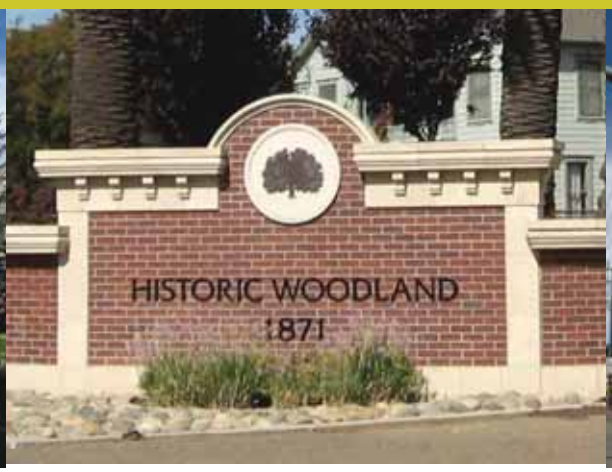
APRIL 2011

City of Woodland

GROUNDWATER MANAGEMENT PLAN

Prepared for
CITY OF WOODLAND

Prepared by
WEST YOST ASSOCIATES



2.1.2.8 Soils

According to DWR (1978), which summarizes work performed by the United States Geological Survey (Bertoldi, 1974), most soils in the Yolo sub-basin are either 1) "soils containing hardpan or other consolidated horizons that restrict the vertical flow of water, including soils over bedrock", such as in the Dunnigan Hills and other areas in which the Tehama Formation is exposed; or 2) "soils containing clay in sufficient quantities to impede the vertical flow of water" (Figure 2-8). Exceptions to this generalization are the soils in the vicinity of Putah and Cache Creeks, which have "few barriers to the vertical flow of water". Figure 2-9 displays a map of the relative permeability of soils within the Yolo County area. Areas containing soils with few barriers to vertical flow are more likely to be the recharge areas for underlying aquifers.

2.1.2.9 Land Subsidence

Significant land subsidence has been documented in Solano and Yolo Counties over the years. Land subsidence of up to 5.4 feet is documented over the past few decades in a north-south trending zone in the southwestern Sacramento Valley that extends from Zamora to Dixon (Ikehara, 1994). Down-well television surveys have been used to document well casings damaged by land subsidence over this same zone, at the Yolo/Colusa County line, and northward into central Colusa County. Of 81 wells found to be damaged, the substantial damage was in the sections of the well casings penetrating the Tehama Formation. A comparison of damaged and undamaged wells in the main area of subsidence showed similar amounts of compressible sediments and that the damaged wells were those in which the greatest declines in head had occurred after well installation (Borchers, et. al., 1998). Recent studies have verified that subsidence is continuing to occur in the Yolo County portion of this zone (Frame, 2005). Figure 2-10 shows the preliminary results of repeat surveys of the Yolo County Subsidence Monitoring Network conducted in 1999 and 2005. Based on these preliminary results, 3.1 inches of subsidence have occurred at the UC Davis Continuously Operating Reference Station (CORS) (Figure 2-10). This equates to an average rate of subsidence of about 0.5 inches per year at the UC Davis CORS. This rate is significantly higher than the average rate recorded at an extensometer located in the Yolo Bypass approximately 10 miles northeast of Davis. The rate recorded at the Conaway Ranch extensometer is roughly 0.03 inches per year. The significantly higher rates calculated based on the repeat elevation surveys implies that part of the land subsidence is occurring due to compaction of geologic materials at depths greater than the completion depth of the extensometer (roughly 600 feet), and some of the recorded subsidence could be caused by factors other than groundwater withdrawal. Possible mechanisms are withdrawal of gas and saline water from deep gas production zones and natural tectonic subsidence occurring at long-term geologic rates. A copy of the Yolo County Subsidence Monitoring Network 2005 Report is included in Appendix D. The locations of the subsidence benchmarks used in the Yolo County Subsidence Monitoring Network are shown on Figure 2-11 for the City area.

Truckee-Carson Irrigation District

Newlands Project

Water Conservation Plan

December 2010

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Section 1: Description of the District

District Name: Truckee-Carson Irrigation District

Contact Name: Rusty Jardine Title: Project Manager

Telephone: (775) 423-2141 E-mail: rusty@TCID.org

A. History

1. Date district formed: 1906 Date of first Reclamation contract: 1918
   Original size (acres): 232,000 Current year (last complete calendar year): 2009

2. Current size, population, and irrigated acres

	Current Year
Size (acres)	73,800
Population served	None
Irrigated acres	58,669

3. Water supplies received in 2009

Water Source	AF
Federal urban water	0
Federal agricultural water	0
State water	0
Other Wholesaler (define)	0
Local surface water	306,700.00
Upslope drain water	0
District ground water	0
Transferred water	0
Waste Water Treatment (Fallon)	953.28
Total	307,653.28

4. Annual entitlement under each right and/or contract

	AF	Source	Contract #	Contract Restrictions
USBR Urban	0	N/A	N/A	N/A
USBR Agriculture	0	N/A	N/A	N/A
Local	300,000+	Carson / Truckee Rivers	NV water right	OCAP (limits Truckee diversions)

5. Anticipated land-use changes

Land use changes within the Project are related to conversion of agricultural lands to urban development. The Fish and Wildlife Service's Final Environmental Impact Statement for Water Rights Acquisition for Lahontan Valley Wetlands states that between 1989 and 1993, approximately 1,500 acres of agriculture land was converted to urban lands. The Statement also indicates that additional lands will be converted in the future. Another change in land use has occurred as a result of the Fish and Wildlife Service acquiring water righted lands to transfer the

water right to the wetlands, thereby retiring the lands from agricultural production. Recently, lands are being purchased by the Pyramid Lake Indian Tribe and the communities of Washoe County, the City of Reno and the City of Sparks for water quality purposes in the Truckee River. Some of these lands have been converted to urban development. Other changes, such as different crops, are relatively minimal in comparison to the conversion of land to urban use and retirement of land for wetland purposes. Conversion of water rights from urban developed water-righted lands to other agriculture lands has been slowed due to water right transfer litigation.

6. Cropping patterns

List of current crops (crops with 5% or less of total acreage can be combined in the 'Other' category.

Original Plan - 2000		Previous Plan-2005		Current Plan - 2010	
Crop Name	Acres	Crop Name	Acres	Crop Name	Acres
alfalfa	31,900	alfalfa	28,000	alfalfa	28,000
forage / pasture	13,800	pasture	9,300	pasture	13,880
cereal	12,000	corn/sudan	2,400	corn/sudan	6,100
vegetables	2,400	small grains	4,200	small grains	4,200
		vegetables	300	vegetables	489
		new seed alfalfa	4,000	new seed alfalfa	4,000
Other (<5%)		Other (<5%)	2,000	Other (<5%)	2,000
Total	60,100	Total	50,200	Total	58,669

7. Major irrigation methods (by acreage) (Agric only)

Original Plan - 2000		Previous Plan 2005		Current Plan - 2010	
Irrigation Method	Acres	Irrigation Method	Acres	Irrigation Method	Acres
Flood	54,090	Flood	49,700	Flood	57,980
Furrow	5,409	Furrow	300	Furrow	489
Other	601	Other	200	Other	200
Total	60,100	Total	50,200	Total	58,669

B. Location and Facilities

Appendix A shows points of delivery, conveyance system, storage facilities, and operational loss recovery system. A series of several maps show turnouts (internal flow), outflow (spill) points, measurement locations and water quality monitoring locations. There are no District wells.

1. Incoming measurement methods and locations

Incoming Locations	Type of Measurement Device	Accuracy
Carson River – Fort Churchill	rated section	USGS Gauge
Truckee Canal at Hazen	combination weir	USGS Gauge
Fallon WWTP discharge into L Canal	City meter	+ or - 1%

2. Current year Agricultural Conveyance System

Miles Unlined - Canal	Miles Lined - Canal	Miles Piped	Miles - Other
360.5	27	2.5	0

The water delivery system for the Project consists of two major diversion dams, and approximately 391 miles of canals, laterals, and sublaterals, located in the Truckee and Carson Divisions of the Newlands Project as shown on the Project map in Appendix A. The water delivery system provides water through canal and lateral turnouts to an estimated 1,500 farm head gates.

Approximately 20 miles downstream from Reno, water for project purposes is diverted from the Truckee River into the Truckee Canal at Derby Dam. The dam is a concrete gate structure 31 feet high with an embankment wing. It has a hydraulic height of 15 feet and controls diversions of up to 1,500 cfs into the Truckee Canal through nine slide gates. 13 slide gates and one 25-foot hinged drop gate control the flow into the river.

The Truckee Canal extends approximately 32.5 miles from Derby Dam on the Truckee River to Lahontan Dam on the Carson River. The canal has a designed carrying capacity of 1,200 cfs at the head; however, the current operating capacity is approximately 350 cfs. The Truckee Canal serves approximately 2,000 acres of irrigated lands, which comprise the Truckee Division, either directly or through laterals and sub-laterals. The Truckee Canal also delivers water to Lahontan Reservoir to supplement the flow of the Carson River and provide more reliable water service to Carson Division lands.

Carson Diversion Dam (Diversion Dam) is located on the Carson River about five miles downstream from Lahontan Dam and is the major diversion point for irrigation water to serve the lands in the Carson Division. The dam is a 23-foot high concrete gate structure with a hydraulic height of 14 feet and a crest length of 241 feet. The two major diversions from Diversion Dam are the T canal, regulated by two slide gates and serving lands north of the river, and the V canal, regulated by three slide gates and serving lands south of the river. The flow of the Carson River is regulated by 17 slide gates and one 25-foot drop gate. Project facilities below Diversion Dam are primarily distribution facilities within the Carson Division to serve approximately 55,791 irrigated acres. In addition, there are drainage facilities to handle return flows.

Lands north of the Carson River are served primarily by the T canal. The only other designated canal system north of the Carson River is the N canal.

The primary diversion to lands south of the Carson River is the V canal. There are several other designated canal systems south of the river including the A, L, S, G, D, and E canals, which are fed either directly or indirectly from the V canal. Two regulating reservoirs, Harmon and the S-Line Reservoirs, are currently utilized in the area south of the river. In addition to Diversion Dam there are two other diversion dams on the Carson River: Coleman Dam, which diverts water to the S canal, and Sagouspe Dam, which diverts water to the D canal. Of the 391 miles of canals and laterals, about 7 percent, or 27 miles are lined. The lined sections are in the main Truckee Canal, the D-Line, T-Line, L1, L8, S5, S7, S8, S17, and V11 in the Carson Division, and the TC-4, TC-5, TC-6 in the Truckee Division. In the Truckee Division, the TC-3 lateral is in pipe. A number of canals have been lined with clay including the A-Line, S-Line, and S-6.

3. Storage facilities

The water delivery system for the Project includes storage of water in Lahontan Reservoir, Lake Tahoe, and Boca Reservoir.

Lake Tahoe Dam, an 18-foot high structure with 17 slide gates, controls the uppermost water in the Lake, and is located at Tahoe City in California. By controlling the top six feet of Lake Tahoe, the dam creates a reservoir with a capacity of 732,000 acre-feet and regulates releases from Lake Tahoe into the Truckee River. Boca Reservoir is located near Truckee, California, with a storage capacity of about 40,000 acre-feet.

Lahontan Dam is a 162-foot high-zoned earth-fill structure with a hydraulic height of 120 feet, a crest length of 1,325 feet, and a total storage capacity of 312,900 acre-feet (with the installation of flashboards). The outlet works at Lahontan Dam through the hydro plants' penstock and together with the right side open tunnel have a capacity of 4,500 cfs to the lower Carson River.

4. Description of the agricultural spill recovery system

There are a number of Spill Recovery Systems in place at this time. These include the Coleman Dam diversion into the S-Line Canal, the G-C17, T-Line Terminus, etc. Most canal and lateral spills or terminal flows have been minimized. The water flows from drains are largely from irrigation runoff or ground water. If the water from the drains is returned to the river it can be reused otherwise the water flows to the Stillwater or Carson Lake wetlands. Old River Reservoir, which is located near the lower end of the T canal, is only utilized during years with excess flows to minimize potential flood impacts in the T canal system. Sheckler Reservoir on the V Canal is also used as a flood control reservoir. During normal to below normal years, the District does not use these two regulating reservoirs in order to minimize seepage and evaporation losses and improve Project efficiencies.

The Project has six regulating reservoirs with areas ranging from approximately 300 to 3,000 acres.

1. Sheckler Reservoir: The District keeps Sheckler Reservoir dry except during years of high flows when it is used to store precautionary and spill releases from Lahontan Reservoir to minimize any flooding potential within Lahontan Valley.
2. Old River Reservoir: The District keeps Old River Reservoir dry except during years of high flows when it is used to store excess flows from Lahontan Reservoir to minimize any flooding potential within Lahontan Valley.
3. S-Line Reservoir: The District reduced losses in 1993 by placing a dike across the reservoir and using only the southern 1/3.
4. Harmon Reservoir: Project efficiencies are improved with Harmon Reservoir as return flows as well as excess flows are stored for later use to supplement flows in the S Canal.
5. Stillwater Point: Deliveries to Fish and Wildlife Service are made to Stillwater Point Reservoir. This reservoir is on the Stillwater Refuge and not considered a project feature but under the control of the US Fish and Wildlife. Most of the drainage from the Project is captured in this reservoir for reuse.
6. Sagouspe Reservoir: Diversions to Project water users as well as releases to water users downstream of Sagouspe who are not part of the Project are made from Sagouspe Reservoir. All Project drains returning to the Carson River between Coleman Dam and Sagouspe Dam are captured by this reservoir for reuse.
7. Ole’s Pond Reservoir: Has been sectioned off and has not been used for 20 years for any reason.

5. Agricultural delivery system operation

Order by 4:00 PM Monday - Friday, delivery possible same day or within 72 hours. This last water season, all individuals that ordered were contacted within 24 hours of placing their order. The District has changed the water delivery process every year since 2006 with the goal to improve customer service, streamline the process, and conserve water. The Rules are expected to change for the next water season to reflect what was achieved in the last water season. Through the addition of a Scheduler the water is ordered and put on a schedule the same day with the goal of leveling out the releases from Lahontan. This ensures that there is less water being spilled because the water is basically sold before it is released from the reservoir. The scheduler places a start time and a stop time on the water order based on the amount of water ordered. Those times are estimates. The Ditchrider will call the irrigator as time for delivery gets close or if there are any changes to the scheduled start time. If the irrigator wants the water turned off earlier than scheduled he will notify the Ditchrider during this initial contact or during the course of his delivery. The Ditchrider will turnoff the water as requested within a hour or less depending on his location in the field. The irrigator has the option to turn-on and/or turn-off his own deliveries with prior approval from the Ditchrider. The irrigators will in most cases coordinate with the Ditchrider and neighbors who are also irrigating to pass water from one field to the next. This insures an efficient and timely delivery and shutoff.

6. Restrictions on water source(s)

Source	Restriction	Cause of Restriction	Effect on Operations
Carson River	Available supply	Hydrologic conditions	Only in water short years
Truckee River	OCAP	Federal regulations	Maximize use of Carson River

7. Proposed changes or additions to facilities and operations for the next 5 years

No significant changes or additions are planned to the Project facilities beyond those described elsewhere in this document related to purchasing of water rights for wetlands purposes and land conversion to urbanization. These purchases will continue to reduce the number of acres in agriculture.

Churchill County and Fallon Naval Air Station have instituted a Conservation Easement Program to encourage property to remain in agriculture. As of 2010 5,550 acres have been sold into this Conservation Program. Churchill County also has a Cluster Development program that has currently set aside 835 acres for agricultural use. The Nevada Land Conservancy has set aside 370 acres and the Trust for Public Lands and State Question One has set aside 300 acres. This would make a total of 7,055 acres that has been designated for agricultural use only in Churchill County.

In the Truckee Division, the major population center is Fernley. In 2000 19,600 AF of project water were diverted from the Truckee Canal and 14,600 AF were delivered (the difference is losses). In 2009 12,106 AF of project water were diverted from the Truckee Canal and 8,183 AF were delivered. The continuing conversion of agricultural to urban land use will further reduce the number of irrigated agricultural acres. The City of Fernley plans to build a surface water treatment plant using their accumulated project water rights.

C. Topography and Soils

1. Topography of the district and its impact on water operations and management

The nearly level conditions within the project have an influence on how water within the District is managed. There is not sufficient fall within the District to create enough head for sprinkler systems without the use of pumps. Wide, shallow and slow flowing canals and laterals are used to deliver water within the District. These nearly level conditions make it difficult to accurately measure water since traditional water measuring devices rely on a differential head to perform the measurement. The level conditions within the District also make it harder to manage the water because of the longer time lag for water moving from one point to another. Water needs on the downstream end of the project must be anticipated well in advance of actual needs.

Most of the irrigated lands in the District are Carson-Stillwater or Dia-Sagouspe-East type soils. The chart below indicates the soil types that occupy the soil survey area called the Fallon-Fernley area of interest (AOI). This AOI, referenced on the map in Appendix B, is the area that the Newlands Project is in. The District boundaries consist of approximately 136,255 acres. It is important to note that not all the area in the AOI is within the District and not all the acreage within the District is irrigated.

2. District soil associations (Agric only)

Soil Association	Estimated Acres	Effect on Water Operations and Management
Playas-Parran	183,798	Unknown
Lahontan	12,193.5	Unknown
Carson-Stillwater	19,374	Unknown
Dia-Sagouspe-East	12,165.9	Unknown

Playas-Parran association: Nearly level playas and somewhat poorly drained, fine-textured soils; in basins and on low lake terraces

Lahontan association: Nearly level, somewhat poorly drained, fine-textured soils; on deltaic flood plains and in basins

Carson-Stillwater association: Nearly level, somewhat poorly drained and poorly drained, fine textured and moderately fine textured soils; on flood plains

Dia-Sagouspe-East Fork association: Nearly level, somewhat poorly drained, coarse-textured to moderately fine textured soils; on flood plains and low stream terraces

The Project is located in the northwestern part of the Great Basin. It is essentially the southern part of a northeastward trending intermountain basin that borders the surrounding foothills and mountains. The Project lies within the Soil Survey of the Fallon-Fernley Area, Nevada (FFSS) that contains detailed soils information on the Project. Parts of Churchill, Lyon, Storey, and Washoe Counties and a portion of the Truckee Canal are located within the adjacent Soil Survey of Storey County Area, Nevada. The irrigated land of the Project is broadly grouped as nearly level soils on flood plains and low lake terraces. Most of the irrigated area is between an elevation of 3,850 and 4,050 feet, with the exception of the slightly higher Truckee Division.

The general soils map of the FFSS shows the soil associations in the FFSS. It is useful for people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building or other structure.

Irrigated soils within the Project area can be characterized as those found in groups 3 and 4 of the General Soils Map from the FFSS with minor inclusions of groups 2, 5, 6, and 7. See Appendix B for soils maps and descriptions.

Soils found in Group 3, the Carson-Stillwater association, are nearly level, fine-textured and moderately fine-textured soils on flood plains. This association is in the eastern portion of the survey between Carson Sink and Carson Lake. These soils formed in alluvium of mixed origins, and occupy smooth flood plains. The soils of this association are used for crops and pasture where water is available for irrigation. They are used for range and wildlife habitat where irrigation water is not available and in areas where salt and alkali content is so high that reclamation is not feasible. The Carson and Stillwater soils make up about 80 percent of this association, and the remaining 20 percent consists of Erber, Bunejug, Swope, Carcity, and Weishaupt soils.

Soils found in Group 4, the Dia-Sagouspe-East Fork association are nearly level, coarse textured to moderately fine-textured soils on flood plains and low stream terraces. This association is mainly in the central farming area surrounding the city of Fallon and in smaller areas near Fernley and along the Carson and Truckee Rivers. These soils formed in alluvium derived from mixed rock, and occupy low stream terraces and flood plains. The major soils of this association are among the most productive in the Area. Where the areas are cleared and leveled and irrigation water is available, alfalfa, small grains, corn, and row crops are produced. Where irrigation water is lacking, these soils are used for range and wildlife habitat. The Dia, Sagouspi, East Fork and Fernley soils make up about 60 percent of this association, and the remaining 40 percent consists of Carcity, Dithod, Bunejug, Erber, Fallon, Pelic, Ragtown, Swope, and Swingler soils.

The areas farmed within the Project area consist of a significant amount of prime farmland, as designated by the Natural Resources Conservation Service. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. Areas, which are not designated as prime farmland within the Project, have been designated as farmland of statewide importance. Exact acreages are not available.

The nearly level topography of the Carson Division of the Project encourages large "to farm" water delivery rates (20 to 30 cfs) and large border irrigation methods. The large capacity and level topography allow for the irrigation of a sizable acreage in a relatively short period of time on a rotational basis. The corrugate method of irrigation predominates in the Truckee Division due to steeper-sloped, well-drained, coarse-textured soils. Water is delivered in the Truckee Division on a rotational basis also. All water allocation in the Project is determined by compliance with the Alpine and Orr Ditch decrees, which dictate water duties. Historically, two categories have been designated - bench and bottomlands. Bench lands have a lower water holding capacity (i.e., less than 8 inches of available water holding capacity in the top 5 feet of soil profile and a depth to the seasonal high water table greater than 5 feet) and are allowed a duty of 4.5 acre-feet to the water-righted acre. Bottom lands, which have 8 inches or more water holding capacity in the top 5 feet of soil profile or a depth to the seasonal high water table of 5 feet or less, are allocated up to 3.5 acre feet to the water-righted acre.

The irrigation water of the Project is of good quality. The water has a medium salinity hazard and practically no sodium hazard. A moderate amount of leaching with this water should prevent any salt buildup in irrigated soils.

Like most soils in arid and subarid regions, the soils in the FFSS contain at least small quantities of soluble salts and alkali. Because rainfall is low and evaporation is high, percolating rainfall is insufficient to leach salts out of the root zone. In the FFSS, three saline and alkali classes are used -soils free of excess salts and alkali, slightly saline-alkali soils, and strongly saline-alkali soils. Soils differ in the kinds of salt they contain and in the practices needed for improvement. For this reason, each soil requires individual treatment; however, some general guidelines are available. The salinity of the soils in this area is very responsive to good farming practices. Many of the soils map units in the FFSS may have been significantly reclaimed since completion of the soil survey. A good supply of irrigation water and adequate drainage must be provided to reclaim any soil in this area.
See Appendix B, District Soils Map

3. Agricultural limitations resulting from soil problems

Soil Problem	Estimated Acres	Effect on Water Operations & Management
None		

D. Climate

1. General climate of the district service area

The climate of the Project area is affected by two main weather regimes that influence the flow of air to the State. The major source is from the Pacific Ocean. The second dominant weather regime is the flow of warm, moist air from the south. This is the main source of summer thunderstorms 10 to 15 days per year. Total precipitation is approximately 5 inches per year. Annual surface evaporation is relatively high (48" to 52") due to the relatively warm and dry climate that prevails throughout the year.* During many years, perennial plants such as alfalfa experience only short periods of dormancy during the winter period of the year.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg Precip.	.54	.53	.46	.49	.61	.44	.16	.22	.29	.39	.38	.47	4.99
Avg Temp.	32	39	44	50	59	68	75	73	64	53	41	33	51
Max. Temp.	44	51	59	66	74	83	92	90	81	69	55	46	68
Min. Temp	18	23	29	34	41	48	54	51	43	34	25	19	35

Weather station ID 262780 Data period: Year 1903 to Year 2005

Average wind velocity 7 mph Average annual frost-free days: 132

2. No microclimates in service area.

* Source is NRCS Nevada table 683.51 (16)

E. Natural and Cultural Resources

1. Natural resource areas within the service area

Name	Estimated Acres	Description
Stillwater National Wildlife Refuge	77,500	Natural habitat (8,779 acres of water rights purchased)
Carson Lake	31,000	Wetlands (2,500 acres of water rights)
Fernley Wildlife Management Area	7,000	Natural habitat
Lahontan Reservoir	41,500	Open body of water and shoreline
Fallon Indian Reservation Wetlands	300	Wetlands (502 acres of water rights)

The water that is delivered to the wetlands by the District is not managed by the District but by the United States Fish and Wildlife Service, the Fallon Paiute Shoshone Tribe, or the Nevada Department of Wildlife depending on the location of the wetlands.

2. Description of district management of these resources in the past or present

Environmental Resources	Improvement	Management
Stillwater National Wildlife Refuge, Component of Pacific Waterfowl Flyway	Historically received Project tailwater. Already purchased 11,000 AF from Project.	Management by USF&WS
Carson Lake, Component of Pacific Waterfowl Flyway	Historically receives Project tailwater.	Management jointly by District & Nevada Dept. of Wildlife
Fernley Wildlife Management Area, Component of Pacific Waterfowl Flyway	Historically receives Project tailwater.	Management Nevada Dept. of Wildlife
Lahontan Reservoir	Sports fishery & water contact activities	Management by Nevada State Park System
Fallon Indian Reservation Wetlands	Wetlands are developed on the Indian Reservation	Managed by USFWS with three year agreement.

3. Recreational and/or cultural resources areas within the service area

Name	Estimated Acres	Description
Stillwater National Wildlife Refuge	77,500	Natural habitat
Carson Lake	31,000	Wetlands
Fernley Wildlife Management Area	7,000	Natural habitat
Massie Slough	500	Open body of water and shoreline
Lahontan Reservoir	41,500	Open body of water and shoreline
Indian Lakes	3,000	Recreational reserve

Recreation Facilities	Uses and Management
Stillwater National Wildlife Refuge	Hunting, fishing & wildlife observation.
Carson Lake	Hunting club & Nevada Dept. of Wildlife cooperative agreements.
Fernley Wildlife Management Area	Hunting club & Nevada Dept. of Wildlife cooperative agreements.
Massie Slough	Hunting club cooperative agreement.

Lahontan Reservoir	Nevada Division of Parks agreement.
Indian Lakes	U.S Fish and Wildlife Service/Nevada Dept of Wildlife

F. Operating Rules and Regulations

1. Operating rules and regulations
See Appendix C, District Rules and Regulations and Management Policies

2. Agricultural water allocation policy
The District Board of Directors sets the annual water allocation based on the April 1 snowmelt forecast and the then existing storage in Lahontan Reservoir. Water users are notified by the Board of Directors of the allocation through public meetings, mailings, and newspaper notices. The annual allocation can be adjusted later in the irrigation year as available supply can be more accurately ascertained. The allocation each year is a uniform percentage of the maximum entitlement for each user.

3. Official and actual lead times necessary for water orders and shut-off
Water orders are placed at least 72 hours prior to the water user's need for water. Shut-off times are immediate as shut-off is set when water order is placed. Second runs of water shall not be made to the water user's same District headgate within a seven (7) day period, except to provide (1) for new seeding during the first 60 days; and (2) for highly sensitive crops.
See Appendix C – Water Delivery Rules and Regulations.

4. Policies regarding surface and subsurface drainage from farms
The District has no limitations on use of drains for agricultural purposes. Water users that pump from the drains must have water rights and a pump permit. The District does not guarantee water delivery to water users that are pumping from the drains as the drains are not considered a delivery point. See Appendix C – Section J Forms for example of Pump Permits.

5. Policies on water transfers by the district and its customers
Water right transfers on the Project have been the subject of litigation for many years. Complete resolution of this issue is still pending with the Federal Courts and the Nevada State Engineer. In 1999, Assembly Bill 380 was enacted into law by the Nevada Legislature and signed by the Governor of Nevada. That legislation is intended to provide mechanisms to resolve the pending judicial and administrative proceedings. AB 380 funding program expired on June 30, 2006.
See Appendix C – Section G Water Management Policies.

G. Water Measurement, Pricing, and Billing

1. Agricultural Customers

a. Number of farms 635

b. Number of delivery points (turnouts and connections) 1,657

c. Number of delivery points serving more than one farm 169

d. Number of measured delivery points (meters and measurement devices) 609 (126 meters) (This leaves 1,048 delivery points that are not measured, however, that reflects only 28% of the total volume of flows that are served through the un-measured delivery points.)
e. Percentage of delivered water that was measured at a delivery point 72%

f. Delivery point measurement device table

Measurement Type	Number	Accuracy (+/- percentage)	Reading Frequency (Days)	Calibration Frequency (Months)	Maintenance Frequency (Months)
Orifices	0				
Propeller meter	4	±10	1 to 14 days	monthly	monthly
Weirs	21	±10	1 to 14 days	monthly	monthly
Flumes	96	±10	1 to 14 days	monthly	monthly
Bernoulli	1	±10	1 to 14 days	monthly	monthly
Metered gates	0	N/A	N/A	N/A	N/A
rated pipe/section	4	±10	1 to 14 days	As required	monthly
Total	126				

Most conservation plans require accuracy of 6%± that is generally applied to flow rates measurement devices. TCID's measurement devices have volumetric measurement accuracy as determined by the ITRC recommendations based on actual field problems including errors in water depth sensors and totalizers, fluctuating flow rates, calibration curves, etc. According to the 2009 review of TCID's Water Delivery Measurement Program done by the ITRC (reference Appendix E).

The volumetric measurement program (see Section 5) would generally be considered to be more accurate than 10%± because the 10% applies to individual turnouts and therefore the average error is less.

The ITRC stated that the error would cancel out because of the process of computing a district-wide average. The actual deliveries will be better than 5%± accuracy.

***2.* Urban Customers**
NONE

3. Agricultural Customers Charges

a. District operations and maintenance charges are based upon the number of water-righted acres owned which were 61,355.82 acres in 2009-2010 tax year. The 2010-2011 charges are $44.90 per water-righted acre ($220.00 minimum charge on water righted acres and $110.00 per District serial number administrative account charge). The charge includes $39.00 per acre for basic O&M charges, plus $3.90 per acre (10 percent) for the Water Conservation Fund. In addition, the last two acre-feet of each water duty is charged $1.00 per acre-foot for Project Efficiency improvements. Any portion of the last two acre feet that is not used is refunded the following year (Project Efficiency Credit). These charges are set by the Board of Directors on an annual basis for the current fiscal year (July 1 to June 30) as an assessment to either the Churchill or Lyon County tax rolls. The

respective county collects the monies and remits the proceeds to the District. Governmental agencies such as the USFWS, NDOW, Bureau of Reclamation (for the Fallon Paiute-Shoshone Tribes), U.S. Navy, Town of Fernley, Churchill County and the City of Fallon are billed by the District annually for their operations and maintenance charges on July 1.
See Appendix C, Management Policies, Section H, for current year fees

b. Annual charges collected from customers (current year data)

Charges	Charge units	Units billed during year	$ collected
Fixed Charges			
$39.00/ac/yr	Per water right acre @ All other duties	58,332.82	$2,274,979.98
$15.00/ac/yr	Per water right acre @ 1.5 duty	3,023	$45,345.00
$3.90/ac/yr	Per water right acre	61,355.82	$239,287.70
$2.00/ac/yr	Per water-right acre	61,355.82	$122,711.64
$110/yr	Per serial #	3389	$372,790.00
$220/yr	Min. acreage charge	2059	$452,980.00
Volumetric charges			
Charge	Charge units	Units billed during year	$ Collected
$1.00/af/yr	AF on last 2 AF of duty*	58,332.82	$116,665.64

*Most water right acres are assigned a duty of 3.5 (bottom) or 4.5 (bench) that is used to determine each parcels water allocation for the year. In order to satisfy contract requirements to charge by volume each serial number with a water allocation is assessed a fee of $1.00 per acre foot (af) on two acre feet of duty per year.

c. Water-use data accounting procedures
Each water user's orders and deliveries are maintained by a parcel serial number for reference and assessment purposes. The above fee scheduled is assessed each year for the previous years water-righted acres and turned into the Churchill and Lyon County Assessors office. The fees become part of the property taxes for each parcel that lies within the District. There are a few entities that do not pay taxes so therefore are not in the assessors database like the US Fish and Wildlife and the Fallon Paiute Shoshone Tribe. Those entities are hand billed by the District. See Appendix D – Sample Bills.

The District monitors the annual irrigated acreage for all water users. Water users are notified regarding their irrigated acreage and the water-right owner is responsible to let the District know of any changes. The BOR thereafter determines the Maximum Allowable Diversion (MAD) as outlined in the Adjusted OCAP (1997).

The District monitors water usage based on the allocation for each water user. Water right pump permits are deducted from the allocation. If a water user disputes the allocation identified by the District, the water user must produce information that shows their correct allocation, based on surveys or aerial photographs. When water orders are placed, the District compares the order with the allocation to assure that the allocation will not be exceeded in the ordered delivery. A water usage summary card is sent to each water user and irrigator each month showing water used to date. With this system, a

water user cannot exceed his decreed allocation. Water cannot be delivered to non-water-right lands. See Appendix D – Sample Water Card.

To encourage water users to be conservative with their water the District offers Project Efficiency Credits for unused water that is left on the books. The credits are calculated on the unused water and then turned in to the Churchill County and Lyon County Assessors office with the fee assessment for the previous water year. The credit is shown on the water users taxes as a credit to their O&M Fees. There are conditions to receiving Efficiency credits such as credits are only offered if the water year's allocation was 100% for the entire irrigation season. Also, individuals that do not use any of their water allocation are not eligible for the Efficiency Credit. Efficiency Credits are independent of O&M Fees.

The District's water management system provides for orders to be submitted via the Internet or phoned in. The orders are placed into a computer database immediately then a listing of water orders in sequential order is downloaded to the scheduler to schedule the delivery, as water is available. These orders are summarized for each day into cfs and acre-feet, which are used to determine daily releases from storage to meet the orders. See Appendix G – Water Delivery Process Flow Chart and Appendix F - Sample Water Order and Sample Water Delivery Schedule

In the past when excess water is released from Lahontan Reservoir, in an effort to alleviate flooding of lands along the Carson River, the spreading of water was allowed to both water righted and non-water righted lands. Those deliveries were not subject to the water right limitations or penalties for delivery to non water right lands and were not charged against the water right allocation of water-righted land for that year. However, that is not the case anymore. During the flooding of 2006 when releases were made from the lake to prevent flooding there was a precautionary draw down of Lahontan Reservoir. Spreading was not allowed so the water was first stored in the regulating reservoirs and then sent to both the Stillwater refuge and the Carson Lake Pasture maintaining a constant but manageable water flow through urban areas.

For purposes of regulation and administration, the District has divided the Project into two subdivisions, each served by one or more major distribution systems. The Carson subdivision is further divided into three districts. One ditchrider manages each district. The ditchriders schedule is 12 hours on and 12 hours off, on a 28 day schedule of nights and days with 7 days in a row off each month. Their supervisor is the O&M Foreman. In addition, there is one individual under the supervision of the O&M Foreman who monitors about 120 existing measuring sites and measures water upon request of either the water department or the water user. This individual makes current meter measurements during the year, either to check calibrations of existing sites or at the request of water users.

Monitoring sites are established at the upper end of most districts or at the boundaries of adjoining districts, to provide information on how the entire system is functioning and which district needs attention or improvements. The BOR has in the past established many sites for monitoring but some of those locations were subsequently discontinued by the BOR because of lack of resources to monitor the sites. The existing sites for gauging within the Project are noted in Appendix A.

The District has been cooperating with BOR to improve its water measurement capability in order to comply with the requirements of OCAP. Significant improvements in the water measuring facilities and the actual taking of water measurements have already occurred. The O&M contract entered into between the BOR and the District in 1996 requires that a comprehensive water measurement program be undertaken by the District

The District has established a Water Conservation Fund beginning with the fiscal year 1997-98 which equals 10% of the District's annual assessments for O&M, as they are collected. These funds are used for implementation of this Conservation Plan. The District and the BOR have cooperated with the California Polytechnic State University's Irrigation Training and Research Center (Cal Poly) to prepare a report on an alternative water measurement program as provided for in Article 11 (b)(2) of the O&M contract to become part of the Conservation Plan. Appendix E includes the conceptual water measurement and management plan for the Project.

Because the Newlands Project was designed and constructed without measuring devices, the District has been required to use a variety of measuring devices to accommodate specific field conditions. The District has compiled a list of over 126 water measurement sites in the Project. Of these 126 measuring sites, four are meters, 107 are weirs or flumes, 1 is a Bernoulli, and 4 are rated sections. The rated sections are calibrated by current meter measurements at least once a year. Sites with recorders are visited every two weeks. All of these measuring devices measure water to the water users accurately enough to be within plus or minus 10 percent of the total volume delivered. Devices such as ramp flumes, Parshall flumes, metered gates, trapezoidal flumes, acoustical meters, etc. have been used. For the most part, all devices and measurement techniques used by the District are contained in the BOR Water Measurement Manual as approved methods for water measurement. The Cal Poly report indicates that the degree of accuracy of the existing measurement program is unknown because of the wide range of factors that are present on the Project. The report recommends that the accuracy of all measuring devices be verified to determine if modifications need to be made. The District is committed to following the Cal Poly report in order to determine the accuracy of existing measuring devices and to repair, modify or replace those that are not providing accurate information. The repair, modification or replacement of these devices will be prioritized as described in the Cal Poly report.

There are currently about 1,699 turnouts in the District and there are about 13,000 deliveries made each year. Roughly 70 percent of those deliveries were measured using some form of measurement. These forms of measurement include meters, weirs, (BOR calibrated, see 3.1 Operator measurement manual) submerged orifice flow measurements using gate openings with upstream and downstream head measurements, and current meter measurements. In 2009 a total of 183,560.11 acre-feet was delivered to a total of 1,699 turnouts. The Cal Poly report in the fall of 2009 stated that 94 flow measurement devices are used to quantify flows at 613 turnouts. That equated to having measuring devices that measure 68.4 percent of the volume of water delivered.

Number of Devices	Year of Installation
9	2000
32	2001

12	2002
11	2003
10	2004
1	2005
3	2006
17	2007
6	2008
10	2009
2	2010

H. Water Shortage Allocation Policies

1. Historically, the District has notified the water-right owners of the anticipated water supply for the coming irrigation season based upon projected water supplies. The projections are based in part upon the annual Natural Resources Conservation Service's April-June water supply forecasts. The water allocation for delivery to the farm headgate is then based upon this predicted percentage and the amount of water storage in Lahontan Reservoir. Later in the season, this projection may be revised as the actual water supply and usage is reassessed. Since the water supplies differ between the Truckee Division and the Carson Division, the respective reduction percentages may differ depending on the conditions.

2. In order to minimize water shortages, the District has a policy that addresses wasteful use of water. The policy provides that any user that is wasting water will be warned by letter for the first offense. For any offense following such notice, the water will be shut off and service will only be resumed when the water user appears before the Project Manager or the O&M Foreman and satisfactorily explains the reasons therefore.
   See Appendix C, Management Policies, Section G

Section 2: Inventory of Water Resources

A. Surface Water Supply

1. Acre-foot amounts of surface water delivered to the district by each of the district sources
   See Water Inventory Tables, Section 4, Table 1.

2. Amount of water delivered to the district by each of the district sources for the last 10 years
   See Water Inventory Tables, Section 4, Table 8

B. Ground Water Supply

1. Acre-foot amounts of ground water pumped and delivered by the district
   The District does not pump any ground water for irrigation purposes. The State Engineer does not authorize the pumping of ground water with surface water-rights. The aquifer is recharged with the application of surface irrigation water but the District has no control of ground water. Municipal, industrial use of the ground water by cities, counties and individuals for potable water are outside the District's responsibility.

C. Other Water Supplies

1. Other water supplies for the District include effluent that is discharged by the Fallon Waste Water Treatment Plant. When the Churchill County Waste Water Treatment Plant comes on line the District will also be able to use that water on the Project.
   See Water Inventory Tables, Section 4, Table 1

D. Source Water Quality Monitoring Practices

1. The irrigation water of the Project is of good quality. The water has a medium salinity hazard and practically no sodium hazard. A moderate amount of leaching with this water should prevent any salt buildup in irrigated soils.

2. Agricultural water quality concerns: Yes _____ No ____X____

3. TCID tests the surface water for TDS at 16 sites quarterly.

4. Current water quality monitoring programs for surface water by source (Agric only)

Analyses Performed	Frequency Range	Concentration Range	Average
TDS	Quarterly	140 PPM – 540 PPM	215 PPM

5. No usable groundwater for agriculture

6. Current year total dissolve solid range for surface water surface water: 140 – 380 ppm

E. Water Uses Within the District

1. Agricultural
   See Water Inventory Tables, Section 4, Table 5 - Crop Water Needs

2. Types of irrigation systems used for each crop in current year

Crop name	Total Acres	Flood - acres	Furrow - acres	Sprinkler - acres	Low Volume - acres	Multiple methods -ac
alfalfa	31,410	31,410	0	0	0	0
forage / pasture	9,100	9,100	0	0	0	0
cereal	8,245	8,245	0	0	0	0
vegetables	510		310	0	0	200

3. No active recharge has been undertaken. Passive recharge from the irrigation district conveyance system and application of irrigation water to agricultural area results in recharge of ground water aquifers. Approximately 4,000 individual domestic wells rely upon the shallow groundwater recharge created by the Project's surface flows.

4. Transfers and exchanges into or out of the service area in current year (Table 6)

From Whom	To Whom	(AF)	Use
NONE			

5. Trades, wheeling, wet/dry year exchanges or other transactions in current year (Table 6)

From Whom	To Whom	(AF)	Use
NONE			

6. Other uses of water in current year

Other Uses	AF
USFWS acquired project water rights for wetlands	30,500
Fallon Paiute-Shoshone Tribe wetlands	1,800
NDOW Carson Lake Pasture wetlands	6,901

F. Outflow from the District (Agricultural only)

The Composite Drainage and Distribution Map, located at the District office and available as a digital file, shows the location of surface and subsurface outflow points, outflow measurement points, and outflow water-quality testing locations

There are approximately 345 miles of drains within the project, nearly all of which are deep, open drains. Drainage was not part of the original Project design but after drainage problems started to develop soon after the Project was placed into service, drain construction contracts were negotiated by the water users and USRS in 1921 and 1925.

The drains in the Truckee Division terminate in the Fernley Wildlife Management Area and two other wetlands, the Massie and Mahala Sloughs. The drains in the Carson Division north of the

river return to the river and the drains south of the river terminate in Carson Lake or Stillwater Wildlife Management Area.

On-farm and District drainage facilities provide limited control of the high ground water and salinity in the crop root zone. Salts in the soil during the normal course of irrigation are concentrated as crops consumptively use water.

Existing drains on the Project carry surface runoff and subsurface returns. Drain water leaving the project is beneficially used in downstream wetland areas. Historically, the District has recovered drain water and re-used that which is feasible and beneficial within the Project. Drain water reuse improves project efficiency. Drain water that is put back into the delivery system is used as water for delivery to irrigators.

Although the wetlands use drain water leaving the Project, this does not preclude the District from diverting drain water back into the Project distribution system before it leaves the Project for delivery to farms. A number of drain water reuse sites exist in the Project and are used in dry years. Those with pumps include Harmon Deep Drain to S-Line. Those that flow by gravity include Curry Drain to G-Line, Carson Lake Drain to A-Line, and New River Drain to L-Line and all drains to the Carson River that are recovered at Coleman or Sagouspe Dams. The USFWS and Nevada Department of Wildlife in the 1987 agreement agreed as follows: "The Department and the USFWS acknowledge that the issuance of the water right certificates are not intended to prevent the District from making necessary changes in their water distribution system and drainage systems for utilization of water on the Project."

1. Surface and subsurface drain / return flows in current year

Drain Location	(AF)	Types of Uses	Measurement
Hazen Drain	< 1 af	Wetlands, Massie Slough	Not Measured
Holmes Drain	< 1 af	Wetlands, Carson Lake	Not Measured
Norcutt Drain	< 1 af	Wetlands, Carson Lake	Not Measured
Carson Lake Drain	< 1 af	Wetlands, Carson Lake	Not Measured
Covertson Drain	< 1 af	Wetlands, Carson Lake	Not Measured
Downs Drain	< 1 af	Wetlands, Carson Lake	Not Measured
Yarbough Drain	< 1 af	Wetlands, Carson Lake	Not Measured
L Deep Drain	< 1 af	Wetlands, Carson Lake	Not Measured
Pierson Drain	< 1 af	Wetlands, Carson Lake	Not Measured
J1 Drain	< 1 af	Wetlands, Carson Lake	Not Measured
Mussi Drain	< 1 af	Carson River	Not Measured
Shaffner Drain	< 1 af	Indian Lakes	Not Measured
Kent Lake Deep Drain	< 1 af	Wetlands, Stillwater	Not Measured
Stillwater Slough	< 1 af	Wetlands, Stillwater	Not Measured
Harmon Drain	< 1 af	Stillwater Slough	Not Measured
Lower Diagonal Deep Drain	< 1 af	Stillwater Point Reservoir	Not Measured
Lower Diagonal 1 Drain	< 1 af	Stillwater Point Reservoir	Not Measured
New River Drain	< 1 af	Harmon Reservoir	Not Measured
TJ Drain	< 1 af	Stillwater NWR	Not Measured
Total	<20 af		

2. TCID tests the drainage water for TDS at 17 sites quarterly.

3. Drainage Water (surface and subsurface) Quality Testing Program

Analyses Performed	Frequency Range	Concentration Range	Average
TDS	quarterly	300 – 1,800 PPM	723 PPM

4. There are no usage limitations resulting from drainage water quality.

G. Water Accounting (Inventory)

1. Water Supplies Quantified

a. Surface water supply
The sole source of water for the Newlands Project is surface water from the Carson and Truckee Rivers. The timing and speed of the snow pack runoff into the Carson River and eventually into Lake Lahontan is key to determining the actual benefit to the crops during the irrigation season. Groundwater is seldom used because of poor quality and cost of pumping. More importantly, the Nevada State Engineer has declared the basin as closed for underground pumping. The water year 2009 was used for this table as the 2010 year is not complete. Since surface water is the total water source for the District, the standard examples for Table 1 and Table 3 have been combined into just Table 1.
See Water Inventory Tables, Section 4, Table 1

TABLE 1

2009	Carson River Water (af)	Truckee River Water (af)	Fallon Waste Water Treatment Water (af)	Total (af)
Method	M2	M2	M1	
January	8,000	12,200	79.44	20,279.44
February	8,600	15,000	79.44	23,679.44
March	16,900	19,800	79.44	36,779.44
April	16,300	19,000	79.44	35,379.44
May	66,600	19,200	79.44	85,879.44
June	25,700	18,600	79.44	44,379.44
July	800	9,000	79.44	9,879.44
August	0	7,100	79.44	7,179.44
September	0	9,500	79.44	9,579.44
October	3,000	8,100	79.44	11,179.44
November	4,200	3,800	79.44	8,079.44
December	6,600	8,600	79.44	15,279.44
TOTAL (af)	156,700	149,900	953.28	307,553.28

Method Definitions:
M1 Measured summation from calibrated measuring devices, accurate to within 1%±
M2 Measured summation from calibrated measuring devices

b. Ground water extracted by the district, by month

Not applicable for this project.

c. Effective precipitation by crop
Precipitation in the Fallon Fernley area is an average of 5 inches per year and that is usually during the winter months. Winter and spring crops benefit from the winter precipitation and soil moisture is replenished and may carry over in the soil.
See Water Inventory Tables, Section 4, Table 5

d. Estimated annual ground water extracted by non-district parties
NONE

e. Recycled urban wastewater, by month
As of October 2010 the District is not delivering water designated as M&I. There are plans to deliver M&I water to the Fernley Water Treatment plant as soon as the facilities at the TC-1 are upgraded to the required standards. Therefore there is no M&I water being recycled.

f. Other supplies, by month
The water that is received from the Wastewater Treatment Plants for the City of Fallon is treated effluent. This water enters the project and is available for the benefit of the project during the irrigation season. During the off season the water is sent to benefit the State Wildlife Management Area and Carson Lake.
See Water Inventory Tables, Section 4, Table 1

2. Water Used Quantified

a. Agricultural conveyance losses, including seepage, evaporation, and operational spills in canal systems.
See Water Inventory Tables, Section 4, Table 4

TABLE 4 Estimates or Approximations

Canal, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	Precipitation af/yr	Evaporation af/yr	Spillage af/yr	Seepage af/yr.	Total af/yr
Lahontan Reservoir			46,173,600	0.42	20,445.00	0.00	6,000.00	26,444.58
Harmon Reservoir			24,045,000	0.42	10,579.80	0.00	500.00	11,079.38
S-Line Reservoir			5,548,000	0.42	2,441.12	0.00	25.00	2,465.70
Truckee Canal	168,960	65	10,982,400	0.42	856.63	1,243.37	20,000.00	22,099.58
V Line	58,080	65	3,775,200	0.42	294.47	0.00	2,500.00	2,794.05
T Line	108,411	15	1,626,165	0.42	126.84	0.00	1,750.00	1,876.42
A Line	76,470	35	2,676,450	0.42	208.76	0.00	2,000.00	2,208.34
L Line	61,552	45	2,769,840	0.42	216.05	0.00	2,000.00	2,215.63
S Line	98,530	40	3,941,200	0.42	307.41	0.00	2,200.00	2,506.99
G Line	32,182	25	804,550	0.42	62.75	0.00	1,200.00	1,262.33
D Line	17,614	15	264,210	0.42	20.61	0.00	0.00	20.19
E Line	27,092	30	812,760	0.42	63.40	0.00	1,200.00	1,262.98
N Line	34,968	20	699,360	0.42	54.55	0.00	1,200.00	1,254.13
R Line	31,838	20	636,760	0.42	49.67	0.00	1,200.00	1,249.25

Total	104,755,495.00	5.88	35,727.05	1,243.37	41,775.00	78,739.54

There were no spills on the Reservoirs in 2010 except for Harmon Reservoir and any spills are charged as deliveries to the USFWS at Stillwater refuge. As well as any spills from the S Line.
Spills on the T Line and the N Line go into to the Carson River and are reused on the Project through Colman and Sagouspe Dams.
The L Line spills into Harmon Reservoir.
The V Line spills into the S Line.
The A Line, E Line and the G Line spills are counted as deliveries to NDOW as Carson Lake Pasture.
The R Line spills are counted as deliveries to the Tribal wetlands.
The D Line spills are counted as deliveries to the USFWS or 31 Corp and since the D Line is concrete lined, there is no seepage.

b. Consumptive use by riparian vegetation or environmental use.
None

c. Applied irrigation water
Irrigation water is applied based on an assigned duty or allocation. The allocation is calculated by the duty times the water righted acres or the land in production. The Crop ET data is from the Nevada Irrigation Guide by NRCS outlining the amount of consumptive use/evapotranspiration rates within the Fallon area of the Newlands Project. Most land in production is rated at an average of 4 ET per acre with the primary crop being alfalfa. However, because of the timing of the cutting and baling of the hay there is a cultural practice that lowers the alfalfa crops to about an ET of 3.5. (Alpine Decree has determined the consumptive use for alfalfa to 2.99 AF/acre with a duty of 3.5 and 4.5 AF/acre for bottom and benchlands, respectively. However, this number is not for maximum yield.) The pasture was also lowered by a cultural practice of a reduced allocation on some pasture to a 1.5 duty. The small amount of acreage that is vegetables requires more water so a duty of 4 was assigned. The same applies for corn and new seed alfalfa.

Throughout the project, water users have improved on-farm efficiencies. For instance, for more efficient flood irrigation, farmers have leveled their fields with the use of a laser-guided system to achieve an optimum flow design. By means of a laser beam, the system adjusts earth-moving machinery in the field to remove high spots and fill low spots. Many farmers, in cooperation with NRCS and the District, have also concrete-lined and installed watertight gates in their on-farm delivery canals. As a result, larger fields of a uniformly optimum grade (slope) can be irrigated with less water per irrigation.

TABLE 5

Crop Name	Area (crop acres)	Crop ET (AF/Ac)	Leaching Requirements (AF/ac)	Cultural Practices (AF/ac)	Effective Precipitation (AF/ac)	Shallow Groundwater (AF/ac)	Applied Crop Water Use (acre feet)
alfalfa	27510	4	0	-0.5	0	0	96285
pasture	8100	4	0	-2.5	0	0	12150
corn/sudan	3245	3.6	0	0	0	0	11682

small grains	4200	4	0	0	0	0	16800
vegetables	310	3.5	0	0	0	0	1085
new seed alfalfa	3900	4	0	0	0	0	15600
Other (<5%)	2000	3.5	0	0	0	0	7000
Crop Acres	49265						160602

d. Urban water use
None

e. Ground water recharge
No active recharge has been undertaken. Passive recharge from the irrigation district conveyance system and application of irrigation water to agricultural area results in recharge of ground water aquifers. Approximately 4,000 individual domestic wells rely upon the shallow groundwater recharge created by the Project's surface flows.
See Water Inventory Tables, Section 4, Table 6

f. Water exchanges and transfers
The District owns water that is stored in Donner Lake. The water is currently in litigation. In the past the Donner Lake water has been used for recoupment. This water is not considered project water and can only be transported with a Warren Act granted by the Bureau for the use of the Truckee Canal.
See Water Inventory Tables, Section 4, Table 6

g. Estimated deep percolation within the service area
Calculated using Table 6

h. Flows to perched water table or saline sink
NONE

i. Irrigation spill or drain water leaving the District
Existing drains on the Project carry surface runoff and subsurface returns. Drain water leaving the Project flows into downstream wetland areas, either Carson Lake or Stillwater National Wildlife Refuge. In furtherance of P.L. 101-618, the U.S. Fish and Wildlife Service intends to acquire a significant amount of Project water. This will likely result in reduced drain flows as these acquired lands will no longer be irrigated and therefore will no longer contribute irrigation return flows to the drains. There is no policy for tail water recovery on individual farms. There is no water quality-monitoring program for surface or subsurface drainage water. There are no NPDES permits that have been issued by or for the Newlands Project.

All spill and drain water that can not be reused within the project flows to the wetlands operated by the USFWS and NDOW. Although the wetlands are entitled to use drain water leaving the Project, this does not preclude the District from diverting drain water back into the Project distribution system before it leaves the Project for delivery to farms.
See Water Inventory Tables, Section 4, Table 6

j. Non-Project Water-Righted Lands

Downstream from Lahontan Dam, the Carson River reaches the Sagouspe Dam and Wolf Dam. There are six parcels of non-Project lands downstream from Wolf Dam totaling 565 water-righted acres. Some of these decreed water rights bear priorities pre-dating the Project and are detailed in the Alpine Decree.

The first parcel, the Mussi Ranch consisting of approximately 400 acres, lies immediately downstream from Wolf Dam. The Alpine Decree states that 200 acres are water-righted and the point of the delivery is upstream of the Wolf Dam. The other five parcels are located downstream of the Wolf Dam and total 1,200 acres of which 365 are water-righted. The diversion right is approximately 647.55 acre-feet at Wolf Dam (per Alpine Decree).

The District delivers water to these lands with decreed rights. But the OCAP limits the credit for these deliveries to 1,300 acre-feet annually (See 1997 OCAP section 418.25). Per the Bureau of Reclamation's 1994 Newlands Project Efficiency Report (Efficiency Report), the District has had to divert two to four times this amount at Sagouspe Dam to provide these lands with their water allocations. For instance in 1989, the District absorbed 3,848 acre-feet in losses as 5,148 acre feet were diverted to fill the Wolf and Mussi Ranches' entitlement. The District believes and here asserts that an adjustment in the method of calculating the annual OCAP efficiency under §418.25, is needed to prevent penalizing the District water users.

3. Overall Water Inventory
The only sources of water for the Newlands Project are the flows of the Carson and Truckee Rivers. The quantity of water that the District is allowed to divert from the Truckee River is determined by the OCAP. Therefore, water accounting for the Newlands Project is accomplished by the BOR through the applicable OCAP. Data concerning the diversion to, use within, efficiencies of the delivery system, and return from the Project are reported to the Bureau of Reclamation each year as required by the applicable OCAP. There are no Project water right transfers or exchanges outside the boundaries of the Project.

a. **Table 6**

2009 District Water Budget

Water Supply	Table 1		307,653.28
Riparian ET	Distribution and Drain	minus	0.00
Groundwater recharge	Intentional-ponds, injection	minus	0.00
Seepage	Table 4	minus	41,775.00
Evaporation – Precipitation	Table 4	minus	35,727.05
Spillage	Table 4	minus	1,243.37
Transfers/exchanges/trades/wheeling	(into or out of the District)	plus/minus	0.00
Non-Agri deliveries	(delivered to non-ag customers)	minus	0.00
Water Available to Water Users			228,907.86
2009 Actual Agricultural Water Delivered		From District Records	184,739.00

Private Groundwater		plus	0.00
Crop Water Needs	Table 5	minus	160,602.00
Drain water outflow	(tail and tile not recycled)	minus	4,500.00
Percolation from Agricultural Land	(calculated)		19,637.00

H. Assess Quantifiable Objectives:

None

Section 3: Best Management Practices (BMPs)

A. Critical Agricultural BMPs

1. Measure the volume of water delivered by the district to each turnout with devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to ±10 percent

Number of turnouts that are unmeasured or do not meet the standards listed above: 1,048

Number of measurement devices installed 2009-2010: 5

Number of new turnouts measured 2009-2010: 25

Number of measurement devices to be installed 2010-2011: 5

Number of new turnouts to be measured this year: 30

Number of measurement devices to be installed 2011-2012: 5

Types of Measurement Devices Being Installed	Accuracy	Total to be Installed During Current Year
Ramp flumes	±3percent	5

The ultimate goal of the conservation efforts of the District is to have all delivered water measured using the latest technology available. This goal is long range and includes upgrading old measurement devices and installing new ones.

Under the Operations and Maintenance Contract between the BOR and the District (signed November 25, 1996), the District has agreed to continue to implement a water measurement program. A needs assessment and analysis has been prepared by California Polytechnic State University, San Luis Obispo (Cal Poly) on water measurement in the Project. The District has used the Final Report as an alternative water measurement program as provided in Article 11 (b)(2) of the O&M Contract. Implementation of the full program as described in Section 6 of the Cal Poly Report will be completed by the end of 2010. The District assisted with Cal-Poly in 2009 to review the status of the 1997 Water Measurement Study Report. An update to that report is contained in Appendix E

The District has installed devices to measure existing turnouts that utilize 75% of the volume delivered by the Project. The District has compared the accuracy of the newly installed devices to the readings obtained by previous methods and determined there is increased accuracy.

The District will implement the recommendations in Section 8 of the Cal-Poly Water Measurement Program 2009 Review.

Program Step	**Anticipated Action and Timeline**
8-1 Take responsibility for all flow measurement devices	Standardize and improve measuring devices on the Truckee Canal. Review and prioritize the laterals off the Truckee Canal that will benefit the most water users with improved design of

	measurement devices.
8-2 Standardize current metering procedures	Verification of flow rates and seepage off laterals off the Truckee Canal.
8-3 Improve the transparency of the accounting process for water delivery with meters	The computations and procedures to calculate water charged to meters will standardized and written down to include the following: • General procedures for computing volumes to delivery gates to include seepage, pass-by flow, start time, end time, and adjustments. • Written specific procedures and values that apply to each individual delivery gate for the season. Could be a spreadsheet that would state which general procedure was used, details of each procedure, and the constant values that are used for each delivery gate. • Worksheet that explains the values that have special calculations on a specific date for each turnout. • Linked worksheets or database that provides input for the calculation of each component. • Description of how the volume is transferred to a charged value for billing. • A written flow chart that shows the procedures, locations of files, and file names.
8-5 Limit the number of takeouts serviced by one measuring device	The District will adopt the rule suggested by the ITRC: *The hydraulic travel distance between the meter and a takeout cannot exceed 1.25 miles. Any exception to this rule must be documented and justified in writing and be approved by a joint USBR/TCID technical committee.*
8-6 Setting conditions that will not allow a metered delivery to count as a metered delivery.	The ITRC has determined two conditions that would disallow a metered delivery to count as a metered delivery they are: • a submerged weir/flume or one that is temporarily inaccurate for any reason. • Simultaneous multiple deliveries from the canal/lateral which would require an estimate of a percentage of the flow that is being delivered to a gate.
8-7 Provide a table at the end of the irrigation season that summarizes the metering for each metered delivery.	A Database will be developed that would compile the details of each measurement and a report will be able to summarize measured deliveries by takeout, measuring device, or

	serial number for a month or the irrigation season.
8-8 Check and verify the zero elevations at the meters identified during the 2009 review that had errors greater than 2%± plus sites that were not visited	The District will institute a process to verify each meter's accuracy with a written policy and documentation on file.
8-9 Flow measurement weirs and flumes to have dataloggers and water level sensors as specified in the 1997 report.	The District will insure that any new dataloggers will be 16-bit resolution.
8-10 Future measurement devices to have an accuracy level of 8%±.	The District will follow the recommendations of the IRTC and install measurement devices that have at least 5%± for determining water charges. Volume estimates at individual takeouts will be 10%± with an average of 7%± for all takeouts used to calculate water charges.

Water use on the Newlands Project continues to change. There are several water purchase programs currently in existence. The USFWS and NDOW are purchasing water and transferring that water to the Stillwater Refuge and Carson Lake Pasture. Washoe County, Reno, Sparks and the Pyramid Lake Indian Tribe are buying water rights for water quality purposes. These water right purchases changed the manner and place of use of delivered water. The Carson Water Subconservancy District bought water rights pursuant to AB380, which was passed by the Nevada Legislature in May 1999. Water rights purchased under the AB380 program were retired. The AB380 program ended June 30, 2006. There is a program called the Water-Right Compensation Program that was originally funded to buy water-rights which may include unpurchased portions of the 6500 acres agreed to in the AB380 program. Both of these programs were instituted to compensate water-right owners that owned water-rights on land that could not be irrigated for any reason. The WRCP has been funded to buy active water-rights to benefit Pyramid Lake. Also, water rights were purchased by developers and transferred to other lands within the District.

The funding for the water measurement program comes from the District's Conservation Fund. Also, the District was required to put 10% of the AB380 O&M funds into a fund that could only be used after the Conservation fund was exhausted. It was thought that each device could be installed for $500 to $700 but the actual cost for 2009 averaged $2,000.

It is known that the terrain in the District is not conducive for measuring devices because the head drop in the canals is often not sufficient. For this reason ramp flumes cannot be installed at all locations. Doppler meters have not provided the desired accuracy and reliability to meet the District's needs. Automation and canal water level stabilizing structures and devices are being installed.

The District will measure flow accurately by regular ditchrider training. Maintenance of the devices will be continued to assure that the devices are properly maintained to assure accurate readings.

The District will install computerized systems that will electronically send data and control water elevations from the main office, as funds are collected. The District will study sites for the

installation of: (1) power gates on the main distribution canals of the Project; (2) automation; (3) measurement devices; (4) telemetry; and (5) remote control.

The District inventories all existing structures and assesses their condition. Those in need of repair are prioritized for necessary repairs and maintenance.

Ditchrider Training: The District, in cooperation with BOR, is in the process of developing Standing Operating Procedures (SOP's). These procedures will have maps of the delivery system for the Urbanized Canals that require clear procedures to operate the structures to prevent wasteful practices and manage the water efficiently. Ditchrider training will include safety training and training in water measurement. The District is constantly improving the procedures and processes involved in serving their customers. Improvement to the tools and training of our ditchriders and Water Conservation personnel will benefit conservation practices.

The District sent six Water Department employees to attend training at Cal Poly's Irrigation Training and Research Center in 2002. Since 2002 Cal Poly has provided onsite training for Ditchriders. The classes provide employees with water management and measurement training.

The District will maintain the data derived from the water measurement program in a computer format for future use.

The District recognizes, as stated in the Cal Poly Report, that access to existing and future measurement sites could be a significant issue and will initiate activities related to acquiring appropriate access. Access may be required to install a measurement device. The District has the required easements for facilities; however encroachments (fences, etc) sometimes limit District access. Improved access will include such things as agreements with water users for the installation of measurement devices on private property.

As required by the Bureau of Reclamation, the District will commit the entire Water Conservation Fund for the next five years covered by this plan to the water conservation program, and we will seek grant funding for other projects and improvements. The O&M contract provides "the total net profits derived from Subsection I Revenues paid to the District pursuant to Article 7, or (ii) 10% of the total revenues received by the District from Operation and Maintenance charges to water users, whichever is greater." This requirement extends beyond the five-year period covered by this plan. Other voluntary funds have been contributed to the Water Conservation Fund and will continue for additional work. The District and the Bureau of Reclamation recognize while dedicating the entire Fund to the measurement program, implementation of the remaining portions of the Water Conservation Plan could only occur if voluntary funds are available from the Bureau of Reclamation until the 75% is met. The District's effort with the water measurement program is anticipated to allow improved measurement of water deliveries.

In the process of moving towards the goal (measurement of 75% of deliveries), the District has installed measuring devices for the largest users of water first in order to maximize the water conservation benefits. As the efforts of the water measurement program proceed to smaller users within the Project, installation of more measuring devices will be required to achieve the same increase in volume of water measured. The following is the 1997 water measurement program that was implemented.

Program Step	Anticipated Action and Timeline
6.1 Categorize the Turnouts	The District has completed the identification and evaluation of existing turnouts that utilized75% of the volume with the Project. As of the fall of 2009 there were 94 flow measurement devices utilized to quantify flows at 510 turnouts. The broadcrested weir designs as reviewed by Cal Poly are of excellent design and construction overall.
6.2 Software and Procedures for Recording Volumes	Since 2008 the District has started to systematically organize information for each field turnout in spreadsheets. This information provides documentation on how each individual delivery event's volume is calculated before it is "charged" to an account. The District is currently working to develop appropriate software, purchase hardware and develop procedures to blend the acquired data with the District's existing water records and software.
6.3 Prioritize Turnouts for Inclusion in the Program	The District will have completed 126 measurement devices by the Spring of 2011 and will continue to install measuring devices to develop a better accounting the water that is spilled and water that is flowing in the main canals and laterals at all times.
6.4 Develop Timelines and Verification Procedures	The steps 6.1 through 6.2 defined the problem, identified equipment and associated costs, and established priorities. With those steps essentially complete, procedures for will need to be developed to provide verification and transparence so that results can be measured and duplicated.
6.5 Design New Structures	The District is investigating new designs and technology for future flume designs. Key personnel have been identified to work on installation, calibration, data collection towards this effort.
6.6 Install New Structures	The installation of measuring devices for turnouts has met the objectives of the 1997 Program but the District will continue to meet the objective to account for all water used on the project.
6.7 Train Operators	Key personnel are trained as software and hardware are acquired and put into service. Office personnel are trained to accurately record the data as collected into existing systems.
6.8 Compare Results	Results will be compared on the newly installed devices to the readings obtained by previous measurements. Comparisons will be on a case by case basis or by turnout.
6.9 Re-Assess the Program	This program was annually re-assessed by Cal Poly with the last review being conducted in the fall of 2009. There recommendations will be addressed in next Section, Section 3 of the Water Conservation Plan.

2. Designate a water conservation coordinator to develop and implement the Plan and develop progress reports

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3. Provide or support the availability of water management services to water users

a. On-Farm Evaluations

(1) On farm irrigation and drainage system evaluations using a mobile lab type assessment
The District supports the NRCS funding request for a mobile laboratory for education of water users and staff regarding irrigation and drainage. If the mobile laboratory were available, the District would participate in training sessions with NRCS.

(2) Timely field and crop-specific water delivery information to the water user
The District provides water users with monthly water use data. Water cards are mailed monthly to each water user that shows water usage but has nothing to do with billing. See Appendix D – Sample Water Card.

b. Real-time and normal irrigation scheduling and crop ET information
Daily ET rates from a local agrimet weather station are available on the internet. A link is available from the District's web site, www.tcid.org. The District is planning to make available the water delivery schedule on the web site to water users. This would allow water users to anticipate delivery times that are scheduled. The schedule would be updated real time as the deliveries are made. See Appendix F – Sample Delivery Schedule.

c. Surface, ground, and drainage water quantity and quality data provided to water users
The District provides no ground water to its users. The amount of surface water available to the District is closely controlled by the current OCAP. Water users are made aware of the quantity of surface water available when Project allocations are made at the beginning of the irrigation season. Monthly statements of water usage and available allocation are provided to the water users through the water cards. See Appendix D – Sample Water Card. During unusual water years, such as floods or drought, the water availability decisions are made by both the users and the Board of Directors. The water quality testing that is done quarterly is available in the office for the water users upon request. The only tests that are performed are for Total Dissolved Solids (TDS), PH, and Water Hardness.

The District, in cooperation with the BOR, is developing a Project-wide drainage policy and permit process for discharges into the Project drainage system of storm drain flows and treated effluent.

d. Agricultural water management educational programs and materials for farmers, staff, and the public

The District web site, www.tcid.org, is the main source to disseminate information to the public. The web site contains information about the District policies, water forecasting, and District forms.

Program	Co-Funders (If Any)	Yearly Targets
Newsletter	none	On Web Site
Ditchrider training	USBR	Once every 3 years
Water users meeting	None	annual
District web site	TCID.org	Keep current
Mobile Museum	Churchill County Museum	monthly

District personnel attend an on-site water measurement and canal operation training by Cal Poly under a grant from the BOR. This education has provided the District with some of the knowledge and skills that will help to better operate the irrigation system, plan for improvement to the delivery facilities, and better manage water deliveries.

The District has an Internet web site, www.tcid.org, for information and communication with the water users. The site has information about the District; its history and policies. There is information on the site about efficient use of water and better management of water resources on farms. In addition, information for the water user on the District water measurement program and water conservation plan is available. Customers can order water online and there are plans to allow the water users to check an on line schedule of water deliveries.

The District has improved water management through the use of cell phone system for better communication between users and staff. As demand for use of the system has increased, continuous improvements and updates are necessary to allow the communications to improve. Each Ditchrider has a laptop computer to receive schedules changes real time in the field. The laptop enables the Ditchrider to complete water orders without paper. That process is being refined and updated. See Appendix G – Water Delivery Flow Chart

The District facilitates, and encourages its users to participate in on-farm conservation programs. The District maintains information on conservation and water management programs for easy access by its users.

The District has a mobile Museum on the history and development of the Newlands Project. Also, the 1976 book, *Turn This Water into Gold*, is available at the District. Once final, the Water Conservation Plan will be posted on the web site, www.tcid.org.

4. Pricing structure - based at least in part on quantity delivered
The O&M contract requires that "in order to promote water conservation, the District shall implement a charging structure based at least in part on the quantities of water delivered to each user, unless an alternative charging structure is contained in a mutually acceptable Plan."

The District has implemented a charging structure as required by the contract, which is based in part on quantities of water delivered to the user. The structure is as follows:

The District has established a Project Efficiency Improvement charge that is paid on the use of the last two acre feet of a water right owner's water duty (except for 1.5 a.f duty and then only on the last acre foot). Those monies are to be credited to the Project Efficiency Improvement Fund.

The District has established an Efficiency Credit to encourage water conservation. An efficiency credit will be paid to water users on the amount of water they have left at the end of the water season. Provided the water year was at 100% allocation for the whole year. This credit will be deducted from O&M fees for that tax year. Farm Units, Subdivisions or property with no water usage for the year will not be eligible for the efficiency credit. (2/8/10)

5. Evaluate the need for changes in policies of the institutions to which the district is subject
The Cal Poly evaluation of the District's Water Measurement Plan recommended changes in policy and procedures of the BOR with regard to measuring devices on the Truckee Canal. The District should take responsibility for the construction, maintenance, and operation of all flow measuring devices within the Project that are used for the purpose of billing (charging) individual field turnouts. The Truckee Canal measuring devices, in particular, need major improvements.

Currently the District and the BOR use different current metering procedures; even if procedures are identical there will be differences in measured flow rates. The different procedures can cause unnecessary conflict. A standardized procedure should be implemented that will be agreeable to both parties.

Most conservation plans require accuracy of 6%± that is generally applied to flow rates measurement devices. TCID's measurement devices have volumetric measurement accuracy as determined by the ITRC recommendations based on actual field problems including errors in water depth sensors and totalizers, fluctuating flow rates, calibration curves, etc. According to the 2009 review of TCID's Water Delivery Measurement Program done by the ITRC (reference Appendix E).

The volumetric measurement program (see Section 5) would generally be considered to be more accurate than 10%± because the 10% applies to individual turnouts and therefore the average error is less.

The ITRC stated that the error would cancel out because of the process of computing a district-wide average. The actual deliveries will be better than 5%± accuracy. The accuracy has been accepted by the Bureau through Cal Poly recommendations.

Measuring Device	Type of Device	Completion Schedule
TC1	Waiting for Direction from BOR	Waiting for Direction from BOR
TC2	Waiting for Direction from BOR	Waiting for Direction from BOR
TC3	Waiting for Direction from BOR	Waiting for Direction from BOR
TC4	Waiting for Direction from BOR	Waiting for Direction from BOR
TC5	Waiting for Direction from BOR	Waiting for Direction from BOR
TC6	Waiting for Direction from BOR	Waiting for Direction from BOR
TC7	Waiting for Direction from BOR	Waiting for Direction from BOR
TC8	Waiting for Direction from BOR	Waiting for Direction from BOR

TC9	Waiting for Direction from BOR	Waiting for Direction from BOR
TC10	Waiting for Direction from BOR	Waiting for Direction from BOR
TC11	Waiting for Direction from BOR	Waiting for Direction from BOR
TC12	Waiting for Direction from BOR	Waiting for Direction from BOR
TC13	Waiting for Direction from BOR	Waiting for Direction from BOR

The above table states that the District is waiting for Direction from the BOR. The Bureau is in the process of preparing a memorandum of agreement that will turn over the responsibility for these measuring devices to the District. When that is completed the District will make the necessary improvements to these measuring devices. Depending upon the improvement needed the District plans to complete approximately three devices off the Truckee Canal per year.

6. Evaluate and improve efficiencies of district pumps
   The District has three pumps and will check with Sierra Pacific Power Company about efficiency testing them all within five years. A reoccurring schedule will be implemented to test the pumps at least once every five years.

B. Exemptible BMPs for Agricultural Contractors

1. Facilitate alternative land use

The Project has been around for over a hundred years and most of land that is unsuitable for agriculture has been put to another use. The classification of bench and bottom land determines the water usage for different types of land for the most economical use of the water.

Most alternative land use would be done through water transfers from one parcel to another. The District maintains a list of people that are interested in buying water rights or purchasing water rights. The District will facilitate getting sellers and buyers of water together and guiding them through the process of transferring water rights from one parcel to another. The District does not buy or sell water rights and encourages whenever possible that water rights and land remain in agriculture for the greater good.

Some land in the District has sand and/or gravel lenses that percolate excessive water. Owners have contracted with sand and gravel companies to remove these materials and then re-leveled the land.

If the District is contacted by a water user about alternate crops that can be grown they are referred to the Cooperative Extension Agency.

2. Facilitate use of available wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to crops or soils

Sources of Effluent Waste Water	AF/Y Available	AF/Y Currently Used in District
City of Fallon	942	942
Naval Air Station (water to Stillwater refuge)	8.84	8.84

3. Facilitate the financing of capital improvements for on-farm irrigation systems
   The District and Lahontan Valley Environmental Alliance newsletters contain notices about the availability of funds from NRCS for on-farm canal lining and other programs.

4. Incentive pricing
   The USBR O&M contract requires that "in order to promote water conservation, within two years of the effective date of this contract, the District shall implement a charging structure based at least in part on the quantities of water delivered to each user, unless an alternative charging structure is contained in a mutually acceptable Plan." District rates provide a refund for unused portion of the last two acre-feet of the water duty.

5. Line or pipe ditches and canals

   a. The District has planned for seepage control at eight locations within the Project. The District plans to use bentonite and plastic. These sites were selected because the high seepage affects neighboring landowners.

      In the past, the District has lined approximately 31 miles of main canals and laterals. The BOR also lined a one-mile section of the T Line. The District participated in a cost sharing of the T Line relocation and cement lining with a water user. The L-8 lateral was lined in a cooperative project with Churchill County. Also two sections of the A Line were concrete lined in cooperative projects with SCS, the water users, and the District. The District intends to line a section of the V Line and T Line canals as part of an automation project at those sites. The District will investigate the feasibility of lining additional portions of the Projects canal systems. Conveyance structures located on the western portion of the Project and the Soda Lakes area would be investigated initially. Conveyance structures located in the central and eastern portion of the Project would be considered at a later time.

      In general, large-scale lining projects of Newlands Project Canals are financially unfeasible because of the high cost in relation to the dollars saved. Within the Newlands Project, the water users own the water rights. The District does not sell the water to the users. In addition, the users cannot transfer and sell the water saved through a lining project. Because of these factors, the cost to benefit ratio is always high. There are some minor benefits related to maintenance of a lined canal but they are insignificant when compared with the cost of lining.

   b. Regulatory reservoirs
      The BOR guidelines for the preparation of water conservation plans suggest that small regulating reservoirs be added to allow delivery on demand without significant seepage and evaporation. The 1988 OCAP, though, suggests that the District could improve its conveyance efficiency by either eliminating Project regulating reservoirs or operating them at lower levels to eliminate seepage. The District Board of Directors has traditionally wanted the reservoirs to retain water for fishery purposes, rather than be drained completely.

      The project has six regulating reservoirs with area ranging from approximately 300 to 3,000 acres. The reservoirs are shallow and unlined.

Reservoir Name	**Description**	**Storage Capacity**
Sheckler	Since 1991, the District has kept this reservoir dry	27,600 af

	except during years of high flows when it is used to store precautionary and spill releases from Lahontan Reservoir to minimize any flooding potential within Lahontan Valley.	
Old River	Since 1991, the District has kept this reservoir dry except during years of high flows when it is used to store precautionary and spill releases from Lahontan Reservoir to minimize any flooding potential within Lahontan Valley.	Unknown
S Line	The District reduced losses in 1993 by placing a dike across the reservoir and using only the southern one-third.	450 af
Harmon	Project efficiencies are improved with Harmon Reservoir because return flows as well as excess flows are stored for later use to supplement flows in the S Line Canal.	2,973 af
Stillwater Point	Deliveries to USFWS are made from this reservoir. Most of the drainage from the Project is captured in this reservoir for reuse.	7,000 af
Sagouspe	Diversions to USFWS and Project water users as well as releases to water users downstream of Sagouspe who are not part of the Project are made from this reservoir. All Project drains returning to the Carson River between Coleman Dam and Sagouspe Dam are captured by this reservoir for reuse.	Unknown

As programs under Public Law 101-618 are implemented and the effects on the Project are evaluated, the feasibility of constructing new or lining existing regulating reservoirs will be evaluated by the District. The District will investigate the sealing or reduction of losses on off canal regulating reservoirs. Consideration will be given to the use of Lahontan Valley natural playa materials such as bentonite for bedding and sealing.

6. Increase flexibility in water ordering by, and delivery to, water users
   The District Rules and Regulations contain a 72 hour lead time for water orders. This enables Scheduling to plan releases and deliveries more efficiently. Water users have the flexibility to request water in advance of when they need the water to allow for the most efficient application of water to their crops.
   See Appendix F – District Water Order form

7. Construct and operate district spill and tailwater recovery systems
   District spills averages about 17,000 AF/year. This water flows by laterals to wetlands and is counted towards deliveries that are used by the wetlands environment, therefore this water is being recovered and used. Reducing these flows would have no benefit.

Distribution System Lateral	Quantity Recovered and reused (AF/Y)	Delivery of Prime Water	Delivered To:
A Line	4,909.6	Yes	Carson Lake wetlands

L Line (goes to Harmon)	1,500	Yes	Stillwater NWR
T Line	1,300	Yes	Carson River
R Line	1,565.6	Yes	Fallon Tribe wetlands
G Line	2,347.3	Yes	Carson Lake wetlands
D Line	3,500	Yes	Indian Lakes, Corp 31
N Line	1,500	Yes	Carson River
Truckee Canal Tributaries (13)	877	No	Fernley Wildlife MA
Total	17,499.5		

Water delivered from laterals are considered delivery of prime water to the wetlands except the Fernley wetlands. Corp 31 is a farm that takes delivery through the D Line and Indian Lakes.

Drainage System Lateral	Annual Drainage Outflow (AF/Y)	Used by:
All drains	4500	(wetlands)
Total	4500	

Significant drain water has been captured and re-used on the Project and contributes to the efficiency of the Project. Terminal flows or mismatched water flowing into drains has been drastically reduced. Water that flows into or from the drains is primarily irrigation runoff and ground water. Once project water is captured in a drain the project loses its ability to use the water. There are no plans to measure the drain outflows because most ramp flumes require a change to flows and most drains are of minimal flows.

While the District strives to minimize terminal flows or operational spills, they are not a total loss, in an overall sense, since this water benefits the wildlife, wetlands and pasture areas that lie downstream of the District water righted lands. Through better management, improved canal controls, and improved scheduling and delivery techniques there are not significant amounts of spills to recover. The District will continue to look for opportunities to reduce the amount of water that leaves the District boundaries.

8. Plan to measure outflow

Total number of outflow location/points __16__

Total number of measured outflow points __2__

Percentage of total outflow measured during 2010 ___7_____

Location	Type	Estimated Time Line for Installation
River at Tarzyn Rd	USGS Gauge	Complete
TJ Drain	Staff Gauge	2010
Dutch Bill Drain	Staff Gauge	2010
Bailey Drain	Staff Gauge	2010
Stillwater Point	Staff Gauge	Complete

Reservoir Drain		
Stillwater Slough Cutoff Drain	Staff Gauge	2010
Canvasback West Drain	Staff Gauge	2010
Natural Drain from D Line	Staff Gauge	2010
West Carson Lake Drain	Staff Gauge	2010
Holmes Deep Drain	Staff Gauge	2011
Carson Lake Deep Drain	Staff Gauge	2011
West Lee Diversion Drain	Staff Gauge	2011
L7 Drain	Staff Gauge	2011
East Lee Diversion Drain	Staff Gauge	2011
Pierson Waste Water Drain	Staff Gauge	2011
L Drain Diversion	Staff Gauge	2011

Outflows as defined by this plan refer to water collected by drains. Drain water can be irrigation runoff from fields, ground water and overflows from laterals. The District currently measures the water on the main laterals and does everything to prevent overflows into the drains. The drain water eventually flows into the wetlands and is not lost or wasted in that respect. Drain flows are monitored to insure that there are no obstructions that could cause flooding. There is a USGS gauge on the Carson River at Tarzyn that measures the out flow of water from the project. This device would measure water that has not been reused or delivered but ends up in the wetlands located at Indian Lakes or Stillwater. This large area could be called the Carson Sink. Placing measuring devices on the outflows from the drains would have minimal benefits and would not be cost-effective.

9. Optimize conjunctive use of surface and ground water
   The District does not use groundwater as the Nevada State Engineer has declared the basin closed to ground water pumping for irrigation.

10. Automate canal structures
    The alternative water measurement program as described in the Cal Poly report and adopted by the District has been and will continue to be used to improve the water accounting capabilities of the District. The essential elements of the recommended 1997 volumetric measurement program are listed below.

Program Step	**Anticipated Action and Timeline**
6.1 Categorize the Turnouts	The District has completed the identification and evaluation of existing turnouts that utilized75% of the volume with the Project. As of the fall of 2009 there were 94 flow measurement devices utilized to quantify flows at 510 turnouts. The broadcrested weir designs as

	reviewed by Cal Poly are of excellent design and construction overall.
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6.5 Design New Structures	The District is investigating new designs and technology for future flume designs. Key personnel have been identified to work on installation, calibration, data collection towards this effort.
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6.7 Train Operators	Key personnel are trained as software and hardware are acquired and put into service. Office personnel are trained to accurately record the data as collected into existing systems.
6.8 Compare Results	Results will be compared on the newly installed devices to the readings obtained by previous measurements. Comparisons will be on a case by case basis or by turnout.
6.9 Re-Assess the Program	This program was annually re-assessed by Cal Poly with the last review being conducted in the fall of 2009. There recommendations will be addressed in next Section, Section 3 of the Water Conservation Plan.

The District will continue to install and support canal automation devices and in-stream gauges as necessary in accordance with the recommendations of Cal-Poly and the ITRC for the proper installation of measurement devices and their accuracy to assist in the measurement and management of water and to aid ditchriders in canal and lateral flow determinations. The recommendations of Cal-Poly are contained in the TCID Water Delivery Measurement Program, in Appendix E.

11. Facilitate or promote water customer pump testing and evaluation
    There are very few irrigation pumps in the District service area. The District will explore the availability of pump efficiency testing and inform customers of any programs.

12. Mapping
    The District has collaborated with the Bureau of Reclamation in mapping the Project with GIS. The Bureau's GIS maps are shared with the District. There are over 400 maps of the District. These maps are on a DVD as Appendix A – District Maps

C. Provide a 3-Year Budget for Implementing BMPs

1. Amount actually spent during current year.

BMP #	BMP Name	Actual Expenditure (not including staff time)	Staff Hours
A1	Measurement	$14,653.90	436
2	Conservation staff	$59,061.56	1,744.5
	On-farm evaluations / water delivery info	$29,530.78	872.25
	Irrigation Scheduling	$14,653.90	436
	Water quality	$0	0
	Agricultural Education Program	$222.98	.25
4	Quantity pricing	$97,812.62	0
5	Policy changes	$0	0
6	Contractor's pumps	$0	0
B1	Alternative land use	$0	0
2	Urban recycled water use	$0	0
3	Financing of on-farm improvements	$0	0
4	Incentive pricing	$0	0
5	Line or pipe canals/install reservoirs	$7,382.70	370
6	Increase delivery flexibility	$0	0
7	District spill/tailwater recovery systems	$3,691.33	185
8	Measure outflow		
9	Optimize conjunctive use	$0	0
10	Automate canal structures	$3,691.35	185
11	Customer pump testing	$0	0
12	Mapping	$60,701.00	2,080
	Total	$291,402.12	6,309

2. Projected budget summary for the next year.

BMP #	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A1	Measurement	$24,770.16	520
2	Conservation staff	$49,540.32	1040
3	On-farm evaluations / water delivery info	$20,009.56	250
	Irrigation Scheduling	$4,760.61	270
	Water quality	$0	0
	Agricultural Education Program	$0	0
4	Quantity pricing	$83,047.24	0
5	Policy changes	$0	0
6	Contractor's pumps	$14,765.38	
B1	Alternative land use	$0	0
2	Urban recycled water use	$0	0
3	Financing of on-farm improvements	$0	0
4	Incentive pricing	$0	370
5	Line or pipe canals/install reservoirs	$7,382.70	0

6	Increase delivery flexibility	$0	0
7	District spill/tailwater recovery systems	$0	0
8	Measure outflow	$3,691.35	370
9	Optimize conjunctive use	$0	0
10	Automate canal structures	$3,691.35	370
11	Customer pump testing	$0	0
12	Mapping	$62,771.14	2,148
	Total	$274,429.81	5,338

3. Projected budget summary for 3rd year.

BMP #	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A1	Measurement	$27,150.48	787
2	Conservation staff	$54,300.96	1574.50
3	On-farm evaluations / water delivery info	$0	0
	Irrigation Scheduling	$27,150.46	787
	Water quality	$0	0
	Agricultural Education Program	$0	0
4	Quantity pricing	$56,289.00	0
5	Policy changes	$0	0
6	Contractor's pumps	$0	0
B1	Alternative land use	$0	0
2	Urban recycled water use	$0	0
3	Financing of on-farm improvements	$0	0
4	Incentive pricing	$0	0
5	Line or pipe canals/install reservoirs	$0	0
6	Increase delivery flexibility	$28,144.50	1057
7	District spill/tailwater recovery systems	$14,072.25	528.5
8	Measure outflow	$0	0
9	Optimize conjunctive use	$0	0
10	Automate canal structures	$14,072.25	528.5
11	Customer pump testing	$0	0
12	Mapping	$61,736.08	2,114
	Total	$282,915.98	7,376.5

Section 4: District Water Inventory Tables

Table 1: Total/Surface Water Supply 2009

	Carson River Water (af)	Truckee River Water (af)	Fallon Waste Water Treatment Water (af)	Total (af)
Method	M2	M2	M1	
January	8,000	12,200	79.44	20,279.44
February	8,600	15,000	79.44	23,679.44
March	16,900	19,800	79.44	36,779.44
April	16,300	19,000	79.44	35,379.44
May	66,600	19,200	79.44	85,879.44
June	25,700	18,600	79.44	44,379.44
July	800	9,000	79.44	9,879.44
August	0	7,100	79.44	7,179.44
September	0	9,500	79.44	9,579.44
October	3,000	8,100	79.44	11,179.44
November	4,200	3,800	79.44	8,079.44
December	6,600	8,600	79.44	15,279.44
TOTAL (af)	156,700	149,900	953.28	307,553.28

The source of this table is the Daily Water Masters Report taken from the TROA website. Averages for the last 100 years are reported in Table 3.23 of the TROA-EIS.

Table 2: Ground Water Supply – Not Applicable

Table 3: Total Water Supply – Same as Table 1

Table 4: Distribution System Estimates and Approximations

Canal, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	Precipitation af/yr	Evaporation af/yr	Spillage af/yr	Seepage af/yr.	Total af/yr
Lahontan Reservoir			46,173,600	0.42	20,445.00	0.00	6,000.00	26,444.58
Harmon Reservoir			24,045,000	0.42	10,579.80	0.00	500.00	11,079.38
S-Line Reservoir			5,548,000	0.42	2,441.12	0.00	25.00	2,465.70
Truckee Canal	168,960	65	10,982,400	0.42	856.63	1,243.37	20,000.00	22,099.58
V Line	58,080	65	3,775,200	0.42	294.47	0.00	2,500.00	2,794.05
T Line	108,411	15	1,626,165	0.42	126.84	0.00	1,750.00	1,876.42
A Line	76,470	35	2,676,450	0.42	208.76	0.00	2,000.00	2,208.34
L Line	61,552	45	2,769,840	0.42	216.05	0.00	2,000.00	2,215.63
S Line	98,530	40	3,941,200	0.42	307.41	0.00	2,200.00	2,506.99
G Line	32,182	25	804,550	0.42	62.75	0.00	1,200.00	1,262.33
D Line	17,614	15	264,210	0.42	20.61	0.00	0.00	20.19
E Line	27,092	30	812,760	0.42	63.40	0.00	1,200.00	1,262.98
N Line	34,968	20	699,360	0.42	54.55	0.00	1,200.00	1,254.13
R Line	31,838	20	636,760	0.42	49.67	0.00	1,200.00	1,249.25
Total			104,755,495.00	5.88	35,727.05	1,243.37	41,775.00	78,739.54

Table 5: Crop Water Needs

Crop Name	Area (crop acres)	Crop ET (AF/Ac)	Leaching Requirements (AF/ac)	Cultural Practices (AF/ac)	Effective Precipitation (AF/ac)	Shallow Groundwater (AF/ac)	Applied Crop Water Use (acre feet)
alfalfa	27510	4	0	-0.5	0	0	96285
pasture	8100	4	0	-2.5	0	0	12150
corn/sudan	3245	3.6	0	0	0	0	11682
small grains	4200	4	0	0	0	0	16800
vegetables	310	3.5	0	0	0	0	1085
new seed alfalfa	3900	4	0	0	0	0	15600
Other (<5%)	2000	3.5	0	0	0	0	7000
Crop Acres	49265						160602

Table 6: 2009 District Water Budget

2009 District Water Budget

Water Supply	Table 1		307,653.28
Riparian ET	Distribution and Drain	minus	0.00
Groundwater recharge	Intensional-ponds, injection	minus	0.00
Seepage	Table 4	minus	41,775.00
Evaporation – Precipitation	Table 4	minus	35,727.05
Spillage	Table 4	minus	1,243.37
Transfers/exchanges/trades/wheeling	(into or out of the District)	plus/minus	0.00
Non-Agri deliveries	(delivered to non-ag customers)	minus	0.00
Water Available to Water Users			228,907.86
2009 Actual Agricultural Water Used		From District Records	184,739.00
Private Groundwater		plus	0.00
Crop Water Needs	Table 5	minus	160,602.00
Drain water outflow	(tail and tile not recycled)	minus	4,500.00
Percolation from Agricultural Land	(calculated)		19,637.00

Table 7: Influence on Groundwater and Saline Sink – Not Applicable

Table 8: Annual Surface Water Quantities Delivered

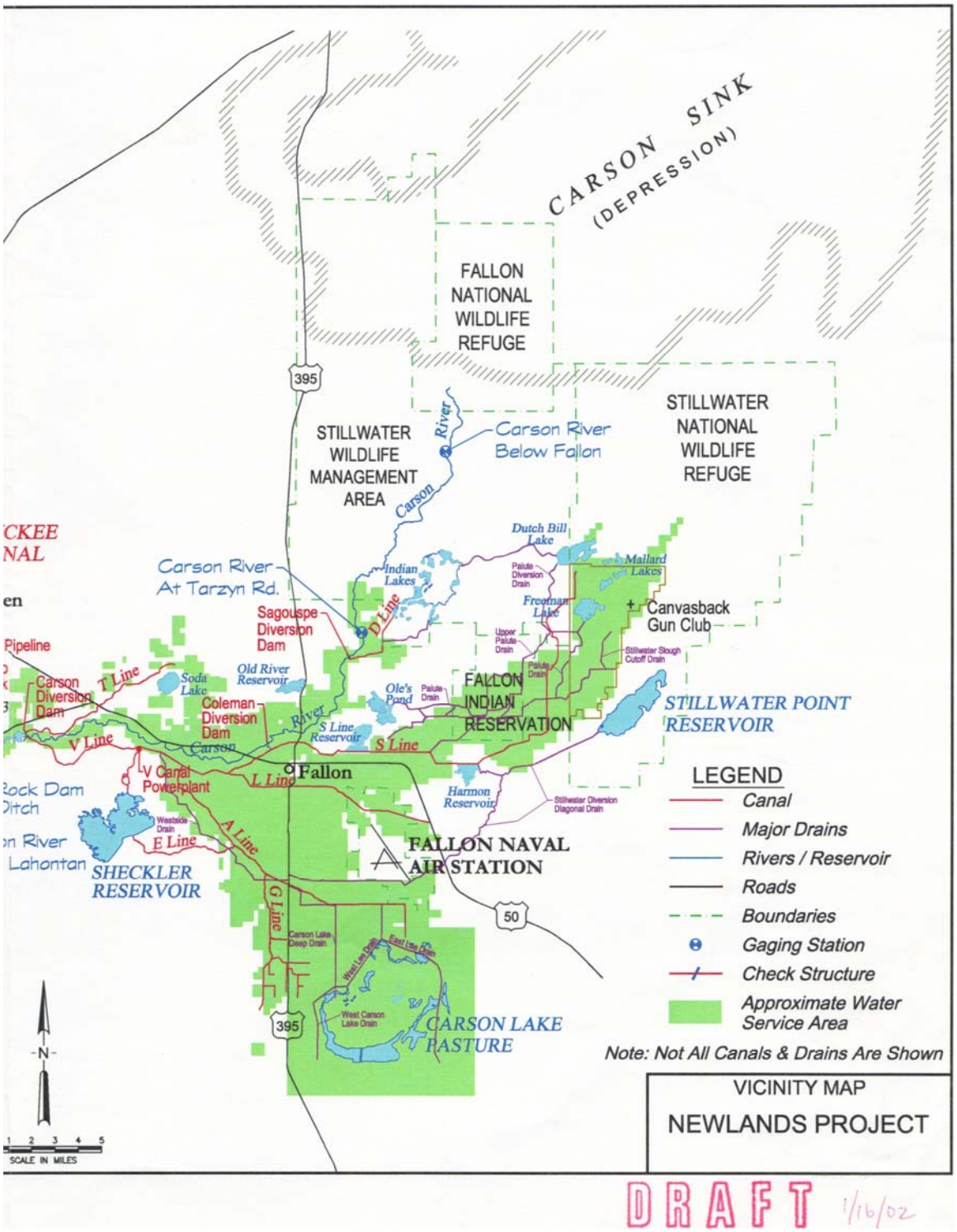
Annual District Sources Water Quantities

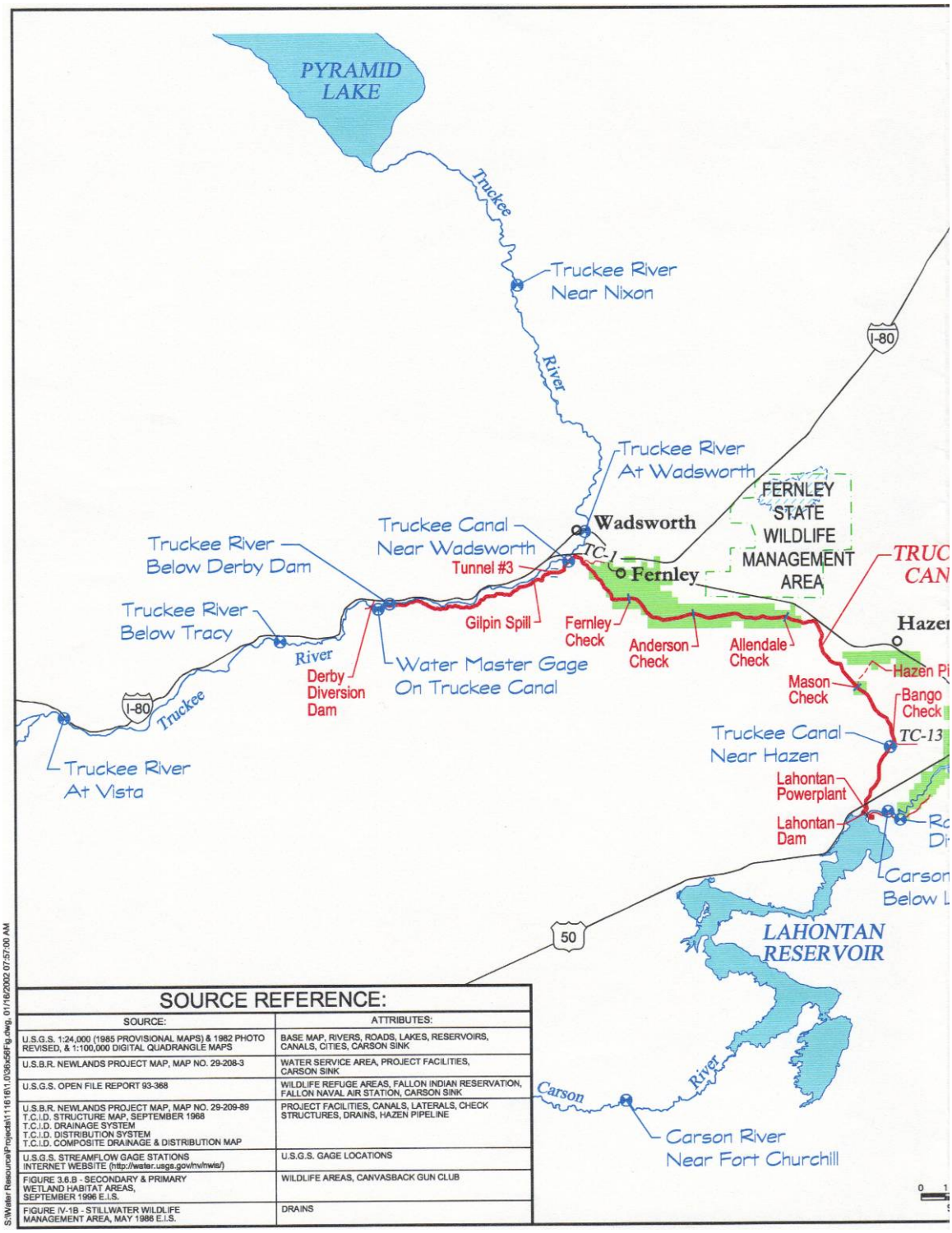
Year	Carson River (af)	Truckee River (af)	Fallon Waste Water Treatment (af)	Total (acre feet)
2000	211,600.0	23,000.0	1,272.9	235,872.9
2001	100,300.0	245,200.0	1,155.8	346,655.8
2002	142,800.0	221,800.0	1,104.2	365,704.2
2003	201,200.0	168,000.0	1,198.3	370,398.3
2004	134,000.0	207,900.0	1,109.8	343,009.8
2005	395,200.0	42,000.0	1,250.6	440,455.6
2006	518,800.0	28,000.0	1,266.4	548,066.4
2007	76,000.0	217,900.0	1,062.9	294,962.9
2008	100,200.0	127,900.0	930.7	229,030.7
2009	156,800.0	149,800.0	953.3	307,553.3
Averages	203,690.0	143,150.0	1,130.5	348,171.0

The source of this information is the Daily Water Master Report as reported on the TROA website. Averages for the last 100 years are reported in Table 3.23 of the TROA-EIS.

APPENDIX A – DISTRICT FACILITIES MAPS

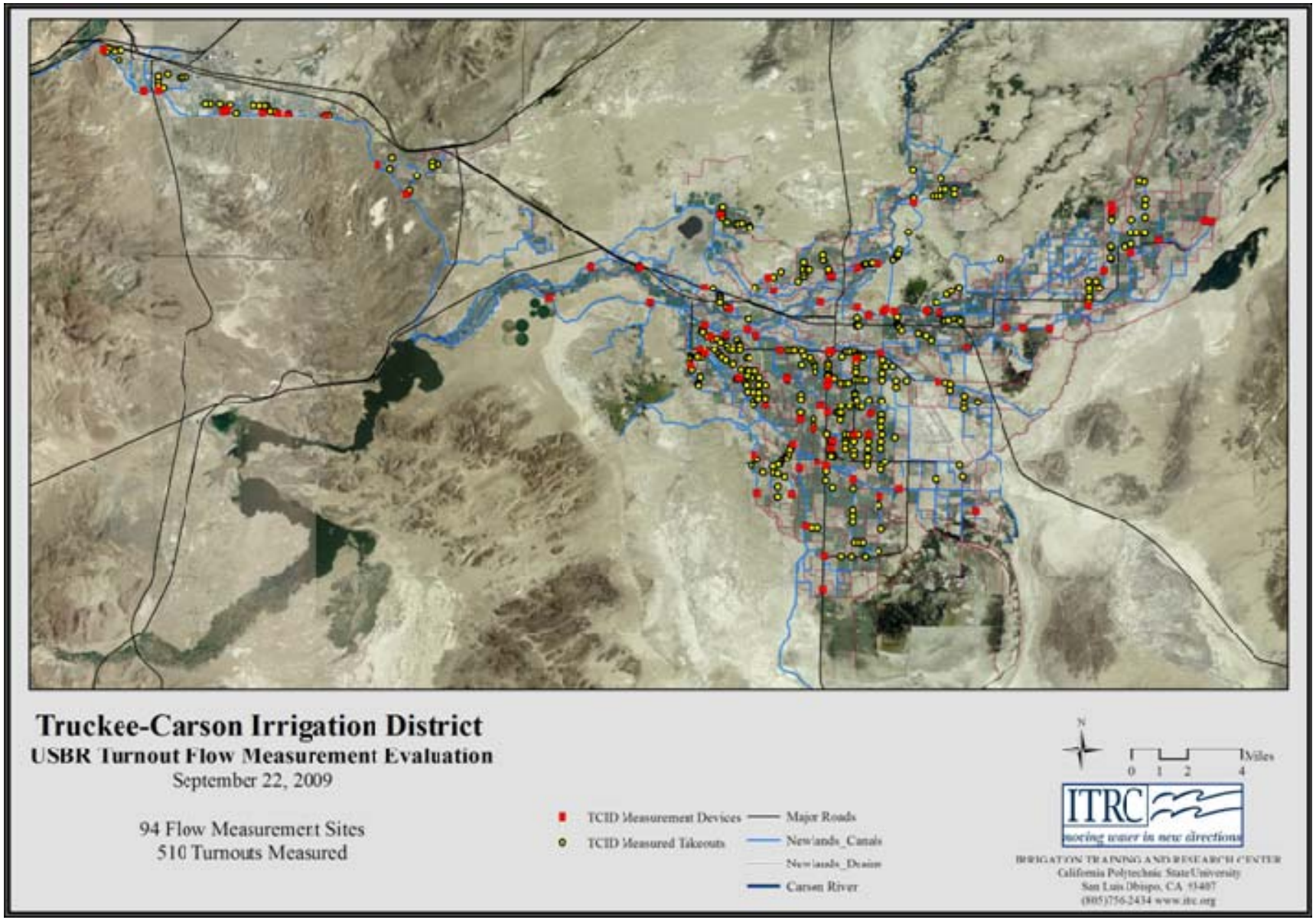
Page Number	Title
A-1	Aerial Map of Water Measurement Devices
A-2	Map of the Project
DVD	Maps of Distribution System (Refer to DVD-438 maps)


CARSON SINK
(DEPRESSION)
FALLON NATIONAL WILDLIFE REFUGE
STILLWATER NATIONAL WILDLIFE REFUGE
STILLWATER WILDLIFE MANAGEMENT AREA
Carson River Below Fallon
Carson River At Tarzyn Rd.
Sagouspe Diversion Dam
D Line
Dutch Bill Lake
Indian Lakes
Mallard Lakes
Freeman Lake
Canvasback Gun Club
Old River Reservoir
Soda Lake
Carson Diversion Dam
T Line
Coleman Diversion Dam
Ole's Pond
FALLON INDIAN RESERVATION
STILLWATER POINT RESERVOIR
S Line Reservoir
S Line
V Line
V Canal Powerplant
L Line
Fallon
Harmon Reservoir
A Line
E Line
SHECKLER RESERVOIR
FALLON NAVAL AIR STATION
G Line
CARSON LAKE PASTURE
395
50
LEGEND
Canal
Major Drains
Rivers / Reservoir
Roads
Boundaries
Gaging Station
Check Structure
Approximate Water Service Area
Note: Not All Canals & Drains Are Shown
N
SCALE IN MILES
VICINITY MAP
NEWLANDS PROJECT
DRAFT 1/16/02



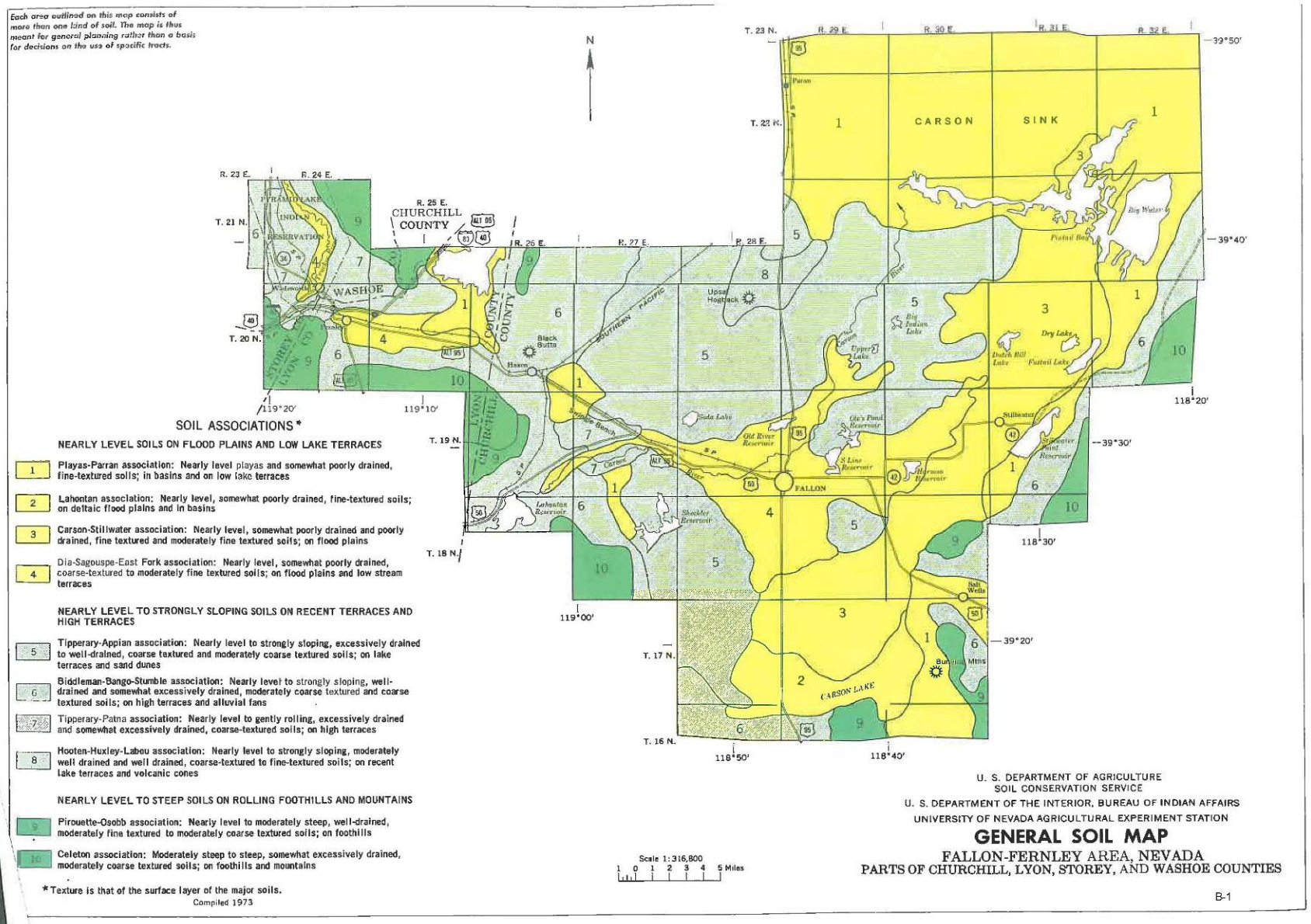
SOURCE REFERENCE:

SOURCE:	ATTRIBUTES:
U.S.G.S. 1:24,000 (1985 PROVISIONAL MAPS) & 1982 PHOTO REVISED, & 1:100,000 DIGITAL QUADRANGLE MAPS	BASE MAP, RIVERS, ROADS, LAKES, RESERVOIRS, CANALS, CITIES, CARSON SINK
U.S.B.R. NEWLANDS PROJECT MAP, MAP NO. 29-208-3	WATER SERVICE AREA, PROJECT FACILITIES, CARSON SINK
U.S.G.S. OPEN FILE REPORT 93-368	WILDLIFE REFUGE AREAS, FALLON INDIAN RESERVATION, FALLON NAVAL AIR STATION, CARSON SINK
U.S.B.R. NEWLANDS PROJECT MAP, MAP NO. 29-209-89 T.C.I.D. STRUCTURE MAP, SEPTEMBER 1968 T.C.I.D. DRAINAGE SYSTEM T.C.I.D. DISTRIBUTION SYSTEM T.C.I.D. COMPOSITE DRAINAGE & DISTRIBUTION MAP	PROJECT FACILITIES, CANALS, LATERALS, CHECK STRUCTURES, DRAINS, HAZEN PIPELINE
U.S.G.S. STREAMFLOW GAGE STATIONS INTERNET WEBSITE (http://water.usgs.gov/nv/nwis/)	U.S.G.S. GAGE LOCATIONS
FIGURE 3.6.B - SECONDARY & PRIMARY WETLAND HABITAT AREAS, SEPTEMBER 1996 E.I.S.	WILDLIFE AREAS, CANVASBACK GUN CLUB
FIGURE IV-1B - STILLWATER WILDLIFE MANAGEMENT AREA, MAY 1986 E.I.S.	DRAINS

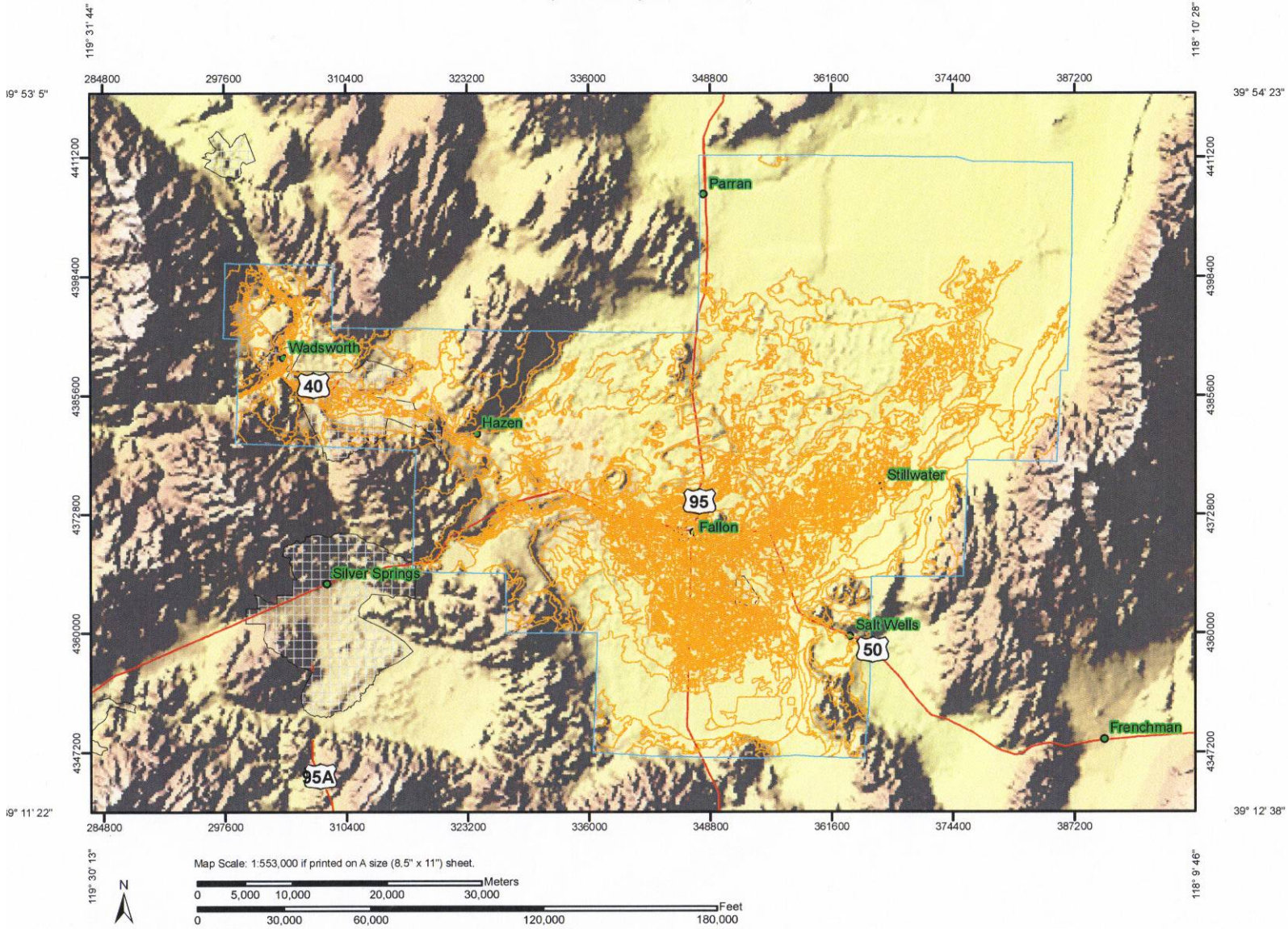

Truckee-Carson Irrigation District
USBR Turnout Flow Measurement Evaluation
September 22, 2009
94 Flow Measurement Sites
510 Turnouts Measured
TCID Measurement Devices
TCID Measured Takeouts
Major Roads
Newlands_Canals
Newlands_Drains
Carson River
N
0 1 2 4 Miles
ITRC
moving water in new directions
IRRIGATION TRAINING AND RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407
(805)756-2434 www.itrc.org

APPENDIX B – DISTRICT SOIL MAP

Page Number	Title
B-1	Fallon-Fernley Soil Survey General Soil Map
B-2	Fallon-Fernley Area of Interest (AOI) Soil Survey
B-4	Small Section of AOI showing detail of soil types


Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.
N
CARSON SINK
CHURCHILL COUNTY
WASHOE COUNTY
LYON COUNTY
STOREY COUNTY
FALLON
CARSON LAKE
SOIL ASSOCIATIONS *
NEARLY LEVEL SOILS ON FLOOD PLAINS AND LOW LAKE TERRACES
1 Playas-Parran association: Nearly level playas and somewhat poorly drained, fine-textured soils; in basins and on low lake terraces
2 Lahontan association: Nearly level, somewhat poorly drained, fine-textured soils; on deltaic flood plains and in basins
3 Carson-Stillwater association: Nearly level, somewhat poorly drained and poorly drained, fine textured and moderately fine textured soils; on flood plains
4 Dia-Sagouspe-East Fork association: Nearly level, somewhat poorly drained, coarse-textured to moderately fine textured soils; on flood plains and low stream terraces
NEARLY LEVEL TO STRONGLY SLOPING SOILS ON RECENT TERRACES AND HIGH TERRACES
5 Tipperary-Appian association: Nearly level to strongly sloping, excessively drained to well-drained, coarse textured and moderately coarse textured soils; on lake terraces and sand dunes
6 Biddleman-Bango-Stumble association: Nearly level to strongly sloping, well-drained and somewhat excessively drained, moderately coarse textured and coarse textured soils; on high terraces and alluvial fans
7 Tipperary-Patna association: Nearly level to gently rolling, excessively drained and somewhat excessively drained, coarse-textured soils; on high terraces
8 Hooten-Huxley-Labou association: Nearly level to strongly sloping, moderately well drained and well drained, coarse-textured to fine-textured soils; on recent lake terraces and volcanic cones
NEARLY LEVEL TO STEEP SOILS ON ROLLING FOOTHILLS AND MOUNTAINS
9 Pirouette-Osobb association: Nearly level to moderately steep, well-drained, moderately fine textured to moderately coarse textured soils; on foothills
10 Celeton association: Moderately steep to steep, somewhat excessively drained, moderately coarse textured soils; on foothills and mountains
* Texture is that of the surface layer of the major soils.
Compiled 1973
Scale 1:316,800
1 0 1 2 3 4 5 Miles
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF INDIAN AFFAIRS
UNIVERSITY OF NEVADA AGRICULTURAL EXPERIMENT STATION
GENERAL SOIL MAP
FALLON-FERNLEY AREA, NEVADA
PARTS OF CHURCHILL, LYON, STOREY, AND WASHOE COUNTIES
B-1

Soil Map—Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties
(Fallon-Fernley Area of Interest)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

11/12/2010
Page 1 of 8

Soil Map–Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties
(Fallon-Fernley Area of Interest)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Gully
- Short Steep Slope
- Other

Political Features
- Urban Areas
- Cities

Water Features
- Oceans

Transportation
- Interstate Highways
- US Routes

MAP INFORMATION

Map Scale: 1:553,000 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

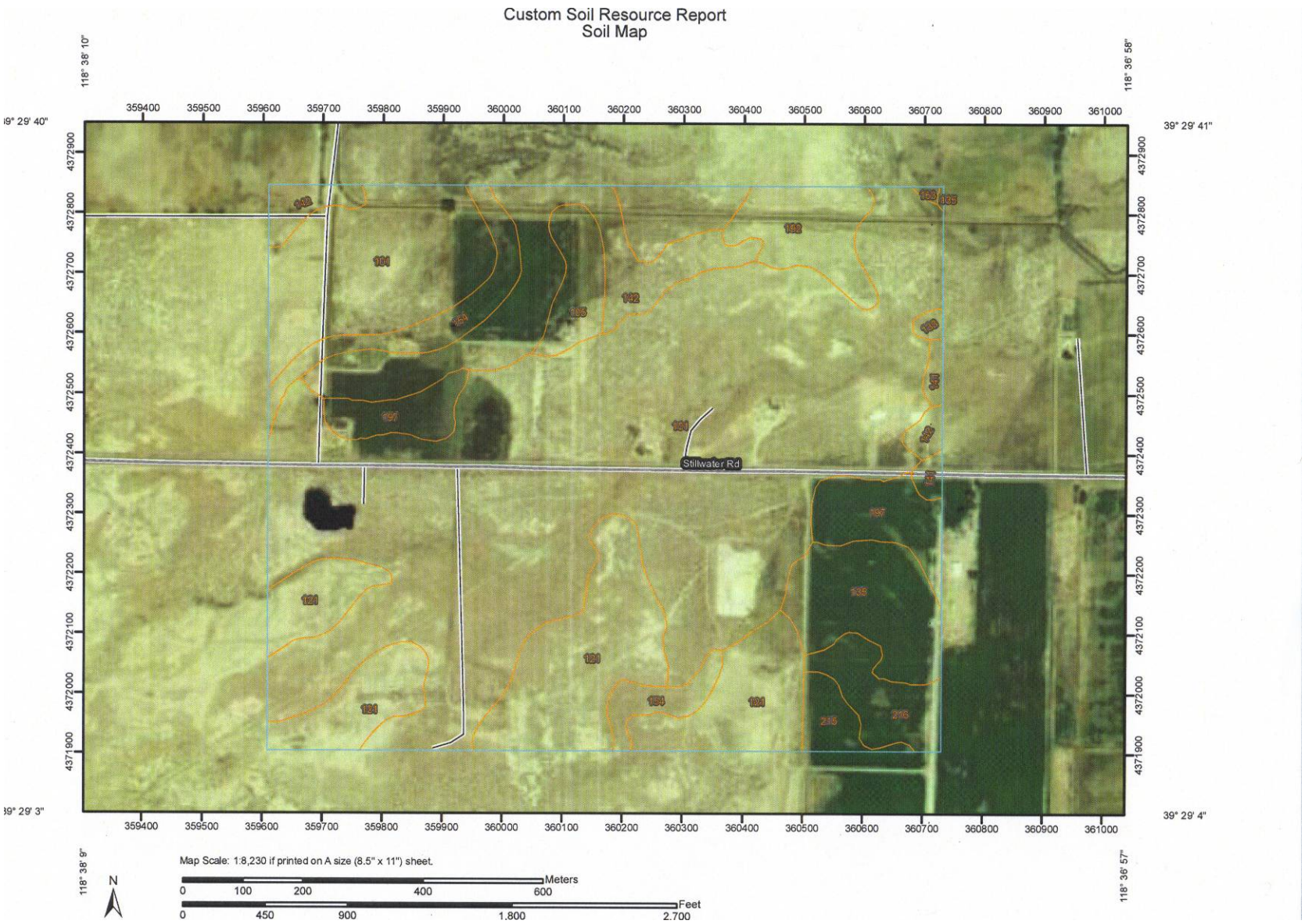
Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties
Survey Area Data: Version 7, Oct 7, 2009

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.


Custom Soil Resource Report
Soil Map
Stillwater Rd
Map Scale: 1:8,230 if printed on A size (8.5" x 11") sheet.
Meters
0 100 200 400 600
Feet
0 450 900 1,800 2,700
N

Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:8,230 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties
Survey Area Data: Version 7, Oct 7, 2009

Date(s) aerial images were photographed: 8/12/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties (NV603)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
101	Isolde-Appian, clay substratum complex, 0 to 4 percent slopes	19,000.3	2.3%
102	Appian, clay substratum complex, 0 to 2 percent slopes	2,896.0	0.4%
103	Appian fine sandy loam, 0 to 2 percent slopes	1,318.2	0.2%
104	Appian loamy fine sand, 0 to 2 percent slopes	882.7	0.1%
105	Appian sandy loam, clay substratum, 0 to 2 percent slopes	1,610.4	0.2%
107	Appian-Isolde complex, 0 to 4 percent slopes	36,751.7	4.4%
108	Appian-Playas association	12,036.1	1.5%
110	Bango loamy sand, 0 to 2 percent slopes	559.7	0.1%
112	Bango sandy loam, 2 to 4 percent slopes	433.8	0.1%
113	Bango silt loam, 0 to 2 percent slopes	481.1	0.1%
114	Bango-Hawsley association	205.7	0.0%
117	Bluewing gravelly loamy sand, 2 to 8 percent slopes	362.2	0.0%
118	Bunejug sandy loam, 0 to 1 percent slopes	775.2	0.1%
119	Bunejug sandy loam, slightly saline, 0 to 1 percent slopes	1,654.2	0.2%
120	Bunejug sandy loam, strongly saline, 0 to 1 percent slopes	2,265.0	0.3%
121	Bunejug-Erber complex, 0 to 1 percent slopes	7,305.8	0.9%
122	Carcity clay, 0 to 1 percent slopes	1,033.0	0.1%
123	Carcity clay, slightly saline, 0 to 1 percent slopes	641.2	0.1%
124	Carcity clay, strongly saline, 0 to 1 percent slopes	318.8	0.0%
125	Carson clay, 0 to 1 percent slopes	2,228.4	0.3%
126	Carson clay loam, strongly saline, 0 to 1 percent slopes	8,902.6	1.1%
127	Carson clay, slightly saline, 0 to 1 percent slopes	2,934.2	0.4%
128	Carson clay, strongly saline, 0 to 1 percent slopes	2,828.5	0.3%
129	Carson-Stillwater complex, 0 to 2 percent slopes	19,374.0	2.3%
131	Churchill-Playas complex, 0 to 2 percent slopes	8,503.6	1.0%
132	Dia loam, 0 to 1 percent slopes	5,753.2	0.7%
133	Dia loam, strongly saline, 0 to 1 percent slopes	4,398.1	0.5%
134	Dia loam, saline, rarely flooded, 0 to 1 percent slopes	3,194.5	0.4%
135	Dia loam, slightly saline, 0 to 1 percent slopes	6,821.0	0.8%
136	Dithod loam, 0 to 1 percent slopes	551.5	0.1%

Soil Map—Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties

Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties (NV603)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
137	Dithod loam, slightly saline, 0 to 1 percent slopes	616.7	0.1%
138	Dithod loam, strongly saline, 0 to 1 percent slopes	344.3	0.0%
139	Dune land-Playas complex	12,980.2	1.6%
140	East Fork clay loam, 0 to 1 percent slopes	2,140.9	0.3%
141	East Fork clay loam, slightly saline, 0 to 1 percent slopes	2,075.7	0.3%
142	East Fork clay loam, strongly saline, 0 to 1 percent slopes	1,449.6	0.2%
143	Erber clay, slightly saline, 0 to 1 percent slopes	726.8	0.1%
144	Erber clay, strongly saline, 0 to 1 percent slopes	1,641.9	0.2%
145	Erber loam, 0 to 1 percent slopes	500.3	0.1%
146	Erber loam, strongly saline, 0 to 1 percent slopes	635.9	0.1%
147	Erber sand, 0 to 1 percent slopes	939.2	0.1%
148	Fallon fine sandy loam, 0 to 1 percent slopes	748.8	0.1%
149	Fallon fine sandy loam, slightly saline, 0 to 1 percent slopes	1,676.2	0.2%
150	Fallon fine sandy loam, strongly saline, 0 to 1 percent slopes	648.8	0.1%
151	Fallon fine sandy loam, wet, 0 to 1 percent slopes	176.1	0.0%
152	Fernley clay, 0 to 1 percent slopes	408.9	0.0%
153	Fernley loam, 0 to 1 percent slopes	1,972.8	0.2%
154	Fernley sand, 0 to 1 percent slopes	4,269.1	0.5%
155	Gardella gravelly silt loam, 0 to 2 percent slopes	2,257.9	0.3%
156	Gravel pits	1,217.6	0.1%
157	Hawsley sand, 0 to 2 percent slopes	3,855.8	0.5%
161	Hooten-Bango-Isolde association	6,249.5	0.8%
162	Huxley gravelly clay loam, 0 to 2 percent slopes	2,587.3	0.3%
163	Isolde fine sand, 0 to 4 percent slopes	3,366.3	0.4%
164	Isolde fine sand, 4 to 15 percent slopes	2,150.2	0.3%
165	Isolde-Appian, clay substratum complex, 0 to 15 percent slopes	8,800.6	1.1%
166	Isolde-Appian complex, 0 to 15 percent slopes	17,586.5	2.1%
167	Isolde-Lahontan complex, 0 to 15 percent slopes	400.9	0.0%
168	Isolde-Parran-Appian, clay substratum complex, 0 to 15 percent slopes	42,744.3	5.2%
169	Juva sandy loam, 0 to 2 percent slopes	1,608.0	0.2%
170	Juva sandy loam, 2 to 4 percent slopes	217.1	0.0%
171	Juva silt loam, 2 to 4 percent slopes	368.9	0.0%
174	Lahontan clay, slightly saline, 0 to 1 percent slopes	747.8	0.1%

Soil Map–Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties

Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties (NV603)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
175	Lahontan clay, strongly saline, 0 to 1 percent slopes	12,193.5	1.5%
176	Loomer-Bombadil-Old Camp association	682.4	0.1%
179	Mine pits	157.6	0.0%
180	Miscellaneous water	71.2	0.0%
181	Parran silty clay, 0 to 2 percent slopes	6,342.7	0.8%
182	Parran-Isolde complex, 0 to 4 percent slopes	19,146.2	2.3%
183	Patna sand, 0 to 2 percent slopes	5,286.2	0.6%
184	Pelic clay, 0 to 2 percent slopes	1,189.9	0.1%
185	Pelic sand, 0 to 2 percent slopes	682.1	0.1%
186	Pelic sand, clay substratum, 0 to 2 percent slopes	2,367.1	0.3%
192	Playas	177,455.3	21.5%
193	Ragtown clay loam, slightly saline, 0 to 1 percent slopes	1,301.1	0.2%
194	Ragtown clay loam, strongly saline, 0 to 1 percent slopes	1,570.9	0.2%
195	Ragtown sandy clay loam, 0 to 1 percent slopes	614.3	0.1%
196	Sagouspe loamy sand, 0 to 1 percent slopes	3,204.0	0.4%
197	Sagouspe loamy sand, saline, 0 to 1 percent slopes	4,723.6	0.6%
198	Soda Lake gravelly loamy sand, 0 to 2 percent slopes	598.1	0.1%
199	Soda Lake gravelly loamy sand, 2 to 15 percent slopes	795.4	0.1%
200	Soda Lake gravelly loamy sand, saline, 0 to 2 percent slopes	1,742.3	0.2%
201	Soda Lake sandy loam, 0 to 2 percent slopes	1,214.8	0.1%
202	Soda Lake sandy loam, saline, 0 to 2 percent slopes	467.9	0.1%
203	Soda Lake-Rock outcrop complex, 2 to 15 percent slopes	400.5	0.0%
204	Stillwater clay, 0 to 1 percent slopes	364.8	0.0%
205	Stillwater clay loam, 0 to 1 percent slopes	817.7	0.1%
206	Stillwater clay loam, slightly saline, 0 to 1 percent slopes	1,441.9	0.2%
207	Stillwater clay loam, strongly saline, 0 to 1 percent slopes	1,386.6	0.2%
208	Stillwater clay loam, wet, 0 to 1 percent slopes	1,135.6	0.1%
209	Swingler clay loam, 0 to 2 percent slopes	379.9	0.0%
210	Swingler clay loam, slightly saline, 0 to 2 percent slopes	277.7	0.0%
211	Swingler clay loam, strongly saline, 0 to 2 percent slopes	1,377.2	0.2%

Soil Map–Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties

Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties (NV603)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
212	Swingler sand, 0 to 4 percent slopes	997.9	0.1%
213	Swingler sandy loam, 0 to 2 percent slopes	1,985.1	0.2%
214	Swope clay loam, 0 to 1 percent slopes	359.7	0.0%
215	Swope clay loam, slightly saline, 0 to 1 percent slopes	799.4	0.1%
216	Swope clay loam, strongly saline, 0 to 1 percent slopes	440.3	0.1%
217	Swope sandy loam, 0 to 1 percent slopes	305.7	0.0%
218	Water	16,845.5	2.0%
219	Weishaupt clay loam, 0 to 1 percent slopes	484.0	0.1%
220	Weishaupt clay loam, slightly saline, 0 to 1 percent slopes	475.0	0.1%
221	Weishaupt clay loam, strongly saline, 0 to 1 percent slopes	1,124.5	0.1%
222	Mackerlake-Turupah association	8,009.0	1.0%
223	Carwalker sand, 0 to 2 percent slopes	1,048.5	0.1%
224	Dia loam, rarely flooded, 0 to 1 percent slopes	1,263.7	0.2%
225	Dithod loam, rarely flooded, 0 to 1 percent slopes	309.4	0.0%
226	Dithod loam, saline, rarely flooded, 0 to 1 percent slopes	351.4	0.0%
227	East Fork clay loam, rarely flooded, 0 to 1 percent slopes	436.8	0.1%
228	East Fork clay loam, saline, rarely flooded, 0 to 1 percent slopes	1,030.7	0.1%
230	Fallon fine sandy loam, saline, rarely flooded, 0 to 1 percent slopes	133.3	0.0%
232	Fernley loam, rarely flooded, 0 to 1 percent slopes	124.4	0.0%
233	Fernley sand, rarely flooded, 0 to 1 precent slopes	259.2	0.0%
234	Carwalker loamy sand, occasionally flooded, 0 to 1 percent slopes	624.8	0.1%
235	Pelic-Turupah complex, 0 to 1 percent slopes	6,005.4	0.7%
236	Carwalker-Dia complex, 0 to 2 percent slopes	610.2	0.1%
237	Numana-Water complex, 0 to 1 percent slopes	466.6	0.1%
238	Mackerlake-Water complex, 0 to 1 percent slopes	10,498.5	1.3%
239	Carson-Mackerlake-Turupah complex, 0 to 1 percent slopes	3,203.0	0.4%
240	Parran-Sondoa association	7,282.6	0.9%
241	Theon very gravelly sandy loam, 8 to 30 percent slopes	101.6	0.0%
7003	Old Camp-Mirkwood-Nemico association	577.5	0.1%
7004	Pirouette-Theon-Weena association	10,871.2	1.3%

Soil Map—Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties

Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties (NV603)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
7008	Theon-Ceejay-Rock outcrop association	962.2	0.1%
7013	Hawsley loamy sand, 2 to 8 percent slopes	18,170.6	2.2%
7016	Biddleman-Mazuma association	4,535.1	0.5%
7017	Biddleman-Mazuma-Weena association	29,763.8	3.6%
7018	Biddleman-Bluewing association	10,008.9	1.2%
7019	Bluewing very gravelly sandy loam, 2 to 8 percent slopes, occasionally flooded	205.9	0.0%
7022	Hawsley-Isolde association	1,895.6	0.2%
7023	Bango-Biddleman-Mazuma association	2,603.6	0.3%
7024	Turupah-Parran association	2,534.4	0.3%
7025	Hawsley-Appian-Ruhe association	122.5	0.0%
7026	Isolde-Parran-Appian association	35,066.1	4.2%
7027	Biddleman-Isolde association	850.0	0.1%
7028	Cleaver-Weena-Hawsley association	2,170.9	0.3%
7030	Doorkiss-Old Camp-Rock outcrop association	216.9	0.0%
7031	Doorkiss-Ceejay association	2,894.1	0.4%
7032	Trocken very gravelly sandy loam, 2 to 8 percent slopes	91.0	0.0%
7033	Ceejay-Piroutte-Weena association	1,815.2	0.2%
7034	Cleaver-Genegraph association	499.6	0.1%
7035	Piroutte-Cleaver-Weena association	8,725.5	1.1%
7036	Theon-Singatse-Weena association	3,700.9	0.4%
7037	Theon-Ceejay-Weena association	436.9	0.1%
7038	Cleaver gravelly sandy loam 4 to 15 percent slopes	1,410.1	0.2%
7039	Pirouette-Theon-Celeton association	5,044.9	0.6%
7040	Doorkiss-Ister-Ceejay association	228.8	0.0%
7042	Bango-Hawsley association	18,902.1	2.3%
7043	Hawsley-Gamgee association	472.8	0.1%
7044	Pirouette-Rezave-Fireball association	2,098.1	0.3%
7045	Trocken-Biddleman-Bluewing assciation	3,658.7	0.4%
7046	Rawe-Bluewing-Trocken association	380.1	0.0%
7047	Hawsley-Ruhe-Bluewing association	1,563.2	0.2%
7051	Trocken-Hawsley-Bluewing association	71.2	0.0%
7052	Hawsley-Badland-Isolde association	191.0	0.0%
7061	Piroutte-Theon association	5,579.4	0.7%
7062	Mazuma-Bango association	5,093.9	0.6%
7099	Tuffman-Bluewing-Labou association	7,122.3	0.9%
7201	Pirouette-Singatse-Hawsley association	12,091.0	1.5%
7210	Hawsley-Piroutte-Isolde association	9,554.9	1.2%

Soil Map–Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties

Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties (NV603)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
7220	Badland-Mazuma complex, 2 to 30 percent slopes	12,787.1	1.5%
7221	Biddleman-Mazuma association, sodic	2,189.7	0.3%
Totals for Area of Interest		**826,253.9**	**100.0%**

APPENDIX C – DISTRICT RULES AND REGULATIONS

Page Number	Title
C-1	2010 Water Delivery Rules and Regulations
C-6	Section B – Construction and Maintenance - Management Policies
C-8	Section G – Water - Management Policies
C-14	Section H – Fee Schedule - Management Policies
C-15	Section J – Forms, Specifications & Construction Standards - Management Policies

2010 Water Season
Water Delivery Rules and Regulations
Procedures for Ordering/Scheduling/Delivery of Irrigation Water

Important Phone Numbers:

1. **Main Office Phone: 775-423-2141**
2. **Main Office Fax: 775-423-5354**
3. **Emergency Contact: 775-427-0314**
4. **Fallon Area Water Order Phone: 775-423-6511**
5. **Fernley Area Water Order Phone: Toll Free 1-877-803-7166**
6. **Truckee (Fernley) Division TCID Ditchrider: 775-427-9840 or Toll Free: 1-877-627-2475**
7. **East District TCID Ditchrider: 775-427-0031**
8. **Central District TCID Ditchrider: 775-427-0125**
9. **West District TCID Ditchrider: 775-427-0100**

Water Order Website Address: www.tcid.org

Due to changes in water use, demand, and potential canal system capacity issues, Truckee-Carson Irrigation District Board of Directors has set limitations to the delivery of irrigation water

General Instructions:

1. To determine your District, Lateral and Takeout, refer to your Annual Allocation Notice
2. Orders can be placed daily except, weekends and Holidays.
3. Orders can only be placed through the website at www.waterorder@tcid.org or by calling the Water Order phone.
4. ***NO ORDERS WILL BE TAKEN BY THE DITCHRIDER.***
5. No water orders will be taken from property owner's with delinquent fees, assessments or charges due TCID.
6. All water orders must be placed a minimum of 72 hours in advance. The Water User or Irrigator should be prepared to take the water any time of day within 72 hour after the order is placed unless a special delivery request of more than 72 hours has been made
7. Separate water orders must be placed for each lateral (i.e. S17 and S6-3).
8. Orders placed after 2:00 pm Monday through Friday will be processed the next business day.
9. Second runs of water shall not be made to the Water User's or authorized Irrigator's same District Head Gate within a seven (7) day period, except to protect:
    a. New Seeding during the first 60 days
    b. Highly sensitive crops during the first 60 days

**For instance, new alfalfa and pasture during the first 60 days and corn during the first 90 days may have preference over established crops

10. Water User's or authorized Irrigator's with sensitive crops, as noted above, may receive water deliveries sooner than seven days (7) apart only to protect those sensitive crops.
11. Notify the person taking the water order of any specific requirements for water delivery (i.e. new seed *as specified in rule #9, what type of new seed *as specified in rule #9, specific delivery times etc). Orders for a specific day and time will be honored as long as it does not negatively affect efficiency or other Water User's or authorized Irrigator's.
12. Water will ***not*** be delivered in excess of allocation.
13. The Scheduler will contact the Water User or Irrigator within two business days with the approximate date and time of delivery.
14. If you receive notice of delivery via voice mail, please verify, with the scheduler, as soon as possible
15. The Water User or Irrigator must be ready to take delivery of water within 12 hours before or after scheduled delivery time.
16. Under no circumstances will the Water User or Irrigator make changes to the schedule once the Water User or Irrigator has been contacted. Only the Scheduler may make changes to the Schedule.
17. The Ditchrider will contact the Water User or Irrigator prior to actual delivery with an updated time. If the Water User or Irrigator is not available at that time, the order may be rescheduled one time or cancelled and a new order will not be taken for seven days from the original order date.
18. The Water User or Irrigator must supply phone numbers or have voice mail/answering machine where they can be reached 24 hours a day.
19. The Water User or Irrigator must be available to take water at any time day or night.
20. Water delivery ***will not*** exceed 120% of the hours ordered.
21. The Ditchrider will make every attempt to deliver the exact CFS ordered. In all cases, the Water User or Irrigator will be notified by the end of the month, the exact CFS delivered and the balance remaining on each account.
    a. If a discrepancy is found, contact the O & M Foreman by the 15th of the month following receipt of the monthly Water Card or the statement will stand as reported.
    b. The O & M Foreman may instruct you to fill out a Water Order Adjustment form. This can be obtained in the Administrative Office of TCID. The office staff will be available to assist you.
    c. The Water User or Irrigator can request a meter reading to insure accurate delivery in the future.
    d. If the Water User or Irrigator performs the measurement, it must be done in accordance with the Bureau of Reclamation Water

Measurement Manual. These rules can be obtained in the Administrative Office of TCID.

e. Present the information to the O & M Foreman on the Water Order Adjustment form.
f. The O&M Foreman will contact the Ditchrider and a decision will be made regarding the request.
g. The Water User or Irrigator will be notified if an adjustment has been made and how much has been adjusted within 30 days of the request.
h. ***The adjusted water will not be available for use until you are notified by the O & M Foreman on the Water Order Adjustment form.***

22. All water deliveries are monitored and measured by the Ditchrider and delivered in accordance with TCID policy as directed by the O & M Foreman.
23. The Water User or Irrigator is NOT TO OPEN, CLOSE OR CHANGE ANY TCID gates or facilities without prior temporary transfer of authority by the ditchrider to act as an agent of the ditchrider
24. If a Water User or Irrigator is designated as an agent the individual must:
    a. Accurately record times and other factors of deliveries
    b. Be willing to accept responsibility for damages that may occur
    c. Be willing to contact the next Water User or Irrigator in order to pass the water or contact the Ditchrider when delivery is complete.
        i. If the agent does not follow instructions, the delivery time will be estimated by the Ditchrider.
    d. Once the delivery is complete the agent's responsibilities will cease.
25. The maximum Cubic Feet per Second (CFS) is limited to a maximum 30 CFS at any one headgate, if, in the opinion of the O & M Foreman or Management, it is felt that safe-rated capacity TCID structures or facilities will be exceeded.
26. No Water User or Irrigator will be allowed to divert more than twenty-five percent (25%) of his/her annual water allocation during any one month provided the diversion will not cause damages to other Water Users or authorized Irrigators or TCID structures or facilities.
27. Unauthorized use of water (irrigating without an order in place) will result in the Water User's or authorized Irrigator's takeout being padlocked and a financial penalty imposed. No future orders will be taken until the penalty is paid in full or until the Water User or Irrigator appears before the Board of Directors and a resolution is reached.
28. A Subdivision Coordinator, agreed upon by the members of the Subdivision, will be responsible for contacting all Water User's or authorized Irrigator's in their Subdivision regarding water delivery. If a Coordinator cannot be agreed upon, a rotation will be set by the O & M Foreman. Neither TCID nor any TCID employee will be responsible for contacting individual Water User's or authorized Irrigator's in a subdivision

except the Coordinator. The order will be completed in a single run. **This is further outlined in section "Subdivisions".*

29. Water must be used to the best advantage. Any Water User or Irrigator wasting water will be warned by letter. Any offense following notification will result in the Water User's or authorized Irrigator's takeout being padlocked. No future orders will be taken until the Water User or Irrigator appears before the Board of Directors and a resolution is reached.
30. Water User's or authorized Irrigator's ditches, takeouts and/or access to the ditches and takeouts must be properly maintained. If TCID or a Water User or Irrigator deems a repair to be necessary, the O & M Foreman will contact the Water User or Irrigator in advance of the inspection so that all parties can be present. At that time, it will be determined if water deliveries should be suspended until repairs are made and inspected. At that time deliveries will resume. **This is further outlined in section "Construction/Repair on Project Easements".*
31. Water Users, Agents and TCID are regulated by court approved Operating Criteria and Procedures (OCAP), which limits the use of water to irrigated water righted acres. Non-compliance will result in penalties as established in the OCAP. Any changes in irrigated acreage should be reported to TCID's Engineering Department. The documentation required are as follows:
    a. Record of Conveyance
    b. Abstract Title

    **This is further outlined in section "Ownership".*
32. Ditchrider's are not employees of the Board of Directors of TCID but, of TCID as a whole. Instructions as to management of water shall come from management and in conformance with policy established by the Board of the Directors.

Subdivisions:

In the case of property having been subdivided, TCID will deliver water to the original takeout only. It shall be the obligation of the Subdivider and purchasers of the subdivided land to construct and maintain necessary facilities to irrigate from original TCID structures in accordance with TCID policy.

A watering subdivision is made up of the Water Users or authorized Irrigators in a neighborhood who irrigate from an original takeout. The irrigation allowance of each member of the group is added together to arrive at the allocation for the subdivision. The members of the subdivision shall irrigate in one delivery, and no additional deliveries will be made for a period of seven days. Water will be measured at the original TCID takeout only.

The members of each watering subdivision shall choose ONE person to act as Coordinator within the watering subdivision and ONE alternate and submit those names to the O & M Foreman for approval. These two persons will be the Ditchrider's and TCID's contact. Other members of the subdivision are required to contact their Coordinator. The responsibilities of the Coordinator would be to: (1) order water as needed by users within the subdivision; (2) coordinate and

organize the efficient distribution of water within the subdivision; and (3) account for usage of water within the subdivision.

Construction/Repair on Project Easements:
TCID owns, or has possessory rights to, the system of irrigation and drainage ditches which serves the Newlands Project, together with the rights-of-way appurtenant thereto. No building or construction thereon, including piping, filling, fencing, or other alteration thereof, may be performed unless WRITTEN permission has first been obtained from TCID.

Ownership:
Change of ownership of water-righted parcels requires that the new owner provide a "Record of Conveyance" and "Abstract of Title" to TCID of the change. Upon payment of the appropriate administrative fee, TCID will make the necessary changes to allow the new owner to order water.

Water Rights Transfers:
Any temporary transfer or permanent water right transfer must be filed and approved by the Nevada State Engineer 60 days prior to the end of a normal irrigation season (75% or above) for addition to the water right owner's allocation during the current irrigation season. During a short irrigation season (75% or below), the deadline for approval by the Nevada State Engineer would be July 1st. TCID cannot guarantee that water will be available nor can TCID guarantee delivery of water if the time limits as stated above are not adhered to.

Start Time:
The time the TCID Lateral/take-out has adequate cfs for the delivery is reached and the water users take out is opened. For example: Building Bay or Head for the A9-T7, the start time of the delivery would begin when the bay or head is high enough to deliver adequate cfs and the take out is opened. Note: the water user's gate should not be opened until proper cfs has been achieved as this may lengthen the delivery time. If adequate cfs is not achieved for the delivery until 02:00 and it takes 4 hours to reach the TCID Lateral/take out with adequate head, the start time would be 06:00. Do not allow the bay height to exceed the freeboard. This may cause severe damage to the structure and crops.

Agent:
The property owner's designated irrigator that has been given temporary authority by the TCID O & M Foreman or ditchrider to open and/or close gates for the purpose of irrigating irrigatable land. After delivery is complete that agent no longer has any authority to open or close any gates.

Freeboard:
The distance between the normal water level and the top of a structure or canal bank.

Stop Time:
The time the water user closed the take out at the TCID Lateral/Take out.

Run-off:
The usable water in the lateral used to finish a delivery after TCID Lateral/Take out are closed. For example: Using the example above—The TCID lateral/take out A9-T7 has 8 cfs for 8 hours ordered. The 4 hours of travel time allows for 2 hours of run off. The TCID lateral/take out above the A9-T7 should be closed at

14:00.

Measurements:

The measurement will be taken at the point upstream and closest to the water user's take out or the takeout itself. Ditch loss will be calculated on metered runs and deliveries adjusted accordingly. Using the example above—The water user at the A9-T7 has closed the gate and contacted the ditchrider. The meter is then read and the information recorded. The automation department calculates the Ditch loss and records the actual delivery.

Ditch Loss:

The estimated water naturally absorbed during travel time to the water user's gate. All other losses will be calculated by the ditchrider.

It is very important to track the start and stop times of all deliveries. Always convey to the ditchrider your start and stop times immediately. If there is a dispute about a particular delivery, this information could prove invaluable.

If at anytime the delivery is not meeting or is exceeding the expected cfs, contact the ditchrider immediately. At that time the check structure can be verified and any necessary adjustments made.

Communication between the water users and the ditchrider is paramount in the effective efficient delivery of irrigation water. The water user needs to give the ditchrider as much lead time as possible. No one person can be everywhere all the time. It is a team effort. The water users must be the eyes of the ditchrider and the ditchrider must be responsive to the water user's concerns.

The following are excerpts taken from Nevada Revised Statutes and are for informational purposes:

N.R.S. 539.783

LIABILITY OF WATER USER NEGLIGENTLY, WRONGFULLY IMPAIRING TCID WORKS; NOTICE TO REPAIR.

Any water user, or his agent or lessees, of an irrigation TCID who shall negligently or wrongfully impair the usefulness of any reservoir, canal, ditch, lateral, drain, headgate, structure, or any part of the irrigation TCID system of works and fails to repair the same within 10 days after notice from TCID so to do, or who fails within such time to file with the Board of Directors good and sufficient reasons for so failing to do, shall become liable for the payment thereof as provided in this chapter, or the irrigation TCID may make such repairs and add and collect the same as an operation and maintenance charge against the lands of the Water User or Irrigator for the next succeeding irrigation season.

N.R.S. 536.040

CONTRIBUTION OF OWNERS FOR PROPORTIONATE SHARE OF WORK. In all cases where ditches are owned by two or more persons, and one or

more of such persons shall fail or neglect to do a proportionate share of the work necessary for the proper maintenance and operation of such ditch or ditches, or to construct suitable headgates or other devices at the point where water is diverted from the main ditch, such owner or owners desiring the performance of such work may, after giving 10 days written notice to such other owner or owners who failed to perform such proportionate share of the work necessary for the operation and maintenance of such ditch or ditches, perform such share of the work, and recover therefore from such person or persons in default the reasonable expense of such work.

N.R.S. 536.050
STATEMENT OF EXPENSES CONSTITUTES VALID LIEN AGAINST PROPERTY OF DEFAULTING CO-OWNER.
Upon the failure of any co-owner to pay his proportionate share of such expense, as mentioned in N.R.S. or persons so performing such labor may secure payment of such claim by filing an itemized and sworn statement thereof, setting forth the date of the performance and the nature of the labor so performed, with the County Clerk of the county wherein the ditch is situated and when so filed it shall constitute a valid lien against the interest of such person or persons in default which lien may be established and enforced in the same manner as provided by law for the enforcement of mechanics' liens.

SECTION B: CONSTRUCTION AND MAINTENANCE

DRAINAGE

Drainage and wasteways will be provided by the District according to the following policies:

The District will operate and maintain all District drain easements as shown on District property and structure maps as approved or modified by the Board. The District will also maintain drainage pumping installations as accepted and approved by the Board. The scheduling of all drainage maintenance will be done by District staff in accordance with established priorities.

Drain water levels will be maintained at an economic level Project-wide and maintained as originally designed. The drainage system will not be construed as being designed to provide ground water relief to all irrigatable lands within the Project. If an open drain satisfactorily serves a farm unit with adequate ground water drainage, this is desirable but only coincidental to specific design.

It is recognized that applications for extensions and alterations to the existing drainage system will be received by the District. The applications for drain extensions will be reviewed with first priority being field surface runoff drainage and second priority being ground water relief. These applications must have Board approval in accordance with District policy. For applications to install a crossing in a drain or to pipe a drain or a lateral that is used as a drain, a 36" minimum polyethylene or concrete pipe and Bureau of Reclamation approval would be required. (02/07/00) The 36" minimum pipe size is necessary for maintenance purposes and is not related to the flow requirement. The District Engineer shall determine if a larger pipe size is necessary. (12/07/98)

When relocating laterals, and if recommended by the Drainage Committee, the party requesting the change will be responsible for lining the lateral, either with concrete or bentonite. (11/7/94)

It is recognized that under certain conditions ground water drainage problems will occur parallel to distribution system canals. It is the policy of the District to review these types of problems on a site by site basis. All sites will undergo recognized investigations and studies to determine true origin of drainage problems. Usage of District drain easements, which continually cause a need for repair to District facilities, shall be charged to the responsible party. District staff shall make such determination and notify the responsible party in advance of repair and that the expense of such repair will be charged to such party. (09/08/98)

All discharges of sewage effluent into District easements without a permit from the District shall be prohibited and reported to the proper authorities. (09/08/98)

Damages incurred to District drainage facilities will be pursued under the provisions of 539.783 of the Nevada Revised Statutes.

FIELD WASTEWAY STRUCTURES

It is the policy of the District to provide and maintain field wasteway structures. One wasteway will be provided per 40-acre tracts of land based on original homestead tracts. In instances where District-maintained facilities divide an original 40-acre tract, two wasteways will be provided. If it is determined that a landowner is not eligible for a wasteway, he may request the District to install the wasteway at the landowner's expense. The landowner may also install the wasteway under the District policy, "Construction by Private Parties Within TCID Easements". Installations under either option will not be replaced or maintained by the District.

The District will install one wasteway to District specifications for fields of less than 40 acres if the following requirements are met:

1. Access to a District drain must be available.
2. Adjoining property owners must cooperate to meet the 40-acre minimum.
3. Adjoining fields equaling at least 40 acres must use a common wasteway.
4. The property owners must construct and maintain surface drainage to the common wasteway.

All wasteway inlets will be sized by District staff. Installations of wasteways by District personnel will not constitute a continued maintenance responsibility of the District. (09/08/98)

STORM DRAINS

See the Bureau of Reclamation memorandum, Regional letter No. 03-11, dated September 19, 2003. (10/07/03**)**

UNDERGROUND TILE DRAIN

Underground tile drain installations that discharge into District easements require the approval of the District and shall be governed by the following principles:

1. If the tile drain is to discharge into District easements, the landowner must first obtain approval from the District for the depth and location of the tile drain discharge. Construction within the District's easement zone shall be in accordance with District policy.
2. If water from the tile drain is to be collected and/or applied to crops, then the District's approval must be obtained.
    a. Such pumped water can only be applied to water-righted land.
    b. Such applied water including all other water when applied to the land cannot exceed the total allocation allowed to the water-righted land.
    c. In determining the depth and extent of any underground drain pumping installation, the District will require data on the level of the

underground water which covers a minimum period of one calendar year (which is considered a normal or wetter than normal year in terms of irrigation allocation and precipitation). Such data must be collected from sites located in the vicinity of the proposed installation on a frequency of at least one observation per week and shall provide sufficient information to allow the District to determine the groundwater level in regard to the irrigation and non-irrigation seasons.

d. The pump size and outlet will be determined and limited in accordance with the specifications of the installation.

SECTION G: WATER

WATER SEASON

The water season in a normal 100% year will be from approximately March 15th to November 15th. Final determination of the season start and finish dates will be made by the Board of Directors. Factors such as snow pack, winter moisture in the Project area, water orders, applicable operating criteria and procedures, and storage will be considered in setting the starting and ending dates of the season. The Board will set the start of the season at the March Board Meeting.

The last day to accept water orders will be five days prior to the close of the irrigation season. In a normal season, November 10th will be the last day water orders will be accepted (or the next business day if the 10th is on a holiday or weekend). Requests for water delivery after the last day to order will not be guaranteed delivery.

Notice of the starting date and the closing date of the season will be posted in the Lahontan Valley News and in the Fernley Leader-Courier for five consecutive days. The closing date of the season and the last day to order water will be posted on the October water card in a normal water year. In a short water season, every effort will be made to post the last day for delivery of water and the last day to order water on the water card that is mailed prior to the close. (12/7/99)

CHANGE IN WATER DUTY

Upon request by the landowner or Bureau of Reclamation for a change in water duty on a farm unit or units of single ownership, the District's Board of Directors will review the request and make a recommendation to the Federal Water Master regarding the change in water duty. The recommendation will be based on information presented to the Board by the landowner and/or the Bureau of Reclamation as well as other information provided to the Board. Beneficial use of water for the production of alfalfa will be the standard to be applied when considering the amount of irrigation water necessary.

Information presented to the Board should include all relevant factors such as water tables; soil types and their water holding capacities; surrounding soil types; farming practices, which should include water conservation practices; cropping patterns and practices; and a history of water use. The information provided with the application for change in water allocation should be as complete as possible in order to avoid delays in the review process.

The following is a checklist of items that should be considered and included with the petition to the Board for a request in change in water allocation for an individual farm unit or units within the same ownership:

REQUIRED

1. Soil scientist review performed by NRCS or private consultant which would identify:
   a. Location of farm unit(s) on soil survey map
   b. Water holding capacity of soil(s)
   c. Water table data and monitoring information
   d. Recommendation of the soil scientist
2. Irrigation engineer review:
   a. Adequacy of maintenance of water user irrigation facilities
   b. Evaluation of the adequacy of TCID system with respect to the individual's operation
   c. Recommendation of the irrigation engineer as to how the applicant could improve his operation
3. Irrigation History: (5 to 10 year history)
   a. Number of acre-feet applied per irrigated acre
   b. Irrigation scheduling
   c. Acres in production
   d. Type of crop(s)
   e. Farm management

OPTIONAL: Cropping history to compare to "standard" yields

DELIVERY AND MEASUREMENT OF WATER

Current TCID policy requires that all deliveries of water be measured and reported accurately. The TCID Board and Management have invested considerable resources in new measuring devices and training of personnel to ensure that water deliveries are measured as accurately as possible.

It is the responsibility of every employee in carrying out these policies that they accurately interpret and record deliveries of water. In keeping with these policies, the TCID Board and Management prohibit the allocation or delivery of water above a water user's entitlement and also prohibit any writing off of water.

The District does not tolerate inaccurate reporting of water use. Each filled water order must contain time on, time off, flow rate, and the amount of water used. Disputes in water charged will be handled as described in the Procedures for the Ordering and the Delivering of Water.

On ditches with measuring devices, the metered totals must be used to record water usage with appropriate loss established by approved protocol for calculating seepage loss. Where multiple users are located along a metered canal or lateral, accurate times on and off must be recorded.

On ditches with no measuring devices, water delivered will be measured by the Ditchriders as accurately as possible, with accurate flow rates and times on and off.

Any employee who violates these policies will be subject to disciplinary measures. (07/09/07

INSTALLATION OF MEASUREMENT DEVICES:

Pursuant to the District's Water Conservation Plan, the District may need to install a water-measuring device on a water right owner's land. The District shall first request permission from the landowner for such installation. If permission is not granted, the District staff will refer the issue to the Board's O & M Committee for resolution. If further process is necessary, the matter shall be referred to the Board for action in reference to NRS 539.233. (08/08/01)

PROTOCOL FOR CALCULATING SEEPAGE LOSSES:

When a new measuring device is installed in a lateral, a method of calculating seepage losses incurred below the meter to the water user's takeout is needed. The Water Department will establish an initial loss based on other laterals in the vicinity and what has been established in the past. Current meter measurements will be made by TCID personnel during the irrigation season, measuring at the meter and at the takeout to determine losses. The losses will be averaged and prorated based on distance downstream of the meter to other takeouts on the lateral. These losses will be deducted from the measurement device readings. The start and stop times provided by the water user will be compared with the meter data to maintain consistency. The following guidelines should be followed to maintain a uniform application of seepage loss determinations:

- At least two sets of measurements at different times during the year should be used to determine losses.
- Water needs to be in the ditch for a minimum of two hours before measurements are taken. used at both locations.
- The loss will be a constant and not vary during the season.
- The same person and the same current meter need to be
- Any disputes on the application of seepage loss rates should be handled under the Procedure for the Ordering and the Delivering of Water.
- These seepage loss rates may be re-evaluated in the future if conditions warrant.
  (07/09/07)

TRANSFERS OF WATER RIGHTS

Temporary or Permanent Transfers

Any temporary transfer or permanent water right transfer must be filed and approved by the Nevada State Engineer 60 days prior to the end of a normal irrigation season (75% or above) for addition to the water right owner's allocation during the current irrigation season. During a short irrigation season (75% or below), the deadline for approval by the Nevada State Engineer would be July 1st. The District cannot guarantee that water will be available nor can the District guarantee delivery of water if the time limits as stated above are not adhered to.

(12/7/99)

Protest of Applications to Appropriate or Transfer Water

The District will protest all applications to appropriate or transfer the waters of the State of Nevada, which might negatively impact the Newlands Project.

Purchase/Transfer of Newlands Project Water Rights to Lahontan Valley Wetlands

1. The District has reviewed the Newlands Project map upon which the NRCS identified those areas having less productive lands by virtue of soil classification. The review concluded that the purchase and/or transfer of water rights presently located on those lands would not negatively impact the District's distribution system efficiencies if the following guidelines are adhered to. It is recommended that the purchase of water right:
   a. Concentrate on lands serviced by the same lateral or sub-lateral.
   b. Should begin at, and move upstream from, the terminus of the lateral/sub-lateral.
   c. Should be acquired in "blocks" or "groups" rather than helter-skelter, which would create a "checkerboard" effect.
   d. The water rights acquired should not cause negative impacts on the agricultural community and economy or the environment.
   e. The entity, "owner", must be willing to be financially and contractually responsible to make payment of the annual O&M charges for the Newlands Project.
2. Once the purchase water rights are transferred to the Lahontan Valley wetlands, no transfer of the water right should be allowed outside the Newlands Project. The water should be kept in the Lahontan Valley for use of the wetlands, which are an integral part of the Pacific Flyway.
3. The water should be stored in Lahontan Reservoir where it would be utilized prior to delivery to the wetlands for multiple beneficial uses.
   a. Recreational benefits will protect the State of Nevada's investment in Lahontan Reservoir and insure water-related recreation for future generations including but not limited to boating, water skiing, swimming, picnicking and fishing.
   b. Hydrogenation benefits which provide an environmentally clean (non-polluting) renewable energy resource.
   c. Fish and wildlife enhancement. (02/07/00)

WATER RIGHT TRANSFER CORRECTIONS

District engineering staff will provide in-house services (i.e. documents, maps, etc.) regarding water right transfer corrections without cost or charge to the water right

owner. (8/7/00)

UNAUTHORIZED USE OF WATER:

When the District staff becomes aware of an unauthorized use of water, such as the use of water without obtaining either a domestic or commercial pump permit, or having placed a water order, and/or without having been told to proceed by the ditchrider, or having proceeded in violation of the ditchrider's instructions, the staff shall notify such individual and place such circumstances in writing to the property owner and to the individual involved, and set up an appointment with the appropriate Board of Director's committee for discussion and resolution of the unauthorized use.

The committee shall have the authority to recommend to charge the individual's water account for such use, to restrict the individual's use of water in the future, and/or impose a financial penalty as set forth in the Fee Schedule, Section H. A financial penalty shall be imposed if there is no water available to charge against such unauthorized use. The committee may waive the financial penalty upon a signed stipulated agreement by the individual involved. Such recommended resolution shall be presented to the full Board of Directors at the next Board of Directors meeting for approval. (10/9/2000)

DELIVERY OF WATER TO NON-WATER-RIGHTED LAND

The District will not deliver water to fields that contain non-water-righted land that is being watered. Until the situation is corrected, the affected serial number will have its allocation reduced by the allocation on the field(s) in question.
Water users who are affected may correct this problem in the manner shown below:

a. If a field contains non-water-righted land that is being watered, the owner must come to the District office and obtain a picture of the questions field(s). The owner must decide what part or parts of the irrigated water rights in the field he wishes dewatered to make the irrigated acres and the water-righted acres balance. The owner will draw a picture of his intent and submit it to the District for approval.
b. Once the District approves the plan, the owner physically creates barriers, and the field(s) are inspected and approved by District employees, orders may be placed and water delivered that irrigation season.
c. The owner must then apply to the State Water Engineer for a permanent or temporary transfer of these rights, since this is allowed by state and federal law. The District will ask the Department of Interior to approve these transfers. Unless written objections are sent to the owner within 30 days, these transfers will be sent as a pre-approved batch of transfers with the support of the District and the

Department of Interior. The State Engineer will be asked to rush these transfers. (Deleted Sept. 7,2000 and to be reviewed by the policy committee for a new policy)

FERNLEY STOCKWATER PIPELINE

In the Fernley area, the District will provide stock water to specific water righted land through the Fernley stockwater pipeline system (see the Fernley Stockwater Pipeline map). The charge for service from the Fernley stockwater pipeline will be established annually by the Board. The Fernley stockwater pipeline water is not to be used other than for stock watering purposes.

When land that is serviced by the Fernley stockwater pipeline is divided or parceled, service from the stockwater pipeline shall be discontinued and the pipeline removed. However, service from the stockwater pipeline shall be continued to that portion of the divided land which is considered to be the original homestead if water rights are retained thereon and there continues to be a need for stockwater. (12/9/96)

If the Truckee Canal does not have enough water to provide water to the stockwater pipeline for reasons beyond the control of the District there is no responsibility of the District to provide water to the stock. If the outage of water in the Truckee Canal can be directly attributable to the District (maintenance on the Canal) then the District will be responsible to deliver water to the stock. (2/8/10)

ORIGINAL CONSTRUCTION CHARGES

Upon signing of a water right agreement, a parcel split, or a transfer of water rights, all remaining original construction charges shall be paid. (1/8/96)

RE-WATERING OF LANDS

If water rights are to be transferred to lands that have had their water rights previously removed, such re-watering shall be approved only when there is no adverse impact to operational efficiencies.

The District staff shall not permit a transfer of water rights, which increase the costs, or decreases the assessments or lessens the efficiency of the operations of the District.

TAKE-OUTS WHERE WATER RIGHTS HAVE BEEN REMOVED

When all active water rights are removed from land by a water right transfer permit issued by the Nevada State Engineer, the owner of the property will be notified by written notice that the takeout for the property will be made inoperable or removed so it can no longer be used. If the property owner does not formerly request an alternative, the takeout will be removed or made inoperable 60 days after the date of the letter. If the owner requests that a takeout not be removed or made

inoperable and such request is granted, then the owner will be given a one-year period of time to reactivate the water rights on the parcel . After that time, an annual fee equal to the sum of the Admin Account Charge and the Minimum water right assessment (see Fee Schedule, Section H) must be paid to keep the takeout from being removed. (02/07/01)

OPERATING FARM UNITS

Consolidation of irrigation allocations for an operating farm unit will be allowed if land is within the exact same ownership (i.e. John and Mary Doe to John and Mary Doe), or if land is leased from others and is part of an operating farm unit. In order to consolidate allocations for an operating farm unit, the owner must sign an acknowledgement form that the lease is for the entire irrigation season and is not revocable during that irrigation season. The owner must also acknowledge that the leased parcel will become part of an operating farm unit under the control of the farm operator. The farm operator must sign a separate acknowledgement form accepting responsibility for ensuring that non-water right land is not irrigated. No parcel can become part of an operating farm unit if water has already been delivered to that parcel that year. All taxes must be current on all parcels that become part of an operating farm unit. (02/07/01)

SECTION H: FEE SCHEDULE

ADMINISTRATIVE CHARGES

	FEE
Copying	
8½" x 11"	$ 0.40
All other sizes	$ 0.85
Property and Structure Maps (each sheet) (6/9/08)	$ 10.00
Settlement Map	$ 22.00
Drainage and Distribution Map	$ 22.00

Update Ownership Records (8/8/05)	$ 40.00
Water Right Detail Record (8/8/05)	$ 5.00
Water Right Agreement and Quitclaim Deed (9/9/02)	$400.00
Annual Fee for Administration of Water Right Agreement (6/9/08)	$ 70.00
Administrative/Construction Labor per hour charge (1 hour minimum) (6/9/08)	$ 40.00

CHARGES

O&M Charge – (all water right, except 1.5 a.f. duty) (4/7/09)	$ 39.00
Conservation Fund Charge (4/7/09)	$ 3.90
Kent/Freeman Agreements (1.5 a.f. allocation per acre)(4/7/09)	*$ 15.00
Project Efficiency Improvement Charge (4/7/09)	$ 2.00 per a.f. on last 2 a.f. of water duty
District General (per acre for each parcel in project) (5/17/10)	$ 4.00
Admin Account Charge (per parcel) (5/07/10)	$110.00
Minimum water right assessment (5/07/10)	$220.00
Fernley pipeline service (6/9/08)	$240.00
Spreadwater Water-righted land Non-water-righted land	 25¢ per a.f. $1.00 per a.f.
Water taken without a water order or without authorization See Policy on "Unauthorized Use of Water"	$500.00 minimum and $100.00 for each .5 a.f. taken up to 1 a.f. and then $200.00 for each .5 a.f. above 1 a.f.
Kent/Freeman Agreements *(10/07/02) $9.27 O & M *(10/07/02) $1.03 for Conservation Fund *(10/07/02) $1.00 On last af for Project Efficiency Improvement	Box intentionally blank

	FEE
CONSTRUCTION LICENSES:	
License Fee (6/9/08)	$300.00
Inspection Fee (1% construction costs or whichever is greater) (6/9/08)	$300.00
Utilities Installation (6/9/08)	$300.00
Inspection fee - fences, gates, & removable walk bridges (6/9/08))	$120.00
Repair that does not need complete replacement (6/9/08)	$ 50.00
Renewal of license	½ license fee
Box Culverts (Minimum Construction Deposits) (05/07/03)	$1,000.00
Pipe Culvert Installation (Minimum Construction Deposits) (05/7/03)	$600.00
GRAZING FEES:	
Per head Carson Lake Pasture	$7.00
50¢ Surcharge plus cost of vaccine/ear tags (06/09/03)	Box intentionally blank
Leases per acre ($100 minimum)	$2.00
PARCEL MAP/BOUNDARY LINE ADJUSTMENT REVIEW: (08/08/01)	
Minimum per map (includes first correction) (8/8/05)	$200.00
Each subsequent correction (8/8/05)	$200.00
Tentative Maps (8/8/05)	$165.00
Review of subdivision Improvement Plans	$300.00
PUMP PERMITS	
Domestic pump incidental to other water right (6/9/08)	$200.00
Commercial-per pump installation with water right permit(6/9/08)	$200.00
Stockwater agreement-incidental to other water right (6/9/08)	$200.00
RELEASE OF EASEMENT, ETC.	
Filing Fee (6/9/08)	$300.00
Review/preparation of required documents (6/9/08)	$300.00
GRAVEL PIT PERMIT	
For approved job. To be completed within 30 days.	$ 50.00
TRAVEL RATE	
Vehicle Mileage Reimbursement per mile for employee use of personal vehicle for District business	IRS Allowed Amount (10/07/02)

SECTION J: FORMS, SPECIFICATIONS, & CONSTRUCTION STANDARDS

TRUCKEE-CARSON IRRIGATION DISTRICT
APPLICATION AND CERTIFICATION FOR GRAZING
CARSON LAKE PASTURE

I hereby **APPLY** for pasturage for the livestock designated below in the Carson Lake Pasture subject to the Rules and Regulations adopted by the Truckee-Carson Irrigation District. I attach herewith a check covering two months advance grazing fees plus vaccine and insecticide costs on all paying stock. In addition, I agree to pay any vaccination and grazing charges upon demand therefore. In the event of my failure to pay surcharges within ten days after demand for such payment, I hereby authorize you to sell a sufficient number of my livestock to satisfy your claim. And I do hereby, for myself and for my heirs, executors, administrators or assigns, waive any claims for damages which may have or which may accrue to me by reason of any loss or injury received by any of the stock hereinafter described while in the District's care and custody. I also release the District from any liability for loss or damage to property and shall indemnify and hold harmless the District from all liability, cost and expense for loss suffered by the user for injuries to person or property or deaths of persons arising directly or indirectly from the issuance of this permit for use of the pasture grazing areas.

Cows_____Heifers _____Two (2) Months Advance Grazing Fee: _____

Bulls _____Steers _____Vaccine/Insecticide Costs: _____

Total Paid: _____

I, the undersigned, hereby **CERTIFY** that the cattle, which will be entered into the grazing areas, are the same as appear on the certificate issued by a licensed veterinarian, which guarantees that this stock is free from brucellosis. I further certify that this stock was at no time allowed to commingle with any other stock following the issuance of the certificate issued by the veterinarian. I realize that misrepresentation of this stock can result in all or any part of the entire herd being removed from District pastures at the District's discretion and may jeopardize future permits in District grazing areas.

APPLICANT

Print: _____**TCID Serial #:** _____**W/R Acres Owned**: _____

W/R Acres Leased: _____

Signed:_____Date:_____

This application for Permit is **not** valid until approved by the Board of Directors and signed by the President.

_____ _____

President, Board of Directors **Date**

TRUCKEE-CARSON IRRIGATION DISTRICT
RULES AND REGULATIONS

CARSON LAKE PASTURE GRAZING AREA

All Carson Lake Pasture grazing area applications, both Old and New users, must be filed with and received by the District annually **on or before March 1**. Fees for vaccine, insect control and for two (2) months grazing must accompany the application for both Old and New users.
The animal unit monthly rate for fees and insect control will be established at the Truckee-Carson Irrigation District Board of Director's regular meeting in February of each year.
The following stock shall be included in the overall application and permit: cows, heifers, steers and bulls. Pasture users must supply one bull to each twenty-five (25) head of cows or fraction thereof entered in the pasture. No application will be accepted for less than one increment, i.e., 26 head.

Permits will be limited to the following:

1. Two head of paying stock per each water-right acre owned as recorded on Truckee-Carson Irrigation District records. Owner water users shall be given first priority in pasture.
2. One head of adult paying stock per water-right acre leased upon written proof of the lease for Truckee-Carson Irrigation District's records. Resident lessee water users shall be given second priority in pasture. All proof of ownership or lease of water-right lands shall be the responsibility of the applicant and not the Truckee-Carson Irrigation District. No user shall be allowed over four hundred (400) head of paying stock except at the discretion of the Board of Directors.

The District's Board of Directors will review the applications at their regularly scheduled Board meeting in March. At that time, the Board will establish the number of cattle that the Carson Lake Pasture will be able to serve. The Board will also establish the number of cows, heifers, steers and bulls that will be acceptable into the grazing area based upon the applications submitted and the condition of the grazing area. If insufficient applications are received and approved by the Board of Directors from Old Users to fill the pasture area to capacity, the balance of capacity shall be filled from New Users in the priority of New User depending upon availability in that particular category of stock.

Permits will be awarded by the following definitions:

1. "Old User" - those who have used the grazing area for the past three years; and
2. "New User" - new user qualifies as an "Old User" when he has been in the pasture for three (3) consecutive years. In case the "New User" is held out of the pasture for one or more years by Board action due to a shortage of water, he will not lose his years of use already accumulated toward qualifying as an "Old User". "New Users" are given priority amongst themselves based on the number of years they have been permitted in the pasture if not qualified as an "Old User" and then by the date "New User" continuously submitted applications.

Pasture areas usually open in the spring between April 1 and April 15. Proposed opening date will be set at the regular board meeting in March of each year and the pasture manager will have discretion to open as close to that date as feed allows. Permitted stock shall be entered in the grazing area by June 1 and each permittee shall be charged for permitted stock for a minimum of 120 days, if application is approved by the Board. Written notice will be sent to applicants of the action taken by the Board of Directors at the regular March Board meeting.
The permittee who must remove stock from the pasture because it is sick may:

1. Replace the sick animal; or

2. Re-enter the sick animal when it is well. However, the animal in question must be identified by the pasture manager as being "sick" before it is released to allow the permittee the above option.

All Cattle, including heifer calves over the age of six (6) months, prior to entry into a Truckee-Carson Irrigation District controlled grazing area must have been vaccinated for brucellosis. Results of tests are to be provided to the District pasture manager before stock is entered in the pasture area. Owner of such stock must also certify that the stock represented by the testing record is the same as that which is now being entered and that this stock was at no time allowed to commingle with any other stock following testing. (02/07/02)

All bulls shall be tested for trichomonas and receive a veterinarian certification showing the bulls are free of trichomonas prior to entering the pasture. The testing veterinarian will tattoo the bull's ear at the time of the test with a number that corresponds with the paperwork. The certification and tattoo on the bull must match and will be presented to the Pasture Manager at entry. (2/7/01)

All paying cattle (all livestock 6 months or older whether weaned or not are considered paying cattle) entering the pasture must be branded with permittee's brand as registered in the Nevada State brand book.

Pasture personnel will administer vaccine and oversee application of insecticide ear tags.
No branding or marking of cattle will be allowed after stock has been put in the pasture area, unless approved by and under the direction of the pasture manager. All paying cattle must be counted in and out by pasture personnel. Pasture personnel will be available Monday through Friday each week to receive or release stock; no stock will be received or released Saturdays or Sundays. Before riding in any of the pasture areas to check cattle, user must notify pasture personnel

In the event that there is insufficient feed in the area, "New Users" shall first be reduced proportionately. Should there still be insufficient feed to accommodate the "Old Users", then they will be cut proportionately. If a permittee does not fill his permit for any year, and does not pay the 120 days, the following year his permit will be reduced to that number of head actually entered in that prior year.

If permittee does not enter sufficient stock to fill his permit, he may retain the permit by paying grazing vaccination charges and insect control charges for a 120 day period on the entire permit, to be paid by November 15 of the current year. This privilege of retaining the permit by the paying of fees for the 120 day period shall pertain to one year only and must be followed by a season of actual use before the retention privileges can again be applied.

After being contacted by the pasture manager, the user shall bring his bulls within 15 days. Failure to do so will result in a $100 per bull penalty and loss of pasture privilege for user's remaining cattle. Loss of pasture privilege will be reinstated only upon authority of the Board of Directors. Bulls must be acceptable to the pasture manager and full discretion as to bull scheduling will be given to him.

Bulls shall be removed within fifteen (15) days following notification by pasture manager. The 120-day requirement shall not apply to bulls. Bulls will be charged for only the number of days actually in the pasture, but in no case will it be less than 60 days. Final discretion as to bulls in and out of the pasture is granted to the pasture manager.

Pasture users will be notified immediately of any identifiable loss that is discovered by pasture personnel. Every effort shall be made by the pasture manager to identify all livestock. Any unidentified stock shall be sold through proper channels.

Any pasture user not assisting in gathering and working of stock as required by the pasture manager is to be fined $1.00 per head of stock owned by that user in the pasture. Help required in gathering and working stock will be one man per 75 head or portion thereof to a maximum of three men.

Pasture bills must be paid before removal of livestock. Bills may be paid at the Truckee-Carson Irrigation District offices at 2666 Harrigan Road, twenty-four (24) hours before removal, or to the Pasture Manager the day of removal. No permanent pasture employees shall be allowed to run stock in the pastures.

Pasture areas shall be closed on November 15 and all stock must be removed by this date. Any livestock not so removed shall be gathered and sold. Specific days for removal of stock from the pasture areas may be set by the pasture manager and users so notified.

When a permittee sells the property, which supports his permit by virtue of water-right acreage requirements, the permit is terminated at the end of the grazing season then in effect. If title to the property changes as a result of an estate proceeding, the permit will be transferred to the heir(s), the intent being to maintain continuity of the farming operation. However, any further disposition of the property to the extent that it affects the status of the grazing permit must come before the Board of Directors for individual review.

Failure to comply with any of the rules shall be reason for cancellation of permit.

I, _____, AGREE TO BE GOVERNED BY THE ABOVE RULES AND REGULATIONS.

_____ _____

Signature of Permittee **Date**

TRUCKEE-CARSON IRRIGATION DISTRICT
NEWLANDS PROJECT, NEVADA
PERMISSION FOR INSTALLATION AND MAINTENANCE OF PRIVATE
COMMERCIAL PUMP

TAG #«tag»
SERIAL #«ser_no»

«name», the undersigned applicant, hereby accepts full responsibility for the entire costs involved in the construction and removal of a private pump installation for commercial purposes within the Newland's Project.
Such installation is to be made at the following location:

STREET ADDRESS: **«pump_add»**
LEGAL DESCRIPTION: **«legdescipt_dist»** District
SECTION: **«sec»**, TOWNSHIP: **«town»** North, RANGE: **«range»** East, M.D.B.&M.
LATERAL/CANAL/DRAIN/RIVER: **«lateral»**

This agreement of use is granted upon the following terms and conditions:

1. The applicant shall be liable for any and all damages to the property of the United States, the District or of any third party or parties by reason of the exercise of privileges conferred by this permission of use.
2. The pump installation shall be so constructed as not to obstruct in any manner whatsoever the flow of water in the canals, laterals or drain ditches operated and maintained by the District. Any interference in any manner whatsoever with the construction, operation and maintenance of any part of the Newlands Project will be cause for removal.
3. Pump and inlet lines are to be removed after the irrigation season. Those not removed will be confiscated by the District if they present an obstacle in any form to the District's regular maintenance program. Pumps for domestic purposes shall not exceed a maximum discharge of one and one-half (1-1/2) inches in diameter. Inlet lines crossing maintenance roads are to be buried at least six (6) inches deep but no more than one foot deep.
4. The cost of construction and maintenance of the pump shall be the responsibility of the applicant.
5. It is subject to an annual fee as set by the District’s Board of Directors and the current District policies.
6. This permit is for commercial pumping: **«description»**.
7. Approximately **«gallons»** gallons per day when in use.
8. The construction and maintenance of the pump installation shall be in accordance with the following additional conditions: **«conditions»**
9. This agreement is personal, revocable, and nontransferable.
10. This agreement will terminate:
    - If applicant fails to pay the annual charge when due.
    - If the Truckee-Carson Irrigation District, or applicant, disposes of its or his interest in the land upon which this agreement applies.
    - Upon failure of applicant to comply with any of the provisions of this agreement, or
    - If this agreement is ever considered detrimental to the public interest.

Upon termination, the District will send a notice of allowing the applicant thirty (30) days to remove the pump and all accessories. Upon failure of applicant to remove the installation, the District, without any liability for so doing, may remove the pump and all accessories at the cost of the applicant. Any costs or expenses incurred by the District shall become a lien upon applicant's property and collected in the same manner as all other liens.

Dated at Fallon, Nevada this _____ day of _____, 20___.

_____ _____

«name» **«title»**

Name: **«name»**
Mailing Address: **«mailadd», «city_st_zip»**

Witness:_____

Truckee-Carson Irrigation District

Approved this _____ day of _____, 20_____.

_____

Rusty D. Jardine, Esq., Project Manager

TRUCKEE-CARSON IRRIGATION DISTRICT
NEWLANDS PROJECT, NEVADA
PERMISSION FOR INSTALLATION AND MAINTENANCE OF PRIVATE
DOMESTIC PUMP

SERIAL #«ser_no»
SUB. #«sub_no»
TAG #«tag»
APN «apn»

«name», the undersigned applicant, hereby accepts full responsibility for the entire costs involved in the construction and removal of a private pump installation for domestic purposes within the Newland's Project.

Such installation is to be made at the following location:

PUMP ADDRESS: **«pump_add»**
LEGAL DESCRIPTION: **«legdescipt_dist» District**
SECTION: **«sec»,** TOWNSHIP: **«town»** North, RANGE: **«range»** East, M.D.B.&M.
LATERAL/CANAL/DRAIN/RIVER: **«lateral»**

This agreement is granted upon the following terms and conditions:

1. The applicant shall be liable for any and all damages to the property of the United States, the District or of any third party or parties by reason of the exercise of privileges conferred by this permission.
2. The pump installation shall be so constructed as not to obstruct in any manner whatsoever the flow of water in the canals, laterals or drain ditches operated and maintained by the District. Any interference in any manner whatsoever with the construction, operation and maintenance of any part of the Newlands Project will be cause for removal.
3. Pump and inlet lines are to be removed after the irrigation season. Those not removed will be confiscated by the District if they present an obstacle in any form to the District's regular maintenance program. Pumps for domestic purposes shall not exceed a maximum discharge of one and one-half (1-1/2) inches in diameter. Inlet lines crossing maintenance roads are to be buried at least six (6) inches deep but no more than one foot deep.
4. The cost of construction and maintenance of the pump shall be the responsibility of the applicant.
5. It is subject to an annual fee as set by the District’s Board of Directors and the current District policies.
6. Such domestic use shall be in conjunction with a residence for a lawn, garden, orchard, or pasture area for domestic animals and shall not exceed 1,800 gallons a day.
7. This agreement is for domestic pumping: **«description».**
8. The construction and maintenance of the pump installation shall be in accordance with the following additional conditions: **«conditions»**
9. This agreement is personal, revocable, and nontransferable.
10. This agreement will terminate:
    - If applicant fails to pay the annual charge when due.
    - If the Truckee-Carson Irrigation District, or applicant, disposes of its or his interest in the land upon which this agreement applies.

- Upon failure of applicant to comply with any of the provisions of this agreement, or
- If this agreement is ever considered detrimental to the public interest.

Upon termination, the District will send a notice of allowing the applicant thirty (30) days to remove the pump and all accessories. Upon failure of applicant to remove the installation, the District, without any liability for so doing, may remove the pump and all accessories at the cost of the applicant. Any costs or expenses incurred by the District shall become a lien upon applicant's property and collected in the same manner as all other liens.

Dated at Fallon, Nevada this _____ day of _____, 20___.

_____ _____

«name» **«name»**

Name: **«name»**
Mailing Address: **«mailadd» «city_st_zip»**

Witness: _____

Approved this _____ day of _____, 20_____.

Truckee-Carson Irrigation District

_____

Rusty D. Jardine, Esq., Project Manager

TRUCKEE-CARSON IRRIGATION DISTRICT
NEWLANDS PROJECT, NEVADA
INSTALLATION AND MAINTENANCE OF PRIVATE
WATER RIGHT PUMP

SERIAL #«ser_no»
SUB #«sub_no»
TAG #«tag»
APN «apn»

«name», the undersigned applicant, hereby accepts full responsibility for the entire costs involved in the construction and removal of a private pump installation for water right purposes within the Newland's Project.

Such installation is to be made at the following location:

STREET ADDRESS: **«pump_add»**
LEGAL DESCRIPTION: **«legdescipt_dist» District**
SECTION: **«sec»,** TOWNSHIP: **«town»** North, RANGE: **«range»** East, M.D.B.&M.
LATERAL/CANAL/DRAIN/RIVER: **«lateral»**

This agreement is granted upon the following terms and conditions:

1. The applicant shall be liable for any and all damages to the property of the United States, the District or of any third party or parties by reason of the exercise of privileges conferred by this license.
2. The pump installation shall be so constructed as not to obstruct in any manner whatsoever the flow of water in the canals, laterals or drain ditches operated and maintained by the District. Any interference in any manner whatsoever with the construction, operation and maintenance of any part of the Newlands Project will be cause for removal.
3. Pump and inlet lines are to be removed after the irrigation season. Those not removed will be confiscated by the District if they present an obstacle in any form to the District's regular maintenance program. Pumps for domestic purposes shall not exceed a maximum discharge of one and one-half (1-1/2) inches in diameter. Inlet lines crossing maintenance roads are to be buried at least six (6) inches deep but no more than one foot deep.
4. The cost of construction and maintenance of the pump shall be the responsibility of the applicant.
5. This agreement is for a water right pump permit: **«description».**
6. This pumping installation is to be used to irrigate **«ppalloc»** acres of water righted land with a duty of **«duty»** per acre and an allocation of **«afused» a.f.** annually. Such amount will annually be charged to T.C.I.D. Serial No**. «ser_no».**
7. The construction and maintenance of the pump installation shall be in accordance with the following additional conditions: **«conditions»**
8. This agreement is personal, revocable, and nontransferable.
9. This agreement will terminate:
   - If applicant fails to pay the annual charge when due.
   - If the Truckee-Carson Irrigation District, or applicant, disposes of its or his interest in the land upon which this agreement applies.
   - Upon failure of applicant to comply with any of the provisions of this agreement, or

- If this license is ever considered detrimental to the public interest.

Upon termination, the District will send a notice of allowing the applicant thirty (30) days to remove the pump and all accessories. Upon failure of applicant to remove the installation, the District, without any liability for so doing, may remove the pump and all accessories at the cost of the applicant. Any costs or expenses incurred by the District shall become a lien upon applicant's property and collected in the same manner as all other liens.

Dated at Fallon, Nevada this _____ day of _____, 20___.

_____ _____

«name» **«name»**

Name: **«name»**
Mailing Address: **«mailadd» «city_st_zip»**

Witness: _____

Approved this _____ day of _____, 20_____.

Truckee-Carson Irrigation District

_____

Rusty D. Jardine, Esq., Project Manager

WATER RIGHT AGREEMENT - IRRIGATION PLAN

THIS WATER RIGHT AGREEMENT, made and entered into this _____ day of _____, 20__, between **«name»**, of the County of **«county»**, State of **«state»**, hereinafter referred to as "Grantor" and TRUCKEE-CARSON IRRIGATION DISTRICT, hereinafter referred to as "District".

WITNESSETH

WHEREAS, Grantor has acquired certain water entitlements within the Newlands Project of the State of Nevada, amounting to **«totalacres»** acre(s) of water rights bearing the District Serial # **«serialno»** and **«county»** County Assessor's # **«apn»**; and

WHEREAS, Grantor has submitted to the appropriate authorities in **«county»** County, a parcel map, District Map Identification # **«idno»**, **«county»** County File # _____ (to be inserted when final maps are recorded) which seeks to subdivide water-righted land; and

WHEREAS, the District and **«county»** County require that all water-righted parcel(s) have easements dedicated for the continuance of irrigation deliveries to such parcel(s), as well as provisions for drainage, a water user's association, and other criteria; and

WHEREAS, Grantor desires to continue irrigation of the entire **«totalacres»** acres of water rights during the **«present_yr»** irrigation season before the installation of the irrigation system that is required to irrigate each of the **«parcels»** parcel(s) separately; and

WHEREAS, the District has agreed to accommodate Grantor by accepting the following water rights as security for grantors promise to install the irrigation system to each parcel after the **«present_yr»** irrigation season and before the **«next_yr»** irrigation season.

«description», M.D.B.&M., in the **«county»** County Records. (See Quitclaim Deed recorded with this agreement); and

NOW THEREFORE, the parties agree as follows:

1. Grantor understands and agrees that by signing this agreement and Quitclaim Deed, the District will own, in trust, and control such water rights that are appurtenant to the above-described parcels. Grantor further understands that as long as these water rights are in trust, Grantor will not be able to vote such water rights at District elections.
2. Grantor understands that the District's subdivision policy requires an irrigation system approved by the District, which provides a method and means to separately irrigate each subdivided parcel. However the existing irrigation system and crop on the entire **«totalacres»** acres of water rights is not in compliance with the District's policy, but Grantor desires to continue the existing irrigation of the **«totalacres»** acres of water rights and wait until the end of the **«present_yr»** irrigation season before installing the required irrigation system to each parcel.
3. Grantor understands that this Water Right Agreement and Quit Claim Deed are for the purpose of securing to the District the Grantor's promise to comply with the District's subdivision policy prior to the **«next_yr»** irrigation season.
4. The District agrees to allow the Grantor to continue irrigation of the **«totalacres»** acres of water righted land without complying with the District's subdivision policy for the **«present_yr»** irrigation season only based upon the unique circumstances of Grantor's irrigation system now in place.
5. Grantor understands and agrees that the District will release its security interest in the **«totalacres»** of water rights upon the Grantor completing the installation of the

required irrigation system to each of the **«parcels»** parcels prior to the **«next_yr»** irrigation season.

6. Grantor further understands and agrees that should he/she fail to install the irrigation system prior to the **«next_yr»** irrigation season that the water rights will then be held in trust by the District as if the land was developed as non-water righted land and the Grantor shall then comply with all the other terms and conditions of this agreement or otherwise the water rights will belong to the District.

7. Grantor understands that such water rights or portion thereof may be used by Grantor on the hereinabove described parcels only upon the following conditions:

   - Grantor has made application to the District prior to February 15th of the year in which Grantor wants to use such water and water rights.
   - Grantor has paid all taxes and assessments on such water rights and there are no delinquent taxes and assessments outstanding.
   - Grantor has reserved such water and water rights in any deed or other instrument, which conveys any portion of the land to which the water rights are appurtenant.

8. Grantor further understands that if the water and water rights or portion thereof are to be sold, transferred, deeded or otherwise disposed of, Grantor must first obtain the permission of the District for such sale, transfer, conveyance or disposition. The District agrees not to unreasonably withhold the District's permission to such disposal as long as Grantor has complied with all the terms of this agreement. Upon sale or other disposition the new owner shall sign and execute an agreement with the District similar to the terms hereof until the water and water rights have been approved for transfer to other lands by the Nevada State Engineer.

9. Grantor understands and agrees that the District will not approve sale or transfer of "active" water rights only without additional or different security provided to the District on the remaining water rights.

10. Grantor understands that there is remaining outstanding at this time the amount of _____ as and for the original construction obligation of the water rights herein; and Grantor agrees to pay in full such outstanding obligation at the time of approval of this Water Right Agreement.

11. If Grantor does not notify the District by February 15 of Grantors intended use (see para. 2) or has not notified the District of a sale or other disposition of such water rights (see para. 3), Grantor understands and agrees that the District may temporarily transfer or use such water and water rights for any and all beneficial purposes that the District deems to be in the best interests of the District.

12. Grantor warrants that the ownership rights to the water entitlements that are described herein, within the Newlands Project amounting to **«totalacres»** acres of water rights which currently bears the District Serial # **«serialno»** and **«county»** County Assessor # **«apn»** have not previously been transferred, sold or otherwise assigned.

13. At the time of signing of this agreement, Grantor warrants that all assessments and charges against the District's Serial # **«serialno»**, **«county»** County Assessor # **«apn»** have been paid in full or have been assessed on the current tax roll and such taxes are in good standing and are not delinquent.

14. Grantor understands and agrees that the divided parcel(s) will be taxed and assessed annually and such parcel(s) will be subject to such assessments of the District until the water right has been approved for transfer to other land by the Nevada State Engineer. Until such time as the State Engineer approves the transfer of such water right, the Grantor agrees to pay upon billing and within thirty (30) days thereof, all water and other assessments levied upon such parcel(s) by the District.

15. It is further understood and agreed that should the O&M assessments not be paid within thirty (30) days, such assessments and charges shall bear interest at the rate of 1-1/2% per month until paid; that should such assessments and charges not be paid for a period of three (3) years, such water right quitclaimed to the District shall thereafter become the property of the District and all rights of Grantor shall be permanently transferred to the District for such delinquency.
16. It is further understood and agreed that should the District actually use the water and water rights or portion thereof during any year then the Grantor would not be billed for or have any obligation for the District O&M assessments for the portion of water rights used for that particular year.
17. It is further understood that it is the District's policy to only sign one water right agreement with respect to the division of water right land, therefore it is agreed that Grantor(s) will not, nor will Grantor(s) heirs successors and assigns, request the District to sign any other water right agreement that involves the water rights (amounting to **«totalacres»** acres) as shown on parcel(s) **«parcels»** of the parcel map **(**District's map Id **#«idno»)** and the map attached to the quitclaim deed executed as part of this agreement.
18. This agreement shall inure to the benefit and bind the heirs, executors, administrators, and assigns of the parties hereto.

The address to which the District shall send the invoice for the O&M assessment shall be as follows, unless the District is notified in writing of a change of address prior to April 15th.

Name: **«name»**
Address: **«address»**

IN WITNESS WHEREOF, the parties hereto have hereunto set their hands the day and year first above written.

_____ _____

«name» **«name»**

TRUCKEE-CARSON IRRIGATION DISTRICT

_____

Rusty D. Jardine, Esq., Project Manager

STATE OF **«state»**)
)ss
COUNTY OF **«county»**)

On this _____ day of _____, 20____, personally appeared before me, a Notary Public in and for the County and State aforesaid, **«name»**, known to me to be the person(s) described herein and who executed the above and foregoing instrument who acknowledged to me that he/she/they executed the same freely and voluntarily and for the uses and purposes therein mentioned.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal the day and year first above written.

_____
Notary Public

STATE OF NEVADA)
)ss
COUNTY OF CHURCHILL)

On this _____ day of _____, 20____, personally appeared before me, a Notary Public in and for the County and State aforesaid, **Rusty D. Jardine, Esq., Project Manager** of the Truckee-Carson Irrigation District, who acknowledged to me that he executed the above and foregoing instrument freely and voluntarily on behalf of the Truckee-Carson Irrigation District for the uses and purposes therein mentioned.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal the day and year first above written.

_____
Notary Public

MAIL TO: Truckee-Carson Irrigation District
P.O. Box 1356
Fallon, NV 89407-1356

QUITCLAIM DEED
OF NEWLANDS PROJECT WATER RIGHTS ONLY

TO ALL CONCERNED, and more specifically to the Truckee-Carson Irrigation District:

On this _____ day of _____, 20____, A.D., I/WE, **«name»**, of **«county»** County, **«state»**, do hereby quitclaim to the Truckee-Carson Irrigation District of **Churchill** County, Nevada, the water right entitlements only to **«county»** County Assessor # **«apn»** bearing the District Serial # **«serialno»**, **«county»** County File # _____ (to be inserted when final map is recorded) and District Map ID # **«idno»** amounting to **«totalacres»** acres of water rights on the following described parcel:

«description», in the **«county»** County Records. (See Exhibit "A").

I/WE **«name»**, do hereby represent said water rights to be free and clear of all liens and encumbrances. The terms of this quitclaim shall be binding upon the heirs, successors, and assigns of the signatory parties hereto forever.

The agreement and this quitclaim will be recorded in the office of the County Recorder, in the County of **«county»**, State of Nevada, where the above described water rights are located.

Dated this _____ day of _____, 20___.

_____ _____
«name» **«name»**

STATE OF **«state»**)
)ss
COUNTY OF **«county»**)

On this _____ day of _____, 20____, personally appeared before me, a Notary Public in and for the County and State aforesaid, **«name»** known to me to be the person(s) described herein and who executed the above and foregoing instrument and who acknowledged to me that he/she/they executed the same freely and voluntarily and for the uses and purposes therein mentioned.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal the day and year first above written.

_____
Notary Public

MAIL TO: Truckee-Carson Irrigation District
P.O. Box 1356
Fallon, NV 89407-1356

APPENDIX D – DISTRICT SAMPLE BILLS AND WATER CARD

Page Number	Title
D-1	Sample Bills for O&M Fees
D-4	Sample Water Card

Truckee-Carson Irrigation District

P.O. Box 1356
Fallon, NV 89407-1356
775 423-2141

Invoice

Date	Invoice #
7/16/2010	2232

PAID

Bill To

Kenneth K. Kent Trust
C/O Peggy Witte
P.O. Box 1096
Blaine, WA 98230

P.O. No.	Terms	Due Date	Account #	Project
	Net 30	8/15/2010	1116	

Description	Qty	Rate	Amount
2010-2011 O&M Assessment Minimum Charge @220.00 (less then 4.46 acres) Serial Number 565-10-D	1	220.00	220.00
2010-2011 O&M Assessment Minimum Charge @220.00 (less then 4.46 acres) Serial Number 565-10-D-1	1	220.00	220.00
2010-2011 O&M Assessment Minimum Charge @220.00 (less then 4.46 acres) Serial Number 565-10-D-2	1	220.00	220.00
2010-2011 O&M Assessment Minimum Charge @220.00 (less then 4.46 acres) Serial Number 565-10-D-3	1	220.00	220.00
2010-2011 O&M Assessment Minimum Charge @220.00 (less then 4.46 acres) Serial Number275-B	1	220.00	220.00
2010-2011 O&M Assessment Minimum Charge @220.00 (less then 4.46 acres) Serial Number 705	1	220.00	220.00
2010-2011 O&M Assessment Minimum Charge @220.00 (less then 4.46 acres) Serial Number705-1	1	220.00	220.00
2010-2011 O&M Assessment Minimum Charge @220.00 (less then 4.46 acres) SN 536	1	220.00	220.00
2010-2011 Operation & Maintenance Administrative fee @ $110.00 per parcel	8	110.00	880.00
CORRECTED INVOICE			

Total	$2,640.00
Payments/Credits	$-2,640.00
Balance Due	$0.00

Web Site
www.tcid.org

CAGE / NCAGE: 1XMG2

DUNS: 023191893

Truckee-Carson Irrigation District

P.O. Box 1356
Fallon, NV 89407-1356
775 423-2141

Invoice

Date	Invoice #
7/20/2010	2234

PAID

Bill To

Churchill County School District
Accounts Payable
545 E. Richards St.
Fallon, NV 89406

P.O. No.	Terms	Due Date	Account #	Project
	Net 30	8/19/2010	1067	

Description	Qty	Rate	Amount
2010-2011 Operation & Maintenance of Irrigation System per water righted acre SN 708-12-A	1	220.00	220.00
2010-2011 Operation & Maintenance of Irrigation System per water righted acre SN 616	41.7	44.90	1,872.33
2010-2011 Operation & Maintenance of Irrigation System per water righted acre SN 704-3	26.83	44.90	1,204.67
2010-2011 Operation & Maintenance of Irrigation System per water righted acre SN 704-3-A	26.84	44.90	1,205.12
2010-2011 Operation & Maintenance of Irrigation System per water righted acre SN 708-12	7.21	44.90	323.73
2010-2011 Operation & Maintenance of Irrigation System per water righted acre	-17.2	44.90	-772.28
2010-2011 Operation & Maintenance Administrative fee @ $110.00 per parcel	5	110.00	550.00

Total	$4,603.57
Payments/Credits	$-4,603.57
Balance Due	$0.00

Web Site
www.tcid.org

CAGE / NCAGE: 1XMG2

DUNS: 023191893

Truckee-Carson Irrigation District

P.O. Box 1356
Fallon, NV 89407-1356
775 423-2141

Invoice

Date	Invoice #
6/1/2010	2167

PAID

Bill To

Bureau of Indian Affairs
C/O Bureau of Reclamation
ATTN: Cathy Wilson
705 N. Plaza St., Rm. 320
Carson City, NV 89701

P.O. No.	Terms	Due Date	Account #	Project
	Net 30	7/1/2010		

Description	Qty	Rate	Amount
2010-2011 Operation & Maintenance of Irrigation System per water righted acre	5,979.89	44.89983	268,496.06
2010-2011 Operation & Maintenance Administrative fee @ $110.00 per parcel	81	110.00	8,910.00

Total	$277,406.06
Payments/Credits	$-277,406.06
Balance Due	$0.00

Web Site
www.tcid.org

CAGE / NCAGE: 1XMG2

DUNS: 023191893

TRUCKEE-CARSON IRRIGATION DISTRICT
P.O. BOX 1356
FALLON, NV 89407-1356
PHONE: (775) 423-2141
FAX: (775) 423-5354

WATER USAGE SUMMARY

UNITED STATES POSTAGE PAID FIRST CLASS PERMIT NO. 7 FALLON, NEVADA

INCLUDES ORDERS FILLED THROUGH: 08/31/10 Season Completed: 67.53%
WATER ORDERS: (775) 423-6511 (877) 803-7166 Allocation Used: 46.56%

ORDER #	START OF RUN		END OF RUN		TOTAL HOURS	CUBIC FT/SEC	ACRE FEET USED THIS RUN	ACRE FEET USED TO DATE	ACRE FEET AVAILABLE
	DATE	TIME	DATE	TIME					
*** BALANCE FORWARD ***								24.35	45.65
08454	08/13	2:30	08/13	7:30	5.00	10.00	4.13	28.48	41.52
09661	08/29	0:01	08/29	5:00	4.98	10.00	4.11	32.59	37.41

Pls. attend TownHall/ NWPA Meeting on 9/23/10 @ 6:00 pm CCC Chambers.

IF THIS SUMMARY OF YOUR WATER SERVICE DOES NOT AGREE WITH YOUR RECORD, PLEASE ADVISE THIS OFFICE WITHIN (15) DAYS; OTEHRWISE, WE WILL CONSIDER THIS STATEMENT CORRECT.

PROPERTY INFORMATION
SERIAL #: 712-41
ALLOCATION: 2010 70.00 (100%)

DITCHRIDER INFORMATION
NAME:

[redacted]
2929 Reservation Rd
Fallon NV 89406

NMR NMR

APPENDIX E – ITRC TCID WATER DELIVERY MEASUREMENT PROGRAM
Update to the June 1997 Water Measurement Study Report

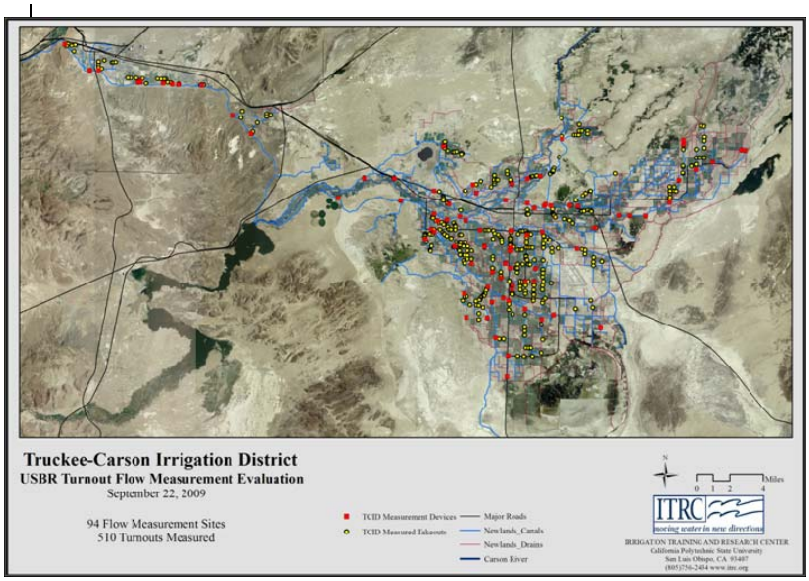
moving water in new directions

IRRIGATION TRAINING AND RESEARCH CENTER

Formatted: Right: 90 pt, Footer distance from edge: 36 pt

Truckee-Carson Irrigation District Water Delivery Measurement Program

Update to the June 1997 Water Measurement Study Report



U.S. Bureau of Reclamation

August 10, 2010

Irrigation Training and Research Center

Prepared by
Dr. Charles Burt
Irrigation Training and Research Center (ITRC)
California Polytechnic State University
San Luis Obispo, California 93407-0730
805-756-2379
www.itrc.org

Prepared for
Truckee-Carson Irrigation District

Mid-Pacific Region, USBR
Carson City Area Office

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1. Background

1.1 The 1997 Study

The O&M contract between Truckee-Carson Irrigation District (TCID) and the US Bureau of Reclamation (USBR) requires that TCID make reasonably accurate measurements of delivered irrigation water volumes to individual water users.

The Mid-Pacific Region of the USBR funded a study in 1997 with the objective of developing recommendations regarding what changes, if any, were needed in the existing TCID water measurement program. TCID and the Mid-Pacific Region of the USBR agreed that the Irrigation Training and Research Center (ITRC) of California Polytechnic State University, San Luis Obispo (Cal Poly), would conduct the study, and both parties would accept the recommendations. TCID allocated 10% of the O&M assessment from its budget to make any changes that are necessary to meet the requirements of "reasonably accurate" water measurement and other provisions of the approved water conservation plan.

Improved water measurement was expected to provide better accountability of water deliveries. Anticipated benefits were that farmers will have greater confidence in the accuracy of their recorded usage of water, and that delivery operations will be improved if flow rates are more accurately known. There was, however, no guarantee that any project water savings would result from the implementation of the water measurement program.

Since 1997, TCID has made many changes to its field and office measurement and water accounting program. Over time, changes were made to the original program design. In 2009, USBR again asked ITRC to review the status of the TCID measurement program, and to make recommendations for modifications or improvements. A report was submitted to both USBR and TCID in early 2010, and accepted without substantial changes. This update incorporates the new procedures, and recommendations for future actions that were included in that report.

1.2 2009/2010 Update Team and Review Process

The review of the Truckee-Carson Irrigation District's (TCID) Water Measurement Program (WMP) was conducted by ITRC under contract with USBR, Mid-Pacific Region.

Thirty measurement sites were randomly selected to visit. Three water measurement specialists (Dr. John Replogle, a consultant and retired USDA/ARS flow measurement expert, Tracy Vermeyen of the USBR Technical Service Center (TSC), and Dr. Charles Burt of ITRC) visited each site and then assigned an estimate of measurement accuracy.

With the exception of some devices that may have had sensor calibration problems, and several devices along the Truckee-Carson Canal that are maintained/operated in some joint manner between USBR and TCID, the measurement devices were found to be designed, operated, and maintained in good/excellent condition.

A review was also made of TCID's evolving procedure to explain and document how individual turnout volumes are computed.

1.3 Flow Rate vs. Volumetric Measurement

The challenge at TCID is to measure the delivered *volumes* of water. *Flow rate* measurement is just one step in the process of measuring volumes. It is much more difficult to measure the delivered volume within 5-10% than it is to measure a flow rate within 5-10%.

Volumetric measurement can be accomplished by doing one of the following:

1. Measure an instantaneous flow rate and then assume that the flow rate remains constant over the time that water is delivered. The resulting volume is:

$$\text{Volume} = (\text{Flow Rate}) \times (\text{Time})$$

The potential errors with this procedure are:

a. The measured instantaneous flow rate may not be the same as the actual instantaneous flow rate (i.e., measurement device error). This may be caused by poor construction, installation, or design of the measurement device. For example, a staff gauge may be installed at the wrong location (vertically or horizontally).
b. The estimate of the delivery time may be in error. An error of 15 minutes for a 24-hour delivery is not very significant (1%), but an error of 15 minutes for a 1-hour delivery is very significant (25%).
c. The flow rate may vary during the duration of the delivery. This may be caused by changes in the supply canal water level, changes in seepage between the flow rate measurement device and the final delivery point, or changes in the water level downstream of the flow measurement device.
d. Human error in measuring or recording otherwise correct data.
e. In the case of TCID, there can be losses between the point of measurement and the point of delivery.

2. Measure an instantaneous flow rate and accumulate (totalize) these instantaneous readings throughout the delivery time. This is done in one of two ways:
   a. Propeller meters are generally equipped with totalizers.
   b. Flumes, weirs, or undershot gates can be equipped with water level sensors that are tied into a datalogger that takes readings frequently and stores the individual flow rates and totalizes the volume.

1.4 Reasonableness and Accuracy

In making the initial recommendations, and in evaluating progress as of 2009, ITRC addressed two aspects of water measurement:

- Reasonableness
- Accuracy

These two aspects are inseparable. No water measurement device is 100% accurate or without problems. If installed incorrectly or in unsuitable conditions, supposedly accurate measurement devices can be expensive to maintain and can be inaccurate and worthless. Accuracy relates to the precision or correctness with which a volume of water can be measured. Reasonableness is affected by other factors such as the affordability, durability, and practicality of the measurement device or technique.

Most of the common flow measurement devices (flumes, weirs, and propeller meters) are accurate to within 6% or so if installed and operated correctly. However, there are inherent problems with many flow measurement devices, either from a technical or economic standpoint.

The challenge, then, is to design a program that is relatively simple and affordable to implement and maintain. Furthermore, it must provide delivered water volumes with a verifiable accuracy. This report does not review the countless means that have been developed to measure turnout flow rates.

A new irrigation project has the luxury of standardizing dimensions and constructing canals, structures, drops, etc., so that one effective volumetric measurement device will work equally well at all sites. TCID has a very different situation, and therefore a program is provided that first evaluates the potential measurement sites, and then recommends technical solutions to different categories of delivery points. All of the recommendations given in the 1997 report had a *proven* verifiable accuracy, which is a requirement in Article 11(b)(1) of the O&M contract between TCID and USBR. The verification process does require additional work in TCID when a single flow measurement device is used for multiple turnouts. The selection (turnout categorization) process addressed which of the proven measurement methods are most appropriate for each location.

1.5 Costs, Timelines, and Verification

Three key points were missing from the 1997 report: (i) total cost estimates, (ii) a detailed timeline for the complete program, and (iii) a verification procedure. The lack of these three points can be understood by

examining the first three recommended steps for the program, and by understanding why those three steps were necessary. The first three program steps were:

a. Categorize the turnouts
b. Test water level sensors, dataloggers, and associated software/hardware
c. Prioritize turnouts for inclusion in the program.

It was impossible to define the timeline and costs until TCID knew what it was facing; different conditions require different solutions. The solutions were defined, but it was unknown how many turnouts would require each type of solution. In 1997, TCID did not even have a map showing the locations of all the turnouts, much less a description of the dimensions and hydraulic characteristics of those turnouts. Such information is necessary before making final decisions. A few individuals in the district had good but non-quantifiable experiences from which they are able to speculate about the extent of various conditions, but that is insufficient for the development of specific solutions at specific turnouts.

Additionally, there were some new technical developments on the horizon. It was hypothesized that there may be some opportunities for TCID to work with various datalogger manufacturers to rapidly develop robust equipment for a fraction of current prices. Such advancements would have an impact on program costs.

It was understood in 1997 that an annual review should be included in the program. Annually, targets (cost and performance) for the next year could be developed after the previous year's work had been evaluated.

2. TCID Conditions As Of 1997

2.1 Study Area

The 1997 study covered the Factory, Island, N-System, Old River, Reservation, St. Clair, Scheckler, Smart, and Stillwater sub-districts of TCID.

2.2 Number of Turnouts

Water delivery records for 1996 were examined. The analysis showed that 1,429 turnouts had deliveries. During the month of July, 1091 turnouts received water from TCID. This analysis required a major effort, and the budget did not allow for a more detailed analysis that might include more years. ITRC believes that the one year of good data was sufficient to develop the program steps.

Seventy-five percent (**75%)** of the total annual acre-feet delivered occurred through **444** turnouts (31% of all active turnouts in the year 1996). The 1997 report referred to "444 turnouts" for convenience, but it was only an approximate number. As the flow measurement improvement program was implemented, it was envisioned that the number would probably decrease as some turnouts were consolidated for economics or improved accuracy of measurement. The number of turnouts that were to be modified or calibrated was not considered to be important; more important was the percentage of annual acre-feet delivered that is represented by those turnouts.

2.3 Turnout Flow Rates

An annual frequency distribution was determined for turnout delivery flow rates and durations. The analysis used the individual water orders listed in the TCID billing records. The time period of the analysis was from 25 March to 10 September 1996. During that period there were 10,016 water orders for the 9 sub-districts. The results of the flow rate analysis for TCID are summarized in **Table 1**.

Table 1. TCID – Delivery Flow Rates and Percent of Delivery Events (1996)

Flow Rate per Delivery	Percent of Total TCID Deliveries
0 < CFS <= 4.99	8.5 %
5< CFS <= 9.99	12.7 %
10< CFS <= 14.99	18.1 %
15< CFS <= 19.99	33.7 %
20< CFS <= 24.99	18.9 %
25< CFS	8.1 %

The average turnout flow rates in TCID are much greater (about 20 CFS) than those in most water districts in the USBR Mid-Pacific Region. The large flow rates require large flow measurement devices, with a relatively large cost per turnout. Since a typical field size is only about 40 acres, this results in a relatively large cost per acre.

In contrast, the 500,000-acre Westlands Water District (WWD), a Mid-Pacific USBR water customer, supplies water to individual 160-acre fields at a typical flow rate of about 4 CFS/turnout (0.025 CFS/acre in WWD, compared to 0.50 CFS/acre in TCID).

2.4 Event Durations

Table 2 shows that half of all deliveries during 1996 had durations of less than 6 hours. This indicates that the canal operators have a large challenge in shifting water around in their districts to meet the changing demand amounts, durations, and locations. This also means that some deliveries are made in the middle of the night, when it is difficult for operators to visit individual turnouts.

Table 2. TCID – Delivery Event Durations and Cumulative Percentages of Delivery Events (1996)

Delivery Duration	Percent of Total TCID Deliveries
15 minutes or less	0.6 %
30 minutes or less	2.6 %
1 hour or less	8.7 %
2 hours or less	18.8 %
3 hours or less	27.9 %
4 hours or less	36.3 %
6 hours or less	**51.2 %**
8 hours or less	63.4 %
10 hours or less	71.4 %
12 hours or less	78.2 %
15 hours or less	83.9 %
18 hours or less	87.8 %
24 hours or less	92.3 %

2.5 Turnout Locations and Accessibility

One of the initial challenges in the 1997 project was to determine where the individual turnouts were located. There were no maps available showing turnout locations or access routes. This has not been a problem for operation, since the operators certainly knew the locations. However, for the purposes of a study and characterization of turnouts an accurate map is very useful if not essential.

Although some turnouts (called "direct turnouts" in this report) are connected directly to the main canals and are therefore relatively easy to access, many of the turnouts must be accessed through closed gates or via private farm roads. Accessibility is a key concern for this project, because any program that requires that individual turnout delivered volumes be directly measured will require easy access to the turnouts. It was stated that if easy access proved to be a major problem, TCID and its water users would need to improve or simplify the access to some sites.

As of March 8, 1997, TCID had completed AutoCAD maps of 6 of its sub-districts, showing canal names and check structures. Turnout locations had yet to be identified.

In 1997, the Fallon Office of the USBR was exploring methodologies to locate all of the turnouts and major structures on an excellent map (elevations and horizontal coordinates). The Lahontan Basin Area Office (LBAO) in Carson City had purchased Global Positioning System (GPS) equipment and was in the process of setting up a Geographic Information System (GIS) in its office. The work plan for developing the map was to be a subset of a larger effort to map all of the project facilities and lands and was to be incorporated into that effort.

2.6 Condition of Existing 1997 Turnouts

It was beyond the scope of the ITRC contract to inventory the condition of all the turnouts. However, several field visits indicated that the conditions vary from excellent to very marginal, in relation to the maintenance of the hardware and surrounding areas.

Some of the open channel turnout gates have very little drop across the gate, which at first glance may indicate a problem for installing flow measurement flumes. However, such a condition does not necessarily mean that sufficient head would be unavailable once a flume is installed.

Some direct turnouts (turnouts that deliver directly from canals that are almost always full of water) have good conditions for accurate submerged orifice usage and others have unsubmerged discharges.

The laterals are often dry, so when a delivery is made to a turnout along a lateral, the pond in the lateral must

first be built up (filled up with water) before a flow rate can be delivered.

In summary, it was clear that the conditions of the individual turnouts and the associated ease of installation of a good flow measurement device would need to be assessed as the program was implemented. Since only about 444 turnouts need to be improved/calibrated, it was not considered necessary to assess the condition of all turnouts.

2.7 Trash and Plugging Potential

There are many sections of canal that are unlined. In addition, the main canals are occasionally used for flood releases. Both conditions contribute to large amounts of water-borne trash and weeds at some times of the year. This is important when considering different types of flow meters or water level sensors.

Propeller meters are ineffective in water that is full of algae and trash, such as is often the case in TCID. It would be unreasonable, for example, to require the installation of the elaborate and expensive trash screening equipment that would be necessary at each turnout for the accurate use of propeller meters. Propeller meters only have a proven accuracy in clean water conditions.

From another technical standpoint, propeller meters require a full pipe to operate accurately, a condition that apparently would not be met in many TCID turnouts.

2.8 Economics

The water users' ability to pay is low, based on the fact that TCID has a very short growing season, thereby limiting the types of crops that can be grown. The average profit from short season alfalfa and small grains is typically low.

The main implication for the 1997 ITRC study was that the initial and on-going costs of any flow/volume measurement program must be kept as low as possible, while still yielding relatively accurate results. The proposed 1997 program was intended to meet those objectives. There are only a limited number of effective ways to measure delivered water volumes in TCID, and those have been selected. They happen to correspond to relatively inexpensive solutions (as opposed to very expensive solutions such as acoustic Doppler meters, propeller meters with moving trash screens at each turnout, Dethridge meters, or other such options).

3. 1997 TCID Measurement Procedures

3.1 Division of TCID and Operator Responsibilities

The area of interest in TCID has 9 sub-districts, often referred to as "districts" within TCID. Each district has its own characteristics in terms of the percentage of lined canals, canal capacities and lengths, slopes, and soil types.

Typically, one operator is responsible for arranging the deliveries within one sub-district, and for moving the flows throughout his sub-district to match the short duration, high flow rate deliveries that are characteristic of TCID.

Water orders are called into the central TCID office. Once sub-district operators learn of the orders, they communicate daily with individual water users to arrange on/off times.

3.2 Determining Delivered Water Volumes

Total water volumes for individual deliveries are often not measured at the individual water user turnouts. In most cases, operators make a measurement of the flow rate into a lateral and then one or more water user(s) downstream will take the water, usually in sequence but sometimes simultaneously. The operator must determine the discrepancy between the amount of water placed into the lateral and the amount delivered to individual user turnouts.

Each operator had developed his own procedure for allocating the amount of seepage and spillage water that occurs in a lateral. Some operators determine that the seepage will vary throughout the season and make adjustments according to their experience. Other operators use a constant amount of seepage per delivery for all dates. TCID and USBR have conducted some studies to verify values of canal seepage losses. That field work was useful for past operations, but it was not saved in a format that could be used by ITRC for this report.

In many cases, the durations of deliveries are reported to the ditchriders by the water users themselves; the individual turnouts are not always visited personally by the canal operators. Water users sometimes question the subsequent water delivery statement, but there is some question as to how the arguments are resolved, since most of the individual turnouts lack flow meters and the flow rates probably vary with time.

In short, many TCID procedures have evolved over time and had been satisfactory for operation purposes up to 1997.

4. 1997 PROGRAM Strategy

The recommended program addressed the different concerns that had been expressed by both TCID and USBR. On one hand, TCID believed that its existing procedures for billing delivered water volumes were reasonably accurate. USBR must have verification that whatever measurement procedure is adopted is reasonably accurate.

4.1 Verifying the Accuracy of Existing Procedures

If the existing procedures are sufficiently accurate, it would be unreasonable to require TCID to change just for the sake of change. In any case, it is important to document the accuracy that presently exists. This means that after the verification program is completed, a new measurement program will be implemented on none, some, or all of the TCID turnouts.

4.2 What Constitutes "Sufficient Accuracy"

Several conditions must be met in order to meet the condition of "sufficient accuracy".

1. The annual delivered volume to each turnout is the particularly important value in question, rather than the average volume per district acre (that could be measured by taking a district average).

2. A key component of the ITRC recommendation was the decision that it may be sufficient to construct an aggressive flow rate measurement program to individual turnouts that account for 75% of the annual volume delivered to users. This represents 444 turnouts with the current configuration of turnouts. In order to upgrade measurements on an extra **5%** of the annual volume (i.e., account for 80% of the annual volume), the number of turnouts studied and improved would need to increase from 444 to 522, an increase of **17**%, which would significantly increase costs. Furthermore, the accuracy measurement of the remaining 25% of the delivered volume (if 75% of the turnouts are upgraded) will improve because the recommended program includes:
   a. The installation of better flow measurement at lateral entrances and better water level control in the main canals, both of which will improve the controllability of water throughout the district.
   b. Integration of lessons learned (regarding seepage and conveyance loss values) into the procedures for measuring flows for the remaining 25% of the delivered volume.

   Of course, the exact costs of installing improved measurement devices/conditions on the 444 turnouts were unknown in 1997. Once the program was in the implementation phase and a verification program was in place, the annual review process was intended to re-evaluate the initial target number. If costs were less than anticipated and the proposed volumetric measurement procedures were unsatisfactory, it was understood that it may be necessary to expand the program beyond the initial 444 turnout estimate.

3. Given the fact that an excellent flume design installed perfectly and with perfect measurement of water levels will only give about 1-3%± accuracy over a range of flows, ITRC believed that a **10%± volumetric measurement accuracy on *individual field* turnouts** is reasonable for TCID conditions. This was based on ITRC experience with actual field problems of volumetric measurement including errors in water depth sensors and totalizers, fluctuating flow rates, calibration curves, etc. A 6%± accuracy has been identified as a target in some water conservation programs outside of TCID. However, that accuracy is generally applied to flow rate measurement devices rather than to volumetric measurement.

   The volumetric measurement program (see Section 5) would generally be considered to be more accurate than 10%± because the 10% applies to individual turnouts and therefore the average error is less.

   Measurement errors are of two types: random and biased. Random errors (due to construction parameters being plus or minus, water depths being measured plus or minus, etc.) probably contribute to at least half of the total errors. This type of error cancels out when computing a district-wide average. As a result, the actual deliveries to all measured fields will probably be known with better than 5%± accuracy.

Several steps for verification of delivered volumes to individual field turnouts were suggested in 1997, as

follows:

1. An undefined number of turnouts were to be selected for verification.
2. Volumetric measurements must be made at each of the selected field turnouts. This was to be done for the complete season.
3. In order to accept the present (1997) accounting procedure at any location, the annual determination of deliveries to that location must be within ±10% of the actual annual value.
4. In order to maintain quality control in the verification procedure, it would be necessary for the operators to make their determination of delivered volumes without any knowledge of the measured volumes at the individual turnouts. This means that operators must turn in their water delivery notes before collecting the dataloggers (see Section 5), or the dataloggers might be collected by other persons. The exception will be sites that do not require dataloggers, because the flow rate is constant over time (see Section 6).

It was recognized in 1997 that there may be situations in which the totalized measurements from a single new flume can accurately estimate the volumes made to a "group of 2-5 turnouts" that are typically irrigated as a unit, at the end of a canal. This was initially verified by installing flumes at the individual turnouts, unless they are all within 500 feet of a common upstream point. In the 2-5 turnout cases, it would be sufficient to allocate an estimate of seepage to each turnout in proportion to its volume delivered. The verification procedure was intended to define the amount of seepage to allocate.

5. Volumetric Metering

5.1 Hardware Components

The 1997 program required some hardware changes in the field. These included:

1. Installation or calibration of flow rate measurement devices for approximately 444 individual turnouts. This is a first estimate, and the final number will depend upon program costs that are to be re-evaluated annually.
2. Some new flow rate measurement devices at the heads of lateral canals.
3. Some new or modified canal check structures to provide more pressure (head) to laterals or field turnouts.
4. Some new or modified canal check structures to stabilize canal water levels.

5.2 Flow Rate Metering at Turnouts

Three types of flow rate meters were recommended, depending upon the situation at the turnout. These are discussed in the following sections.

5.2.1 Replogle Flume

The Replogle Flume (a.k.a. "Broadcrested weir" or "ramp weir") was designed at the U.S. Water Conservation Laboratory in Phoenix in the early 1980's. As of 1997, ITRC personnel had apparently designed more of these than any other group in the world, in sizes ranging from about 2000 CFS down to 0.02 CFS. This flume has excellent characteristics such as:

- A high tolerance for construction errors.
- Calibration using a theoretical computer program. Most measurement devices, such as other flumes and various sharp-crested weirs, have empirical discharge equations and they can only be calibrated in the field by using some other field measurement of flow rate.
- Ability to operate with a minimum of water surface drop (2-4 inches).
- Ability to pass trash.
- The water level at only one location must be measured for all flow rates and conditions.
- Simple and relatively inexpensive construction. It is estimated that a single field turnout flume for TCID will average less than $1000. This is considerably less than an equivalent propeller meter or other device.

There are two conditions under which the Replogle Flume will not be the flow measurement device of choice:

- If the turnout is a "direct turnout" and already has an excellent submerged orifice installation.
- If there is less than 2-3 inches of head loss available at the turnout.

It was intended that ITRC could work with TCID and the Fallon office of USBR to develop some standard Replogle Flume designs. These should be conservatively designed, in the sense that the ramps might be too low in some installations. If they are too low to eliminate submergence, it will be easy to raise the ramp heights by adding some concrete in the field.

Each flume should be equipped with an easy-to-read staff gauge that reads out directly in CFS (as opposed to tenths of feet of water depth). This would be important for the water users who will want to know instantaneous flow rates when they pass by the flumes.

These flumes were proscribed from being "field calibrated" with current meters, as current meters are less accurate than the Replogle Flumes if the dimensions have been properly measured.

5.2.2 Canal Submerged Orifices

Submerged orifices (a.k.a. “Metergates” or similar designs) have been used for decades. They are used to both adjust and measure flow rates. Flow rates are measured by determining the pressure drop across the gate and the gate opening, and then referring to a standard table for that gate size. If the submerged orifices are of a standard design and installation, they will measure within the necessary proven accuracy.

Submerged orifices were deemed to be acceptable for this program if they meet the following conditions:

- They are of a standard design.
- They are located on a canal that is always full before and after the delivery.
- The downstream head measurement can be taken accurately and at the correct location.
- The upstream and downstream water levels do not vary substantially (see Section 6) during a delivery.
- The submerged orifice will be at least 30% closed during a delivery. (The accuracy of these devices degrades rapidly if the gate is more than 70% open.)

It was noted that it might be necessary to develop calibration tables for some standard designs. A portable Replogle Flume with an adjustable ramp could be used for such field calibration. A current meter can also be used for calibration if the flow is not turbulent. Calibration must account not only for the proper discharge coefficient (Cd), but must also utilize the proper measurement technique and equation(s). ITRC could review the calibration procedures with USBR and TCID when the program was implemented.

There may be some additional types of orifices in TCID that do not qualify as "metergates". Some of these may have free flow (unsubmerged) conditions, and others may have flow conditions that vary from submerged to unsubmerged, depending upon the flow rate delivered. Further classification of such orifice installations was required to determine if they could be included as "acceptable".

5.2.3 Electromagnetic Meter ("Flo-Tote") or Other Similar Device

In 1997, it was recognized that there may be some cases for which there is less than 2 inches of drop available. These locations would have a low priority (see Section 6.3) because of the inherent flow measurement problems. As of 1997, there was no excellent, reasonably priced technology available for measuring open channel flows with this condition with dirty water. However, if some of these sites must be measured because other sites cannot be added or canal banks cannot be raised, an option to explore (Flo-Tote) was described. *It was anticipated that this would only be a last resort condition, and hopefully by the time the priorities had advanced this far, new technology would be available.*

This option would require that a standard cross section be installed with sufficient length to create a uniform velocity profile across the cross section width. In these situations, the "Flo-Tote" device from Marsh-McBirney might be used successfully. This device has a probe that is set in the bottom of a standard section. It measures both a point velocity of the water and the depth, from which it computes the flow rate. It must be calibrated at each site, which requires additional expense. Furthermore, it is susceptible to trash pickup. This device has a datalogger to totalize flow rates into volumes. As with the totalizer and depth sensor for the Replogle Flume, it was expected that the Flo-Tote could be a portable unit that would be moved between locations, with a standard frame in which to set it at each site. Again, it should be emphasized that this type of device would not be needed until the 6th or 7th year of the program, and it was hoped that improved technology would be available by then. However, it was recommended that no additional work be done as of 1997 with the Flo-Tote for this particular flow measurement program.

5.3 Volumetric Measurements at Turnouts

The three flow rate measurement devices described in Section 5.2 were intended to be used for the program as of 1997. As mentioned earlier, the objective was to measure volumes rather than flow rates. Flow rates were to be converted to volumes using one of the following techniques, depending upon the turnout:

1. Volume = (Constant Flow Rate) × (Time)
   This procedure will be acceptable only where all of the following conditions are met:
   a. The operator has easy access to the turnouts.
   b. The operator is present at the turnout when the flow begins and ends.
   c. The flow rate is "relatively constant" throughout the duration of the delivery.
   d. The measuring device is a Replogle Flume or submerged orifice.

2. Volume = Sum of **[**(Flow Rate Measurements) × (Time between Measurements)**]**
   This will require the use of a datalogger and would only be used with the Replogle Flume or similar

flumes. Measurements must be taken at least as frequently as given in **Table 3** in order to accurately totalize the delivered volume.

Table 3. Required Frequency of Flow Rate Measurements for Totalizers

Delivery Duration	Minimum Frequency, minutes
15 minutes	0.5
30 minutes	0.5
45-90 minutes	1
2 hours	2
3-6 hours	3
7-10 hours	5
10-20 hours	10
More than 1 day	15

Determining the volumetric measurement with a totalizer on a Replogle Flume requires an accurate, calibrated water level sensor and a datalogger, as well as the software and hardware for retrieving (downloading) the data into a useful form. The most practical water level sensor was envisioned to be either:

a. A float in a stilling well to the side of the flume, suspended to a transducer that will provide a 0-5 volt or 4-20 milli-amp signal to a datalogger. ITRC and others have had excellent long-term success with some of these units. They are very simple, easy to troubleshoot, and require a minimal power draw. The stilling well access tube (between the stilling well and the canal) must be designed so that it can be easily cleaned. The float must also be large enough to eliminate hysteresis. Installation and equipment details have been provided to TCID and the Fallon Office of USBR.
b. A double bubbler system. The bubbler systems can utilize a relatively small bottle of compressed air or CO_2 that can last for several months without replacement. The double bubbler feature (instead of a less expensive single bubbler) provides self-calibration of the pressure transducer that sends the electrical signal to the datalogger.

The dataloggers for each type of sensor could be basically the same. A configuration could be designed so that the float/sensor assembly or double bubbler/gas cylinder assembly could be enclosed in a vandal-resistant enclosure and left on-site. Quick disconnect couplers could be used to connect a portable datalogger to the transducer wires. Both configurations have a low power requirement, and could use small and easily portable, rechargeable batteries for operation.

As of 1997, it was estimated that an analysis of the delivery trends of approximately 500 turnouts would indicate how many dataloggers will be needed. A rough estimate was that 200 units would eventually be needed if individual turnout flows were eventually metered throughout the district, representing 75% of the total annual volume.

6. 1997 Program Steps

The essential elements of the recommended 1997 volumetric measurement program are listed below in outline format.

6.1 Categorize the Turnouts

The first step was to categorize each of the 500 potential turnouts. This was greater than the 444 that utilize 75% of the district volume, so that other turnouts with equivalent volumes can be substituted for very difficult locations that may occur in the first 444. A "difficult location" is one that would be very expensive to modify, or that has very poor conditions for the installation of a flume. The term "difficult" does not imply that the current measurement of volumes at that location is any more or less difficult or accurate than at other locations.

6.1.1 Location

There are three classifications of turnouts:

1. Direct Turnouts
   a. Those with water level fluctuations (upstream or downstream) during a delivery that would cause less than 5%± flow rate change during a delivery. **Table 4** indicates the allowable rise or fall in water level *if the flow into the turnout is controlled by an undershot (orifice) gate located at the turnout*, which should be the case in almost all of the direct turnouts.

Table 4. Allowable Rise or Fall in Canal Water Level during a Turnout Delivery, to Maintain Steady Turnout Flow Rates (less than 5% change)

Drop across turnout undershot gate, feet	Allowable change in canal water level, feet
0.2	0.02
0.4	0.05
0.6	0.07
0.8	0.10
1	0.12
1.2	0.14
1.4	0.17
1.6	0.19
1.8	0.22
2	0.24
2.4	0.29
2.8	0.34
3.2	0.38

   b. Those with water level fluctuations (upstream or downstream) that would cause more than 5%± flow rate change during a delivery. Those with upstream water level fluctuations would require improved water level control in the canals, through the use of modified check structures such as Begemann gates, long-crested weirs, AMIL gates, or PLC-controlled electrical gates.
2. Turnouts that are grouped (2-5 turnouts) close together (within 500 feet of each other and a common upstream point), which may be eventually served by a single flow rate measurement device.
3. Turnouts along long laterals.

6.1.2 Available Head

Each turnout will have one of the following conditions:

1. Sufficient head for a flume (2 inches minimum).

2. Insufficient head for a flume, but a new cross-regulator could provide sufficient head.
3. Insufficient head for a flume and a new cross-regulator would not provide sufficient head.

6.1.3 Estimated Delivery Life

Some fields may be sold for their water rights and those should have a low priority for inclusion in the program.

6.1.4 Probability of Error

Main turnouts with a maximum probability of error under the present measurement procedures should receive a high priority (see priority #3 in **Table 5**).

6.2 Develop Software and Procedures for Recording Volumes

(Note: Step 6.2 should begin at the same time as Step 6.1)

1. Select float/transducer water level sensors and double bubbler sensors.
2. Select datalogger manufacturers to work with and experiment with various dataloggers.
3. Identify software to download and record.
4. Develop procedures to blend with existing water records.

6.3 1997 Prioritization of Turnouts for Inclusion in the Program

Table 5. 1997 Turnout Priorities

Priority	Conditions	Recommended Action
1	Turnouts with existing totalizers.	Examine the sites for proper design and frequency of measurement.
2	> 200 AF delivered/year. Direct turnouts from full canal. Canal operator will be at turnout when delivery starts and stops. Sufficient head. **CONSTANT** canal water level. **CONSTANT** downstream conditions (if d/s conditions would affect the T.O. flow rate).	Install Replogle Flume or use existing good submerged orifice. Existing submerged orifice calibration must be verified. No totalizer needed.
3	> 200 AF delivered/year. Direct turnouts from full canal. Canal operator will be at turnout when delivery starts and stops. Sufficient head. **VARYING** canal water levels. **CONSTANT** water level <u>downstream</u> of the T.O., or changes downstream of T.O., does not affect the T.O. flow rate significantly.	Install improved canal water level control. Install Replogle Flume or use existing good submerged orifice. Existing submerged orifice calibration must be verified. No totalizer needed.
4	> 200 AF delivered/year. Direct turnouts from full canal. Canal operator will be at turnout when delivery starts and stops. Sufficient head. **CONSTANT** canal water level. **VARYING** water levels <u>downstream</u> of the turnout that would affect the T.O. flow rate.	Install Replogle Flume. Use portable totalizer.
5	Adjacent turnouts with a single owner that can be consolidated into a single large turnout.	Install Replogle Flume at new turnout. Install Replogle Flume at the head of the lateral. Use portable totalizer at individual turnouts.

6	> 200 AF delivered/year. Sufficient head. Turnouts at the ends of laterals and are close enough to each other and a common measurement point, that eventually they might be grouped together (2-5 turnouts) using one new flume w/ totalizer.	Install Replogle Flume at each turnout. Install Replogle Flume at potential new measurement site in the lateral. Use portable totalizers at individual turnouts.
7	>200 AF delivered/year. Sufficient head. Turnouts are located along long lateral, with flow (volume) presently only measured at the head of the lateral.	Install Replogle Flume at each turnout. Use portable totalizer at ind. turnouts. Install a new Replogle Flume at the head of the lateral.
8	Less than 200 AF delivered/year. First priority should go to those with greater than 130 AF delivered/year. Sufficient head. Turnouts are located along long lateral, with flow (volume) presently only measured at the head of the lateral.	Install Replogle Flume at each turnout. Use portable totalizer at ind. turnouts. Install a new Replogle Flume at the head of the lateral.
9	All others with insufficient head, which could have sufficient head if a new cross regulator would be installed. First priority should go to those with greater than 130 AF delivered/year.	Install a new cross regulator. Install Replogle Flume at ind. turnouts. Install Replogle Flume at head of lateral. Use portable totalizer at ind. turnouts.
10	All others from the top 500 with insufficient head, for which a new cross-regulator will not help.	Install a standard control section at individual turnouts. Use Flo-Tote or better device at individual turnouts, with totalizer.

6.4 Develop Timelines and Verification Procedures

Steps 6.1 - 6.3 have defined the problem, identified equipment and associated costs, and established priorities. At this point, it will be possible to establish good timelines and verification procedures for the remainder of the project.

6.5 Design New Structures

TCID may investigate the possibility of using several pre-cast flume designs in its yard. It is recommended that TCID designate specific personnel to work full-time on the entire design, installation, calibration, data collection, etc., effort.

6.6 Install New Structures

Installation of some new structures could begin in the winter of 1997.

6.7 Train Operators

Operators will need to understand the program, as well as proper procedures for collecting and recording data. Office personnel will need to know how to incorporate the data into existing water accounting procedures.

6.8 Compare Results

Results from the existing TCID procedures must be compared with individual turnout results, on a case-by-case basis.

6.9 Re-Assess the Program

This program will need an annual re-assessment for successful implementation. The procedures which have been used, the results obtained, the use of those results, and other factors should all be reviewed. As an example, at the time of the writing of this report it is not known how many turnouts fall under various categories. The categorization of the turnouts will definitely impact the eventual cost of the program.

7. Status as of Fall 2009

7.1 Mapping Information

As recommended in the 1997 report, since 2001, the USBR Carson City office has developed several GIS files showing GPS locations of structures throughout the Newlands project. The key files are:

- **Allpoints** – This file, provided in 2001, originated as GPS coordinates, elevations, and identification of over 18,000 individual points throughout the region. Nearly every structure was surveyed including canal centerlines and tops of banks at key locations. However, the identification of the sites was incomplete and the naming conventions of turnouts and checks were not always uniform. This file was used in this evaluation only to locate sites missing from the other files.
- **Structures.shp** – This file was provided in 2007. This file is more concise than the Allpoints file, and only shows turnouts, headgates, check structures, spills, and measurement devices. The naming conventions are much more uniform and for many sites there is a structure description. Some sites are missing in this file, but this file is nevertheless used as the basis of this evaluation. Missing sites were added based on approximated locations using the Allpoints shapefile.
- **Inventory.shp** – This file was provided in 2009. It has a uniform naming convention (although it differs from the first two), but has more missing locations than the Structures.shp file.

7.2 Flow Measurement Devices

As of the fall of 2009, there were 94 flow measurement devices utilized to quantify flows at 510 turnouts. **Figure 1** shows the locations of these devices. The broadcrested weir designs of TCID are of excellent design and construction overall.

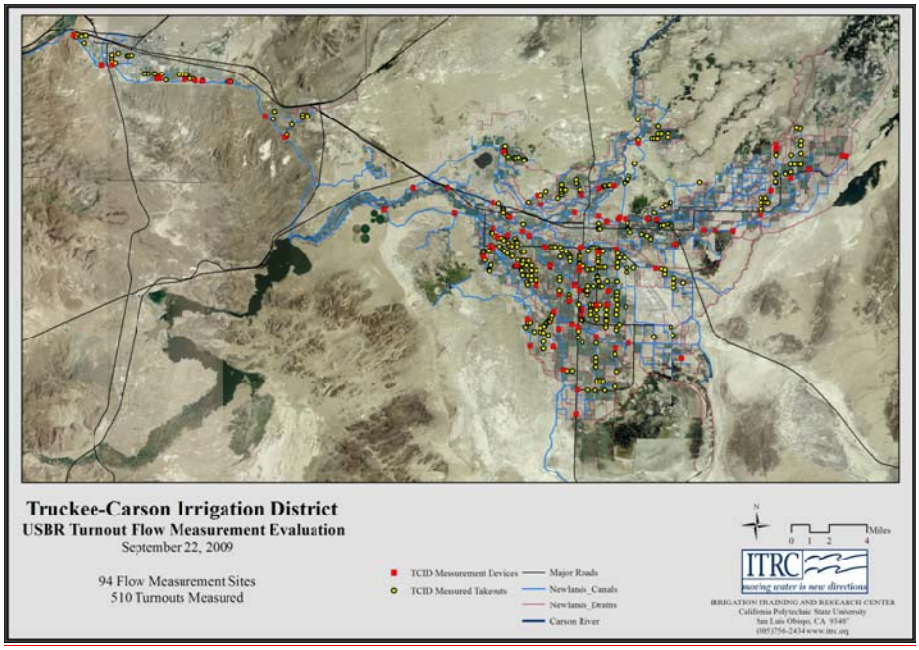


Figure 1. Locations of TCID Flow Measurement Sites

The types of devices are listed in **Table 6**.

Table 6. Numbers and Types of Flow Measurement Devices

Type of Measurement Device	# of Devices	Datalogger?
Broadcrested weir (a.k.a. "ramp", "Replogle Flume")	53	Yes
Weir	20	Some
Trapezoidal flume	13	Yes
Other (Parshall flume, rated pipe or section, propeller meter in a pipe)	8	Some

TCID noted that the meters above measured 67% of the total delivered volume. Eight percent of the volume remained to meet the 75% volume target.

In 2009, TCID performed a "Meter Audit". For all of the metered laterals, the following values were computed:

Total metered flow (through the flumes, weirs, or propeller meters) = 148,516 AF
Total charges to turnouts downstream of those points: = 100,404 AF
% of metered flow that is charged to fields = 67%

There were many reasons for the difference in values, including:

1. TCID does not include as "charges" some turnouts that are at the extreme downstream ends of some of the metered laterals. In other words, TCID does not feel that there is sufficient backup data to use the measurement device at the head of the lateral to estimate some deliveries.
2. Some of the measurement devices pass substantial return flows while deliveries are not being made. Therefore, the total metered flow is greater than the charged flows.
3. Seepage losses occur between the meter and the turnouts.
4. The charges are based on the duration of the delivery to the farm turnouts. The farm turnout may be closed at the end of an irrigation, but water continues to flow through the meter at the head of the canal.

Starting in 2009, TCID began to systematically organize information for each field turnout in spreadsheets. This information provides documentation on how each individual delivery event's volume is calculated before it is entered as a "charged" value. For each event and each turnout, the following are considered:

1. Seepage estimates that have been made. Different seepage values are used for different times of the irrigation season.
2. The flow rate through the lateral at the time of the delivery. This impacts the seepage rate.
3. Ditchrider records of on/off times for the turnout.
4. Ditchrider records of Poly weir stick measurements upstream and downstream of turnouts.
5. Datalogger flow measurements, adjusted for lag times to the turnout.
6. Complaints by users, and subsequent checks of seepage or other values.

8. Recommendations

8.1 Water Measurement Program (WMP)

1. The existing Water Measurement Plan, with some modifications, appears to be functional, reasonably accurate, and reasonably cost-effective to administer.

2. TCID should take responsibility for the construction, maintenance, and operation of all flow measurement devices within TCID that are used for the purpose of billing

(charging) individual field turnouts. The TC Canal measurement devices, in particular, need major improvements.

3. Verification of flow rates (or inversely, seepage), whether by TCID or a USBR representative, must be done with a standardized procedure that is mutually agreeable to both parties. Currently, TCID current metering procedures (including verification of a steady flow rate) are different from those used by USBR representatives. Even if procedures are identical, there will be differences in measured flow rates; different procedures can cause unnecessary conflict.

4. TCID must improve the transparency of its accounting process for estimating individual turnout volumes. Most districts have conditions which require only limited, occasional interpretation of field data before assigning values of delivered volumes. TCID does not have a combination of hardware and delivery gate access and personnel that can provide this simplified volumetric accounting.

   TCID has elected to substitute a fairly complex procedure to compute the delivered volume for each individual delivery event. The procedures are difficult to understand and explain, and training a new employee to duplicate the process would be problematic. An external auditor must listen to a verbal description of procedures on an event-by-event basis.

   The computation and background data collection procedures must be modified so that they are very transparent to both insiders and outsiders, with very standard and well documented protocols. Aspects of an improved accounting process should include:

   a. Written <u>general</u> procedures for computing volumes to delivery <u>gates</u>.
      i. All the procedures would not be used for all delivery locations.
      ii. They should be described in a detailed background document. This document would define all procedures (and the techniques and mathematics) used for items such as:
         1. Seepage (there may be 3 or 4 different procedures)
         2. Pass-by flow in the lateral canal
         3. Start time
         4. End time
         5. Adjustments at a later date for the correction of errors

   b. Written specific procedures and values that apply to each <u>individual</u> delivery gate throughout the season. This document (likely a spreadsheet) would define:
      i. Which of the general procedures were used
      ii. Details of each procedure – for example, when and where things are measured. In the case of seepage, the date and details the seepage tests should be supplied.
      iii. Constant values that are used for each delivery gate

   c. A worksheet that provides explanations for values that have special computations on specific dates for each turnout. These should be coded to enable simple display in a readable summary table at the end of the season.

d. Linked or readily available worksheets and/or databases that provide input for the computation of each component.

e. Description of how the computed volume is transferred to a charged value for billing.

f. A written flow chart that shows the procedures, locations of files, file names, etc.

The end result of this documentation would be that anyone interested in understanding the procedures and source of numbers for a single delivery event could quickly (within a few minutes) learn from the written backup information/procedures without needing to talk to someone. It is assumed that it would take longer for the visitor to understand the linkages.

5. The procedures listed in (4) above are more complicated and inaccurate if there are large numbers of field turnouts serviced by one flow measurement device a long distance from the meter. TCID staff members recognize this problem, and have plans to install more "intermediate" flow measurement devices in such situations. ITRC provides the following specific recommendation:
   - *The hydraulic travel distance between the meter and a turnout cannot exceed 1.25 miles. Any exceptions to this rule must be documented and justified in writing and be approved by a joint USBR/TCID technical committee.*

6. If either one of the following conditions occurs during a delivery event, that volume cannot be counted toward the required metered volume for the district. However, the user must be billed for every delivery volume, even though the volume for a specific event is not counted toward the district metering requirement. The two conditions are:
   a. A submerged weir/flume, or one temporarily inaccurate for any of many reasons.
   b. Simultaneous multiple deliveries from the canal/lateral which would require an estimate of what percentage of the flow is being delivered to a delivery gate.

7. TCID must provide, at the end of every irrigation season, a clear table that provides the following information for each delivery gate that is included in the metering program:
   a. Delivery gate ID
   b. Meter used to measure the flow rate
   c. Acres supplied by that delivery gate
   d. Acre-feet that were billed and were counted as part of the metering program.
   e. Acre-feet that were billed but were not counted as part of the metering program, plus code(s) describing what problems were encountered.
   f. A summary of:
      i. Total AF billed under the metering program
      ii. Total AF billed for turnouts that would normally fall under the metering program, but which were not counted this year.
      iii. Total AF billed for turnouts outside the metering program
      iv. Total AF billed to all fields in TCID (i + ii + iii)

8. TCID must re-check the zero elevations/settings for its data collection at flumes and weirs, where errors greater than 2% were noted during the November 2009 site review, plus at the sites that were not visited. Written documentation of the results should be maintained on file.

9. All flow measurement weirs and flumes must have dataloggers and water level sensors for automatic recording of levels, with the minimum logging interval at least as good as is specified in the 1997 report. It is recommended that any new dataloggers have at least 16-bit resolution.

10. For future policy, individual flow measurement devices must be within 8%± accurate in measuring flow rate. The average accuracy of all measurement devices used for determining water charges must be within 5%±. Volume estimates at individual turnouts must be within 10%±, with an average accuracy of 7%± for all of the turnouts used to calculate water charges.

8.2 Water Conservation Plan

The OCAP agreement provides a target project efficiency. The Water Measurement Plan (WMP) is one element that is useful in achieving the goal. Improving and expanding the WMP beyond the 75% measurement target, and stressing even more accuracy than is recommended in this update, would likely have limited success in achieving or exceeding the efficiency target.

In districts with a similar hydrology, it is common to improve project efficiency through a combination of improved canal control (including regulating reservoirs) and recirculation of good quality drainage water. That also appears to be a reasonable approach for this project.

APPENDIX F – DISTRICT WATER ORDER FORM

Page Number	Title
F-1	Sample Water Order Forms
F-3	Sample of Delivery Schedule

ST Head 2	EAST District

Scheduled

Order Date	Irrigator's Name	Contact Phone Number	Contact Phone Number	Contact Phone Number	METER	Take out	CFS	Hours Ordered	Order #	Serial #	Max Hours	Date Order Scheduled	Start Date / Time	Stop Date / Time	Travel Time
08-Nov-10	Viera, Ward	[redacted]	[redacted]			S17-T28	30	9.00	12711	6068	10:48:00	12-Nov-10	11/15/10 9:00	11/15/10 18:00	4:00

Contact:

Date Called	Time Called	Initials	Date Called	Time Called	Initials
11/12/10 11:21		KGH			

Remarks

dlb

Actual

Boards		Jet Flow		Submerged Gate		Meter		Start Date and Start Time		Time	
Upstream	[redacted]	Upstream	[redacted]	Upstream	[redacted]	Stage	[redacted]	11/15/10 9:00		11/15/10 18:00	
Boards	[redacted]	Gates	[redacted]	Downstream	[redacted]	CFS	[redacted]	Initials	BB	Initials	BB
Length	[redacted]	Sill	[redacted]	Gates	[redacted]	Cal-Poly Stick		Time Hours / Minutes		CFS Delivered	Actual CFS
Upstream	[redacted]	Length	[redacted]	Sill	[redacted]	Width	[redacted]	9:00:00		30.00	
Boards	[redacted]	Calc. Measurement:		Length	[redacted]	Poly Stick	[redacted]	AF Delivered			
Length	[redacted]			Calc. Measurement:		Calc. Measurement:		22.28			
Calc. Measurement:						Meter-M		FINISHED			
						Regular-R					
Measurement Time:				If Not Measured, Explain Below:		Poly Stick-P		**Measurement Required**			
[redacted]						Not Measurable-U	U				
Location:											
[redacted]				[redacted]							

VAE Head 1 **WEST District**

Scheduled

Order Date	Irrigator's Name	Contact Phone Number	Contact Phone Number	Contact Phone Number	METER	Take out	CFS	Hours Ordered	Order #	Serial #	Max Hours	Date Order Scheduled	Start Date / Time	Stop Date / Time	Travel Time
25-Oct-10	Kissick, Maureen	[redacted]	[redacted]		M	V4-T9 (METER)	18	5.00	12208	5209	6:00:00	27-Oct-10	10/29/10 12:00	10/29/10 17:00	

Contact:

Date Called	Time Called	Initials	Date Called	Time Called	Initials
10/27/10 15:45		jrc			

Remarks

mac

Actual

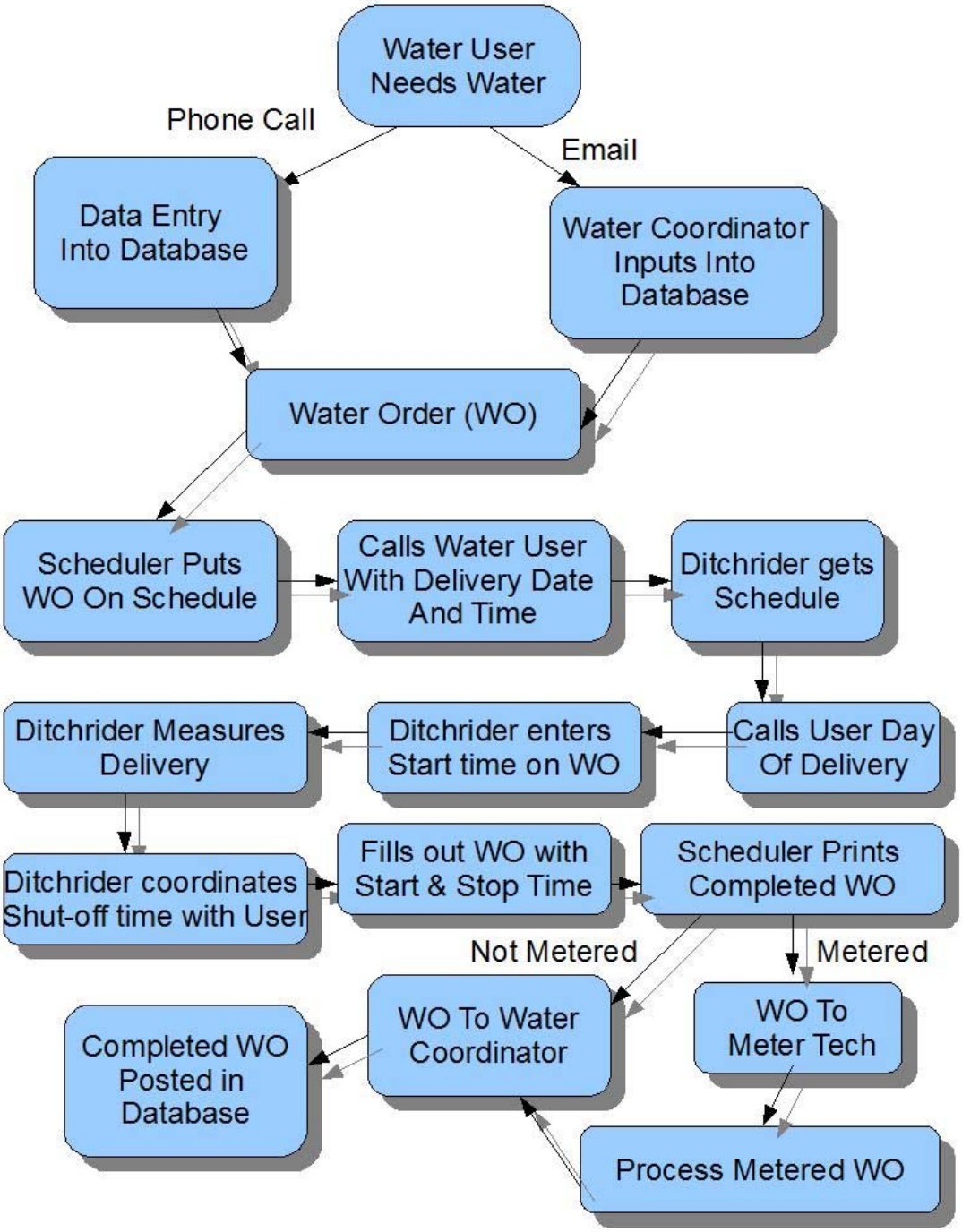
Boards		Jet Flow		Submerged Gate		Meter		Start Date and Start Time		Stop Date and Stop Time	
Upstream		Upstream		Upstream		Stage		10/29/10 12:20		10/29/10 17:~~40~~ 20	
Boards		Gates		Downstream		CFS		Initials	SS	Initials	CR
Length		Sill		Gates		Cal-Poly Stick		Time Hours / Minutes		CFS Delivered	Actual CFS
Upstream		Length		Sill		Width		5:20:00			
Boards		Calc. Measurement:		Length		Poly Stick		AF Delivered			
Length				Calc. Measurement:		Calc. Measurement:		7.43 mae			
Calc. Measurement:						Meter-M		FINISHED			
						Regular-R					
Measurement Time:				If Not Measured, Explain Below:		Poly Stick-P					
						Not Measurable-U	U				
Location:											

Scheduling

10/26/10 13:33

NDOW																	CENTRAL
Order Date	Irrigator's Name	Contact Phone Number	Contact Phone Number	Contact Phone Number	Take out	CFS	Hours Ordered	Order #	Serial #	Remarks	Special Instructions	If Metered Type "M"	Max Hours	Date Order Scheduled	Start Date / Time	Stop Date / Time	Travel Time
HEAD 1																	
20-Oct-10	Goddard;Lunderstadt;Henry&Wilson	7754235128			A-T37 (LEE SPILL) (METER)	40	288	12049	970-C	mld	CONTINUATION ORDER.	m	345:36:00	10/20	10/26/10 1:55	11/7/10 1:55	
															11/7/10 1:55	11/7/10 1:55	

APPENDIX G – DISTRICT WATER DELIVERY FLOW CHART


Water User Needs Water
Phone Call
Email
Data Entry Into Database
Water Coordinator Inputs Into Database
Water Order (WO)
Scheduler Puts WO On Schedule
Calls Water User With Delivery Date And Time
Ditchrider gets Schedule
Ditchrider Measures Delivery
Ditchrider enters Start time on WO
Calls User Day Of Delivery
Ditchrider coordinates Shut-off time with User
Fills out WO with Start & Stop Time
Scheduler Prints Completed WO
Not Metered
Metered
WO To Water Coordinator
WO To Meter Tech
Completed WO Posted in Database
Process Metered WO

TRUCKEE-CARSON IRRIGATION DISTRICT
RESOLUTION 12/7/10

AUTHORIZING THE
TRUCKEE-CARSON IRRIGATION DISTRICT
TO APPROVE THE
WATER CONSERVATION PLAN
2010

At the regular meeting of the Board of Directors of the Truckee-Carson Irrigation District, held at the office of TCID, on the 7th day of December, 2010, the following resolution was approved and adopted:

WHEREAS, the Newlands Project, authorized by law by the Federal Government, beginning in 1902 and constructed thereafter, under the control of the U.S. Bureau of Reclamation, is managed by the Truckee Carson Irrigation District; and,

WHEREAS, the Truckee Carson Irrigation District is fully committed to the protection of water as a precious resource necessary for our continued existence; and,

WHEREAS, the Truckee-Carson Irrigation District entered into a contract on the 25th day of November 1996 with the Bureau of Reclamation, Contract Number 7-07-20-X0348, providing for the Operations and Maintenance of the Newlands Project; and

WHEREAS, the Operations and Maintenance Contract, Article 11, called Water Management requires that the District develop a Water Conservation Plan; and,

WHEREAS, this Water Conservation Plan was developed in consultation with the representative for the Contracting Officer of the Bureau of Reclamation; and,

WHEREAS, the Water Conservation Plan meets the Mid-Pacific criteria for evaluating Water Management Plans, provides reasonable levels of efficiency for Project operations, ensures that Efficiency Targets set forth in the applicable OCAP are met or exceeded, and is consistent with applicable federal and state laws, rules and regulations,

NOW, THEREFORE, BE IT RESOLVED that this Water Conservation Plan meets the requirements stated above and is approved by the Board of Directors of the Truckee Carson Irrigation District.

The District will implement the Plan, committing funds, through the Water Conservation Fund, and resources.

The District will continue to implement a water measurement program in accordance with the Plan.

The District will consult with California Polytechnic State University and the Bureau of Reclamation for training, technical reviews, and advice.

IT IS HEREBY FURTHER RESOLVED that the District and the Contracting Officer shall review and revise the Water Conservation Plan at least once every five years.

PASSED, APPROVED, AND ADOPTED by the following Board members present at the regular meeting of the Board of Directors of the Truckee-Carson Irrigation District on the 7th of December, 2010.

Present:

Ernest C. Schank	Ray Peterson	Richard Harriman
David Stix Jr.	Eric Olsen	Bob Oakden
Lester deBraga		

AYES: 7 NAYS: 0 ABSTENTIONS: 0 ABSENT: 0

BY: Ernest C. Schank
President, Truckee-Carson Irrigation District

ATTEST:

Ray Peterson
Secretary

Enhanced Canal Recharge Feasibility Report

Yolo County Flood Control and Water Conservation District
Woodland, California USA

December 2012

This report is part of an AB303 grant funded project from the Local Groundwater Assistance program of the California Department of Water Resources. This report is a combined report including both Enhanced Canal Recharge and Gravel Pit Recharge tasks. Cooperation and access to the Capay Mining Facility was kindly provided by Granite Construction, Inc.

34274 State Highway 16, Woodland, CA 95695
530-662-0265 www.ycfcwcd.org

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Introduction

During the original construction of the District's canal system in 1914, it was known that some canal reaches were very "leak prone" and that other areas lost less to groundwater. At the time, a few of the leaky canal stretches were lined with concrete, but 95% of the canals were left as dirt lined. Presumably, only a portion of the canal was lined to save money, as lining canals is very expensive. However, today it is the policy of the District to leave the canals unlined, to promote groundwater recharge during the irrigation season (summer).

> "Losses from this system, as seepage and evaporation, vary from year to year, but have ranged from 15 to 65 percent from 1970 to 1996... The greatest part of the losses is the result of seepage and percolation along the canals and laterals. It is important to note, however, that the major part of these losses are recoverable from the groundwater basin. Over the years, various parties have suggested that the District should concrete-line its water

delivery system to minimize seepage losses. From the standpoint of managing the water supply available from the Cache Creek system, lining the District's water delivery system is not deemed to be a prudent water management measure." (YCFCWCD Water Management Plan 2000 http://archive.org/details/watermanagementp00borcrich)

In between winter storms, the canals are dry. If during these dry times in winter, water could be diverted from Cache Creek into the canals, increased recharge could be realized.

For this study, infiltration of canal recharge water was measured or summarized using the following methods:

1. Delivery amount by volume minus sales and spills. The difference is gain to groundwater.
2. Instantaneous flow rate measurement upstream and downstream of two points. The difference is gain to groundwater.
3. Percolation tests. Water was ponded in more than 6,600 linear feet of canal. The rate of drop in water level can be converted to a volumetric infiltration rate.

All three methods compared well showing similar results (as explained in the section on Percolation Test Results).

A map was also made showing SURRGO Soil Survey infiltration rates on all reaches of the canal system. Historical recharge rates and measurements were also summarized and compared to current findings. Infiltration measurements in sections of canal were scaled up to the entire canal system. (Of note, there exists infiltration data from 1914 in the District Archives.)

In addition to groundwater recharge from the bottom of unlined canals, winter water can be applied to land areas, such as gravel pits, to promote recharge. Delivering winter water for groundwater recharge to a nearby gravel pit near the town of Capay, CA, was planned. However, this task was modified. Instead of delivering water to the gravel pit, losses from a stretch of canal near the pit were very closely measured. The losses from the canal entered the pit through an

underground path. Water levels in the canal, the pond in the pit, and nearby monitoring wells were measured. The responsiveness of the pond to water losses in the canal was analyzed. The gravel pit near Capay was unexpectedly found to have a low infiltration rate, as explained in the Gravel Pit Results section.

Background Information: Inflatable Dam on Cache Creek at Capay

In 1994, a 500 foot long inflatable bladder was installed on the top of Capay Dam. This dam raises the water level 5 feet during the irrigation season. Previously, wooden boards had to be installed at the beginning of each summer, taking 9 workers two days to accomplish. The process was repeated to remove the boards each fall. Today, the bladder can be raised or lowered in 20 minutes at the touch of a button. The bladder can also be operated remotely during storms and safely observed w/ video camera surveillance.

The bladder was installed for safety reasons, but the District also wanted to have the ability to inflate the dam in winter or early spring, when water is still flowing in the Creek. Inflating the bladder in the winter allows the diversion of water in to the canals for recharge purposes. This operation of the dam could facilitate implementing the District's proposed groundwater recharge / recovery projects in the canal system.

Map of soil infiltration rates by canal reach

Soil map data from Soil Survey Geographic (SSURGO) Database from the NRCS, showing infiltration rate of the upper horizon layer of soil, was overlaid on the canal system. SSURGO data presents a high and low infiltration rate for each soil horizon and the low infiltration rate was used for the map. The lowest rate should be the limiting rate for overall infiltration rate and therefore this low rate was used. A new map, titled *Soil Permeability*, was created showing the infiltration rate along all sections of the canal. The *Soil Permeability* map is attached.

SSURGO: Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO). Available online at http://soildatamart.nrcs.usda.gov. Accessed June 2010.

Table 1. below shows a summary of canal lengths by infiltration rate as shown in the attached *Soil Permeability* map. The majority of the canals have an infiltration rate of 0.57 in/hr or less, while only 4 percent of the canals have an infiltration rate of 1.98 in/hr or higher.

Table 1. Summary of canal length by infiltration rate as presented in the attached *Soil Permeability Map.*			
Infiltration Rate in/hr ksat	Canal Length Miles	Percent Length	Infiltration Category
0	0.0	0.08%	Low
0.06	45.3	27%	Low
0.2	51.2	31%	Low
0.57	64.5	39%	Med
1.98	2.6	2%	High
5.95	3.1	2%	High
total	166.9 total miles		

The *Soil Permeability* map was used to plan and identify good areas for measurement of ponded infiltration rate: high, medium, and low flow rates. The map can also be used to identify promising sections of canal for future recharge projects. Areas of higher recharge, in red and orange, are more promising than green areas, with lower infiltration rates. Short sections of red canal areas near the Capay Dam historically have been lined with concrete and are not available for recharge activities today.

The map was also used to scale up the pond tests on each canal section (low, med, high) to the infiltration rate of the entire District. The percent of high, medium, and low infiltration rate areas was calculated from the map, and the results of the high, medium, and low pond test were used to multiply up to the entire District canal system. The results are presented in the Canal Infiltration section.

Canal Infiltration Rates in Ponded Sections (Percolation Tests)

At the end of the 2010 irrigation a large construction repair project necessitated ending the irrigation season early, Sept 15, 2010. Usually the season ends as irrigation demand tapers off, but with the quick drawdown in the canals, we were able to “pond up” sections of the canal and block all inflow and outflow to these

sections. With our SCADA flow monitoring system, the drop in water level was automatically measured and logged by the data collection system. In this way, static pond infiltration rates were measured on more the 6,600 feet of canal.

Twenty-two canal sites were evaluated for possible inclusion in the ponding tests (Table 2). Fourteen sites were eliminated right away, as they were located in sloughs, did not have a downstream check to pond water, or were concrete lined and were likely to have a very low infiltration rate. The remaining 8 sites were considered in depth. One major concern was the ability to stop all incoming water into the ponding area during the test. This meant that any remaining water draining out of the canal system, and any drain water from nearby fields, had to be diverted out of the ponding area. Only 4 sites were able to be configured this way; West Adams @ Granite, the Chapman Reservoir Inlet, the Yolo Central Spill, and the Winters Canal @ the Fredericks Flume. The Fredericks Flume site was tested, but no data was collected. The steepness of the canal and the position of the water level sensor was too far upstream of the check, so no water was beneath the sensor during the test and no measurements could be made.

The remaining three sites were successfully measured during the pond test. These sites are listed in bold in Table 2.

Table 2. Twenty two canal sites were evaluated for the end of season percolation test. The three sites highlighted in bold were selected.						
Canal Monitoring Site	Operational?	Site Notes	Possible Infiltration site	Upstream Check	Downstream Check	Measured?
Clover Spill	X	earthen lined	x	CLV 0543	CLV 0601	No
PLP Spill #1	x	earthen lined	x	PLP 0965	PLP 1013	No
PLP @ Gayle Check	broken	earthen lined	x	PLP 0534	PLP 0593	No
West Adams Canal @ Granite	**x**	**earthen lined**	**x**	**WEA 0170**	**WEA 0240**	**Sept. 18, 2010**
Alder Canal @ Gordon Slough Heading	x	earthen lined	x	WEA 0970	ALD 0009	No
Winters Canal @ Fredricks	x	earthen lined	x	WIN 1119	WIN 1313	attempted
Chapman Inlet	**x**	**earthen lined**	**x**	**WIN 1536**	**WIN 1603**	**Sept. 14-15, 2010**
Yolo Central Spill	**x**	**earthen lined**	**x**	**YOC 0970**	**YOC 1008**	**Sept. 28-29, 2010**
Alder Drop	x	concrete lined				
Chapman Outlet	x	concrete lined				
Cottonwood Spill	x	in slough				
Fairfield Ditch Heading	no sensors	earthen lined				
Gordon Slough Heading	x	in slough				
Hungry Hollow Spill	x	in slough				
PLP Spill #2	x	concrete lined				
Salisbury Spill	x	in slough				
University Spill	x	concrete lined				
West Adams Canal Heading	x	concrete lined				
Willow Slough @ 98	x	in slough				
Willow Slough Bypass	x	in slough				
Winters Canal Heading	x	concrete lined				
Yolo Central Heading	x	no d/s check				

Percolation Tests: Field Data Acquisition Methods

Water depth in the canals is measured constantly with a network of telemeterized non-contact ultrasonic sensors. These data are logged on a server at District HQ running the ClearSCADA database. A duplicate "hot standby" server is simultaneously running at a remote location to ensure no lost data. The main use of this system is to monitor canal flows and to manage irrigation deliveries. For the pond infiltration test, this system was used to monitor dropping water levels in sections of ponded canal. Canals were visually monitored periodically during the test to check for leaks or water entering to ensure that changes in water level were due to losses to groundwater only (evaporation over the few hours of the test were estimated and found to be very small and were ignored).

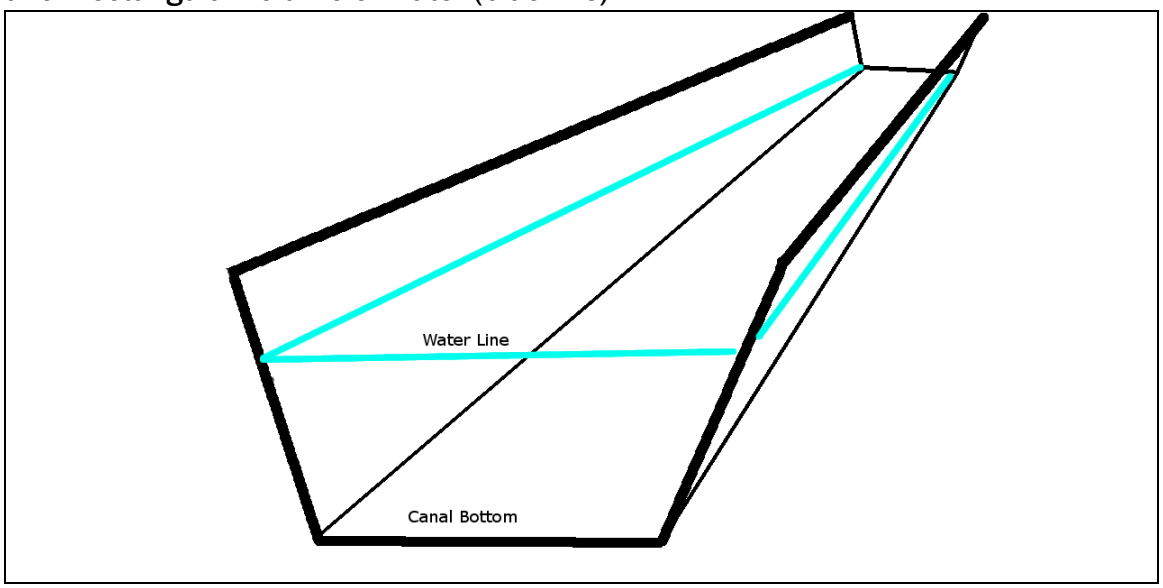
Hydrographs showing the water level were printed out and the slope of the line during the ponding test was measured and converted to infiltration in inches/hour. Table 3 shows the date and duration of the ponding test for each location.

Table 3. Dates and time of ponding tests in three sections of canal during September 2011

Canal section name	Date of Pond Test	Length of time used for level drop measurement (hours)
WEA @ Granite	9-18-2010	8
WIN Chapman inlet	9-14-2010	12
YOC Spill	9-29-2010	15

After the canals dried out, the canal cross section dimensions were measured with a tag line stretched across the canal and a measuring tape was used to measure canal depth at each station along the tag line. The beginning and end of each ponded canal section was measured and a minimum of 5 intermediate cross sections were used to model the geometry and volume of the canal. Figure 1 shows how the top one inch of water surface in the canal can be modeled as long thin slab, or volume, of water. The upstream depth of water eventually reaches zero, as the canal drops over its length while the water surface stays level (Figure 1).

Figure 1. The top surface of the ponded canal water was modeled as a one inch thick rectangular volume of water (blue line).



Percolation Tests: Results

Table 4 shows the results of the percolation test in inches/hour. The results are compared to SSURGO database values. The infiltration rates are also converted to losses in CFS/mile and acre feet/day mile. These loss data can be used to "scale up" and estimate losses for the entire District canal system (Table 4).

Ponded canal versus full flow infiltration rate is presented in Figure 1. The water surface during the pond test was level, while the canal floor drops along its length (Figure 1.) Therefore, the dimension of the modeled "thin slab of water" is a

different size at the ponded water surface, versus a full flowing canal. The difference in these dimension are reflected in "ponded" versus "full flow" volumes in Table 4.

Table 4. Results of ponding tests in three sections of canal during September 2010

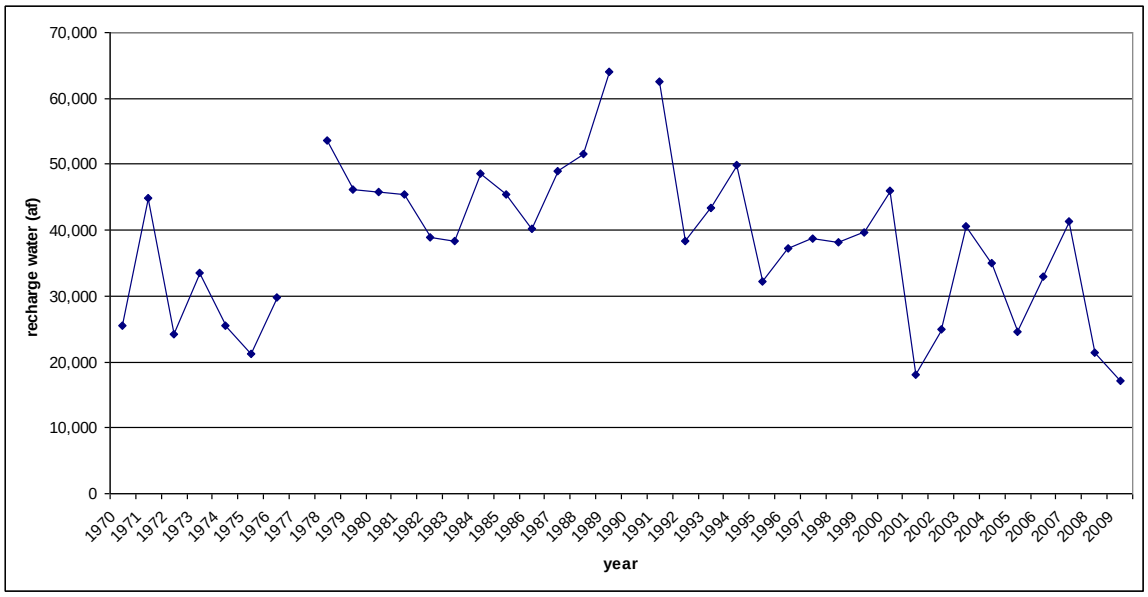
Canal section name	Length of section (ft)	Average width full flow (ft)	Volume of top one inch ponded (cf)	Volume of top one inch full flow (cf)	K_{sat} inches/hr Measured	K_{sat} inches/hr SSURGO	cfs/ mile	acre feet / day mile
WEA @ Granite	1,440	30.6	3,336	3,675	0.50	.32 - 20	1.87	3.7
WIN Chapman inlet	3,552	18.66	5,523	5,523	0.29	.12 - 1.2	0.66	1.3
YOC Spill	1,640	12	1,367	1,640	0.25	.12 - .50	0.31	0.62

Note: Ksat from SSURGO does not match the *Soil Infiltration* map exactly because the map used low values from the uppermost soil horizon, where depth is variable depending on location, and this table uses the low value for the top 20 cm of the soil profile, regardless of the depth to the first horizon.

Potential for Increased Groundwater Storage

The farms and cities within the District depend on the groundwater recharge that occurs because of the unlined canals. The amount of recharge has been quantified over the years and is presented Figure 2. The additional amount of recharge available from winter water diversion (Table 5) into the canals will be compared to the current amount of recharge that occurs.

Figure 2. YCFCWCD Annual losses to recharge. These losses are calculated as the total releases from storage, minus the sales. The result is losses and the total is assumed to be losses to groundwater, although small amount of evaporation and spill occur. In 1977 and 1990 there were no deliveries of irrigation water and hence zero losses.



The water lost from the canal system is mostly recoverable from the groundwater. Figure 2 shows the amount lost to range from ~18,000 af in 2009 to a maximum of ~64,000 af in 1989 and on average 38,264 af of water is lost. Other data, for example, Table 3 of the 2000 Water Management Plan (http://www.archive.org/download/watermanagementp00borcrich/watermanagementp00borcrich.pdf), show that on average 28,500 af are lost to recharge each year from the District's system.

Table 5. Recharge estimates using pond test infiltration data

Category	Canal	length (mi)	af/day mile	af/ day	days	af
Large Main Canal	Winters Canal	16.05	1.3	21	212	4,423
Medium Main Canal	West Adams Canal	10.55	3.7	39	212	8,275
Small Lateral	Canal Laterals (using YOC Spill as average loss rate)	140.3	0.62	87	212	18,441
	Total	166.9				31,140

In Table 5, estimates of losses from the pond infiltration tests were multiplied by total length of the canal and an assumed 212 day season. Two hundred and twelve days is the average season length between 1981 and 2009 (with minimum length of 171 and maximum of 280 days). This analysis of pond infiltration data shows that 31,140 af would be lost in an average length season. This amount is in between the two estimates of losses from sales data discussed above (Figure 2).

Promising Canal Stretches for Recharge

There are two main canals in the District's system: the Winters Canal, which diverts water south of Cache Creek at Capay, and the West Adams which diverts waters on the north and opposite side of the Creek. All other canals in the system branch off of one of these two main canals (the *Soil Permeability* map, attached, shows the canal system).

Any winter time diversions into the canal system will, by design, pass first into the Winters or West Adams Canals.

The volume of recharge water depends on both the infiltration rate and the size of the canal. Two stretches of canal can have a similar infiltration rate, for example canal sections 'WIN Chapman inlet' and "YOC Spill' from Table 3, but very different recharge rates due to differences in overall size of the canal.

In most stretches of canal, the infiltration rate is relatively low. But because there are so many miles of canal (166.9) the total infiltration rate for the system can be significant. In other words, there are no particularly promising sections of canal, most of the system must be used to achieve significant amounts of recharge.

Wintertime Canal Recharge Feasibility: Administrative Costs and Other Factors

The main factor limiting wintertime recharge is that the canal system has dual modes: summer-mode and winter-mode. During summer-mode the canals are full for irrigation deliveries. During winter-mode the canals are empty to accept storm runoff. Changing the canal configuration from summer-mode (irrigation) to winter-

mode typically requires a crew of 10 people to work one week. If a storm comes in the winter and the canal system is in summer-mode (full of water for recharge), the canals could overtop and flooding and damage could result.

For wintertime recharge the canals must be in summer-mode. However, since storms cannot be predicted more than a few days in advance, when storms are predicted, there is not enough time to switch from summer to winter mode. Therefore the canals must remain in the wintertime configuration for the duration of the winter season and recharge water cannot be introduced into the canals.

It is possible to install a system of automated gates, which would allow the canals to switch from winter to summer mode in minutes, instead of days, allowing wintertime recharge to occur. Although these gates could preserve the ability of the canals to carry flood flows at a moments notice, it would take many years to plan, finance, and install this system.

Even with an automated gate system, the system must be managed in such a way to monitor for approaching storms, protect against localized flooding, and protect the headgates and diversion works at Capay from flood damage. There will be an incremental increase in administrative costs for these activities. Additionally, the financing of a capital improvement program to install automated gates will incur additional administrative overhead.

Gravel Pit Recharge

The use of existing gravel pits for active groundwater recharge has been discussed for many years in Yolo County (YCFCWCD Water Management Plan 2000). Active recharge allows the opportunity to increase groundwater storage and optimize conjunctive use of both surface and groundwater resources. Optimized conjunctive use can provide more water for all uses, without creating new surface water reservoirs.

In 2006, the Yolo County Flood Control and Water Conservation District (the District) completed a Countywide groundwater simulation model, which specifically looked at using gravel pits in a groundwater recharge and recovery scenario.

For this current grant project, we planned to deliver water to the pit at Capay for active recharge. However, no wintertime deliveries of water were made. Certain

aspects of the District's irrigation system made it difficult or impossible to deliver the water during winter. Infrastructure improvements of more than $25,000 were needed to deliver the water, but were not part of the original budget. Additionally, the road to the canal heading is dirt and not passable at times during wet winter weather and the control gates could not be reached. After the end of the study, the District installed remote control on these gates, but this feature was not available at the time for the gravel pit test.

The gravel pit at the Granite Capay Facility is a 10 acre excavation in the ground, left over from extraction of aggregate resources (gravel) (see Map 1).

Aggregate Industry Partnerships

Both aggregate mining and the District (or predecessor water companies) have a long history in Yolo County, starting with the first white settlements in the 1850's. The aggregate industry along Cache Creek has been mining for high quality aggregate resources since the late 1800's. (Irrigation diversions started in 1856 at the Moore Dam, with a water right currently held by the District.) Historically, gravel mining was generally in the main Creek channel itself, but off-stream mining is documented starting around 1981.

For the current study, Granite Construction kindly agreed to provide access to their mining facility near Capay, CA, the pond, monitoring wells, and other monitoring data in exchange for a copy of this report, when completed.

Infiltration Rate near the Gravel Pit from Canal Flow Measurement: Field Data Acquisition

During normal canal operations, losses to groundwater must be taken into account. For example, if a canal has sales for a particular day of 75 cfs, 100 cfs of water must be delivered to the canal heading, to account for losses. By carefully measuring flows upstream and downstream of a particular point along the canal, losses can be quantified.

From April 30, 2012 to June 17, 2010, canal flows were manually measured daily at 6 locations in the West Adams Canal system near the Granite Capay aggregate mining facility (Figure 3). The weir stick overpour method was used (http://www.usbr.gov/pmts/hydraulics_lab/pubs/wmm/). The flows after June 17, 2010 became too high for use of the weir stick method and those measurements were stopped. Two sites, the uppermost WEA0170 and the lowermost WEA0240 were equipped with continuous flow measurement sensors and telemetry allowing real-time collection of flow data at these two sites (Figure 4). Figure 4 is a screen shot from the District's Real-time SCADA system. For each day shown in Figure 4, a single value for daily average difference in flow was estimated and used to make the hydrograph shown in Figure 5. Figure 5 shows the losses in cfs between the two sites.

Infiltration Rate Estimates from Canal Flow Measurement: Results

Shown in Figure 3 are the acre feet of water lost per day in the West Adams canal, during the early irrigation season, from late April until mid May of 2010. Approximately 20 acre feet were lost per day along that 1.81 mile section of canal (WEA0170 to WEA0351CK), or 5.5 cfs per mile.

Figures 4 and 5 shows the losses from the canal nearby the Granite gravel mining facility, between the WEA0170 and the WEA0240, a distance of 0.7 miles. The water that was leaving the canal due to infiltration was moving into the ground and percolating to the groundwater surface, "filling the profile" and raising the groundwater. The daily average losses from the data in Figure 5 are 9.4 cfs, or 13.4 cfs/mile.

The difference in losses to groundwater between Figures 3 and 5 do not match because the measurements involved different sections of canal.

Gravel Pit Water Level and nearby Groundwater Levels: Field Data Acquisition

The monitoring wells surrounding the pit were surveyed during installation by Granite Construction Inc an unknown number of years ago and this well casing elevation data was supplied to District. For this current study, a GPS Total Station survey instrument, with sub centimeter accuracy, was used to tie the canal water and pond water levels in with the monitoring well casing elevations. A U-10 Hobo waterlevel data logger was deployed in each of the wells and the pond, while the previously constructed SCADA station at WEA0240 measured the water levels in the canal. Water level monitoring locations are summarized in Table 6 and shown on Map 1.

Table 6. recharge amounts using current infiltration data

Location name	Reference Elevation ft msl (NGV27)	UTM 10 S Easting	UTM Northing	Notes
MW1	204.02	582888.54	4285410.24	Monitoring Well #1 (MW1)
MW2	198.29	583698.40	4285985.65	Monitoring Well #2 (MW2)
MW3	194.22	583963.88	4285390.20	Monitoring Well #3 (MW3)
Pond 1A	Pond surface variable	--	--	Pond size and surface elevation is variable, for location please see Map #1
WEA0240CK	201.715	583033.94	4285899.23	West Adams Canal 0240 Check

Figure 3. Daily flow at 6 locations on the West Adams Canal near the Granite Capay facility. The difference in flow between the uppermost location (WEA0170) and the most downstream location (WEA0351CK) is converted to af/day.

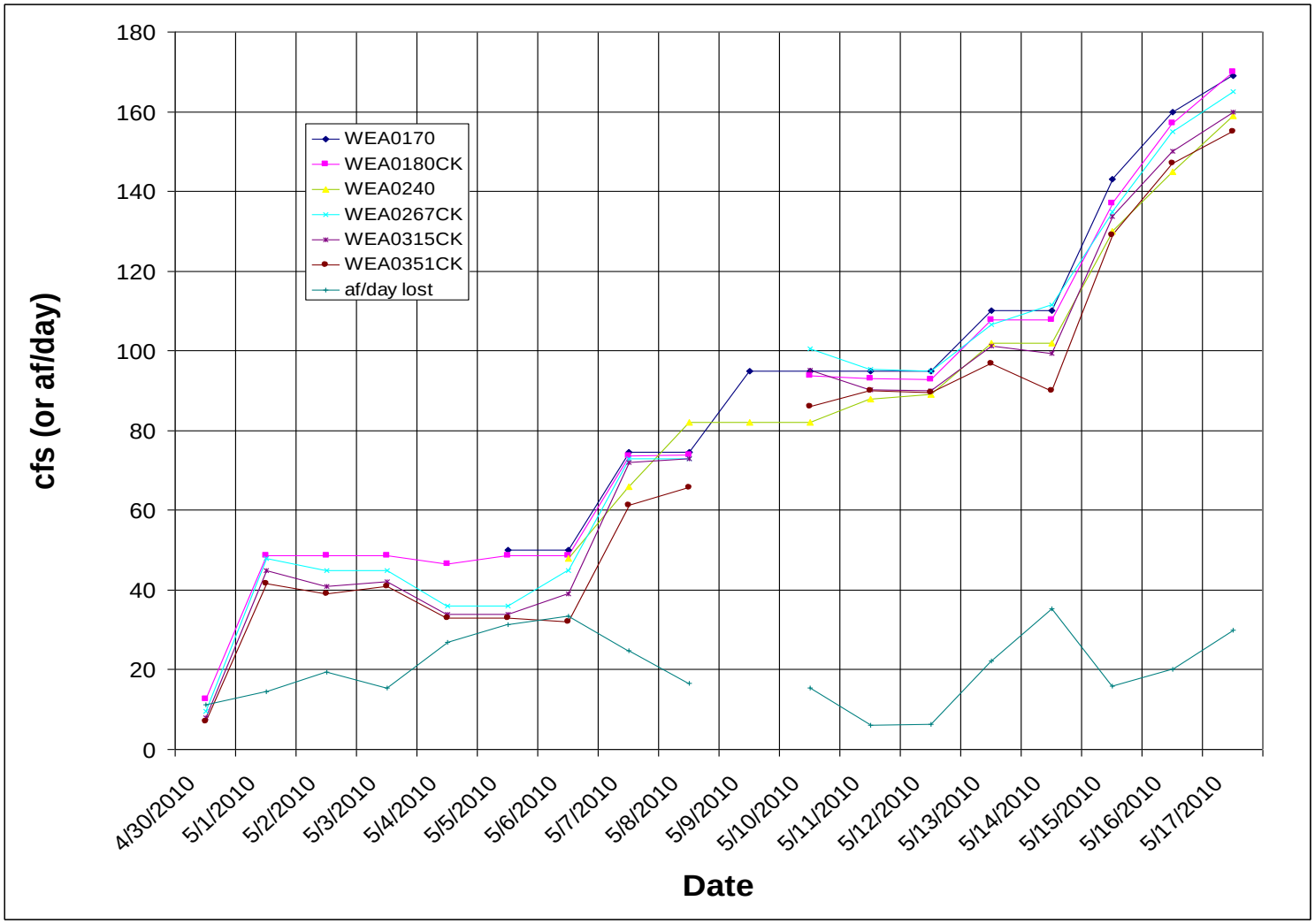


Figure 4. Screenshot showing upstream and downstream flows at two locations. The difference in flow between the green (upstream) and blue (downstream) lines is loss to groundwater.

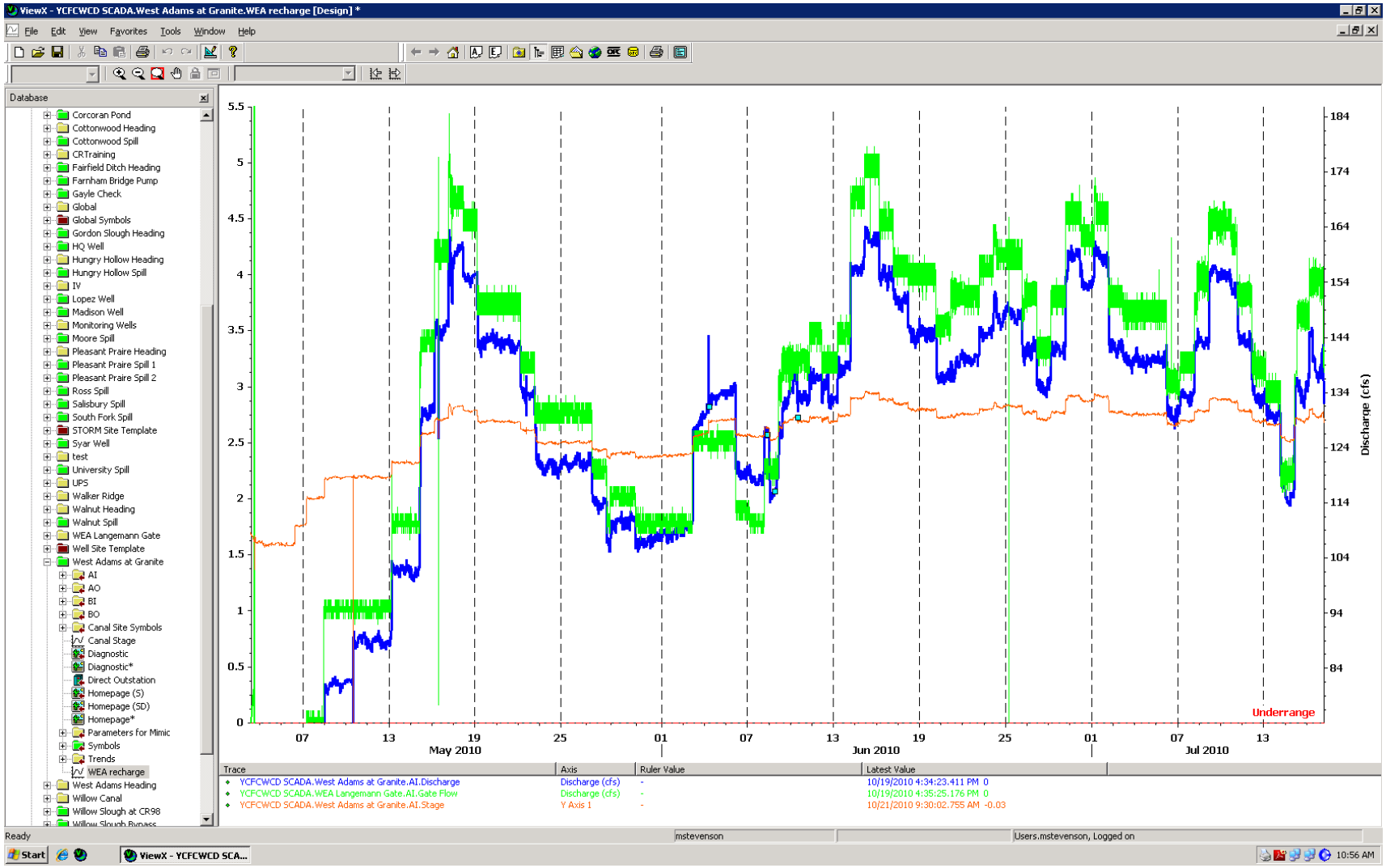
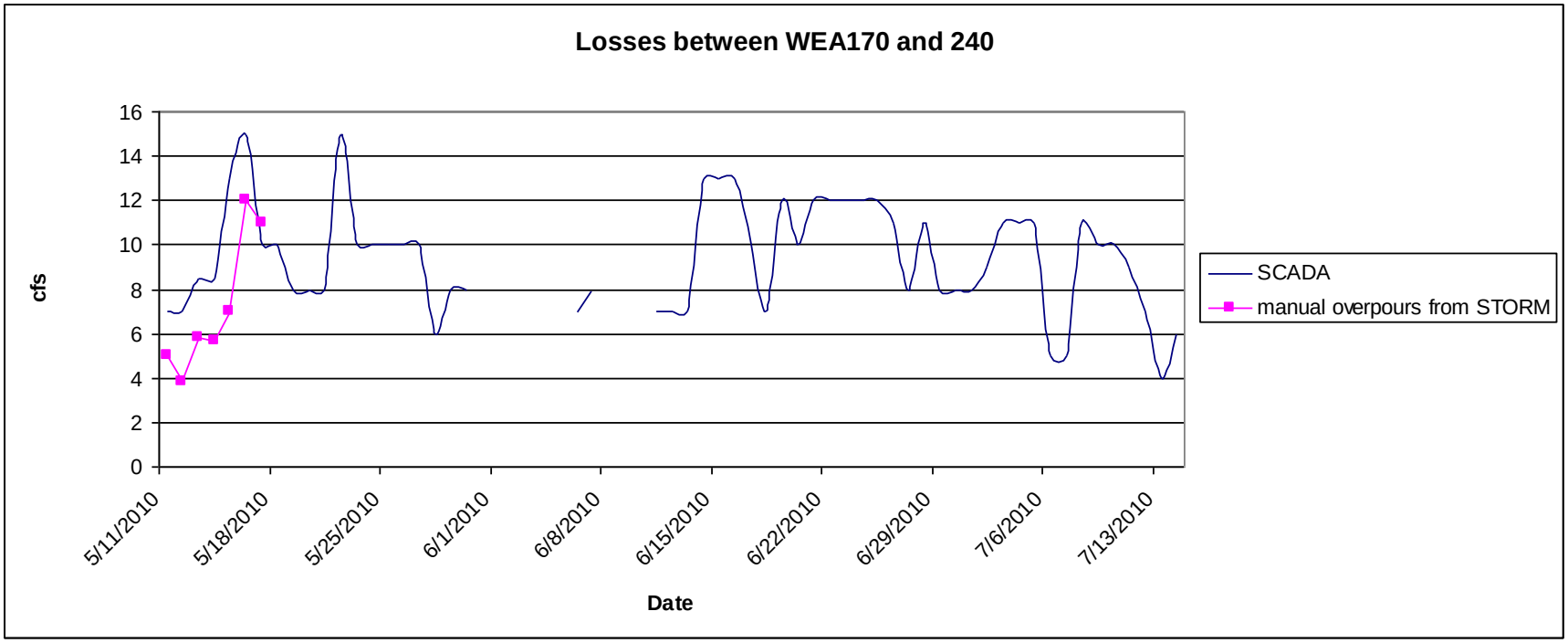
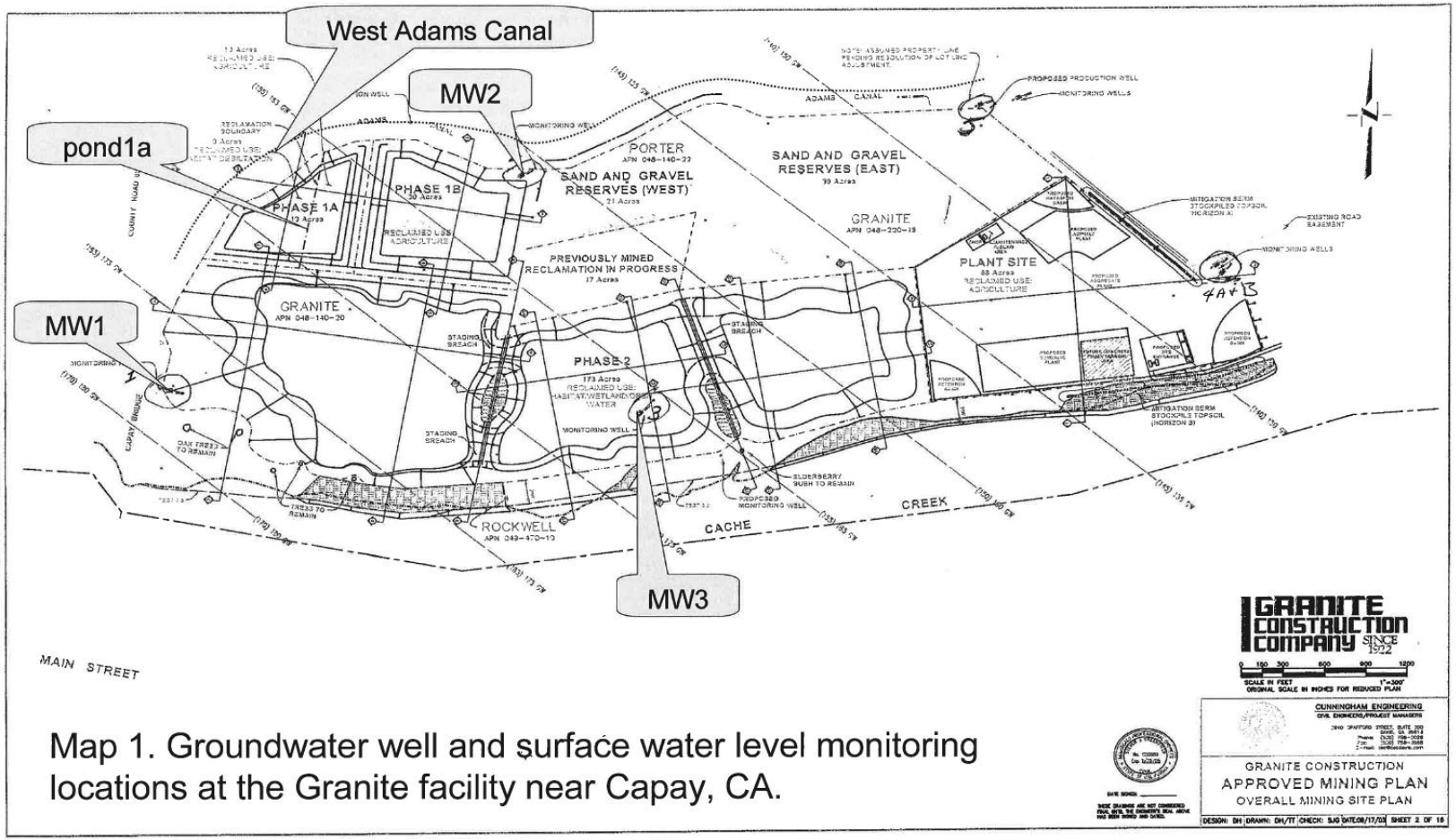


Figure 5. Losses to groundwater as measured by difference in flow between two SCADA stations. Manual overpours from STORM are measurements taken with the weir stick method.





Map 1. Groundwater well and surface water level monitoring locations at the Granite facility near Capay, CA.

Gravel Pit Water Level and nearby Groundwater Levels: Results

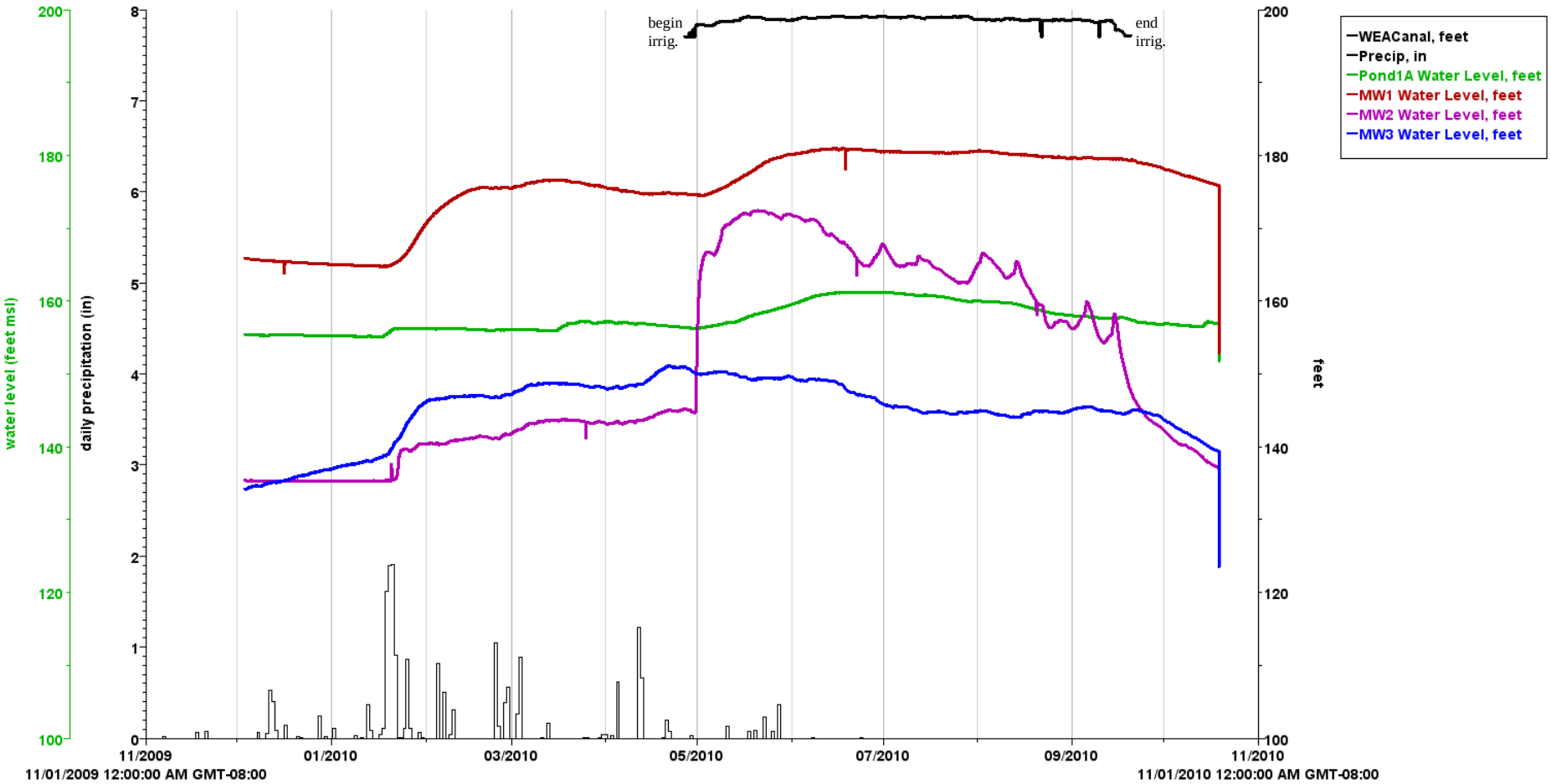
Figure 6 shows the response of groundwater level and the pond surface level to rain and irrigation water present in the canal. The water level in the pond rose 10 feet when irrigation water was placed in the canal at the beginning of May, 2010 (Figure 6.) The closest monitoring well to the canal (MW2) rose more than 30 feet. At the end of the irrigation season in September 2010, the groundwater level in MW2 immediately dropped, while the pond dropped very slowly.

The phase 1A pond at the Granite Capay Facility is 10 acres in size. A rise of 10 feet in water level is 100 acrefeet (af). One hundred af is a very small amount of water for the District which delivers over 180,000 af per year. Although the pond looks like a surface water reservoir, it would be very small if so and not much use to the District if it only held 100 af. It is better to think of the pond as a very large diameter well. The water level in the pond reflects the water level in the surrounding aquifer. The water levels for the pond in Figure 6 show that during irrigation season, the pond is intermediate between the canal and MW2, up gradient, and MW3, down gradient. It is apparent that the pond is filling with water from the canal.

During the non-irrigation season, the pond water level stays higher than the surrounding aquifer, as shown in the monitoring wells. If there was a good hydraulic connection between the bottom of the pond and the surrounding aquifer, the pond should quickly drain. This does not appear to happen.

The pond is used at the Granite facility to dispose of 'fines' from the gravel washing process. Perhaps the bottom of pond is clogging up with silt. The sides of the pit, above the pond high water level, may not be clogged with silt and high groundwater from the surrounding aquifer can drain into the pond, filling it. However, when the surrounding groundwater levels drop below the level of the pond, the pond drains very slowly. For the 24 days after the end of irrigation season, when no water was present in the canal, the pond level dropped only 6.2 inches, a rate of 0.01 inches per hour. This rate is more than 10 times smaller than any infiltration rate measured in the canals (Table 4). Of note, the water level is MW1 was still high after the end of irrigation season and water could be coming from up gradient to keep the pond high, perhaps lowering the measured infiltration rate.

Figure 6. Water levels (NGV27) at the Granite Capay Facility during 2010. Rain also shown in vertical bars.



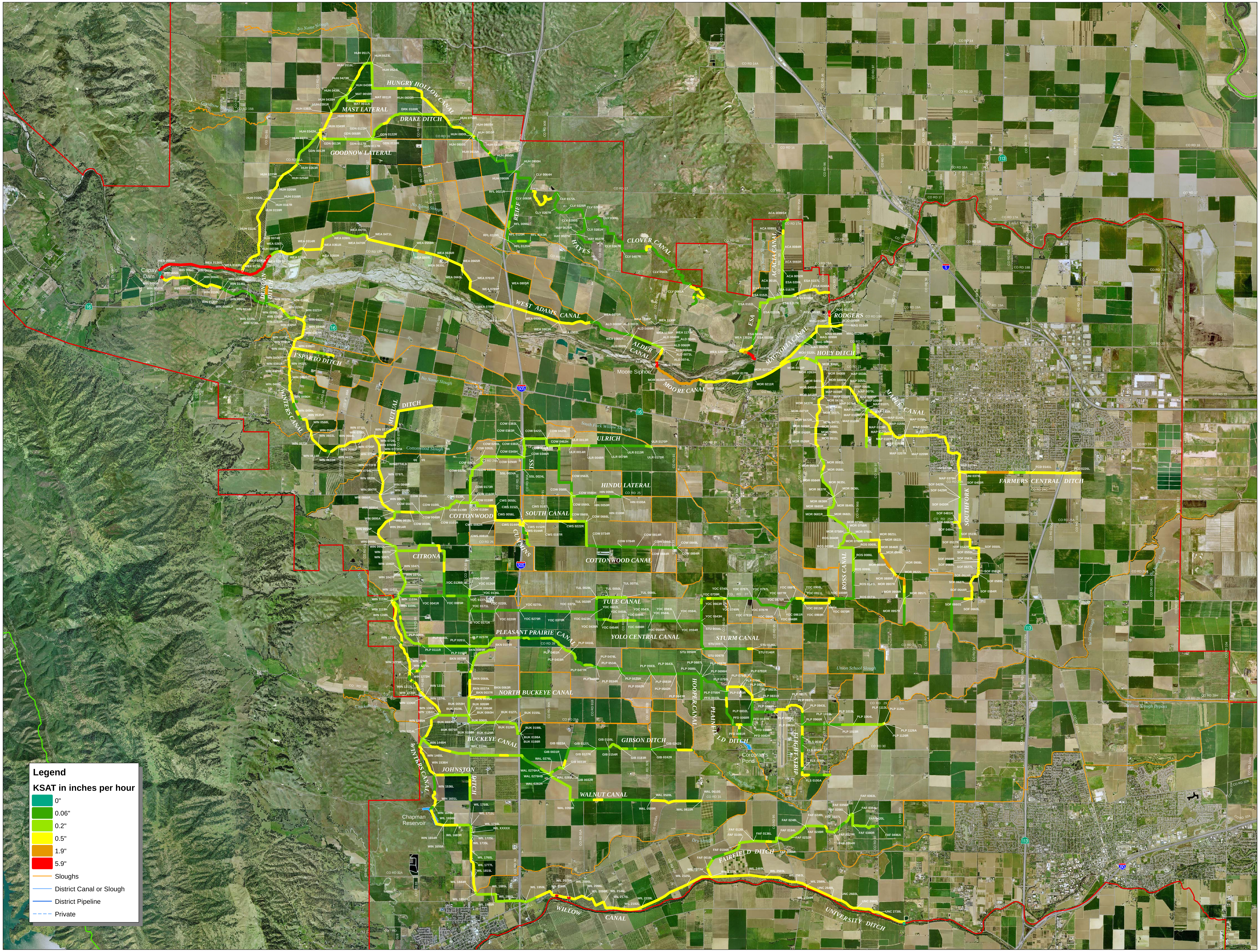
Gravel Pit Conclusions

It appears that using the gravel pit pond as a recharge basin would not be very effective, as it drains slowly in its current configuration. If the pond were filled with water, it would remain relatively static and not recharge the aquifer. These are preliminary results. Perhaps if the pond was filled with water above its current level and no fines were added, infiltration rates could be increased. However, the current plan for this particular pond is to eventually fill it completely with fines from the washing process, and reclaim the land. The canal bottoms in the District's system appear to have much higher infiltration rates. The canals and other opportunities in the area for active recharge basin development should be explored.

Recommended Action Plan

The Granite Capay facility pond has a low capability as a recharge facility and likely should not be used for an active recharge program, however other gravel mining facilities may be appropriate. The District's canal system should be the focus of future active recharge systems. This is due to higher infiltration rates in the canals versus the gravel pit and the large size overall of the District system. Other gravel pits in the Cache Creek system may be more appropriate for active groundwater recharge.

Although not discussed earlier, but mentioned here, the gravel pits along the Cache Creek system involve large amounts of administrative overhead due to coordination of mining operations and safety, unusual wintertime water delivery systems, and important environmental concerns. In contrast, the District's existing canal system is already designed to accept water, is efficient with no pumps, and may be ideal for wintertime recharge. Over the next decades, the District should continue upgrading its canal infrastructure with automated gates for wintertime recharge operations.



Soil Permeability

Yolo County Flood Control and Water Conservation District

Attachment 12** – GHG Emission Calculations

Energy savings include savings in electricity use and fossil fuel consumptions (diesel, natural gas, gasoline, etc.). If the applicant's project generates renewable energy, add the amount of renewable energy to the category of electricity saving. To convert the energy/fuel savings to the avoided Greenhouse Gas (GHG) emissions, use the following equation:

GHG Emission Reduction = (Energy Savings) x (Emission Factor)
or
GHG Emission Reduction = (Fuel Savings) x (Emission Factor)

For calculation convenience, below are some Emission Factors quoted from a State Air Resources Board's report: www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_Protocol_v1_1_2010-05-03.pdf

Type of Energy/Fuel	Emission Factors
Diesel	10.21 kgCO2/gallon
Natural Gas	0.0545 kgCO2/scf
Gasoline	8.78 kgCO2/gallon
Electricity	451.7 kgCO2e/MWh

scf – standard cubic foot. Standard condition refers to the air condition at temperature of 60 degree Fahrenheit with 1 atmospheric pressure.
MWh – Megawatt-hours, an electricity unit.

The Emission Factor for electricity is from USEPA 2012 eGRID (2009 data, www.epa.gov/eGRID) for the non-baseload output emission rate in CAMX sub-region (California).

Annual gasoline savings from reduced vehicle use: 8,531 kg of CO_2 GHG Emission Reduction

To operate during the irrigation season, the Winters Canal needs 6 field staff, 7 days a week. We estimate that one field staff person equivalent can be saved. For the 2011 irrigation season (May to September) 5830 gallons of gasoline were used in these six pickup trucks. The fuel use per truck is 972 gallons per irrigation season, reducing use by one truck would save of 8,531 kg of CO_2 per year.

Annual electricity savings from photovoltaic solar panel use: 333.6 kg of CO_2 GHG Emission Reduction

The load in kWh was measured from an existing Langemann automated gate during up movement (4 amps @ 24VDC), down movement (2 amps @ 24 VDC), and standby (0.2 amps @ 24 VDC). The number of up (6,272) and down (5,493) movements of the gate were counted

** Completing this Attachment is not required for AWMP preparation proposals.

during the 2011 season. Movements were estimate to last 30 seconds. Total annual load is 49.2 kWh. If 15 automatic gates are installed, the savings will be 738 kWh/year (0.738 MWh) or 333.6 kg of CO_2 per year.

Annual diesel savings from reduced water customer (farmer) pumping attributable to improved delivery flexibility (early shut offs): TBD kg of CO_2 GHG Emission Reduction

Due to large uncertainties regarding how much improved delivery flexibility will promote early shut off of diesel pumps, the amount GHG emission reduction has not been calculated. The District will conduct a survey to help estimate this amount as part of its monitoring and reporting program.

AGRICULTURAL WATER MANAGEMENT PLAN
2013

Prepared Pursuant to Water Code Section 10826

YOLO COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
34274 State Hwy. 16
Woodland, CA 95695

Adopted: October 1, 2013

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Section I: Introduction

A. Description of Previous Water Management Activities

In October 2000, the Yolo County Flood Control and Water Conservation District (District) adopted a Water Management Plan (Borcalli, 2000). The October 2000 Water Management Plan was prepared pursuant to Assembly Bill (AB) 3616 and AB 3030 as a comprehensive plan for Yolo County's surface water and groundwater resources. This Agricultural Water Management Plan (AWMP) is being prepared to update the October 2000 Water Management Plan and to comply with the requirements of SBx7-7.

The District received AB 303 grant funds to develop a groundwater management project and plan. This project is described in the July 2004 report entitled "Groundwater Monitoring Program, Data Management System, and Update of Groundwater Conditions in the Yolo County Area" (Luhdorff & Scalmanini, 2004). This 2004 report is the foundational document for the District's June 2006 Groundwater Management Plan.

In addition to developing its Groundwater Management Plan, the District has developed and implemented numerous water management practices and participated in several regional planning efforts since the October 2000 Water Management Plan was prepared, some of which are highlighted below:

- Installation of a Supervisory Control and Data Acquisition (SCADA) system to allow the District to remotely monitor and operate major system components. This includes the installation of automatic gates as well as auto-flow and level control devices
- Development of a systematic flow measurement program
- Development and implementation of conjunctive use programs to supplement dry year surface water supplies
- Implementation of an electronic accounting program for tracking deliveries (STORM)
- Implementation of a water quality monitoring program
- Development of a groundwater model
- Purchased land for its proposed mid-lateral reservoir
- Provided training for ditch tenders through the Irrigation Training and Research Center (ITRC) at California Polytechnic State University, San Luis Obispo (Cal Poly)
- Participation in the Local Area Land Subsidence Program
- Participation in the 2007 Yolo County Integrated Regional Water Management Plan (IRWMP)
- Participation in the 2013 Sacramento Valley Westside Group IRWMP

B. Coordination Activities

1. Notification of AWMP Preparation

Agricultural Water Suppliers required to prepare an AWMP Plan pursuant to SBx7-7 must notify each city and county within which they provide water supplies that the agricultural water supplier is preparing or reviewing a plan and is considering changes or amendments to the plan. SBx7-7 does not specify how much advance notification of cities and counties is required nor does it require notification to any other agency(s). Further SBx7-7 does not require that comments from any city, county, or other agency must be solicited and considered. Table 1 identifies the entities notified by the District. A copy of the public notice of the District's intention to review, update, consider changes to its AWMP, and to comply with SBx7-7 is presented in Appendix A.

2. Public Participation

Notice of the District intent to update its AWMP and to comply with the provisions of SBx7-7 was published on September 12, 2013 and September 19, 2013 in the *Daily Democrat*. The notice identified that the Draft AWMP was available for public review at the District's office and also identified the time and date of the hearing for public comment and intent to adopt the AWMP.

C. AWMP Adoption and Submittal

1. AWMP Adoption

The resolution adopting the AWMP is included in Appendix B.

2. AWMP Submittal

The steps followed in a submittal of the AWMP are described in *A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan (2012 Guidebook)* and are outlined in Table 1.

3. AWMP Availability

The requirements for the availability of AWMP's are described in the 2012 Guidebook. Table 1 summarizes the District's compliance with notification and AWMP availability requirements.

Table 1: Summary of Coordination, Adoption, and Submittal Activities

Potential Interested Parties	Notified of Public Hearing and Intention to Adopt	Copy of Adopted AWMP/ Amendment Sent
Department of Water Resources	Sept 12, 2013	Within 1 week of adoption
Yolo County	Sept 12, 2013	Within 1 week of adoption
Any Cities within which water is supplied: The District does not supply water to any cities within its service area.	NA	NA
Water Resources Association of Yolo County	Sept 5, 2013	Within 1 week of adoption
Urban water suppliers within which jurisdiction(s) water is supplied: The District does not supply water to any cities within its service area.	NA	NA
Any City or County Library within which jurisdiction water is supplied Woodland City Library	NA	Within 1 week of adoption
The California State Library	NA	
Local Newspaper: Daily Democrat	Sept 12, 2013 & September 19, 2013	NA
District Website	September 12, 2013	Within 1 week of adoption

D. AWMP Implementation Schedule

The District has adopted this AWMP in accordance with the provisions of SBx7-7. As identified in this AWMP, the District continues to implement many of the EWMPs including the water measurement and volumetric pricing EWMPs. As identified later in this plan, the District intends to develop a Water Measurement Certification Program which will be implemented over the next three years.

Section II: Description of Agricultural Water Supplier and Service Area

A. Physical Characteristics

1. Size of the Service Area

The District was established by the California State Legislature on July 1, 1951 under the provisions of General Law 9307, Statutes of 1951, Chapter 1657, as amended.

The District's General Manager is responsible for planning for the District's long-term water needs and oversees the activities carried out under the Construction, Flood Control, and Irrigation Divisions of the District. In addition to the General Manager, the District's normal work force includes 25 employees, including a dam tender and power plant operator, irrigation workers, field and equipment supervisors, water resources technicians, and office staff members. All operations and maintenance services are provided by District personnel, including water delivery, billings, accounting, construction, and facility and equipment repair and replacement.

The District, which includes approximately 190,000 acres, or nearly 40 percent of the valley lands in Yolo County, is governed by a five-member Board of Directors appointed by the County Board of Supervisors to serve four-year terms. During the past 10 years, not including the critical year 2009 when very little water was available for delivery by the District, an average of approximately 50,000 acres has been irrigated (see Table 2).

Table 2: Water Supplier History and Size

Date of Formation	**Date: July 1, 1951**
Source of Water	
Local Surface Water	X
Local Groundwater (landowner)	X
Service Area Gross Acreage	190,000
Current Irrigated Acreage (2012)	46,542

The District has no authority or responsibility regarding land use planning. This is the responsibility of the county and cities. Accordingly, it is the responsibility of the county and cities to assess existing and proposed land uses from the standpoint of land use impacts on groundwater supplies and contamination. The District reviews proposals for changes in land use and offers comments relative to water use, flood control, and drainage to the county and cities in Lake and Yolo counties.

From time to time the District considers minor property annexations. Because of their size and the various supplies available to the District, these minor property annexations do not have a material

change in the available water supply. The District does not anticipate any major changes to area served or the uses of water within its service area in the foreseeable future.

2. Location of the Service Area and Water Management Facilities

The District is located within the northern portion of Yolo County and includes the cities of Woodland, Davis, and Winters, and the towns of Capay, Esparto, Madison, and other small communities within the Capay Valley. The distribution system is comprised of approximately 160 miles of canals and laterals (see Table 3). Three dams, Cache Creek Dam, Indian Valley Dam, and the Capay Diversion Dam are managed by the District. A map showing the location of the District and major facilities is included as Figure 1.

Table 3: Water Conveyance and Delivery System

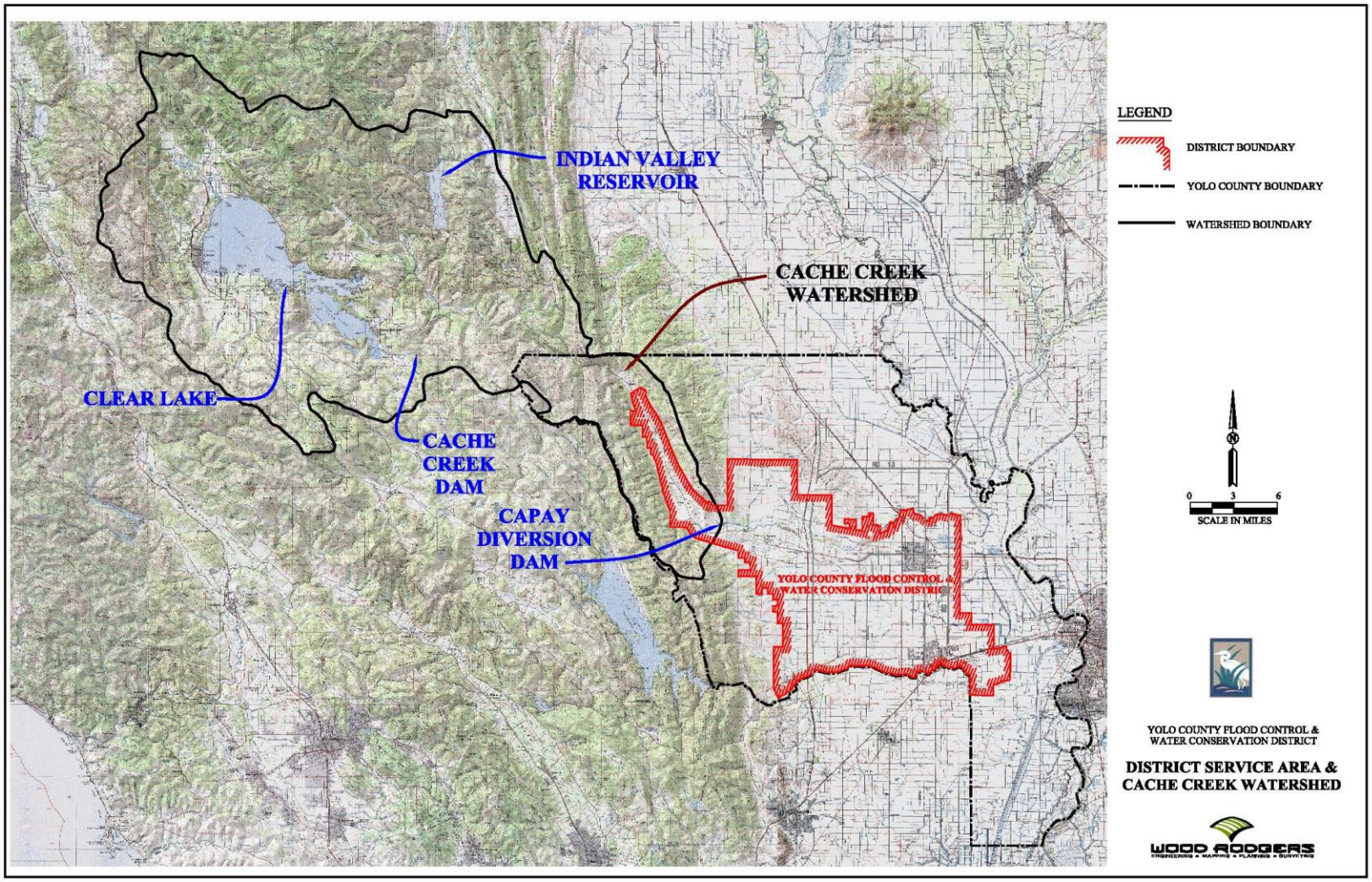
System Used	Number of Miles
Unlined Canals	150
Lined Canal	10
Pipelines	0

The District's surface water supply consists of the Clear Lake-Indian Valley and Cache Creek system within the Cache Creek watershed, which encompasses approximately 950 square miles. Virtually all precipitation in the Cache Creek watershed occurs as rainfall. The term "system" is used because it is truly the "system" that the District manages for its water users. As experienced in 1990, the District has and will continue to have years or periods where there is no surface water supply available for its water users.

The various components of the District's water supply system are described below:

> Clear Lake – Clear Lake is a large shallow natural body of water with an area of approximately 44,000 acres when full, and has a maximum depth of approximately 50 feet. The water level fluctuations have been modified since the construction of Cache Creek Dam by the Yolo Water and Power Company in 1914. Since 1915 water levels in Clear Lake have been regulated by the operation of Clear Lake Dam in accordance with the “Gopcevic Decree”, approved in 1920, and the "Solano Decree", approved in February 1978 and revised in 1995. Cache Creek Dam is now owned by the District. An operation schedule established in the Gopcevic Decree for filling the lake identifies lake levels to which Clear Lake is allowed to fill for different times during the winter. The Solano Decree specifies how much water is available for use by the District each month during the summer irrigation season based on the Rumsey Gage. This decree stipulates the amount and rate by which the District can withdraw water between the limits of zero and

Figure 1: District Service Area and Cache Creek Watershed



7.56 feet on the Rumsey Gage, which is located on the lake at Lakeport. Zero on the Rumsey Gage is regarded as the natural rim of the lake. The existing storage between zero and 7.56 feet on the Rumsey Gage is about 320,000 acre-feet (AF). The District's allowable withdrawal from Clear Lake is determined by the stage of Clear Lake on May 1. The maximum withdrawal is 150,000 AF. The District may not withdraw any water delivery below the Cache Creek Dam in any year the Clear Lake stage is 3.22 feet or less on the Rumsey Gage on May 1.

Clear Lake provides no carryover storage. Therefore, the District attempts to use its full allowable withdrawal each year.

Indian Valley Dam and Reservoir – In 1975, the District completed construction of the Indian Valley Dam and Reservoir project. The Indian Valley Dam and Reservoir are owned and operated by the District. The dam and reservoir are located on the North Fork Cache Creek approximately 54 miles from the Capay Diversion Dam.

When full, Indian Valley Reservoir has a surface area of 4,000 acres and a total storage capacity of 300,600 AF. Forty thousand (40,000) AF of the reservoir storage capacity is dedicated to flood control. Unlike Clear Lake, Indian Valley Reservoir provides carryover storage from one season to another.

In 1982, a hydroelectric project with a nominal capacity of 3,000 kW was retrofitted to the outlet works of the dam.

Table 4: District Reservoirs

Reservoir Name	Usable Capacity (AF)
Clear Lake	150,000
Indian Valley Reservoir	280,600

Cache Creek – Downstream of Clear Lake and Indian Valley Dam and Reservoir, the most significant streams are Long Valley Creek, a tributary to the North Fork Cache Creek, and Bear Creek. As noted previously, all precipitation in the Cache Creek watershed occurs as rainfall. Thus, runoff tapers off sharply following winter and spring rainfall.

The District owns and operates Cache Creek Dam, a conservation structure constructed on Cache Creek approximately five miles downstream of Clear Lake. In 1986, the District completed construction of a hydroelectric project with a nominal capacity of 1,750 kW. Cache Creek Dam is located approximately 49 miles upstream from the District's Capay Diversion Dam. This hydroelectric facility is currently non-operational. Investigations are being conducted to assess the feasibility of bringing this facility back on line.

The District's basic management objective regarding its water supply system is to utilize runoff in Cache Creek first. If the runoff in Cache Creek is not sufficient to meet irrigation demand, the District will

withdraw from Clear Lake in accordance with the Solano Decree. Once the District compiles its "water orders" and estimates its seasonal demand, the District will then determine the amount of water required from Indian Valley Reservoir. Releases from Indian Valley Reservoir are made to augment releases from Clear Lake on as uniform a basis as possible.

In years when inadequate water supplies are available from Clear Lake, the District will withdraw water from Indian Valley Reservoir. Water supplies from Indian Valley Reservoir are used to meet current year demand. The facility is not operated to maximize carryover storage. Although Indian Valley Reservoir was designed to provide a firm yield of approximately 55,000 AF, the District determined it was most efficient, from a water management standpoint, to operate to meet demand in a given year even though there may be no water available in subsequent years. This was the case in 1990, when the District had little or no water to deliver from Clear Lake or Indian Valley Reservoir.

This operational strategy maximizes storage in the groundwater basin, which is the most efficient reservoir available to lands within the District. If Indian Valley Reservoir was operated on a firm yield basis, the frequency and magnitude of flood spills would be greater than under current operations. Water "dumped" as a flood spill is essentially lost to the system.

Operational spills that occur along the District's distribution system discharge into sloughs or drains and are recovered and reused by the District and individual landowners. In addition, individual landowners have constructed tailwater recovery systems to increase on-farm efficiency. The District has participated with the Resource Conservation District (RCD) in its Model Farm Program by providing in-kind services to assist landowners in constructing tailwater recovery systems to conserve water and minimize the amount of sediment leaving the farm. Table 5 summarizes the existence of tailwater/ operational spill recovery systems.

Table 5: Tailwater/Operational Outflow Recovery System

System	Yes/No
District Operated Tailwater/Spill Recovery	Yes
Grower Operated Tailwater/Spill Recovery	Yes

To help maintain a healthy and vibrant agricultural industry in Yolo County, the District must maintain and improve its aging water delivery system. The integrity of District structures is a public safety and economic issue as well. The District's water system of today is a descendant of the ditches dug as many as 150 years ago by Yolo County's farming pioneers who dreamed that orchards and other fresh produce might flourish on land once thought suitable only for grazing and wheat production. Though the canals, culverts, bridges, and gates of today's system are not necessarily original structures, many of them now require replacement or significant repair, and all of them need regular assessment. Two of the District's three dams are approaching the 100-year mark, and its newest is over 30 years old. The District believes that its capital improvement projects, scheduled infrastructure maintenance, and readiness for

emergency repairs are essential functions that help ensure safety and prosperity for Yolo County and its residents.

3. Terrain and Soils

A portion of the western edge of the District reaches up into the Coast Range; these lands are gently sloping towards the valley. The majority of the District is in the Sacramento Valley. The terrain in the District is nearly level, sloping gently from the Coast Range to the Sacramento Valley. The soils can generally be classified lowland associations and upland associations.

The majority of the soils within the District are classified as lowland association. These soils are well drained to poorly drained, silty loams to clays with slopes ranging from 0 to 2 percent. The remaining soils on the upland associations are well drained gravelly loams or loams, with slopes ranging from 2 to 30 percent. A map showing the geologic units in and around the District is included as Figure 2.

The water diverted into the District discharges as surface flow through Cache Creek and the Willow Slough Bypass and as sub-surface flow under Putah Creek. Water that leaves the District's system spills into sloughs or constructed drains.

4. Climate

Yolo County has a Mediterranean climate characterized by warm, dry summers and cool, moist winters. The southern part of the District is cooler because of the cool air from the ocean. Marine clouds gather in the Coast Range and move eastward, thus the heaviest rainfall occurs in the Coast Range. Average annual rainfall ranges from about 25 inches near Winters to about 20 inches in Woodland and Davis. Most of the precipitation occurs in December, January, and February; with little to no precipitation in July through September. Table 6 summarizes average climatic conditions within the District.

Table 6: Summary of Climate Characteristics

Climate Characteristic	Value
Average Annual Precipitation (inches)	24.9 inches
Annual Minimum Precipitation (inches)	12.0 inches
Annual Maximum Precipitation (inches)	42.1 inches
Average Annual Minimum Temperature	38.6°F
Average Annual Maximum Temperature	96.4°F

Table 7 presents more detailed information. Precipitation and temperature data was obtained from the National Climatic Data Center (NCDC); the information in the tables below is from 1991-2012 for the Winters station located within the District. The evapotranspiration data was obtained from the California Irrigation Management Information System (CIMIS) for Esparto also located within the District.

Figure 2: Soils and Terrain

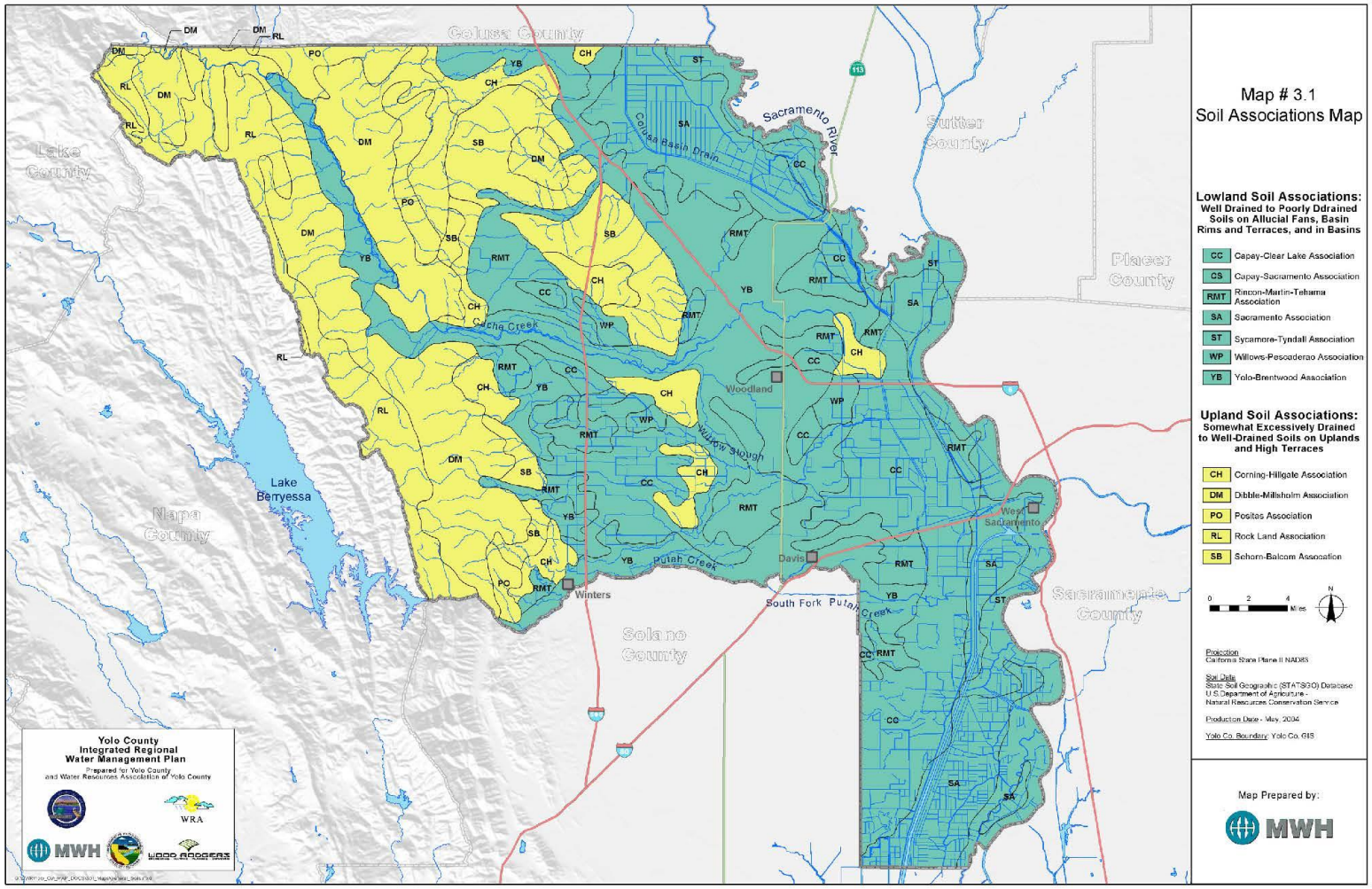


Table 7: Detailed Climate Characteristics

Month/Time	Average Precipitation, Inches	Average Reference Evapotranspiration (Et_o), Inches	Average Minimum Temperature, ^oF	Average Maximum Temperature, ^oF
January	5.20	0.99	38.7	56.9
February	5.11	1.73	41.8	62.4
March	3.34	3.37	45.3	68.9
April	1.34	5.47	48.4	74.9
May	0.89	6.89	54.1	83.8
June	0.22	8.12	58.9	90.9
July	0.01	8.49	60.8	96.4
August	0.03	7.48	59.8	95.8
September	0.08	5.79	57.7	92.2
October	1.02	4.24	51.7	81.2
November	2.43	2.04	43.8	67.2
December	5.25	1.16	38.6	57.3
Wet Season**	23.69	19.00		
Dry Season**	1.23	36.77		
Notes: **Wet season is typically October through April				

B. Operational Characteristics

1. Operating Rules and Regulations

The Rules and Regulations, as last amended by the District's Board of Directors in March 2003, governs the distribution of water and defines the rates and charges for water service and is presented in Appendix C.

The District's water delivery system is operated as a modified demand system (see Table 8). This manner of operation is the most efficient in terms of water management. The District delivers water at the request of the farmers. Water users order water by 11:00 a.m. for delivery the following day. Thus, water is delivered when it is needed. This type of operation facilitates the most efficient use of water for irrigation.

Table 8: District Delivery System

Type	Check if Used	Percent of System Supplied
On Demand*	X	5%
Modified Demand	X	95%
Rotation	0	0
Other	0	0
* Littoral use around Clear Lake and riparian use along Cache Creek is taken On Demand		

Water that may flow past the end of a canal or lateral may be retrieved in a downstream section of the District's system or sold in a downstream slough. The same is true of tailwater from farm fields. Excess applied irrigation water that does not percolate and runs off the end of a farm field is recovered and reused. Thus, very little water of suitable quality leaves the District.

The District provides water to both agricultural and nonagricultural users. As described further in the following sections, deliveries to most customers are measured; however, flat rate service is provided to select parcels.

Applications for water service are typically due no later than March 15. The application must state the type of service requested, the number of acres of each field for which agricultural service is requested, the crop or crops to be grown, the landowner's name, the assessor's parcel number, and other information.

All orders for delivery of water for agricultural service by the District through a District canal or natural channel must be received by the District in sufficient time to allow 24 hours travel time for the water from the source to point of delivery unless the water is available as determined by the District. Orders must be received before 11:00 a.m., unless an earlier deadline is provided in a notice from the District. The 24 hour lead time for order received after the deadline will be calculated from the following day. Orders may be made in writing, orally in person, or by telephone by the water user. Orders must include the name of applicant, the location of service by the canal designation, the flow in cubic feet per second (cfs), the crop, and the preferred date for service.

Water users served from a District canal or natural channel who wish to discontinue the service of water or reduce the head will give notice to the office of the District before 11:00 a.m. the day before such service is to be discontinued or such head reduced, unless an earlier deadline is provided in notice from the District. Where the service is to be for less than 24 hours, notice of the time of shutting off the water or reducing the head, will be given when the order for water is placed (see Table 9). With certain exceptions, if a water user uses more than 0.5 cfs for less than 24 hours on consecutive days, the water user is charged for the water spilled between irrigations.

Table 9: Lead Times

Operations	Hours
Water orders	24
Water shut-off (discontinue)	24

2. Water Delivery Measurements or Calculations

The District uses a variety of methods and devices to measure water within its system. The District uses a SCADA system to monitor storage in Clear Lake and Indian Valley Reservoir. The SCADA system is also used to monitor and control releases from the two reservoirs as well as diversions and rediversions at Capay Dam.

Deliveries to approximately 80% of the District's customers are measured using orifice gates and flow tables. Measuring devices for agricultural service are read and the readings are recorded daily. Measuring devices for most nonagricultural service are read monthly. Deliveries to the remaining customers are mostly made via customer owned pumps, and measurement is generally based on pump capacities and time of use as reported by the customer although some propeller meters have been installed (see Table 10).

Table 10: Water Delivery Measurements

Measurement Device	Frequency of Calibration (Months)	Frequency of Maintenance (Months)	Estimated Level of Accuracy (%)
Orifices (meter gates)	Periodic	As needed	± 10%
Propeller Meters	Periodic	As needed	± 10%
Weirs	Periodic	As needed	± 10%
Pump, Run Time	-	-	Unknown
Pump, KWH, RPM	Periodic	As needed	± 10%
Other	Periodic	As needed	± 10%

In addition to the measured deliveries, the District provides flat rate water service to a small number of select agricultural and nonagricultural users.

3. Water Rate Schedules and Billing

The District's Board of Directors establishes water rates from time to time based on budget requirements and board policy (see Table 11). Invoices for agricultural service providing the amount of water delivered each day are mailed monthly to each water user for each turnout. Bills for flat rate water service for each calendar year are mailed on or about July of each year, or at the time of approval of application if application is made after July 1 (see Table 12 and Table 13). Invoices for water services

other than agricultural service are mailed monthly, unless otherwise determined by the District. A copy of the 2013 billing rate schedule is attached as Appendix D.

Table 11: Water Rate Basis

Water Charge Basis	Percent of Water Deliveries (%)	Description
Volume of Water Delivered	98%	Per acre-foot (AF); rates established for both crop and non-crop irrigation
Flat Rate Agricultural Service	< 1%	(a) Agricultural properties diverting water in the Clear Lake-Cache Creek watershed upstream from the Capay Dam, and (b) agricultural properties of five acres or less, diverting less than three cfs from the Winters Canal upstream of the Chapman Reservoir
Measured Nonagricultural Service	< 1%	Per acre-foot (AF)
Flat Rate Nonagricultural Service	< 1%	(a) single-family dwelling units having premises averaging not more than one-quarter acre per unit, and (b) to premises without dwellings not more than one-quarter acre in size; provided that larger premises without dwellings may receive flat rate nonagricultural service on the basis of a per unit annual charge for each one-quarter acre or part thereof
Outside of Service Area	< 1%	125% of the rate applicable to similar service within the District's service area
Other Types of Service	< 1%	The Board may establish rates for other types of service from time to time

Table 12: Representative Year

Type of Billing	Check if Used	Description
Declining		
Uniform		
Increasing Block Rate		
Other	X	Inverted tiered pricing

Table 13: Frequency of Billing

Frequency	Check if Used
Weekly	
Biweekly	
Monthly	X
Bimonthly	
Semiannually	
Annually	X

4. Water Shortage Allocation Policies

The District exercises reasonable diligence to furnish a continuous and adequate supply of water to its water users and to avoid any shortage or interruption of delivery. When, for any reason, the District is unable to deliver the full supply of water required by its water users, such supply as can be delivered is prorated until such time as delivery of a full supply can be restored.

When it is necessary to suspend service temporarily to make necessary repairs or improvements to its water system, the District notifies the affected water users as soon as circumstances permit.

During times of water shortage, applications for water service are due no later than February 7 unless the District extends the filing deadline to a later date. Each application must be followed by an acreage deposit, due no later than March 15, or by an earlier date if water delivery is requested by the applicant prior to March 15. The application will not be considered approvable until such deposit is received. The deposit is a guaranteed minimum water purchase for the season and a credit on the applicant's aggregated water bill if District water is available for delivery, whether or not the applicant actually takes any water.

The District apportions its available water supply among its water users as follows:

(a) The District will attempt to supply nonagricultural water service without reduction. Water not needed to supply nonagricultural water service will be apportioned as set forth below.

(b) The requirements for agricultural service on lands for which application was made not later than February 15, and the acreage deposit was received no later than March 15 will have an equal priority to the water available for agricultural water use. The Board reserves the right to require payment for all water ordered during a time of water shortage, whether used or not.

(c) No applications are accepted after the filing date unless deemed proper by the General Manager.

Applications or portions thereof may be transferred from one applicant to another, acre for acre, if accomplished not later than June 1 and only if approved by the District. Applications or portions thereof may also be canceled not later than March 15, except on parcels that have already used water.

The District does not allow wasteful use of water. Any agricultural water user who, as determined by the District, is wasting water or floods any portion of land to an unreasonable depth, or whose land has been improperly checked for the economical use of water, or allows an unnecessary amount of water to escape from any tailgate, will be refused service until the situation is remedied. The District may refuse service when it is determined the proposed use, or method of use, will require such excessive quantities of water as will constitute waste. The District aims to deliver sufficient water for nonagricultural uses. However, waste of water may cause water to be shut off until the District receives satisfactory assurances that the conditions causing such waste have been remedied.

C. Basis for Reporting Quantities

Water year types in the Sacramento Region have ranged from "critical" in 2008 to "wet" in 2011. The District has selected 2012, a "below normal" year type as the representative year for reporting water use and water supply data in subsequent sections of this AWMP (see Table 14).

Table 14: Representative Year

	Description
Representative year(s) based upon	2012
First month of representative year	January
Last month of representative year	December

Section III: Description of Quantity of Water Uses

A. Agriculture Water Use

Agricultural lands within the District are irrigated with surface water supplies from the District, groundwater from privately owned wells, and recirculated tailwater. Some lands are irrigated with water from a combination of these three sources of supply. In years when the District has little or no surface water available, virtually all irrigation will be with groundwater supplies from privately owned wells (see Table 15).

Table 15: Agricultural Water Use for 2012

Source	2012
Agricultural Water Supplier Delivered	
Surface Water	151,961 AF
Groundwater	0
Other – Recaptured Tailwater	Quantity included "Surface Water" water above
Other Water Supplies Used	
Surface Water	0
Private Groundwater	Quantity unknown

Approximately 50 different crops were grown within the District in 2012, the representative year. Crops have been grouped by crop type for the purposes of reporting in Table 16 below (also see Table 17 and Table 18). The water requirements to meet crop ET (ETc), cultural practices, and leaching requirements were determined for each crop based on data from CIMIS for 2012 and information developed by the ITRC, Cal Poly. Reference Evapotranspiration (ETo) is based on the average monthly ETo published by CIMIS for the stations at Davis, Woodland, and Esparto. Crop Coefficients (Kc values) were developed based ETc data for Zone 14 contained in ITRC Report 03-001 - California Crop and Soil Evapotranspiration, January 2003, assuming surface irrigation in a typical year. Leaching requirements are based on information contained in FAO Irrigation and Drainage Paper 29 Revision 1, 1994.

Table 16: Agricultural Crop Data for 2012

Crop Type	Total Acreage	ET crop (AF/Ac)	Cultural Practices (AF/Ac)	Leaching Requirement (AF/Ac)	Total Crop Water Needs (AF)
Field Crops	24,911	68,970	4,386	2,637	75,993
Vegetable Crops	6,703	9,306	0	526	9,832
Fruit and Nut Crops	6,184	14,872	0	811	15,683
Grapes / Wine Grapes	1,747	3,791	0	314	4,105
Seed Crops	6,003	11,074	0	601	11,675
Miscellaneous	1,390	1,308	0	63	1,371
TOTAL	**46,938**	**102,619**	**12,278**	**4,952**	**119,849**

Table 17: Irrigated Acres

	2012
Total Irrigated Acres	46,938

Table 18: Multiple Crop Information (acres)

Cropping System	2012
Single-Cropped Acres	46,468
Inter-cropping Acres	0
Double Cropping Acres	470

B. Environmental Water Use

Cache Creek, which is used to convey water from Clear Lake and Indian Valley Reservoir to the major portion of the District's service area, was added to California's Wild and Scenic Rivers System in October, 2005. The District maintains a number of sites specifically dedicated to preservation of the natural environment in the Cache Creek watershed. These areas, in addition to Indian Valley Reservoir now provide critical habitat for area species. Numerous natural drainages and sloughs throughout the service area are used by the District as conveyance and drainage channels to provide habitat and environmental benefits. Additionally, the District has implemented a Native Vegetation Canal Bank Program which provides habitat and other environmental benefits. The water use associated with these environmental programs has not been quantified.

C. Recreational Water Use

Recreational water uses within the District are non-consumptive. Indian Valley Reservoir and Campground provides recreational activities including swimming, camping, fishing, and boating. The District's operation of Clear Lake provides similar recreational opportunities. The District communicates and coordinates with rafting companies and kayaking groups to facilitate their operations and activities throughout the season. This includes providing higher flows in Cache Creek at critical times.

D. Municipal and Industrial Use

Although not within its boundaries, the District currently provides water from Clear Lake for municipal and industrial (M&I) purposes to 15 water suppliers and to one water supplier from the North Fork of Cache Creek under various agreements with Lake County and various entities and individuals. Some of these entities also receive water under their own littoral rights. The deliveries by the District for M&I uses provided are summarized in Table 19.

Table 19: Municipal/Industrial Water Uses (AF)

Municipal/ Industrial Use Type	Representative Year 2012	2011	2010	2009	2008
M&I – Non Ag	3,819	3,427	3,512	3,844	3,844

The cities of Davis, Woodland, and Winters, University of California (U.C.) Davis and the smaller communities of Esparto, Madison, Capay, and others in the Capay Valley are within or adjacent to the District's exterior boundaries. However, the District does not supply water directly to these municipalities. Currently, the demands of these areas are met by groundwater supplies.

E. Groundwater Recharge Use

One of the ways that the District is committed to maintaining groundwater health is through aquifer recharge. The two types of groundwater recharge the District is engaged in is direct and in-lieu recharge. Direct aquifer recharge takes place when surface water from rain, lakes, streams, and irrigation seeps back into the aquifer. The District maintains a policy of not lining its irrigation canals and ditches. During the summer months, over 160 miles of canals and ditches, and many more miles of sloughs and drainage channels, are saturated with water that percolates into the aquifer. The District estimates an average of approximately 38,200 AF of recharge annually (YCFCWCD, 2012). In an average year, approximately 25% of the water released from Clear Lake and Indian Valley Reservoir goes directly to groundwater recharge. In-lieu recharge takes place when farmers use surface water from Indian Valley Reservoir and Clear Lake; consequently, they do not need to pump as much water from the aquifers. To the extent the pumping of groundwater by the cities of Woodland and Davis create a pumping depression; recharge also occurs from the east Yolo Bypass area.

By maintaining groundwater levels, aquifers provide regional drought protection without the costs of constructing dams. Use of the groundwater basin for storage also provides the benefit of avoiding losses to evaporation. Evaporation losses are especially significant in shallow bodies of water like Clear Lake, where typically half of the water stored is lost to evaporation each year.

F. Transfer and Exchange Use

The District has not participated in any transfers or water exchanges either into or out of the District.

G. Other Water Use

There are no other uses within the service area for which the District provides water.

Section IV: Description of Quantity and Quality of the Water Resources of the Agricultural Water Supplier

A. Water Supply Quantity

1. Surface Water Supply

The District's surface water supplies consist of water stored in Clear Lake under pre-1914 rights, water stored in Indian Valley Reservoir under appropriative rights issued by the State Water Resources Control Board (SWRCB), pre-1914 rights from Cache Creek and North Fork Cache Creek, and riparian rights along Cache Creek and North Fork Cache Creek.

The District owns lands along Cache Creek and the North Fork of Cache Creek that have riparian rights. These rights are used for purposes of irrigation and hydroelectric power generation.

The District has an 1855 priority right to divert the natural flow of Cache Creek and 1912 priority right to store waters in Clear Lake to elevation 7.56 feet Rumsey Gage for later release and beneficial use. These rights allow direct diversion of natural flow from Cache Creek and for the storage of 313,000 AF in Clear Lake. The District's right provides water for municipal purposes around Clear Lake under agreements with various water suppliers and Lake County. The District may release up to 150,000 AF of stored water from Clear Lake for use within its boundaries in accordance with the provisions of the Solano Decree.

The District holds appropriative Water Right Permits 12848 and 12849 issued by the SWRCB that collectively allow for direct diversion of up to 1,000 cfs from October 1 to June 30 of the subsequent year from Cache Creek and North Fork of Cache Creek, and for storage of up to 300,600 AF in Indian Valley Reservoir during the winter for later release. Collectively, these permits direct diversion and storage of up to 431,000 AF per year for irrigation, domestic, municipal, recreational, and flood control purposes. The District also holds Permit 18295 which authorizes direct diversion from North Fork Cache Creek and storage in Indian Valley Reservoir for power generation.

The District releases water under its pre-1914 rights from Clear Lake into Cache Creek. The District also releases water from the Indian Valley Reservoir into the North Fork of Cache Creek. Those waters come together and are co-mingled with the District's pre-1914 and riparian rights for diversion from Cache Creek, more than 50 miles downstream of the two storage facilities.

Table 20 identifies the total quantity of surface water released by the District from Clear Lake and Indian Valley Reservoir. Although there is some inflow to Cache Creek below the two reservoirs, the quantity of this inflow is unknown and typically small during the irrigation season. Therefore, the quantities shown in Table 20 do not include inflow to Cache Creek below the reservoirs. The quantities of M&I use shown in Table 19 are also not included in Table 20.

Table 20: Surface Water Supplies

Source	2012 (AF)
Stored water release combined Clear Lake and Indian Valley Reservoir releases	216,107
TOTAL	**216,107**

Table 21 summarizes the restrictions on the District's various water sources; Cache Creek, Clear Lake, and Indian Valley Reservoir.

Table 21: Restrictions on Water Sources

Source	Restrictions	Name of Agency Imposing Restrictions	Operational Constraints
Cache Creek	Riparian and Pre-1914 Water Rights	Prior appropriation and use	
Clear Lake	Gopcevic and Solano Decrees	Superior Court, FERC	Storage filling and withdrawal limitations
Indian Valley Reservoir	Storage and Diversion Limitations	SWRCB	Permit terms and conditions

2. Groundwater Supply

The District does not own any groundwater wells or supply groundwater to its water users, nor does the District maintain records of groundwater pumped by privately owned groundwater wells. That said, the District does have an interest in maintaining the groundwater basin underlying its boundaries and in 2006, adopted its current Groundwater Management Plan (GWMP). The basis of the GWMP was the District's established Groundwater Monitoring Program, developed by Luhdorff & Scalmanini in 2004 as described in the Groundwater Monitoring Program Report. Additionally, the District works with its landowners in maximizing their groundwater well operations in a conjunctive use fashion.

The District is contained within the Yolo, Solano, Capay Valley, and Colusa Subbasin of the Sacramento Valley Groundwater Basin as described by DWR Bulletin 118 - Update 2003 (DWR, 2003). Table 22 summarizes the information from Bulletin 118.

Table 22: Groundwater Basins

Basin Name	Code
Yolo Subbasin*	5-21.67
Solano Subasin	5-21.66
Colusa Subbasin	5-21.52
Capay Valley Subasin	5-21.68

*DWR Bulletin 118 (DWR, 2003)

The groundwater basins delineated and presented in the GWMP differ from subbasins delineated in DWR Bulletin 118. The subbasin boundaries in the GWMP and shown in Figure 3 were developed for the Yolo County Integrated Regional Water Management Plan (IRWMP), with the support of the DWR, as well as Yolo County Water Resources Association (WRA) member agencies. The subbasins identified in the GWMP as underlying the District, the Capay Valley Subbasin, the West Yolo Subbasin, the East Yolo Subbasin and a portion of the Dunnigan Hills subbasin, were developed to more concisely characterize the groundwater hydrology of the county and better coincide with political boundaries under which water management occurs in Yolo County (WRA, 2007). A copy of the GWMP is available on the District's web site at http://www.ycfcwcd.org/documents/gwmp2006final.pdf.

Groundwater is pumped by individual landowners. There are areas within the District that surface water cannot reach; these areas pump groundwater annually as their source of water. Areas within the District that do receive surface water rely on groundwater when surface water supplies are not adequate. Because Clear Lake and Indian Valley Reservoir are not operated for carryover storage, there have been years where there is no surface water supply. This occurred in 1977 and 1990 (YCFCWCD, 2012). Because groundwater is of such importance, the District collaborates with the cities and other entities to gather information on groundwater levels and quality.

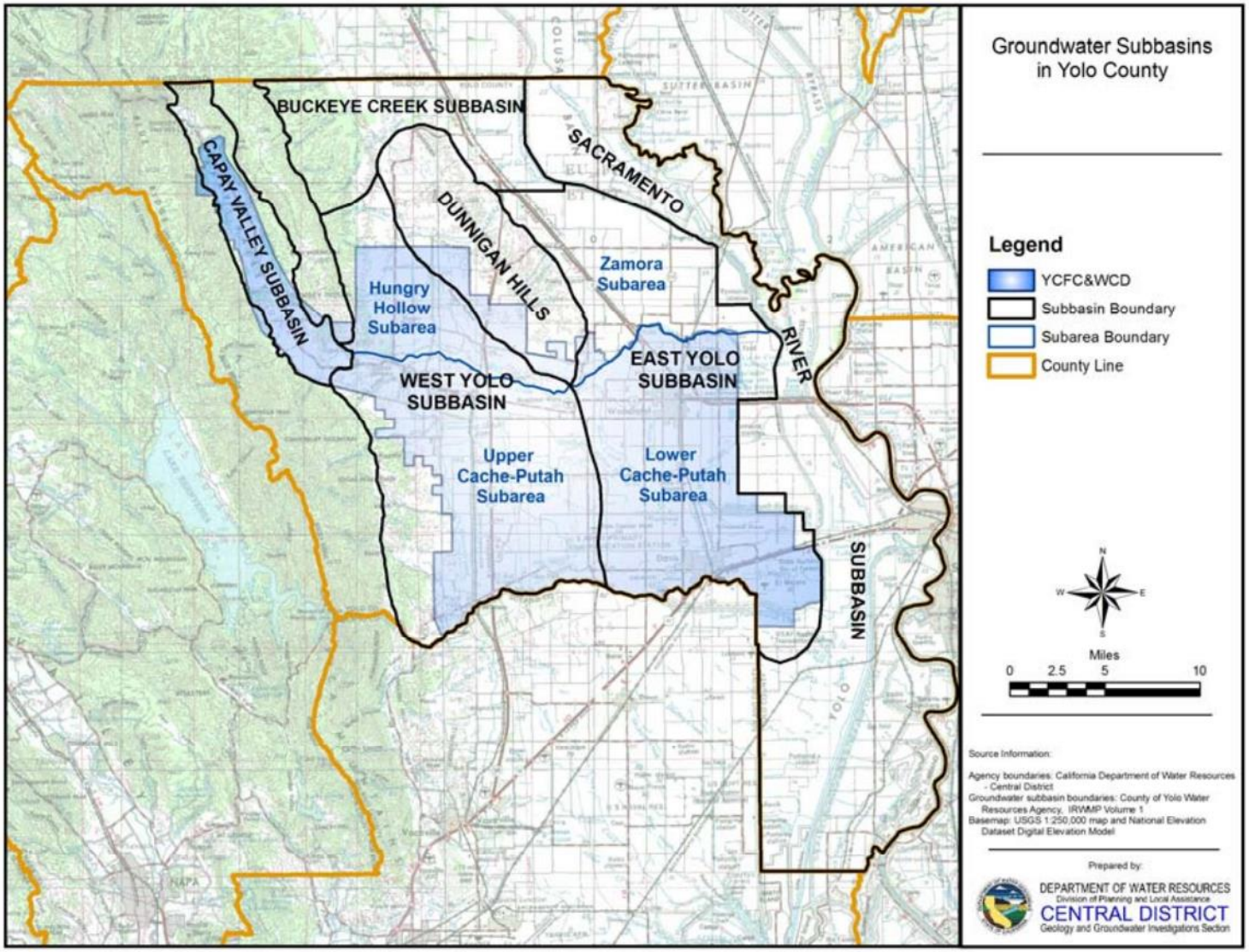
The District is working on a computer simulation of the aquifer in Yolo County. Data obtained from the Groundwater Monitoring Program, among other sources has been used to create a mathematical model of the aquifer. This half million dollar ($0.5 million) project, which is funded in part by the Local Groundwater Assistance Fund through AB 303, has been used for analyzing aquifer recharge and recovery on Cache Creek, and for simulating urban issues such as population growth and water supply during a drought. The District has been actively working with and supporting the cities of Woodland and Davis in the development of a major regional surface water treatment plant. The operation of this new treatment plant will help protect and sustain the region's groundwater resource.

Through these programs and projects, the goal is to maintain or enhance groundwater quantity and quality. This will result in a reliable groundwater supply for beneficial uses and avoidance of adverse subsidence.

The District's Qualitative Basin Management Objectives include:

- Minimize the long-term drawdown of groundwater levels;
- Protect groundwater quality;
- Minimize changes to surface water flows and quality that directly affect groundwater levels or quality;
- Facilitate groundwater replenishment and cooperative management projects, including subsidence monitoring; and
- Work collaboratively with and understand the goals and objectives of entities engaged in groundwater management in surrounding areas.

Figure 3: Subbasin Map



3. Other Water Supplies

There are no other water supplies available to the District.

4. Drainage from District's Service Area

Essentially all water delivered by the District for irrigation is diverted or rediverted along Cache Creek in Capay Valley and at the District's Capay Diversion Dam. Operational spills occur at the District's Capay Diversion Dam and within the District's water delivery system. Operational spills that occur at Capay Dam in the summer will generally percolate to the groundwater basin before reaching Interstate 505. Operational spills that occur along the District's distribution system discharge into sloughs or drains and are recovered and reused by the District and individual landowners. The water diverted into the District discharges as surface flow through Cache Creek and the Willow Slough Bypass and as sub-surface flow under Putah Creek into Solano County.

With respect to groundwater flowing out of the District, the delivery of water by the Solano Irrigation District (SID) since the early 1960s, has served to alter groundwater gradients near Putah Creek. Prior to SID's delivery of water from the Solano Project, the groundwater gradients in the vicinity of Winters were in a south easterly direction. The delivery of water by SID relieved the overdraft that was occurring in Solano County, thereby significantly raising groundwater levels. The result was beneficial for Yolo County in that the groundwater gradients now tend to flow in a more easterly direction towards Davis.

In summary, although not quantified, the amount of surface water leaving the District is small and that which flows out via Cache Creek is high in boron. Thus, as a system, the efficiency of water use within the District is judged to be high.

B. Water Supply Quality

1. Surface Water Supply

All water delivered or made available by the District is from open reservoirs, natural channels, ditches, canals, conduits, and flumes. The District's water supply is generally considered of high quality for agricultural purposes. The District does not guarantee that water it delivers is potable or of a quality suitable for human consumption or for any other purpose.

Boron exists in the watershed and has been monitored by the District or its predecessor agencies since the 1930's. Boron is a naturally occurring element. Certain crops display boron sensitivity. Therefore, crop selection in certain areas may be affected. The dominant crops grown within the District are boron tolerant.

In addition to monitoring boron, the District has a program for monitoring various water quality parameters such as EC, turbidity, temperature, ph, dissolved oxygen, etc. The District also participates in regional water quality monitoring programs such as the Central Valley Irrigated Lands Program, Cache Creek Resource Management Plan, and Regional Board mercury monitoring.

Water quality data is contained in the District managed Water Resources Information Database (WRID) which is publicly accessible at wrid.facilitiesmap.com.

2. Groundwater Supply

Groundwater quality is variable in Yolo County. The deep aquifer (601-1,500 feet) tends to be of higher quality than the shallow aquifer (0-220 feet), while the intermediate aquifer (221-600 feet) is of intermediate quality. Electrical Conductivity (saltiness) and nitrate concentrations are increasing in both the shallow and intermediate aquifers. Boron is a problem in some areas. A complete detailed description of groundwater quality by depth zone and sub-basin is in the District's 2006 Groundwater Management Plan.

3. Other Water Supplies

There are no other water supplies available to the District.

4. Drainage from District's Service Area

Drainage leaves the District at Cache Creek, Willow Slough, and Willow Slough Bypass. During the storm season, storm water drainage from the District's service area can be large. During the irrigation season, the amount of irrigation drainage leaving the District is very small.

C. Source Water Quality Monitoring Practices

Surface Water – Responding to an increased regulatory environment, the District expanded its water testing program by adding more sampling sites and increasing the frequency and nature of data collection in its canals, test wells, and at dam sites in 2006. The District has continued to build a comprehensive database of water quality attributes such as temperature, sediments, algae, microbes, dissolved chemicals, oxygen, and more. As a member of the Sacramento Valley Water Quality Coalition, the District worked closely with the Yolo County Farm Bureau and Agricultural Commissioner.

Groundwater – The District has a groundwater quality monitoring program that samples ~30 wells periodically, when funds are available. This program started in 2004. District sampling is from the shallow aquifer (usually less than 220 feet deep). The shallow aquifer is often of low quality water; electrical conductivity (TDS), boron, nitrate, barium, aluminum, iron, manganese, hardness, and turbidity sometimes exceed recommendations for drinking or irrigation (YCFCWCD, 2006). The Groundwater Monitoring Program Report includes a table of wells in the Groundwater Quality Monitoring Network. Table 23 breaks down the District's surface and sub-surface supply and drainage water quality monitoring practices.

Table 23: Surface/Sub-Surface Supply and Drainage Water Quality Monitoring Practices

Water Source	Monitoring Location	Measurement/ Monitoring Method or Practice	Frequency
Cache Creek	8 locations	Grab samples delivered to laboratory	Monthly
Cache Creek	Capay Dam	Irrigated Lands Regulatory Program	6-8 times per year
Willow Slough	Various	Irrigated Lands Regulatory Program	6-8 times per year
Cache Creek	5 locations	Yolo County CCRMP	3-times per year
Cache Creek	Capay Dam	Continuous data logging sensors	Real time

Section V: Water Accounting and Water Supply Reliability

A. Quantifying the Water Supplies

1. Agricultural Water Supplier Water Quantities

Table 24 shows the combined monthly releases from Clear Lake and Indian Valley Reservoir for 2012. Also shown, are the District's total deliveries for M&I purposes around Clear Lake.

2. Other Water Sources Quantities

The District does not own or operate any groundwater wells. Landowners supplement the surface water supplies from the District with groundwater from privately owned wells. The District does not collect or maintain records of quantities pumped at privately owned wells.

Table 25 summarizes the effective precipitation for lands within the District that received surface water deliveries from the District during 2012[1]. No deliveries were made during the months of January through March, November and December; therefore effective precipitation for those months is not included (see Table 24).

[1] Effective Precipitation is estimated as 60% of the average monthly growing season precipitation greater than 0.5 inch as recorded at the Davis, Woodland, and Esparto CIMIS stations multiplied by the non-rice and non-habitat crop acreage. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, it typically flows through the fields; and therefore, is assumed to be unavailable to meet the crop water needs.

Table 24: Surface and Other Water Supplies for Representative Year – 2012 (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
District Surface Water Releases	1,007	850	945	1,366	44,546	46,509	49,059	42,824	26,394	6,886	870	842	222,098
Local Surface Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Upslope Drain Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Transfers & Exchanges	0	0	0	0	0	0	0	0	0	0	0	0	0
Recycled Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	-	-	-	-	-	-	-	-	-	-	-	-	0
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**222,098**

Table 25: Effective Precipitation

Month	2012 (AF)
January	-
February	-
March	-
April	1,408
May	0
June	0
July	0
August	0
September	0
October	240
November	-
December	-
TOTAL	**1,648**

B. Quantification of Water Uses

Table 26 shows the volume of surface water delivered to the District's irrigation customers and M&I customers around Clear Lake in 2012. This volume of delivered water is based on measurements used as the basis for determining water charges.

Table 26: Applied Water for 2012

	2012 (AF)
Applied Water* (from Table 15)	151,961

Table 27 summarizes water uses within the District's service area and surface water supplied by the District for M&I purposes around Clear Lake.

Table 27: Quantity of Water Use for 2012

	Water Use	2012 (AF)
Crop Water Use (from Table 16)		
1	Crop evapotranspiration	109,321
2	Leaching	4,952
3	Cultural practices	4,386
Conveyance & Storage System[1]		
4	Conveyance seepage	-
5	Conveyance evaporation	-
6	Conveyance operational spills	-
7	Reservoir evaporation	-
8	Reservoir seepage	-
Environmental Use (Consumptive)[1]		
9	Environmental use – wetlands	-
10	Environmental use – other	-
11	Riparian vegetation	-
12	Recreational use	-
Municipal and Industrial[2]		
13	M&I non-ag	0
14	Industrial	0
Outside the District		
15	Transfers or exchanges out of the service area	0
Conjunctive Use		
16	Groundwater recharge (from Section III.E.)	38,200
Other		
17	Estimated conveyance system, environmental, and recreational consumptive uses*	48,241
	Subtotal	**205,100**

[1]Conveyance System Seepage & Evaporation and Consumptive Environmental, Riparian, and Recreational Uses are unknown and not easily quantified at this time. For the purposes of the 2012 Water Budget these quantities have been collectively estimated as the difference between the total releases from Clear Lake and Indian Valley Reservoir and the quantity delivered below the reservoirs by the District.

2AS identified in Section III.D., M&I use deliveries by the District occur at Clear Lake above the dam. Because these deliveries are not made from the release of water from the District's reservoirs they have not been included in this table nor are they included in the District's water budget.

Table 28 summarizes the amount of surface and sub-surface water leaving the District. As discussed earlier, the amount of water leaving the District is minimal.

Table 28: Water Leaving the District

Drain Water	2012
Surface drain water leaving the service area	Minimal
Sub-surface drain water leaving the service area	Minimal

As shown in Table 29 there are no irrecoverable losses from the District.

Table 29: Water Irrecoverable Losses

	2012
Flows to saline sink	None
Flows to perched water table	None
Subtotal	None

C. Overall Water Budget

Table 30 summarizes the total supplies utilized by the District in 2012. Surface water includes the total volume released from Clear Lake, Indian Valley Reservoir, unregulated flows in Cache Creek below Clear Lake and Indian Valley Reservoir, and the water delivered by the District around Clear Lake. The effective precipitation is based on CIMIS rainfall data for stations at Davis, Woodland, and Esparto. Effective precipitation was estimated only for the lands within the service area that received surface water from the District in 2012.

Table 30: Quantification of Water Supplies for 2012

	Water Supplies	2012 (AF)
1	Surface water (summary total from Table 24)	222,098
2	District groundwater	0
3	Effective precipitation (summary total from Table 25)	1,648
4	Water purchases	0
	Subtotal	**223,746**

Table 31 summarizes the District's water budget for 2012. As discussed above, water supplies include water released from storage in Clear Lake and Indian Valley Reservoir which are located approximately 50-miles upstream of the District's service area. The "Excess Deep Percolation" includes percolation along the 50-miles of Cache Creek, 13-miles of North Fork Cache Creek, and evapotranspiration by riparian vegetation within those reaches as well as deep percolation from farms, canals, and ditches within the District's service area.

Table 31: Water Budget Summary

Water Accounting		Rep. Year (AF)
1	Subtotal of Water Supplies (Table 30)	223,746
2	Subtotal of Water Uses (Table 27)	205,100
3	Drain Water Leaving Service Area (Table 28)	0
Excess Deep Percolation[1]		18,646

[1]*Excess Deep Percolation* in this table is the closure term in the mass water balance. As such, in addition to any deep percolation the quantity shown includes unaccounted for drain water outflow, any errors in assumptions used in calculations or estimated uses such as crop water use (ET), effective precipitation, evaporation, groundwater recharge, etc.

D. Water Supply Reliability

District records show that on a long term average (post Indian Valley Reservoir construction in 1976) the District has full water supply reliability 7 years out of 10. The other 3 years out of 10, the available water supply is allocated in varying degrees ranging from zero (0) to approximately 80% of full supply. In years of allocation, the District's water customers adapt by using a variety of methods; increased groundwater pumping, crop shifting, and land fallowing. Table 32 shows the total monthly releases by the District from Clear Lake and Indian Valley Reservoir for downstream uses for the 10 year period 2003 through 2012.

Table 32: Total Releases for Downstream Use from Clear Lake and Indian Valley Reservoir – 2003-2012 (AF)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2003	0	0	0	3,135	27,225	46,064	43,792	32,211	21,843	10,650	1,235	0	186,155
2004	0	0	725	26,596	46,946	51,169	47,803	34,418	21,958	6,142	0	0	235,757
2005	0	0	0	8,387	38,727	40,291	44,457	34,989	19,750	13,981	1,721	0	202,303
2006	0	0	0	0	21,071	45,370	52,656	42,202	24,630	8,685	0	0	194,614
2007	0	0	10,921	33,176	46,932	52,585	48,755	42,540	27,049	7,160	0	0	269,098
2008	0	0	3,700	35,903	43,424	47,399	46,566	39,555	21,776	998	693	0	240,014
2009	0	0	54	986	6,748	22,036	25,249	5,726	1,722	0	0	0	62,521
2010	0	0	0	52	31,629	37,244	48,702	37,941	15,108	365	0	0	171,041
2011	0	0	0	5,107	33,448	33,499	46,510	37,453	19,863	3,232	52	0	179,164
2012	0	0	0	321	44,096	31,306	49,061	42,572	26,193	6,477	0	0	200,026

Section VI: Climate Change

Based on a recent study by the Stockholm Environmental Institute in collaboration with U.C. Davis and the District, climate change will likely result in progressively warmer and drier conditions within the District's service area (Mehta et al., 2013)[2]. These changes are expected to result in increased demands for irrigation water. Because spring precipitation is projected to increase with climate change, the surface water supplies available from the District's reservoirs is not expected to change significantly. However, the limits on the District's storage releases, particularly from Clear Lake, mean that increased demands must be met by increased groundwater pumping, changes in cropping patterns, or a combination thereof.

The District is committed to monitoring key indicators of climate change that affect the hydrology of the Cache Creek watershed and growing conditions in the District's service area and to adapting its water management practices to respond to changes as they become evident. In addition to adaptive management, implementation of water conservation and conjunctive use management efforts, including the District's SCADA system, are intended to help the District and its customers prepare for the impacts of climate change both by increasing the efficiency of water use and by improving operational control within the District. Improving operational control enables the District to exercise adaptive management in its water deliveries.

[2] Vishal K. Mehta, Van R. Haden, Brian A. Joyce, David R. Purkey, Louise E. Jackson, 2013. Irrigation demand and supply, given projections of climate and land-use change, in Yolo County, California. Agricultural Water Management 117 (2013) 70–82

Section VII: Water Use Efficiency Information

A. EWMP Implementation and Reporting

EWMPs Implemented/Planned/Ongoing

EWMP No. 1 – Water Measurement

Diversions and releases from Clear Lake and Indian Valley Reservoir are measured by the District and the U.S. Geological Survey. Diversions and re-diversions of water from Cache Creek are measured by the District at Capay Dam and various other locations.

Field deliveries are measured by the District using various devices and methods. These measurements are used for volumetric billing of the District's customers. As identified previously in this AWMP the District believes the field or turnout delivery measurements to be within the accuracy requirements of the water measurement regulation. The District has developed a Certification Plan in accordance with the provisions of the water measurement regulation which it intends to implement over the next three years. As required by the measurement regulation, the report to be prepared to verify the accuracy of the District's field or turnout measurements will be certified by a registered engineer and will include a description of the District's water measurement best professional practices, documentation of the conversion of water measurements to volume, and a corrective action plan for devices that are found not to be within the appropriate accuracy requirement. A copy of the Water Measurement Certification Plan is attached as Appendix F.

EWMP No. 2 – Volumetric Pricing (Implemented)

The District bills its customers by the volume delivered in AF. This EWMP is fully implemented.

EWMP No. 3 – On-Farm Irrigation Capital Improvements (Ongoing)

To facilitate the transition of its customers to micro/drip irrigation systems, the District is retro-fitting field turnouts with sumps and screening devices. The typical cost of these improvements is approximately $12,000 per turnout. Over the past two years, seven of these new structures have been installed at the District's expense. The District intends to continue this program.

EWMP No. 4 – Incentive Pricing Structure (Implemented)

The District has developed and implemented an innovative tiered rate structure in 2007. This tiered rate structure takes into account the surface water supply availability of each hydrologic season. This rate structure promotes conjunctive use water management by incentivizing groundwater use during times of limited surface water availability. This EWMP is fully implemented.

EWMP No. 5 – Infrastructure Improvements (Implemented/Ongoing)

The District's water delivery infrastructure was originally built over 100-years ago. The District has developed a capital improvement program to address the sustainability and modernization of its water delivery system. This capital improvement program includes both major structures (dams and reservoirs) and minor infrastructure related to its distribution system (canals, laterals, check structures,

field turnouts, and bridges and crossings). Following is a list of some of the improvements made over the past 10-years:

- Capay Dam Apron Improvement Project – $4.5 million
- Canal and lateral check structures – approximately $1.2 million
- Field delivery turnouts – approximately $0.6 million
- Other – Bridges, crossings roads – approximately $0.4 million

This does not include the significant automated control improvements listed in EWMP No. 9. These infrastructure improvements are an ongoing effort by the District.

EWMP No. 6 – Order/Delivery Flexibility (Implemented/Ongoing)

The District officially has a 24-hour delivery schedule. Over the past few years, the District has been working with it water customers to accommodate more flexible deliveries. The District has supplied its ditch tenders with cell phones and direct radio connection to its SCADA system from their vehicles to accommodate delivery flexibility. This is part of an ongoing process to improve water service and efficiency within the District.

EWMP No. 7 – Supplier Spill and Tailwater Systems (Planned)

The District has purchased property for a planned mid-lateral reservoir. This reservoir will enable tailwater and spill recovery improvements. The reservoir will also allow for order delivery flexibility as described in EWMP No. 6 and will also result in reduced on-farm runoff or tailwater. Mid-lateral reservoirs will result in flexibility and efficiency improvements. The property was purchased for a cost of approximately $170,000. The cost to construct the mid-lateral reservoir is estimated to be approximately $0.5 million. Other mid-lateral reservoir sites are to be actively investigated.

EWMP No. 8 – Conjunctive Use (Implemented/Ongoing)

The District has historically encouraged conjunctive use by its customers. Most District water customers have access to private groundwater sources. This allows each customer to choose to use surface or groundwater based on availability and cost. The District uses multiple strategies to encourage conjunctive use including but not limited to the following:

- Unlined canals, by District policy, promotes groundwater recharge
- Tiered pricing rate structure to incentivize conjunctive water use
- Wheeling of private groundwater through the District's distribution system
- Banking of private groundwater by exchange with surface supply
- Pilot groundwater pumping incentive program (2007 & 2008)
- Investigation for installation of District owned wells
- Ongoing seasonal groundwater monitoring program with more than 150 volunteer well owners
- Real time monitoring of water levels in a select number of wells
- Public education campaign making groundwater monitoring database publicly available on the internet

Most of these efforts are ongoing and part of the District's comprehensive conjunctive use program.

EWMP No. 9 – Automated Canal Controls (Implemented/Ongoing)

The District has been building out its SCADA system over the past 10-years and intends to continue to build upon the existing improvements in the future. The following is a list of improvements that have been implemented and contribute to improved water delivery service and operational efficiency.

- SCADA Communication Backbone – 4.9gHz Broadband Ethernet radio system that allows for unlimited expansion
- Lateral Canal Heading Control and Monitoring
- Lateral Spill Monitoring and Reporting
- Environmental Water Quality Monitoring
- Real Time Groundwater Level Monitoring
- SCADA System Quality Control and Maintenance Program
- Main System Controls – Reservoir releases, hydroelectric monitoring, headwork diversion controls
- Main Canal Check Structure Level / Flow Control and Monitoring

To date the District has invested approximately $2.5 million in developing, implementing, and maintaining the SCADA system. The District intends to continue to build out the SCADA system and invest at a similar rate into the future.

EWMP No. 10 – Customer Pump Test/Evaluations (Implemented/Ongoing)

The District provides a flow measurement service to its customers. Pipe flow is measured with a strap-on acoustic Doppler flowmeter (GE Sensing PT-868) for well or booster pump applications. Water customers use the flow data to calibrate their own meters, gauge how much a well is delivering to the canal or a field, and create RPM vs GPM curves for diesel driven pumps. More than 75 customer service calls have been answered since 2009.

EWMP No. 11 – Water Conservation Coordinator (Implemented)

The District has named Tim O'Halloran and Max Stevenson as Co-Water Conservation Coordinators. This EWMP is fully implemented.

EWMP No. 12 – Water Management Services to Customers

The District provides access to CIMIS on its website. CIMIS data is used for irrigation scheduling. The District website provides daily updates to allocations of available water to individual customers during allocated years, monthly water quality data, and access to the Yolo County-wide groundwater monitoring database.

On request, the District provides pumpflow (both groundwater wells and surface water booster pumps) measurement to individual customers.

When possible, the District provides flexible water delivery run times as an exception from the usual 24 hour schedule. This allows for increased on-farm irrigation efficiency.

Periodically during the year, the District convenes water customer meetings for coordination and strategic planning purposes.

EWMP No. 13 – Identify Institutional Changes (Implemented/Ongoing)

The District has implemented a number of institutional changes to improve operation flexibility and supply including but not limited to the following:

1. Development and adoption of a tiered conjunctive use water rate schedule based on available storage on April 1 of a given year. This rate schedule takes into account individual year hydrologic conditions, and encourages the appropriate use of groundwater.
2. Development and adoption of a policy to allow private individuals to wheel (convey) groundwater in the District's canal system thereby increasing the flexibility of the supply available to its users.
3. Development and adoption of an accounting system to allow customers to bank (by exchange) groundwater in the District's reservoir system.

Estimate of Water Use Efficiency Improvements

As described previously, the District has been and continues to implement numerous projects to improve the efficiency of its water operations and water use. While many of these projects have resulted in more efficient water use within the District water use saving from these improvements have not been quantified at this time. It is also important to note that the District is located in an essentially closed basin. Seepage from the District's conveyance and drainage systems as well as deep percolation from agricultural lands serves to recharge the groundwater basin. The District intends to evaluate results of the implementation of the various EWMPs described above and will provide additional information as to the estimated water use efficiency improvements in the next update of this AWMP.

B. Documentation for Non-Implemented EWMPs

As identified in Table 33, the District has determined that EWMP Nos. 1, 2, and 14 are not applicable to the District or its service area. Table 34 provides the justification for the District's determination.

Table 33: Schedule to Implement EWMPs

EWMP	Implementation Schedule	Finance Plan	Budget Allotment*
Critical			
1 – Water Measurement**	Implemented 2014-2016		
2 - Volume-Based Pricing	Implemented		
Conditional			
1 – Alternate Land Use	Not Applicable - See Table 34		
2 – Recycled Water Use	Not Applicable - See Table 34		
3 – On-Farm Irrigation Capital Improvements	Ongoing	Annual Capital Budget	$20,000/yr
4 – Incentive Pricing Structure	Implemented	N/A	N/A
5 – Infrastructure Improvements	Ongoing	Annual Capital Budget, Grants and Loans	$900,000/yr plus grants
6 – Order/Delivery Flexibility	Ongoing	Annual Expense Budget	Variable staff time
7 – Supplier Spill and Tailwater Systems	2014-2017	Annual Capital Budget, Grants and Loans	See EWMP #5
8 – Conjunctive Use	Ongoing	Annual Expense Budget	$169,000/yr includes regional contributions from Yolo WRA
9 – Automated Canal Controls	Ongoing (SCADA, etc)	Annual Capital Budget, Grants and Loans	$1.5 million WUE grant project 2014-2016
10 – Customer Pump Test/Eval.	Ongoing (flow testing)	Annual Expense Budget	$20,000 staff time/yr
11 – Water Conservation Coordinator	Implemented	Annual Expense Budget	$20,000 staff time/yr
12 – Water Management Services to Customers	Ongoing (CIMIS) STORM Water Accounting Program, GISDirect	Annual Expense Budget	$20,000 staff time/yr + $8,200/yr license fees
13 – Identify Institutional Changes	Ongoing	Annual Expense Budget	$20,000 staff time/yr
14 – Supplier Pump Improved Efficiency	Not Applicable - See Table 34		
Grand Total all EWMPs			**$2,677,200**

Notes:
*Budget allotment amounts are approximate and vary from year to year. Values included in Table 33 represent 2012 expenditures and multi year grants awarded.
** Critical EWMPs 1 and 2 are considered fully implemented. The Implementation Schedule, Finance Plan, and the Budget Allotment costs refer to the Measurement Certification Program required in accordance with the Measurement Regulation.

Table 34: Non-Implemented EWMPs

		(check one or both)		
Conditional EWMP #	**Description**	**Technically Infeasible**	**Not Locally Cost-Effective**	**Justification/Documentation***
1	Alternate Land Use	X		District lands do not include drainage problem areas or crops grown on inappropriate soil types. Therefore, this EWMP is not applicable to the District.
2	Recycled Water Use	X		Recycled water not available to the District. Therefore, this EWMP is not applicable to the District.
14	Supplier Pump Improved Efficiency	X		The District does not own or operate diversion or delivery pumps. All diversions by the District are by gravity. Deliveries are by gravity or customer owned pumps. Therefore, this EWMP is not applicable to the District.

Section VIII: Supporting Documentation

The following supporting documentation is attached as Appendices:

Appendices

Appendix A: Notice of Hearing

Appendix B: Board Resolution Adopting AWMP

Appendix C: Rules and Regulations

Appendix D: 2013 Rate Schedule

Appendix E: Water Order Form

Appendix F: Water Measurement Certification Plan (Compliance Program)

Appendix G: Agricultural Water Management Plan Checklist

Appendix A: Notice of Hearing

Christy Barton

From: Christy Barton
Sent: Tuesday, September 10, 2013 9:35 AM
To: 'Daily Democrat (legals@dailydemocrat.com)'
Subject: Publication of Legal Notice - Revised
Attachments: 20130910083221.pdf

Importance: High

To Whom It May Concern,

A notice of public hearing was faxed early to your office. This email replaces that fax as the notice has been changed slightly.

Please publish the Notice of Hearing as a legal notice on Thursdays, September 12 and 19, 2013. Proof of publication and an invoice should be mailed to me at the Yolo County Flood Control and Water Conservation District office.

If you have questions, please call. Thank you.

Christy Barton
Yolo County Flood Control &
Water Conservation District
34274 State Highway 16
Woodland, CA 95695
(530) 662-0265 P
(530) 662-4982 F

NOTICE OF PUBLIC HEARING

Notice is hereby given that the Yolo County Flood Control and Water Conservation District staff has prepared an Agricultural Water Management Plan and that the Board of Directors will conduct a hearing to consider that plan and its recommendation.

Place: Yolo County Flood Control and
Water Conservation District
District office
34274 State Highway 16
(Corner of Highway 16 and Road 94B)
Woodland, CA 95695

Date & Time: Tuesday, October 1, 2013 at 7:15 p.m.

The document is available on the District's website at www.ycfcwcd.org and at the District office, as identified above.

For further information contact Christy Barton at (530) 662-0265.

Appendix B: Board Resolution Adopting AWMP

RESOLUTION NO. 13.04

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE YOLO COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT ADOPTING THE 2013 AGRICULTURAL WATER MANAGEMENT PLAN

WHEREAS, the Legislature has codified the Agricultural Water Management Planning Act (AWMPA) at Water Code Sections 10800-10853;

WHEREAS, the AWMPA requires certain agricultural water suppliers to prepare and adopt an Agricultural Water Management Plan (AWMP);

WHEREAS, the AWMPA defines an "Agricultural Water Supplier" as a water supplier, either publicly or privately owned, providing water to 10,000 or more acres, excluding recycled water, and requires that an Agricultural Water Supplier serving at least 25,000 acres prepare an AWMP;

WHEREAS, the District is an Agricultural Water Supplier under the AWMPA and must prepare an AWMP;

WHEREAS, an AWMP must contain information regarding an Agricultural Water Supplier's service area, quantity and quality of water supplies, and specific water use efficiency information;

WHEREAS, the District in October 2000 adopted a comprehensive Water Management Plan (WMP) related to Yolo County's surface and groundwater resources;

WHEREAS, the District helped develop and adopted the Yolo County Integrated Regional Water Management Plan in 2007, which it is helping to implement;

WHEREAS, the District helped develop and adopted the Sacramento Westside Integrated Regional Water Management Plan in 2013, which it is helping to implement; and

WHEREAS, the District has prepared an AWMP to update the WMP and to comply with Water Code section 10826, including a report regarding efficient water management practices.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Yolo County Flood Control and Water Conservation District as follows:

1. The foregoing recitals and findings, and each of them, are true and correct.

2. The Board hereby adopts the 2013 Agricultural Water Management Plan to comply with the requirements of Water Code Section 10826.

3. The adopted 2013 Agricultural Water Management Plan updates and supersedes the comprehensive Water Management Plan that was adopted in October 2000.

PASSED AND ADOPTED by the Board of Directors of the Yolo County Flood Control and Water Conservation District on the 1st day of October, 2013, by the following vote:

AYES:	DIRECTORS BRICE, MAYER, ROMINGER, TADLOCK AND VINK
NOES:	NONE
ABSTAIN:	NONE
ABSENT:	NONE

Signed and approved by me this 1st day of October 2013.

Erik Vink, Chair

Attest:

Tim O'Halloran, Secretary

Appendix C: Rules and Regulations

YOLO COUNTY

FLOOD CONTROL &
WATER CONSERVATION
DISTRICT

Effective water resource management

RULES AND REGULATIONS

As Amended by the
Board of Directors

1 March 2003

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RULES AND REGULATIONS
GOVERNING DISTRIBUTION AND USE OF WATER
AND FIXING RATES AND CHARGES FOR WATER SERVICE
BY THE YOLO COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT
(Adopted 3/2/93)
(As amended through 3/2002)

The Board of Directors of the Yolo County
Flood Control and Water Conservation District
do ordain as follows:

I. DEFINITIONS

The terms below will have the following respective meanings unless the context of the Rules and Regulations indicates otherwise.

Agricultural Service - the furnishing or diverting of District water for use primarily in the commercial production of agricultural crops or livestock, including incidental domestic use thereon.

Applicant - the individual or entity applying to the District for water service or structure addition.

Board - the Board of Directors of the District.

District - the Yolo County Flood Control and Water Conservation District. Unless otherwise specified, all acts or determinations by the District permitted or required by these rules and regulations will be performed or made by the General Manager of the District.

District Water - the water, which the District has the right to store, divert, deliver and/or sell for use.

Flat Rate Service - the provision of District water by unmeasured quantities.

Manager - the General Manager of the District or any person designated by the General Manager to perform the acts or to make the determinations permitted or required under these rules and regulations to be made by the General Manager.

Measured Service - the provision of District water by measured quantities.

Measuring Device - the device used for measuring water, a venturi, meter, weir, flume, meter gate, or other standard device.

Nonagricultural Service - the furnishing or diverting of District water for other than agricultural service.

Premises - the integral property or area, including improvements thereon, to which District water service is or is to be provided.

Service Area - all lands within the District's boundary as it may change from time to time and lands upstream of the Cache Creek Dam along Cache Creek and around Clear Lake, as determined by the Board from time to time.

Turnout - a structure, pump or other approved device to deliver or divert District water from a District canal or reservoir or natural channel into facilities owned or controlled by other than the District.

Water System - all dams, reservoirs, pumps, canals, channels, flumes, tunnels, measuring devices and other pertinent works, facilities and properties and right-of-ways owned, operated or used by the District for the purpose of storing, diverting or delivering District water.

Water User - those receiving water service from the District or its authorized agent.

II. MUNICIPAL WATER SERVICE

Water service for municipal use will be provided under water service contracts that specify, among other things, the maximum quantity of water to be diverted, the diversion and measurement of water, the rate to be paid, the provisions for increases in rates, the time and the method of payment, and the term of agreement.

III. APPLICATIONS

A. APPROVAL OF APPLICATIONS REQUIRED, POINT OF DELIVERY OR DIVERSION.

District water service or the addition or change of structure to allow such water service will be provided or permitted only upon District approval of written applications on forms prescribed by the District as required below. Each application will be signed by the applicant and by the owner of the property upon which service is requested if such owner is not the applicant, unless the requirement of execution by the land owner is waived by the District upon satisfactory establishment of credit under Section V.A. Each application will specify the applicant's desired point or points of delivery or diversion from the water system. In its approval of such application, the District will specify the approved point or points of delivery or diversion, and also the point of measurement for measured water service.

B. APPLICATIONS FOR AGRICULTURAL SERVICE

1. During Times of Short Supply

a. Deadline for Filing Applications.

Applications are due no later than February 7 of each year (or the first Monday following February 7, if February 7 falls on a weekend), or a later date if the District extends the filing deadline. By the due date, each applicant desiring agricultural service will have an application on file, whether hand delivered or mailed to the District office (34274 State Highway 16, Woodland, CA 95695), stating (a) the number of irrigable acres of each field for which irrigation service is desired, (b) an accurate location on an assessor's parcel map of the boundaries of the land to be irrigated, (c) the crop or crops growing or to be grown, (d) the landowner's name if different from the applicant, (e) the assessor's parcel number of the property, and (f) any other information required by the District.

b. Application Acreage Deposits.

Each application will be followed by an acreage deposit, due no later than March 15 (or the first Monday following if March 15 is on a weekend), or by an earlier date if water delivery is requested by the applicant prior to March 15. The application will not be considered approvable until such deposit is received. Such deposit is a guaranteed minimum water purchase for the season and a credit on the applicant's aggregated water bill if District water is available for delivery, whether or not the applicant actually takes any water. If the acreage deposit is less than the amount of the minimum charge as set by the Board from time to time, the applicant will pay the minimum charge. Any deposit check returned to the District for lack of sufficient funds for payment or for any reason other than bank error will be treated as if it were not received.

See the rate schedule at the end of this document. The Board may modify the rate schedule from time to time.

c. Transfers and Cancellation of Applications and Deposits.

Applications or portions thereof may be transferred from one applicant to another, acre for acre, if accomplished not later than June 1 and only if approved by the District. Applications or portions thereof may also be canceled not later than March 15, except on parcels that have already used water. Acreage deposits relating to applications that are canceled as permitted above will be credited to the applicant's water account as an independent payment rather than as a portion of the guaranteed minimum purchase for the season or will be refunded at the applicant's option. Other than as provided above, applications may not be canceled and the District will retain acreage deposits whether or not the applicant actually takes any water.

d. Late Applications.

No applications will be accepted after the filing deadline except as deemed proper by the General Manager.

e. Lands Outside the District.

Lands outside the District will be served on a surplus water basis only. In the event that those lands are unable to be serviced the acreage deposit will be returned.

2. During Times of Full Supply.

a. Deadline for Filing Applications.

Applications are due no later than March 15 of each year (or the first Monday following March 15, if March 15 falls on a weekend), or a later date if the District extends the filing deadline. By the due date, each applicant desiring agricultural service will have an application on file, whether hand delivered or mailed to the District office (34274 State Highway 16, Woodland, 95695), stating (a) whether the service desired is flat rate or measured agricultural service, (b) the number of acres of each field for which irrigation service is desired, (c) an accurate location on an assessor's parcel map of the boundaries of the land to be irrigated, (d) the crop or crops growing or to be grown, (e) the landowner's name if different from the applicant, (f) the assessor's parcel number of the property, and (g) any other information required by the District.

b. Application Acreage Deposits.

An acreage deposit will accompany each application. The application will not be considered filed until such deposit is received. Such deposit is a guaranteed minimum water purchase for the season and a credit on the applicant's aggregated water bill if District water is available for delivery, whether or not the applicant actually takes any water. If the acreage deposit is less than the amount of the minimum charge, the applicant will pay the minimum charge.

See the rate schedule at the end of this document. The Board may modify the rate schedule from time to time.

c. Transfers and Cancellation of Applications and Deposits.

Applications or portions of them may be transferred from one applicant to another, acre for acre, if accomplished not later than June 1 and if approved by the District. Applications or portions of them may be canceled not later than May 1. Acreage deposits relating to applications that are canceled as permitted above will be credited to the applicant's water account as an independent payment rather than as a portion of the guaranteed minimum purchase for the season or will be refunded at the applicant's option. Other than as provided above, applications may not be canceled and the District will retain acreage deposits whether or not the applicant actually takes any water.

d. Late Applications, Penalty.

In the event that application for water service is filed subsequent to March 15, (or the first Monday following March 15, if March 15 falls on a weekend), or a later date if the District extends the filing deadline, a penalty charge in the amount set by the Board from time to time will be paid when the application is made, and this charge will not be a credit on the water bill of the applicant. The minimum penalty will be equal to the minimum set for any application. No application filed after May 1 will be accepted unless the District determines that water will be available for the balance of the irrigation season surplus to the needs of lands covered by applications filed on or before May 1.

C. APPLICATIONS FOR AGRICULTURAL STRUCTURE ADDITIONS OR CHANGES.

Applications for agricultural structure additions or changes will not be approved, if, in District's determination, the requested addition or change will interfere with delivery of water to other Water Users or there is insufficient water or capacity in the water system to satisfy the service requested in the application. If such application is approved, the District will determine whether the work will be performed by (a) the District or under its direction, or (b) by the applicant, pursuant to plans approved by the District.

Before construction is begun by the District or under its direction, the applicant will execute a repayment contract with the District upon approval by the General Manager or the applicant will deposit the amount estimated by the District as the cost of the work and the structure. The adjustment between the estimated and actual cost payable by the applicant will be made within 90 days after completion of construction.

1. Additions Involving Canal Construction or Extension.

If the approved application is for agricultural service additions requiring canal construction or extension, the cost or any portion of it may be paid by the District if, in it's judgment, the annual ongoing use of water on the lands to be served will justify the expenditure. Applicants for such additions may be required to pay all or a specified part of the cost of such addition as a condition to approval of the application. The District may form a zone of benefit for this purpose. Persons applying for service from such additions who have not made a deposit to apply on the cost thereof may be required to pay the District their fair share of the reasonable cost of such addition before receiving service, which sum will, unless otherwise provided, be refunded by the District ratably to the participants who have previously made such deposits with the District. If the District is unable, with reasonable effort in the District's determination, to locate the participants, the sum will default to the District.

D. APPLICATIONS FOR NONAGRICULTURAL SERVICE AND STRUCTURE ADDITIONS OR CHANGES.

1. For Service Through Existing Service Connection or Turnout.

Any applicant requesting nonagricultural service through an existing service connection or turnout where measuring devices are already installed will apply to the District for such service specifying whether flat rate or measured service is desired and will pay a turn on fee.

See the rate schedule at the end of this document. The Board may modify the rate schedule from time to time.

2. For Change in Ownership, Tenancy, or Service.

A new application must be made and a turnout fee paid in the amount set from time to time by the Board by the applicant on any change in nonagricultural service or the Water User as described in the application.

3. For Service Requiring the Installation of Additional Structures.

Any applicant requesting nonagricultural service requiring the installation of a new service connection, turnout or measuring device will apply to the District for such service.

4. For Change in Location of Service or Size of Meter.

Any Water User desiring to change the location of any nonagricultural water service or the size of any service connection or measuring device that has been installed will make application to the District for such installation.

5. Approval Dependent of Sufficient Capacity and Water.

No application for new nonagricultural service or structure addition or change will be approved if, in the District's determination, there is insufficient District water and/or insufficient capacity in the water system to satisfy the requested service, or if the requested addition or change will interfere with delivery of water to other Water Users.

6. Installation of Additional or Changed Structures.

Except as otherwise specifically approved by the Board, the applicant will be responsible for installing the additional or changed facilities under Sections III.D.3. and III.D.4. Such installation will be in accordance with plans approved by the District prior to commencement of installation. The District will not review plans for approval until the applicant has paid a fee as determined by the District to cover its cost of plan review and inspection of installation.

IV. TEMPORARY SERVICE

The District may, if no undue hardship to its Water Users will result there from, furnish temporary service, by contract, not exceeding three years, to contractors, road builders, or any purpose approved by the District under the following conditions:

(1) The applicant may be required to install or at the District's discretion pay the District in advance, the cost as estimated by the District of installation and removal of the facilities necessary to furnish the service, subject to adjustment when the actual cost becomes known.

(2) If the duration of service is to be not more than one month, the applicant may also be required to deposit a sum of money equal to the estimated bill, subject to adjustment in accordance with the actual bill due upon discontinuance of service.

(3) If the duration of service is to exceed one month, the applicant may also be required to establish his credit in the manner prescribed in Section V.

(4) Rates for temporary service will be those prescribed for measured service in Rule VI, with a minimum charge based on one-half acre-foot per day or part thereof for any day of water use for such temporary service.

V. ESTABLISHMENT AND REESTABLISHMENT OF CREDIT AND DEPOSITS

A. ESTABLISHMENT OF CREDIT.

Each applicant for service or structure addition will be required to establish credit before the applicant's application is approved. Credit is established when, in the discretion of the District, any one of the following conditions is met:

(1) The owner of the property upon which service is requested enters into a contract with the District providing that payment of the cost of the service or structure addition is secured by, and can be enforced against, such property.

(2) Applicant makes a deposit in cash (hereinafter referred to as "credit deposit") to secure payment of applicant's water bill as prescribed in Section V.C.

(3) Applicant furnishes a guarantor satisfactory to the District to secure payment of applicant's water bills.

(4) Applicant has been a Water User for a period of time satisfactory to the District and has timely paid all water bills to the satisfaction of the District.

B. REESTABLISHMENT OF CREDIT.

An applicant who within the previous 24 months had (a) water service discontinued or service refused because of nonpayment of District bills, or (b) had an unpaid balance for water service for a period of 90 days, or (c) had an unpaid balance for water service as of December 31 of the previous year, will be required to reestablish credit by depositing the amount prescribed in Section V.D. as a credit deposit, except as otherwise specifically determined by the Board.

C. DEPOSITS TO ESTABLISH CREDIT.

For all service, the amount of credit deposit is the estimated maximum monthly bill for the service desired, as determined by the District. Such credit deposit is a credit to the Water User's account for water service and to be used after depletion of the required acreage deposit.

D. DEPOSITS TO REESTABLISH CREDIT.

For all service, the amount of credit deposit to reestablish credit is twice the estimated maximum monthly bill for the service desired as determined by the District. In addition, all unpaid bills plus penalties must be paid in full to reestablish credit.

E. REFUND OF DEPOSITS TO ESTABLISH OR REESTABLISH CREDIT.

1. Agricultural Service.

At the end of the irrigation season, the District will refund the Water User's credit deposit or the balance in excess of unpaid bills for that service (in excess of the minimum charge under Sections III.B.1.b. and III.B.2.b.).

2. Nonagricultural Service.

After the Water User has, for twelve (12) consecutive months, paid bills for service on the average of fifteen (15) days after presentation, the District will refund the credit deposit.

F. DEPOSIT RECEIPTS.

A credit deposit to establish or reestablish credit for service may be applied by the District to unpaid balances where the District because of nonpayment of bills has discontinued service.

VI. RATES

The Board will set the rates from time to time for the types of District water service set forth below, whether received by gravity or pumped by the Water User. The Board of Directors of the District reserves the right to change these rates at any time and without prior notice.

See the rate schedule at the end of this document.

A. FLAT RATE AGRICULTURAL SERVICE.

Flat rate agricultural service is available for agricultural properties diverting water in the Clear Lake-Cache Creek watershed upstream from the Capay Dam and is due with the filing of the application. As an alternative to the flat rate charges, the District will charge for actual water used if the Water User can verify actual usage and indicates this payment option upon the service application. In no event shall the flat rate change be less than the Board's set a minimum charge.

Flat rate agricultural service is also available for agricultural properties of five acres or less, diverting less than three cubic feet per second from the Winters Canal upstream of the Chapman Reservoir and is due with the filing of the application. In no event shall the flat rate change be less than the Board's set a minimum charge.

To qualify for this rate, the property must place a meter on the discharge and provide the discharge information at the end of the season. The water user will be required to call in to verify adequate water is available to divert prior to diverting. Only one flat rate will be allowed per wateruser.

B. MEASURED AGRICULTURAL SERVICE.

Measured agricultural service rates will be set for crop and non-crop irrigation.

C. FLAT RATE NONAGRICULTURAL SERVICE.

Flat rate nonagricultural service is available at an annual rate per unit to (a) single-family dwelling units having premises averaging not more than one-quarter acre per unit, and (b) to premises without dwellings not more than one-quarter acre in size; provided that larger premises without dwellings may receive flat rate nonagricultural service on the basis of a per unit annual charge for each one-quarter acre or part thereof.

D. MEASURED NONAGRICULTURAL SERVICE.

Measured nonagricultural service is available at a per acre foot rate to all Water Users to whom flat rate nonagricultural service is not available or is not desired.

E. OUTSIDE OF SERVICE AREA.

The rate for service outside the service area is established to be 125% of the rate applicable to similar service within the District's service area except as provided under Section VI.F. or VI.G. The Board may change this rate and ratio from time to time.

F. KELSEY CREEK GROUNDWATER RECHARGE PROJECT, BIG VALLEY, ZONE 5 OF LAKE COUNTY.

The rate is to be established by the Board from time to time.

G. OTHER TYPES OF SERVICE.

The Board may establish rates for other types of service from time to time.

VII. ORDERS AND DELIVERY OF AGRICULTURAL SERVICE

A. PLACING START ORDERS.

All orders by a Water User for delivery by the District of water for agricultural service through a District canal or natural channel must be received by the District office in sufficient time to allow 24 hours travel time for the water from the source to point of delivery unless the water is available as determined by the District. The orders must be received before 11:00 a.m. unless an earlier deadline is provided in notice from the District, otherwise the 24 hours will be calculated from deadline time on the following day. The District may refuse to accept orders for irrigation water for a lesser amount than 1 cubic feet per second or which, in the District's opinion will constitute an unjustifiable use of water. Orders may be made in writing, or orally in person or by telephone by the Water User.

Orders will include the name of applicant, the location of service by the canal designation, the flow in cfs, the crop and the preferred date for service.

B. ROTATION OF WATER SERVICE.

Water will be taken on a canal or lateral in turn or rotation based on priority of order, except that, when agreeable to the District, Water Users on a canal or lateral may exchange turns for mutual accommodation, provided such change will not alter the system of delivery to other Water Users on the same canal or lateral.

C. LIABILITY FOR TAKING HEAD OF WATER.

Water Users will be liable for damages or loss caused by their taking a head of water without permission of the District.

VIII. NOTICE OF SHUTTING OFF AGRICULTURAL WATER

SERVICE

A. REQUIRED NOTICE.

1. General.

Water Users served from a District canal or natural channel who wish to discontinue the service of water or reduce the head will give notice to the office of the District before 11:00 a.m. the day before such service is to be discontinued or such head reduced, unless an earlier deadline is provided in notice from the District.

2. Service of Less Than 24 Hours Duration.

Where the service is to be for less than 24 hours, notice of the time of shutting off the water or reducing the head, will be given when the order for water is placed. If Water User uses more than 0.5 cfs for less than 24 hours on consecutive days, Water User will be charged for the water spilled between irrigations. An exception will be made for Water Users on the Winters Canal because the unused water will be captured in the Chapman Reservoir and available for subsequent use.

The maximum number of consecutive days allowed on an order is seven. For intermittent service lasting in excess of seven days, Water User will be required to place additional orders not to exceed seven days.

3. Failure to Give Notice.

Failure of the Water User to give required notice may cause a waste of water, in which case the water ordered for, but not diverted by the Water User may be charged to the Water User's water bill as provided in VIII-C.

B. LIABILITY FOR DAMAGE CAUSED BY TURNING BACK HEAD OF WATER.

Water Users will be liable for damages or loss caused by their turning a head of water, which was being used by them, back into the District's canal without permission of the District.

C. FAILURE TO USE AGRICULTURAL WATER.

When an agricultural service Water User fails to make use of water that the Water User has ordered and the same is ready for delivery and is not actually delivered by the District to another Water User, the Water User who placed the order will make full payment for water until it can be shut off at the source plus 18 hours or delivered to another Water User. If the District determines waste has occurred, the District may charge the Water User for water wasted at 1.5 times (150%) the regular rate.

IX. MEASUREMENT OF WATER AND RENDERING AND PAYMENT OF BILLS

A. DISTRICT ACCESS TO MEASURING DEVICE.

Each Water User will give the District access for all reasonable purposes to the measuring device that measures the amount of District water delivered to or diverted by such Water User, whether the District or the Water User owns such device.

B. MEASUREMENT OF WATER. MEASURED AGRICULTURAL SERVICE.

The measuring devices for measured agricultural service will be read and the reading recorded by the District once each day when there is no change in the rate of flow of water delivered. Additional daily readings will be made and recorded when deemed necessary by the District.

C. MEASUREMENT OF WATER. MEASURED NONAGRICULTURAL SERVICE.

The measuring device for measured nonagricultural service will be read monthly by the District, or by the Water User and the results reported immediately to the District if so agreed to by the Water User and the District, unless otherwise determined by the District.

D. TESTS OF MEASURING DEVICE ON WATER USER REQUEST.

The District will, on reasonable notice by a Water User, test any water-measuring device serving Water User's premises. No charge will be made for such a test, except where a Water User requests more than one test of a device in any year, in which case he will be required to reimburse the District the cost of the test if the test shows the District has not been overcharging the Water User. The Water User will have the right to require the District to conduct the test in his presence or in the presence of his representative.

X. BILLING AND PAYMENT

A. BILLING.

1. Agricultural Service Invoices.

Agricultural service invoices will be mailed monthly to each Water User for each turnout. Invoices will provide the amount of water delivered each day.

a. Bills for Measured Service.

Bills for measured water service will be mailed monthly, unless otherwise determined by the District.

b. Flat Rate Service.

Bills for flat rate water service for each calendar year will be mailed on or about July of such year, or at the time of approval of application if application is made after July 1.

2. Other Invoices.

Invoices other than agricultural service will be mailed monthly, unless otherwise determined by the District.

B. PAYMENT OF BILLS.

All bills will be due and payable upon receipt.

C. DELINQUENT BILLS.

Bills become delinquent 30 days after the date of the bill. All delinquent payments and penalties will bear finance charges at the rate set by the Board from time to time. All payments delinquent as of December 31 of any year will be charged a one-time penalty in the amount set from time to time by the Board. All delinquent payments, penalties and finance charges which are added to the county tax roll for collection are subject to being charged an additional penalty in an amount set from time to time by the Board so long as the total penalties assessed by the District excluding finance charges do not exceed 10%.

See the rate schedule at the end of this document. The Board may modify the rate schedule from time to time.
A Water User's service may be discontinued for nonpayment of a bill under Section XII.A.

D. DISPUTED BILLS.

Should a water user dispute the correctness of a bill rendered by the District for water, the Water User may, within 30 days after presentation of the bill on which the Water User claims an error has been made, deposit with the District the amount claimed by the District to be due and submit a written statement setting forth the reasons why the bill is disputed. On receipt of the deposit, the District will investigate the complaint and communicate its findings to the Water User. If the Water User fails to comply with this provision within 30 days after presentation of the bill, Water User's failure will constitute an acceptance of the bill as correct and warrant the District in discontinuing service without further notice if the bill becomes delinquent.

E. CHARGE FOR RETURNED CHECKS.

A fee will be charged against any Water User whose check is returned to the District for lack of sufficient funds for payment or reasons other than bank errors.

XI. ACCESS TO PREMISES SERVED BY DISTRICT WATER AND CONTROL OF WATER SYSTEM

A. ACCESS.

The District and its officers, agents, and employees will have free access at all times to and across all premises served with District water for any purpose connected with the distribution of District water or the operations of the District or its water system.

B. CONTROL.

The entire water system and all measuring devices there from, whether such measuring devices were installed or are owned by the District or the Water User, are under the exclusive control of the District General Manager and no other person, except District employees or such other persons as the General Manager may authorize, will have any right to interfere with or to operate the water system or any part thereof.

C. RESPONSIBILITY FOR WATER AFTER LEAVING WATER SYSTEM.

The District will not be responsible for the distribution of District water among Water Users from facilities outside the water system, nor will the District be responsible for water after it leaves the points of delivery or diversion from its water system to facilities owned by others. Several Water Users may unite in the construction and operation of a common distribution system, in which case the District will deliver District water at the junction of such distribution system with the canal of the District.

D. RESPONSIBILITY FOR FACILITIES NOT OWNED BY DISTRICT.

The District will not be responsible for operating, maintaining or replacing water distribution facilities not owned by the District. The installation and maintenance of a District-owned measuring device on private property or within a portion of a water distribution system not owned by the District will not create any obligation on the part of the District for operation, maintenance, or replacement of any segments of the water distribution system owned by others.

The District does not share with landowners in the cost of maintenance of natural waterways used to convey water by the District.

E. PROTECTION OF WATER SYSTEM CANALS.

All lands to be served with District water will be so prepared and Water User-owned structures and laterals so located as not to require water in the District's canals to be raised to such a level, in order to irrigate said

lands, as to endanger the canals or structures of the District or cause seepage to lands adjacent thereto. The District will determine the level to which water may be safely raised in its canal.

F. MAINTENANCE OF WATER USER-OWNED LATERALS.

At the beginning of each irrigation season and before the water will be turned therein, Water User-owned canals or laterals, including the structures thereon, must be put and thereafter kept in good repair, with vegetation removed from them so that water may flow through them with the least practicable loss. Such canals and laterals must be of sufficient capacity to carry an adequate quantity of water to economically irrigate the area under them. Failure on the part of any Water User along any canal or lateral to do the things herein required will warrant the District in refusing to turn water therein, until said ditches or canals are put in condition.

G. CONTROL OF WATER.

Under California water law, the District has control of water under its water rights, including return flows, transported in District facilities and natural watercourses, such as streams, within the boundaries of the District. No diversions of water under control of the District from District facilities or natural watercourses will be permitted unless the District has approved the manner of diversion and such diversion complies with the provisions of these rules and regulations. All persons taking delivery of District water from natural watercourses or the District's ditches or canals must take such deliveries through gates or structures approved by the District.

XII. DISCONTINUANCE OR REFUSAL OF SERVICE

A. NONPAYMENT OF BILLS.

A Water User's water may be discontinued for nonpayment of a bill for water service if the bill becomes delinquent. A Water User's service, however, will not be discontinued until the amount of any credit deposit has been fully absorbed. If an agricultural applicant in any year is delinquent in the payment of a bill for water service during a prior year, his application will be denied and service will be refused, except that the District may provide service on the condition that payment for water during such year is made in advance of delivery.

B. SERVICE DETRIMENTAL TO OTHER WATER USERS.

The District may refuse to furnish water, or reduce water service or discontinue service to any premises, where the use of water thereon is detrimental or injurious to the water service furnished to other Water Users.

C. FRAUD AND ABUSE.

The District will have the right to refuse or to discontinue water service to any premises if necessary to protect itself against fraud or abuse.

D. NONCOMPLIANCE.

The District may discontinue water service to a Water User for noncompliance with any of these rules and regulations, if the Water User fails to comply therewith within five days after receiving written notice of intention to discontinue service.

XIII. SHORTAGE OF SUPPLY AND INTERRUPTION OF DELIVERY

A. SHORTAGE AND INTERRUPTION.

The District will exercise reasonable diligence to furnish a continuous and adequate supply of water to its Water Users and to avoid any shortage or interruption of delivery **thereof**. It **cannot**, however, guarantee a full supply or complete freedom from interruption. When, for any reasons, the District is unable to deliver the full supply of water required by the Water User, such supply as can be delivered will be prorated until such time as delivery of a full supply can be restored.

B. TEMPORARY SUSPENSION FOR REPAIRS.

The District reserves the right to suspend service temporarily to make necessary repairs or improvements to its water system. In doing so, the District will notify the Water Users affected as soon as circumstances permit, and will prosecute the work with due diligence and with the least possible inconvenience to Water Users.

C. APPORTIONMENT OF SUPPLY DURING THE TIME OF SHORTAGE.

In any year the District will apportion its available water supply among its Water Users as follows:

(1) The District will attempt to supply nonagricultural water service without reduction. Water not needed to supply nonagricultural water service will be apportioned as set forth below.

(2) The requirements for agricultural service on lands for which application was made not later than February 15 (or the first Monday following February 15, if February 15 falls on a weekend), and the acreage deposit was received no later than March 15 (or the first Monday following March 15, if March 15 falls on a

weekend) will have an equal priority to the water available for agricultural water use. The Board reserves the right to require payment for all water ordered during a time of water shortage, whether used or not.

XIV. WATER WASTE

A. AGRICULTURAL WATER WASTE.

Any Water User who, in the determination of the District, is wasting water or floods any portion of Water User's land to an unreasonable depth in order to properly irrigate other portions, or whose land has been improperly checked for the economical use of water, or allows an unnecessary amount of water to escape from any tailgate, will be refused service until such conditions are remedied. The District may refuse service when in its determination the proposed use, or method of use, will require such excessive quantities of water as will constitute waste.

B. NONAGRICULTURAL WATER.

The District will endeavor to furnish sufficient water for nonagricultural uses. No Water User will waste water. Any violation of this rule may cause water to be shut off until the District receives satisfactory assurances that the conditions causing such waste have been remedied.

XV. WATER QUALITY

All District water delivered to or made available for diversion by Water Users is from open reservoirs, natural channels, ditches, canals, conduits and flumes. The District does not represent or guarantee that any District water is potable or of a quality suitable for human consumption or for any other purpose. Any Water User who uses said water or makes it available to others for human consumption will take all necessary precautions to make the water potable and will assume all risks and liabilities in connection therewith.

XVI. DAMAGE TO DISTRICT'S PROPERTIES

A. LIABILITY OF OWNER OR WATER USER.

The owner or Water User through whose lands any part of the water system passes will be liable for any damage to the system or loss of District water caused by (a) stock crossing or pasturing on the banks of a canal, (b) operating machinery of any kind across or along the banks of a canal or above a pipeline, (c) burning vegetation, (d) dumping drainage water, waste water, vegetable matter, garbage, chemical pollutants or other water materials into any other part of the water system, (e) turning a head of water, which was being used by the Water User, back into the District's canal without permission of the District or its canal tender,

or (f) any other cause within the owner's or Water User's control or for which the owner or Water User would, as owner or occupier of the lands, be legally responsible.

B. WRITTEN PERMISSION FOR OBSTRUCTIONS OR DISCHARGES.

No fences, bridges, ditches, buildings, domestic water pipes, stock watering pipes, sewer pipes or other obstructions of any kind will be placed upon, over, across or along any part of the water system, nor will there by any discharge of water or any other matter into any part of the water system, without first obtaining written permission of the District, which will state the time, the conditions or other regulations governing the same.

C. DISTRICT ROADS.

No ditch, bank, or District road will be sprinkled or flooded with water in connection with irrigation of adjacent lands.

XVII. NOTICES

A. NOTICES TO WATER USERS.

Notices from the District to a Water User normally will be given in writing either delivered to the Water User or mailed to the Water User's last known address. Where conditions warrant, and in emergencies, the District may give verbal notices by telephone or in person.

B. NOTICES FROM WATER USERS.

Except as otherwise provided in Section VII.A., notices from a Water User to the District will be given by the Water User or an authorized representative in writing and mailed postage prepaid or hand delivered to the District office, 34274 State Highway 16, Woodland, California 95695, telephone (530) 662-0265.

XVIII. ENFORCEMENT OF RULES AND REGULATIONS

The General Manager will be responsible for the enforcement of the rules and regulations. Failure of a Water User to comply with any of the rules and regulations will be sufficient cause for the termination of water service, and water service will not again be furnished to such Water User until full compliance has been made with all the requirements as herein set forth; provided, however, that the Water User will in no way be relieved of any responsibility for payment of any charges or obligations by reason of such termination of water service. In no event will any liability accrue against the District or any of its officers, agents or employees, for damage, direct or indirect, arising from such termination of water service.

XIX. ADMINISTRATION OF RULES AND REGULATIONS: NOTICE HEARING AND APPEAL

At least ten days before termination of water service as provided in Section XVIII is to be effected, a Water User will be provided written notice of such termination and advised of the opportunity and procedure to discuss the reason for termination of service with the General Manager, or other employee designated by the General Manager who will be empowered to review disputed bills, rectify errors, and settle controversies pertaining to termination of service.

In the event that the Water User disagrees with the decision of the General Manager or the General Manager's designee in administering the rules and regulations, Water User will then have the right to appeal to the Board. Such appeal must be made within five days after written notice of the General Manager's or the designee's decision. Appeals must be submitted in writing and will specifically set forth the decision being appealed and the reasons for the appeal. Appeals will be considered at the next regular meeting of the Board, but the Board may, in its discretion, consider an appeal at an earlier meeting.

Termination of water service will be stayed until the time for filing an appeal with the Board has expired. In the event that such an appeal is filed with the Board, termination of water service will be stayed until the Board has ruled on the appeal.

XX. CHANGES IN RULES AND REGULATIONS

The rules and regulations will become effective immediately and may be added to, amended or repealed at any time by the Board.

XXI. PENALTY FOR UNAUTHORIZED TAKING OF WATER

Section 592 of the California Water Code provides as follows:

"Every person who will, without authority of the owner or managing agent, and with the intent to defraud, take water from any canal, ditch, flume, reservoir, or natural waterway used for the purpose of holding or conveying water for manufacturing, agriculture, mining, irrigation, groundwater recharge, generation of power, or domestic uses, IS GUILTY OF A MISDEMEANOR. The penalty for such act will be a fine of $1,000 per day and 10 times the District's most current rates and charges for the estimated amount of water taken."

"Every person who will without like authority raise, lower, or otherwise disturb any gate or other apparatus thereof, used for the control of measurement of water or who will empty or place or cause to be emptied or placed into any such canal, ditch, flume, or reservoir, any rubbish, filth, or obstruction to the free flow of the water **IS GUILTY OF A MISDEMEANOR.**"

XXII. LEGAL ENFORCEMENT

In the event litigation results concerning the enforcement of any portion of these rules and regulations or the payment of any charges to the District, the prevailing party will be entitled to recover from the losing party any attorney's fees and other legal costs as part of its costs.

XXIII. RIGHTS IN DISTRICT WATER

No Water User receiving District water service acquires a proprietary right thereto by reason of use. No Water User acquires a right to use it for a purpose or on premises other than specified in the application and as approved by the District. The District expressly asserts and reserves the right to recapture, reuse and resell all District water after it has been originally delivered or diverted and used.

Under California water law, the District has control of water under its water rights, including return flows, transported in District facilities and natural watercourses, such as streams, within the boundaries of the District. No diversions of water under control of the District from District facilities or natural watercourses will be permitted unless the District has approved the manner of diversion and such diversion complies with the provisions of theses rules and regulations. (For example, see *Stevens* v. *Oakdale Irrigation District* (1939) 13 Cal.2d343, and Water Code Sections 7043 and 7044.)

Adopted and passed by the Board of Directors of the Yolo County Flood Control and Water Conservation District on the 4th day of March 2003.

Appendix D: 2013 Rate Schedule

RATE SCHEDULE MAY 2013

The Board of Directors reserves the right to change rates and charges from time to time.

SECTION	DESCRIPTION	RATE OR CHARGE	
III.B.1.b.	Acreage Deposit	$ 5.00 per acre	$30.00 Minimum Charge
III.B.2.b.	Acreage Deposit	$ 5.00 per acre	$30.00 Minimum Charge
III.B.2.d.	Late Penalty	$ 1.00 per acre	$30.00 Minimum Charge $500.00 Maximum Charge
III.D.1	Nonagricultural Service Existing Turn on Fee	$ 15.00 first time	
III.D.2	Nonagricultural-Ownership Change	$ 15.00 per change	
VI.A.	Flat Rate Agricultural		
	Orchards	$ 48.00 per acre	$30.00 Minimum Charge
	Other than Orchards	$ 72.00 per acre	$30.00 Minimum Charge
VI.B.	Measured Agricultural	$ 24.00 per ac/ft	$ 5.00 Minimum Charge Per Irrigation
VI.C.	Flat Rate Nonagricultural	$ 57.00 per unit	$30.00 Minimum Charge
VI.D.	Measured Nonagricultural	$ 57.00 per ac/ft	$30.00 Minimum Charge
VI.E.	Outside of Service Area		
	(125% Ag Rate)	$ 30.00 per ac/ft	$30.00 Minimum Charge
	(125% Non-Ag Rate)	$ 71.25 per ac/ft	$30.00 Minimum Charge
VI.F.	Kelsey Creek (47% Ag Rate)	$ 11.28 per ac/ft	
VI.G.	Others - Established on a Case by Case Basis		
	Bottled Water Rate	$189.00 per ac/ft	$30.00 Minimum Charge
	Recreation	$ 57.00 per ac/ft	$30.00 Minimum Charge
	Highlands Reservoir	Per Contract	$30.00 Minimum Charge
X.C.	Delinquent Bills		
	Finance Charge	1.5 % per month	
	Minimum Charge	$ 2.00 per month	
	Penalty on Dec. 31	5 %	
X.E.	Returned Check Charge	$ 15.00	

Appendix E: Water Order Form

YOLO COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

34274 State Highway 16 Woodland, CA 95695-9371 (530) 662-0265 www.ycfcwcd.org

2013 APPLICATION FOR AGRICULTURAL WATER SERVICE

Applicant_____ E-Mail Address_____

Address_____ Work Phone (___)_____ Cell Phone (___)_____

Home Phone (___)_____ Person authorized to order water changes _____

Restricted Material Permit # (PUR from Ag Commissioner)_____

Landowner	Parcel #	Field # from PUR	Acres	1st Crop	Double Crop	Date 1st Delivery	Turnout #
1.							
2.							
3.							
4.							
5.							
6.							

***** PLEASE PROVIDE A SKETCH OF FIELD LOCATIONS FOR EACH PARCEL ON THE BACK OF THIS APPLICATION*****

A deposit of $5.00/Acre (or $30.00 minimum) is due by March 15, 2013 or prior to ordering water whichever comes first.

$5.00 X _____ (Acres) = Total deposit due $_____. **(GUARANTEED MINIMUM PURCHASE)**

The undersigned hereby applies for water service on the lands described above, and agrees to use and pay therefore in accordance with the rates, rules, and regulations of the Yolo County Flood Control & Water Conservation District.

(A COPY OF THE RULES AND REGULATIONS HAS BEEN PROVIDED TO THE APPLICANT AND CAN BE FOUND ON OUR WEBSITE).

Accounts are due and payable on receipt of invoice and become delinquent 30 days from the date mailed. Delinquent accounts are charged a finance charge of 1.5% per month with a 5% penalty on December 31st on all accounts delinquent on that date.

SIGNATURE OF APPLICANT _____ DATE _____

TITLE _____

****

Application Accepted By _____ DATE _____

Applicant Name _____

Landowner	Parcel #	Field # From PUR	Acres	1st Crop	Double Crop	Date 1st Delivery	Turnout #
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							

Appendix F: Water Measurement Certification Plan (Compliance Program)

Yolo County Flood Control and Water Conservation District

SBx7-7 Water Measurement
Compliance Program

PURPOSE

This SBx7-7 Water Measurement Compliance Program (Program) has been developed by the Yolo County Flood Control and Water Conservation District (District) to comply with the requirements of Water Code Section 10608.48 (WC §10608.48) and the Agricultural Water Measurement Regulation, California Code of Regulations (CCR) §597. The Program is a component of the District's Agricultural Water Management Plan (AWMP). Specifically, the Program outlines how the District has or intends to address the critical Efficient Water Management Practices (EWMPs) of measurement and pricing identified in WC §10608.48.

WC §10608.48(a) states that agricultural water suppliers *"shall implement efficient water management practices pursuant to subdivisions (b) and (c)."* Subdivision (b) identifies the following two *"critical efficient water management practices:*

(1) Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) Section 531.10 and to implement paragraph (2).

(2) Adopt a pricing structure for water customers based at least in part on quantity delivered."

CRITICAL EFFICIENT WATER MANAGEMENT PRACTICES

CCR §597, approved on July 11, 2012, defines how agriculture suppliers comply with WC §10608.48(b)(1). The District currently measures its deliveries to all customers and believes it is in compliance with the provisions of WC §10608.48(b)(1) and the measurement accuracy provisions of CCR §597.

Critical EWMP #1 - Measurement

The District currently measures and records deliveries to each customer using standardized flow measurement devices. Deliveries to approximately 80% of the District's customers are measured using

orifice gates and flow tables. Measuring devices for agricultural service are read and the readings are recorded daily. Measuring devices for most nonagricultural service are read monthly. Deliveries to the remaining customers are mostly made via customer owned pumps, and measurement is generally based on pump capacities and time of use as reported by the customer although some propeller meters have been installed. In addition to the measured deliveries, the District provides flat rate water service to a small number of select agricultural and nonagricultural users.

Table 1 below identifies the type and number of flow measurement devices along with an estimated level of accuracy. The District utilizes a volumetric pricing scheme based on these measurements as described further below. The District will continue to measure and report deliveries using the existing flow measurement devices until the measurement accuracy verification is complete.

Table 1: Current Water Delivery Measurements

Measurement Device	Number of Devices	Frequency of Measurement	Frequency of Maintenance	Estimated Level of Accuracy (%)
Orifice gates and flow tables	~ 562	Daily	At measurement & annually	< ±12%
Pump capacity and time of use	~ 51	--	--	< ±12%
In-line flow meters	~ 52	Continuous	--	< ±12%

The District intends to comply with the certification requirements pursuant to CCR §597.4(a)(1)(A), using field-testing and analysis completed on a random and statistically representative sample of existing measurement devices as described in CCR §597.4(b)(1). The field-testing and analysis protocols will be performed according to manufacturer's recommendations or design specifications. The results will be approved by an engineer for the sample of existing measurement devices to determine if the existing measurement devices meet the accuracy standards of CCR §597.3(a) and operation and maintenance protocols meet best professional practices. Through the certification process, water measurement best professional practices will be documented or developed for collection and recording of water measurement data.

Certification methods will be developed for each type of device and installation as appropriate. Inspections and testing will be conducted by individuals trained in the use of the field testing and inspection techniques and will be documented in a report approved by an engineer. In addition to the field inspections, current operation and maintenance practices will be reviewed to assure they meet best professional practices. A summary of the operation and maintenance practices, together with any recommendations for changes, will be included in the report approved by the engineer. The initial estimate of the cost to develop and implement the certification program and to prepare the report required pursuant to CCR §597 is $250,000. This cost estimate may be revised as the certification

program developed and refined. The District intends to conduct the certification program over a three year period. Table 2 below provides the anticipated schedule for implementation.

Table 2: Schedule of Measurement Certification Program

Task	2014	2015	2016
Develop Plan	X		
Field Testing	X	X	X
Data Analysis		X	X
Report by Engineer			X

The District update to the AWMP will include the results of the certification program, including the report approved by an engineer as required under CCR §594.4, Description of Best Professional Practices; and a Corrective Action Plan together with any necessary corrective actions including a summary of the actual costs to implement the Program.

Appendix G: Agricultural Water Management Plan Checklist

Appendix G

Yolo County Flood Control and Water Conservation District Agriculture Water Management Plan Checklist

AWMP Location	Guidebook Location	Description	SB X7-7 Section (or other, as identified)
Yes	1.4	AWMP Required?	10820, 10608.12
Yes	1.4	At least 25,000 irrigated acres or	10853
NA	1.4	Less than 25,000 acres and funding provided	10853
No	1.4	Initial AWMP prepared and adopted by December 1, 2012?	10820 (a)
NA	1.4	December 31, 2015 update?	10820 (a)
NA	1.4	5-year cycle update?	10820 (a)
NA	1.4	New agricultural water supplier after December 31, 2012 - AWMP prepared and adopted within 1 year?	10820 (b)
	1.5, 4.2	AWC 1999 MOU: Report on EWMP implemented or scheduled for implementation included?	10827
NA	1.5, 5	USBR water management/conservation plan:	10828(a)
NA	1.5, 5.1	Adopted and submitted to the United States Bureau of Reclamation within the previous four years? and	10828(a)(1)
NA	1.5, 5.1	The USBR has accepted the water management/conservation plan as adequate?	10828(a)(2)
NA	1.4	UWMP or participation in area wide, regional, watershed, or basinwide water management planning: does the plan meet requirements of SB X7-7 2.8? (use checklist)	10829
Section I.A.	3.1 A	Description of previous water management activities.	10826(d)
Yes	3.1 B.1	Was each city or county within which supplier provides water supplies notified that the agricultural water supplier will be preparing or amending a plan?	10821(a)
Yes	3.2 B.2	Was the proposed plan available for public inspection prior to plan adoption?	10841
Yes	3.1 B.2	Publicly-owned supplier: Prior to the hearing, was the notice of the time and place of hearing published within the jurisdiction of the publicly owned agricultural water supplier in accordance with Government Code 6066?	10841
Yes	3.1 B.2	14 days notification for public hearing?	GC 6066
Yes	3.1 B.2	Two publications in newspaper within those 14 days?	GC 6066
Yes	3.1 B.2	At least 5 days between publications (not including publication date)?	GC 6066
NA	3.1 B.2	Privately-owned supplier: was equivalent notice within its service area and reasonably equivalent opportunity that would otherwise be afforded through a public hearing process provided?	10841
As prepared	3.1 C.1	After hearing/equivalent notice, was the plan adopted as prepared or as modified during or after the hearing?	10841

AWMP Location	Guidebook Location	Description	SB X7-7 Section (or other, as identified)
Yes	3.1 C.2	Was a copy of the AWMP, amendments, or changes, submitted to the entities below, no later than 30 days after the adoption?	10843(a)
Yes	3.1 C.2	The department.	10843(b)(1)
Yes	3.1 C.2	Any city, county, or city and county within which the agricultural water supplier provides water supplies.?	10843(b)(2)
Yes	3.1 C.2	Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies?	10843(b)(3)
Yes	3.1 C.2	Any local agency formation commission serving a county within which the agricultural water supplier provides water supplies.	10843(b)(7)
	3.1 C.3	Adopted AWMP availability?	10844
Yes	3.1 C.3	Was the AWMP available for public review on the agricultural water supplier's Internet Web site within 30 days of adoption?	10844(a)
NA	3.1 C.3	If no Internet Web site, was an electronic copy of the AWMP submitted to DWR within 30 days of adoption?	10844(b)
Future action	3.1 D.1	Implement the AWMP in accordance with the schedule set forth in its plan, as determined by the governing body of the agricultural water supplier.	10842
Section II	3.2	Description of the agricultural water supplier and service area including:	10826(a)
Section II.A.1	3.2 A.1	Size of the service area.	10826(a)(1)
Section II.A.2	3.2 A.2	Location of the service area and its water management facilities.	10826(a)(2)
Section II.A.3	3.2 A.3	Terrain and soils.	10826(a)(3)
Section II.A.4	3.2 A.4	Climate.	10826(a)(4)
Section II.B.1	3.2 B.1	Operating rules and regulations.	10826(a)(5)
Section II.B.2	3.2 B.2	Water delivery measurements or calculations.	10826(a)(6)
Section II.B.3	3.2 B.3	Water rate schedules and billing.	10826(a)(7)
Section II.B.4	3.2 B.4	Water shortage allocation policies.	10826(a)(8)
Section III	3.3	Water uses within the service area, including all of the following:	10826(b)(5)
Section III.A	3.3 A	Agricultural.	10826(b)(5)(A)
Section III.B	3.3 B	Environmental.	10826(b)(5)(B)
Section III.C	3.3 C	Recreational.	10826(b)(5)(C)
Section III.D	3.3 D	Municipal and industrial.	10826(b)(5)(D)
Section III.E	3.3 E	Groundwater recharge.	10826(b)(5)(E)
Section III.F	3.3 F	Transfers and exchanges.	10826(b)(5)(F)
Section III.G	3.3 G	Other water uses.	10826(b)(5)(G)
Section IV	3.4 A	Description of the quantity of agricultural water supplier's supplies as:	10826(b)
Section IV.A.1	3.4 A.1	Surface water supply.	10826(b)(1)

AWMP Location	Guidebook Location	Description	SB X7-7 Section (or other, as identified)
Section IV.A.2	3.4 A.2	Groundwater supply.	10826(b)(2)
Section IV.A.3	3.4 A.3	Other water supplies.	10826(b)(3)
Section IV.A.4	3.4 A.4	Drainage from the water supplier's service area.	10826(b)(6)
Section IV.B	3.4 B	Description of the quality of agricultural waters suppliers supplies as:	10826(b)
Section IV.B.1	3.4 B.1	Surface water supply.	10826(b)(1)
Section IV.B.2.	3.4 B.2	Groundwater supply.	10826(b)(2)
Section IV.B.3	3.4 B.3	Other water supplies.	10826(b)(3)
Section IV.B.4	3.4 B.4	Drainage from the water supplier's service area.	10826(b)(6)
Section IV.C	3.4 C	Source water quality monitoring practices.	10826(b)(4)
Section V	3.5	Description of water accounting, including all of the following:	10826(b)(7)
Section V.A.	3.5 A	Quantifying the water supplier's water supplies.	10826(b)(7)(A)
Section V.B.	3.5 B	Quantification of water uses.	10826(b)(7)(B)
Section V.C.	3.5 C	Overall water budget.	10826(b)(7)(C)
Section V.D.	3.5 D	Description of water supply reliability.	10826(b)(8)
Section VI	3.6	Analysis of climate change effect on future water supplies analysis.	10826(c)
Section VII	3.7	Water use efficiency information required pursuant to Section 10608.48.	10826(e)
Section VII.A.	3.7 A	Implement efficient water management practices (EWMPs).	10608.48(a)
Section VII.A.	3.7 A.1	Implement Critical EWMP: Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).	10608.48(b)
Section VII.A.	3.7 A.1	Implement Critical EWMP: Adopt a pricing structure for water customers based at least in part on quantity delivered.	10608.48(b)
Section VII.A.	3.7 A.2	Implement additional locally cost-effective and technically feasible EWMPs .	10608.48(c)
Section VII.B.	3.7 B	If applicable, document (in the report) the determination that EWMPs are not locally cost-effective or technically feasible.	10608.48(d)
Section VII.A.	3.7 A	Include a report on which EWMPs have been implemented and planned to be implemented.	10608.48(d)
Section VII.A.	3.7 A	Include (in the report) an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future.	10608.48(d)
NA	5	USBR water management/conservation plan may meet requirements for EWMPs.	10608.48(f)
NA	6 A	Lack of legal access certification (if water measuring not at farm gate or delivery point).	CCR §597.3(b)(2)(A)

AWMP Location	Guidebook Location	Description	SB X7-7 Section (or other, as identified)
NA	6 A, 6 B	Delivery apportioning methodology (if water measuring not at farm gate or delivery point).	CCR §597.3.b(2)(C),
Section VII.A. & Appendix F	6 C	Description of water measurement BPP.	CCR §597.4(e)(2)
Section VII.A. & Appendix F	6 D	Conversion to measurement to volume.	CCR §597.4(e)(3)
Section VII.A. & Appendix F	6 E	Existing water measurement device corrective action plan? (if applicable, including schedule, budget and finance plan).	CCR §597.4(e)(4))