THE RESIDENTIAL END USES OF WATER STUDY DATABASE

INTRODUCTION

One of the products of the *Residential End Uses of Water Update (REU2016)* is the extensive database developed over the entire research effort. This database, which is in Microsoft Access format, contains all of the end use water events recorded during the REU2016 study along with the survey response data, historic billing data, and other data obtained for each study site. The database also contains summary results from other Aquacraft end use studies including REU1999, the California Single-Family End Use Study, the EPA New Home and Retrofit Studies, and others. The Water Research Foundation hopes to make these data available to subscriber utilities, academic institutions, and other researchers so that additional and more extensive analysis can be performed. This is a tremendously rich data resource, and the analysis presented in this report can be seen as a jumping off point for further research which can utilize this database.

The purpose of this section is to provide a general introduction to the database. It is assumed that the reader is familiar with a few database fundamentals including a basic understanding of the following terms: field, record, table, and query.

DATA COLLECTION

The data collected for this project came primarily from three sources: billing databases provided by the participating water agencies, survey information provided by the responding water customers and water agencies, and flow trace data obtained through the data logging effort. This is true for both the historical studies and the current REU2016 study.

A great deal of effort was required to summarize the data from the various sources into useable tables. This was especially true of the survey information since each survey was slightly different from the others and as a result the compilation of the results required a significant amount of programming in order to reorder and re-code the responses. In addition, not all surveys contained the same questions, so it was necessary to create a summary response table for the historical survey data that consisted of a subset of the most commonly asked questions.

Table 1 shows a list of the studies included in the historical data set.

Table 1 Historical studies included in combined database (Number of surveys =14,066)

Study name	Number of homes in record	Start of data collection
Albuquerque Bernalillo County (ABQ)	209	8/30/10
ABQ Retrofit	29	8/10/11
Cal Single Family	734	7/19/07
EPA Retrofit - Tampa + EBMUD	178	5/22/02
EPA Retrofit-Seattle	111	3/18/00
EPA-HE-New Homes	25	7/18/09
EPA-New Home Study	302	4/16/08
Louisville, KY	59	11/21/07
REU1999	1187	1/18/97
REU2016	762	8/2/12
Westminster, CO	61	12/4/10
Total	3657	--

DATABASE TABLES

The following are description of tables of data found in the REUWS database.

1) **Daily_Use_Summary_ALL_STUDIES** – Contains daily use and per household end use summary data and collated customer survey data for 3,657 single-family homes collected from the various end use studies listed above. All volumes are in gallons unless otherwise noted. (60 fields, 3,657 records).

2) **REU2016_Main_Meter_Events** - Contains each individual water use event recorded from the main household water meter during the REU2016 and all available information about each water use event including the date, start time, volume, and peak flow rate. All volumes are in gallons. (8 fields, 2,981,053 records)

3) **REU2016_Hot_Water_Events** - Contains each individual water use event recorded from the separate hot water meters installed during the REU2016 and all available information about each water use event including the date, start time, volume, and peak flow rate. All volumes are in gallons. (8 fields, 144,242 records).

4) **REU2016 Hot Water** – Contains daily hot water use and per household hot water end use summary for sub-sample of homes monitored for hot water. All volumes are in gallons. (44 fields, 101 records).

5) **REU2016_Daily_Use_Main** – Contains water use volumes measured from the main meter on each day for each home in the end use monitoring sample. All volumes are in gallons. (21 fields, 9,613 records).

6) **REU2016_Survey – End Use Sample** – Contains extensive customer survey results from the homes from which end use flow data were also obtained. (360 fields, 772 records).

7) **REU2016_Survey_Results** – Contains all coded survey response data received as part of the REU2016. (360 fields, 13,752 records).

8) **REU2016_Survey_Key** – Contains explanatory information to help better understand the questions and information in the REU2016_Survey_Results table. (2 fields, 164 records).

DATA CONSIDERATIONS

The data contained in the REU2016 database ranges from numerical survey responses to annual water use consumption to average daily water use to measured daily water use and specific end use data. There are a number of database idiosyncrasies which must be understood in order to understand and work with the REU2016 data. This section describes some of the specific details about the data contained in the database including details about the assignment of KEYCODES to specific study sites, and the disaggregated end use categories.

Each of the surveys in the REU2016 was assigned a Survey ID code, which identified the survey in relationship to the household information and billing data. When surveys were returned a sample of 100+ were selected for flow trace analysis. Each of these homes was assigned a keycode, which identified the homes from the flow trace analysis sample. The Keycodes were linked to the Survey ID's so that data from the surveys could be used for the water use analysis. The Keycodes all had a common format: YYSNNNN, where the first two digits represented the year in which the data were collected, the S indicated that the data came from a single family account, and NNNN represented a number assigned in sequence from 0001 to 9999 for all keycodes assigned in the single family group during the year. Extra keycodes were assigned in order to allow for alternate logging homes in case some houses had to be rejected for any reason.

Table 2 Keycode assignments

No.	Level 1 agency	Survey ID range	Keycode range
1	Denver Water	521,000-999	12S101-226
2	City of Fort Collins Water Department	530,000-999	12S230-360
3	City of Scottsdale Water Department	552,000-999	12S370-489
4	San Antonio Water System	541,000-999	12S500-609
5	Clayton County Water Authority	511,000-999	12S701-810
6	Toho Water Authority	571,000-999	12S820-917
7	Region of Peel Public Works	611,000-999	12S1001-1122
8	Region of Waterloo, Water Services Division	521,000-999	12S1201-1319
9	Tacoma Water	561,000-999	13S101-215

End Use Events Data

The REU2016_Main_Meter_Events table contains the name, date, and specific statistics about each water use event recorded during the flow monitoring portion of the study. These water use events include individual toilet flushes, showers, faucet uses, clothes washer and dishwasher cycles, irrigation uses, etc. Each record also contains a KEYCODE assignment so that each specific water use can be associated with a specific study house and study site.

DATABASE KEYS

Table 3 Key for common survey questions table

Question No.	Description
CSQ01	Number of Toilets
CSQ02	Bath w/shower
CSQ03	Tub only
CSQ04	Tub w/jets
CSQ05	Shower stall only
CSQ06	Utility Sink
CSQ07	Disposal
CSQ08	ice maker
CSQ09	Dishwasher
CSQ10	HE CW
CSQ11	On Demand HW
CSQ12	Evaporative Cooler
CSQ13	W.H. Water Treatment
CSQ14	Pets
CSQ15	Indoor Spa
CSQ16	Indoor Water Feature
CSQ17	Indoor greenhouse
CSQ18	# of 1.6 gpf toilets
CSQ19	# of HET's
CSQ20	# of Dual Flush
CSQ21	# of hydra showers
CSQ22	# of Body Sprays
CSQ23	Are leaking toilets present?
CSQ24	Are dripping faucets present?
CSQ25	Do you have a leaking pool?
CSQ26	Do you have a leaking irrigation system?
CSQ27	other leaks
CSQ28	Do you water your landscape
CSQ29	How do you maintain landscape?
CSQ30	Does contractor schedule irrigation?
CSQ31	No additional irrigation sources
CSQ32	Is in-ground sprinkler present?
CSQ33	Auto timer for irrigation present
CSQ34	Weather-based controller present
CSQ35	No over-ride devices on irrigation system
CSQ36	Is Outdoor spa present?

CSQ37	Outdoor water feature present
CSQ38	Swimming pool?
CSQ39	How is pool filled?
CSQ40	Pool Cover?
CSQ41	How often are cars washed at home?
CSQ42	Wash walks and drives
CSQ43	Who pays the water bill?
CSQ44	Year home built?
CSQ45	Year moved into home
CSQ46	Rent or own home?
CSQ47	How many Bedrooms
CSQ48	No of adults in home
CSQ49	Teenagers
CSQ50	Children
CSQ51	Infants/todlers
CSQ52	# of adults homes in day
CSQ53	# of adults employed full or part time
CSQ54	Number of baths per week in home
CSQ55	showers in clubs
CSQ56	highest grade of school
CSQ57	HH income pre tax

Table 4 Key for REU2016 all customer surveys table

SurveyID	Description
Utility	
Service City	
Service State	
Service ZIP	
AnnualKgal	
SeasonalKgal	
NonseasonalKgal	
PctSeasonal	
Log_AnnualKgal_Bin	
survey_year_moved_in	In what year did you move to this home?
survey_number_of_bedrooms	How many bedrooms does this house have?
survey_number_of_adults	Adults, including you (age 18+)
survey_number_of_teenagers	Teenagers (age 13-17)
survey_number_of_children	Children (age 3-12)

SurveyID	Description
survey_number_of_infants	Infants or Toddlers (under age 3)
survey_year	
survey_number_of_toilets	Toilet
survey_number_of_bathtub_showers	Bathtub with shower
survey_number_of_bathtub_only	Standard bathtub only
survey_number_of_whirlpools	Large bathtub tub w/jets
survey_number_of_shower_only	Shower stall only
survey_number_of_utility_sink	Indoor utility/garage sink
survey_number_of_bathtubs	Bathtubs
survey_number_of_showers	Showers
survey_disposal	In-sink garbage disposal
survey_ice_maker	Automatic ice maker
survey_dishwasher	Dishwasher
survey_clothes_washer_HE	Water & energy efficient (EnergyStar) clothes washer
survey_hot_water_tankless	Tankless water heater
survey_hot_water_on_demand	On-demand hot water system (recirculating pump)
survey_evap_cooler	Evaporative/swamp cooler
survey_humidifier	Whole house humidifier (usually attached to furnace)
survey_treatment	Whole house water treatment system like a water softener or a reverse osmosis system
survey_aquarium	Fish aquarium larger than 10 gallons
survey_pets	Pets (e.g., dogs, cats, or other medium to large size animal)
survey_spa_indoor	Indoor spa or hot tub with jets (if hot tub is NOT usually filled with water, indicate "no")
survey_water_feature_indoor	A built-in indoor water feature (like a water fountain or water pond)
survey_greenhouse_indoor	Indoor garden or greenhouse
survey_other_features	Do you have any water-using appliances and fixtures that were not listed in Questions #1 and #2?
survey_number_of_toilets_GT16	Older toilet with a flush volume greater than 1.6 gallons
survey_number_of_toilets_16	Flush volume of 1.6 gallons/6.1 liters
survey_number_of_toilets_HET	Flush volume of 1.28 gallons/4.84 liters or less
survey_number_of_toilets_dual	Dual Flush (~1.6/0.8 gallons/ 6.1/0.3 liters)
survey_number_of_showers_hydra	Multiple showerheads

SurveyID	Description
survey_number_of_showers_rain	Rain panels (on the ceiling)
survey_number_of_showers_spray	Body spray panels (on the wall)
survey_replaced_toilets_10	Toilets
survey_replaced_showerheads_10	Showerheads
survey_replaced_clothes_washer_10	Clothes washer
survey_replaced_dishwasher_10	Dishwasher
survey_leak_toilet	Leaking toilet (you may hear it running when not in use)
survey_faucet_drips	Dripping faucet
survey_leak_pool	Leaks in your swimming pool system
survey_leak_irrigation	Leaks in your irrigation system
survey_leak_other	Other water leaks
survey_hot_water_gas	Gas
survey_hot_water_electric	Electric
survey_hot_water_propane	Propane
survey_hot_water_solar	Solar
survey_hot_water_wait	Does hot water take longer to reach some places in your house than others?
survey_hot_water_wait_kitchen	kitchen
survey_hot_water_wait_master_bath	master bathroom
survey_hot_water_wait_other_bath	other bathroom
survey_hot_water_wait_other_room	other room
survey_hot_water_waiting	Thinking of the room where it takes hot water the longest to reach, how long would you say you have to wait for hot water?
survey_hot_water_wait_bother	Does the wait for hot water bother you?
survey_irrigation	Do you regularly water your outside landscape? (Includes hand watering, irrigation system, hose and sprinkler, or other method.)
survey_landscape_no_maintenance	
survey_landscaper	How do you maintain your landscape and garden?
survey_landscaper_waters	Is your landscape service provider responsible for adjusting your outdoor landscape watering schedule?
survey_well	Well water
survey_canal_ditch	Canal/ditch
survey_stream	Stream/river
survey_rain_barrel	Rain barrel or cistern (rainwater harvesting)

SurveyID	Description
survey_roof_direction	Directing roof/rain water towards plants in the yard
survey_gray_water	Graywater reuse from indoor fixtures
survey_other_sources_pct	About how much of your outdoor irrigation water comes from the source(s) above (assuming the rest comes from water supplier)?
survey_landscape_turf	Lawn/grass/turf (any variety)
survey_landscape_trees_and_shrubs	Trees and shrubs
survey_garden_veggie	Vegetable garden
survey_garden_flower	Flower garden
survey_landscape_low_water	Low-water use trees, shrubs, and plants
survey_landscape_nonirrigated	Non-watered ground cover (mulch, gravel, rocks, artificial turf, etc.)
survey_manual_irrigation_pct	About how much of your outdoor landscape is watered by hand/manually?
survey_irrigation_inground	Do you have an in-ground irrigation/sprinkling system?
survey_irrigation_inground_timer	Automatic timer/controller
survey_irrigation_inground_master	Master valve
survey_irrigation_inground_bfp	Back-flow preventer (anti-siphon device)
survey_irrigation_inground_drip	Drip irrigation, micro spray and/or bubbler
survey_irrigation_manual_override	No, but I manually try and turn it off when it rains
survey_irrigation_sensor_soil	Yes, soil moisture sensor installed
survey_irrigation_sensor_rain	Yes, rain shut-off sensor installed
survey_irrigation_inground_timer_adjusted	How frequently do you (or your landscape company) adjust the run times on your irrigation timer?
survey_irrigation_inground_wbic	Weather-based "smart" controller
survey_spa_or_hot_tub_outdoor	Does your home have an outdoor spa or hot tub?
survey_spa_or_hot_tub_outdoor_filled	Is the outdoor spa or hot tub usually filled?
survey_water_feature_outdoor	Do you have an outdoor water feature like a fountain or pond that is filled regularly?
survey_pool	Does your home have a swimming pool (indoor and/or outdoor)?
survey_pool_fill_automatic	Automatic swimming pool filling/re-filling system
survey_pool_cover_chemical	Chemical pool cover
survey_pool_cover	What type of swimming pool cover, if any, do you use?

SurveyID	Description
survey_pool_cover_overnight	Physical pool cover replaced overnight
survey_car_washed	Wash a car / personal vehicle at home
survey_walk_washed	Use a hose to clean the sidewalks, patios and driveways around your home
survey_program_participation_3	In the past three years, have you participated in a water conservation program sponsored by your local water utility?
survey_conservation_last_few	In the last several years, has your household taken any action to conserve water, or are you currently engaging in water conservation practices?
survey_giveaway_3	A water fixture give-away or exchange program
survey_retrofit_rebate_3	A water fixture or water appliance rebate program (i.e., get reimbursed some or all of the cost of purchasing a high efficiency water fixture or appliance)
survey_landscape_rebate_3	A landscape rebate for removing lawn or high water use plants or increasing the efficiency of the irrigation system
survey_followed_guidelines	Followed water conservation guidelines set by the water utility
survey_replaced_clothes_washer_HE	Installed water-efficient clothes washer
survey_conservation_shower_short	Take shorter showers
survey_replaced_showerheads_LF	Installed low-flow showerheads
survey_toilet_inserts	Installed water savers (inserts) in toilet
survey_replaced_toilets_last_few	Installed new toilet(s)
survey_disposal_used_less	Use garbage disposal less often
survey_dishwasher_used_less	Use dishwasher less/use fuller loads
survey_clothes_washer_used_less	Use clothes washer less/use fuller loads
survey_faucet_drips_repaired	Repaired leaks in faucet/toilet
survey_audit_last_few	Had a home water audit/survey done
survey_shower_bucket	Catch water in bucket to re-use while waiting for water to get hot
survey_replaced_dishwasher_HE	Installed water-efficient dishwasher
survey_car_washed_less_often	Wash car less often
survey_irrigation_less_often	Water lawn and shrubs less often
survey_irrigation_avoid_heat	Avoid watering lawn and shrubs during the heat of the day
survey_landscape_low_water_last_few	Installed low-water-use landscaping/plants
survey_irrigation_timer_shortened_last_few	Reduced run-times on automatic sprinklers
survey_leak_irrigation_repaired	Repaired damaged or leaking irrigation system

SurveyID	Description
survey_irrigation_in ground_monitor	Monitor irrigation system for leaks, blown heads, etc.
survey_irrigation_in ground_cycle	Cycle irrigate lawns (e.g., 5 min. on, 1 hour off, repeated several times or similar arrangement)
survey_gray_water_l ast_few	Use graywater/reuse household water
survey_rain_barrel_l ast_few	Installed a rain barrel or cistern
survey_drought	At the present time, would you say that your community is experiencing:
survey_household_p ays	Is your household responsible for paying the water bill, OR does a landlord or homeowners' association pay it?
survey_year_built	When was your home built?
survey_age_of_home	House age (years)
survey_years_in_ho me	Residency (years)
survey_renter	Do you rent or own your home?
survey_number of persons at home in dat	What number of adults living at this address are usually at home during the day on a weekday (i.e., not at work outside the home or a full-time student)?
survey_adults_emplo yed	What is the number of adults living at this address who are employed full or part-time?
survey_baths_per_w eek	About how many times per week does someone take a bath (in a bathtub) in your household?
survey_showers_not _at_home	About how many times per week does someone in your home take a shower at an athletic club or recreation center instead of at home?
survey_highest_grad e	What is the highest level of education in the household?
survey_income	About how much was your household's total income before taxes for all of 2010? (Please include in your total income money from all sources for all persons living in your household.)
survey_participant	Agree to participate
REU2016_attitude_ A	Most households in my community know where their water comes from when they turn on the tap.
REU2016_attitude_B	Residents should be allowed to track their household water use via the web or by reading their own water meter.
REU2016_attitude_ C	Households would conserve more water if they had an easier way to monitor their water use.
REU2016_attitude_ D	Without looking at past bills, I know about how much my average (typical) household water bill was (in dollars) last year.
REU2016_attitude_E	Without looking at past bills, I know about how much water my household used in an average (typical) billing period last year.
REU2016_attitude_F	The cost of water is an important factor for me when deciding how much water to use indoors (e.g. for washing dishes,
REU2016_attitude_ G	The cost of water is an important factor for me when deciding how much water to use outdoors (e.g., for watering the lawn or garden, etc.).
REU2016_attitude_ H	I take into account the cost of wastewater (sewer) service when deciding how much water to use.* *If you are charged a flat rate for wasterwater/sewer service, mark "not applicable."
REU2016_attitude_I	Conservation of water is critical for the future of my community.
REU2016_attitude_J	There should be strong financial penalties for people who use too much water.

SurveyID	Description
REU2016_attitude_K	I am aware of rebates offered by my water utility.
REU2016_attitude_L	Water rates should be increased to encourage water conservation.
REU2016_attitude_M	I conserve water to save money.
REU2016_attitude_N	I conserve water to save energy.
REU2016_attitude_O	I conserve water because it is the right thing to do.
REU2016_attitude_P	People who use more water should pay more per gallon for their water.
REU2016_attitude_Q	My water utility should be more active in promoting water conservation on the part of households and businesses.
REU2016_attitude_R	My water utility should provide financial incentives to conserve water.
REU2016_attitude_S	My water utility should promote water use guidelines.

Table 5 Key for Daily_Use_Summaries_ALL_STUDIES table

Question No.	Description
1	Study
2	Keycode
3	Serv_Add
4	City
5	State
6	Zip5
7	SurveyID
8	Type
9	Cooling Deg Days this month (Deg F)
10	Cooling Degree Days previous month (Deg F)
11	Mean Monthly TEMP_LOG MONTH (Deg F)
12	Total PRECIP_LOG MONTH (IN)
13	TEMP_PREV MONTH (Deg F)
14	PRECIP_PREV MONTH (IN)
15	Total Volume
16	TraceBegins
17	TraceEnds
18	Trace Length Days
19	Total GPHD
20	Indoor GPHD
21	Outdoor GPHD
22	Indoor total gal
23	Outdoor total gal

24	Bathtub total gal
25	Clotheswasher total gal
26	Dishwasher total gal
27	Faucet total gal
28	Leak total gal
29	Other total gal
30	Shower total gal
31	Toilet total gal
32	Bathtub events
33	Clotheswasher events
34	Dishwasher events
35	Faucet events
36	Leak events
37	Other events
38	Shower events
39	Toilet events
40	Bathtub gphd
41	Clotheswasher gphd
42	Dishwasher gphd
43	Faucet gphd
44	Leak gphd
45	Other gphd
46	Shower gphd
47	Toilet gphd
48	Average clotheswasher load gal
49	Clotheswasher loads per day
50	Total shower minutes
51	Average shower seconds
52	Total shower gal
53	Average shower gal
54	Average shower mode flow gpm
55	Showers per day
56	Shower minutes per day
57	Average toilet flush volume
58	Toilet flush stdev
59	Flushes > 2.2gal
60	Flushes < 2.2 gal

Table 6 Key for REU2016 Outdoor Factors

Question No.	Description
1	Study
2	Keycode
3	SurveyID
4	City
5	Type
6	Annual_kgal
7	Nonseas_kgal
8	Seas_kgal
9	Projected Indoor_kgal
10	Lot Area_sf
11	Hardscape_sf
12	House_sf
13	Non-irrigated Vegetation_sf
14	NonTurfPlants_sf
15	TreeCanopy_sf
16	Pool_sf
17	Turf_sf
18	Veggie_sf
19	Xeri_sf
20	Gross Et_o_in
21	Annual Precip_in
22	Net ET_in
23	ET Source
24	Indoor_kgal
25	Outdoor_kgal
26	Tot_Irri_area_sf
27	Average application_in
28	Reference Demand_kgal
29	placeholder
30	TIR_kgal
31	TIR_in
32	Application Ratio
33	Excess Irrigation_kgal
34	Net application_kgal
35	Landscape Ratio
36	Placeholder
37	Placeholder

38	Placeholder
39	Placeholder
40	Is Excess

Table 7 Key for REU2016 Survey and Water Use Tables

Question No.	Keycode
1	SurveyID
2	utility
3	ServiceCity
4	ServiceState
5	ServiceZip
6	ServiceProvince
7	ServicePostalCode
8	MeterSize
9	AnnualKgal
10	SeasonalKgal
11	NonseasonalKgal
12	PctSeasonal
13	survey_year_moved_in
14	survey_number_of_bedrooms
15	survey_number_of_adults
16	survey_number_of_teenagers
17	survey_number_of_children
18	survey_number_of_infants
19	capita
20	survey_year
21	survey_number_of_toilets
22	survey_number_of_bathtub_showers
23	survey_number_of_bathtub_only
24	survey_number_of_whirlpools
25	survey_number_of_shower_only
26	survey_number_of_bathtubs
27	survey_number_of_showers
28	survey_disposal
29	survey_ice_maker
30	survey_dishwasher
31	survey_clothes_washer_HE
32	survey_hot_water_tankless
33	survey_hot_water_on_demand
34	survey_evap_cooler
35	survey_humidifier
36	survey_treatment
37	survey_aquarium
38	survey_pets

39	survey_spa_indoor
40	survey_water_feature_indoor
41	survey_greenhouse_indoor
42	survey_other_features
43	survey_number_of_toilets_GT16
44	survey_number_of_toilets_16
45	survey_number_of_toilets_HET
46	survey_number_of_toilets_dual
47	survey_number_of_showers_hydra
48	survey_number_of_showers_rain
49	survey_number_of_showers_spray
50	survey_replaced_toilets_10
51	survey_replaced_showerheads_10
52	survey_replaced_clothes_washer_10
53	survey_replaced_dishwasher_10
54	survey_leak_toilet
55	survey_faucet_drips
56	survey_leak_pool
57	survey_leak_irrigation
58	survey_leak_other
59	survey_hot_water_gas
60	survey_hot_water_electric
61	survey_hot_water_propane
62	survey_hot_water_solar
63	survey_hot_water_wait
64	survey_hot_water_wait_kitchen
65	survey_hot_water_wait_master_bath
66	survey_hot_water_wait_other_bath
67	survey_hot_water_wait_other_room
68	survey_hot_water_waiting
69	survey_hot_water_wait_bother
70	survey_irrigation
71	survey_landscape_no_maintenance
72	survey_landscaper
73	survey_landscaper_waters
74	survey_well
75	survey_canal_ditch
76	survey_stream
77	survey_rain_barrel
78	survey_roof_direction
79	survey_gray_water
80	survey_other_sources_pct
81	survey_landscape_turf
82	survey_landscape_trees_and_shrubs
83	survey_garden_veggie
84	survey_garden_flower
85	survey_landscape_low_water

86	survey_landscape_nonirrigated
87	survey_manual_irrigation_pct
88	survey_irrigation_inground
89	survey_irrigation_inground_timer
90	survey_irrigation_inground_master
91	survey_irrigation_inground_bfp
92	survey_irrigation_inground_drip
93	survey_irrigation_manual_override
94	survey_irrigation_sensor_soil
95	survey_irrigation_sensor_rain
96	survey_irrigation_inground_timer_adjusted
97	survey_irrigation_inground_wbic
98	survey_spa_or_hot_tub_outdoor
99	survey_spa_or_hot_tub_outdoor_filled
100	survey_water_feature_outdoor
101	survey_pool
102	survey_pool_fill_automatic
103	survey_pool_cover_chemical
104	survey_pool_cover
105	survey_pool_cover_overnight
106	survey_car_washed
107	survey_walk_washed
108	survey_program_participation_3
109	survey_conservation_last_few
110	survey_giveaway_3
111	survey_retrofit_rebate_3
112	survey_landscape_rebate_3
113	survey_followed_guidelines
114	survey_replaced_clothes_washer_HE
115	survey_conservation_shower_short
116	survey_replaced_showerheads_LF
117	survey_toilet_inserts
118	survey_replaced_toilets_last_few
119	survey_disposal_used_less
120	survey_dishwasher_used_less
121	survey_clothes_washer_used_less
122	survey_faucet_drips_repaired
123	survey_audit_last_few
124	survey_shower_bucket
125	survey_replaced_dishwasher_HE
126	survey_car_washed_less_often
127	survey_irrigation_less_often
128	survey_irrigation_avoid_heat
129	survey_landscape_low_water_last_few
130	survey_irrigation_timer_shortened_last_few
131	survey_leak_irrigation_repaired
132	survey_irrigation_inground_monitor

133	survey_irrigation_inground_cycle
134	survey_gray_water_last_few
135	survey_rain_barrel_last_few
136	survey_drought
137	survey_household_pays
138	survey_year_built
139	survey_age_of_home
140	survey_years_in_home
141	survey_renter
142	survey_number of persons home in day
143	survey_adults_employed
144	survey_baths_per_week
145	survey_showers_not_at_home
146	survey_highest_grade
147	survey_income
148	REU2016_attitude_A
149	REU2016_attitude_B
150	REU2016_attitude_C
151	REU2016_attitude_D
152	REU2016_attitude_E
153	REU2016_attitude_F
154	REU2016_attitude_G
155	REU2016_attitude_H
156	REU2016_attitude_I
157	REU2016_attitude_J
158	REU2016_attitude_K
159	REU2016_attitude_L
160	REU2016_attitude_M
161	REU2016_attitude_N
162	REU2016_attitude_O
163	REU2016_attitude_P
164	REU2016_attitude_Q
165	REU2016_attitude_R
166	REU2016_attitude_S
167	TraceBegins
168	TraceEnds
169	TraceLengthDays
170	TraceDaily
171	TraceIndoorDaily
172	TraceOutdoorDaily
173	Bathtubevents
174	Clotheswasherevents
175	Dishwasherevents
176	Faucetevents
177	Leakevents
178	Otherevents
179	Showerevents

180	Toiletevents
181	BathtubDaily
182	ClothesWasherDailyVolume
183	DishwasherDaily
184	FaucetDaily
185	LeakDaily
186	OtherDaily
187	ShowerDailyVolume
188	ToiletDailyVolume
189	ClothesWasherUseVolume
190	ClothesWasherDailyUses
191	ShowerUseVolume
192	ShowerMode
193	ShowerDailyUses
194	ShowerDailyMinutes
195	ToiletUseVolume
196	ToiletUseStDev
197	ToiletDailyUses
198	pct_flushes_lt_2_2
199	pct_flushes_gt_2_2
200	TraceIndoorDailyHot
201	BathtubDailyHot
202	ClothesWasherDailyVolumeHot
203	DishwasherDailyHot
204	FaucetDailyHot
205	LeakDailyHot
206	OtherDailyHot
207	ShowerDailyVolumeHot
208	ToiletDailyVolumeHot
209	ClothesWasherUseVolumeHot
210	Averageshowerseconds
211	ShowerUseVolumeHot
212	House_Footprint
213	NonIrrigated_Vegetation
214	Veggie_Garden
215	IndoorKgal
216	OutdoorKgal
217	TotalIrrigatedAreaSqFt
218	ApplicationIn
219	ReferenceDemandKgal
220	TIRKgal
221	TheoreticalDemandIn
222	ApplicationRatio
223	ExcessApplicationKgal
224	NetApplication
225	LandscapeRatio
226	IsExcess

227	Parcel_Area
228	Tree_Shrub_Area
229	Turf_Area
230	Pool_Area
231	Xeriscape_Density
232	Xeriscape_Area
233	Annual_Precip
234	ET_o_Source
235	CoolingDegDaysthismonthDegF
236	CoolingDegreeDayspreviousmonthDegF
237	Annual_ET_o
238	MeanMonthlyTEMP_LOGMONTHDegF
239	Net_ET
240	PRECIP_PREVMONTHIN
241	TEMP_PREVMONTHDegF
242	TotalPRECIP_LOGMONTHIN
243	Billingstructure
244	WinterBillingStructureType
245	SummerBillingStructureType
246	FixedCharges
247	Billfor5kgal
248	Billfor25kgal
249	Billfor50kgal
250	AvgCost@5kgal
251	AvgCost@25kgal
252	AvgCost@50kgal
253	MarginalRate
254	TopTierBreakVolumekgal
255	BillingStructureType