	193	67.7	0	73	0	11.5	450.2	2,649.8
2021	3,100	105	205	67.7	0	78	0	11.5	467.2	2,632.8
2022	3,100	105	203	67.7	0	83	0	11.5	470.2	2,629.8
2023	3,100	105	200	67.7	0	88	0	11.5	472.2	2,627.8
2024	3,100	105	200	67.7	0	93	0	11.5	477.2	2,622.8
2025	3,100	105	200	67.7	0	98	0	11.5	482.2	2,617.8
2026	3,100	105	200	67.7	0	103	0	11.5	487.2	2,612.8
2027	3,100	105	200	67.7	0	103	0	11.5	487.2	2,612.8
2028	3,100	105	200	67.7	0	103	0	11.5	487.2	2,612.8
'29-37	3,100	105	200	67.7	0	103	0	11.5	487.2	2,612.8
'38-47	3,100	105	200	67.7	0	103	0	11.5	487.2	2,612.8
'48-77 [6]	3,100	105	200	67.7	0	50 [8]	0	11.5	484.2	2,665.8

1. Volume are at Imperial Dam. Volumes for 2003-2014 are adjusted for USBR Decree Accounting actual values. For 2003-2014, IID Net Available for Consumptive Use may not equal Col 2 minus Col 10 as not all IID are reported in this table.
2. Second Amendment to IID/MWD 1988 Approval Agreement starting in 2007 fixed MWD Transfer at 105 KAFY with reduction limited to minimum of 101.5 KAF under certain conditions. 2014 Letter for Substitution and Conservation Modifications to the IID/MWD Water Conservation Agreement effective 01/01/2016 total transfer will be 105 KAFY, except in 2015 is 107.82 KAF. IID Total Reduction & IID Net Available for Consumptive Use volumes for 2015-2077 are recalculated to reflect this change.
3. Conserved Salton Sea Mitigation volumes may vary based on year water was conservation and method of conservation.
4. Transfer water to MWD subject to satisfaction of certain conditions and appropriate federal approvals, may also be subject to state approvals. *This transfer is not likely given lack of progress on Salton Sea restoration as of 2014.*
5. Reductions include conservation for 1988 IID/MWD Transfer, IID/SDCWA Transfer, AAC Lining; SDCWA Transfer Mitigation, MWD Transfer w/Salton Sea Restoration (if any). Reduction for Misc. PPRs. is not required to be from conservation. Amounts are independent of increases and reductions as allowed under the IOPP.
6. Assumes SDCWA and IID mutually consent to renewal term of 30 years.
7. Modified from 100 KAFY shown in CRWDA Exhibit B as MWD will provide CVWD 50 KAFY of the 100 KAFY starting in year 46.

Notes: Substitute transfers can be made provided total volume of water to be transferred remains equal or greater than amounts shown consistent with applicable federal approvals. Shaded columns represent amounts that may vary.
Source: CRWDA Exhibit B, p 13, IID QSA Annual reports and USBR Water Accounting (Decree) reports

Table 13 shows IID's Colorado River water distribution for calendar years 2010-2014, from Imperial Dam (IID Station 60) to IID's eastern boundary (AAC Station 2900 u/s Mesa Lateral 5 Check, Adj.).

Table 13. Surface Water Supply (KAF), 2010-2014

Source	2010	2011	2012	2013	2014	CI [1]
IID Station 60 Diversion [2]	2,640.8	2,899.4	2,897.6	2,535.4	2,496.4	+2.3%
Measured Returns	106.4	98.2	121.2	101.9	111.4	+2.3%
Delivery from Brock Reservoir [3]	11.2	114.6	126.9	121.3	148.4	+2.3%
Total IID Consumptive Use [4]	**2,454.6**	**2,915.8**	**2,903.2**	**2,554.9**	**2,533.4**	+2.4%
Lower Colorado Water Supply Project (USBR) [8]	5.1	4.5	4.6	5.5	7.2	
Delivery to Farms above Station 2900 [5]	8.8	9.5	9.9	9.5	9.8	+3.0%
Station 60 to Station 1117 Fixed Phreatophyte & Evap. [6]	7.2	7.2	7.2	7.2	7.2	
Station 1117 to Station 2900 IID Variance [7]	44.2	41.9	44.4	63.4	45.5	
Calculated: AAC Station 2900 u/s Mesa Lateral 5 Check [9]	**2,399.5**	**2,861.7**	**2,846.3**	**2,480.3**	**2,478.1**	+2.4%
WIS: AAC Station 2900 u/s Mesa Lateral 5 AVM, Adj. [10]	2,580.3	2,872.0	2,870.9	2,561.3	2,577.1	+2.4%
Δ Station 2900 WIS Adj. - Calculated	177.9	13.2	30.9	82.4	98.2	
(Δ Station 2900 WIS Adj. - Calculated)/(Δ Sta. 2900 Adj.), %	7.0%	0.4%	0.9%	3.2%	3.8%	

1. Confidence Interval at 95%. IID Station 60 CI based on accuracy analysis by USDA ARS US Water Conservation Laboratory, Maricopa, AZ. AAC Station 2900 Mesa Lateral 5 u/s Mesa Lat 5 AVM, Adj. CI based on Station 1117 and Coachella Heading Flume measurements, deliveries and recovered AAC seepage above Station 2900; and unrecovered seepage, evaporation and phreatophyte ET estimates from Station 1117 gauging station to the check by Keller-Bliesner, Logan, UT.
2. USBR Decree Accounting: Volume into AAC at Imperial Dam, includes measured return flow
3. USBR Decree Accounting: Flow measurement at Brock reservoir outlet channel, Station 21+36
4. USBR Decree Accounting: IID Station 60 diversion minus return flow to Colorado River plus delivery from Brock Reservoir
5. IID TPS delivery record: Deliveries from Coachella Canal
6. IID/USBR agreed upon fixed value
7. IID 660 Report: Annual Summary of AAC and Coachella Canal Monthly Distribution, Column 8
8. USBR Decree Accounting Volume into AAC at Imperial Dam. Water pumped from the LCWSP wells and delivered to IID for its use via the AAC. IID forbears consumptive use of this amount from the Colorado River to make water available to exchange to LCWSP beneficiaries. LCWSP is operated and maintained by USBR Yuma Area Office.
9. Calculation: [(Total IID CU) + (LCWSP)] - [(Del to Farms) + (Station 60 to Station 1117 Fixed Phreatophyte & Evap) + (Station 1117 to Station 2900 IID Variance)]. Seepage recovery that is pumped back into the AAC is included in AAC Station 2900 u/s Mesa Lateral 5 AVM reported flow.
10. An adjustment is made monthly to distribute AAC "losses" to be about 40 percent from Pilot Knob to Station 2900 and 60 percent from Station 2900 to Westside Main Canal heading, as actual measurements are rarely precise enough to capture the relatively small "loss" amounts.

Groundwater

The Salton Basin, which is comprised of the broad region draining directly into the Salton Sea, lies within the Salton Trough of southern California. The Salton Trough as shown in Table 3 is the dominant feature of the Colorado Desert geomorphic province of California. The Basin is about 130 miles long and up to 70 miles wide, and is generally considered the northwesterly landward extension of the Gulf of California (Loeltz et al., 1975).

While the Salton Trough extends to the Gulf of California, it forms a concave desert basin that descends to 235 feet below sea level at the Salton Sea. The earth's thin crust in the region and the proximity of hot magma beneath are a result of Imperial Valley's location at the top of a fault in which tectonic plates are moving apart from one another to form the Gulf of California.

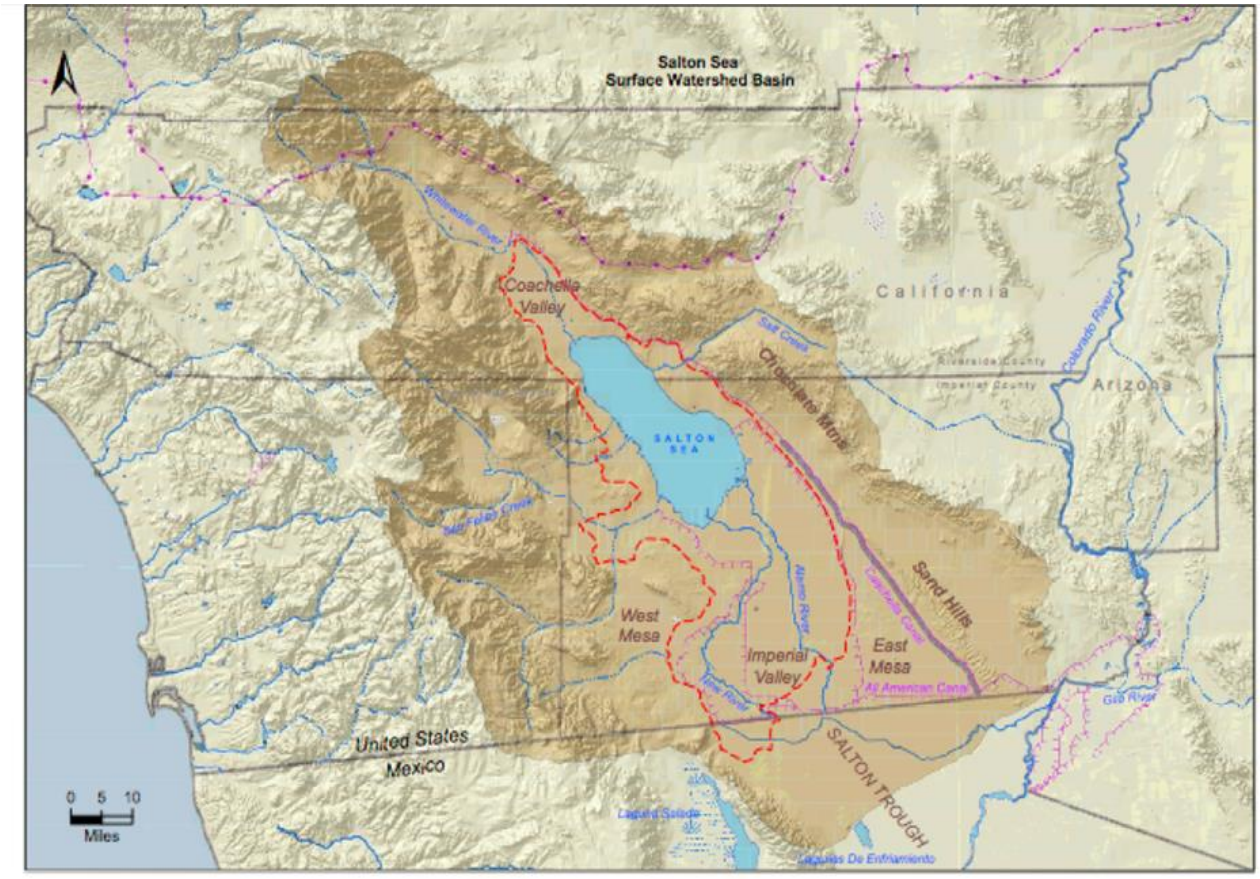

Figure 3.*Map of the Salton Basin in Southern California* [10]

Source: Thompson, A., et al., Ground Water Availability within the Salton Sea Basin: A Final Report, Lawrence Livermore National Laboratory, Jan. 29, 2008, p 16.

In 1975, California Department of Water Resources Bulletin 118 reported that the 1,870 square-mile Imperial Valley groundwater basin (number 7-30 shown **FIGURE 4**) basin consists of younger and older alluvium with a groundwater storage capacity of 14 MAF (CDWR, 1975). Basin 7-30 encompasses the West Mesa, Imperial Valley and East Mesa subbasins shown in **FIGURE 3**.

[10] Red dashed line is sea level elevation contour within the Salton Trough. Shaded area is the watershed basin, 8360 square miles in area. Imported water aqueducts are shown in purple. Thick gray line indicates lined portion of Coachella Canal in 2008.

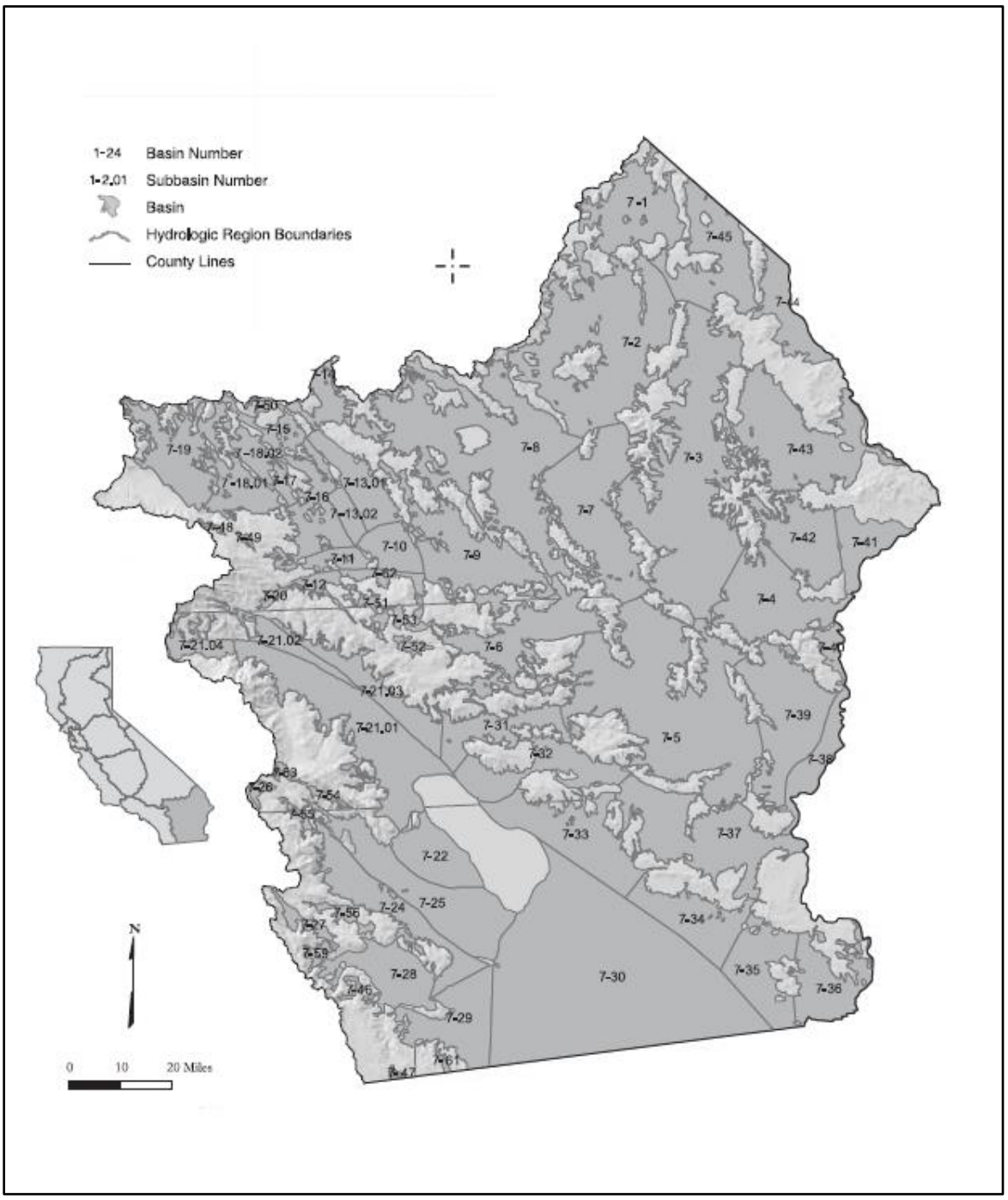

Figure 4.*CDWR Colorado Hydrologic Region Groundwater Basins*
Source: CDWR. California's Ground Water Bulletin 118 Update 2003, October 2003, p 202.

Groundwater in the Imperial Valley subbasin is of generally poor quality and unsuitable for domestic or irrigation use due to high levels of total dissolved solids and of fluoride and boron concentrations. Salinity levels range from hundreds to an extreme of up to tens of thousands of milligrams per liter. Groundwater in the West Mesa is from a sole source aquifer of good quality. East Mesa groundwater is largely undeveloped and quality varies. US Bureau of Reclamation operates the Lower Colorado River Water Supply Project well field along the AAC, which operates as follows:

> Under a May 22, 1992 contract with Reclamation, IID and CVWD have agreed to exchange a portion of their rights to divert water from the Colorado River for an equivalent quantity and quality of groundwater ("exchange water") to be withdrawn from a well field located in the Sand Hills along the AAC in Imperial County. IID and CVWD would reduce their diversions from the Colorado River in an amount equal to the volume of groundwater discharged into the AAC up to a maximum of 10,000 acre-feet per year. An amount of Colorado River water equal to the amount of water that would have otherwise been diverted by IID and CVWD would be made available for beneficial consumptive use by Project beneficiaries. Project facilities are being developed in stages. [11]

Imperial Valley (Irrigated Area)

Imperial Valley is located in the central portion of the basin, south of the Salton Sea, north of the U.S./Mexico International Border, and generally in the 600,000-acre area between IID's Westside Main and East Highline canals. Studies of groundwater conditions in the Imperial Valley focus exclusively on the upper 1,000 feet of water-bearing strata; however, data is limited because groundwater in the upper 300 feet of this area is generally of poor quality (saline) and well yields are quite low. Historically there has been little need to investigate and develop the groundwater in the Imperial Valley due to the availability and relatively higher quality of imported Colorado River water.

West Mesa

Located to the west of the Imperial Valley, West Mesa consists of gently southwest to northeasterly sloping, non-irrigated desert land that lies to the south and west of the Salton Sea and east of the Coyote and Jacumba Mountains. With a saturated thickness of about 400 feet and an average depth to groundwater of approximately 100 feet, the aquifer is generally homogenous and of a more coarse-grained nature than the Imperial Valley area. Thus, the data do not indicate separate water-bearing zones or intervening aquitards of any regional significance. Groundwater and surface water flow mimics the topography.

The area includes portions of several relatively small groundwater subbasins for which little direct information is known. The exception to this is the Ocotillo/Coyote Wells Subbasin, for which studies on both the quality and quantity of available groundwater exist (Bookman-Edmonston, 1996; Bookman-Edmonston, 2004; and U.S. Gypsum Final EIR/EIS). Project studies show the sustainable and sole reliance on the Ocotillo-Coyote Wells Groundwater Basin, which was designated a sole source aquifer by the U.S. Environmental Protection Agency in 1996.[12] As a result of this designation, new projects relying on and overlying the Ocotillo-Coyote Wells Groundwater Basin are to be based on safe yield consideration and resource constraints to protect correlative rights of overlying users.

East Mesa

East Mesa to the southeastern of the Imperial Valley, and is described as the broad area that lies that lies to the south and east of the Salton Sea, east of IID's East Highline Canal and to west of the Sand Hills Fault.[13] That is, East Mesa is roughly bordered by East Highline Canal on the west, Coachella Canal on

[11] Source: Lower Colorado River Water Supply Act of 1986.

[12] See: Sole Source Aquifer USEPA Ground Water Quick Finder

[13] Sand Hills Fault (also named Algodones Fault), an easterly splay of the San Andreas Fault system, is mapped as bordering the east side of the Sand Hills (Loeltz et. al., 1975).

the east and the AAC on the south. East Mesa, a non-irrigated alluvial surface that slopes gently northwest towards the Salton Sea, is covered with thin veneers of wind-blown sand. The East Mesa aquifer is chiefly unconfined, homogenous, and composed of coarse-grained deposits of gravels, sands, silts, and silty clays that are thought to be deposited by the Colorado River during the Pliocene era, 5 million to 1.6 million years ago. Available aquifer storage within East Mesa lying between the East Highline Canal and Coachella Canal is estimated to be one million acre-feet (USBR, 1988). Much of the groundwater in East Mesa was replenished as a result of Coachella Canal seepage.

Groundwater Recharge

A desalination/groundwater development feasibility study was conducted as part of the *2012 Imperial Integrated Water Resources Management Plan*. Reconnaissance-level wellfield designs and costs were prepared to configure an array of recharge projects concepts both with and without desalination and are reported in Imperial Integrated Regional Water Management Plan Appendix B. Aquifer recharge was presented on pages B-17 and B-18, as follows:

> In the Imperial Valley, recharge to the groundwater reservoir by subsurface inflow from tributary areas is small compared with recharge from the imported Colorado River water. Total recharge to the groundwater system from precipitation within the valley was estimated to be somewhat less than 10,000 acre-feet per year (Loeltz et. al., 1975). However, a more likely recharge rate of 0.02 inch per year cited for the Ocotillo area equates to [a much lower] 800 acre-feet of recharge per year, over the 500,000 acres of unirrigated land in the West Mesa (Montgomery Watson, 1995). Major sources of groundwater discharge [and removal] from Imperial Valley aquifers include groundwater discharging directly into the New and Alamo rivers, pumping in Mexicali Valley to the south, intercepted shallow groundwater from the agricultural fields by drains and the extensive tile drain network, and subsurface discharge into the Salton Sea. Phreatophytes also remove groundwater by evapotranspiration in areas where the groundwater table is shallow, especially in the rivers and drains and by wetlands (Tetra Tech, Inc., 1999). Artesian groundwater conditions exist in the Imperial Valley, primarily east of the Alamo River in a band extending roughly from Holtville in the south to Calipatria in the north.
>
> In the West Mesa area, recharge to the aquifer is from two sources: precipitation falling directly on the area and percolation of stream runoff from the Coyote and Jacumba Mountains to the west. Sources of discharge in the West Mesa include pumpage by U.S. Gypsum, limited urban water use into the town of Ocotillo, and subsurface outflow across the Elsinore/Laguna Salada faults and toward Mexico (Bookman-Edmonston Engineering, 1996).
>
> In the East Mesa, the source of water supply recharge to the groundwater aquifer was from canal seepage from the old unlined Coachella Canal and the AAC. However, recharge essentially ceased when unlined portions of the Coachella Canal were lined in 1979. Although portions of the AAC were lined between 2006 and 2010, the project did not line the canal completely through the East Mesa area, so some recharge from the canal to the mesa still continues. Due to the arid conditions, virtually no direct precipitation reaches the groundwater aquifer in the East Mesa (Crandall, et al., 1983). Groundwater from the East Mesa is discharged at ground surface in springs and in the subsurface into Imperial Valley aquifers. Discharge of groundwater onto ground surface in springs occurs at areas of shallow

groundwater along the AAC. In these areas, where wetlands have been created from canal seepage, discharged groundwater consumptive use is mainly attributable to phreatophyte evapotranspiration and surface evaporation. Subsurface outflow in the East Mesa occurs toward the Imperial Valley, toward Mexico, and into a portion of the East Highline Canal.

Water Uses and Crop Census Data

Availability of Colorado River water and its desert climate make the Imperial Valley among the most productive farming regions in California, with crop production approaching $1.8 billion in 2013.[14] Agriculture, by far the largest industry in the Imperial Valley, accounts for around 50 percent of all employment. **TABLE 14** lists total acreage by crop types and crops.

Table 14. Crop Survey, total acres and percentages, 1994, 2004, 2014

Rank	Crop Type	1994		2004		2014	
		AC	%	AC	%	AC	%
1	Field (all)	418,749	77.6	390,999	77.9	320,662	72.4
2	Garden (all)	98,714	18.3	91,078	18.1	101,537	22.9
3	Permanent (all)	22,204	4.1	19,962	4.0	20,424	4.6
	Total Acres of Crops	**539,667**	**100.0**	**502,039**	**100.0**	**442,623**	**100.0**

Source: IID website: Library: Crop Reports IID Annual Inventory of Areas Receiving Water

TABLE 15 lists crop types and crops with five percent or more of total acreages.

Table 15. Crops with five percent or more of total acreage & total acres of crops, 1994, 2004, 2014

1994			2004			2014		
Crop	AC	%	Crop	AC	%	Crop	AC	%
Alfalfa, all	194,984	36.1	Alfalfa, all	159,651	31.8	Alfalfa, all	142,594	32.2
Flat	188,309	34.9	Flat	83,956	16.7	Flat	86,689	19.6
Row	0	0.0	Row	51,417	10.2	Row	30,720	6.9
Seed	6,675	1.2	Seed	24,278	4.8	Seed	25,185	5.7
Sudangrass, all	79,144	14.7	Bermudagrass, all	65,034	13.0	Sudangrass, all	52,304	11.8
Grass	78,878	14.6	Grass	35,118	7.0	Grass	51,546	11.6
Seed	266	0.0	Seed	29,916	6.0	Seed	758	0.2
Wheat	58,247	10.8	Sudangrass, all	52,907	10.5	Bermudagrass, all	47,623	10.8
Sugarbeets	34,802	6.4	Grass	52,585	10.5	Grass	28,574	6.5
Bermudagrass, all	34,409	6.4	Seed	322	0.1	Seed	19,049	4.3
Grass	17,056	3.2	Wheat	49,431	9.8	Lettuce	27,446	6.2
Seed	17,353	3.2	Sugarbeets	26,107	5.2	Wheat	25,781	5.8
Lettuce	22,143	4.1	Lettuce, all	22,302	4.4	Sugarbeets	24,376	5.5
Total Acres	**539,667**	**100.0**	**Total Acres**	**502,039**	**100.0**	**Total Acres**	**442,623**	**100.0**

Source: IID website: Library: Crop Reports IID Annual Inventory of Areas Receiving Water

FIGURE 5 provides a graphic representation of the fourteen crop types with the most acreage in 2014. As explained in relation to **TABLE 2**, most of the duck ponds, which are operated by federal and state wildlife agencies as well as private owners, provide food, habitat, and roosting areas for migrating waterfowl and shore birds. Many of the duck ponds are also used commercially to grow seeds of various aquatic

[14] Imperial County 2013 Agricultural Crop and Livestock Report, Agricultural Commissioner, August 5, 2014.

plants that are sold for restoration and habitat projects. Duck ponds are usually flooded in late August and September and remain flooded until February or March.

Some of the duck ponds, but not all, may be hunted two to three days a week during waterfowl season. The 2014-2015 hunting season started in Mid-October and ran through late January. For white geese, the season on private lands with the permission of the landowner extends through most of February.

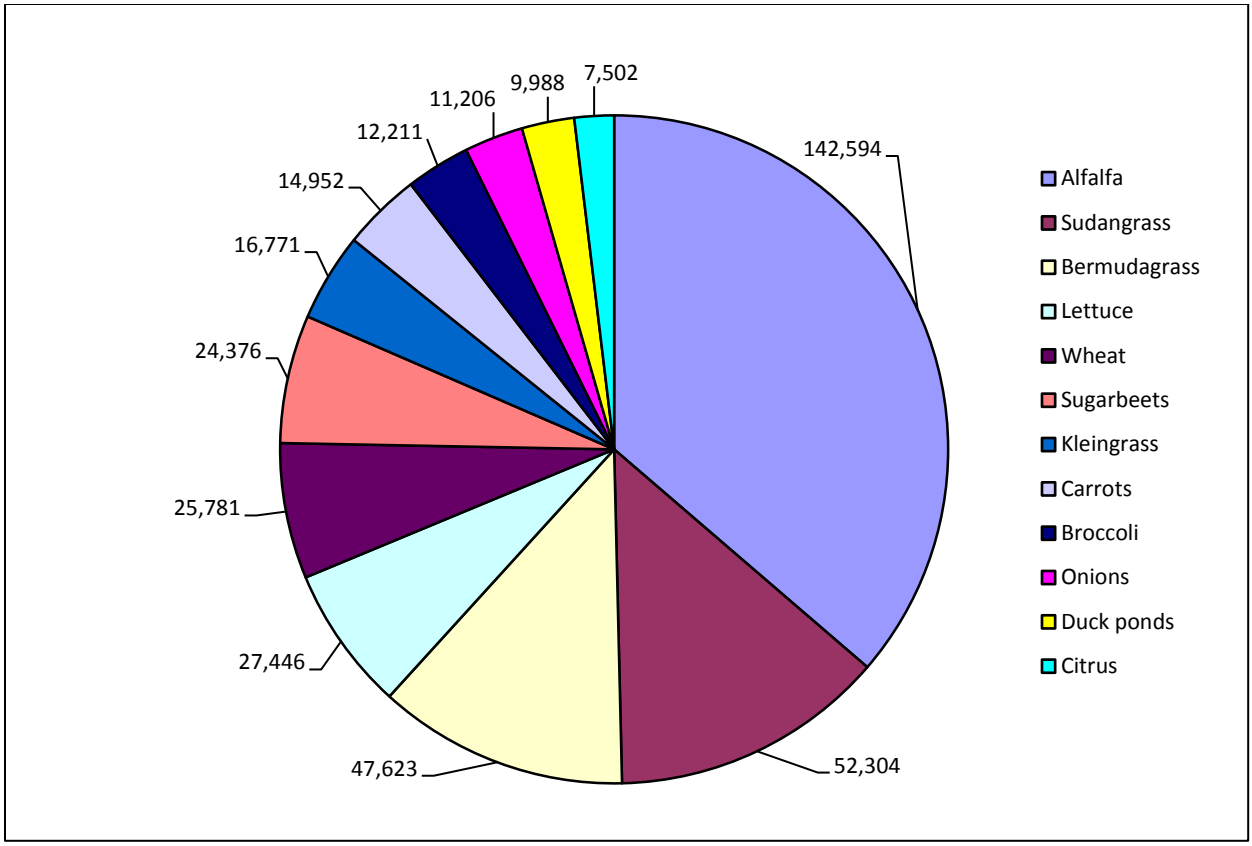

Figure 5.*Twelve Crops by Acre, 2014*

Source: IID 2014 Crop Rank and Acreage
For records from 2004 to 2014, see Crop Rank and Acreage reports under **Crop Reports** in the IID Web Library

TABLE 16 lists the irrigation methods used by IID growers by volume (AF) and by percent of volume for 1997, 2004, 2014. The record for 1994 is not available, because the Water Information System came online in late 1996; so 1997 is first full year of irrigation method available for this report.

Unknown, under Irrigation Method, means that the method was not entered for an irrigation event.

Table 16. Irrigation Method by Volume and by Percent of Volume, 1997, 2004, 2014

Irrigation Method	1997	2004	2014
	Volume, AF		
Flat/Flood	1,652,729	1,359,067	1,308,421
Row	872,022	719,887	561,728
Sprinkler	82,623	72,356	208,731
Drip	28,290	20,939	56,862
Unknown	23,975	64,494	18,278
Gated Pipe	12,007	12,615	20,240
Total	2,671,645	2,249,359	2,174,260

Irrigation Method	1997	2004	2014
	Percent of Volume		
Flat/Flood	61.9%	60.4%	60.2%
Row	32.6%	32.0%	25.8%
Sprinkler	3.1%	3.2%	9.6%
Drip	1.1%	0.9%	2.6%
Unknown	0.9%	2.9%	0.8%
Gated Pipe	0.4%	0.6%	0.9%
Total	100.0%	100.0%	100.0%

Note: 1997 is first full year of irrigation method record.

TABLE 17 lists vegetable (garden crop) germination irrigation methods by acreage and by volume, respectively for 1997, 2004, 2014. The record for 1994 is not available, because record of irrigation method began in November of 1996. For germination irrigations, very few events are coded unknown, and in 2014, all germination irrigations have been coded for an irrigation method.

Table 17. Vegetable (Garden Crop) Germination Irrigation Method by Volume and Percent of Volume, 1997, 2004 and 2014

Irrigation Method	1997	2004	2014
	Volume, AF		
Sprinkler	42,239	38,953	58,240
Row	20,176	7,869	5,455
Drip	958	270	524
Flat	382	578	464
Gated Pipe	378	503	736
Unknown	39	62	0
Total	64,171	48,235	65,419

Irrigation Method	1997	2004	2014
	Percent of Volume		
Sprinkler	65.8%	80.8%	89.0%
Row	31.4%	16.3%	8.3%
Drip	1.5%	0.6%	0.8%
Flat	0.6%	1.2%	0.7%
Gated Pipe	0.6%	1.0%	1.1%
Unknown	0.1%	0.1%	0.0%
Total	100.0%	100.0%	100.0%

Note: 1997 is first full year of irrigation method record.

In addition to agricultural use, IID distributes water for non-agricultural use to the Valley's seven municipalities, one private water company, and two community water systems for treatment to potable standards; to industrial users; feedlot, dairy and fishery users, and environmental resources demand and recreational uses. Rainfall is less than three inches per year and does not contribute to IID water delivery, although at times it does reduce agricultural water demand.[15]

Storage

IID operates and maintains Colorado River facilities in addition to IID facilities in the Imperial Valley.

Colorado River Facilities

Senator Wash Dam and Reservoir

Senator Wash Dam and Reservoir, an off-stream pumping facility, is located about 18 miles northeast of Yuma, Arizona, on the California side of the Colorado River two miles upstream from Imperial Dam. The facility acts as a regulating reservoir to balance fluctuating flow and delivery schedules at Imperial Dam.

The reservoir is controlled by IID's River Water Dispatching Unit under the direction of the USBR's Yuma Area Office. Constructed in 1964-1966 to balance the flow in the river at Imperial Dam, the reservoir

[15] One inch of rainfall across the IID irrigated area results in a reduction of about 50 KAF in net consumptive use.

was designed to hold almost 14,000 acre-feet, in 2001, the reservoir was restricted to an elevation of 240 feet above mean sea level with approximately 9,000 acre-feet of storage.

Imperial Dam and Desilting Works

Imperial Dam, which straddles the California-Arizona border about 20 miles north of Yuma, Arizona, serves as a diversion structure for water deliveries throughout southeastern California, southwestern Arizona and northwestern Mexico.

The AAC trash rack and headgates are located adjacent to the California abutment of the dam. Three desilting basins with a design capacity of 4,000 cfs each remove sand and silt from the river water before it passes to the AAC. Each desilting basin is 540 feet wide by 770 feet long and is equipped with 72 scrapers designed to remove 70,000 tons of silt per day. The silt is returned to the river by means of six sludge return pipes that deposit the silt into the California Sluiceway. The sand and silt removed are continuously returned to the river at the California Sluiceway Channel.

Gila Canal headgates are located adjacent to the Arizona abutment of the dam. One desilting basin removes the sand from the water before it enters the Gila Gravity Main Canal, which serves the Yuma area. Removed sediment is returned to the river when necessary by opening the sluiceway gates located on the bottom and downstream end of the basin. The basin will handle a flow of 2,200 cfs.

Imperial Dam, Gila Headworks, AAC Headworks and the AAC are operated and maintained by IID with costs shared by USBR and the California and Arizona water agencies served. The operations of IID's River Division Office at Imperial Dam are under the direction of the USBR.

Warren H. Brock Reservoir

Brock Reservoir is a USBR off-line facility located approximately 25 miles west of Yuma, Arizona above AAC Drop 2. The reservoir is controlled by IID's Water Dispatching Unit under the direction of the USBR Yuma Area Office. Brock Reservoir was constructed to capture excess water that would otherwise flow to Mexico unordered. The Brock Reservoir has two 4,000 acre-feet storage cells. The Brock Reservoir began service in 2010.

Southern Nevada Water Authority (SNWA), MWD and the Central Arizona Project all contributed funds for the construction of the reservoir. In return, SNWA will receive 400,000 acre-feet of intentionally created surplus storage credits in Lake Mead at a maximum of 40,000 acre-feet per year until 2036, and MWD and CAP will each receive 100,000 acre-feet of ICS credits at a maximum of 65,000 acre-feet per year between 2016 and 2036. Annual water conservation is anticipated to be around 70,000 acre-feet.

Specifications for the USBR reservoirs are provided in **TABLE 18**.

Table 18. USBR Reservoir Specifications, 2014

Facility	Type	Surface Area, AC	Capacity, AF	Maximum Depth, ft	Flow Capacity, cfs		Date of Diversion
					Inlet	Outlet	
Senator Wash	Off-stream storage	470	14,000	18	1,200	1,200	1966
Imperial Dam	Diversion	n/a	n/a	shallow	n/a	AAC 15,155 Gila Canal 2,200 Sluiceway 31,000 to 42,500	1938
Brock Reservoir	Off-stream AAC storage	485	8,000	22	1,800	1,800	2010

Source: USBR websites: Imperial Diversion Dam, and Draft EIS – Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, Feb 2007, p B-27; IID website: Colorado River Facilities

Imperial Valley Facilities

Reservoirs

IID's distribution system includes seven regulating and four interceptor reservoirs with a total water storage capacity of 4,372 acre-feet. These reservoirs allow increased delivery flexibility and provide conservation opportunities within the IID water service area.

Seven of IID's 11 reservoirs are part of the IID/MWD Water Conservation Program, including construction of Galleano Reservoir and four interceptor reservoirs (Bevins, Young, Russell, and Willey) and installation of a pumping plant at Singh Reservoir. Carter Reservoir, constructed by IID, was included under the IID/MWD Augmentation Program. The AAC Off-Line Storage Reservoir was constructed as part of the AAC Lining Project, which reduced system storage in AAC Drop 1 pond. To compensate, the original channel between AAC Drop 1 and AAC Drop 2 was converted into the OLS Reservoir, which replaces nearly all of the lost storage.

IID reservoir specifications are provided in **TABLE 19**.

Table 19. IID Reservoir Specifications, 2014

Reservoir	Type	Surface Area, AC	Storage Capacity, AF	Maximum Depth, ft	Flow Capacity, cfs		Date of Diversion
					Inlet	Outlet	
Singh	Regulating	32	323	11.0	100	100	Jan 20, 1976
Sheldon	Regulating	50	476	10.0	100	100	Mar 29, 1977
Fudge	Regulating	38	300	10.0	100	100	Feb 26, 1982
Sperber	Regulating	64	470	9.0	100	200	May 1, 1983
Carter	Regulating	32	350	11.3	150	50	Sep 19, 1988
Galleano	Regulating	40	425	21.0	150	75	Oct 9, 1991
Bevins	Interceptor	37	253	12.9	165	50	Nov 12, 1992
Young	Interceptor	47	275	9.0	100	100	Feb 9, 1996
Russell	Interceptor	29	200	8.3	100	50	Dec 5, 1996
Willey	Interceptor	51	300	7.0	190	51	Jan 22, 1998
AAC Off-Line Storage (OLS)	Regulating	74	1,000	13.6	400	400	Jan 1, 2009
TOTAL		**494**	**4,372**				

Source: IID website Reservoirs, and IID/MWD Final Program Construction Report Sections 4 and 5.

Lateral Interceptor and Discharge Return Systems

The 1988 IID/MWD Water Conservation Program included three lateral interceptor projects, serving 83,246 acres; and an incentive program for growers under which 25 tailwater return systems were

installed, serving 6,779 acres. By 2015, all TRS's were eliminated from this program and the conservation replaced with additional conserved water yield attributed to the 12-Hour Delivery program.

IID returns operational discharge from 16 laterals and two canals back into two main canals (the Central Main and the Westside Main) and 2 supply canals (the Rositas and the Vail).

An overview of lateral interceptor and tailwater/operational discharge recovery systems in the IID water service area is provided in **TABLE 20**. For additional details about the IID/MWD Lateral Interceptor and TRS projects (prior to 2015), see IID/MWD Final Program Construction Report Sections 4 and 11, respectively.

Table 20. Lateral Interceptor and Tailwater/Operational Discharge Recovery System Overview, 2014

System		Number	Area Served (AC)
Plum-Oasis Lateral Interceptor	IID/MWD Project	8 laterals	22,246
Mulberry-D Lateral Interceptor	IID/MWD Project	13 laterals	31,000
Trifolium Lateral Interceptor	IID/MWD Project	15 laterals	30,000
Active Tailwater Return Systems (TRS)	IID/MWD Project	17 systems	5,006
Ash Lat 30, Palmetto Lat & Pear 9th Street Ditch to Rositas	IID Project	3 laterals	n/a
Briar Canal to Central Main	IID Project	1 canal	n/a
Nectarine, Nectarine A & Nutmeg Lat, Rockwood C to Vail	IID Project	3 laterals, 1 canal	n/a
Sumac, Turnip & Thistle Laterals to Westside Main	IID Project	11 laterals	n/a
Tailwater Return Systems (TRS)	Grower Owned	Varies	n/a

Source: IID/MWD Final Program Construction Report, Sections 4 and 11

Distribution Facilities

IID operates and maintains an extensive open channel irrigation and drainage network. The system is comprised of main and supply canals with diversions to lateral canals, and from lateral canals into customer's head ditches. Given the daily diversion of water from the Colorado River, the available technology and the nature of the system, operating procedures were developed for a 24-hour delivery cycle.

As part of the 1988 IID/MWD Water Conservation Agreement, IID instituted procedures allowing water delivery on a 12-hour basis. The first 12-hour orders were taken in the fall of 1989.[16] Since that time, IID customers have been able to place orders in 12-hour or 24-hour increments and multiples thereof. Regulations and procedures also allow order changes, open orders and other variations.

Water Control Center

Another provision called for in the 1988 IID/MWD Water Conservation Agreement was the construction of a modern, automated Water Control Center. This centralized facility, in concert with modernization of system automation facilities, improvements to water control sites and development of a comprehensive supervisory control and data acquisition communications system to monitor and operate the AAC and main canal transmission system, has greatly improved control of IID's water delivery system.

Operation of IID's main canal system has evolved extensively over the years. Initially, field personnel manually controlled the system, routing water on-site by electric powered gates or manual gate lifts. In

[16] For details, see IID/MWD Water Conservation Agreement Project 9 12-Hour Delivery Verification Summary Report, CVC, October 15, 2000.

the late 1950s, IID began installing remote-controlled equipment operated through telephone lines, which provided better control of large sites along main canals. Beginning in the late 1980s, IID began replacement of approximately half of the old remote-controlled systems in the field and at the control office with computerized equipment. Prefabricated electrical control equipment, in cargo containers at each field site, is solar powered or equipped with generators. Telephone communication links to the sites were also replaced with a radio/microwave communication network. This radio communication network provided automated operation of field sites along with monitoring and control capabilities directly from the control room. Since that time Water Dispatching has electronically controlled all main canal water.

In September 1993, the $3 million WCC became fully operational. The 10,000 square-foot building constructed at IID Headquarters houses hardware and software used to regulate automated gates for water control and to collect the information needed to verify efficiency conservation water savings. The building is equipped with a backup generator that ensures uninterrupted power service to the control system. Other technology at the WCC includes earthquake disaster recovery features, computer-generated screens displaying control room information and changeover procedures to allow for continuous 24-hour service from the WCC to the canal sites.

The WCC provides a controlled environment for water dispatchers, engineers and operations personnel. The center was equipped with a visitor's lobby where IID artifacts from the 1930s, '40s and '50s, including the very first system automation equipment, are on display. The center also houses a large conference room, small kitchen and several administrative offices.

In early 1998, IID received the International Award of Excellence for Innovation Technology for its System Automation Program, which provides water management utilizing modern control technology. The IID/MWD System Automation Program technology includes the WCC as well as remote flow monitoring sites and automation used for other water conservation programs, and has provided the basis for IID to expand improved water management to other parts of its water distribution system.

Conveyance System

The AAC transports IID’s annual entitlement of 3.1 million acre-feet of Colorado River water, less IID water transfer obligations, which IID delivers untreated throughout the Imperial Valley. The 80-mile gravity-flow canal begins at Imperial Dam. Dropping 175 feet from Imperial Dam to the Westside Main Canal, the AAC extends south and then west, following the U.S./Mexican border much of the way. Crossing 14 miles of sand dunes to the east of the Imperial Valley, the canal ends in the southwest corner of IID's delivery area. In 2009, the district completed a project that resulted in the concrete lining of 23 miles of the canal.

Within the Imperial Valley, three main canals receive water from the AAC – the East Highline, Central Main and Westside Main. From these canals, the untreated water is distributed through a network of supply and lateral canals for delivery to IID customers. The main canal system is segmented into six operating reaches defined by the location of the regulating reservoirs. The reservoirs absorb flow mismatches from the main canal reach upstream of the reservoir and allow delivery of scheduled flows into the next reach downstream.

The six operating reaches, along with their associated regulating reservoirs, are as follows:

- AAC Drop 1 to Central Main Canal Check - Off Line Storage Reservoir
- East Highline Canal Reach 1 - Singh Reservoir
- East Highline Canal Reach 2 - Galleano Reservoir
- Central Main Canal - Fudge Reservoir
- Westside Main Canal Reach 1 - Sheldon Reservoir
- Westside Main Canal Reach 2 - Carter Reservoir

The operational procedures described above constitute a supply-control process, where flows to meet scheduled water deliveries are released into canals and routed from upstream to downstream according to the operations schedule. The objective at flow control locations, such as main canal and lateral headings, is to maintain scheduled deliveries. Between flow control locations, the objective is to use check structures to maintain a targeted water level. IID distribution system details including total length as well as earthen, concrete lined and piped sections are provided in **TABLE 21**.

Table 21. IID Distribution System (miles), 2014

System Used	Total Length	Earthen	Concrete Lined	Piped
All-American Canal	**79.720**	56.720	23.000	0.071[1]
Main Canals	**150.290**	129.390	20.900	0.000
Lateral Canals	**1,437.810**	321.778	1,089.794	26.238
Canals Total	**1,667.820**	507.888	1,133.694	26.309

1. The New River Siphon is a 374 foot piped portion of the AAC.

FIGURE 6 shows how water is diverted and conveyed from the Colorado River through the AAC to IID's main canal system. Colorado River water is also transported through the AAC for delivery to Coachella Valley Water District via the Coachella Canal.

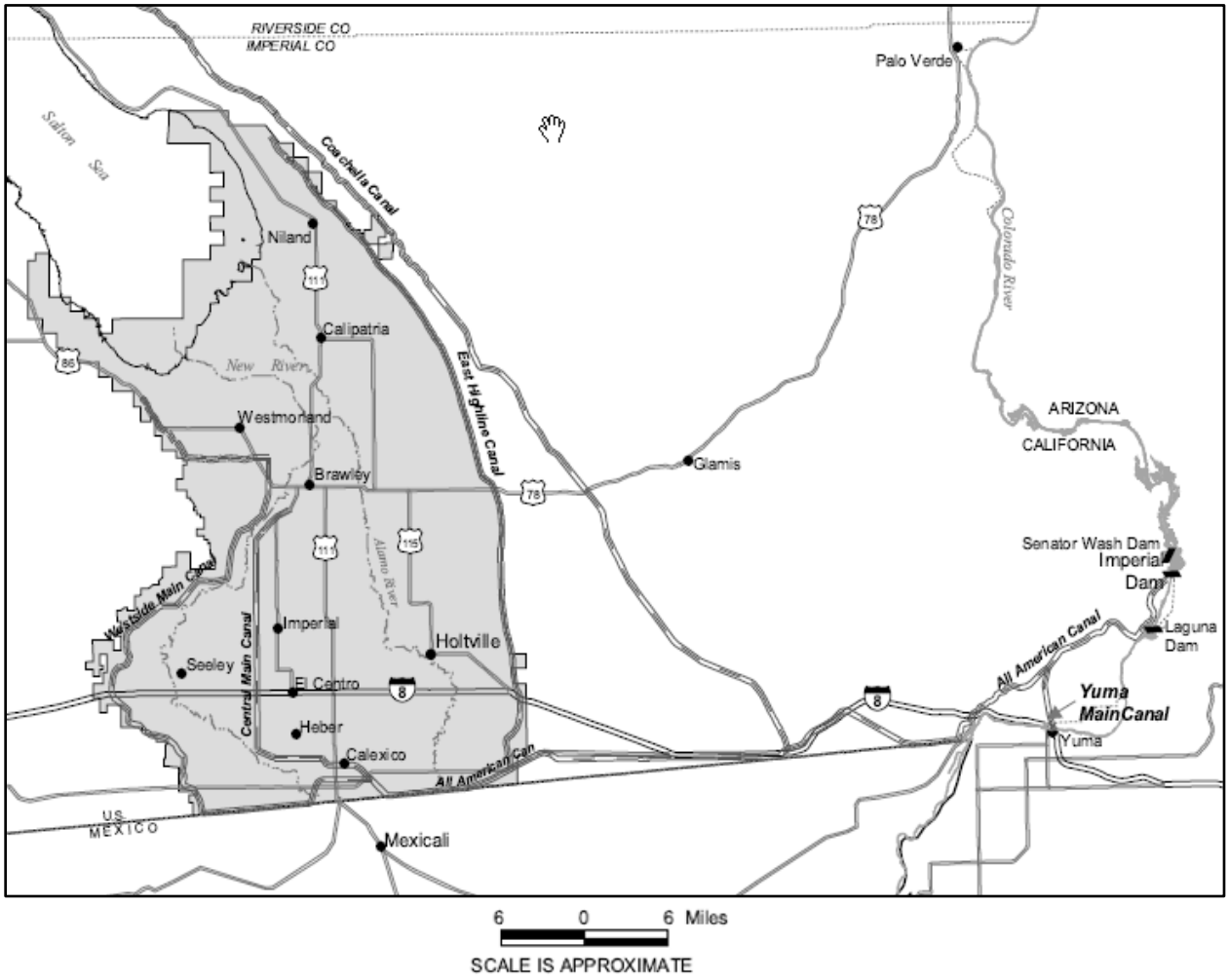

Figure 6.*IID Water Transmission System*
Source: University of Redlands, 1999; Department of the Interior 1999 and USBR LCR GIS

FIGURE 7 shows IID's canal layout and location of communities within the IID water service area.

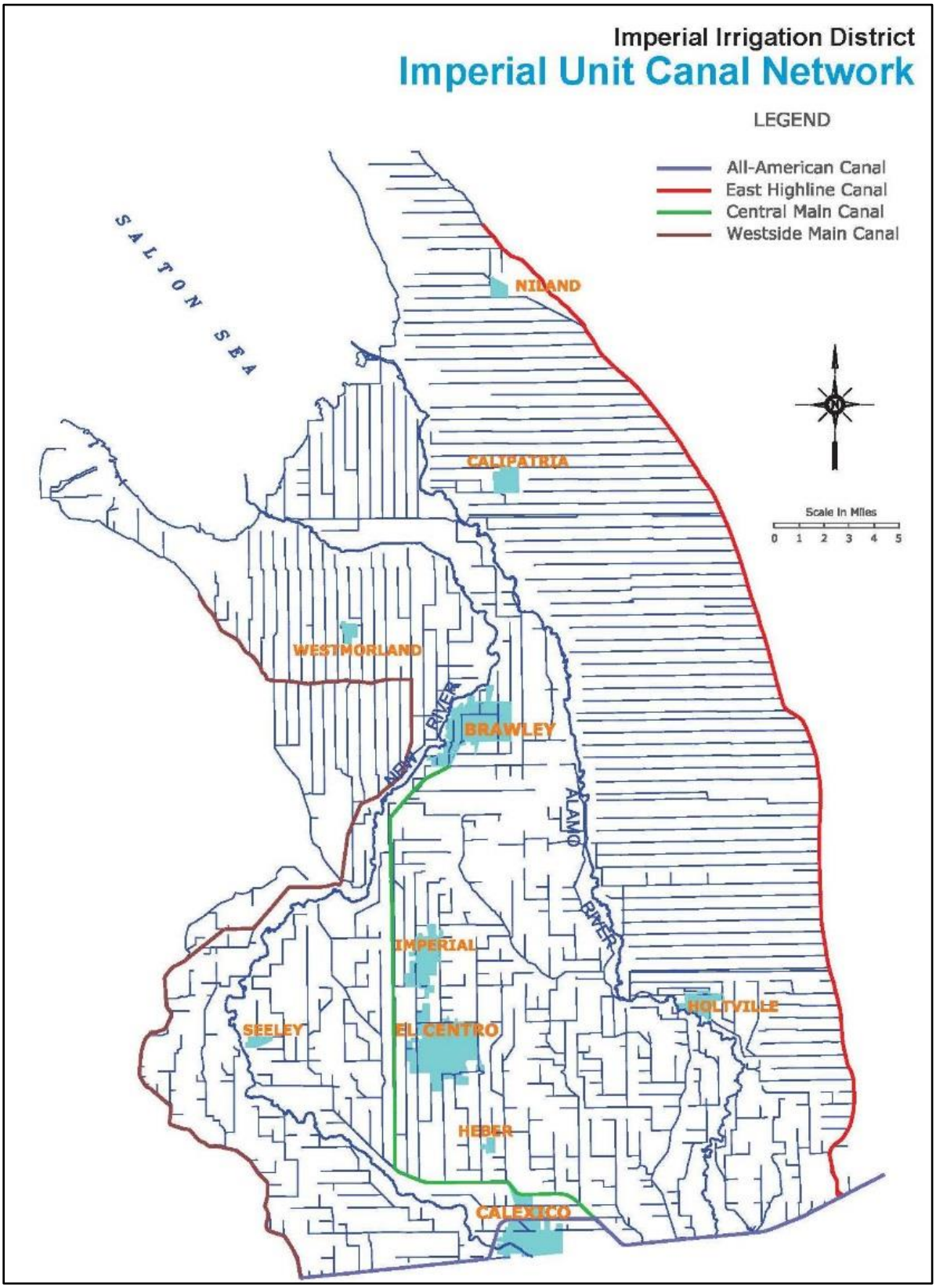

Figure 7.*IID Imperial Unit Boundary and Canal Network*

IID has ten types of flow control and/or measurement sites located throughout the conveyance system.

1. **Main canal turnouts, lateral headings and other canal flow measurement sites:** Water flows from one part of the distribution system to another and flow rate is controlled to meet an order related to downstream demands in a defined part of the distribution system. Examples include Orchid Lateral Heading, Orange Lateral Heading BCW and Rockwood Canal Heading AG.
2. **Check flow sites (also called drop flow sites)**: Water flows from one part of the distribution system to another and, but generally, the flow is not controlled at these locations. The function of a check is to maintain a nearly constant level to provide for a constant delivery flow at turnouts and headings located upstream of these structures. Examples include East Highline Drop 16 and Y Lateral Drop near delivery gate 14.
3. **Delivery gate flow sites:** Water flows from the distribution system to a farm head ditch and then to the farm field and is controlled to meet an order to the downstream field or fields. Examples include gates that are hand-set by zanjeros and Orange Lateral automated farm delivery gates.
4. **Interface flow sites (also called return flow or intertie return flow sites):** Water flows from one part of the distribution system to another part of the distribution without flow control. No customer order associated with these flow sites. Examples include Rockwood Return to Vail Supply Canal and Palmetto Lateral Return to Rositas Canal.
5. **Operational discharge flow sites:** Water flows from the distribution system to the drainage system. The goal is to minimize discharge at these sites while maximizing service to growers; no customer order is associated with these sites. Examples include Orange Lateral operational discharge and Westside Main Canal Spill to Trifolium Storm Drain.
6. **Drainage flow measurement sites:** Water flows from one part of the drainage system (the Alamo River and New River function as part of the drainage system) to another part, or the Salton Sea. There is no order associated with these sites. Examples include the R Drain and Pumice Drain.
7. **Dewatering Pump & Seepage Recovery flow sites:** Water is pumped from the drainage system into the delivery system. No order associated with these sites. DP sites developed by IID have water credited to flow at AAC Mesa Lateral 5 (stations along the AAC) and to IID Seepage Interception (stations within IID water service area). DP sites include AAC Drain 2 #1 Return to AAC and East Highline Canal DP 17. SR sites developed by IID as part of the QSA/Transfer Agreements have water credited to QSA Seepage Interception. Examples include SR Dixie Drain #2 and East Highline Canal DP 28, which is a hybrid site developed by IID and upgraded as part of the QSA/Transfer Agreements with the base volume of 1140 AFY credited to IID Seepage Interception and volumes beyond that to QSA Seepage Recovery.
8. **Tailwater flow sites:** Water flows from the surface of an irrigated field through a tailwater structure into the drainage system.
9. **Reservoir flow sites:** Water flows into a reservoir from the distribution system or out of a reservoir into a distribution system. Flow out of a reservoir has an associated order. Examples include East Highline Canal Interface Gate to Galleano Reservoir and Galleano Reservoir Discharge to East Highline Canal.

10. **Groundwater flow sites:** Water is pumped from wells into the distribution system, the Lower Colorado Water Supply Project wells are the only existing example in IID.

Distribution System Operation

Each September, IID submits an annual water order to the USBR for the next calendar year. The annual water order is the amount of Colorado River water the IID is requesting to use during the next year.

Each Wednesday, IID provides the USBR an estimated water order for the upcoming water week. IID's Watermaster submits a weekly master schedule order to IID's River Division office for the following week's (Monday through Sunday) water requirement. The Watermaster bases the weekly water order on historic trends, the prior week's customer orders, cropping patterns and expected weather. IID's River Division office collects the weekly water orders from all Imperial Dam users and relays the request to the USBR Yuma Area Office. After accumulating water orders from all water users on the lower Colorado River, the USBR prepares a weekly master schedule for releasing flows from Hoover Dam during the upcoming seven-day period.

The weekly master schedule specifies the daily maximum flow available for IID water delivery. Every day before 1:00 PM, the Watermaster's staff through River Division staff contacts the USBR to verify the water delivery for the next water day and make adjustments (if needed) for the master schedule order four days (96 hours) and three days (72 hours) in the future.

IID customers can order water until 12 noon of the day before the requested delivery date. Division staff enters the orders into IID's water ordering system.[17] Once the divisions have entered all of their orders, Water Dispatchers analyze the demand and distribute the available water to the water sale areas: Holtville, Southwest, Brawley, Calipatria and Westmorland. Divisions use the water allotted to them by the watermaster to schedule deliveries in their areas. When there is not enough water or canal capacity to meet all delivery requests, some orders are carried over to the next day.

Once the divisions have scheduled the lateral and main canal deliveries, the Dispatching Unit can schedule the next day's main canal flow. Water Dispatch performs all main canal scheduling using a custom-built Main Canal Decision Support System populated with SCADA flow data for the main canal system, lateral heading flows, and the next day's lateral delivery schedule. Water Dispatch uses the MCDSS to prepare a water plan for the following day's deliveries and schedule required changes throughout the main canal system to best meet water user demands.

On a 24 hours a day, 7 days a week basis, Water Dispatchers use IID's automated water control system to manage the main canal system from the WCC. Water Dispatchers use IID's SCADA system to adjust flows to transport water through the main canal system according to the water plan prepared the previous day with adjustments to accommodate both customer requests for changes and unforeseen events. The primary goal is to meet customer demand and secondly to minimize operational discharge. Water Dispatch turns responsibility over to Division staff for distribution into and through IID laterals and delivery gates for release into customer's head ditches.

Three division field offices, Northend, Southend and Holtville, operate the lateral canal distribution system. The USBR modified master schedule sets the amount of flow available for the operational day,

[17] IID's proprietary web-based water delivery scheduling and accounting management system.

so demand for water and available supply typically do not match. If demand exceeds supply, Divisions carry over orders to a future operating day, usually no more than 1 or 2 days (maximum 3) beyond the desired delivery date. By shifting water orders forward this way, Divisions match daily demand for water with the available supply from the Colorado River.

Despite the intent to balance each day's water supply with demand, imbalances do occur. The long transportation time from Hoover Dam (4 days), the need to give growers delivery flexibility, canal storage variations, and storm events are among the factors that can cause a mismatch between supply and demand flow. Fortunately, IID has regulating and interceptor reservoirs to reduce shortages and/or minimize main canal operational discharge in most instances.

Delivery data details entered by Division staff into the water ordering system are migrated to the WIS for quality control and warehousing. IID uses this information for scheduling main and lateral canal flows, customer billing, to support the equitable distribution and on-farm efficiency conservation programs described in sections below, and for information needed to prepare the water conservation plan.

Ordering Water

IID operates a delivery system with five types of orders available for growers and other customers: 24-hour, finish head, pump, 12-hour and interceptor order. A grower may request a finish head, which can last for one day only, up to three days prior to the delivery date. Growers may place any other type of order for multiple days as an open order.

Customers must place their order with the district division office (Northend, Southend or Holtville) that serves the area where the field to be irrigated is located. By using IID's online web portal, growers can place and review water orders online 24/7. In addition, customers can place water orders in person or by telephone with the Water Coordinator in the appropriate district division office between 5:30 AM and 5:00 PM, seven days a week.

Orders for change of quantity, including early termination (shutoff orders), can be placed at the appropriate district division office until 4:30 PM of the day previous to the date of desired change.

Except finish heads, orders to complete an irrigation, delivery of orders for water received at the appropriate division office before 12:00 noon will be received within the following three days. Orders received later than 12:00 noon are considered as having been received the following day. A finish head, can be ordered up to 3:00 PM of the day preceding delivery but must be ordered within three days of the original order.

A request for an increase to a running order that is placed with three (3) hours of notice will be honored if water is available and channel capacity is not a problem. From 5:30 AM to 5:00 PM, the request can be made to the appropriate Division office. From 5 PM to 5:30 AM, the request can be made directly to the Zanjero or to a Water Dispatcher at the WCC who will notify the Zanjero of the requested change.

In late 1995, as part of the IID/MWD Water Conservation Program, IID instituted a delivery flexibility program based on 12-hour orders. Twelve-hour (12-hour) AM orders must be placed prior to 12 noon on the previous day; 12-hour PM orders may be placed before 12 noon on the day of delivery for the

afternoon run. IID encourages agricultural customers to place orders for Sunday delivery (when deliveries are typically lower), especially during high use periods from March thru May.

Delivering Water to the Customer

To manage customer deliveries, IID has installed nearly 6,000 delivery gates throughout the district's 595,000-acre water service area to deliver untreated Colorado water into water users' private head ditches for use on 520,000 acres. Drains, canals, reservoirs, roads and railroads take up the area that does not receive water. In 2014, IID had an inventory of 5,570 delivery gates, of which 4,549 were active serving all categories of users throughout the district's water service area. A small percentage of water is delivered unmeasured to feedlots, small parcels and rural service pipes.

IID measures water supplied to growers through more than 5,000 delivery gates for irrigation of crops on about 475,000 acres, varying yearly. IID operates another approximately 130 gates to deliver measured flow to municipal, environmental, recreational and other users. Some delivery gates are inactive due to solar facilities or other developments, while others serve areas in the IID fallowing programs or farmland that is idle. Farming in the Imperial Valley is a year-round activity requiring continuous service. Staff accomplish maintenance of the system with minimal benefit of cutouts; that is, placing a canal out of service and dewatering it.

Each morning, zanjeros set head gates to release the required amount of water from the main canal into each lateral canal scheduled to receive water. Using a Run Schedule, instructions for when and what delivery gate to open or close, the zanjeros set the delivery gates in their runs to divert the required amount of water from the lateral canal to fulfill the customer's order. Runs are comprised of a set of lateral canals and all the associated delivery gates within a geographic area. Zanjeros are being provided with mobile laptops that they can use to access real-time SCADA flow data, make lateral heading changes, and monitor operational discharge; thereby upgrading these operations.

A small amount of irrigated acreage located outside the Imperial Unit receives water from the East Highline and the Westside Main canals. Customers order delivery for this acreage using IID's standard procedure, and the zanjero sets a delivery gate to the grower's pond. Water from this pond is delivered to the fields using the grower's own pump.

TABLE 22 and **TABLE 23** provide an overview of IID regulations and procedures for agricultural water orders and deliveries.

Table 22. Agricultural Water Order and Delivery Regulations

Type	Water Turn Time	Exceptions	Governing Regulation
24-Hour	Regular AM	Multi-day open order ok; To-follow order ok ; Run ordered or carry over with another order ok; Can move to adjacent gate if system has capacity	No. 13
Finish Head	Regular AM	One day only; Priority over other orders; Order within 3 days of original order; Can't be larger than original order; Can't move	No. 8
Pumps	Regular AM	Multi-day open order ok; Allowed up to 2-hour start time delay if mechanical problems; Can't move	No. 12
12-Hour	Regular AM or PM	Multi-day open order ok; Can't move	No. 13 & No. 48
Interceptor	Regular AM or PM	Only in IID/MWD intercepted areas; No 12-hour order; Multi-day open order ok Flexible delivery - must request shutoff/decrease at least 3 hours before desired change time if other than regular turn time; Orders ≤ 7 cfs charged min of 12 hours, if longer prorated for run time; Orders > 7 cfs charged min of 19 hours, if longer prorated for run time	No. 54 No. 48 does not apply

Source: Rules and Regulations Governing Distribution and Use of Water (Revised January 2016)

Table 23. Agricultural Water Order and Delivery Procedures

Conditions	24-Hour	Finish Head	Pumps	12-Hour AM	12-Hour PM	Interceptor
Applicable	Districtwide	Districtwide	Districtwide	Districtwide, not in intercepted areas	Districtwide, not in intercepted areas	Plum-Oasis Mulberry-D Trifolium
Order by	12 noon prior day	3 PM prior day	12 noon prior day	12 noon prior day	12 noon same day	12 noon prior day
Confirmed by	3-5 PM prior day	3-5 PM prior day	3-5 PM prior day	3-5 PM prior day	1-3 PM same day	3-5 PM prior day
Request change /cutoff by	4:30 PM prior day	4:30 PM prior day	4:30 PM prior day	4:30 PM prior day	4:30 PM prior day	4:30 PM prior day
Order limit	Delivery capacity	Delivery capacity	Delivery capacity	7 cfs: Dec-Feb & Jun-Aug; 5 cfs: Mar-May & Sep-Nov	12 cfs	Delivery capacity
Request flexibility delivery	3-hour notice if water & capacity	3-hour notice if water & capacity	3-hour notice if water & capacity	3-hour notice if water & capacity	3-hour notice if water & capacity	3-hour notice if water & capacity
Order carry over ok	Yes	No	Yes	Yes	Yes	Yes

Note: If 12-Hour AM orders with multiple pumps exceed seasonal limit (need more water), charge is for 24-hour delivery.

Drainage Facilities

As a part of its water transportation system, IID maintains an extensive gravity flow agricultural drainage system. The district is obligated to provide drains at sufficient depth, generally 6 to 10 feet, to accept subsurface discharge from over 32,000 miles of tile drains underlying nearly 475,000 acres of farmland. Where a drain cannot be maintained at sufficient depth, the district provides and maintains a sump and pump.

The lateral drain system is laid out to provide a drainage outlet for each governmental subdivision of approximately 160 acres and, as such, the drains usually parallel the laterals and canals. IID's gravity flow drainage system collects subsurface tile discharges and excess surface flow (tailwater) from

agricultural fields; operational discharge, including early cutoff of orders, from IID canals and laterals; and system seepage from water that has seeped from canals and laterals. IID's drains, as a matter of necessity, also collect surface runoff from rainfall events, treated wastewater discharge, surface runoff from non-agricultural users, and a small amount of groundwater intercepted from an aquifer near the east boundary of the irrigated area, however IID's agricultural drainage facilities were not designed for and are not managed for non-agricultural discharges, flood, or storm water management purposes. All drainage flows ultimately discharge into the Salton Sea.

As shown in **TABLE 24**, the department operates and maintains 1,456 miles of drainage ditches. The drainage system is designed collect IID's operational discharge, agricultural tailwater and tile water from thousands of miles of subsurface (tile) drains that growers have installed and operate. To that end, 750 surface and subsurface drainage pumps, and approximately 430 control structures installed along the drainage system. IID surface drains can be divided into three main areas: Alamo River system, New River system, and direct-to-sea drains that discharge into the Salton Sea; 50 miles of drains serving lands along the AAC also discharge to the Salton Sea via the Alamo River or New River.

Table 24. IID Drainage System (MI), 2014

System Used	Total Length	Earthen	Concrete Lined	Piped
All-American Drains	**50.110**	37.410	0.000	12.700
Drains	**1,405.940**	1295.912	1.180	108.848
Drains Total	**1,456.050**	1333.322	1.180	121.548

IID began seepage recovery along the AAC in 1947, along the East Highline Canal in 1967, and are expanding these projects to meet QSA/Transfer Agreements obligations beginning in 2009. The program returns seepage water with sufficiently low salinity levels back into the respective main canals. This program is described below in section **K. Reuse systems / IID ECP Initiatives**.

Water Measurement and Accounting Procedures

IID measures and records all water delivered to users except for service pipes and small parcels. Flow is also measured and recorded throughout the water transportation system and at key points in the drainage system by means of IID's WIS, using SCADA technology. Flow measurement and data management include current metering, SCADA, WIS, TruePoint, GIS and Decision Support Systems.[18] Of the district's 5,570 delivery gates, 4,549 received water in 2014. **TABLE 25** and **TABLE 26** document the IID farm accounts, customer delivery and system measurement details.

[18] Data Control, Monitoring and Management details:

1. **Current Metering** - Measurements used to recalibrate, reconfigure parameters in PLC that calculate flow; and in rare cases, used for flow data where other measurement is not viable.
2. **SCADA -** Software application for process control; gathers data in real time from remote locations to control equipment and conditions; records and logs events into a data storage file; warns when conditions become hazardous by posting alarms.
3. **WIS -** Oracle-based system to collect and process flow data in support of water management and conservation verification.
4. **TruePoint -** Software that enables field staff to take water orders and record deliveries. At IID, TPS record is used for billing, for IID's EDP water use tracking and for on-farm efficiency conservation programs. TPS records are stored in the WIS and is used in Water Balance water delivery flow path components.
5. **GIS -** Geographical information system designed to capture, store, manipulate, analyze, manage, and present spatial or geographical data (IID)
6. **Decision Support Systems -** WIS applications for water management by IID Division and WCC staff.

Table 25. Customer Farm Accounts and Measured Turnouts, 2014

Type	Total Number
Customer Farm Accounts	
Owner Operated	2,592
Tenant Operated	3,027
Measured Farm Accounts	5,619
Customer Turnouts – All Users	
Active & Inactive Delivery Gates (Measured Turnouts)	5,570
Active Delivery Gates (Measured Turnouts)	4,549
Feedlots	33
Small Parcels	728
Service Pipes	2,886

Source: Customer Accounts: Annual Inventory of Area Receiving Water 2016, 2015, 2014; Customer Turnouts: WIS query

Table 26. IID System Measurement, 2014

Type	Process	Number	Reading	Calibration	Maintenance
Automated System					
Sharp-Crested Weir	Logger	5	15-min	Semi-Annual	As-Needed
Sharp-Crested Weir	SCADA	82	15-min	Semi-Annual	As-Needed
Grade Board Weir	SCADA	23	15-min	Semi-Annual	As-Needed
Broad-Crested Weir	SCADA	34	15-min	Semi-Annual	As-Needed
Rated Drop or Weir	SCADA	8	15-min	Semi-Annual	As-Needed
Long-throated Flume	SCADA	2	15-min	Semi-Annual	As-Needed
Notched Weir	SCADA	1	15-min	Semi-Annual	As-Needed
Orifice Gate	SCADA	37	15-min	Semi-Annual	As-Needed
Automated Drop-Leaf Gate (ADLG)	SCADA	105	15-min	Semi-Annual	As-Needed
Acoustic Meter	SCADA	8	15-min	Semi-Annual	Semi-Annual
Rated Structure	SCADA	1	15-min	Semi-Annual	As-Needed
Level Only	SCADA	1	15-min	Semi-Annual	As-Needed
Total		**307**			
Seepage Recovery System					
Magnetic Flow Meter	SCADA	**22**	15-min	Annual	As-Needed
Manual System					
Main Canal or Lateral Heading	Manual	126	2 x/day	As-Needed	As-Needed
Dewatering Pump	Manual	23			
Delivery Gate	Manual	4,549	2 x/day	As-Needed	As-Needed
Total		**4,698**			
GRAND TOTAL		**5,027**			

IID contracts with the US Geological Survey to maintain official flow record at four of IID's automated measurement sites. CVWD contracts with US Geological Survey to maintain the official flow record at Coachella Canal Turn Out Flume. IID collects backup raw data for these sites, which USGS uses from time to time. USGS also collects flow data at AAC Station 60 and level data for Salton Sea near Westmorland. **TABLE 27** lists the monitoring stations and their calibration and maintenance schedules.

Table 27. IID System Measurement (USGS), 2014

Type		Reading	Calibration	Maintenance
AAC Station nr Imperial Dam: Station 60 paid by USGS	USGS 09523000	Daily	Monthly	As-Needed
AAC below Drop 2 Reservoir Outlet (Station 2235)	USGS 09527700	15-min	Monthly	As-Needed
Coachella Canal above AAC Diversion: paid by CVWD	USGS 09527590	15-min	Monthly	As-Needed
New River at International Boundary at Calexico CA	USGS 10254970	15-min	Monthly	As-Needed
Alamo River nr Niland CA (to Salton Sea)	USGS 10254730	15-min	Monthly	As-Needed
New River nr Westmorland CA (to Salton Sea)	USGS 10255550	15-min	Monthly	As-Needed
Salton Sea nr Westmorland CA: paid by USGS	USGS 10254005	15-min	Monthly	As-Needed

Note: AAC below Drop 2 readings start 10/26/2011, earlier readings were at AAC Drop 1; location changed due to AAC lining.

To maintain accuracy at rated-structure and acoustic velocity meter sites, IID Hydrographic Technicians performed 2,399 current metering readings at 89 major sites during 2013 and 2014. Metering data collected on a regular basis or for IID record when a data collection site is out of service are stored on IID's WIS. Other metering reports, such as requests for flow verification by divisions and Water Dispatching at major and minor sites and at farm delivery gates, are forwarded to requesting staff and maintained in files on the WIS. **TABLE 28** provides a list of IID current metering equipment and the calibration and maintenance schedule.

Table 28. Current Metering Equipment, 2014

Type	Number	Calibration	Maintenance
AA Propeller Meter	10	As-Needed	As-Needed
Flow Tracker / Point Velocity	2	Each time used	As-Needed
ADCP (Rivercat – Sontek)	3	Daily	As-Needed
ADCP (Stream Pro RDI)	1	Daily	As-Needed
Marsh-McBurney	2	As-Needed	As-Needed

IID maintains four California Irrigation Management Information System sites, which are calibrated by CDWR staff. IID downloads CIMIS data into the WIS, where IID performs additional QC. IID maintains three additional weather stations in the IID water service area. Water Dispatching manually enters data for these stations into the WIS. **TABLE 29** lists the monitoring stations and their calibration and maintenance schedules.

Table 29. Weather Stations, CIMIS & IID Sites

Data Stations/Source	CMIS Station No. /IID Report Name	Maintenance	Calibration
Calipatria/Mulberry CIMIS	0041	Monthly	As-Needed
Meloland CIMIS	0087	Monthly	As-Needed
Seeley CIMIS	0068	Monthly	As-Needed
Westmorland North CIMIS	0181	Monthly	As-Needed
Imperial Operating Headquarters	IMPW	Monthly	As-Needed
Niland Weather Station	NILW	Monthly	As-Needed
Northend Yard Weather Station	NEYW	Monthly	As-Needed

For CIMIS information and data, visit CIMIS California Irrigation Management Information System

Water Service, Pricing and Billing Practices

Water Cards

IID requires completion of a Certificate of Ownership and Authorization of Agent or Tenant, referred to as a water card, to establish an agriculture, municipal, industrial and commercial, or service pipe account and receive IID water delivery. A completed water card is required to order water from the district division offices. The water card establishes who is responsible to pay for the ordered water, where the ordered water can be used, who has certain rights, authority and obligations under IID rules and regulations, and who will receive notice with respect to proposed changes in water rates.

By signing the water card, the owner and any other party receiving water services is/are jointly and severally responsible for the payment of water delivered to the property. In addition, the owner and any other signatory acknowledges that all water delivered will be untreated and is to be used solely for irrigation or other non-potable purposes.

Industrial water users may be required to maintain a metering device and to sign a contract that limits the amount of water discharged into IID drains. The contract may also specify the water holding/ retention facilities required for the industry. Temporary water users are required to complete an application for temporary service. This application authorizes the water user to remove water from the location specified for the time period stated on the application, and requires a water metering device.

Water Rate Schedules

IID water accounts have four main customer groups: agricultural, municipal, industrial, and service pipe. Water deliveries to agricultural users (including feedlots), to municipal providers within the water service area, and for use by several industries are measured. IID maintains a record of all of water delivered to customers with these accounts and bills monthly on a volumetric (acre-foot) basis.

Untreated water delivered to homes, farmsteads and small businesses throughout the rural areas of the valley from IID canals and laterals into service pipes is generally not metered. Deliveries to schools, parks and playgrounds are distributed throughout the valley. Grass areas for these community facilities are often irrigated with unmetered canal water.

Customer billing is according to the applicable rate schedule provided in **TABLE 30**.

Table 30. IID Water Rate Schedules

1 General Agricultural – Service where water is taken from IID canals for general irrigation use by lands or properties located within the Imperial Unit. Effective Date: 1/1/2011	
Water Rate	$20/AF
Stock Water (minimum charge $10/day)	$10/day
1-A Mesa Agricultural Service – Applicable to service by irrigation on mesa lands within the Imperial Unit. By "mesa lands" is meant all lands located above 1030-foot contour line with MSL referenced at the 1000-foot elevation. Effective Date: 1/1/2011	
Up to 6 AF/AC/yr	$20/AF
Over 6 AF/AC to 8 AF/AC/yr	$40/AF
Over 8 AF/AC/yr	$80/AF
Stock Water (minimum charge $10/day)	$10/day
Special Conditions – (a) All lands receiving water service under this Schedule shall comply in all respects with Regulation No. 19 of the "Rules and Regulations Governing Distribution and Use of Water."	

2 Pump Service – Applicable to service to private pumping plants where water is taken from IID canals to be used for general irrigation for lands or properties within the Imperial Unit. Effective date: 1/1/2011	
Annual water rate per acre irrigated: 6 AF/AC x $20/AF, billed monthly for delivered water up to 6 AF/AC	Up to $120/yr
3 Pipe and Small Parcel Service – Applicable to service from pipes installed to take water by gravity flow only from IID canals for general use, or for any service to small parcels from an irrigation system within the Imperial Unit. Water provided by IID is raw canal water, and not suitable for cooking and drinking purposes unless treated according to all applicable state/ federal regulations. Effective Date: 8/1/2009	
Tier 1: Diameter ≤ 2 inches	$250/yr
Tier 2: 2 inch < Diameter < 6 inch (2 acre minimum charge per year)	$100/AC/yr
Special Conditions - (a) If pipes serve more than one water user, each additional user shall be subject to annual charges provided for in this schedule. (b) Pump accounts used for water service to dairies, cattle and/or feed yards or other animal husbandry activity shall be charged on basis of Tier 2, whether water delivery is made by pipe or otherwise. (c) Water service to small acreage shall be charged on basis of Tier 2. Houses receiving water through private field head ditches during normal irrigations will not be charged under this schedule but may order regular Stock Water. (d) Accounts that provide service for domestic (residential/business) purposes must adhere to all state and federal regulations and IID's Safe Drinking Water Act compliance efforts as outlined in Regulations No. 10 and 21.	
4 Wholesale Service – Applicable to raw water service to water users' associations within the Imperial Unit and Pilot Knob Unit. IID provides raw canal water that is not suitable for cooking and drinking purposes unless treated according to all applicable state and federal regulations. Effective Date: 1/1/2011	
Tier 1: For all water delivered	$20/AF
Tier 2 (Annual Rate Based on Gross Acreage): Where customer facilities make it impractical for IID to install measuring equipment, water service shall be furnished on annual charge per acre (2 acre minimum charge)	$105/AC/yr
Special Conditions - a) Accounts that provide service for domestic (residential and/or business) purposes must adhere to all state and federal regulations as well as IID's Safe Drinking Water Act compliance efforts as outlined in Reg. Nos. 10 and 21.	
5 Reuse of Drainage Water – Discontinued effective: 8/1/ 2009	Discontinued
6 Stand-by Service – Applicable to lands within IID water service area that are entitled to water service in accordance with IID Rules and Regulations, except lands not subject to assessment (City, County, State and Federal lands including public water districts). Effective Date: 1/1/1999	
Annual Water Availability Charge per gross acre whether water is used or not	$4/AC
Less minimum allowance for any and all right-of-way considerations	5%
Net per acre charge	$3.80
Special Conditions - (a) Annual billing will occur in advance of Jan 1, payable on a semi-annual basis. The date of delinquency is established as being Feb 15 and Aug 15 for the respective six-month periods. (b) No charge for parcels of 5.0 acres or less. (c) Charges for acreage within IID that are directly served by private water systems, mutual water companies, or other private agencies providing water service shall be collected from said agencies. Effective Date: 1/1/1999	
7 General Industrial Service – Applicable to water service to all industrial users who divert water from IID's canal system within the Imperial Unit. Exception: Where there is a signed contract between water user and IID Board of Directors. For drainage limits (excess water discharged to IID drains), see Reg. No. 46 of the "Rules and Regulations Governing Distribution and Use of Water" Effective Date: 8/1/2009	
Water Rate	$85/AF
Temporary Water Service (minimum charge)	$425/yr
Excess Drainage Assessment (for excess discharge into IID drain)	$258/AF
8 Penalty for Adjusting Gates – Applicable to anyone who adjusts a delivery gate which results in a change in the amount of water delivered without prior authorization from IID. Effective Date: 10/1/1987	
For each delivery gate adjusted without authorization	$100/gate
9 Drainage Service – Applicable to facilities outside the Imperial Unit that require drainage into IID system. Drainage limit is set at 5% of total volume of water received within a billing period; maximum allowable flow rate to drain shall be 10% of maximum flow rate of water received, and shall not exceed 1.5 cfs. Limitations are set as guidelines; individual contracts may be written. Effective Date: 10/1/1987	
Drainage Rate ($200/month/discharge point minimum charge)	$250/AF
Excess Drainage Rate (3 times the drainage rate for excess discharge into IID drain)	$750/AF

10 Free Water - Schedule No. 10 [listed churches, cemeteries, and schools] discontinued; customers will be billed under applicable Schedule based on type of water service provided. Effective: 8/1/ 2009.	Discontinued
11 Drainage Construction - Construction of drains as part of IID system to provide tile and/or surface drain outlet for each governmental sub-division of approximately 160 acres. Effective Date: 10/1/1987	
Drainage Construction Rate (for contribution to IID Capital Improvement Account)	$30/AC
12 12-Hour Runs – Applicable to all water deliveries as defined in Reg. No. 48, 12-hour runs. Effective Date: 1/1/2011	
Water Rate	$20/AF
13 – Conserved Water – Applicable to water delivered outside IID boundary, inside Imperial County. Effective Date: 1/1/2015	
Water Rate	$512.33/AF*
*To be adjusted annually after 1988 in accordance with the Consumer Price Index (CPI) *Based on $250/AF, 1988$, using all urban consumers CPI, US City Average, all items, 1982-1984 = 100	
14 –Municipal and Miscellaneous Service – Applicable to service where water is taken from IID canals for use by (a) cities, incorporated or unincorporated, towns, private water companies, mutual water companies, and water utility districts for lands or properties within the Imperial Unit; (b) schools, churches, cemeteries, experimental farms, golf courses, and recreational activities directly connected with such agencies. (Except where charged under Schedule No. 3.) Effective Date: 3/1/2014	
Water Rate	$20/AF

Note: Several rate schedules stipulate under Special Condition, 'In year where Supply/Demand Imbalance is declared, this rate schedule shall be adjusted as defined by "Regulations for EDP".
Source: Water Rate Schedules, see also Water Rules and Regulations

Water Billing

A sample water billing statement with definitions to assist with the understanding of each item reported on the water statement is posted on the Water Department website under How to Read Your Bill.

To clarify distinctions related to IID's water apportionment plan and efficiency conservation programs, the statement reports billing and consumption separately. To assist agricultural customers to keep up to date on their Equitable Distribution Policy apportionment details, farm unit apportionment balances, field apportionment details, apportionment adjustments and daily consumption details are also reported.

Water Shortage Allocation Policies: Supply and Apportionment

As of 2014, the IID board had adopted the following policies and programs to address how to accommodate future water demands under the terms of the QSA and related agreements and ameliorate potential negative impacts on agricultural water use.

- Western Farms Land purchase in 2004 to help manage IID's 3.1 MAF QSA/Transfer Agreements cap and potentially supplement ongoing programs that contract with landowners and/or water users to implement a range of conservation efficiency measures and to reduce water usage through land fallowing.

- Interim Water Supply Policy for Non-Agricultural Projects adopted by the board on September 29, 2009, to ensure sufficient water would be available for new development, in particular much anticipated renewable energy projects until the board selects and implements capital development projects such as those explored in the Imperial IRWMP.

- Temporary Land Conversion Fallowing Policy adopted by the board on May 8, 2012 and revised on March 29, 2016, to provide a framework for a temporary, long-term fallowing program to work in concert with the IWSP and IID's coordinated land use/water supply strategy.

- Imperial Integrated Regional Water Management Plan adopted by the board on December 18, 2012, and by the County, the City of Imperial, to meet the basic requirement of CDWR for an IRWM plan. In all, 14 local agencies adopted the 2012 Imperial IRWMP.

- Equitable Distribution Plan initiated by the board on November 28, 2006, followed by revisions in 2008, 2009 and 2013, adopted on October 28, 2013, to provide the mechanism for IID to administer the apportionment of the district's quantified annual supply of Colorado River water.

Western Farms Land

In 2004 IID purchased roughly 42,000 acres of Imperial Valley farmland of varying qualities of acreage dispersed throughout the valley (but with a degree of concentration in the North End). The land had been owned by U.S. Filter/Western Farms. The plan was to manage the land as a water resource for inadvertent overrun paybacks or district fallowing and conservation programs, if necessary. The district's board of directors also realized the acreage could be utilized in the early stages of QSA/Transfer Agreements implementation to assist the Water Department in managing the annual 3.1 MAF QSA cap.

Under the QSA, land fallowing is recognized as a conservation measure and is required for a period of 15 years to mitigate potential impacts to the Salton Sea of transferring water out of the Imperial Valley. At the same time, the district's purchase of the Western Farms land gives IID flexibility to actively manage its water conservation programs while returning land ownership to an Imperial Valley interest.

After acquiring the land, the board directed staff to declare some of the land as surplus in order to sell some of the parcels and use the proceeds to retire debt incurred in the land purchase. Once the bonds used to purchase the lands were defeased, the district kept the balance of lands for use in its water management portfolio.

IID Interim Water Supply Policy for Non-Agricultural Projects (September 2009)

The Interim Water Supply Policy provides a mechanism to address water supply requests for projects being developed within the IID service area. The IWSP designates up to 25,000 acre-feet per year of IID's annual Colorado River water supply for new projects and provides a mechanism and process to develop a water supply agreement for any appropriately permitted project. In addition, the policy establishes a framework and set of fees to ensure the supplies used to meet new demands do not adversely affect existing users by funding water conservation or augmentation projects as needed.

Depending on the nature, complexity and water demands of any newly proposed non-agricultural project, IID charges a renewable two-year Reservation Fee and an annual Water Supply Development Fee for the contracted water volume that is used solely to assist in funding new water supply or conservation projects. The 2015 fee schedule is shown in **TABLE 31**. All new industrial use projects are subject to the fee, while new municipal and mixed-use projects may be subject to the fee if the projects' water demands exceed certain district-wide average per capita use standards and require supplemental

water supplies from IID. The applicability of the fee to mixed-use projects will be determined by IID on a case-by-case basis, based on the proportion of types of land uses and water demand being proposed.

Table 31. Interim Water Supply Policy Annual Non-Agricultural Water Supply Development Fee, 2015

Annual Demand (AF)	Reservation Fee ($/AF)*	Development Fee ($/AF)*
0-500	$68.97	$275.87
501-1000	$97.11	$388.42
1001-2500	$121.93	$487.74
2501-5000	$150.62	$602.50

*Adjusted annually after 2010 in accordance with the Consumer Price Index (CPI).

IID customers with new projects will be charged the appropriate water rate based on measured deliveries, see **TABLE 30. IID WATER RATE SCHEDULES**. As of December 2015, IID has issued one Water Supply Agreement for 1,200 acre-feet per year, leaving a balance of 23,800 acre-feet per year of supply available for contracting under the IWSP.

IID Temporary Land Conversion Fallowing Policy (May 2012)

Water demands for certain non-agricultural projects are typically less than that required for agricultural production; this reduced demand allows additional water to be made available for other users under IID's annual consumptive use cap. This allows the district to avail itself of the ability during the term of the QSA under California Water Code Section 1013 to create conserved water through these projects as temporary land fallowing conservation measures. This conserved water can then be used to satisfy the district's conserved water transfer obligation and for environmental mitigation purposes.

Under the terms of the legislation adopted to facilitate the QSA and enacted in California Water Code Section 1013, the Temporary Land Conversion Fallowing Policy was adopted by the IID Board of Directors on May 8, 2012 and revised on March 29, 2016. This policy provides a framework for a temporary, long-term fallowing program to work in concert with the IWSP and in line with the EDP. While conserved water generated from the TLCFP is limited by law for use for water transfer or environmental purposes, by satisfying multiple district objectives the TLCFP serves to reduce efficiency conservation and water use reduction demands on IID water users, thus providing districtwide benefits.[19]

Imperial Integrated Regional Water Management Plan (October 2012)

On September 23, 2008, the IID Board of Directors adopted a strategic plan tasking the Water Department to develop an IWRMP to assist in meeting future water resource demands. On September 29, 2009, the IID board accepted the findings of the draft IWRMP and authorized development of the Imperial IRWMP to further these efforts and to assist regional water planning efforts through a process conforming to CDWR guidelines.[20]

The Water Department prepared documentation, *Imperial IRWMP Regional Acceptance Process* (RAP, April 2009), that defined boundaries for the Imperial Region and identified how the region met CDWR

[19] For details of how water conservation yield attributable to land removed from agricultural production and temporarily fallowed is computed, see TLCFP for Water Conservation Yield.

[20] The 2009 draft IID Plan is superseded by the 2012 Imperial IRWMP, which incorporates the IID Interim Water Supply Policy.

guidelines. The Imperial County Board of Supervisors Chairman and the IID Board of Directors President signed the April 28, 2009 cover letter submitting the RAP to CDWR. Upon review, CDWR approved the Imperial Region for the purposes of preparing an IRWMP and applying for a Proposition 84 Planning Grant. IID subsequently applied for and in 2011 was awarded a Proposition 84 IRWM Planning Grant.

On June 24, 2010, IID and the County convened a Water Forum comprised of IID, Imperial County and Imperial Region cities and other stakeholders. The Water Forum undertook an extensive process to develop the Imperial IRWMP, with stakeholders reviewing regional conditions and requirements as well as methods for water supply augmentation including water storage and banking, recycling of municipal wastewater, and desalination of brackish water. Water storage and banking have the potential to benefit both agricultural and non-agricultural users, while other IID and municipal capital projects would be implemented primarily to meet water requirements for new non-agricultural projects that have higher demand than was previously delivered to the development footprint.

In November 2012, the Imperial County Board of Supervisors adopted the *2012 Imperial IRWMP*, and in December 2012, the City of Imperial City Council and the IID Board adopted the plan.[21] Adoption by IID, the County and the City of Imperial meets the basic requirement of CDWR for an IRWM plan. The Water Forum authorized the City of Imperial to serve as the Proposition 84 grant administrator.

Until the IID board selects and implements any such capital development projects, IID will provide water to new non-agricultural projects under the terms of the IID EDP and the IWSP, which was incorporated into the 2012 Imperial IRWMP by reference.

Imperial IRWMP Chapter 5 addresses the region's supply and demand, including baseline and forecasted values through 2050. Chapter 12 reviews projects, programs and policies, and funding alternatives that exist or might become available to the Imperial Region. Chapter 12 lists and Appendix N details a set of capital projects that IID might pursue, including the amount of water that might result (AFY) and estimated cost ($/AF). The capital projects could generate long-term water supply augmentation while agency policies could provide demand management opportunities to address forecasted growth in non-agricultural water requirements. In particular, Chapter 5 and Chapter 12 present:

- IID's water rights
- Forecasted non-agricultural use in five-year increments for 2010 through 2050
- IID's level of service (provisional water budget) for 2006-2011
- Sources, volume (AFY), and costs ($/AF) of potential new IID capital projects
- Prioritized list of water management opportunities submitted by Imperial IRWMP stakeholders
- Strawman proposals for demand management, non-agriculture water use best management practices, drought management strategies, emergency contingency plans, and policies for non-agricultural water use
- Potential funding sources.

Through the IRWMP process, IID presented to region stakeholders a comprehensive set of potential methods for long-term water supply augmentation such as water storage and banking, recycling of

[21] IID website: IID Resolution 43-2012

municipal wastewater, and desalination of brackish water, which can be found in Table 12-5 IID Capital Project Alternatives and Cost (2012 Imperial IRWM, Chapter 12, p 12-14).

Potential water storage and banking opportunities would benefit agricultural and non-agricultural users, while other IID capital projects would be implemented primarily to meet requirements for new non-agricultural projects having a water demand higher than historic delivery to the development footprint.

IID Equitable Distribution Plan (October 2013)

In support of IID's Colorado River water management responsibilities, each calendar year the Water Department apportions its annual water supply to all users in accordance with the Oct. 28, 2013 EDP. To be eligible for agricultural apportionment, a field must be connected to IID's canal system, be current with its water availability charges and water bills, be larger than five (5) acres and be used for crop production, algae farming or an actively managed duck pond.

Water users may aggregate water accounts into farm units to facilitate the use and management of water among the fields in those accounts. Additionally, the EDP allows for an intra-district clearinghouse for moving agricultural water between agricultural water users and farm units within the IID water service area. Movement of water between users is only possible through the use of the Agricultural Water Clearinghouse.

- FOR EDP RULES AND REGULATIONS, SEE IID WEBSITE: Equitable Distribution[22]

Operation and Maintenance Program

The 2017 Water Budget Plan (Appendix A, attached) provides the Water Department's resource budget, summary and details of the operation and maintenance capital budget, the capital budget, the IID/SDCWA budget, the MWD budget, staffing, O&M cost centers; activity (labor), vehicle and overhead rates, accounting reports procedure, and a list of cost elements. The Budget Plan provides a high-level overview of the Water Department's operation and maintenance program for 2017.

INVENTORY OF WATER RESOURCES

Water Budget Tables

The IID water balance analyses include monthly and annual accounting. The water balances are based on a modified version of spreadsheets developed for IID by Dr. Bert Clemmens for 1987- 1996.[23] Monthly and annual balances are available from IID WIS for calendar years 1990-2014. Methods and Assumptions that follow are from Davids Engineering, et al., May 2007.[24]

Figure 8 provides a conceptual overview of all flow paths within the IID water balance study area boundary. These include all water sources - AAC, rainfall, surface and subsurface inflows. The arrows are

[22] On February 6, 2018 the IID Board of Directors rescinded IID's EDP to comply with a judicial statement of decision resulting from litigation challenging this policy in the Imperial County Superior Court. IID filed a notice of appeal on September 26, 2017 and the litigation is ongoing.

[23] Albert J. Clemmens, Ph.D., PE, WEST Consultants, Inc. since 2011, before that USDA Agricultural Research Service, U. S. Water Conservation Laboratory, Maricopa, AZ.

[24] Davids Engineering, et al., May 2007, IID Delivery System Analyses (Vol 2) Technical App. 1.b.

sized relative to flow volume. Blue arrows signify water flow paths and red arrows signify discharge of water to the atmosphere via crop evapotranspiration (ET), evaporation from IID conveyance/distribution systems, rivers, drains, municipal and industrial consumptive use, and transpiration by vegetation growing along canals, drains, and rivers.

Methods & Assumptions

For the purpose of the IID water balance, boundaries are AAC inflow at Mesa Lateral 5 on the East, the Mexican border on the South, the Westside Main Canal on the West, and the Salton Sea on the North. The first step in the IID water balance is to sum inflows and subtract outflows to close on total consumptive use and change in soil water storage:

- Σ Inflows – Σ Outflows = Consumptive Use + Δ Storage

Inflows include the AAC, the New and Alamo rivers from Mexico, rainfall, Mesa storm flows, and subsurface inflows. Outflows, which discharge to the Salton Sea, include the New and Alamo rivers, Direct-to-Sea drain flows, and subsurface outflow.

IID WIS and AAC Report data for AAC inflows at Mesa Lateral 5 are provided above in **TABLE 13 SURFACE WATER SUPPLY (KAF), 2010-2014**. Adjusted Modeled System Inflow is used for the water balance.[25] This flow is based on the calibrated Imperial Irrigation Decision Support System modeled AAC inflow.

IIDSS is demand driven: summing all reported IID water deliveries to users and calibrated estimates of system seepage, evaporation, and spillage to arrive at AAC inflow at Mesa Lateral 5 check. It does not include unaccounted water. Thus, IIDSS modeled system inflow is expected to be less than measured system inflow by the amount of unaccounted water. Monthly Adjusted Modeled System Inflow is calculated as the maximum of IIDSS modeled system inflow and the lesser of WIS and 660 Report estimated inflows. Unaccounted water in the water balance is the difference between Adjusted Modeled System Inflow and IIDSS modeled system inflow. Monthly Adjusted Modeled System Inflows are summed by water year to obtain the annual inflows used.

Stored soil water is estimated in the monthly water balance as recorded ag water deliveries minus the amount of soil moisture discharging to drain flows plus effective precipitation minus consumptive use on irrigated agricultural land. Monthly ag ET is estimated by multiplying monthly reference ET values by the crop coefficient. Monthly crop coefficients were estimated using October 1997 to September 1998 SEBAL ET data with a 15 meter buffer applied within the outside edges of the fields.

[25] Historically and logically AAC "loss" should be about 50 percent above Station 2900 and 50% below Station 2900. The adjustment is done to equalize "loss" and make sure IID and other users do not end up delivering more water than shown in their accounts. Main canal measurements are rarely precise enough to deal with the relatively small amounts of canal "losses".

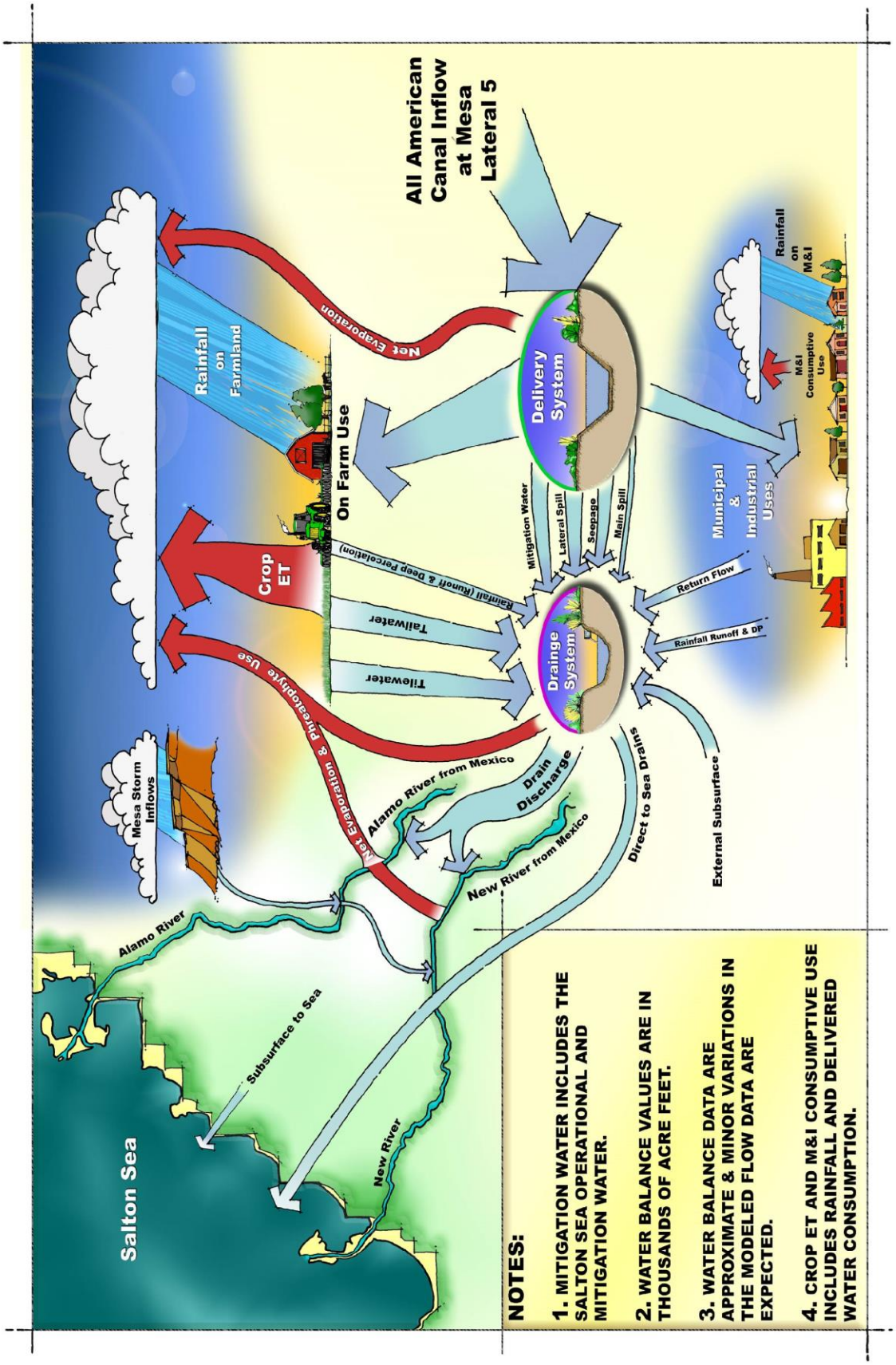

Figure 8. ***IID Water Balance Components and Flow Paths***

Source: Davids Engineering, et al., May 2007, IID Delivery System Analyses (Vol 2) Technical App. 1.b, p 2

2014 Provisional Monthly Water Balance

Except for a small volume from Lower Colorado Water Supply Project pumping, IID surface water supply is entirely from the Colorado River. With an average annual rainfall of less than 3 inches, there is also a variable amount of annual effective precipitation. Information in **TABLE 32** is from USBR 2014 Decree Accounting Report and IID 2014 provisional monthly water balance analysis.

Table 32. IID Monthly Water Supplies (AF), 2014

	All Surface Water (USBR)	Groundwater Extraction		Effective Precipitation	Reclaimed Water Used	Total Effective Water Supply
		LCWSP (USBR)	IID Customers			
January	118,093	520	0	3,029	3,029	145,229
February	153,047	585	0	2,676	2,676	156,308
March	246,639	583	0	3,032	3,032	250,345
April	275,660	585	0	3,244	3,244	288,978
May	302,145	529	0	3,217	3,217	307,021
June	285,409	675	0	3,721	3,721	289,805
July	288,395	655	0	3,775	3,775	292,825
August	217,518	502	0	3,721	3,721	221,832
September	199,814	587	0	3,505	3,505	211,589
October	197,573	720	0	3,777	3,777	202,251
November	152,414	582	0	3,098	3,098	156,953
December	96,707	672	0	2,824	2,824	126,080
Totals	**2,533,414**	**7,195**	**0**	**39,619**	**39,619**	**2,649,216**

Source and Notes:
All Surface Water (USBR): 2014 Decree Accounting Report, Table 5a, volume at Imperial Dam.
Groundwater Extraction LCWSP (USBR): 2014 Decree Accounting Report, Table 19 and IID WIS provisional monthly record, volume at Imperial Dam. Groundwater pumped from East Mesa wellfield and delivered to IID for its use via the AAC. IID forbears consumptive use of this amount from the Colorado River to make water available to exchange to LCWSP beneficiaries. LCWSP is operated and maintained by USBR Yuma Area Office.
Effective Precipitation: IID WIS 2014 Provisional Water Balance Run Date 03/21/2017: [Rainfall on Ag Land + Non-Ag Land + Envr Land + Rec Land] – [Rainfall Runoff & Deep Perc. on Ag Land + Non-Ag Land + Envr Land + Rec Land]
Reclaimed Water Used: IID 2014 WIS Provisional Water Balance Run Date 03/21/2017: [QSA Seepage Interception + IID Seepage Interception] + Colorado River water seepage from AAC.

Each year IID provides USBR Yuma Area Office with an annual crop and water data report. The 2014 report data is shown in **TABLE 33**.

Table 33. Provisional IID Monthly Water Distribution (AF), 2014

a	b	c	d	f1	f2	f3	f4	g
			b-(c+f4+g)	Delivered to Non-Ag			f1+f2+f3	
USBR Category	Water Supply (USBR)	Operational Spills	Transportation "Losses"	(1) Muni & Industry	(2) Wildlife	(3) Misc	Delivered to Non-Ag	Delivered to Farms
IID WB Component		Main Canal Spill + Main Canal Spill Due to Rainfall		Non-Ag Water Delivery	Envr Water Delivery	Recr Water Delivery		Ag Water Delivery
January	118,093	218	12,059	7,472	89	398	7,959	97,857
February	153,047	75	17,113	6,902	94	401	7,397	128,462
March	246,639	64	22,486	7,555	93	399	8,047	216,042
April	275,660	114	27,472	7,944	123	439	8,506	239,568
May	302,145	65	30,564	8,312	240	539	9,091	262,425
June	285,409	108	27,530	8,303	415	528	9,246	248,525
July	288,395	68	27,819	8,770	557	612	9,939	250,569
August	217,518	829	22,868	8,260	530	562	9,352	184,469
September	199,814	288	21,241	7,606	506	621	8,733	169,552

October	197,573	73	13,347	7,868	487	570	8,925	175,228
November	152,414	87	11,747	7,024	532	566	8,122	132,458
December	96,707	303	10,033	6,655	215	527	7,397	78,974
Totals	**2,533,414**	**2,292**	**244,279**	**92,613**	**3,881**	**6,162**	**102,714**	**2,184,129**

Source: 2014 Decree Accounting Report, Table 5a, volume at Imperial Dam; and IID WIS 2014 Provisional Water Balance Run Date 03/21/2017

The detailed monthly consumptive use summary for 2014 is provided in **TABLE 34** (Jan – Jul), and **TABLE 35** (Aug – Dec and annual total).

Table 34. Provisional IID Monthly Consumptive Use Summary (AF), Jan-Jun 2014

IID Water Balance Component	Jan	Feb	Mar	Apr	May	Jun	Jul
Delivery System Evaporation	922	1,090	1,915	2,322	3,052	3,471	3,204
Ag ET from Delivered Water & Stored Soil Water	52,261	78,754	141,858	158,698	179,589	177,205	188,537
Ag ET from Rainfall	0	1,102	512	0	0	0	1,024
Non-Ag CU of Delivered Water	4,603	4,252	4,654	4,894	5,120	5,115	5,402
Non-Ag ET from Rainfall	0	160	75	0	0	0	147
ET from Delivered Water & Stored Soil Water	89	94	93	123	240	415	423
Envr ET from Rainfall	0	1	0	0	0	0	4
Recr ET from Delivered Water & Stored Soil Water	360	401	399	439	539	528	612
Recr ET from Rainfall	0	1	1	0	0	0	1
Drain Evap. & Phreatophytes ET	2,730	3,226	5,667	6,872	9,035	10,274	9,482
River Evap. & Phreatophytes ET	726	858	1,506	1,827	2,402	2,731	2,521
Total Consumptive Use	**61,690**	**89,939**	**156,678**	**175,174**	**199,977**	**199,739**	**211,356**

Source: IID WIS 2014 Provisional Water Balance Run Date 03/21/2017, due to rounding, totals may differ from sum of components.

Table 35. Provisional IID Monthly Consumptive Use Summary (AF), Jul-Dec & Total 2014

IID Water Balance Component	Aug	Sep	Oct	Nov	Dec	Total
Delivery System Evaporation	2,892	2,412	1,648	1,082	679	24,689
Ag ET from Delivered Water & Stored Soil Water	132,589	116,625	115,068	84,575	45,726	1,471,485
Ag ET from Rainfall	19,526	7,834	0	1,024	12,400	43,422
Non-Ag CU of Delivered Water	5,088	4,686	4,844	4,327	4,067	57,052
Non-Ag ET from Rainfall	2,776	1,101	0	142	1,774	6,175
ET from Delivered Water & Stored Soil Water	387	329	230	166	117	2,706
Envr ET from Rainfall	9	6	0	0	5	25
Recr ET from Delivered Water & Stored Soil Water	562	621	570	566	210	5,807
Recr ET from Rainfall	109	63	0	12	54	241
Drain Evap. & Phreatophytes ET	8,560	7,139	4,878	3,202	2,010	73,075
River Evap. & Phreatophytes ET	2,275	1,898	1,297	851	534	19,426
Total Consumptive Use	**174,774**	**142,713**	**128,534**	**95,947**	**67,576**	**1,704,096**

Source: IID WIS 2014 Provisional Water Balance Run Date 03/21/2017.
Due to rounding, totals may differ from sum of components.

2010-2014 Provisional Annual Water Balance Results

Results of the overall water balance analysis for 2010-2014 are provided in **Table 36**.

Table 36. Provisional IID Calendar Year Water Balance (KAF), 2010-2014

IID Water Balance Component	2010	2011	2012	2013	2014
IID Inflows					
All-American Canal at Mesa Lateral 5	2,580.3	2,872.0	2,870.9	2,561.3	2,577.1
Alamo River Flow from Mexico	0.7	0.7	1.0	1.3	1.1
New River Flow from Mexico	90.3	82.0	70.9	83.6	73.5

Total Rainfall	189.6	109.7	133.5	134.5	53.5
Mesa Storm Inflows to Drain	10.8	6.2	14.3	7.6	3.0
Mesa Storm Inflows to Delivery System	6.5	1.8	6.7	2.3	0.8
External Subsurface Inflows	20.0	20.0	20.0	20.0	20.0
Total All IID Inflows	2,898.1	3,092.5	3,117.3	2,810.6	2,729.0
IID Outflows					
Alamo River Flow to Salton Sea	587.3	612.0	661.9	569.2	547.8
New River Flow to Salton Sea	415.3	392.6	422.7	402.1	384.0
Direct-to-Sea Drain Flow	109.2	112.3	112.6	102.7	93.0
Subsurface Flow to Salton Sea	1.0	1.0	1.0	1.0	1.0
Consumptive Uses and Change in Soil Storage	1,785.3	1,974.6	1,919.2	1,735.6	1,703.2
Total All IID Outflows	**2,898.1**	**3,092.5**	**3,117.3**	**2,810.6**	**2,729.0**
Consumptive Use					
Delivery System Evaporation	24.3	25.0	24.6	24.4	24.7
Ag ET from Delivered & Stored Soil Water	1,500.5	1,705.8	1,624.5	1,438.3	1,471.5
Ag ET from Rainfall	127.9	80.1	104.7	106.3	43.4
Non-Ag CU of Delivered Water	55.0	56.7	58.2	58.6	57.1
Non-Ag ET from Rainfall	22.2	12.8	15.7	15.7	6.2
Envr ET from Delivered & Stored Soil Water	2.3	2.5	2.3	2.4	2.7
Envr ET from Rainfall	0.1	0.0	0.1	0.1	0.0
Recr ET from Delivered & Stored Soil Water	6.2	5.9	7.3	5.1	5.8
Recr ET from Rainfall	0.4	0.3	0.4	0.4	0.2
Drain Evaporation & Phreatophyte ET	71.9	74.1	72.7	72.3	73.1
River Evaporation & Phreatophyte ET	19.1	19.7	19.3	19.2	19.4
Total Consumptive Use	**1,830.0**	**1,983.0**	**1,929.6**	**1,742.8**	**1,704.1**
Delivery System Inflows					
All-American Canal at Mesa Lateral 5	2,580.3	2,872.0	2,870.9	2,561.3	2,577.1
QSA Seepage Interception	6.7	26.0	31.3	30.2	31.3
IID Seepage Interception	8.4	7.2	6.4	8.2	7.3
Rainfall on Delivery System	1.1	0.6	0.8	0.8	0.3
Mesa Storm Inflows to Delivery System	6.5	1.8	6.7	2.3	0.8
Total Delivery System Inflows	**2,603.0**	**2,907.6**	**2,916.2**	**2,602.8**	**2,616.8**
Delivery System Outflows					
Ag Water Delivery	2,232.8	2,545.8	2,534.1	2,178.3	2,184.1
Non-Ag Water Delivery	89.4	92.1	94.4	95.1	92.6
Environmental Water Delivery	2.4	2.6	2.4	2.6	3.9
Recreational Water Delivery	7.0	6.8	8.4	5.9	6.2
Canal Seepage	94.4	93.2	92.4	94.2	93.3
Main Canal Operational Discharge	2.1	4.2	5.8	3.3	1.5
Main Canal Operational Discharge Due to Rainfall	6.5	1.8	6.7	2.3	0.8
Lateral Canal Operational Discharge	115.2	144.6	143.7	137.3	128.1
QSA Salton Sea Mitigation Water	73.7	0.0	14.0	66.6	82.5
Delivery System Evaporation	24.3	25.0	24.6	24.4	24.7
Unaccounted Canal Water	-44.7	-8.3	-10.4	-7.2	-0.9
Total Delivery System Outflows	**2,603.0**	**2,907.6**	**2,916.2**	**2,602.8**	**2,616.8**
Unaccounted Canal Water Percent	*-1.7%*	*-0.3%*	*-0.4%*	*-0.3%*	*0.0%*
Ag Water (On-Farm) Inflows					
Ag Water Delivery	2,232.8	2,545.8	2,534.1	2,178.3	2,184.1
Rainfall on Ag Land	153.7	89.0	108.1	109.0	43.4
Total Ag Water (On-Farm) Inflows	**2,386.4**	**2,634.8**	**2,642.2**	**2,287.3**	**2,227.6**
Ag Water (On-Farm) Outflows					
Ag ET from Delivered & Stored Soil Water	1,500.5	1,705.8	1,624.5	1,438.3	1,471.5
Ag ET from Rainfall	127.9	80.1	104.7	106.3	43.4
Ag Land Tilewater	383.9	424.9	413.9	367.4	382.1

Ag Land Tailwater	348.5	415.1	495.7	372.6	330.5
Ag Land Rainfall Runoff & Deep Percolation	25.8	8.9	3.4	2.7	0.0
Total Ag Water (On-Farm) Outflows	**2,386.4**	**2,634.8**	**2,642.2**	**2,287.3**	**2,227.6**
Non-Ag (MCI) Inflows					
Non-Ag Water Delivery	89.4	92.1	94.4	95.1	92.6
Rainfall on Non-Ag Land	29.6	17.1	20.9	21.0	8.2
Total Non-Ag (MCI) Inflows	**119.0**	**109.2**	**115.3**	**116.0**	**100.9**
Non-Ag (MCI) Outflows					
Non-Ag CU of Delivered Water	55.0	56.7	58.2	58.6	57.1
Non-Ag ET from Rainfall	22.2	12.8	15.7	15.7	6.2
Non-Ag Return Flow to IID Drains	34.3	35.4	36.3	36.5	35.6
Non-Ag Land Rainfall Runoff & Deep Percolation	7.4	4.3	5.2	5.2	2.1
Total Non-Ag (MCI) Outflows	**119.0**	**109.1**	**115.3**	**116.0**	**100.9**
Environmental Inflows					
Environmental Water Delivery	2.4	2.6	2.4	2.6	3.9
Rainfall on Environmental Land	0.2	0.1	0.1	0.1	0.0
Total Environmental Inflows	**2.6**	**2.6**	**2.5**	**2.6**	**3.9**
Environmental Outflows					
Envr ET from Delivered Water & Stored Soil Water	2.3	2.5	2.3	2.4	2.7
Environmental ET from Rainfall	0.1	0.0	0.1	0.1	0.0
Environmental Tailwater	0.1	0.0	0.1	0.2	1.2
Envr Land Rainfall Runoff & Deep Percolation	0.0	0.0	0.0	0.0	0.0
Total Environmental Outflows	**2.6**	**2.6**	**2.4**	**2.6**	**3.9**
Recreational Inflows					
Recreational Water Delivery	7.0	6.8	8.4	5.9	6.2
Rainfall on Recreational Land	0.5	0.4	0.5	0.5	0.3
Total Recreational Inflows	**7.5**	**7.1**	**8.9**	**6.4**	**6.4**
Recreational Outflows					
Recr ET from Delivered Water & Stored Soil Water	6.2	5.9	7.3	5.1	5.8
Recreational ET from Rainfall	0.4	0.3	0.4	0.4	0.2
Recreational Tailwater	0.8	0.9	1.1	0.8	0.4
Recr Land Rainfall Runoff & Deep Percolation	0.1	0.1	0.1	0.1	0.0
Total Recreational Outflows	**7.5**	**7.1**	**8.9**	**6.4**	**6.4**
Drainage System Inflows					
Alamo River Flow from Mexico	0.7	0.7	1.0	1.3	1.1
New River Flow from Mexico	90.3	82.0	70.9	83.6	73.5
Mesa Storm Inflows to Drain	10.8	6.2	14.3	7.6	3.0
External Subsurface Inflows	20.0	20.0	20.0	20.0	20.0
Main Canal Operational Discharge	2.1	4.2	5.8	3.3	1.5
Main Canal Operational Discharge Due to Rainfall	6.5	1.8	6.7	2.3	0.8
Lateral Canal Operational Discharge	115.2	144.6	143.7	137.3	128.1
QSA Salton Sea Mitigation Water	73.7	0.0	14.0	66.6	82.5
Canal Seepage	94.4	93.2	92.4	94.2	93.3
Non-Ag Return Flow to IID Drains	34.3	35.4	36.3	36.5	35.6
Ag Land Rainfall Runoff & Deep Percolation	25.8	8.9	3.4	2.7	0.0
Non-Ag Land Rainfall Runoff & Deep Percolation	7.4	4.3	5.2	5.2	2.1
Envr Land Rainfall Runoff & Deep Percolation	0.0	0.0	0.0	0.0	0.0
Recr Land Rainfall Runoff & Deep Percolation	0.1	0.1	0.1	0.1	0.0
Rainfall on Drains and Phreatophytes	3.5	2.1	2.5	2.5	1.0
Rainfall on Rivers and Phreatophytes	0.9	0.6	0.7	0.7	0.3
Ag Land Tilewater	383.9	424.9	413.9	367.4	382.1
Ag Land Tailwater	348.5	415.1	495.7	372.6	330.5

Environmental Tailwater	0.1	0.0	0.1	0.2	1.2
Recreational Tailwater	0.8	0.9	1.1	0.8	0.4
Total Drainage System Inflows	**1,218.9**	**1,244.8**	**1,327.9**	**1,204.9**	**1,156.9**
Drainage System Outflows					
Alamo River Flow to Salton Sea	587.3	612.0	661.9	569.2	547.8
New River Flow to Salton Sea	415.3	392.6	422.7	402.1	384.0
Direct-to-Sea Drain Flow	109.2	112.3	112.6	102.7	93.0
Subsurface Flow to Salton Sea	1.0	1.0	1.0	1.0	1.0
Drain Evaporation & Phreatophytes ET	71.9	74.1	72.7	72.3	73.1
River Evaporation & Phreatophytes ET	19.1	19.7	19.3	19.2	19.4
QSA Seepage Interception	6.7	26.0	31.3	30.2	31.3
IID Seepage Interception	8.4	7.2	6.4	8.2	7.3
Total Drainage System Outflows	**1,219.0**	**1,244.8**	**1,327.9**	**1,205.0**	**1,156.9**

Source: IID WIS run date 05/18/2017, due to rounding, totals may differ from sum of components.

Quality of Water Sources

The overriding water quality constraint for IID customers is the salinity of IID source water, drainage water and groundwater. A secondary concern is the possibility of contaminants in drainage water that make growers resistant to or prohibit its reuse for irrigation.

For 1970 to 2007, the average flow-weighted salinity of the Colorado River inflow at Imperial Dam was 749 mg/L, just over one ton of salt per acre-foot.[26] As can be seen in **FIGURE 9**, in recent years, Colorado River salinity at Imperial Dam has been around 700 mg/L, slightly less than one ton of salt per acre-foot. This reduction may be due to actions taken as a result of the Colorado River Basin Salinity Control Act, PL 93-320, which was enacted in June 1974.

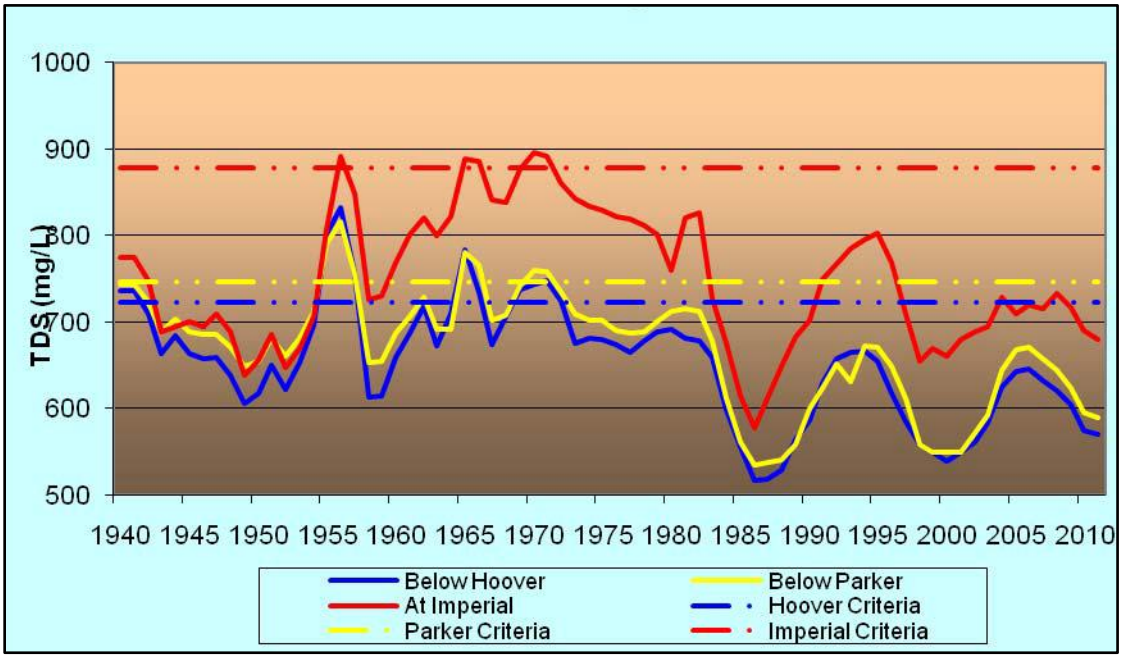

Figure 9.*Colorado River Salinity at Lower Basin Compact Points (see Imperial)*
Source: Quality of Water Colorado River Basin Progress Report No. 24 (2013), p 20 of 130.

[26] Determined by U.S. Geological Survey (USGS) from data collected by the USBR and USGS

Salinity in IID drains has been measured in the range of 1,000 to 2,200 mg/L. For 1963-2007, average salinity of the New River was reported to be about 3,300 mg/L and about 2,500 mg/L for the Alamo River.[27] When fully implemented, the CRWDA will reduce flows into the IID water service area by 303,000 acre-feet per year. This reduction in use is to be accomplished by reducing operational discharge and agricultural tailwater runoff while maintaining tilewater discharge to prevent salt buildup in the crop root zone. Reduction of total flow while maintaining tilewater discharge to manage salt discharge from the soil root zone will inevitably increase salinity levels in IID drains, the New and Alamo rivers and to a greater extent in the Salton Sea.

As reported in the Imperial IRWMP Appendix P, page P-34, and shown in **FIGURE 10**:

> Total dissolved solids concentrations have been summarized for three distinct water-bearing zones, shallow (80' to 300'), intermediate (300' to 1,500') and deep (>1,500') aquifers (Durbin and Imhoff 1993). The shallow aquifer contains highly variable water quality, ranging from 800 to over 10,000 mg/L. The intermediate aquifer contains water that is uniform averaging 2,200 mg/L, while the deep aquifer contains the poorest quality water. Imperial Valley contains a large area of poor quality groundwater that is generally unsuitable for domestic or irrigation use without treatment. The chemical quality of groundwater differs greatly from place to place, and salinity is the primary water quality issue. Salinity ranges from a few hundred to more than 10,000 mg/L.

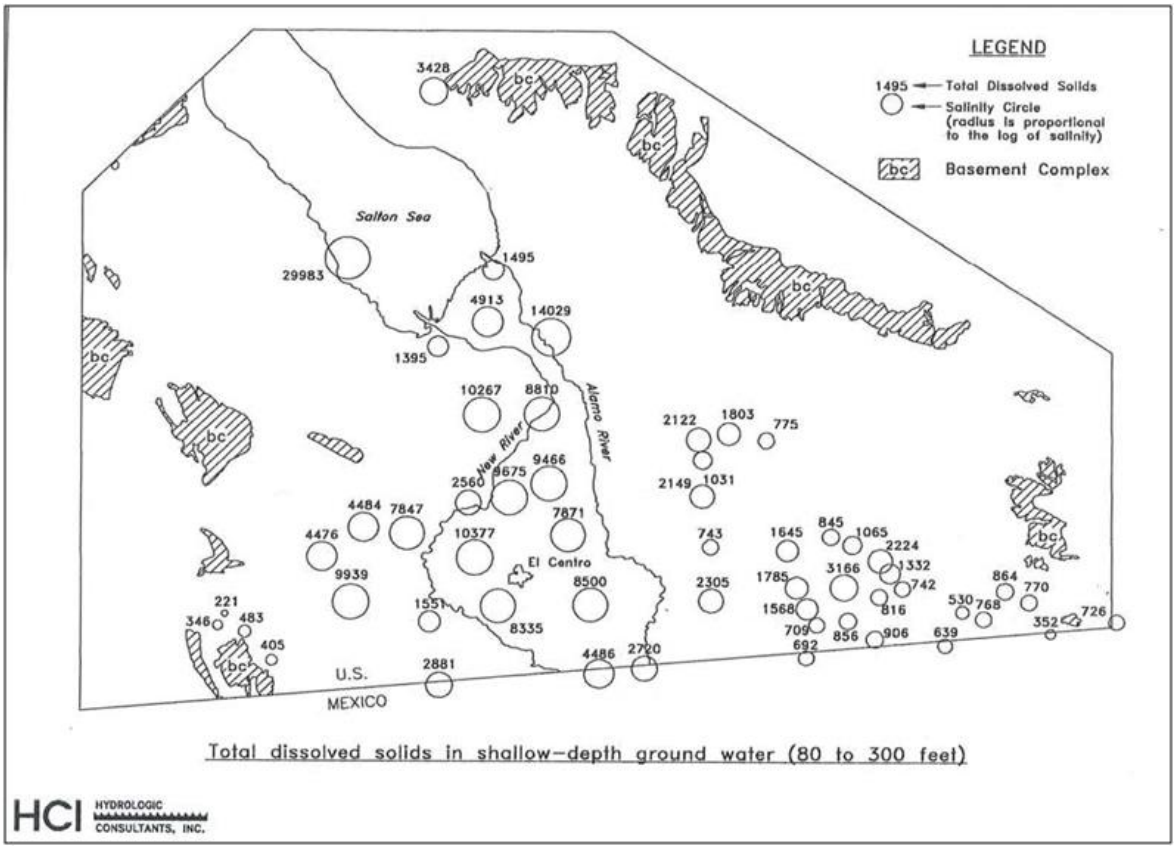

Figure 10. ***Salinity in Shallow Groundwater in the Imperial Region***
Source: Imperial IRWMP Appendix P, page P-34

[27] Imperial IRWMP, Chapter 4, p 4-12. Data from USGS Record No. USGS 10255550 New River Near Westmorland CA and No. USGS 10254730 Alamo River Near Niland, CA for the period 1963 through 2007.

Known geothermal resource areas shown in **FIGURE 11** underlie the IID water service. These properties have resulted in geothermal energy development in the northern portion of the IID water service area.

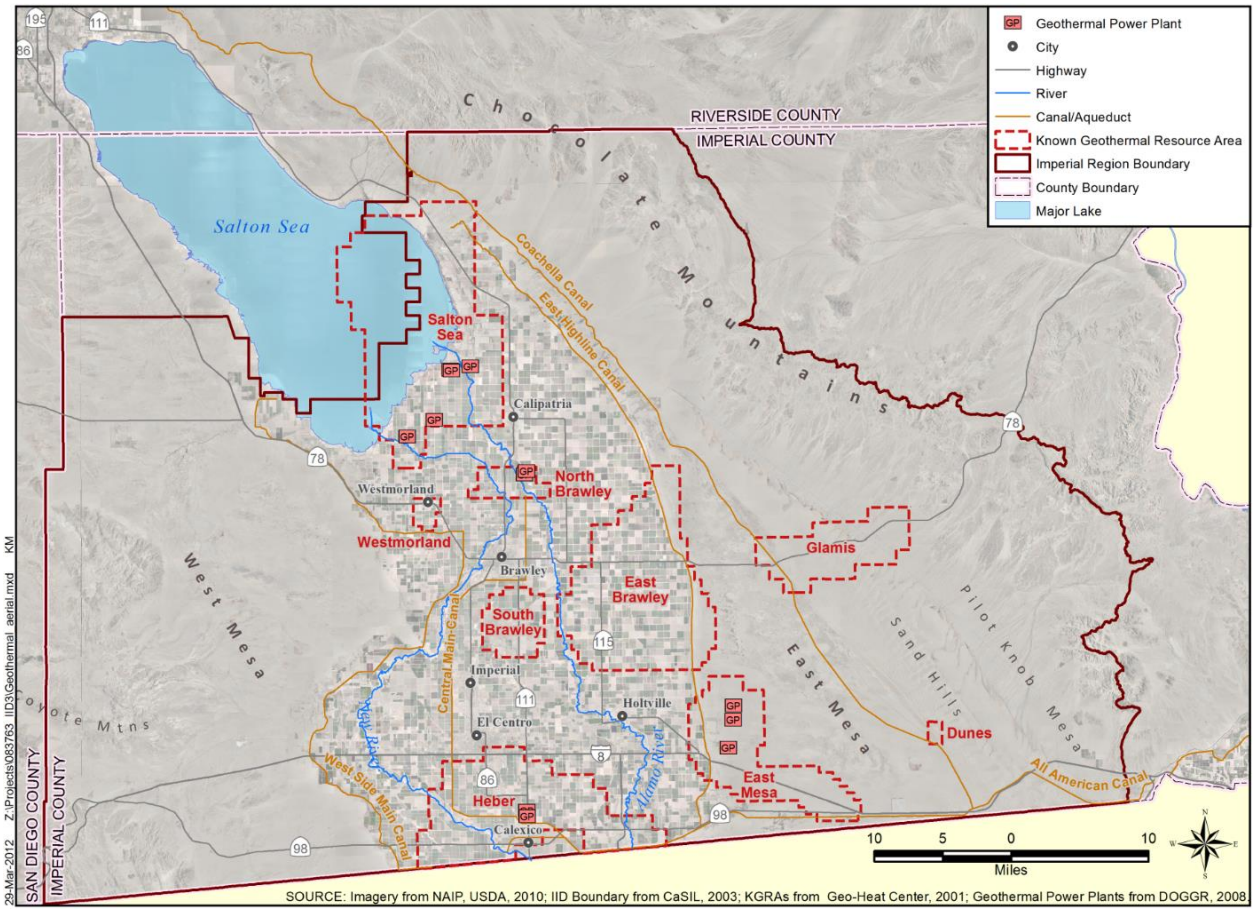

Figure 11. ***Known Geothermal Resource Areas***

Source: Imperial IRWMP Chapter 4, page 4-30

Surface Water Monitoring

IID annually coordinates with a state certified laboratory for the collection and analysis of Title 22 of the California Code of Regulations source water samples as a service to local public water treatment systems to facilitate the annual production of Consumer Confidence Reports. The data and a share of the incurred costs are forwarded to all of the participants in association with the Title 22 Joint Watershed Monitoring Program.

The AAC and three main supply canals (East Highline, Central Main, and Westside Main) are sampled each year for numerous constituents as required by law and in coordination with the State Water Resources Control Board – Division of Drinking Water, formerly known as the Drinking Water Field Operations Branch of the California Department of Health Services.

Table 37. Links to IID Title 22 Reports, 2014

◆ *All-American Canal Drop 4*	◆ *Central Main Canal*
◆ *East Highline Canal*	◆ *Westside Main Canal*

Water Use Accounting

The Secretary of the Interior annually provides detailed and accurate records of diversions, return flows, and consumptive use of water diverted from the mainstream of the Colorado River below Lee Ferry (lower Colorado River). Water delivered to IID by the US Secretary of the Interior under the CRWDA is accounted for in annual USBR Water (Decree) Accounting Reports.

Agricultural

IID agricultural water delivery volumes are based on IID TruePoint delivery records. All agricultural deliveries are Colorado River water. In addition, a small amount of rain falls on the agricultural land. Agricultural water accounting for 2010-2014 is presented in **Table 36**.

Groundwater Recharge

High salinity levels of the groundwater underlying the Imperial Basin preclude groundwater recharge. The only effective groundwater storage is temporary soil moisture storage from delivered water that is subsequently used for crop ET (consumptive uses). IID has an exchange agreement with CVWD to store some water in the CVWD recharge basin. For volumes, see **TRANSFERS AND EXCHANGES**, below.

Transfers and Exchanges

IID receives water only under its USBR contract, and no water is transferred into the district. Under the terms of the CRWDA, IID transfers water to a number of agencies as shown in **TABLE 38**, and provides 11,500 acre-feet per year of water for Miscellaneous PPRs.

As noted above in **GROUNDWATER RECHARGE**, IID has an exchange agreement with CVWD for groundwater storage. In 2010, IID delivered 525 acre-feet to CVWD for storage. In 2012, IID used 448 acre-feet of this water, which is the volume delivered in 2010 less conveyance losses and storage losses. Net stored as of January 1, 2015 is 0.0 acre-feet.

Table 38. IID Transfers and Exchanges Water Accounting, 2010-2014

IID Water Balance Component	2010	2011	2012	2013	2014
Water Transfers (Outflow)					
1988 IID/MWD Transfer	105,000	103,940	104,140	105,000	104,100
IID/SDCWA Transfer	70,000	63,278	106,722	100,000	100,000
IID/CVWD Transfer	12,000	16,000	21,000	26,000	31,000
IID/SDCWA Transfer Salton Sea Mitigation	33,736	-	15,182	71,398	89,168
AAC Lining Project Transfer [1]	67,700	67,700	67,700	67,700	67,700
Total Water Transfers	**288,436**	**250,918**	**314,744**	**370,098**	**391,968**
Water Exchanges (Outflow)					
Misc PPR	11,500	11,500	11,500	11,500	11,500
IID CVWD Groundwater Storage Exchange [2]	525		-448		
Total Water Exchanges	**12,025**	**11,500**	**11,052**	**11,500**	**11,500**

Notes:
All Values are Consumptive Use Volumes in Acre-Feet at Imperial Dam
1. Outside IID water service area
2. Negative value for 2012 means water was inflow to IID water service area
Source: 2015 QSA Annual Report

Total Consumptive Use with Transfer Accounting

IID consumptive use with transfer accounting for 2010-2014 is provided in **TABLE 39**.

Table 39. IID Consumptive Use with Transfer Accounting (AF), 2010-2014

IID Water Accounting					
	2010	**2011**	**2012**	**2013**	**2014**
Mist PPR	11,500	11,500	11,500	11,500	11,500
1988 IID/MWD Transfer	105,000	103,940	104,140	105,000	104,100
IID/SDCWA Transfer	70,000	63,278	106,722	100,000	100,000
IID/CVWD Transfer	12,000	16,000	21,000	26,000	31,000
SDCWA Transfer Salton Sea Mitigation	33,736	0	15,182	71,398	89,168
Inadvertent Overrun Payback	—	—	—	55,710	117,391
Early Inadvertent Overrun Payback	—	—	—	37,347	—
Intentionally Created Surplus	—	—	—	—	37,735
AAC Lining Project Transfer	67,700	67,700	67,700	67,700	67,700
IID Water Use	2,545,593	2,915,784	2,903,216	2,554,854	2,533,414
LCWSP Wellfield Pumpage*	5,104	4,460	4,616	5,510	7,195
IID Additional Conserved Water & Storage**	46,546	10,528	14,299	—	—
Total Consumptive Use	**2,897,179**	**3,193,190**	**3,248,375**	**3,035,019**	**3,099,203**
IID QSA Entitlement	3,100,000	3,100,000	3,100,000	3,100,000	3,100,000
Early Payback Applied to 2012 Overrun	—	—	—	37,347	
Amount Approved Exceeding Approved Water Order	—	93,190	148,375	—	—
Planned ICS; Applied to Overrun	—	10,528	14,299	—	—
EOY Inadvertent (Underrun) Overrun Reported by USBR	(207,925)	82,662	134,076	(64,981)	(797)

All values are consumptive use volumes in acre-feet at Imperial Dam
For each year's notes, conservation practice and distribution of conserved water not transferred, see 2015 QSA Annual Report, pp 7-9.
*LCWSP water is pumped into AAC from wellfield alongside AAC and used by IID in lieu of Colorado River diversion
** Conserved for ICS; due to policy limitations in overrun years was used instead to reduce current year's overrun
Source: 2015 QSA Annual Report

Quantity and Quality of Drainage Discharge

IID monitors water quality to satisfy Total Maximum Daily Load water quality monitoring and other drain water quality improvement program obligations.

Water entering the drainage system can originate from the following sources:

- System seepage: water that seeps from canals and laterals and is intercepted by IID drains [28]
- Operational discharge: unused water that travels through the delivery system to ensure full demand is met and is discharged to IID drains [29]
- On-farm tailwater runoff: irrigators manage tailwater to fill the root zone at the lower end of field; surface water runoff from the end of an irrigated field results when water application exceeds the soil infiltration rate or soil storage capacity
- On-farm tilewater: water passing the crop root zone to ensure leaching that enters a tile drain
- Stormwater runoff: surface water runoff when precipitation exceeds the soil infiltration rate or storage capacity

[28] IID has seepage recovery installations along the AAC and EHL canals where seepage is collected and pumped into a main canal for delivery to users.

[29] IID has three lateral interceptor systems plus a portion of WSM Canal (in total, serving around 100,000 acres) where operational discharge is collected for delivery to users.

- Groundwater: intercepted groundwater that moves into IID drains from the deeper aquifer near the east boundary of the irrigated area

IID's agricultural drainage facilities are not designed or managed for non-agricultural discharges, flood, or stormwater management purposes.

Quantity of Drainage Water

IID drainage system water accounting for 2010-2014 and inflow to the sea from both IID drainage and other sources are provided in **TABLE 36**, showing total inflow to the Salton Sea using a complementary set of components. All IID drainage components that are not consumptively used discharge into the Salton Sea, as shown in **TABLE 40**.

Table 40. Inflow to Salton Sea Water Accounting (KAF), 2010-2014

IID Water Balance Component	2010	2011	2012	2013	2014
Inflow to Salton Sea					
Total Alamo River Flow to Salton Sea	587.3	612.0	661.9	569.2	547.8
Total New River Flow to Salton Sea	415.3	392.6	422.7	402.1	384.0
Direct-to-Sea Drain Flow	109.2	112.3	112.6	102.7	93.0
Subsurface Flow to Salton Sea	1.0	1.0	1.0	1.0	1.0
Total Inflow to Salton Sea	**1,112.8**	**1,117.9**	**1,198.2**	**1,075.0**	**1,025.8**

Source: IID WIS run date 05/18/2017, due to rounding total inflow to Salton Sea in ERROR! REFERENCE SOURCE NOT FOUND. and **TABLE 40** may vary slightly.

Discharge of Drainage Water to Salton Sea

Inflow of Colorado River water and rainfall in the IID water service area are shown in **TABLE 36**. Discharge of these components to the Salton Sea and the ratio of outflow due to Colorado River water (not including mitigation flows) and rainfall to AAC inflow at Station 2900 are provided in **TABLE 41**. This analysis shows that during this stage of IID implementation of CRWDA measures, changes in flow to the Salton Sea from IID drainage discharge are largely a function of total rainfall, which is to be expected as the mitigation flow was delivered to mitigate impacts of the out-of-basin water transfer to SDCWA .

In the 1980s and 1990s Salton Sea inflows ranged from 1.2 to 1.3 MAFY, with the majority from agricultural return flow. Historically, IID drainage of Colorado River water averaged around 1.0 MAFY. Decrease inflow to the Salton Sea is due to reduced inflow from Mexico (which decreased each year since 1999, when inflow was 177.5 KAF; 2014 inflow was 73.5 KAF), to IID efficiency conservation practices not related to the IID/SDCWA water transfer, which through calendar year 2017 is mitigated under the CRWDA. In 2018 and thereafter, following completion of IID/SDCWA Salton Sea mitigation deliveries in calendar year 2017, Salton Sea annual inflow will decrease by 150.0 KAFY. IID drainage discharge volumes are expected to continue to decline through 2021 (the year of the largest IID/SDCWA transfer volume) as on-farm and IID system conservation efficiency programs are implemented to reduce IID diversion of Colorado River water as per the CRWDA.

Table 41. IID Discharge to Salton Sea v. Colorado River Inflow to and Rainfall on IID Water Service Area (%), 2010-2014

Flow Components	2010	2011	2012	2013	2014
IID Colorado River & Rainfall Discharge to Salton Sea/AAC @ Mesa Lat 5	36.0%	35.4%	38.0%	35.3%	32.9%
IID Colorado River & Rainfall Discharge - (Mesa Storm Inflows to Drains + Main Canal Spill Due to Rain)/AAC @ Mesa Lat 5	35.3%	35.1%	37.3%	34.9%	32.8%
IID Colorado River & Rainfall Discharge/AAC @ Mesa Lat 5 +Total Rainfall	**33.5%**	**34.1%**	**36.4%**	**33.5%**	**32.3%**

Source: Based on IID WIS run date 05/18/2017

Drainage Water Quality Monitoring

Under its Colorado River Basin Irrigated Lands Regulatory Program, the California Regional Water Quality Control Board, Colorado River Basin – Region 7 regulates irrigation and stormwater discharges from irrigated agricultural lands by establishing total maximum daily loads for impaired water bodies. [30]

In May 2005, IID submitted Drain Water Quality Improvement Plan Version 1.1. In accordance with the provisions of the 2005 DWQIP, IID performs water quality monitoring throughout its source and drain water systems. IID monitors 26 drain sites throughout the Imperial Valley and one inflow site at AAC Drop 1. IID reports the results to the Regional Board and provides flow data for 56 sites: incoming flow at AAC Mesa Lateral 5, drainage flow for seven river and 48 drain sites throughout the Imperial Valley.

IID is a participant in New River Improvement Project to improve the quality of water flowing into the Salton Sea. Under this program, construction and monitoring of water quality treatment wetlands on the New and Alamo rivers have been undertaken. The Imperial and Brawley wetlands on the New River were completed in 2001; Shank Wetland on the Alamo River was completed in 2013. Quarterly monitoring is ongoing on all three sites. For more information, visit IID Water Library: Water Quality.

Table 42. Water Quality Monitoring, 2014

Location	Practice	Frequency	Agency
Source Water			
Imperial Dam	EC (salinity)	Daily	USBR
AAC Drop 1 [1]	TDS, pH, Ca+, Mg, Na+K, CO_3, HCO_3, SO_4, Cl, Temp	Monthly	IID
Salton Sea (5 sites) [1]	TDS, pH, Ca+, Mg, Na+K, HCO_3+CO_3, SO_4, Cl	Semi-annually	IID
10 sites: AAC, EHL, CM, WSM [1]	Total Coli. Fecal Coli. E.coli	Monthly	IID
AAC (12 sites) [2]	Silt load analysis	Monthly	IID
4 sites: AAC, EHL, CM, WSM [3]	Title 22 compliance	Yearly	IID
Drain Water [1]			
Alamo River Outlet at Salton Sea New River Outlet at Salton Sea	TDS, pH, Ca+, Mg, Na+K, CO_3, HCO_3, SO_4, Cl, Temp	Monthly	IID
TMDL Drain Water [4]			
7 major drains: 5 to Alamo River 2 to New River	DO, EC, pH, Field & Lab Turbidity, TSS, NH_3-, NO_2-, NO_3, Kjeldahl-N, Orthophosphate, Total P, Total Hardness, Ca+, Mg, Total A_T, HCO_3+CO_3, SO_4	Monthly	IID

[30] In January 2015, the Regional Board adopted Order R7-2015-0008, a "Conditional Waiver of Waste Discharge Requirements for Agricultural Wastewater Discharges and Discharges of Wastes from Drain Operation and Maintenance Activities within the Imperial Valley, Imperial County, California". The conditional waiver program supersedes the TMDL program. In May 2016, IID submitted DWQIP Version 1.2 to meet conditional waiver requirements. Under Version 1.2, monitoring requirements are mostly unchanged from Version 1.1. For the location of the 2016 sites, visit DWQIP Report Monitoring Sites.

18 minor drains: 8 to Alamo River 6 to New River 4 Direct to Salton Sea		Quarterly	IID

[1] Collected by IID; analysis by ATS Labs, Inc. Brawley, CA; Alamo River at US/Mexico Border WERE discontinued Jan 2008 due to low flow (estimated as 1142 AF in 2014)

[2] Collected by IID; analysis by IID

[3] Collected & analysis by Clinical Laboratory of San Bernardino, Inc.

[4] Collected by IID; analysis by BABCOCK Labs, Inc., Riverside, CA

Quality of Drainage Water

Drainage flow reductions impact IID drains, New and Alamo rivers and the Salton Sea. For 1963 through 2007, average salinity of the New River was about 3,300 mg/L and salinity of the Alamo River about 2,500 mg/L.[31] With full implementation of the IID efficiency conservation measures required by CRWDA, salinity balance calculations project that salinity of agricultural drainage water discharging to the Salton Sea will increase by about 500 mg/L. The average salinity of the New River will increase to about 3,800 mg/L and the average salinity of the Alamo River will increase to about 3,000 mg/L.

As shown in **FIGURE 12**, from 1982 to 2014, salinity of the Salton Sea has increased by nearly 20,000 ppm, from around 40,000 ppm to 60,000 ppm. This is the result of lower average rainfall, from around 3 inches per year to 2.5 inches per year, and decreased inflow to the sea. The reduction of IID drainage inflow, with consequent increases to New River and Alamo River salinity indicated above, will continue.

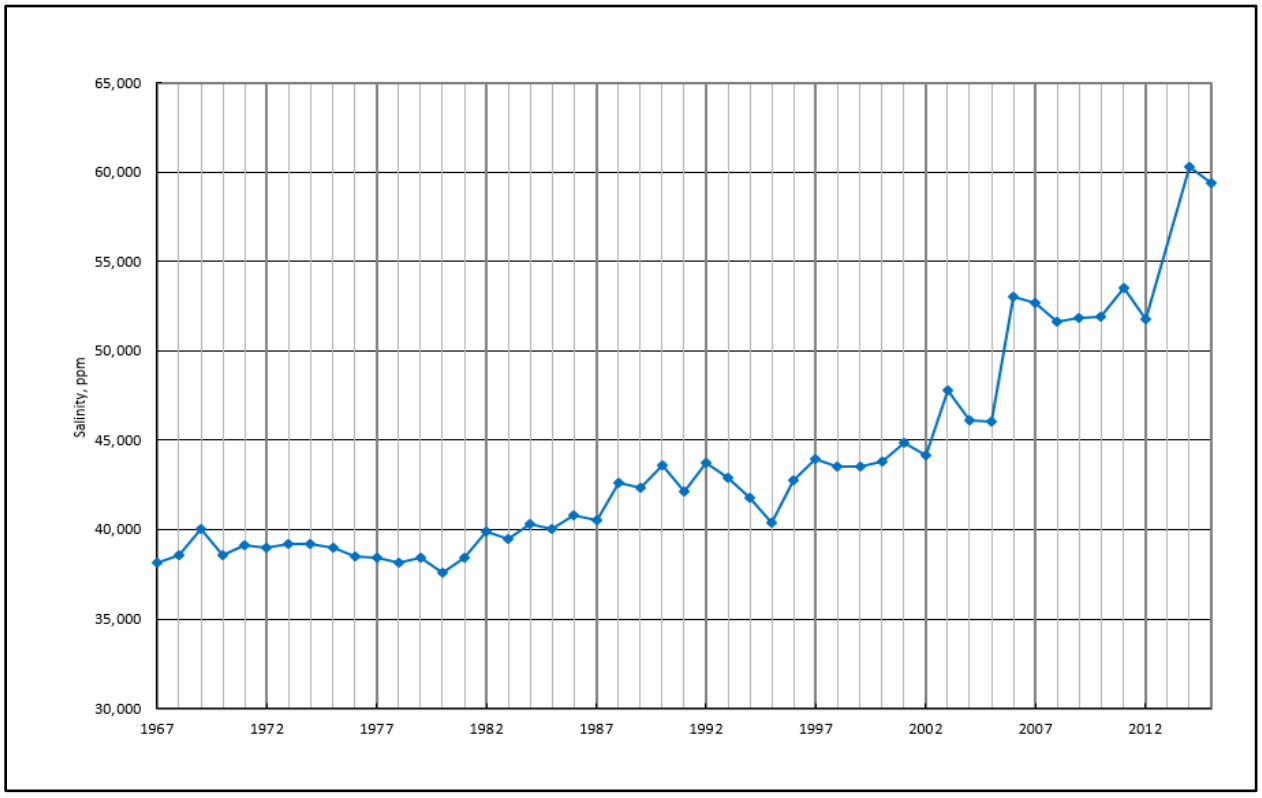

Figure 12. ***Salton Sea Salinity, Average at Four IID Monitoring Stations, 1967-2014***

[31] USGS Records No. USGS 10255550 New River Near Westmorland CA and No. USGS 10254730 Alamo River Near Niland, CA for the period 1963 through 2007.

Imperial Valley Groundwater Basin

All of the IID water service area is underlain by the Imperial Valley groundwater basin. Basin details are provided in **TABLE 43**.

Table 43. District Groundwater Basin

Basin Name	Size (SQ MI)	Usable Capacity (AF)	Safe Yield (AF/year)
Imperial Valley	1,870	None – highly saline water	Not applicable

Groundwater Movement

In general, as reported in *County of Imperial, Imperial County Groundwater Study* (Montgomery Watson, 1995, pp 3-13 & 3-14):

> Groundwater moves toward the axis of the valley and then northwestward toward the Salton Sea. Groundwater discharge occurs along the lower reaches of the New and Alamo rivers. Where the New River crosses the International border, the groundwater is exceedingly shallow, less than five feet below ground surface in most places.

Groundwater Yield and Quality

While a large amount of water is stored in the groundwater basin, few wells have been drilled for production purposes because the yield is low and of poor quality.

Chapter 7 of the *Salton Sea Ecosystem Restoration Program Draft Programmatic Environmental Impact Report* (CDWR, et al., 2006) contains a detailed description of the Imperial Valley Basin. Regarding usage of groundwater, the report (p 7-5) states:

> Groundwater quality varies extensively in the Imperial Valley Basin. Total dissolved solids, a measure of salinity, ranged from 498 to 7,280 mg/L (CDWR, 2003). High concentrations of fluoride have been reported (IID and Reclamation, [CH2M-Hill 2000]).
>
> Due to the low yield and poor water quality, few production wells have been drilled in the Imperial Valley. Most of the wells in the Imperial Valley are domestic wells. Total production from these wells is estimated to be a few thousand acre-feet per year (Salton Sea Authority, [Tetra Tech, 1999]).

Geothermal Resources

Extremely deep groundwater has been developed along the southern Salton Sea shoreline for geothermal resources. These wells access non-potable groundwater from several thousand feet below ground surface.

Imperial Groundwater Management Ordinance

The Imperial Groundwater Management Ordinance was revised May 11, 2004 and amended August 3, 2004. The portions referring to IID are contained in 92202.01 - Imperial irrigation district.

A map showing the Imperial Valley Basin is provided below in **Figure 13**, Salton Sea Watershed Groundwater Basins.

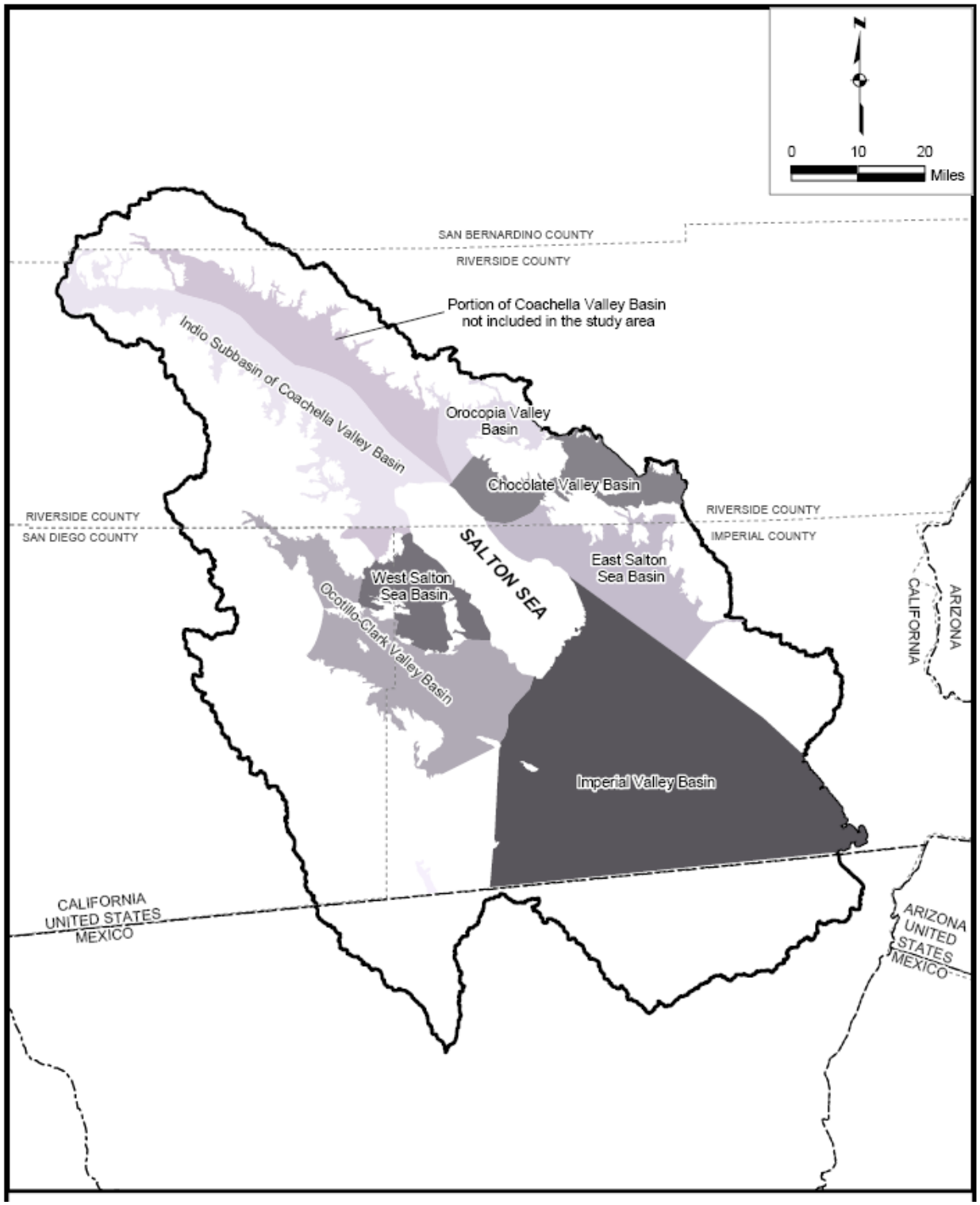

Figure 13. ***Salton Sea Watershed Groundwater Basins***

SOURCE: CDWR, et al., 2007, Salton Sea Ecosystem Restoration Program Draft PEIR (Chapter 7, p 7-2)

WATER MANAGEMENT PROBLEMS, OPPORTUNITIES AND CONSERVATION GOALS

Water Management Problems and Challenges

- Flat terrain – limits water storage
- Colorado River salinity – limits reuse opportunity
- Salton Sea – environmental impacts (exposed playa, increased salinity levels) associated with QSA/Transfer Agreements
- Groundwater salinity and low levels of precipitation – Blending groundwater with the AAC is not favored by agricultural stakeholders; Colorado River water is already salty and difficult to manage; increased salt levels in AAC water, which is delivered to all users, would impact ability to grow certain crops.

Water Goals

- Strive to provide the highest level of service at the most economical price while preserving the unique ecosystem associated with this working landscape
- Timely operation and maintenance of the extensive open channel system, and effectively deliver annual entitlement of 3.1 million acre-feet, less water transfer obligations, to nearly one-half million acres for agricultural, municipal and industrial use
- Implement extraordinary conservation projects, develop innovative efficiency measures and use progressive management tools to ensure both long-term viability of agriculture and continue protection of water resources within the district's water service area
- Implement system and on-farm conservation efficiency measures to meet the district's QSA/Water Agreements obligations

WATER CONSERVATION MEASURES AND RESULTS

As the Imperial Valley grows and as its economy diversifies so do the function and role of IID's Water Department. By implementing extraordinary conservation projects, developing innovative efficiency measures and utilizing progressive management tools, the Water Department is working to ensure both the long-term viability of agriculture and the continued protection of water resources within its water service area. IID's Colorado River water entitlement is significant, and as the agency in charge of these water rights IID continues to responsibly manage its Colorado River water supply and related resources.

Water conservation programs at IID fall under a number of rubrics: IID initiatives, IID/MWD initiatives, IID Efficiency Conservation Program which include System Conservation Program and On-Farm Efficiency Conservation Program measures.

IID Water Conservation Programs and Projects, 1940-2014

IID water conservation program details are provided as follows; IID programs and projects in **TABLE 44**; IID/MWD programs and projects in **TABLE 45**, and IID QSA programs and projects in **TABLE 46**.

Table 44. IID Water Conservation Programs and Projects, 1940-2014

Conservation Project	Year	Activity Summary
On-Farm Tile Drainage	1940 – present	IID in cooperation with USDA Soil Conservation Service designed & installed tile drainage systems to remove water & salts from soil.

AAC Seepage Recovery AAC Drain 2	1947 – present	AAC seepage returned to canal with 1 dewatering pump system.
AAC Seepage Recovery AAC Drain 1	1948 – present	AAC seepage returned to canal with 1 dewatering pump system.
AAC Seepage Recovery	1951 – present	AAC seepage returned to the canal with 6 pump systems.
Concrete Lined Canals & Laterals	1954 – present	Cumulatively 3,679 miles of canals, laterals & head ditches lined (owned privately & by IID; & MWD funded through 1994).
Water Distribution System Automation – Installation & Operation	1958 – present	In 1958, installed telemetry system, w/automated structures on upper reaches of main canals, telephone lines to access remote sites. In 1990s, installed SCADA system, w/computers, radio & microwave communication network. In 2010, upgraded to ClearSCADA system.
Drain Pipelines	1962 – present	Cumulatively installed 117.24 miles of drain pipelines, 1962 – 1994, 119.317 miles by 2006, and 121.548 by 2015.
EHL Seepage Recovery	1967 – present	EHL seepage returned to canal with 12 dewatering pump systems.
Regulating Reservoirs – Construction & Operation	1976 – 1988	Singh (1976), Sheldon (1977), Fudge (1981) Sperber (1983) Carter (1988), storage capacity of 1,619 AF.
13-Point Water Conservation Program	1976 – 1987	Program to reduce tailwater, canal seepage & operational spill.
Water Conservation Advisory Board	1979 – present	15-member board makes water conservation recommendations to IID Board of Directors.
21-Point Water Conservation Program	1980 – 1987	Policies & procedures for water orders, delivery system operation & assessing charges for excessive water use.
Water Conservation Program	1981 – present	Personnel hired to staff various activities.
Irrigation Scheduling Program	1981 – present	Assist growers to reduce on-farm tail & tile water; IMMU is responsible for this program.
Aquatic Weed Control	1981 – present	Support research; built fish hatchery to produce sterile Triploid Grass carp that feed on hydrilla, which would clog IID's canals & drains, O&M of the hatchery is ongoing.
Field Irrigation Evaluations	1982	Improve on-farm irrigation management.
Modified Demand Irrigation Trial	1984	Water orders could be terminated up to 4 hrs. before or after regular (24-hour) end time.
Irrigation Training Program	1984	For growers & irrigators, to reduce volume of on-farm tailwater.
IID Water Conservation Plan	1985 – 1987	Plan with yearly updates.
EHL Seepage & System Improvement Study	1985 – 1989	Cooperative IID/USBR study to identify water conservation opportunities.
Tailwater Recovery Demonstration Program	1985 – 1990	Five-year demonstration of 5 tailwater-return (recovery) systems.
Lateral Fluctuation Study	1986, 1987	IID/USWCL cooperative study of causes & effects of water level fluctuation in open channel irrigation to identify conservation opportunities.
Irrigation Field Trials	1987 & 1988	Determine effect of tested soil moisture conditions on sugar beet tonnage & sugar content.
15-Point Water Conservation Program	1987 – present	Replaced the 13-Point & 21-Point Water Conservation Programs.
Non-Crop Irrigation Demand Reduction Program	1991 – 1992	Limit on length of time water could be applied to lands that were not seeded (i.e., could be flooded).
Crop Specific Modified Irrigation Pilot Program	1991	Evaluate removal of irrigation water from alfalfa during the period August 1 - October 15, 1991.
Concrete Lining Rehabilitation	2003-2006	IID received a $2.5 million, 3-year matching grant from NADBank.
Central Main Automation	2005 - 2006	In 2005, USBR Water 2025 Grant - $350,000 to automate 10 headings & 15 gates on the Central Main Canal.
AAC Flow Monitoring	2006 - present	In 2005, USBR grant - $115,000; install 4 AVMs on AAC - U/S & D/S of Pilot Knob, at Drop 1, and U/S of Mesa Lateral 5
IID Water Management System	Online Dec 2006 - present	IID contracted with consultants to develop WMS using IID SAP & WIS data/ capabilities to manage water ordering/delivery & water operations, reduce manual procedures, manage response to QSA requirements by improved water tracking & system performance.

Tailwater Education Program	2007 - 2015	Each year selected at random 10% of irrigated fields (approx. 550). Electronically tracked delivery & tailwater flow for 3 consecutive irrigations. After each event, farmer received a graph reviewed by IID; if tailwater exceeded delivery by 15% on third irrigation, attendance at a quarterly irrigation class was required.
Temporary Land Conversion Fallowing Policy	2012-present	Under terms of legislation adopted to facilitate QSA/ enacted in CWC 1013, TLCFP was adopted by IID board on May 8, 2012. TLCFP developed the framework for a temporary, long-term fallowing program to work in concert with IWSP and in line with IID's coordinated land use/water supply strategy, EDP apportionment.

Table 45. IID/MWD Water Conservation Program and Projects, 1988-2014

Conservation Project	Year	Activity Summary
Agreements		
IID/MWD Water Conservation Agreement	1988 - present	Agreement provided for water conservation from projects constructed by IID; 2 pre-program augmentation projects & 15 newly constructed projects. Projected conservation when final project placed in operation was 106,110 AF per year. MWD to fund all costs of the 15 new projects (construction plus O&M) unless a project was eliminated from program in return for conserved amount of Colorado River water from all projects being available for diversion to its Colorado River Aqueduct.
1989 Approval Agreement among IID, MWD, PVID and CVWD	1989 - present	Approval Agreement called for a Water Conservation Measurement Committee to provide an orderly basis among the parties for verification of amount of water conserved & amount conserved by each project. WCMC membership comprised of all three members of the Program Coordinating Committee, plus one representative each from PVID & CVWD. PCC Chair to serve as WCMC Chair.
Second Amendment to 1988 Agreement	2007 - 2014	Effective January 1, 2007, WCMC terminated; IID, MWD, et al. revised agreement for amount to be transferred. MWD to cover O&M costs.
Letter for Substitution and Conservation Modifications to the IID/MWD Water Conservation Agreement	2015 - present	Effective Jan 1, 2015, Project 18 TRS eliminated from program; IID/MWD transfer yield set for 2014, 2015 and 2016 et seq. MWD to cover O&M costs & various Project 9 12-hour delivery expenses.
Programs & Projects		
IID/MWD Water Conservation & Transfer – Construction	1990 – 1998	Construction, from 1990 thru 1998, when 35-year water transfer period began. Water conservation studies & reports were completed. For details, see text and links at IID/MWD Conservation.
	1990 - 2005	Water transfer for each calendar year is based on verified conservation for previous water year, amounts determined from IID data using methodology developed by team of three consultants and approved by all affected parties.
	2007 - 2014	Water transfer for each calendar year set at 105 KAFY minus amount less than 3.5 KAF conserved by Project 18 TRS in previous water year, amounts determined from IID data using methodology developed by team of 3 consultants & approved by affected parties.
	2015 - present	Effective Jan 1, 2015, Project 18 TRS eliminated from program; conservation yield set at 104,100 AF for 2014; 107,820 AF for 2015 and 105 KAFY effective Jan 1, 2016, et seq.
Augmentation Program Projects 1 & 2		IID used State loan to construct Carter Reservoir & complete South Alamo Canal Lining Phase I prior to finalizing the 1989 Approval Agreement, which provided that IID would make water conserved from these projects, an augmentation program, available for MWD.
Lateral Interceptors Projects 3, 8, 17		Three interceptor projects constructed with automated reservoir facilities. Automated drop-leaf gates control flow from each intercepted lateral & function as measurement structures for flow from lateral to drain. Collected water is transported to a reservoir;

		flow in interceptor canal upstream of reservoir is measured using a BCW. Flow discharged from reservoir is distributed to other parts of system, as needed.
Reservoirs Projects 1, 3, 4, 8, 9, 17		Carter Reservoir, built by IID was included in program; 1 regulating reservoir, Galleano, & 4 interceptor reservoirs, Bevins, Young, Russell & Willey, were constructed; installed plant installed at Singh.
Concrete Lining – Main & Lateral Canals Projects 5, 7, 10, 11, & 16		Lateral canals: Sections throughout IID water service area where projected conservation savings cost/AF was $125/AF or less in 1988 dollars, 199.7 miles lined. Main canals: South Alamo II, Vail Supply, Rositas, & Westside Main, 13.3 miles lined.
12-Hour Delivery Project 9		IID delivery was 24-hour AM order; instituted 12-hr. delivery to provide additional flexibility to match crop requirements & conserve water; allows growers to take AM or PM order to coincide with normal AM turn times; 12-hr. orders limited to max. 7 cfs for AM run, no limit on PM run; flow reduction on last 12 hrs. of 24-hr. delivery not to exceed 5 cfs or ½ of ordered delivery rate. To request additional time or to reduce or remove order prior to full 12-hr. run, must notify division at least 3 hrs. in advance. Charges are based on full 12-hr. run; except additional flow which is prorated for each additional hour.
Non-Leak Gate Project 12		Of 25 investigated sites, 19 were developed based on projected savings (leakage & expected opportunity time), 5 were subsequently removed.
Irrigation Water Management Project 14	1995 - 2015	Use portable water level sensors to monitor delivery & tailwater flow on selected fields; evaluation charts showing delivered water & tailwater are used for grower/irrigator education.
	1995 – 2002	Linear move irrigation pilot project to demonstrate/evaluate viability for IID conditions; drip irrigation rebate (cost-sharing) pilot project.
System Automation Project 15		WCC construction completed Sept 1993, houses computer-based monitoring equipment, workstations, map board, file & database servers, & centralized communications equipment; field site improvements upgrade of 63 water control sites (34 major sites, 6 minor sites, 23 overshot gates); & SCADA system developed to monitor & operate IID water distribution system.
Additional Irrigation Water Management Project 18	1991 - 2014	Installed 25 tailwater recovery systems, serving 6,779 acres; first TRS began operation in June 1991, last installation completed August 1995. Program terminated as of January 1, 2015.
Conservation Verification Program		
Systemwide Monitoring Project 19		Program developed to identify & explain trends in IID system performance as a function of operational environment within which IID/MWD conservation projects operate.
Water Information System (WIS)		Oracle-based system to collect, process & ware flow data in support of water conservation verification, automated data collection, quality control, processing & retrieval system was developed; generates daily, monthly, calendar year & water year tables, summary tables & charts that are available and/or are presented in annual reports.

Table 46. IID QSA Programs and Projects, 1995-2014

Conservation Project	Year	Activity Summary
Agreements		For details, visit IID Water/Library Water Conservation/QSA - Water Transfer
IID/SDCWA Water Conservation & Transfer Agreement	1995 - 1998	In 1995 IID & SDCWA signed an MOU to pursue & in 1998 signed water conservation & transfer agreement.
Quantification Settlement	1999	IID, CVWD, MWD, SDCWA, State of CA & USBR issue key

Agreement Key Terms		terms for a QSA re Colorado River water supply.
Quantification Settlement Agreement & Related Agreements	Oct. 10, 2003	QSA & Related Agreements, a set of interrelated contracts that settle certain disputes among US, CA, IID, MWD, CVWD, & SDCWA, for period of 35 to 75 years, including issues of reasonable & beneficial use of and ability to conserve, transfer & acquire conserved Colorado River water; quantification & priority of Priorities 3 & 6 within CA for use of Colorado River water; and obligation to implement & fund environmental impact mitigation related to the above. Conserved water transfer agreements between IID & SDCWA, IID & CVWD, & IID & MWD identify volumes & transfer schedules for IID with price & payment terms. As specified, IID will transfer up to 200 KAFY to SDCWA & up to 103 KAFY to CVWD & MWD combined, of water conserved from additional system & on-farm efficiency improvements. IID will also transfer up to 67 KAFY of water conserved from AAC lining to SDCWA & certain San Luis Rey Indian Tribes in exchange for payment of all lining project costs & a grant to IID of certain rights to use the conserved water. Extends IID/MWD Water Conservation Program (105 KAFY) for term of QSA. For details, see IID website: QSA - Water Transfer
Fallowing Programs		For details see Fallowing Programs and associated links, and see QSA Annual Reports.
Emergency FP 2003-2004 FPs to date: 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, CY 2013, 2013-2014, CY 2014	2003 - 2014	15-year program to mitigate potential effects to Salton Sea from water transfer out of Imperial Valley. FP efforts to conserve water for transfer to SDCWA and delivery to Salton Sea ramp up for 10 years then decrease for next 5 years as efficiency conservation projects are implemented. FPs also generated water for IID Colorado River overrun payback and for storage purposes. 2003-2004 13-month Emergency FP began on Dec 1, 2013; 12 more FPs were implemented through Dec 31, 2017
2014-2015 Farm Unit FP	2014-2017	2014-2015 FUFP, 07/01/2014 through 06/30/2015. QSA fallowing programs continue through 12/31/2017.
AAC Lining Project		
	2008 - present	Concrete lining of 23 miles of unlined AAC, completed in 2009; includes seepage wetlands complex between AAC Drop 3 and Drop 4
System Conservation Program		Integrated package of system improvements to existing infrastructure and construction of new facilities to achieve QSA efficiency conservation goals.
Discharge Reduction	2013 - present	SCADA & communication system upgrades, zanjero laptops; automate lateral headings; flow measurement at deliveries on pilot runs; flow measurement at 108 lateral spills systemwide. Structural upgrades continue, finalizing procurement/installation of flow measurement equipment.
Seepage Recovery	2008 - present	Main canal seepage recovery, 23 sites
Intertie Returns	2015 - present	Lateral or canal interties that route spill from the end of one lateral to an adjacent lateral or main canal via a lined canal or pipeline
On-Farm Efficiency Conservation Program		Program to meet QSA delivery targets. For program details see OFECP Program Description
2008 Pilot Program	2008	Irrigation scheduling/event management
2013 Pilot Solicitation	2013	Incentivize ag water customers to implement on-farm water use efficiency improvements to conserve 16 KAF to

		20 KAF. Participants paid $285/AF for conserved water, verified against historical deliveries specific to each field and crop. For program details, see 2013 OFECP Proposal Solicitation Announcement
2013-2014 Pilot Solicitation	2013-2014	Incentivize ag water customers to conserve 20 KAF in 2013 and 40 KAF in 2014. Participants paid $285/AF for conserved water, up to 4 AF/AC For program details, see 2013-14 On-Farm Efficiency Conservation Pilot Program Proposal Solicitation Announcement
2014-2015	2014-2015	Incentivize ag water customers to conserve water for transfer to SDCWA and generate water for storage purposes. Participants paid $285/AF for conserved water, up to 4 AF/AC

Fundamental Water Conservation Measures

A. Water measurement and accounting system

A system to measure and account for the water conveyed through the district distribution system to water users.

IID's measurement and accounting system has been described in detail in previous sections of this report. As indicated, except for delivery to service pipes and small parcels, IID measures and accounts for all water volumes conveyed to individual users.

IID conducts water accounting activities including water orders and deliveries, and billing using TruePoint Solutions web-based water entry and recording system. Orders and delivered amounts, along with other on-farm information the district tracks are entered into the TruePoint systems by Division staff. The data are subsequently transferred to IID's WIS where they undergo a quality control/quality assurance protocol and are maintained for the historical record.

IID has an extensive and accurate flow measurement system throughout its delivery system, much of which is automated. IID supports four CIMIS stations in the IID water service area as well as three district weather stations. IID contracts with USGS for flow monitoring on the New and Alamo rivers and the Coachella Canal Heading Flume. IID conducts current metering throughout its system to ensure that reported flow values are accurate.

As part of the IID ECP, the Water Department has begun to install flow monitoring equipment on heading and spill sites throughout the district. Over time, IID plans to extend this capacity to all heading and spill sites, and to upgrade its farm delivery measurements. Water measurements for all automated flow structures are stored in IID's WIS, where QA/QC is performed and the data are warehoused. The WIS also has the capability of generating annual IID/MWD Conservation Projections and monthly and annual IID Water Balance reports.

B. Water pricing structure

A structure that encourages efficiency improvements by water users

IID's pricing structure is based almost exclusively on volume of water delivered, for details see **Water Service, Pricing and Billing Practices**.

Agricultural water users are compensated for participating in Fallowing Programs and in the On-Farm Efficiency Conservation Program as outlined in the ECP. Water users are compensated for the amount of water they conserve.

C. An information and education program

Designed for and delivered to users to promote increased efficiency of water use.

Tailwater Education Program

IID's Tailwater Education Program is similar to a previous Irrigation Management and Monitoring Unit tailwater reduction program, which used 20 sets of electronic meters that stayed on a farmer's field for an entire season. By its eighth year, this program yielded nearly 3,000 irrigation evaluations and reached over 80 farmers.

Under the TEP, each year 10 percent of irrigated fields (up to 550 sites) are selected at random and measurement hardware is temporarily installed. Meters are placed on the delivery gate and the tailwater box, and remain at the site for three (3) consecutive irrigations. After each irrigation event, the farmer is sent the results. Irrigation education support is provided to the farmer through IID's IMMU. If tailwater exceeds delivery by 15 percent on the third irrigation, attendance at a quarterly irrigation class is required.

Fields in the program are given priority access to IID's Salinity Assessment Vehicle, known as the "Salty Dawg," to determine salt levels in the soil, assist in determining leaching requirements, and contribute to effective water use.

Salty Dawg (Salinity Assessment Vehicle)

IID and the USBR work as partners to improve provide better understanding of soil salinity for Imperial Valley growers. The Imperial Valley Research Center analyzes soil samples required for ground-truthing. IID staff meets with the cooperating grower to discuss the results, which include two sets of two-dimensional salinity maps of the field and transect trends depicting average profile salinity along every other transect across the field. Other reports include projected potential yield/yield loss for specific crops, laboratory results and the soil-sample plan map.

Growers see how soil salts are distributed throughout the field, at various depths to the maximum sampling depth, and throughout the profile along individual transects/lanes; how subsurface tile drain location affects operation effectiveness in fields with such systems; and how soil texture and moisture content change within the field boundaries. Growers use the information to improve farming practices such as modifying their irrigation management plans, irrigation schedules and leaching irrigation, or scheduling tile line cleaning.

Water Flow Measurement Classes

With the implementation of an EDP for 2008, IID offers monthly instruction on water flow measurement to its water users upon request. Instruction includes teaching applicable measurement procedures for both over-pour and under-pour applicable for delivery gates and tailwater boxes. Classes are offered by appointment only from 12 noon to 1 PM, the same day and location of the Water Conservation Advisory

Board meeting (the second Thursday of each month) at the WCC conference room in Imperial). Instruction is to be provided in English and Spanish.

The Ditchbank

In October 2007, IID reintroduced a monthly publication, *Ditchbank*, to keep water users apprised of issues facing the district. The publication is included as an insert in water bills. It can also be found online at the IID website and the link is forwarded by email to a list of agricultural water users. Copies are also available at IID division offices and at all IID board meetings.

- FOR PAST AND RECENT PUBLICATIONS, VISIT IID WEBSITE LIBRARY: DITCHBANK NEWSLETTER.

D. A Water Conservation Coordinator

David E. Bradshaw, Assistant Manager
Water Resources and Grant Management
Phone: (760) 339-9083
Cell: (760) 427-7586
Fax: (760) 339-9009
debradshaw@iid.com

Additional Agricultural Water Conservation Measures

As stated in Chapter 1 of IID's *Water Conservation and Transfer Project Final EIR/EIS Habitat Conservation Plan,*[32]

> In addition to establishing water budgets for IID, MWD and CVWD, the QSA sets forth the approved parameters of various water transfers and exchanges, including conservation by IID ramping up an additional 303 KAFY by 2026 for delivery to SDCWA, CVWD and/or MWD. The QSA further allocates water to be conserved by the AAC and Coachella Canal lining projects. The QSA incorporates a consensual limit by IID on its total Priority 3 diversions of Colorado River water at 3.1 million acre-feet per year. IID's limit is further reduced by the amounts IID conserves and transfers to others under the QSA, by the amount to be conserved by the AAC Lining Project, and by any Priority 3 water made available by IID to holders of miscellaneous PPRs and Indian reserved rights, resulting in a net Priority 3 diversion of approximately 2.6 to 2.7 MAFY for use within the IID water service area." Source HCP, Chapter 1, p A1-4.

The 2003 QSA/Transfer Agreements provide for a long-term transfer of water from IID to MWD, SDCWA and CVWD. To enable IID to meet its obligations pursuant to the agreements, IID and its agricultural water customers need to develop an additional of 303 KAFY of water through an integrated program of on-farm and delivery system efficiency conservation. The Compromise IID/SDCWA and QSA Delivery Schedule lays out the ramp up and disposition of water from the programs.[33] In addition to meeting

[32] The IID Water Conservation and Transfer Project (Transfer Project) includes all IID QSA programs. Visit IID website: Environmental Assessments & Permits for EIR/EIS & Draft HCP, see Draft EIR/ES, Appendices C & E Figures, List of Figures, Final EIR/EIS, List of Figures, Addendum to EIR/EIS, and Supplement to EIR/EIS. Note: EIR/EIS Attachment A is the Draft HCP.

[33] QSA by and among IID, MWD, and CVWD, Exhibit C, p 39 of 44.

transfer obligations, IID may use water conserved through certain approved conservation measures to satisfy IOPP requirements and ICS for storage at Lake Mead and at MWD.

In 2015 and for the duration of the QSA, IID will meet its QSA water transfer obligations by means of existing IID/MWD projects, the AACLP, and fallowing and efficiency conservation programs, as follows (volumes at Imperial Dam):

IID/MWD Program, yield of 104,100 AF in 2014

- IID 2015 transfer is 107,820 AF
- For 2016 and the duration of the QSA, obligation is 105,000 AFY

AACLP, yield of 67,700 AF in 2014

- AACLP 67,700 AFY expected for duration of the QSA/Transfer Agreements

Fallowing Programs, yield of 298,692 AF in 2014

- Traditional FP terminates at end of 2017 while TLCFP may continue through the term of the QSA
- FP for transfer was 60,000 AF; then ramps down to 40 KAF in 2015, 20 KAF in 2016

IID Efficiency Conservation Programs, yield of 76,602 AF in 2014

- OFECP, yield of 32,321 AF; to expand to 195,000 AFY to 2020, and to 200,000 AFY by 2026
- SCP, yield of 44,371 AF; to expand to 73 AFY to 2020, and to 103,000 AFY by 2026
- IID OFECP and IID SCP programs may be reduced in scope if TLCFP yield remains available.

Table 47. QSA – IID Conservation Programs and Yield (KAF) Schedule, 2015-2020

	IID Efficiency			IID Fallowing	
Cal Year	**Yield**	**Annual Change**	**Cumulative Change**	**Yield**	**Annual Change**
2014	71	-	-	150	-
2015	96	25	25	150	0
2016	121	25	50	150	0
2017	145	24	74	150	0
2018	193	48	122	0	- 150
2013	228	35	157	0	0
2020	268	40	197	0	0

Source: QSA by and among IID, MWD, and CVWD, Exhibit C, p 39 of 44, Volumes at Imperial Dam.

As with existing OFECP measures, additional water required for transfer to SDCWA will come from voluntary on-farm conservation programs adopted by farmers in the Imperial Valley. Farmers enter into contracts with IID committing to implementation of conservation measures. These measures typically require farmers to make capital investments in selected types of water conservation equipment and facilities. In some cases, farmers may be required to obtain financing and pay for construction costs and implement and maintain conservation measures.[34]

[34] HCP, Chapter 1, pp A1-5 to A1-6.

In addition to on-farm conservation, IID will continue to implement system improvement projects that support the on-farm practices or that result in direct system conservation. The IID board continues to authorize on-farm and system elements as needed to meet the QSA/Transfer Agreements schedule.

Specific initiatives and programs that IID is pursuing that relate to the Additional Agricultural Water Conservation Measures (A – M) are presented below. Details of these IID initiatives and programs can be found on IID's website, as noted for each measure.

A. On-farm program incentives

Facilitate/provide financial incentives & assistance for on-farm water use efficiency improvements (e.g., lease, low interest loans, or water charge rebates for on-farm conservation measures).

IID Initiatives

IID contracts with willing land owners and/or lessees to fallow fields in order to meet water transfer and Salton Sea mitigation requirements for the first 15 years of the IID/SDCWA according to the Compromise IID/SDCWA and QSA Delivery Schedule as well as any IID overrun payback obligations. The price for fallowed water is set by the IID Board of Directors, and a solicitation is conducted that includes a mailing to all IID water users and agricultural land owners.

A Local Entity was created by the Revised Fourth Amendment to the IID/SDCWA Water Transfer Agreement to quantify third-party socio-economic impacts of fallowing; however, this proved to be a contentious process with ongoing analytical disputes between IID and SDCWA regarding the severity of these impacts within the Imperial Valley. In 2007, IID and SDCWA executed a settlement agreement to resolve this dispute, and $50 million was made available to mitigate the direct and indirect impacts of the mandated fallowing within the IID water service area, with $30 million provided by SDCWA and $20 million by IID.

The IID Board of Directors, acting as the Local Entity, has disbursed over $19 million in mitigation funding to farm service providers whose businesses were affected by fields contracted for fallowing by IID in support of the water transfer and mitigation programs, with $12.3 million of mitigation funding remaining for the 2014-2017 fallowing period. IID has also funded nearly $11 million to community business endeavors to support the creation and retention of local jobs. Finally, over $6 million of additional funding was also provided to assist in the reopening of a beef processing plant by One World Beef in Brawley, the development of a processing plant (and related sugarcane crop economy) by California Ethanol & Power and to the Imperial Valley Food Bank.

IID ECP Initiatives

The IID OFECP provides incentives to agricultural water customers to implement on-farm efficiency conservation measures, but due to concerns regarding the Salton Sea was prohibited from being implemented at scale until 2013.

The OFCEP initiative is being implemented to further IID's commitment to efficient water use by contracting with water customers to achieve efficiency conservation goals and meet IID QSA/Transfer Agreements requirements and any IID overrun payback obligations. Landowners and tenants voluntarily propose conservation measures, delivery reduction volume, contract duration, and a cropping plan for

IID consideration. After review and consultation with the applicant, IID accepts proposals as needed. The level of compensation and total contracted volume for on-farm efficiency conservation is set by the IID board, and staff implements an open solicitation until IID obligations are met.

Applicants must complete a single Applicant Information Form and Conservation Measure Proposal Form covering all proposed fields and submit the completed application. The conservation measure proposal form requires information about the field site; proposed crop; pre-irrigation, plant and harvest dates; tenant and owner; and the proposed conservation measure.

During the growing season, field visits are conducted to ensure that contractual agreements are being met. IID TruePoint water delivery records are used as the basis to confirm the amount of delivery reduction achieved by the contractor.

For the program beginning in 2013, the IID board set the level of compensation at $285/AF of delivered water reduction, which is verified against baseline efficiencies specific to each field and crop. In 2013 the OFECP yielded 17,276 AF of conservation followed by 44,371 AF in 2014, the first two years of implementation as IID transitioned from fallowing to efficiency-based conservation programs.

- FOR PROGRAM OVERVIEW, VISIT IID WEBSITE ON-FARM EFFICIENCY CONSERVATION PROGRAM
- FOR PROGRAM DESCRIPTION, SEE ON-FARM EFFICIENCY PROGRAM, PROGRAM DESCRIPTION (IID, SEPTEMBER 2015, 32 PAGES)
- FOR APPLICATION FORMS, AND SAMPLE CONTRACTS, VISIT IID WEBSITE: CURRENT OFECP SOLICITATION

B. Drought/water shortage contingency plan

Develop a drought/water shortage contingency plan for the district that outlines policies & procedures for operation and allocation during water supply shortages.

IID Initiatives

By 2016, IID had formulated and implemented a number of policies and programs to address potential drought or water shortage conditions resulting from limitations on IID water supplies. Of the various programs and policies IID has implemented, the EDP is the primary mechanism in the IID tool kit for managing IID's annual 3.1 MAF water supply cap implemented under the QSA.

In 2008 the IID board adopted the EDP to deal with anticipated imbalances between available supply and water user demands. Since 2014, the October 28, 2013 version of the EDP has been the guiding policy for IID's apportionment of its annual water supply to all water users; municipal, industrial; feed lots, dairies and fish farms; environmental resources water and agricultural.

- FOR PROGRAM DETAILS AND GOVERNING RULES AND REGULATIONS, VISIT IID WEBSITE: WATER/RULES AND REGULATIONS/EQUITABLE DISTRIBUTION

C. Water transfers

Facilitate voluntary defensive water transfers that do not unreasonably affect the district, the environment, or third parties and increase the efficient use of water within IID's service area.

IID/MWD Transfer

In December 1988, IID and MWD entered into the IID/MWD Water Conservation Agreement. Major construction work was completed in December 1997, with construction of the last project completed in September 1998. The first water was made available for delivery to MWD in 1990.

- FOR AGREEMENT, SEE ABOVE Table 45 IID/MWD Water Conservation Program and Projects, 1988-2014.

- FOR ADDITIONAL DETAILS, VISIT IID WEBSITE: WATER/WATER CONSERVATION/IID CONSERVATION

QSA/Transfers Agreements

In October 2003, IID became a signatory to the QSA and related agreements, which includes the CRWDA. These documents define the transfer of water from agricultural users in the Imperial Valley to urban users in the Coachella Valley and in California's South Coast region. IID and its agricultural water users will participate in the designated water transfers throughout the 45-year up to 75-year life of the QSA (2037, 2047 or 2077).

To meet its QSA water transfer obligations, IID has implemented Fallowing Programs (conservation savings from 2003), a System Conservation Program (conservation savings from 2008), and an On-Farm Efficiency Conservation Program (conservation savings from 2008). The Fallowing Program will continue through calendar year 2017. The SCP and OFECP will expand through 2026, then continue for the duration of the QSA/Transfer Agreements.

Volumes reported herein for conservation projects are provisional consumptive use volume in acre-feet at Imperial Dam.

IID Fallowing Program

Fallowing is the practice of temporarily taking active farmland out of production. Water, which under normal circumstances would have gone to the land to produce crops, is considered conserved under the fallowing program. Conserved water from fallowing is transferred to SDCWA, used for delivery to the Salton Sea (through 2017) to mitigate the environmental impacts of these transfers, and used for payback or storage purposes. The water transfer schedules call for the district to generate approximately 150,000 acre-feet per year through fallowing from 2013 through 2017 for these mitigation and transfer needs, after which IID's required fallowing will be completed.

Each field's participation in the fallowing program is limited to three out of every five years. During the program, no water can be delivered to the contracted field and the delivery gate is locked physically and in IID's computer system to prevent accidental water orders.

- FOR ADDITIONAL DETAILS, VISIT IID WEBSITE: FALLOWING PROGRAMS

IID System Conservation Program

IID SCP is an integrated package of improvements to existing system infrastructure and construction of new facilities designed to reduce system seepage, conserve water through targeted discharge

reductions and enable more flexible delivery operations that are required to achieve the on-farm conservation goals.

IID generates conserved water to meet the requirements of the QSA/Transfer Agreements by making water efficiency improvements to the delivery system and through enrolling voluntary participants in the On-Farm Efficiency Program.

Conservation targets started at 4,000 acre-feet in 2008 with the capture and reuse of system seepage water. IID system conservation may generate up to 103,000 acre-feet annually by 2026. System conservation efforts improve the reliability and flexibility of water deliveries and facilitate future on-farm conservation efforts.

- Main canal seepage interception. Twenty-five (25) recovery sites completed as of January 2012.

As of December 2013, Integrated Information Management implementation status was as follows:

- IID had contracted for construction of 22 of the total 223 lateral headings to be automated
- With its own forces, IID had completed improvements on 97 of the total 108 spill sites to be upgraded, with SCADA improvements scheduled to follow.
- IID had fielded five of 120 mobile laptops eventually to be deployed on zanjero vehicles.
- IID had implemented a pilot project for flow measurement on 22 Orange Lateral delivery gates.

Planned future SCP projects are as follows:

- Completion of the major IIM components of the program including SCADA system upgrades, communication system upgrades and zanjero laptops
- Automation of the remaining lateral headings.
- Upgrade of flow measurement at remaining unmonitored lateral spills systemwide.
- Construction of intertie returns.
- Construction of mid-lateral and operations reservoirs.

- FOR PROGRAM DESCRIPTION, SEE: DESIGN & CONSTRUCTION READY SCP PROJECTS, DAVIDS ENGINEERING & KB ENGINEERING, MARCH 2015, 32 PAGES

IID On-Farm Efficiency Conservation Program

Of the 303,000 acre-feet of conserved water IID needs to generate for the QSA/Transfer Agreements at full implementation (in 2026), up to 200,000 acre-feet is expected to come from on-farm conservation measures.

- 2013-2014 program with total enrollment of 34,166.5 crop acres, generated yield at-Farm of 44,702.3 AF and Yield at-River of 46,404.6 AF

- FOR PROGRAM DETAILS, SEE ABOVE SECTION A. ON-FARM PROGRAM INCENTIVES / IID ECP INITIATIVES.

D. Conjunctive use

Where appropriate, increase conjunctive use of surface and groundwater within the district, and work with appropriate entities to develop a groundwater management plan.

- **Demonstrably Inappropriate:** The January 2000 *Salton Sea Restoration Draft EIS/EIR,* states, "The groundwater is generally of poor quality and is not used for agriculture. In the central part of the valley, the TDS in most wells is between 1,000 and 3,000 mg/L. Water with TDS above 1,000 mg/L is considered to be of poor quality" (Tetra Tech, 2000, pp 3-31 & 32), and as such IID's Colorado River surface water supply is generally the sole water supply source within its service area.

- On September 16, 2014, Governor Jerry Brown signed into law a three-bill legislative package, composed of AB 1739 (Dickinson), SB 1168 (Pavley), and SB 1319 (Pavley), collectively known as the Sustainable Groundwater Management Act (SGMA). In 2015, IID elected to become a groundwater sustainability agency for eight groundwater basins within the district's service area, and is partnering with Imperial County to operate as co-GSAs as agreed to in a Memorandum of Understanding approved by both IID's Board of Directors and Imperial County's Board of Supervisors in December, 2015. IID and IC anticipate developing a groundwater sustainability plan or alternative plan by December 31, 2022.

- SEE IMPERIAL COUNTY GROUNDWATER MANAGEMENT ORDINANCE, Title 9 Land Use Code, Division 22 Groundwater Management Chapter 2 Groundwater Extraction, 92202.01 Imperial Irrigation District

E. Land management

Facilitate potential alternative uses for lands with exceptionally high water duty, or whose irrigation contributes to significant problems (e.g., drainage that precludes attainment of water quality standards).

- **Demonstrably Inappropriate:** No such lands exist within the IID water service area.

F. Operational practices and procedures

Evaluate potential district operational policy and institutional changes that could allow more flexibility in water delivery and carry-over storage.

IID Initiative

IID deliveries were historically based on a 24-hour run. With the implementation of the IID/MWD program, the district now allows 12-hour deliveries and will take water back with three (3) hours' notice, but the user is charged for a full order (12 or 24-hour).

- FOR DETAILS, VISIT IID WEBSITE: *RULES AND REGULATIONS GOVERNING THE DISTRIBUTION AND USE OF WATER*

IID/MWD Program

In 1994, 12-hour water deliveries were instituted to the limit of IID's system capacity. A 12-hour delivery may be an AM or PM order. Initially, both were limited to a maximum of 7 cfs. Subsequently, as a matter of policy (not regulation), the AM rate was restricted to 5 cfs during vegetable seasons, September-November and March–May, remaining at 7 cfs for the rest of the year. The PM order restriction was raised to 12 cfs. These restrictions are due to capacity limitations of IID's gravity delivery system.

- FOR IID/MWD PROGRAM DETAILS, SEE IID/MWD WATER CONSERVATION PROGRAM FINAL PROGRAM CONSTRUCTION REPORT

- FOR IID REGULATIONS, SEE Reg. No. 48, 12-Hour Runs in Rules and Regulations Governing the Distribution and Use of Water

IID ECP Initiatives

Components of the IID delivery system are being upgraded and reoperated to provide additional flexibility to agricultural water users while maintaining existing high levels of service and reliability. IID evaluated effective approaches for delivery system improvements as a function of on-farm conservation needs. Based on cost-effectiveness and practicality for improved operations and minor system improvements a set of methods were chosen to be incorporated into IID's IIM system. IIM is an overarching, systemwide project designed to provide zanjeros with the tools and information needed to operate laterals more intensively and precisely, with the objective of reducing lateral spills while maintaining customer service. IIM is being implemented as part of IID's Discharge Reduction Project.

IIM system changes are being made throughout the IID delivery system to allow better water delivery management, capture of returned water resulting from on-farm efficiency practices, and reduction of operational spill. IIM system water savings depend on minor system changes and human interaction with real-time information. IIM focus is on refining operating procedures, updating IID's SCADA system, automating IID headings and monitoring spills, and providing equipment and training to IID personnel. The result will be a more refined set of system operating procedures that will allow IID to benefit from improved information and minor delivery system modifications consisting of automatic heading and spill monitoring.

- FOR DETAILS, SEE IID WEBSITE: System Conservation Program
- FOR DETAILS, SEE *DESIGN AND CONSTRUCTION READY SCP PROJECTS, REVISION 1*, DAVIDS ENGINEERING AND KELLER BLIESNER ENGINEERING, MARCH 31, 2014.
- FOR ADDITIONAL INFORMATION ON IID DISCHARGE REDUCTION PROGRAM, SEE BELOW SECTION J. Distribution control

G. Distribution system scheduling

Implement a program of distribution system scheduling based on area-wide crop demand modeling or advanced ordering requirements.

- FOR IID DISTRIBUTION SYSTEM SCHEDULING OPERATION, SEE ABOVE SECTIONS **Water Control Center** and **Distribution System Operation**

IID Initiatives

IID provides water based on grower demand. As water transfer requirements increase, IID and the growers will continue to adjust and refine their practices. Growers can enter their water order using IID's online portal. Water Division staff uses IID's TruePoint software to enter and schedule water orders for delivery. Information from division water order entry and scheduling is used for Colorado River Master order scheduling and main canal scheduling.

IID/MWD Initiatives

The Main Canal Decision Support System (MCDSS) is an integral part of IID's Oracle-based Water Information System that exists as part of the WISKI database. The main canal decision system gathers water order information from TruePoint, real-time flow information from ClearScada and manually entered flows from Daily Water Record portion of the MCDSS to allow for the scheduling of main canal operations.

H. On-farm irrigation scheduling

Facilitate the delivery of crop water use and on-farm water delivery information to district customers for on-farm irrigation scheduling.

IID Initiatives

IID provides scheduling information upon grower request and periodically provides additional irrigation scheduling information through the publication of *The Ditchbank*. Should additional programs be required in the case of a water shortage and/or as on-farm efficiency programs are implemented, IID will respond to meet this demand.

IID website: Water and Crop News

IID ECP Initiatives

Irrigation scheduling and event management is an accepted on-farm efficiency conservation measure.

- FOR FURTHER DETAILS, SEE 2014-2015 ON-FARM EFFICIENCY CONSERVATION SOLICITATION

I. Pump efficiency evaluations

Coordinate the evaluation of district and private pumps with local utilities, evaluating both energy and water efficiency.

IID Pumps

IID pumps are evaluated on an as-needed basis.

IID/MWD Pumps

Flow tests were conducted on these pumps for the first five (5) years of the program to verify flowmeter accuracy. When a flow rate drops or a mechanical defect is noticed, the pump is pulled for inspection and repairs. Flow meters are digital with no moving parts except the propeller in the pipe. Energy use and runtimes are tracked through SCADA and have been relatively consistent. Flow meters are calibrated periodically.

IID ECP Pumps

Seepage recovery sites are equipped with Siemens Flow Meters on discharge tubes. The metered discharge data is transmitted to the WIS via IID's SCADA system. The SCP Efficiency Conservation group reviews reported flow graphs daily to monitor each seepage recovery site. When a flow rate drops or a mechanical defect is noticed, the pump is pulled for inspection and repairs. Typically, a pump is rebuilt or replaced every four years with some adjustments to the pumps and impellers as needed. Calibration for each flow meter is verified annually by an outside contractor.

J. Distribution control

Modify distribution facilities and controls to increase the flexibility of water deliveries (e.g., automate canal structures, institute variable turn-off times, etc.).

IID Initiatives

In 1958, IID installed a telemetry system and automated structures on upper reaches of its main canals. Telephone lines were used to access remote sites. In 1984, IID conducted a Modified Demand Irrigation Trial, wherein water orders could be terminated up to four hours before or after the regular (24-hour) end time.

IID/MWD Programs

In the 1990s, a distributed control SCADA system that uses computers, radio and microwave communication network was developed to monitor and operate IID's irrigation distribution system. The new WCC was constructed to house the computer-based monitoring equipment, including workstations, map board, file and database servers, and updated communications equipment. Field site improvements consisted of upgrades to 63 water control sites (34 major sites, 6 minor sites, and 23 overshot gates). In 1991, 12-hour delivery was instituted, allowing growers to take AM or PM orders (7 cfs maximum; or flow reduction on last 12 hours of 24-hour delivery, not to exceed 5 cfs or ½ delivery rate).

- FOR DETAILS, SEE IID/MWD WATER CONSERVATION PROGRAM FINAL PROGRAM CONSTRUCTION REPORT

Additional delivery flexibility was provided to growers served by three (3) IID/MWD Lateral Interceptor projects.

- FOR DETAILS, SEE Reg. No. 54, Interceptor Orders in Rules and Regulations Governing the Distribution and Use of Water

IID ECP Initiatives

As described above in section **F. Operational practices and procedures / IID ECP Initiatives**, a major Discharge Reduction Project activity is implementation of IIM, which uses SCADA technology to enable real-time lateral spill monitoring and remote operation of lateral headings by zanjeros in their vehicles. Lateral interceptor projects are also being considered.

Increased distribution control will allow the Water Department to increase flexibility and thereby provide additional capacity to accommodate water returned to the delivery system resulting from early delivery shut offs and other on-farm efficiency practices. The goal of increased system delivery flexibility is to allow IID growers to institute on-farm efficiency practices that match on-farm crop requirements and that produce water conservation sufficient to meet IID's QSA water transfer requirements.

- FOR DETAILS, SEE IID WEBSITE: System Conservation Program
- FOR DETAILS, SEE *DESIGN AND CONSTRUCTION READY SCP PROJECTS, REVISION 1*, DAVIDS ENGINEERING AND KELLER BLIESNER ENGINEERING, MARCH 31, 2014.

K. Reuse systems

Construct district operational discharge reuse systems.

IID & Grower Initiatives

From 1947 through 1951, IID installed seepage recovery dewatering pumps along the AAC. A similar program was initiated on the EHL Canal in 1967. These pumps remain in operation, with conservation savings in the order of 25 KAFY. IID intercepts discharge from laterals that lie to the south of the WSM (Tuberose through Thistle); however, those return flows are unmeasured. In 2014, IID seepage recovery in the Imperial Valley was 7.3 KAF.

IID/MWD Program

Three (3) lateral interceptor systems were constructed as part of the IID/MWD Water Conservation Program and remain in the program with conservation savings in the range of 33 KAFY.

On-farm TRS's consisting of a pond, a pumping plant, and a pipeline to convey tailwater from the pond to field ditch(es) served by the system were also developed. Under the terms of the 2014 Letter for Substitution and Conservation Modifications to the IID/MWD Water Conservation Agreement, the IID/MWD TRS project was dropped from the IID/MWD Program effective January 1, 2015. For most of the duration of the IID/MWD TRS program, 24 TRS's covering nearly 6,630 acres produced conservation savings in the range of 2.5 KAFY.

- FOR DETAILS, SEE IID/MWD WATER CONSERVATION PROGRAM FINAL PROGRAM CONSTRUCTION REPORT

IID ECP Initiatives

System Conservation: IID SCP reuse systems include main canal seepage recovery and intertie return projects.

Main canal seepage contributes a large portion of the estimated 86 KAFY of total canal seepage from the IID delivery system. In areas of highly permeable soils where main canal seepage is greatest, open drains parallel to the AAC, EHL, and WSM canals were constructed to intercept seepage so the down-slope lands could be farmed. Where salinity levels allow, some of the intercepted water is recovered and returned to the AAC and EHL canal. Unrecovered seepage is carried via the IID drainage system and New and Alamo rivers to the Salton Sea.

Main canal seepage recovery was the first efficiency conservation program IID undertook to meet its QSA/Transfer Agreements water transfer obligations, with delivery of 4 KAF to CVWD in 2008. In 2014, 24 seepage recovery sites were operational, producing 32,231 AF of conservation efficiency savings.

An analysis and recommendations regarding potential SCP projects was developed in 2014, while no further seepage reduction projects were recommended for final design and construction, a number of intertie connection projects were proposed. Intertie return projects will provide stand-alone connections that allow IID to capture and route small volumes of water to existing canals. Lateral interceptor projects are also being considered.

- FOR DETAILS, SEE *DESIGN AND CONSTRUCTION READY SCP PROJECTS, REVISION 1*, DAVIDS ENGINEERING AND KELLER BLIESNER ENGINEERING, MARCH 31, 2014.

On-Farm Conservation: On-farm reuse projects involve tailwater recovery systems. OFECP TRS options include portable, permanent, and cascading systems.

- FOR FURTHER SOLICITATION DETAILS, SEE 2014-2015 ON-FARM EFFICIENCY CONSERVATION SOLICITATION

L. Reduction of conveyance seepage

Line distribution ditches and canals; convert to pipe.

IID & Grower Initiatives

IID initiated concrete lining of canals, laterals and delivery ditches in 1954. The last major concrete lining projects were completed in 1994, and IID lined portions of several laterals under a matching NADBank grant in 2003-2006. By 2015, IID had lined approximately 1,090.8 miles (199.7 under the IID/MWD program) and piped 26.2 miles of lateral canals, and 20.9 miles (13.3 miles under the IID/MWD program) of main canal. Minor canal lining projects are ongoing at IID. Growers, with IID and federal assistance, have lined nearly 2,570 miles of delivery head ditches.

IID/MWD Program

From 1989 through 1992, 13.3 miles of main canal were lined. For lateral canals, the objective was to line sections throughout IID's water service area where the total life-cycle cost per projected AF of conservation savings would be $125/year or less in 1988 dollars; 199.7 miles of lateral canal were lined under this program, with conservation savings of 24.25 KAFY.

- FOR DETAILS, SEE IID/MWD WATER CONSERVATION PROGRAM FINAL PROGRAM CONSTRUCTION REPORT

IID ECP Initiatives

As part of the QSA/ Agreements and with financial assistance from the CDWR, 23.0 miles of the AAC have been lined. In 2008, the first transfer of 8,898 AF was made; in 2009, 65,577 AF were transferred; with conservation savings for 2010 et seq., conservation savings of 67,700 KAFY.

In 2015, an analysis and recommendations regarding potential SCP projects was developed, no further canal lining projects were recommended for final design and construction.

- FOR DETAILS, SEE *DESIGN AND CONSTRUCTION READY SCP PROJECTS, REVISION 1*, DAVIDS ENGINEERING AND KELLER BLIESNER ENGINEERING, MARCH 31, 2014.

M. Construction, lining or covering of regulatory reservoirs

Construct line or cover small regulatory reservoirs within the distribution system.

IID Initiatives

IID is served by 10 regulating reservoirs, having a storage capacity of nearly 3.4 KAF. IID constructed five of the reservoirs as part of an ongoing water conservation program. They receive water that would normally be surplus and store that water for beneficial use when needed.

- FOR FURTHER DETAILS, SEE IID website: Reservoirs

IID/MWD Program

Reservoirs that are part of the IID/MWD Program include two (2) regulating reservoirs, Carter and Galleano; a pumping plant addition at Singh Reservoir; and four (4) interceptor reservoirs, Bevins, Young, Russell and Willey. Carter Reservoir, built by IID, is part of the IID/MWD Augmentation Program. Galleano Reservoir is a stand-alone project built under the IID/MWD Agreement. A pumping plant was installed at the existing Singh Reservoir, as part of the 12-Hour Deliver Project, to offset EHL fluctuations caused by increased flexibility. Four reservoirs – Bevins, Young, Russell and Willey – were constructed as part of the three IID/MWD lateral interceptor projects.

- FOR DETAILS, SEE IID/MWD Water Conservation Program Final Program Construction Report

IID ECP Initiatives

A main canal operational reservoir is in the reconnaissance phase, and mid-lateral reservoirs may be constructed.

System Conservation: Capital projects including one new main canal reservoir and other capital projects are being considered.

On-farm: Lining of head ditches is a recognized measure under the IID OFECP.

SELECTED MEASURES AND PROJECTED RESULTS

IID Initiatives

- Records used for water conservation verification have been collected, analyzed and stored in formats contemporary to the times, from manual readings and Stevens recorder charts, to data loggers and early versions of spreadsheets and databases, to automated SCADA and WIS Oracle-database.
- Water conservation for 1975-2005 are documented in the annual IID Water Report (these reports are hard copies located at IID).

IID initiatives that predate the QSA/Transfer Agreements will remain in place. Conservation yields are expected to remain about the same.

IID/MWD Program

- Verification documents prepared for the overall program and for specific projects are available on the IID website: Verification Documentation

An automated data collection, quality control, processing and retrieval system was developed under the IID/MWD Program. The system was designated to include many of the control sites for the various programs as well as the sites needed for systemwide monitoring. In December 1995, data processing procedures developed by the Conservation Verification Committee were institutionalized and incorporated into IID's WIS. Data collected on the WIS is QC'd on a daily, monthly and annual basis. QC

procedures are automated, with human oversight based on daily reports of out-of-range elements, and monthly QC based on review of graphs for each site. By mid-March before the last year's water balance record is run, final QC is carried out on that data that will be used to produce that report.

The IID/MWD Water Conservation Program has produced anticipated conservation savings and the program will retain all projects, except effective January 1, 2015 the TRS projects will be removed from Project 18 Additional Irrigation Water Management under the terms of the 2014 Letter for Substitution and Conservation Modifications to the IID/MWD Water Conservation Agreement.

Going forward, conservation efficiency yields are expected to produce at least the 105,000 AFY needed for the IID/MWD transfer in the QSA/Transfer Agreements.

IID ECP Initiatives

- IID staff meet with other QSA agencies annually to review and verify ECP conservation.
- Semi-annually, Reclamation staff perform site visits of a 5 percent random sample set of IID's conservation programs for ICS/IOP purposes.

System Conservation: Projects are metered in the field and data is collected into the WIS automatically. Staff QC final program conservation. Staff perform routine field inspections to ensure all equipment is functionally properly. System conservation programs are conserving more water than anticipated and this program will continue to ramp up to meet the QSA conservation obligation schedule.

On-farm: IID's field verification team makes multiple field visits while each conservation measure is being implemented. In addition, IID staff monitor program acreage and delivery volumes with the On-Farm Decision Support System, a subcomponent of the WIS. OFECP has proven to be a popular program with Imperial Valley farmers, exceeding the QSA conservation obligation schedule volumes.

ENVIRONMENTAL REVIEW

QSA/Water Transfer Environmental Compliance

Environmental Assessments, Permits & Reports

- Environmental Assessments & Permits

Documents assessing the environmental impacts of IID actions under the IID Water Conservation and Transfer Project (Transfer Project)[35] and the QSA and related agreements, pursuant to the California

[35] "As described in the Final EIR/EIS, the [Transfer] Project may be implemented under one of two possible scenarios. Under the first scenario (IID/SDCWA Transfer Agreement Implementation Only), the terms of the waiter conservation and transfer transactions are set forth in the Agreement for Transfer of Conserved Water (IID/SDCWA Transfer Agreement) executed by IID and SDCWA in 1998, as amended. Under the second scenario (QSA Implementation), the terms of the water conservation and transfer transactions are set forth in the proposed QSA and related agreements, to be executed by IID, CVWD, and MWD." Source: Amended and Restated Addendum to EIR/EIS for IID Water Conservation and Transfer Project (Sept 2003), p 1-1

"The [Transfer] Project also includes implementation of a Habitat Conservation Plan … to address impacts to species and habitats within the IID water service area, the right-of-way of the AAC, and the Salton Sea." Source: IID Water Conservation and Transfer Project/Draft Habitat Conservation Plan/ Draft EIR/EIS (Jan 2002), p 1-2

Environmental Quality Act are on IID's website at www.iid.com/water/library/qsa-water-transfer/environmental-assessments-permits.

Mitigation Implementation

- Mitigation Implementation
- Environmental Reports

IID is implementing the Transfer Project together with the biological mitigation measures included in the 2002 Draft HCP and the measures required under existing incidental take authorizations issued pursuant to US Endangered Species Act and California State Endangered Species Act. Following initiation of the Transfer Project and using the 2002 Draft HCP as a basis, IID began preparing an HCP and a Natural Communities Conservation Plan to support applications for incidental take authorizations for the Transfer Project pursuant to ESA Section 10 and California Department of Fish & Game Code Section 2835, and the California NCCP Act. As a result of consultation with US Fish and Wildlife Services and CDFG, it is expected that the proposed HCP/NCCP under preparation will contain certain modified, or new, mitigation and conservation measures that were neither included in the 2002 Draft HCP nor evaluated in the Transfer Project Final EIR/EIS.

Specifically, it is expected that the managed marsh requirement will be increased in size by 307 acres to a total of 959 acres, including the addition of a non-emergent vegetation component. The increase in the acreage of the managed marsh complex is primarily the result of a drain vegetation survey completed by IID in 2004, which documented more drain vegetation than the amount estimated in the 2002 Draft HCP.

IID also completed a suite of additional mitigation projects including burrowing owl population studies (2007-2008, 2011-2012), a selenium toxicity study on Desert Pupfish, a selenium study in IID direct-to-Sea drains, and Managed Marsh phases I and II.

Development of the Draft HCP/NCCP is in process; however, IID is required to begin creating the managed marsh complex pursuant to existing biological mitigation measures and ESA/CESA approvals. IID wishes to designate a site that will accommodate the managed marsh currently required (up to 652 acres) as well as the expanded managed marsh (959 acres) anticipated to be required by the Draft HCP/NCCP. Requirements of the In-Valley Biological Opinion, the In-Valley CESA Permit, and the 2002 Draft HCP were assessed as part of the evaluation of the Transfer Project in the Transfer Project Final EIR/EIS. Pursuant to California Environmental Quality Act, IID completed the Supplement to the Transfer Project Final EIR/EIS that provided additional environmental assessment to designate, construct, and manage a specific site for the expanded managed marsh complex.

Salton Sea Mitigation

Under the State Water Resources Control Board's revised order (WRO 2002-0013), IID has been fallowing land to generate mitigation water for the Salton Sea. In 2017, that mitigation water, which was intended to provide the state sufficient time to select, adopt and fund Salton Sea restoration, will end.

Air Quality Mitigation

As part of the 2003 QSA Water Transfer, the Salton Sea Air Quality Mitigation Program was developed in 2016 to address air quality mitigation requirements that are associated with transferring up to 303,000 acre-feet of conserved water per year. The transfer of water reduces the volume of agricultural return flow to the Salton Sea, exposing playa and increasing the potential for dust emissions around the Salton Sea. Mitigation measures to address potential dust emissions include: 1) restricting access to exposed playa, 2) researching and monitoring the exposed playa, 3) creating or purchasing offsetting emission reduction credits and 4) implementation of direct emission reduction measures on the exposed playa. The Program's objective is to detect, locate, assess and identify options to mitigate dust from the exposed playa.

- Air Quality Mitigation

IMPLEMENTATION SCHEDULE AND BUDGET

IID/MWD Conservation Program

The Water Department will continue operation of projects and programs included in the 1988 Water Conservation Agreement between IID and MWD and in the 1989 Approval Agreement among IID, MWD, Palo Verde Irrigation District and CVWD, as amended to align with the 2003 QSA/Transfer Agreements and the 2014 Letter for Substitution and Conservation Modifications to the 1988 Agreement related to tailwater return systems.

- Continuation of the 1988 IID/MWD Water Conservation Program, as amended

Fallowing Programs

The Water Department, under direction of the IID Board of Directors, implemented the IID Fallowing Program to meet the district's QSA /Transfer Agreement obligations for water transfer to CVWD and SDCWA Salton Sea mitigation and the IID Temporary Land Conversion Fallowing Program for land with renewable energy facilities developed under conditional use permits issued by Imperial County.

- Continuation of IID Fallowing Program for water transfer to CVWD and SDCWA through 2016
- Continuation of IID Fallowing Program for Salton Sea mitigation through 2017
- Continuation of Temporary Land Conversion Fallowing Program

ECP Implementation

The Water Department, under direction of the IID Board of Directors, has begun and will continue to implement system and on-farm efficiency conservation programs to meet the district's QSA /Transfer Agreement obligations. Planned implementation for these programs for 2016-2020 is described below.

System Conservation Program

- Main Canal Seepage Interception
  - Four (4) additional projects with estimated yield of 4,920 AFY
  - Installation of telemetry on all sites where conservation efficiency yield is reported
- Intertie Returns

- 10 projects with estimated yield of 8,800 AFY

- Discharge Reduction Project
  - Completion of SCADA system upgrades, communication system upgrades, laptops for all zanjeros
  - Automation of remaining manually operated lateral headings
  - Upgrade of flow measurement at remaining unmonitored lateral spills

- Mid-Lateral Reservoirs
  - Initiation of program

- SCP Operational Reservoir
  - Initiation of program

- Lateral Interceptors
  - Investigation of projects
- Groundwater Storage and Conjunctive Use
  - Investigation of projects

On-Farm Efficiency Conservation Program

- Ongoing implementation of OFECP
  - Program goal is to incentivize agricultural water customers to conserve up to 80,00 AF in 2016, increasing to 200,000 AFY for 2026 et seq., as needed.

IID Program Staffing and Budget Projections, 2016 - 2020

Positions listed in **Table 48** will be filled to the level needed to administer, implement, operate and maintain the district's water conservation programs. For 2016-2020 budget projections, see **Table 49**.

Table 48. IID QSA Staffing, 2016-2020

Program Administration	Efficiency Conservation Program
Ag Water Management Unit	**Farm Unit**
Engineer	Project Manager Sr.
Mitigation Program	Administrative Assistant
Environmental Unit	Engineer Assistant
Environmental Project Manager	Engineering Technician 1
Environmental Specialist I	Operations Analyst Water I
Environmental Specialist I	Operations Analyst Water II
Water Conservation Data Tech I	Program Management Specialist
Irrigation Maintenance Unit	Water Conservation Data Tech
Construction Maintenance Worker	**System Conservation Programs**
Construction Resources Work Forman	Supt General Efficiency Conservation Program
Heavy Equipment Unit	Water Conservation Data Tech
Heavy Equipment Operator	**Drainage Maintenance Unit**
Heavy Transport Truck Driver	Construction & Maintenance Worker
Engineering Services	**Heavy Equipment Unit**
Engineer	Heavy Equipment Operator
Engineer Assistant	Heavy Transport Truck Driver
Engineering Tech	**Water SCADA Unit**
Survey Party Chief	Control Systems Specialist
Survey Technician	Programmer Senior

Heavy Transport Truck Driver	SCADA/Telecom Foreman
Engineering Services	SCADA/Telecon Journeyman
Engineer	**Water Monitoring Unit**
Engineer Assistant	Engineering Technician 1
Engineering Tech	Hydrographic Technician
Survey Party Chief	Operations Analyst Water I
Survey Technician	Water Conservation Data Tech 1
Biological Control Unit	Water Conservation Data Tech 2
Hatchery Worker	
Hatchery Operations Coordinator	
Ag Water Management Unit	
Agricultural Pest Control Advisor	
Fallowing Program (will end 12/31/2017)	
Farm Unit Programs	
Operations Analyst Water II	
Water Operations Unit	
Zanjero	
Irrigation Management Unit	
Construction Maintenance Worker	

Table 49. IID QSA Projected Budgets, US Dollars, 2016-2020

	2016	2017	2018	2019	2020
IID/SDCWA PROGRAM					
REVENUE & FUNDING					
Water Sales to SDCWA	66,257,000	66,883,400	85,408,300	105,272,600	126,915,700
Water Sales to CVWA	3,052,800	3,349,000	6,312,100	7,366,300	8,330,900
QSA/JPA Envr Mitigation	4,683,200	14,596,800	16,889,300	17,380,600	20,279,800
JPA Payment Mitig. Reimbursement	16,807,900	19,927,000	-	-	-
Grant Mitigation	33,268,000	1,677,000	3,711,900	-	-
Capital Settlement Payment (SDCWA)	19,968,500	13,019,600	10,400,000	-	-
Capital Funding from Grants	-	1,300,000	2,193,000	-	-
Capital Funding from CP/COP	-	-	31,743,100	51,300,000	44,804,000
TOTAL REVENUE & FUNDING	144,037,400	120,752,800	156,657,700	181,319,500	200,330,400
EXPENDITURES					
Environmental Mitigation	3,726,700	14,296,800	15,719,000	17,130,600	20,279,800
Envr Obligation Payments	7,489,800	6,685,800	6,361,500	6,034,600	5,482,100
Mitigation – Misc. Projects	34,601,800	255,000	273,000	171,300	-
Mitigation Projects (Grant/State)	-	1,727,000	4,021,800	-	-
Fallowing Program	26,592,600	23,326,300	-	-	-
System Conservation O&M	8,345,300	7,216,000	8,266,200	6,465,400	7,811,600
On-Farm Payments	23,000,000	34,200,000	37,050,000	46,400,000	56,367,100
Admin/Program Management	2,960,500	2,326,700	1,785,000	1,705,000	1,358,800
G&A Expense (Legal)	3,269,500	2,166,300	1,411,300	1,420,000	2,298,200
Capital Projects (SCP)	22,968,500	16,019,600	43,143,100	51,300,000	44,804,000
Capital (Mitigation)	1,176,500	1,600,000	3,203,300	250,000	-
Debt Service	-	-	3,267,600	6,535,300	10,489,600
Lost Water Sales	4,600,000	5,000,000	2,600,000	3,200,000	3,850,000
TOTAL EXPENDITURES	138,731,200	114,819,500	127,101,800	140,612,200	152,742,200
TRANSFER OUT TO WATER DEPARTMENT	(5,306,200)	(5,933,300)	(29,555,900)	(30,548,400)	(28,078,100)
Total IID/SDCWA	**-**	**-**	**-**	**10,158,900**	**19,510,100**
WESTERN FARM LANDS					
REVENUE & FUNDING	1,400,000	1,500,000	1,500,000	1,500,000	1,500,000
EXPENDITURES	964,000	929,100	960,900	980,000	997,400
Total WFL	**436,000**	**570,900**	**539,100**	**520,000**	**502,600**
LOCAL ENTITY					
REVENUE & FUNDING	8,710,000	16,491,200	3,067,100	-	-

EXPENDITURES	8,710,000	16,491,200	3,067,100	-	-
Total Local Entity	-	-	-	-	-
IID/MWD AGREEMENT					
REVENUE & FUNDING	12,940,600	13,225,400	13,225,400	12,925,400	14,740,700
EXPENDITURES	12,940,600	13,225,400	13,225,400	12,925,400	14,740,700
	-	-	-	-	-

PUBLIC INVOLVEMENT AND SUPPORT

1. Has development of the plan been a public process?

   Yes, the plan was presented to the Water Conservation Advisory Board and to the IID board for Information and Action at scheduled public meetings.

2. Has the water conservation plan been adopted and approved by the board or governing body?

   Yes, adopted and approved by the IID Board of Directions at the _____ board meeting.

ACRONYMS AND ABBREVIATIONS

AAC	All-American Canal
AC	acre or acres
ADCP	acoustic doppler current profiler
ADLG	automated drop-leaf gate
Adj.	Adjusted
AF	acre-foot, or acre-feet
AF/AC/yr	acre-feet per acre per year
AFY	acre-foot per year, or acre-feet per year
AVM	acoustic velocity meter
AWC	agricultural water clearinghouse
AZ	Arizona
CA	California
CAP	Central Arizona Project
CDC	California Development Company
CDFG	California Department of Fish and Game
CDWR	California Department of Water Resources
CESA	California State Endangered Species Act
cfs	cubic feet per second
CI	confidence interval
CIMIS	California Irrigation Management Information System
CM	Central Main Canal
CRWDA	*Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement for the purposes of Section 5(B) of Interim Surplus Guidelines,* Oct 10, 2003
CU	consumptive use
CVC	IID/MWD Water Conservation Program Conservation Verification Committee
CVWD	Coachella Valley Water District
CWC	California Water Code
CY	calendar year
D/S	Downstream
DP	dewatering pumps
DWQIP	Drain Water Quality Improvement Plan
EC	electrical conductivity
ECP	Efficiency Conservation Program (IID Plan)
EDP	IID Equitable Distribution Policy
EHL	East Highline Canal
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
EOY	end of year
ESA	US Endangered Species Act of 1973
ET	evapotranspiration
FP	IID Fallowing Program
FT	feet
GIS	geographical information system designed to capture, store, manipulate, analyze, manage,

	and present spatial or geographical data (IID)
HCP	Habitat Conservation Plan
ICS	Intentionally Created Surplus
IID	Imperial Irrigation District
IIDSS	Imperial Irrigation Decision Support System
IIM	Integrated Information Management
IMMU	Irrigation Management and Monitoring Unit
IN	Inch(es)
IOPP	Inadvertent Overrun Payback Policy
IRWMP	Integrated Regional Water Management Plan
IWRMP	Integrated Water Resources Management Plan, Draft IID Plan
JPA	Joint powers authority
KAF	thousand acre-feet
KAFY	thousand acre-feet per year
LCR	Lower Colorado River
LCWSP	Lower Colorado Water Supply Project
MAF	million acre-feet
MAFY	million acre-feet per year
MCDSS	Main Canal Decision Support System
mg/L	milligrams per liter
MI	Miles
Mo(s)	Month(s)
MOU	Memorandum of Understanding
mph	miles per hour
MWD	Metropolitan Water District of Southern California
MWD 88 Agreement	*1988 IID/MWD Water Conservation Agreement*
n/a	Not Applicable or Not Available
NADBank	North American Development Bank
NCCP	Natural Communities Conservation Plan
No.	number
OFECP	On-Farm Efficiency Conservation Program
PCC	IID/MWD Program Coordinating Committee
PEIR	Preliminary Environmental Impact Report
Perc.	Percolation
Phreat.	Phreatophyte
PPR	Present Perfected Colorado River water Right
PVID	Palo Verde Irrigation District
QA/QC	quality assurance/quality control
QSA	Quantification Settlement Agreement and related agreements
RAP	CDWR Regional Acceptance Process for the purpose of an IRWMP
SAP	Business software used by IID
SCADA	Supervisory Control and Data Acquisition
SCP	System Conservation Program
SDCWA	San Diego County Water Authority

SEBAL	Surface Energy Balance Algorithm for Land, a remote-sensing evapotranspiration estimation model
SLR	San Luis Rey Indians
SR	Seepage Recovery
TDS	Total dissolved solids: total mass content of dissolved ions and molecules or suspended microgranules in a liquid medium
TEP	Tailwater Education Program
TMDL	Total Maximum Daily Load
Transfer Project	Water Conservation and Transfer Project, includes all programs in the QSA (IID)
TRS	Tailwater Return (Recovery) System
TruePoint, TPS	Proprietary web-based water delivery scheduling and accounting management system
TSS	Total Suspended Solids
U/S	upstream
USBR	US Bureau of Reclamation
USEPA	US Environmental Protection Agency
USGS	US Geological Survey
USWCL	US Water Conservation Laboratory
WCC	IID Water Control Center
WCMC	Water Conservation Measurement Committee
WFL	IID Western Farm Land
WIS	IID Water Information System, Oracle-based system to collect & process flow data needed in support of water management and conservation verification
WMS	IID Water Management System, Oracle-based system for order/delivery
WSM	Westside Main Canal