

INDIAN HILLS GENERAL IMPROVEMENT DISTRICT WATER CONSERVATION PLAN

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TABLE OF CONTENTS

TABLE OF CONTENTS.....	2
INTRODUCTION.....	4
1 CONSERVATION GOALS.....	5
1.1 REDUCE WATER USAGE.....	5
1.2 LANDSCAPING CODES AND EDUCATION ENCOURAGEMENT.....	5
1.3 INCREASE THE USE OF WASTEWATER EFFLUENT	6
1.4 IDENTIFY AND REDUCE WATER LOSS	6
1.5 INCREASE COMMUNITY PARTICIPATION IN CONSERVATION	6
1.6 MAINTAINING AN ADEQUATE SUPPLY OF WATER	7
1.7 THE CREATION OF WATER WATCHER PROCEDURES.....	7
1.8 IMPLEMENT A TIERED RATE STRUCTURE.....	7
1.9 CONSERVATION PLAN IMPLEMENTATION SCHEDULE	8
2 WATER USE PROFILE AND FORECAST	9
2.1 EXISTING DISTRIBUTION, SUPPLY SOURCES, AND STORAGE	9
2.2 WATER RIGHTS.....	11
2.3 WATER USE PROFILE.....	13
2.4 UNACCOUNTED-FOR WATER.....	14
2.5 ESTIMATED AMOUNT OF WATER CONSERVED DUE TO MEASURES/INCENTIVES.....	15
2.6 IMPACT OF PRIOR CONSERVATION EFFORTS REQUIREMENTS	16
3 BASE CASE CONSERVATION INCENTIVES AND MEASURES	17
3.1 BASE CASE CONSERVATION INCENTIVES.....	17
3.2 BASE CASE CONSERVATION MEASURES.....	22
4 COMPREHENSIVE CONSERVATION MEASURES.....	23
4.1 GENERAL CONSERVATION MEASURES.....	23

5 COMPREHENSIVE CONSERVATION INCENTIVES.....	30
5.1 EDUCATIONAL INCENTIVES.....	30
5.2 FINANCIAL INCENTIVES.....	32
5.3 REGULATORY INCENTIVES.....	32
6 WATER CONSERVATION INITIATIVES AND RECOMMENDATIONS.....	35
6.1 INDIAN HILLS GID CONSERVATION MEASURES	35
6.2 FINANCIAL MEASURES	35
6.3 EDUCATIONAL INCENTIVES.....	35
APPENDIX A – CONSERVATION MEASURES	36
APPENDIX B – DOUGLAS COUNTY LANDSCAPE CODE.....	48
APPENDIX C – LANDSCAPE GUIDES	51
APPENDIX D – WATER CONSERVATION WEBSITES.....	57
APPENDIX E – INDIAN HILLS GID WATER ORDINANCE.....	58
APPENDIX F – METER INSTRUCTIONS	61

INTRODUCTION

This water conservation plan has been prepared for the Indian Hills General Improvement District (Indian Hills GID). The purpose of the conservation plan is to continue to encourage a more efficient use of water within the Indian Hills GID service area.

The suburban community of Indian Hills is located in Nevada within northern Douglas County, just south of Carson City. The Indian Hills GID supplies residents of the community with their water, wastewater, and storm water needs in addition to paving, sidewalks, curb, gutter, street lighting. The Indian Hills GID was formed in 1973 to accommodate new developments that were planned in the area at the time. The district is approaching a build-out status within its own service area boundaries; however, outlying areas (based on potential contingency agreements with Douglas County for new developments) may be served in the future by the Indian Hills GID.

Although population growth is not anticipated to unduly burden the water capabilities of the Indian Hills GID water system in the near future, it will result in an increased water demand over time. As the demand for water increases, new facilities will need to be constructed/maintained and new sources of water will need to be developed. Water conservation could be used to defer these activities, resulting in a financial savings.

This plan includes information to help water customers in the Indian Hills GID service area continue to conserve water. The plan can be used as a resource to implement and measure the effectiveness of conservation efforts and can provide a planning guide for future conservation.

The following is included in this conservation plan prepared for the Indian Hills GID:

- Conservation Goals
- Existing and planned conservation measures and incentives
- Indian Hills General Improvement District's water system use profile
- Educational Materials

This plan is compliant with Nevada Revised Statutes (NRS) sections 540.121 through 540.151 and is available for public inspection at the following location:

**Indian Hills General Improvement District
3394 James Lee Park Road
Carson City, Nevada 89705
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Public comments about this plan are encouraged. Written comments may be sent to the address above.

1 CONSERVATION GOALS

This section includes the water conservation goals for the Indian Hills General Improvement District (Indian Hills GID) water system. Some of these goals involve ongoing efforts and others are one-time projects that will improve the abilities of the Indian Hills GID to manage available water. Project related goals will be revised or replaced by new goals as the conservation plan is periodically reviewed.

1.1 REDUCE WATER USAGE

The primary objective of the conservation plan is to help the Indian Hills GID and its customers meet and possibly exceed the conservation goals stated in this section. The primary goal of this plan is to reduce consumption by 10% by the year 2012. Examples of water conservation measures are included in **Appendix A**.

An audit comparing water production with metered amounts will be performed prior to implementing incentives or measures. Additional audits will then be done every year thereafter. Results from the initial audit will be compared with those of subsequent audits in order to determine the effectiveness of measures and/or incentives.

Usage amounts measured will include summer use, average use per connection, and per capita use. If there is a decrease in usage as a result of a particular measure or incentive, that incentive or measure can be expanded, if possible, to maximize efficiency. If it is discovered that a particular measure or incentive is ineffective, it will be discontinued and a new one will then be implemented to take its place.

1.2 LANDSCAPING CODES AND EDUCATION ENCOURAGEMENT

Water usage is much higher in the summer than the winter due to the watering needs of landscaping. For this reason, a landscaping code is a fundamental part of an effective water conservation plan. Landscape codes will regulate new landscapes and the replacement of existing landscapes. The intent of the code is not to limit landscaping options, but to help customers optimize the efficiency of landscape water use.

The Indian Hills GID is located within Douglas County and is regulated by codes and ordinances that are passed county-wide. Douglas County currently regulates landscaping for new construction within *Chapter 20.694 of the Douglas County Code, (February 16, 2006 revision)*. Douglas County Codes and Standards (**Appendix B**) for new construction encourages the use of Xeriscape™ designs with drought tolerant and native plants, does not allow for turf to be placed in areas less than four feet in width or length or with a slope greater than 20 percent, includes details on the percentages and types of groundcover permitted, and states the requirements of sprinkler systems and drip systems. The Douglas County Landscaping Code applies to the new construction of the following land uses: duplex/multifamily, industrial, commercial, institutional, and public uses. Single-family subdivisions (creating parcels of one-half acre or less) are only required to submit the landscaping plans of the street trees only.

While the code is enforceable to these new developments, the code will also continue to include public education in order to encourage the reduction in the size of lawns and to encourage the use of plants that are adapted to arid and semiarid climates for all land uses (including single-family residential). **Appendix C** gives a list of compatible shrubs,

trees, and plant for Douglas County. Educational information for both residences and businesses can be in the form of mailers, guides, and websites.

The Indian Hills GID currently encourages its customers to participate in *“The Annual Yard Improvements Contest”*. The District established this contest to recognize residents who have improved their yards, to increase water conservation awareness within the community, to promote the use of native plants and Xeriscape™ techniques, and to educate the community in understanding the watering needs of each of the individual plants within the landscaping as a whole. Participants are judged on utilizing good water conservation efforts in the planning of an attractive landscape and are rewarded by incentives provided by local contributing sponsors. This program will be analyzed for effectiveness and expanded upon if found effective or revamped/discontinued if not found effective. The Indian Hills GID will continue to encourage the reduction of lawn sizes within its service area through education, incentives, a voluntary watering schedule of even/odd addresses to water on certain days, etc.

1.3 INCREASE THE USE OF WASTEWATER EFFLUENT

This plan will encourage good management practices for the reuse of effluent by those holding authority for its use. Note that the Indian Hills GID currently has primary storage rights to effluent water from the Indian Hills Wastewater Treatment facility. The Indian Hills GID currently uses effluent water from the Indian Hills Wastewater Treatment facility for irrigation reuse to the adjacent lands owned by the Sunridge Golf Course. The current design capacity of the wastewater treatment plant is 0.6 MGD (million gallons per day). Current average plant influent is approximately 0.385 MGD into the Indian Hills Wastewater Treatment facility. Agreements are in place with the Sunridge Corporation for the disposal of 0.6 MGD, or full plant treatment capacity, to the Sunridge Golf Course. As the service area grows, the effluent is anticipated to increase as well. Under the agreement, the Sunridge Golf Course will continue to receive the effluent water from the Indian Hills Wastewater Treatment facility.

1.4 IDENTIFY AND REDUCE WATER LOSS

The District will strive to reduce the amount of water extracted from the various sources vs. the water actually delivered (billed) to customers through a system of identifying and reducing leaks in the water distribution system, instituting a meter maintenance/replacement program, connecting un-metered and multiple users, monitoring water usages that are not billed for, and servicing the system valves and connections.

1.5 INCREASE COMMUNITY PARTICIPATION IN CONSERVATION

A key objective of this plan is to increase public awareness of the limited supply of water in Nevada and the need to conserve water. A successful educational program provides information to the public that helps and motivates water users in their efforts to conserve. The Indian Hills GID will continue to provide its customers with educational materials and resources including home & landscape guides, mailers, and links to conservation websites. Regardless of the type of educational resources that are used, the most important consideration is their content and if the information is disseminated successfully. **Appendix D** contains a list of websites that contain water conservation information that can be a useful resource for obtaining conservation education material.

1.6 MAINTAINING AN ADEQUATE SUPPLY OF WATER

The Indian Hills GID will maintain an adequate supply of potable water. This includes the implementation of a detailed contingency plan for drought conditions. Currently, the Indian Hills GID acknowledges water shortage conditions within its *Water Use Restriction Ordinance No .001 (adopted June 9, 1999)*. The ordinance states that *“upon declaration by the Chairman of the Board, after a majority vote of the Board...the Board may impose any of the following restrictions...Require that irrigation be conducted only as may be permitted by the decision of the Board at the time of the Declaration of Shortage. Prohibit the use of water other than household purposes (Appendix E).”* The current plan acknowledges the extreme drought condition, but does not include provisions for staged water shortage conditions, which can help to conserve water before an extreme drought condition happens. Indian Hills GID will implement a contingency plan with staged water shortage restrictions.

The primary goal of water conservation is to insure that there is sufficient water for essential public health and safety needs at all times. The climate in Northern Nevada is arid and subject to periodic droughts that can vary in duration. It is important, therefore, to have a reserve on hand for such events. Conserving water during times of plenty will insure that such reserves are available for drought and emergency conditions. With recent water shortages becoming evident in other locations around the United States, maintaining an adequate supply of water is becoming a more and more vital component of providing the water that a community needs.

1.7 THE CREATION OF WATER WATCHER PROCEDURES

The Indian Hills GID does not currently have personnel or procedures in place to monitor water waste full time; however, there is value in training existing personnel in conservation management practices and techniques so that waste can be prevented and conservation related ordinances can be enforced. Without this training the conservation and drought sections of the water ordinance will be ineffective. Indian Hills GID will train existing personnel in these conservation management practices and techniques.

1.8 IMPLEMENT A TIERED RATE STRUCTURE

The Indian Hills GID currently charges its users based on a uniform rate schedule. The current water rates include a monthly flat administration fee of \$6.95 and an additional \$1.95 per 1,000 gallons of water used. All customers are charged the same water rate regardless of meter size or customer classification (residential, commercial, etc). Although the current rate structure encourages conservation by charging a consumer based on the actual amount of water used; it does not include provisions for the specific residential and commercial uses. It also does not include rates based on multiple increasing tiers, to encourage conservation as well as generate sufficient revenue for the District's operational requirements. Multiple increasing tiers encourage the conservation of water by increasing the cost to use higher volumes of water.

According to the US Census Bureau, the Indian Hills community (in 1999) had a median household income equal to \$56,109. Water utility rates that are generally considered affordable; yet high enough to encourage conservation, are 1.0% to 1.5% of the median household income. The range in acceptable charges based on this median household income is from \$46.76 to \$70.14 per month (\$561.09 to \$841.64 yearly). The majority of

the Indian Hills GID customers use an average of 5,000 gallons per month in the winter months and 15,000 gallons per month during the summer months which correlates to a monthly bill of \$16.70 to \$36.20 (during the winter and summer months, respectively). The current rate structure provides for average consumer costs that are well below the lower 1.0% of the median household income. To encourage conservation, the Indian Hills GID will consider the implementation of a tiered rate structure to help encourage its users to become more conscious of the water in which they are using. Farr West Engineering conducted a *Water and Sewer Rate Study (June of 2007)* which analyzed the Indian Hills GID's budgetary needs for both of the systems. The study goes into detail on the Indian Hill GID's financial benefits to implementing different rate options for the water system. Included is a cost comparison for an inclining block rate structure with an increase in the base rate. Indian Hills GID will consider implementing a rate structure that increases its financial stability as well as helps to promote conservation.

1.9 CONSERVATION PLAN IMPLEMENTATION SCHEDULE

The conservation measures and incentives in this plan will be implemented according to the schedule shown in Table 1.1 (see section 6 for detailed descriptions of incentives and measures included in the schedule).

Table 1.1

Plan Implementation Schedule

	2008	2009	2010
Incentives			
Annual Production Audit	Implement	Ongoing	Ongoing
Landscape Ordinance	Draft	Implement	Ongoing
Conservation Education	Ongoing	Ongoing	Ongoing
Create Water Watching Procedures	Draft	Implement	Ongoing
Implement Tiered Rate Structure	Implement	Ongoing	Ongoing
Implement Voluntary Watering Schedule	Draft	Implement	Ongoing
Measures			
System Leak Detection/Repair		Implement	Ongoing
Meter Maintenance/Repair Program	Implement	Ongoing	Ongoing

The annual production audit will help determine if the schedule needs to be adjusted to accommodate the implementation of new measures or incentives or the discontinuation of old ones.

2 WATER USE PROFILE AND FORECAST

This chapter provides a description of the Indian Hills General Improvement District water system. Section 2.1 identifies the distribution system and supply sources and Section 2.2 identifies water rights. Sections 2.3, 2.4, 2.5, and 2.6 discuss the water use profiles, unaccounted for water, estimations for the amount of water conserved, and impacts of previous water conservation efforts and regulatory requirements, respectively.

2.1 EXISTING DISTRIBUTION, SUPPLY SOURCES, AND STORAGE

The Indian Hills General Improvement District (Indian Hills GID) was formed in June 1973 as a result of an agreement between Douglas County and the developers of two proposed mobile home subdivisions. Upon condition of development approval, Douglas County required the creation of the Indian Hills GID (creating a regional water and sewer system for the newly developed area). The Indian Hills GID consists of approximately 540 acres and is located in north Douglas County bordering Carson City and serving the suburban community of Indian Hills. The district is approaching a build-out status and will not likely be expanding to serve new developments. However, contingent upon agreements with Douglas County, areas outside of the Indian Hills GID's current boundaries may need to serve system expansions for new developments within Douglas County.

Existing Distribution System

A distribution system, of approximately 22 miles in length, consisting of various diameters of ACP and PVC piping, lie within the Indian Hills GID service area. Most of the distribution system is fairly new PVC piping and in good condition, however there are some old ACP lines (dating back to the early 1970's) which may need to be replaced soon. There is no indication of excessive leaks from the existing pipes; however the ACP pipe is old and has exceeded its useful life.

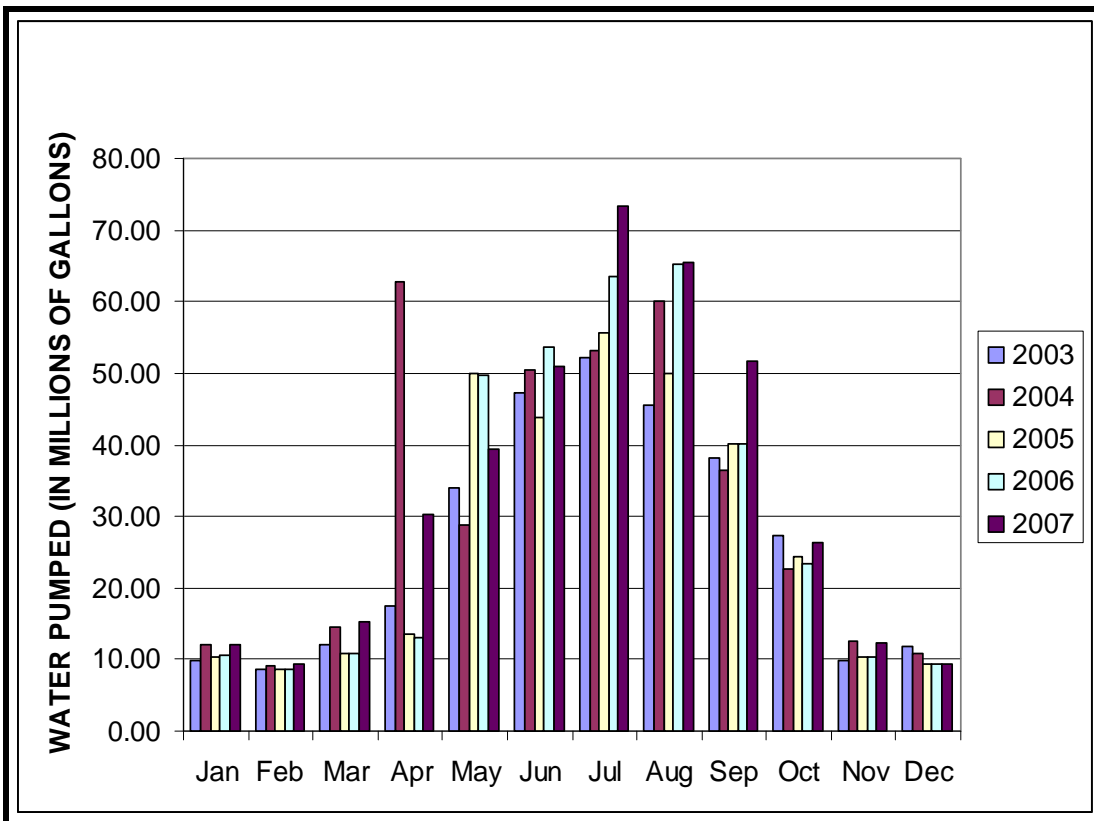
Existing Supply Sources

Indian Hills GID obtains its municipal water supply from several groundwater wells located throughout the Indian Hills GID service area (Browns Well, Hobo Well, Impala #1 Well, Opalite Well, Ridgeview Well #5, School Well #1, and School Well #2). The wells have a rating in gallons per minute (gpm) of 1,400 gpm, 400gpm, 75 gpm, 25 gpm, 100 gpm, 100gpm, and 100gpm, respectively. Although the Browns Well is sufficient to handle existing and estimated future populations, if it were to fail during peak seasons, the other wells could not sustain the demand and as such the Indian Hills GID is currently looking for a new viable well site. There is no indication that the wells are not in good condition. There are five additional inactive wells which need to be properly decommissioned (Ballpark Well, East 395 Well, Impala #2 Well, Old Canyon Well, New Canyon Well). The Ridgeview #4 Well is inactive, but not to be decommissioned. It cannot be used for municipal service because of the high nitrate level resulting from local septic system discharge. The Indian Hills GID has installed a 4-inch line from the well site to the James Lee Park facility, and the well will be equipped for irrigation of park landscaping and fields to eliminate the use of treated water park use and assist with peak flow demands.

There are no other sources currently being used for municipal purposes. Figure 2.1 shows the historical combined monthly water production for the years between 2003 through 2007 for the Indian Hills GID wells. The peak monthly demand is in July, with an average over the five years of approximately 55 million gallons of water pumped from the combined well locations. During the winter months, the average amount of water pumped is approximately 10 million gallons per month, indicating that (on average) the summer usage for irrigation is five times the amount of the domestic usage during the winter.

FIGURE 2.1

Combined Historical Production for Indian Hills GID Wells



Existing Storage

The Indian Hills GID has six water storage tanks (Green Tank, Ridgeview Tank, School Tank, Vista Tank, Hobo Water Treatment #1, and Hobo Water Treatment #2). The six storage tanks provide a capacity of 420,000 gallons, 420,000 gallons, 600,000 gallons, 100,000 gallons, 200,000 gallons, and 200,000 gallons respectively, for a total capacity of 1.94 million gallons. All tanks are due for inspection and routine maintenance (some painting needed). The Vista Tank needs rehabilitation or abandonment.

The Hobo Water Treatment Facility is equipped with emergency power, so the two storage tanks located there store water that is available for distribution to the system. In addition to these storage tanks, the School Tank is cross-connected to Douglas County's existing 2,000,000 gallon storage tank that is located at the School Tank site. The cross-connection is equipped with a control valve to allow the automatic flow to the IHGID system from the Douglas County tank in the event of a low School Tank storage level.

2.2 WATER RIGHTS

Indian Hills GID holds title to several underground water rights in the Carson Valley Basin, with a total combined duty not to exceed 642.07 million gallons annually or 1,970.44 acre-feet annually. Table 2.1 shows the permitted and certificated ground water rights assigned to each well within the Indian Hills GID service area. As indicated in the table, the majority of the duty originates in the Browns Well. The permits listed in Table 2.1 are owned by the Indian Hills GID with the exception of Permits 52288 and 52289 which are owned by the Douglas County School District and Permit 76309T which is owned by the Sunridge Corporation.

All water rights from the School Well permits listed in Table 2.1 can be used only at the Douglas County school facility, excepting the fire protection rights that can be used throughout the District on an emergency basis. School Well Permits 42793 and 42794 allow the Indian Hills GID water use for fire protection only, no consumptive uses are allowed on either of these permits.

The New Well Permit 71765 has been issued to the Indian Hills GID in the amount of 4.64 cfs, not to exceed 1,680.2 acre-feet annually to supplement the Brown's Well water rights. This permit Point of Diversion is at the site of an exploratory well drilled in 2007, located on IHGID property approximately ¼ mile northwest of the Brown's well, and is to be developed as a standby source for the District's service.

The Indian Hills GID is required under agreement to provide water from the Brown's Well to maintain the storage level in the adjacent ski lake facility. Ski Lake Facility Permits 62508, 62509, 62510, 62872, and 62873 are owned by the Indian Hills GID and allow for the diversion of a total of 68.34 acre-feet per year to the ski lake facility. Permits 62872 and 62873 are non-consumptive uses.

The Golf Course Site Well is owned and operated by the Sunridge Corporation for golf course irrigation. Under an agreement between the parties, a total of 100 acre-feet per year are pumped from the Golf Course Well as authorized under unused Indian Hills GID water rights from the Brown's Well.

TABLE 2.1

Summary of Ground Water Rights

Source	Permit Numbers	Status	Max Annual Use (AFA)	Max Annual Use (MGA)
SOUTH SCHOOL	42548 ^a	C.13262	20.68	6.739
	42793 ^a	C.13264	0.00 (fire protection)	0.00
	52288 ^a	PERMIT	78.44	25.56
NORTH SCHOOL	42549 ^a	C.13263	22.37	7.29
	42794 ^a	C.13265	0.00 (fire protection)	0.00
	52289 ^a	PERMIT	78.44	25.56
Not To Exceed^a			100.8 AFA	32.85 MGA
EAST 395	43685 ^d	PERMIT	60.9	19.85
OPALITE	42799 ^d	PERMIT	64.45	21.0
	42800 ^d	PERMIT	64.45	21.0
HOBO	42795 ^d	PERMIT	672.09	219.0
IMPALA I	42791 ^d	C.14879	40.41	13.168
IMPALA II	52093 ^d	C.14882	40.41	13.168
OLD CANYON	42792 ^d	PERMIT	47.02	15.32
NEW CANYON	44626 ^d	PERMIT	121.2	39.5
BROWN	58131 ^d	PERMIT	695.00	226.47
	58528 ^d	PERMIT	165.60	54.0
	58530 ^d	PERMIT	398.20	129.75
	67951 ^d	PERMIT	602.7	196.4
	68890 ^d	PERMIT	672.09	219.0
SEWER TREAT SITE	61366 ^d	PERMIT	5.60	1.82
GOLF COURSE SITE	73609T ^d	PERMIT	100.0	32.5
NEW WELL PERMIT	71765	PERMIT	547.5	178.4
Not To Exceed^b			1,680.2 AFA	547.5 MGA
RIDGEVIEW #4	48632 ^c	C.11859	31.61	10.3
	60772 ^c	C.14901	42.23	13.57
	71495 ^d	PERMIT	28.96	9.44
RIDGEVIEW #5	27180 ^c	C.14877	56.99	18.57
	71496 ^d	PERMIT	60.00	19.55
Not To Exceed^c			121.1 AFA	39.45 MGA
SKI LAKE FACILITY	62508 ^d	PERMIT	34.74	11.32
	62509 ^d	PERMIT	34.74	11.32
	62510 ^d	PERMIT	33.60	10.95
	62872 ^d	C.15813	0.0 (non-consumptive)	0.0
	62873 ^d	C.15814	0.0 (non-consumptive)	0.0
Not To Exceed^d			68.34 AFA	22.27 MGA
TOTAL NOT TO EXCEED			1,970.44 AFA	642.07 MGA
Notes:				
^a The total combined duty of water under Permits 42548, 42549, 42793, 42794, 52288, and 52289 shall not exceed 32.85 million gallons annually.				
^b The total combined duty of water under Permits 42791, Certificate 14879; 42792, 42795, 42799, 42800, 43685, 44626, 48105, 52093, Certificate 14882; 58131, 58528, 58530, 61366, 67951, 68890, 71495, 71496, 71765, 76309-T shall not exceed 1,680.2 acre-feet annually.				
^c The total combined duty of water under Permits 27180, 48632, and 60772 shall not exceed 39.45 million gallons annually.				
^d The total combined duty of water under Permits 62508, 62509, 62510, 62872, 62873 shall not exceed 68.34 acre-feet annually.				

A review of the records of the State Engineer shows that the Indian Hills GID is the owner of record to primary storage rights (Permits 35891 and 51016) and secondary storage rights (Permit 51016 S01, Certificate 14562) on the effluent from the Indian Hills Wastewater Treatment Plant. The Sunridge Corporation is the owner of record to the secondary storage rights associated to Permit 51016 S03. Table 2.2 is a summary of the primary and secondary surface water rights. Indian Hills GID currently uses these effluent surface water rights for the purpose of golf course irrigation and does not use any surface water for municipal purposes.

TABLE 2.2

Summary of Primary and Secondary Surface Water Rights

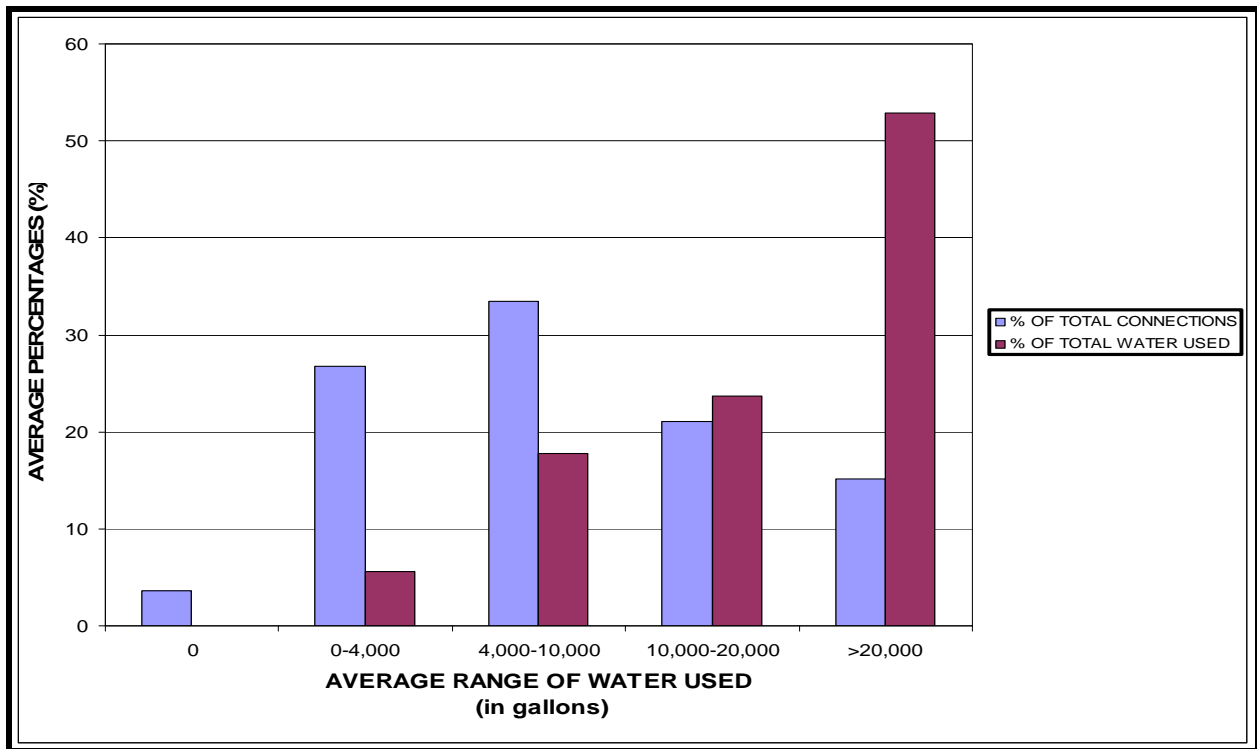
<u>Source</u>	<u>Permit Numbers</u>	<u>Owner</u>	<u>Max Rate of Diversion (CFS)</u>	<u>Max Annual Use (AFA)</u>	<u>Max Annual Use (MGA)</u>
Effluent	35891	Indian Hills GID	2.0	360.0	117.3
Effluent	51016	Indian Hills GID	5.0	3619.8	1,179.5
Effluent	51016 S01 (Certificate 14562)	Indian Hills GID	0.55	17.75	5.8
Effluent	51016 S03	Sunridge Corporation	0.77	560	182.48

2.3 WATER USE PROFILE

The monthly records for billable water usage (based on connection size) were not available; however, the number of connections using a range of water was available for each month during the year 2007. Figure 2.2 shows five ranges of water usage, the percentage of billable water for each range as compared to the total billed usage, and the percentage of connections for each range as compared to the total number of connections. The percentages were calculated based on the total monthly average of the entire year. As indicated in the Figure 2.2, 15% of the total connections use 53% of the billable water annually. The figure also indicates that 27% and 33% of the connections are withdrawing an average of 0-4,000 and 4,000-10,000 gallons of water, respectively. This means that 60% of the Indian Hills GID connections are withdrawing an average of 10,000 gallons of water per month or less and they are also using less than 24% of the total water that is being billed.

FIGURE 2.2

Connection Type Use Percentages for 2007



2.4 UNACCOUNTED-FOR WATER

The amount of unaccounted-for water was determined by comparing the total water production from the Browns Well, Hobo Well, Impala Well, Opalite Well, Ridgeview Well #5, School Well #1, and School Well #2 with customer billing records and other metered uses that are not billed for in the year 2007. The customer billing records and the metered flows were provided to Farr West directly from the Indian Hills GID.

The total amount of water that was pumped in 2007 from all of the Indian Hills GID's wells was 396.3 million gallons. The total billed water usage in 2007 was 300.2 million gallons in 2007. The total metered unbilled uses that are not directly billed for was 94.6 million gallons in 2007. The total amount of water usage that was metered in 2007 was 394.8 million gallons. The total percentage of unaccounted-for water in 2007 was .48%. Refer to Table 2.3 regarding the percent of unaccounted-for water.

Water that is pumped from the Brown's Well and the Golf Course Well that are not billed for include flows going to the Ski Lake facility and the Sunridge Golf Course. Production from the Brown's Well that went to the Ski Lake facility was 32.3 million gallons in 2007. Water from the Hobo Well that went to irrigation of the Sunridge Golf Course rather than the municipal water system was metered at 10.7 million gallons in 2007. The Hobo Well has high fluoride levels, and must be blended for municipal use. The balance of the well production is pumped to the Sunridge Golf Course for irrigation when wastewater plant

effluent production is insufficient to maintain the golf course. The golf course well is owned and operated by the Sunridge Corporation. Water does not meet drinking water quality standards. Water rights for this well have been transferred from the IHGID Brown's well and will be discontinued at such future time as the Hobo Wastewater Treatment facility's production meets the golf course's irrigation demands. The golf course well production in 2007 was 48.6 million gallons (149.1 acre-feet). Only 100 acre-feet of water was authorized under the Indian Hills GID permit; however, water pumped in excess of the permitted 100 acre-feet was either unauthorized, or covered by permits held by the Sunridge Corporation. Indian Hills GID has no control over operation of the golf course well.

TABLE 2.3

Indian Hills GID Unaccounted-for Water

Year	Total Production (MGA)	Total Billed (MGA)	Total Unbilled Metered (MGA)	Unaccounted-for Water (MGA)	% Unaccounted-for
2007	396.3	300.2	94.6	1.5	.48

Causes for water being unaccounted-for are numerous. Leaking mains, dead meters, under-registering meters, record keeping practices, un-metered uses, and multiple users on meters all contribute to the problem. Based on data provided directly from the District, an unaccounted-for water loss of .48% indicates that the water system is operating efficiently.

Currently, the District does not have a distribution leak detection program. Leaks in the system are detected through meter readings and customer reports. On average, an efficient system would have 10% or less of unaccounted-for water. The amount of unaccounted-for water for the Indian Hills GID in 2007 was 1.5 million gallons.

2.5 ESTIMATED AMOUNT OF WATER CONSERVED DUE TO MEASURES/INCENTIVES

Table 2.4 shows U.S. Environmental Protection Agency's range of residential use per person per day based water use.

TABLE 2.4

Range of Residential Water Use in Gallons per Day (EPA Estimates)

Use	Per Person (Low)	Per Person (High)
Toilets	6.4	48.00
Showers	7.50	75.00
Baths	6.00	10.00
Washing Machine	9.00	25.00
Dish Washer	1.00	4.50
Kitchen Faucet	1.00	15.00
Bathroom Faucet	1.00	9.00
Landscape	12.2	182.2
Total	44.1	368.7

Currently the average per person use in the Indian Hills GID service area is approximately 165 gpcpd which is lower than the State average of 200 gpcpd. The per person usage range shown in Table 2.4 provides conservation benchmarks for residential water use between 44.1 gpcpd and 368.7 gpcpd.

Indian Hills GID already has in place an extensive education program that includes water conservation links on their website, mailing out flyers in the monthly bill (especially during the summer months) that reminds customers when to water, an annual yard competition sponsored by local companies, etc. These current measures have all helped to contribute to the Indian Hills GID reduction of water waste within its District. The Indian Hills GID water usage of 165 gpcpd is lower than the State average; however, conservation can still be obtained through an increase in the residential customers becoming further educated and continually reminded on the value of conserving water. Table 2.5 shows a range of potential water savings based on different customer participation levels (assuming a population of 5,000 within the Indian Hills GID service area). The amounts in Table 2.5 show the potential savings due to conservation education and the amounts of water the District already has saved below the State average. A range is provided for an additional savings of 10 gpcpd (reduction to 155 gpcpd) because it is difficult to determine the additional level of individual participation in conservation educational conservation programs.

TABLE 2.5

Range of Conserved Water From Residential Conservation

% of Users Consuming 155 gallons/day	New gpcpd Average	Amount Conserved Annually (MG)
0	165	0
25	163	3.7
50	160	9.1
75	158	12.8
AMOUNT OF WATER ALREADY SAVED THROUGH CONSERVATION EFFORTS		
200 gpcpd	165 gpcpd	63.9 MGA

2.6 IMPACT OF PRIOR CONSERVATION EFFORTS REQUIREMENTS

There has been no recorded impact from prior conservation efforts. Implementation of the plan and several years of data collection to evaluate its effectiveness will be required; however the Indian Hills GID is currently under the State average of 200 gpcpd by 26 gpcpd and Table 2.5, previous, shows the average amount of savings per year from the State’s average is 45.1 million gallons.

3 BASE CASE CONSERVATION INCENTIVES AND MEASURES

3.1 BASE CASE CONSERVATION INCENTIVES

A conservation incentive by definition is something that raises awareness about saving water. There are three classes of conservation incentives: (1) educational, (2) financial, and (3) regulatory. The following conservation incentives are included here for reference. The incentive classification for each of these is in parentheses.

3.1.1 Water Shortage and Waste of Water Ordinance (Regulatory)

The Indian Hills GID and/or Douglas County are responsible for enacting ordinances. The intent of water ordinances is to limit water use during water shortages and drought conditions, or to restrict use if it is found that water is being wasted. Ordinances define “water shortage” and “waste of water” and include sections on enforcement through the use of citations, fines, and discontinuation of service. Currently, the Indian Hills GID has an ordinance in place (Ordinance #001 “Water Use Restrictions” adopted June 9, 1999) that outlines the water restrictions, citations, fines, etc. for the Indian Hills GID consumers. The current ordinance in place does not include a description for the different levels of “water shortages”. A revised ordinance will be considered by the Indian Hills GID defining the different levels of a drought and detailing the restrictions for each.

3.1.2 Watering Schedule (Regulatory)

The Indian Hills GID does not currently include a watering schedule for residences and businesses relating to days of the week to water. Voluntary watering schedules of odd addresses (Tuesday, Thursday, and Sunday) and even addresses (Monday, Wednesday, and Saturday), etc will be considered for implementation and sent out as reminders in monthly bills during the summer months.

3.1.3 Landscape Use Education (Educational)

Educational information for both residences and businesses can be in the form of mailers, guides, and websites. This conservation plan is also a resource that can be employed. **Appendix C** gives a list of compatible shrubs, trees, and plants for Douglas County.

3.1.4 Conservation Literature (Educational)

The District will consider utilizing education tools and resources for the water system users through the use of:

- Home and Landscape Guides/Mailers/Websites
- Lawn Watering Schedules
- Plumbing Fixture Retrofit Kits provided by the utility
- Video Instruction
- Water Watcher Personnel/Water Hotlines
- Home Water Audits
- The Water Conservation Plan

3.1.5 Water Conservation Plan (Educational)

The information in this water conservation plan can be used for educational purposes. It must be available for inspection by members of the public during office hours at the offices of the supplier of water. Public comment can be submitted through written views and recommendations to the plan can be sent to the Indian Hills GID at the address located at the beginning of this plan.

3.1.6 Water Rates (Financial)

Water rates, as a conservation incentive, work to increase awareness about the value of reducing water use and can motivate water users to implement water conservation measures.

The Indian Hills GID currently charges its users based on a uniform rate schedule. The current water rates include a monthly flat administration fee of \$6.95 and an additional \$1.95 per 1,000 gallons of water used. All customers are charged the same water rate regardless of meter size or customer classification (residential, commercial, etc). The most recent water usage rates, as of January 2008, are shown in Table 3.1.

TABLE 3.1

Indian Hills GID Water Rates (as of October 2007)

Base Rate \$ Charge	\$ Charge Per 1000 Gallons
\$ 6.39/base	\$ 1.95/1,000 gallons

Although the current rate structure does not include multiple tiers, the rates have been designed to charge users for the amount of water they actually use and to encourage conservation. The current rates, however, do not generate sufficient revenues for the operational requirements of the Indian Hills GID. Water utility rates that are generally considered affordable; yet high enough to encourage conservation, is 1.0% to 1.5% of the median household income. In 1999 the median household income in the Indian Hills area was \$56,109. The current rates are between 0.3% and 0.6% of the median household income (which is well below the 1.0% to 1.5% range).

Introducing and implementing an inclining block rate structure to a water system is an additional way the Indian Hills GID can encourage conservation. The purpose of an inclining block schedule is to encourage the reduction in water that each individual consumer uses by charging for the actual amount used, thereby rewarding those who do not use as much water. Water rates would increase based on the actual consumption. An example of an inclining block rate schedule is shown in Table 3.2. An inclining block rate schedule can be implemented for the Indian Hills GID's customers because the water connections are currently on meters.

TABLE 3.2**Example Inclining Water Rate Structure/Schedule**

Billing Tier	Base Rate	Rate for Each 1000 Gallons Used	Gallons of usage included in each billing tier
Base Rate	\$27.50	-	0-10,000
Tier 2	-	\$3.25	10,001-20,000
Tier 3	-	\$3.60	20,001-30,000
Tier 4	-	\$4.00	30,001-40,000
Tier 5	-	\$4.00	40,001-50,000

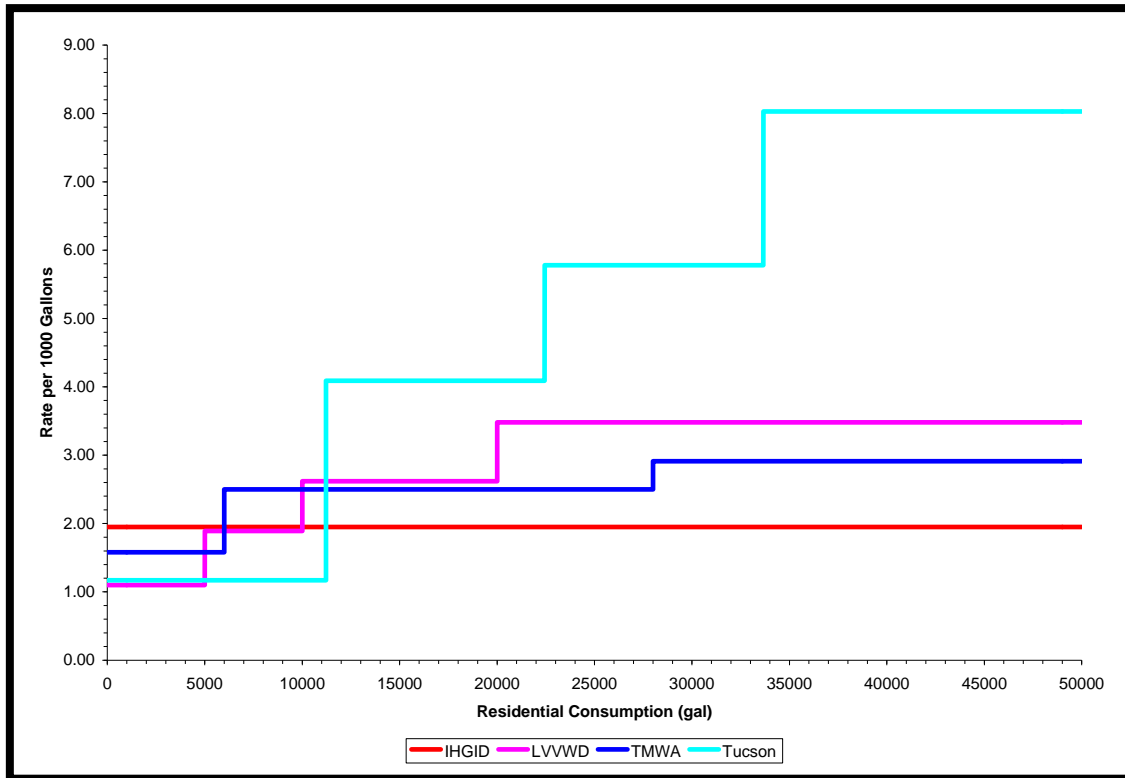
Farr West Engineering recently completed a *“Water and Sewer Rate Study”* (dated June 2007) for the Indian Hills GID which analyzed the existing and projected expenses and revenues for both the Indian Hills GID’s water and wastewater systems. This study found that the Indian Hills GID would need to complete some restructuring of fees in order to be able to keep up with growing expenses. New service rates for the water system were presented to the public by the Indian Hills GID Board in the July 2007 Board meeting; however, due to public comments the water rate increase has not yet been adopted. It is important that rates do not become excessive, causing a loss of revenue needed for operational costs. The Indian Hills GID will consider implementing a rate structure that increases its financial stability as well as helps to promote conservation.

Marginal Rate Comparison

Water companies that have an inclining block as its rate structure have “tiers” for each level of water usage and the rate increases (per 1,000 gallons) as a consumer enters into the next tier. The marginal rate is the rate that a consumer is charged per 1,000 gallons of water within each tier. Figure 3.1 shows the marginal price comparison curves for Las Vegas Valley Water District (LVVWD), Truckee Meadows Water Authority (TMWA), Tucson Water (Tucson), and the Indian Hills GID. The curves are shown together to illustrate the different approaches to rate-related conservation. Note that the Tucson curve starts lower than the others but increases substantially in the second tier and remains higher than the others from that point forward. Also note that the rate structure for the Indian Hills GID is a straight line at \$1.95 because it is not currently on an inclining block structure. As more water is used the cost to use water (per 1,000 gallons) remains the same for Indian Hills GID customers. In the future, the Indian Hills GID will consider a marginal rate structure that promotes water conservation.

Figure 3.1

Marginal Rate Comparison



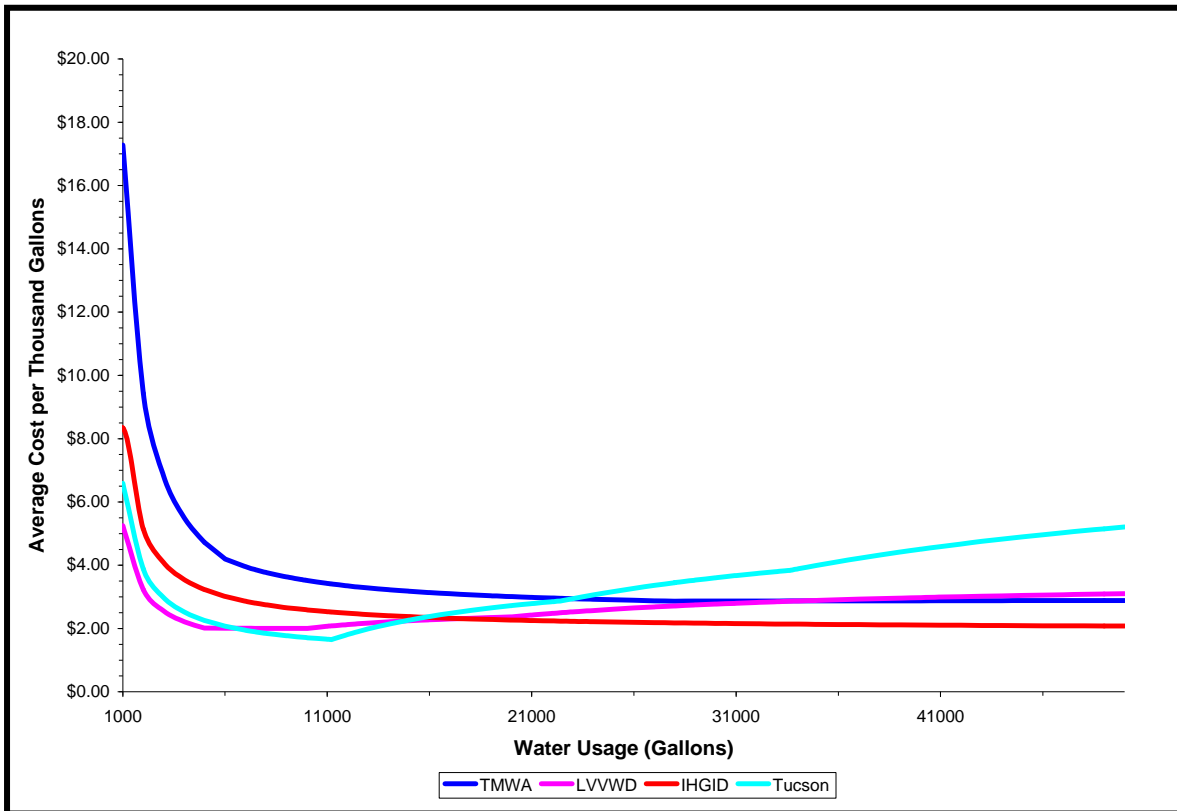
Average Rate Comparison

For the Indian Hills GID water system the marginal cost per 1,000 gallons of water remains constant at \$1.95 because it is not on an inclining block structure. For the three other systems the marginal rates in Figure 3.1 show the price of water increasing with use. Although an increasing marginal cost for water usage promotes conservation, it is the average price per unit that actually has the greatest impact on conservation.

Figure 3.2 shows the average price per thousand gallons for each of the four systems. Tucson's average price per thousand gallons increases sharply at high consumption levels (going from under \$2.00 to over \$5.00 per thousand gallons of water usage when water usage is increased from 10,000 gallons to 40,000 gallons per month). The Indian Hills GID's average price per 1,000 gallons initially starts out higher than both Tucson's and LVVWD's because Indian Hills GID charges a base rate of \$6.39 per month. At higher consumption levels the average price per thousand gallons decreases for the Indian Hills GID customers. This type of rate structure does not promote the conservation of water at the higher consumption levels. Rates used for both figures were taken from the websites of the included systems. In the future, the Indian Hills GID will consider implementing a rate structure with an average rate per thousand gallons that would promote water conservation.

Figure 3.2

Average Rate Comparison



3.1.7 Water Meters (Financial)

Although water meters are a device, they don't actually save any water according to the definition of a conservation measure. Because of this they are considered a conservation incentive.

The District reports that all of the users in the system are on meters; however, there are some metered usages that are not being billed which needs to be accounted for. There are also some multiple users on single meters and the District will consider connecting these users to single meters in order to better evaluate water use and losses.

The source meters for the supply wells have not been tested or calibrated in the past 10 years and it is likely that the meters are under-registering. SCADA control is already installed on the Browns, North School, South School, and Ridgeview #5 wells. The Opalite and Impala wells flow 25 and 75 gpm, respectively. SCADA control on these wells would not be cost effective. Indian Hills GID will consider testing and/or calibrating the supply wells for accurate registering.

3.2 BASE CASE CONSERVATION MEASURES

There are two classifications of conservation measures: (1) Hardware or equipment and (2) behavior or management practices. The following conservation measures being currently used or proposed to be used in the Indian Hills GID conservation program. The measure classification is in parentheses.

3.1.8 Effluent Use (Behavior/Management)

Treated effluent can be used to irrigate landscapes on public property, golf courses, cemeteries, etc. and can also be used for construction purposes and agriculture. The Indian Hills GID currently uses effluent water from the Indian Hills Wastewater Treatment facility for irrigation reuse during the summer for adjacent lands owned by the Sunridge Golf Course. The current design capacity of the wastewater treatment plant is 0.6 MGD (million gallons per day). Current average plant influent is approximately 0.385 MGD into the Indian Hills Wastewater Treatment facility. Agreements are in place with the Sunridge Corporation for the disposal of 0.6 MGD, or full plant treatment capacity, to the Sunridge Golf Course. As the service area grows, the effluent is anticipated to increase as well. Under the agreement, the Sunridge Golf Course will continue to receive the effluent water from the Indian Hills Wastewater Treatment facility.

3.1.9 Leak Detection (Hardware/Equipment)

Indian Hills GID currently detects leaks through unusual meter readings and customer reports. Whenever a meter shows unusually high use Indian Hills GID personnel are sent to investigate. If a leak is discovered the customer is notified. Presently Indian Hills GID does not have a distribution level leak detection program in place. **Appendix F** has residential meter reading and leak detection instructions.

4 COMPREHENSIVE CONSERVATION MEASURES

The following are comprehensive conservation measures that can be employed by the District to supplement the base case measure itemized in section 3. As stated in section 3, conservation measures are divided into two types: (1) Hardware/Equipment measures and (2) Behavioral/Managerial measures. Conservation measures can also be classified into five categories of application: (1) Residences, (2) Landscape, (3) Industrial, Commercial, and Institutional (ICI) (4) Agricultural, and (5) Water Utilities. In addition to measures in this section, **Appendix A** includes specific conservation measures for residential, commercial/industrial, and institutional water users. The following conservation measures are included here for reference and are classified first by application and then by type.

4.1 GENERAL CONSERVATION MEASURES

4.1.1 Plumbing Standards

The most recent federal plumbing standards (table 4.1) are included here since these standards are applicable to the DCU service area. It is valuable to include California's standards for reference since in most cases California's requirements are more stringent. The comparison infers that there are plumbing fixtures available that exceed federal efficiency requirements and offer consumers alternatives that further improve conservation efforts.

TABLE 4.1

Federal and California Plumbing Standards

Device	FEDERAL ENERGY POLICY ACT (FEPA)		CALIFORNIA	
	Manufacture	Effective Date	Sale and Installation	Effective Date
Shower Heads	2.5 gpm*	1/1/94	2.5 gpm	3/20/92
Lavatory Faucets	2.5 gpm	1/1/94	2.2 gpm	3/20/92
Sink Faucets	2.5 gpm	1/1/94	2.2 gpm	3/20/92
Metering Faucets	*	1/1/94	†	7/1/92
Tub Spout Diverters	Not included in FEPA		0.1 to 0.3‡	3/20/92
Residential Toilets	1.6 gpf	1/1/94	1.6gpf	3/20/92
Flushometer Valves	1.6 gpf§	1/1/97	1.6 gpf	1/1/92
Commercial Toilets	1.6 gpf	1/1/97	1.6 gpf	1/1/94
Urinals	1.0 gpf	1/1/94	1.0 gpf	1/1/92

* Gallons per minute.

** 0.25 gal/cycle (pertains to maximum water delivery per cycle).

† Hot water maximum flow rate range from 0.25 to 0.75 gal/cycle and/or from 0.5 gpm to 2.5 gpm, depending on controls and hot water system.

‡ 0.1 (new), to 0.3 gpm (after 15,000 cycles of diverting).

§ Gallons per flush.

4.1.2 Drought Conservation Measures

All water supplied by Indian Hills GID comes from groundwater sources. Because of this it is difficult to determine the effect of a drought year on the groundwater system and the consequences of a drought may not be detected in the water table until several years after the drought. For this reason it is important that Indian Hills GID monitor precipitation, surface water levels, water table levels, and pumping records over the

long term. An annual review of water supplies will be done to determine the availability of water for the current year and the following year. This analysis will need to be done in the spring before the high use season. In extreme instances, where a well can no longer provide the needed water, Indian Hills GID will consider options such as restricting water usage until the problem can be solved, increasing the depth of the existing wells, developing a new well site, and/or aggressively finding a new water source, etc. In order to determine when it is necessary to impose special drought conservation measures, parameters or limits must be established for groundwater levels and groundwater levels will relate to measures. For instance, if groundwater drops to a certain level, a corresponding stage of drought measures are then required. Indian Hills GID will determine how groundwater levels relate to the different stages of drought. This plan uses a drought assessment system similar to the one used by the Southern Nevada Water Authority (SNWA) that includes the following levels of drought observation:

- Stage1: No Drought
- Stage 2: Drought Watch
- Stage 3: Drought Alert
- Stage 4: Drought Emergency

A staged assessment system gives specific measures associated with each stage of drought that can apply to water customers within the Indian Hills GID. Table 4.2 summarizes an example of staged drought measurements that the Indian Hills GID can implement within its district.

TABLE 4.2

Staged Drought Conservation Measures

Stage	Reduction Goal	Information Measures	Water System Measures
STAGE1: No Drought	10%	Encourage conservation through educational efforts	Institute intensive leak reduction program, Reduce % of unaccounted for water. Increase enforcement.
STAGE2: Drought Watch	15-18%	Use media to communicate drought information, warn of potential for more stringent measures associated with succeeding stages. 1 st stage measures.	Reduce water use for flushing, public fountains, and public facility landscape irrigation. 1 st stage measures.
STAGE 3: Drought Alert	25-30%	Public officials appeal for water use reductions. Explain details of emergency. 1 st and 2 nd stage measures.	Prohibit all public water uses not required for health or safety. 1 st and 2 nd stage measures.
STAGE 4: Drought Emergency	50% or more	1 st , 2 nd , and 3 rd stage measures.	Prohibit all outdoor water use and selected commercial/industrial use. 1 st , 2 nd , and 3 rd stage measures.

Drought conservation measures implemented by customers can save more water than those measures applied by the water system (Table 4.2). For this reason water customers must also be expected to employ special conservation measures during times of drought. Special drought conservation measures for water users have been divided into the following categories:

1. Fountains and Water Features
3. Government Facilities
4. Landscape Irrigation
5. Mist Systems
6. Parks and Community Use Areas
7. Pools
8. Surface, Equipment, and Building Washing
9. Turf Installation
10. Vehicle Washing

4.1.2.1 Fountains and Water Features

Drought measures are summarized in table 4.3.

TABLE 4.3

Drought Measures for Fountains and Features

Stage	Residential	Common Areas	Commercial
Watch	Fountains and features with a surface area of 200 ft ² or less allowed.	Same as residential but feature cannot be incorporated into an entry way of streetscape, as defined by local government and only one fountain or water feature may be operated.	May maintain a re-circulating water pool to sustain pumps, pond liners, surface coatings and ancillary equipment. The feature of fountain may run only between 1 a.m. and 4 a.m. or whenever freezing conditions require system preservation.
Alert	Fountains and features with a surface area of 25 ft ² or less allowed.	Same as Watch	Same as Watch
Emergency	Fountains and features not allowed.	Fountains and features not allowed.	Fountains and features not allowed.

4.1.2.2 Government Facilities

Drought measures are summarized in table 4.4.

TABLE 4.4

Drought Measures for Government Facilities

Stage	Government Facilities
Watch	To be determined by Indian Hills GID after government facility needs have been established.
Alert	
Emergency	

4.1.2.3 Landscape Watering

Drought measures are summarized in table 4.5.

TABLE 4.5

Drought Measures for Landscape Watering

Stage	Winter (Oct – Mar)	Spring, Summer, Fall (Apr – Sept)
Watch	No Watering	2 assigned days per week
Alert	No Watering	2 assigned days per week
Emergency	No Watering	To be determined

4.1.2.4 Mist Systems

Drought measures are summarized in table 4.6.

TABLE 4.6

Drought Measures for Misting Systems

Stage	Residential	Commercial
Watch	Allowed, No restrictions	Use only for human comfort in June, July, and August and only between the hours of noon and 6 p.m.
Alert	Allowed, No restrictions	Use only for human comfort in June, July, and August and only between the hours of noon and 6 p.m.
Emergency	Not allowed	Not allowed

4.1.2.5 Parks and Community Use Areas

Drought measures are summarized in table 4.7.

TABLE 4.7

Drought Measures for Parks and Community Use Areas

Stage	Parks and Community Use Areas
Watch	
Alert	To be determined by Indian Hills GID after parks needs have been established.
Emergency	

4.1.2.6 Swimming Pools

Drought measures are summarized in table 4.8.

TABLE 4.8

Drought Measures for Swimming Pools

Stage	Swimming Pools
Watch	No restrictions. Pools should be drained into the sewer system so the water can be recycled.
Alert	
Emergency	Not to be filled during drought emergency

4.1.2.7 Surface Equipment and Building Washing

Drought measures are summarized in table 4.9.

TABLE 4.9

Drought Measures for Surface Equipment and Building Washing

Stage	Surface Equipment and Building Washing
Watch	Prohibited unless water is discharged into the sanitary sewer through approved methods or contained onsite.
Alert	
Emergency	

4.1.2.8 Vehicle Washing

Drought measures are summarized in table 4.10.

TABLE 4.10

Drought Measures for Vehicle Washing

Stage	Personal Vehicle Washing	Commercial Vehicle Washing
Watch	Once a week per vehicle using a hose with an automatic shut-off nozzle.	Only at a facility where water is discharged into the sanitary sewer through approved methods. Also with high-pressure, low-volume sprayer using less than 10 gallons per vehicle.
Alert		
Emergency	Not allowed	Not allowed

4.1.2.9 Turf Installation

Drought measures are summarized in table 4.11.

TABLE 4.11

Drought Measures for New Turf Installation

Stage	Residential Single and Multi-family	Non-Residential
Watch	Allowed	Allowed within Landscape Code limits.
Alert	Allowed	Allowed within Landscape Code limits.
Emergency	Not allowed	Not allowed

4.1.2.10 General Water User Measures

Drought measures are summarized in table 4.12.

TABLE 4.12

General Drought Measures

Stage	General Water User Measures
Watch	Mandatory restrictions on all outside uses by residential users, except landscape irrigation. Unnecessary outdoor uses by any commercial users prohibited.
Alert	All outdoor water use severely restricted. Serve water in restaurants only upon request.
Emergency	All outdoor water use and selected commercial and industrial use prohibited.

4.1.3 Emergency Conservation Measures

4.1.3.1 Definition

Currently Indian Hills GID has a sufficient storage capacity to meet the needs of its service area. Indian Hills GID will need to monitor system capacity to determine at what point an emergency will be declared. Conditions other than inadequate pump capacity that might require a declaration of emergency include major water line breaks, pump or system failures, or contamination of water supply sources. Regardless of the reason, the goal of emergency measures would be to restrict water usage to allow the water system to recover from the emergency condition. The following sections discuss additional measures that may be implemented during an emergency.

4.1.3.2 Water System Operational Measures

The following are examples of operation measures that could be implemented for a water emergency:

- Continue all actions from watch and alert stages (drought conservation measures), as appropriate.
- All emergency measures will be applied with any additional measures that Indian Hills GID considers to be necessary.
- The problem will be defined as an emergency by Indian Hills GID.
- Water use reduction goals will be established by Indian Hills GID. Single-family residences may be set as a per house allotment or as a percentage from previous years consumption. Commercial, multi-family, and industrial will be asked to reduce use by a percentage of the average of the previous year's consumption.
- Penalties or excess use charges will be established for customers that exceed their allotment.
- Indian Hills GID billing system could be adjusted to implement penalty or use charges.
- Enforcement actions will be increased (see section 6.3.5).
- Inform local law enforcement of the need for assistance.
- Increase aquifer level monitoring actions.

4.1.3.3 Communication Measures

The following are the communication measures that could be implemented for a water emergency:

- Indian Hills GID will increase the frequency of reports to the board. The initial report will include the suggested nature and scope of proposed conservation measures. Subsequent reports should provide details on measure implementation and customer response to those measures.
- Provide status reports to entities with special interests, public agencies including the Douglas County, school districts, fire departments, and law enforcement agencies.

- Through a media campaign and direct mail announce to Indian Hills GID customers the:
 - Scope and nature of the measures.
 - Reasons for imposing the measures.
 - Water use reduction goals.
 - Enforcement mechanisms and fines.
 - Projections for how long the measures will be in place.
 - Penalty or excess use charges.
- Clearly identify any exemptions from the conservation measures.
- Inform customers about possible pressure reductions and any problems this may cause.
- Provide landscape firms with conservation measure information.
- Provide contractors and landscape companies with information on locations to obtain reclaimed water (effluent) for street cleaning, construction projects, irrigation, dust control, etc.
- Post updated status reports on the Indian Hills GID website.
- Post signs where possible that note major conservation measures.
- Continue to enhance communication measures. This includes increasing education and establishing a hotline for emergency updates.
- Keep fire departments informed on the status of the emergency and require that they discontinue the use of water in training exercises until the emergency is over.

4.1.3.4 Emergency Conservation Summary

Advance preparation is necessary for the successful implementation of emergency conservation measures. Public education prior to an emergency is essential. It is also important that communication systems (hotlines, websites, etc.) have been set-up in advance. Enforcement procedures including personnel assignments will also be outlined ahead of time.

5 COMPREHENSIVE CONSERVATION INCENTIVES

The following are comprehensive conservation incentives that can be employed by the District to supplement the base case incentives itemized in section 3. A conservation incentive is something that increases awareness about the value of reducing water use. Incentives can help motivate water users to implement water conservation measures. As stated in section 3, conservation measures are divided into 3 categories: Educational, Financial, and Regulatory. This chapter discusses each of these categories and provides examples of incentives.

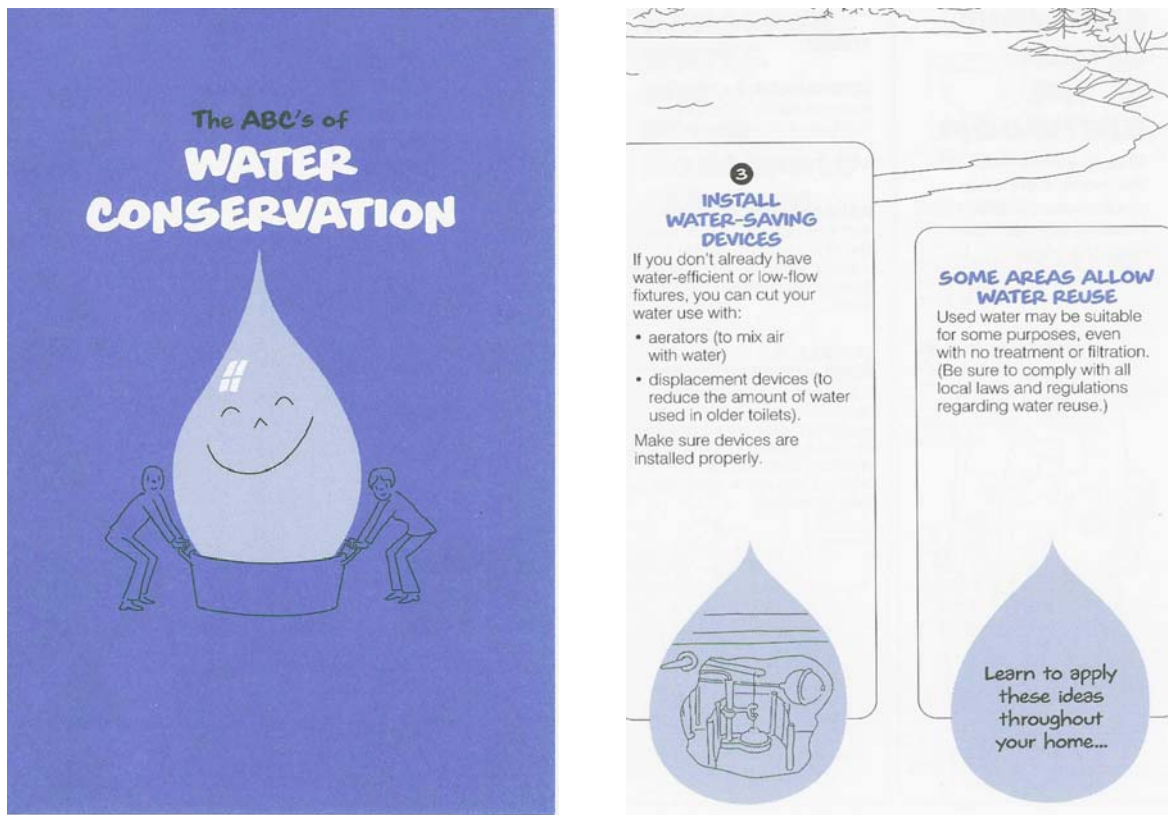
5.1 EDUCATIONAL INCENTIVES

5.1.1 Literature

Examples of conservation literature include water saving guides, direct mailers, or possibly even redesigned bills that include historical use information. The following are examples of conservation literature.

FIGURE 5.1

Pershing County Water Conservation Guide and Sample Page



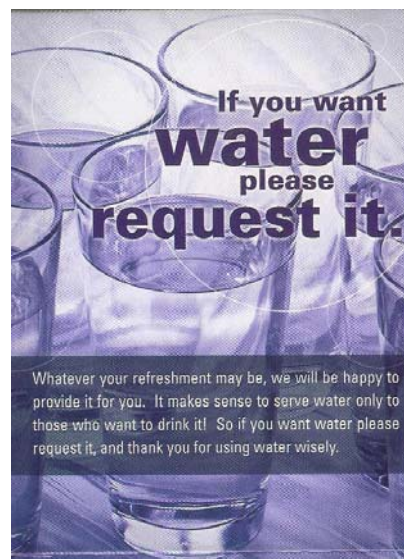
A guide like the one in figure 5.1 can be distributed by Indian Hills GID to new customers when they start their water service and contains suggestions for indoor and outdoor residential water conservation. The guide also provides instructions on basic leak repair and encourages the installation of water saving devices.

Another conservation education resource is landscape guides that contain detailed how-to information. These landscape guides may give advice on landscape design including plant layout, how to properly install an automated irrigation system, and which plants are best suited for the specific region. Lawn care guides that include the utilities summer watering schedule can be helpful. Refrigerator magnets that have the watering schedule are also a possibility. **Appendix C** includes a list of plants that grow well in the Douglas County area.

Table signs can be used in restaurants to inform patrons that if they want water they must request it. These signs can be obtained from the AWWA. Figure 5.2 is an example of such a sign.

FIGURE 5.2

Table Tent for use in restaurants



Internet websites are also a good way to distribute water conservation information and can be less expensive than published materials. **Appendix D** contains a list of websites that contain water conservation information. Many existing websites contain instructional information on the following subjects:

- Xeriscaping
- Irrigation/Lawn Care
- Rebates
- Watering Schedules
- Water Rates
- Water Saving Appliances
- Meter Reading Instructions
- Leak Detection Tips
- Water Conservation Tips
- Water Audit Forms & Waste Report Forms
- Water Use Exemptions
- Water Conservation Plan

Unless otherwise indicated, the educational literature included in this conservation plan is not currently being used by Indian Hills GID and is for reference purposes only. The additional included literature is intended to be a resource for ideas that can be implemented if more conservation incentives become necessary and if the Indian Hills GID budget can support such incentives.

5.1.2 Conservation Workshops

Conservation workshops can be conducted by utilities to promote water conservation. Workshop subject matter can include but is not limited to xeriscaping, irrigation, home water audits, etc. Indian Hills GID currently does not conduct water conservation workshops or training.

A possible approach to workshops may be to train persons in industries that are affected by conservation (landscapers, nurseries, appliance vendors, etc.). They in turn may be encouraged to offer clinics promoting conservation.

5.1.3 School Curriculums

There are a number of school curriculums available on-line from other cities. Utilities can also sponsor special visits to schools where students can be instructed by members of water related industries or government entities. Some of these visits have taken place in Nevada schools where visitors included employees from the Nevada Department of Environmental Protection, the U.S. Forest Service, members of the local Indian Tribes, and the River Wranglers. Indian Hills GID currently does not have a school visiting program in place.

5.2 FINANCIAL INCENTIVES

Financial incentives include rebates, inclining rate schedules, savings and so forth. Indian Hills GID does not have the financial capability to institute a rebate program at this time. However, the current rate schedule does encourage conservation.

5.3 REGULATORY INCENTIVES

Regulatory incentives include but are not limited to conservation policies and ordinances, laws and plumbing codes, and irrigation schedules. It is important to have a means of enforcing regulatory incentives or they will not be as effective. For this reason enforcement information is included in this section.

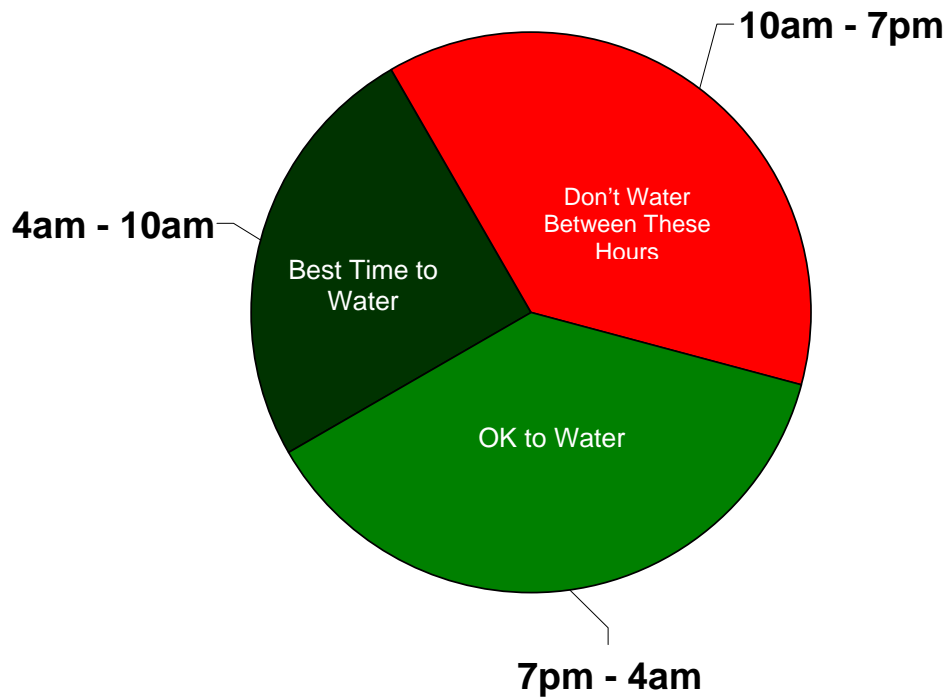
5.3.1 Watering Schedules

Indian Hills GID currently has an ordinance that regulates the wasting of water by customers in its service area. The ordinance includes a mandatory time restriction between the hours of 12pm and 4pm in which irrigation watering is not permitted and regulations making it unlawful to waste water at any time. There is currently not a watering schedule for water customers with even and odd addresses that are promoted within the Indian Hills GID service area. Indian Hills GID will consider implementing a voluntary watering schedule that will include specific days that each will be allowed to water and reminders will be sent in monthly billing and/or included in the Indian Hills GID's newsletter during the summer months.

Another effective watering program that will be implemented if more restrictive watering becomes necessary is the “Water Twice a Week” plan. It allows for watering of lawns on say Sunday and Thursday for odd numbered addresses and Wednesday and Saturday for even numbered addresses. Businesses water on Tuesday and Friday. No one is allowed to water on Monday which becomes a day off for the watering system. Watering is allowed at any time except between 1:00 p.m. and 5:00 p.m. which is the time off highest daytime temperatures. Figure 5.3 shows the ideal watering times.

FIGURE 5.3

Ideal Watering Times in Indian Hills GID Service Area



It is also important that irrigation timers are timed properly to match seasonal temperatures and that watering is not done when it is raining. Additionally, individual irrigation stations should only need to run for about 10 to 15 minutes before puddles form and runoff occurs.

5.3.2 Landscape Standards

Douglas County currently has a Landscape Code for new construction and includes the Indian Hills GID service area. The following summarizes an example of potential code provisions that would help to provide guidelines for both residential and commercial/industrial landscape applications. Landscape Code will include all the critical elements for the installation of a water efficient landscape as follows:

5.3.2.1 Landscape Size

Size of landscapes is defined in the code for all building zones in the Indian Hills GID service area. Landscape sizes vary from 6 to 20 percent depending upon zoning.

5.3.2.2 Landscape Materials

Minimum sizes and quantities of trees and shrubs are defined in the code. Trees not to be planted are identified. A list of trees that thrive in arid climates is also included in **Appendix C** of this plan.

The minimum and maximum areas allowed for turf installation in multi-family and commercial/industrial developments are defined. The turf section also encourages the use of effluent on these properties as it becomes available. The maximum slope of the turf is also limited at 4 to 1. Ground cover types are specified as shrubs, turf, vines, meadow grass, and wild flowers, or any other living ground covers. Minimum amounts of unplanted, non-living materials are identified in the code. These materials include wood chips, bark, decorative rock or other non-living materials.

The code also specifies that soils in planted areas are to be loosened and amended with organic materials. Mulch depths are also defined to reduce evaporation.

5.3.2.3 Landscape Irrigation

Water conserving irrigation is encouraged. The following items are included in the regulations regarding irrigation:

- Use of drip irrigation where appropriate.
- Use of irrigation timers.
- Use of storm water harvesting systems.
- Water conserving sprinkler heads.
- Use of reduced pressure PVB's.
- Depth of water line (to avoid freezing)
- Schedule 40 PVC required.

5.3.3 Water Ordinance

Indian Hills GID currently has a water ordinance that was adopted in June, 1999. It includes descriptions of "water waste" and defines procedures on how to declare a "water emergency". The ordinance does not include "levels" of water shortages and procedures based on these "levels". The current plan acknowledges the extreme drought condition, but does not include provisions for staged water shortage conditions (which can help to conserve water before an extreme drought condition happens) or short term water shortages. Indian Hills GID will implement a contingency plan with staged water shortage restrictions. This contingency plan will consider stages based on water availability and will encourage water conservation.

6 WATER CONSERVATION INITIATIVES AND RECOMMENDATIONS

This section discusses recommended conservation incentives and measures that will be considered for future implementation.

6.1 INDIAN HILLS GID CONSERVATION MEASURES

6.1.1 Conservation Specialist/Supervisor

In order to implement future conservation incentives and measures a member of the Indian Hills GID staff will need to be selected to oversee conservation efforts. This person will be responsible for managing a conservation budget, organizing educational programs, and overseeing Indian Hills GID conservation efforts (leak detection, public awareness, water loss accountability, etc.). This selected staff member will review and update the conservation plan every five years and will evaluate the effectiveness of existing conservation measures and incentives.

6.1.2 Meter Testing Program

The District will implement a meter maintenance/repair program to locate and replace inoperative and under registering meters, particularly meters over 2 inches in size. Due to the limited staff for the Indian Hills GID water system, the program will need to focus on the meters that the District deems to be the most pertinent (older meters, large meters, etc). Currently, most of the residential meters are 10 years old or newer. There are some older meters (not a significant number) on the system that the Indian Hills GID will replace.

The District will also implement a meter maintenance/calibration program for the source well meters. Due to the limited staff, the wells producing the most water for the District will take precedence on this evaluation.

6.2 FINANCIAL MEASURES

6.2.1 Water Conservation Budget

A water conservation budget will be created to allow for the implementation of conservation measures and incentives. The staff member described in section 6.1.1 would be responsible for the use of funds allocated for conservation programs and/or personnel. This budget will need to reflect the financial capabilities of the District and could be used to purchase educational materials or any other programs deemed necessary.

6.3 EDUCATIONAL INCENTIVES

6.3.1 Distribution of Educational Materials

Indian Hills GID will distribute educational materials similar to those discussed in Section 5.1.1 and will continue to include conservation measures in its newsletter.

APPENDIX A – CONSERVATION MEASURES

Conservation measures are divided into two types: (1) Hardware/Equipment and (2) Behavioral/Managerial. Each of these is subdivided into five categories of application: (1) Residential, (2) Landscape, (3) Industrial, Commercial, and Institutional (ICI) (4) Agricultural, and (5) Purveyor. The following conservation measures will be classified first by application and then by type. These measures are suggestions and can only be enforced if included as part of an ordinance.

A.1 RESIDENTIAL CONSERVATION MEASURES

A.1.1 Behavioral Measures

A.1.1.1 Residential Water Audits. Water audits could target high use customers first and then be offered to all customers. The following elements should be part of an effective audit.

- Purpose for the audit.
- Estimation of use for all fixtures and appliances.
- Check for and repair leaks.
- Evaluation of Landscape (See “Landscape Conservation Measures)
- Evaluation of outdoor water use.
- Evaluate efficiency measures.
- Educate customers using available flyers

An audit should take no more than 30 to 45 minutes.

A.1.1.2 Additional Measures. The sample pamphlets in Appendix A include additional behavioral conservation measures.

A.1.2 Hardware/Equipment Measures

The following is a list of devices/practices that will reduce water consumption in the home.

Measure	Description
<i>Bathroom/Kitchen Fixtures</i>	
Low-flow toilets	1.6 gallons per flush
Toilet retrofit devices	Bladders (bags), dams, early close flappers, other hardware and adjustments
Toilet leak repairs	Includes detection (dye tabs) and replacement of worn parts.
Low-volume shower heads	2.5 gallons per minute @ 80 psi
Showerhead retrofit devices	Includes temporary cutoff valves and restrictors.
Low-volume faucets	2.5 gallons per minute @ 80 psi
Faucet retrofit devices	Includes aerators, activation sensors, self closing and metered valves
Faucet maintenance	Includes washer replacement, repacking, tightening, and cleaning aerators
Water pressure reduction	Only needed if house pressure exceeds what’s required
<i>High Efficiency Appliances</i>	
Clothes washers	27 gallons per load
Dish washers	4.5 gallons per load

A.2 LANDSCAPE CONSERVATION MEASURES

A.2.1 Behavioral Measures

A.2.1.1 Landscape Water Audits. Landscape water audits should be conducted on park and golf course irrigation systems and could be considered an option on residential irrigation systems, targeting high-volume users.

- Purpose for the audit.
- Estimation of outdoor use based on meter records.
- Check for and repair leaks.
- Evaluation of Landscape (size, soil, amount of turf, types of plants)
- Evaluation of irrigation system (Timers, Use of drip, Precipitation amounts).
- Efficiency recommendations.
- Educate customers using available flyers

A residential landscape audit should take no more than an hour. Parks and golf courses could take substantially longer.

A.2.1.2 Xeriscape™. Xeriscape is a method of landscaping that employs low-water use plants, turf, ground covers, shrubs and trees. It includes careful planning, soil analysis, and irrigation system design.

A.1.1.3 Additional Measures. The sample pamphlets in Section 5.1 include additional behavioral conservation measures.

A.2.2 Hardware/Equipment Measures

Landscape hardware measures consist of two basic groups: (1) Landscape materials and (2) irrigation equipment.

Measure	Description
<i>Landscape Materials</i>	
Trees, plants, and grass	Should be well suited to climate and altitude and be drought tolerant
Organic mulch	Grass clippings, leaves, wood chips, bark, and pine needles. Organic mulches help to retain soil moisture and keep ground cool around plants.
Inorganic mulch	Boulders, gravel, pavers, decomposed granite, and stepping stones. Inorganic mulches are generally more for decorative purposes but they reduce the amount of trees, plants, and turf thereby conserving water.
Compost	Made of manure or biosolids and wood, straw, grass, and leaves. Helps plants stay healthy and retains moisture in the soil.
<i>Irrigation Equipment</i>	
Valves	Should be sized to meet requirements and checked periodically for leaks
Sprinkler Heads	Should match water volume requirements of area being irrigated.
Sprinkler Nozzles	Should have proper arc of coverage and proper trajectory.
Irrigation Controllers	Should have required number of stations, programs, and starts. Also rain delays and sensor terminals.
Drip irrigation	Insures water is directed to where it's needed.

A.3 INDUSTRIAL, COMMERCIAL, AND INSTITUTIONAL (ICI) CONSERVATION MEASURES

A.3.1 Behavioral and Hardware/Equipment Measures

A.3.1.1 ICI Water Audits. Since ICI water audits can require a substantial amount of time (4 hours or more), it may be necessary to have a private engineering firm hired by the water user conduct the audit. There is incentive for ICI customers to pay for audits since the results of an audit could translate into substantial savings. An ICI water audit should include the following elements:

- Support from ICI owners, managers, and employees
- Survey/Estimation of facility use based on meter records.
- Calculation of water-related costs.
- Evaluation of efficiency measures.
- Evaluation of payback periods for measures.
- Efficiency recommendations and implementation.
- Tracking and reporting system.

A.3.1.2 Manual Washing. Manual washing is cleaning done on surfaces with hoses and cloths.

MANUAL WASHING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Surfaces should be swept or brushed off before using water to clean. 	<ul style="list-style-type: none"> • High pressure low-volume hoses with automatic shut-off nozzles • High-pressure pumps, steam cleaners.

A.3.1.3 Vehicle Washing. Vehicle washing includes manual washing and automated car washes or a combination of both.

VEHICLE WASHING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Limit number of spray nozzles and set flow rates at lowest volume and pressure required. • Adjust nozzles in automated systems so that they take full advantage of gravity and position. Also make sure water shuts off after vehicles have passed. • Increase conveyor speeds or reduce rinse cycle time. • Sweep wash area before using water to clean. • Establish a regular maintenance schedule that includes checking for leaks and making repairs. 	<ul style="list-style-type: none"> • Recycling systems. These would include filters and storage tanks. • High pressure pumping systems.

A.3.1.4 Kitchens and Restaurants. Kitchen and restaurant conservation is divided into four areas of application; 1. Food and drink preparation, 2. Dishwashing, 3. Garbage disposal and scraping trough, and 4. Ice making.

FOOD AND DRINK PREPARATION

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Presoak and wash food service articles in basins instead of running water. • Reduce thawing of food with hot water unless required by law. If required use lower flow. • Avoid running water to melt ice in sinks. • Use full loads in dishwashers and other automated equipment. • Serve water only when requested by customers. 	<ul style="list-style-type: none"> • Low-volume faucets • Hands-free foot pedal valves for faucets • On demand hot water dispensers

DISHWASHING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Presoak utensils, dishes, and pots and pans in basins of water instead of using running water prior to loading dishwashing machines. • Scrape food off of plates rather than use running water. • Operate scraping troughs only while dishes are actually being washed. • Assess the water efficiency of the current dishwashing system to determine where improvements might be made. • Always wash full loads in automated machines. • Operate conveyor type dishwashers only when dishes are actually passing through the machine. • Verify that the dishwashing equipment is using the minimum amount of flow recommended by the manufacturer. • Since many older automated dishwashing systems are neither energy nor water efficient, evaluate the cost of retrofitting or replacing existing equipment. • Turn dishwashers off when not in use. • Routinely check all dishwashing equipment to ensure there are no leaks. • Post signs requesting that personnel minimize their use of utensils, dishes, and pots and pans to save water. 	<ul style="list-style-type: none"> • Manual pre-wash sprayers with “dead man” shut off controls. • Low-flow spray heads on all sprayers. • New water efficient dishwashing equipment. • Electronic eye sensors that shut off conveyer type systems when dishes are not passing through the machine.

GARBAGE DISPOSER AND SCRAPING TROUGH

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Eliminate disposers and troughs. • Use the minimum acceptable flow rate on all machines. • Reuse wastewater in the mixing chamber of the disposer. 	<ul style="list-style-type: none"> • Garbage strainers (instead of disposers) • Sensors that detect the amount of flow in a disposer and regulate flow accordingly. • Solenoid valves that turn water off when the disposer is off. • Flow regulators for disposer supply lines.

ICE MAKERS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Use the minimum flow rate recommended by the manufacturer on water cooled icemakers. • Adjust machines to produce ice only when it's needed. <p>Collect spent cooling water and reuse it for non-potable purposes.</p>	<ul style="list-style-type: none"> • Air-cooled icemakers. • Re-circulating systems for water-cooled icemakers. • Ice flake machines that use less bleed off than cube machines.

A.3.1.5 Laundries and Laundromats. This section includes measures that are applicable in hotels, motels, hospitals, nursing homes, diaper services, restaurants, and coin operated Laundromats.

LAUNDRIES AND LAUNDROMATS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Operate equipment with full loads only. • Reduce water levels for partial loads. • Back flush filters or softeners only when necessary. 	<ul style="list-style-type: none"> • Computer controlled rinse water reclamation systems. • Wash and rinse water treatment and reclamation systems. • Continuous batch washers. • Ozone laundry systems. • Horizontal axis washers.

A.3.1.6 Swimming Pools. The measures in this section can be applied to commercial and residential swimming pools.

SWIMMING POOLS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Limit the frequency of pool refilling. • Cover the pool with an insulated cover when not in use to reduce losses due to heat and evaporation. • Reduce the level of the pool to avoid losses due to splashing. • Lower the pool temperature. • Back wash filters only when necessary. If timed, verify that frequency is efficient. • Regularly check pool for leaks and cracks. Keep pool and filter clean to avoid unnecessary backwashing. 	<p>There are no special equipment measures that would help conserve water in pools. It is important however that available equipment is efficient and used properly.</p>

A.3.1.7 Cooling Systems. This section includes measures for three types of cooling systems: 1. Single-pass, 2. Evaporative, and 3. Equipment. Single-pass cooling uses fresh water to cool without re-circulating any of the water used in the first pass. Evaporative coolers are used for cooling in commercial and residential applications and are commonly known as swamp coolers. Equipment cooling includes both single-pass and re-circulating systems that are used to cool equipment and machinery.

SINGLE-PASS COOLING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Reuse water for landscaping, vehicle washing, or another cooling application that allows for water to be at a higher temperature. • Eliminate single-pass systems. 	<ul style="list-style-type: none"> • Air-cooled equipment (i.e. compressors, pumps, icemakers, etc...) • Automatic controls that insure coolers only operate when needed.

EVAPORATIVE COOLING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Regularly check for leaks in hoses and pan. • Replace pads at least annually. • Shut cooler off when building is unoccupied. • Annually service the equipment by oiling moving parts and cleaning off accumulated scale or corrosion. 	<p>There are currently no equipment measures for evaporative coolers. The design of the coolers is relatively simple.</p>

EQUIPMENT COOLING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Reuse water in single pass systems for other cooling purposes. Examples of reuse include cooling molten materials, landscape, of boiler make-up water. • Replace al single pass cooling systems with closed-loop systems or replace water-cooled equipment with air-cooled. 	

A.3.1.8 Heating Systems. This section deals with conservation measures for boilers and steam generators which are used to heat large buildings and multiple-building facilities.

HEATING SYSTEMS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Regularly inspect systems for leaks and make repairs. • Insulate all piping. • Limit boiler bleed-off to a level that satisfies water quality requirements. • Discharge blow-down into an expansion tank instead of using cold water to cool it. 	<ul style="list-style-type: none"> • Flow meters for make-up and blow-down valves. • Automatic controls to discharge blow-down.

A.3.1.9 Leaks and Water Losses. This section covers water conservation measures relating to leaks and losses.

LEAKS AND WATER LOSSES

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> • Regularly check for leaks at all water connections. Keep in mind that higher pressure applications have more incidence of leakage. • Regularly check all vessels that contain water for cracks or bad seals. • Regularly check all heating and cooling systems. • Repair any leaks that are discovered. 	<ul style="list-style-type: none"> • Leak detection equipment. This could include sonic or probe type equipment. • Any equipment used to stop a leak. This would depend on the material of the pipe or vessel that has a leak.

A.3.1.10 ICI Maintenance Practices. This section reemphasizes maintenance conservation measures for ICI facilities that have been mentioned in previous sections. These measures should become standard procedure at all ICI facilities.

- Create a maintenance schedule that includes schedules for leak detection inspections and meter reading, and repair procedures.
- Monitor water-use records keeping track of any increases or decreases in use.
- Conduct water audits every one to three years.
- Shut off supply lines to areas that are not being used.
- Install pressure reducers where feasible.
- Keep a maintenance schedule to clean cooling and heating equipment regularly.
- Recycle and reuse water when feasible.
- Insulate all hot water pipes.
- Replace old equipment with water saving equipment.
- Install timers wherever possible.
- Educate employees on water saving techniques.

A.4 GENERAL CONSERVATION MEASURES

This list of conservation behaviors and is divided into four parts: Home, Landscaping, Community, and Miscellaneous.

HOME BEHAVIORS

1. When washing dishes by hand, don't let the water run while rinsing. Fill one sink with wash water and the other with rinse water.
2. Evaporative coolers require a seasonal maintenance checkup. For more efficient cooling, check your evaporative cooler annually.
3. Run your washing machine and dishwasher only when they are full and you could save 1000 gallons a month.
4. Use the garbage disposal sparingly. Compost instead and save gallons every time.
5. Keep a pitcher of water in the refrigerator instead of running the tap for cold drinks, so that every drop goes down you not the drain.
6. Check your water meter and bill to track your water usage.
7. Wash your produce in the sink or a pan that is partially filled with water instead of running water from the tap.
8. Use a broom instead of a hose to clean your driveway or sidewalk and save 80 gallons of water every time.
9. If your shower can fill a one-gallon bucket in less than 20 seconds, then replace it with a water efficient showerhead.
10. Collect the water you use for rinsing produce and reuse it to water houseplants.
11. We're more likely to notice leaky faucets indoors, but don't forget to check outdoor faucets, pipes, and hoses for leaks.
12. When you shop for a new appliance, consider one offering cycle and load size adjustments. They are more water and energy-efficient than older appliances.
13. Time your shower to keep it under 5 minutes. You'll save up to 1000 gallons a month.
14. Install low-volume toilets.
15. When you clean your fish tank, use the water you've drained on your plants. The water is rich in nitrogen and phosphorus, providing you with a free and effective fertilizer.
16. Put food coloring in your toilet tank. If it seeps into the toilet bowl, you have a leak. It's easy to fix, and you can save more than 600 gallons a month.
17. Plug the bathtub before turning the water on, and then adjust the temperature as the tub fills up.
18. Designate one glass for your drinking water each day. This will cut down on the number of times you run your dishwasher.

19. Don't use running water to thaw food.
20. Grab a wrench and fix that leaky faucet. It's simple, inexpensive, and can save 140 gallons a week.
21. When doing laundry, match the water level to the size of the load.
22. Teach your children to turn the faucets off tightly after each use.
23. Before you lather up, install a low-flow showerhead. They're inexpensive, easy to install, and can save your family more than 500 gallons a week.
24. Soak your pots and pans instead of letting the water run while you scrape them clean.
25. Make sure you know where your master water shut-off valve is located. This could save gallons of water and damage to your home if a pipe were to burst.
26. Turn off the water while you brush your teeth and save 4 gallons a minute. That's 200 gallons a week for a family of four.
27. Make sure your toilet flapper doesn't stick open after flushing.
28. Make sure there are aerators on all of your faucets.
29. Install an instant water heater on your kitchen sink so you don't have to let the water run while it heats up. This will also reduce heating costs for your household.
30. Cut back on rinsing if your dishwasher is new. Newer models clean more thoroughly than older ones.
31. Bathe your young children together.
32. Winterize outdoor spigots when temps dip to 20 degrees F to prevent pipes from bursting or freezing.
33. Insulate hot water pipes so you don't have to run as much water to get hot water to the faucet.
34. Drop that tissue in the trash instead of flushing it and save gallons every time.
35. If your toilet was installed prior to 1980, place a toilet dam or bottle filled with water in your toilet tank to cut down on the amount of water used for each flush. Be sure these devices do not interfere with operating parts.
36. Install water softening systems only when necessary. Save water and salt by running the minimum number of regenerations necessary to maintain water softness.
37. Wash clothes only when you have a full load and save up to 600 gallons each month.
38. Listen for dripping faucets and toilets that flush themselves. Fixing a leak can save 500 gallons each month.
39. Cook food in as little water as possible. This will also retain more of the nutrients.
40. Turn the water off while you shampoo and condition your hair and you can save more than 50 gallons a week.
41. Choose new water-saving appliances, like washing machines that save up to 20 gallons per load.

42. Select the proper size pans for cooking. Large pans require more cooking water than may be necessary.
43. Turn off the water while you shave and you can save more than 100 gallons a week.
44. To save water and time, consider washing your face or brushing your teeth while in the shower.
45. For hanging baskets, planters and pots, place ice cubes under the moss or dirt to give your plants a cool drink of water and help eliminate water overflow.
46. Throw trimmings and peelings from fruits and vegetables into your yard compost to prevent from using the garbage disposal.
47. Keep a bucket in the shower to catch water as it warms up or runs. Use this water to flush toilets or water plants.
48. When you are washing your hands, don't let the water run while you lather.
49. Pre-treat stains before washing clothes to avoid re-washing.
50. Use the shortest wash cycle for lightly soil cloths.
51. Check washing machine hoses regularly for leaks.
52. Do not pre-rinse dishes except in cases of sticky or burn-on food.
53. Scrape off food with a utensil or used paper napkin when pre-cleaning for dishwasher.

LANDSCAPE BEHAVIORS

1. Check your sprinkler system frequently and adjust sprinklers so only your lawn is watered and not the house, sidewalk, or street.
2. Avoid planting turf in areas that are hard to water such as steep inclines and isolated strips along sidewalks and driveways.
3. Plant during the spring or fall when the watering requirements are lower.
4. Minimize evaporation by watering during the early morning hours, when temperatures are cooler and winds are lighter.
5. Use a layer of organic mulch around plants to reduce evaporation and save hundreds of gallons of water a year.
6. Divide your watering cycle into shorter periods to reduce runoff and allow for better absorption every time you water.
7. Only water your lawn when needed. You can tell this by simply walking across your lawn. If you leave footprints, it's time to water.
8. Adjust your lawn mower to a higher setting. Longer grass shades root systems and holds soil moisture better than a closely clipped lawn.
9. Use the sprinkler for larger areas of grass. Water small patches by hand to avoid waste.

10. Use porous materials for walkways and patios to keep water in your yard and prevent wasteful runoff.
11. Direct downspouts and other runoff towards shrubs and trees, or collect and use for your garden.
12. Install a rain shut-off device on your automatic sprinklers to eliminate unnecessary watering.
13. Choose a water-efficient drip irrigation system for trees, shrubs and flowers. Watering at the roots is very effective, be careful not to over water.
14. Reduce the amount of grass in your yard by planting shrubs and ground cover with rock and granite mulching.
15. Remember to check your sprinkler system valves periodically for leaks and keep the heads in good shape.
16. Don't water your lawn on windy days. After all, sidewalks and driveways don't need water.
17. Water your plants deeply but less frequently to create healthier and stronger landscapes.
18. When watering grass on steep slopes, use a soaker hose to prevent wasteful runoff.
19. Group plants with the same watering needs together to get the most out of your watering time.
20. Remember to weed your lawn and garden regularly. Weeds compete with other plants for nutrients, light, and water.
21. While fertilizers promote plant growth, they also increase water consumption. Apply the minimum amount of fertilizer needed.
22. Avoid installing ornamental water features and fountains that spray water into the air. Trickling or cascading fountains lose less water to evaporation.
23. Buy a rain gauge to track how much rain or irrigation your yard receives. Check with your local water agency to see how much rain is needed to skip an irrigation cycle.
24. Teach your family how to shut off your automatic watering systems. Turn sprinklers off if the system is malfunctioning or when a storm is approaching.
25. Set a kitchen timer when watering your lawn or garden with a hose.
26. Next time you add or replace a flower or shrub, choose a low water use plant for year-round landscape color and save up to 550 gallons each year.
27. Use a screwdriver as a soil probe to test soil moisture. If it goes in easily, don't water. Proper lawn watering can save thousands of gallons of water annually.
28. Avoid over-seeding your lawn with winter grass. Once established, ryegrass needs water every three to five days, whereas dormant Bermuda grass needs water only once a month.
29. Landscape with Xeriscape trees, plants and groundcovers. Call your local conservation office for more information about these water thrifty plants.
30. If you have an evaporative cooler, direct the water drain to a flowerbed, tree, or your lawn.
31. Leave lower branches on trees and shrubs and allow leaf litter to accumulate on top of the soil. This keeps the soil cooler and reduces evaporation.

32. Start a compost pile. Using compost when you plant adds water-holding organic matter to the soil.
33. Use sprinklers that throw big drops of water close to the ground. Smaller drops of water and mist often evaporate before they hit the ground.
34. More plants die from over-watering than from under-watering. Be sure only to water plants when necessary.
35. Water only as rapidly as the soil can absorb the water.
36. Aerate your lawn. Punch holes in your lawn about six inches apart so water will reach the roots rather than run off the surface.

COMMUNITY BEHAVIORS

1. Encourage your school system and local government to help develop and promote a water conservation ethic among children and adults.
2. Make suggestions to your employer to save water (and dollars) at work.
3. Support projects that use reclaimed wastewater for irrigation and other uses.
4. Encourage your friends and neighbors to be part of a water-conscious community.
5. Pick-up the phone and report significant water losses from broken pipes, open hydrants and errant sprinklers to the property owner or your water management district.

MISCELLANEOUS BEHAVIORS

1. Install covers on pools and spas and check for leaks around your pumps.
2. Periodically check your pool for leaks if you have an automatic refilling device.
3. Use a commercial car wash that recycles water.
4. Don't buy recreational water toys that require a constant flow of water.
5. Use a grease pencil to mark the water level of your pool at the skimmer. Check the mark 24 hours later. Your pool should lose no more than $\frac{1}{4}$ inch each day.
6. When the kids want to cool off, use the sprinkler in an area where your lawn needs it the most.
7. Make sure your swimming pools, fountains, and ponds are equipped with re-circulating pumps.
8. Bathe your pets outdoors in an area in need of water.
9. While staying in a hotel or even at home, consider reusing your towels.
10. When backwashing your pool, consider using the water on your landscaping

APPENDIX B – DOUGLAS COUNTY LANDSCAPE CODE

Chapter 20.694

LANDSCAPE STANDARDS

Sections:

[20.694.010 Purpose.](#)

[20.694.020 Applicability.](#)

[20.694.030 Exemptions.](#)

[20.694.040 General.](#)

[20.694.050 Maintenance.](#)

[20.694.060 Landscape plans, required.](#)

[20.694.070 Landscape plans, submittal requirements.](#)

[20.694.080 Irrigation plans, submittal requirements.](#)

[20.694.090 Landscape materials.](#)

[20.694.100 Landscape design standards.](#)

[20.694.110 Screening](#)

[20.694.120 Site distance for landscaping adjacent to public rights-of-way and points of access.](#)

[20.694.130 Final inspection.](#)

20.694.010 Purpose.

The purpose of this chapter is to establish minimum standards for the placement, amount, and type of landscape materials to be installed in order to enhance the aesthetics of the community, including the visual appearance of streets, to reduce noise, dust, and erosion, conserve water resources, provide groundwater recharge, preserve open space and wetlands, provide privacy from visual and physical intrusion, and to insulate from the effects of weather conditions. (Ord. 763, 1996)

20.694.020 Applicability.

A. Landscaping requirements shall apply to construction of the following projects unless specifically listed as an exemption or otherwise noted in this chapter:

1. Single-family subdivisions creating parcels of one-half acre or less (for street trees only).
2. Duplex or multi-family residential;
3. Industrial;
4. Commercial;
5. Institutional uses; and
6. Public uses. (Ord. 763, 1996)

20.694.030 Exemptions.

A. The following types of development are exempt from the landscape requirements in this chapter:

1. Development of a single-family detached dwelling not a part of a subdivision tentatively approved after adoption of this title, and accessory structures;
2. Previously approved development which conforms to all conditions of approval;
3. Additions to existing structures or accessory structures that are under ten percent of the total gross floor area or 5,000 square feet, whichever is less. (Ord. 763, 1996)

20.694.040 General.

A. All landscape materials shall be natural or living materials. Plastic, simulated or synthetic materials are not permitted except for the use as weed block and as irrigation materials.

B. All landscape areas must be irrigated with an underground irrigation system, adequate to service the landscape areas.

C. Final landscape and irrigation plans must be submitted at the time of building permit application.

D. Landscape materials shall follow the approved tree, shrub, and groundcover species list contained within the county design criteria and improvement standards manual to the extent possible. Exceptions to the list are at the sole discretion of the director.

E. Installation of landscaping and irrigation systems must follow the approved plans. Any plant substitutes can only be authorized by the person who develops the plan, with the director's approval. Approval must be obtained prior to plant installation. (Ord.763, 1996)

20.694.050 Maintenance.

The owner, or his agent, is responsible for the maintenance of all landscaping and irrigation systems, which shall be maintained in good condition, to present a healthy, neat, and orderly appearance and must be kept free from weeds, refuse, and debris. Maintenance includes the immediate replacement of all dead and diseased plant material. (Ord. 763, 1996)

20.694.060 Landscape plans, required.

A. A landscape plan must be filed with the department for the following:

1. Applications for a building permit or improvement plans which requires design review approval;
2. Any tentative map which includes common, improved open space areas, or required street trees.

B. The plan shall, at a minimum, identify all areas to be landscaped and include area and tree calculations and general types of landscaping proposed for the area.

C. A landscape plan must be approved by the director, prior to the issuance of a building permit or the approval of a final map including common area. The landscape plan must be approved for remodel permits for a change of use from residential to non-residential or from single-family to multi-family.

D. The landscape plan must be prepared by one of the following:

1. A licensed landscape architect;
2. A licensed landscape contractor;
3. A licensed architect; or
4. A registered civil engineer. (Ord. 801, 1997, Ord. 763, 1996)

20.694.070 Landscape plans, submittal requirements.

A. Landscape and irrigation plans must be in the format as prescribed in this section and contain the following for the development and installation of all landscape areas.

B. The final landscape plan shall include the following:

1. Scale (one inch equals 20 feet (1"=20') or one inch equals 30 feet(1"=30')), north arrow, location of adjacent streets, property lines, easements, sidewalks, drives, paved areas, lighting, signs, buildings, all utilities and mechanical equipment within the landscape areas, existing trees and other natural or man-made site features influencing the use of the site, and surrounding types of landscaping;
2. Construction details for installation of the landscape in accordance with county standards, including topographical features and grading plans, soil type, method of soil preparation, fertilization added at time of planting, area to be excavated before planting and manner of root exposure, tree staking and guying;
3. A note or calculation sheet with all landscape calculations relevant to the application of this chapter, including site area, areas of required number of parking spaces, number of trees and shrubs, type and amount of living and non-living ground cover, type and amount, if any, of decorative paving material, and percentage of each to be used on the property;
4. A plant list utilizing a wide variety of native and drought tolerant trees, shrubs and plants, based upon the recommended list of species provided in this chapter. The plant list shall include the common and botanical names of plants to be used. This plant list must be arranged in legend form with a key number assigned to each plant. On the plan, each plant shall be identified by a key number. The size of the plant, its spacing and the quantity to be used shall follow in the legend, as the following example illustrates: (Ord. 763, 1996)

Typical Plan List

No.	Botanical Name	Common Name	Size	Space	Quantity
1.	Acer ginnala	Amur Maple	2-inch caliper	30 feet o.c.*	10
2.	Pyrus calleryana	Flowering Pear	2-inch caliper	20 feet o.c.	12
3.	Forsythia	Early Forsythia	1 gallon	3 feet o.c	25
4.	Syringa	Late Lilac	5 gallons	5 feet o.c.	7
5.	Vinca Minor	Dwarf Periwinkle	flat	12 inches o.c	68

* o.c. = "on center"
Ord. 763, 1996)

20.694.080 Irrigation plans, submittal requirements.

A. Irrigation plans, and specifications which comply with the Uniform Plumbing Code, must be submitted with the landscape plan to insure adequate irrigation coverage. To increase water conservation, the system must be automatic drip, bubbler, or sprinkler irrigation. Sprinkler irrigation is only allowed on lawn areas, except that some groundcovers may use sprinkler irrigation with the approval by the director. All drip and bubbler irrigation systems must be installed separately from turf irrigation systems. All irrigation plans must include the following:

1. Scale at the same scale as the landscape plan, north arrow, location of adjacent streets, property lines, easements, sidewalks, drives, paved areas, lighting, signs, buildings, all utilities and mechanical equipment within the landscape areas, existing trees and other natural or man-made site features influencing the use of the site;
2. Identification and description of automatic irrigation components to insure that vegetation is adequately irrigated. All irrigation plans shall incorporate water conserving principles, including multiple program controllers with percent scaling, low precipitation heads, drip irrigation, and check valves. Where applicable, irrigation details must include the method for the watering of required street trees. All valves and other devices are to be housed in a box of adequate size and design to protect the components.
3. Indication of the system point of connection and size, water pressure available, and maximum demand of the system in gallons per minute (gpm);
4. Irrigation equipment specified must be identified by manufacturer's name and equipment identification number;
5. Cross connection devices installed for all construction shall have a reduced pressure backflow preventer (R.P. device), except for single-family development;
6. All locations of irrigation valves, controllers, hose bibs, quick coupler valves, and backflow preventers. Sprinkler location on plans must include typical pattern of sprays (i.e., full circle, half circle), psi, radius of throw and gallons per minute;
7. Irrigation details must be used to clarify particular situations. Typical details must include backflow prevention devices, valves, irrigation heads, and irrigation controllers;
8. Sizes of irrigation lines. Schedule 40 P.V.C. is required for all pressure lines and under all paved areas. Piping must be installed a minimum of 12 inches underground for non pressure irrigation lines and 18 inches underground for constant pressure irrigation lines. (Ord. 763, 1996)

20.694.090 Landscape materials.

A. Landscape materials are limited to the following:

1. Living materials, including turf, ground covers, plants and shrubs, vines, hedges, and trees;
2. Non-living materials, including rocks, gravel, tile, bricks, wood, bark, and related materials, may be used as ground cover within the required landscape areas with the approval of the community development department. No more than 20 percent of the landscape material shall include rock or gravel, and at least 50 percent of the area devoted to groundcover and planter areas shall be living materials. A variety of living and non-living ground cover materials is required for all projects;
3. Existing trees and shrubs shall be preserved wherever possible and may be considered part of the required landscape material;
4. Existing trees with a trunk diameter of eight inches or more at a point 12 inches above ground level shall be preserved, unless its removal is authorized on the approved site plan or map;
5. Turf is not allowed in any space measuring less than four feet in width or length. Turf is not allowed in areas with a slope greater than 20 percent (1:5), only drought-tolerant native grasses, which decrease soil erosion and require less water consumption, are allowed on slopes in excess of 20 percent;
6. Plant material and ground cover must be distributed evenly throughout the parking lot or site area.
7. Xeriscape designs using drought tolerant, native plant species are encouraged. (Ord. 763, 1996)

20.694.100 Landscape design standards.

A. At least 15 percent of the total paved area devoted to parking and driveway areas must be offset by pervious areas of landscape material (new or existing trees and shrubs). All landscaping must be irrigated with an irrigation system approved by the department.

B. Plant materials existing or proposed within public rights-of-way adjacent to a landscaping project shall be included on the landscape plan but will not be counted toward the total required landscape area.

C. Where a perimeter fence or wall is proposed along a street frontage within a residential subdivision, a minimum five-foot landscape planter area shall be provided outside the fenced area adjacent to the sidewalk. This area shall include street trees and a variety of shrubs and plants to screen the fence and provide an aesthetically pleasing streetscape.

D. On multi-family developments, 50 percent of the required common open space areas shall be planted in turf.

E. New construction shall provide adequate shade trees in all paved areas and provide an appropriate balance of evergreen and deciduous plantings throughout the site.

F. The landscape plans shall show a minimum of one tree for every 400 square feet of required on-site landscaped area.

G. In addition to paragraph F above, street trees, with a minimum two-inch caliper and five-foot spread, are required for all new commercial, industrial, public, institutional, or residential subdivisions creating parcels of one-half net acre or less. One tree shall be planted, at a maximum, for each 40 lineal feet of street frontage, on average. Street trees must be planted by the developer and include proper irrigation prior to the issuance of a certificate of occupancy. In single-family residential subdivisions, installation of trees and irrigation system shall occur prior to issuance of a certificate of occupancy for each individual dwelling unit. Street trees must be setback a minimum of ten feet from water and sewer lines, 30 feet from an intersection, and ten feet from any driveway, hydrant, or street sign. Trees which grow to more than 20 feet in height may not be planted under overhead utility lines. Street trees within highway rights-of-way shall limit mature spread to 20 feet. Street trees shall follow the approved street tree list. Any exceptions to the list shall be at the discretion of the director.

H. All trees must be staked in accordance with the International Society of Arborists standards.

I. Street trees adjacent to sidewalks, parking lots, or streets must be free of fruit or other elements which litter the ground. All street trees must be heat and cold resistant, tolerant of the urban environment, and insect and disease resistant.

J. Shrubs and hedges must be a minimum five-gallon size. Hedges, where required, shall be planted and maintained to form a continuous, unbroken, solid, visual screen within three years after planting. Vines shall be a minimum of two feet in height at the time of planting and may be used only in conjunction with fences, screens, or walls to meet physical barrier requirements.

K. Wherever rock or bark are used as ground cover, the installation must prevent vegetation growth through the ground cover either through the use of herbicides or landscape fabric material. Fabric material must be properly pinned to the soil to avoid lifting.

L. All required street trees, parking lot trees, and trees required for screening purposes must be a minimum two-inch caliper and five-foot spread. All other landscaped trees may be one and one-half inch caliper for deciduous trees, and six-foot minimum height for evergreen trees. (Ord. 801, 1977; Ord. 763, 1996)

20.694.110 Screening.

Plant materials shall be used to screen irrigation equipment boxes, storage, refuse, public utilities, and other features which do not enhance the overall appearance of the site. Landscape screening shall achieve the desired effect within three years. (Ord. 763, 1996)

20.694.120 Site distance for landscaping adjacent to public rights-of-way and points of access.

When an accessway or driveway intersects a public right-of-way or when the subject property abuts the intersection of two or more public rights-of-way, all landscaping within the traffic safety site area must provide unobstructed cross-visibility at a level between three feet and eight feet in height. Trees having limbs and foliage trimmed in a manner that no limbs or foliage extend into the cross-visibility area are allowed, provided their location does not create a traffic hazard. (Ord. 763, 1996)

20.694.130 Final inspection.

All landscaping must be properly installed and be according to approved plans prior to final inspection and certificate of occupancy by the department. An exception is allowed only when the landscaping cannot be completed due to weather related delays. In lieu of the installation of landscaping, financial security per chapter 20.720, shall be provided at 150 percent of the estimated cost of installation. The owner must guarantee installation as specified in the temporary certificate of occupancy agreement, and final inspection must be completed within six months of the issuance of a temporary certificate. The estimated cost of the landscaping is subject to verification by the department. (Ord. 763, 1996)

APPENDIX C – LANDSCAPE GUIDES

The following list is taken from the Truckee Meadows Water Authority (TMWA) website. More information on these plants, including color photos can be found at www.tmwandscapeguide.com.

PERENNIAL FLOWERS

[Artemisia species](#)/Sage or Wormwood (Perennial)—water use: Very Low

[Eriogonum umbellatum](#)/Sulfur Flowered Buckwheat (Perennial)—water use: Very Low

[Achillea species](#)/Yarrow (Perennial)—water use: Low

[Agastache cana](#)/Bubblemint (Perennial)—water use: Low

[Aurinia saxatilis](#)/Basket-of-Gold (Perennial)—water use: Low

[Coreopsis species](#)/Tickseed (Perennial)—water use: Low

[Crocus species](#)/Spring Crocus (Perennial)—water use: Low

[Dianthus species](#)/Pinks (Perennial)—water use: Low

[Eschscholzia californica](#)/California poppy (Perennial)—water use: Low

[Gaillardia grandiflora](#)/Blanket Flower (Perennial)—water use: Low

[Iris germanica](#)/Iris germanica (Perennial)—water use: Low

[Linum species](#)/Flax (Perennial)—water use: Low

[Narcissus species](#)/Daffodil or Narcissus (Perennial)—water use: Low

[Nepeta racemosa](#)/Catmint (Perennial)—water use: Low

[Oenothera species](#)/Evening Primrose (Perennial)—water use: Low

[Perovskia atriplicifolia](#)/Russian Sage (Perennial)—water use: Low

[Sedum species](#)/Stonecrop (Perennial)—water use: Low

[Senecio Cineraria](#)/Dusty Miller (Perennial)—water use: Low

[Stachys byzantina](#)/Lamb's Ears (Perennial)—water use: Low

[Thermopsis montana](#)/No Lupine (Perennial)—water use: Low

[Tulbaghia violacea](#)/Society Garlic (Perennial)—water use: Low

[Alcea rosea](#)/Hollyhock (Perennial)—water use: Moderate

[Antirrhinum majus](#)/Snapdragon (Perennial)—water use: Moderate

[Armeria maritima](#)/Sea Pinks (Perennial)—water use: Moderate

[Aster species](#)/Aster (Perennial)—water use: Moderate

[Echinacea purpurea](#)/Coneflower (Perennial)—water use: Moderate

[Gaura lindheimeri](#)/Gaura (Perennial)—water use: Moderate

[Geranium species](#)/Handy Geranium (Perennial)—water use: Moderate

[Gypsophila species](#)/Baby's Breath (Perennial)—water use: Moderate

[Hemerocallis hybrids](#)/Daylily (Perennial)—water use: Moderate

[Heuchera sanguinea](#)/Coral Bells (Perennial)—water use: Moderate

[Iberis sempervirens](#)/Candytuft (Perennial)—water use: Moderate

[Kniphofia uvaria](#)/Red Hot Poker (Perennial)—water use: Moderate

[Lavandula angustifolia](#)/Lavender (Perennial)—water use: Moderate

[Lilium species](#)/Lily (Perennial)—water use: Moderate

[N/A](#)/Pussy toes (Perennial)—water use: moderate

[Papaver species](#)/Poppy (Perennial)—water use: Moderate

[Penstemon species](#)/Beard Tongue (Perennial)—water use: Moderate

[Platycodon grandiflorus](#)/Balloon Flower (Perennial)—water use: Moderate

[Rudbeckia fulgida](#)/Black-Eyed Susan (Perennial)—water use: Moderate

[Salvia Species](#)/Sage or Salvia (Perennial)—water use: Moderate

[Saponaria species](#)/Soapwort (Perennial)—water use: Moderate

[Tanacetum species](#)/Painted or Michaelmas Daisy (Perennial)—water use: Moderate

[Tulipa species](#)/Tulip (Perennial)—water use: Moderate

[Veronica spicata](#)/Spike Speedwell (Perennial)—water use: Moderate

[Viola species](#)/Violet or Pansy (Perennial)—water use: Moderate

GROUNDCOVERS, VINES, AND GRASSES

[Opuntia polyacantha](#)/Prickly Pear Cactus (Groundcovers)—water use: Very Low

[Clematis species](#)/Clematis (Groundcovers)—water use: Low

[Euphorbia species](#)/Spurge (Groundcovers)—water use: Low

[Helictorichon sempervirens](#)/Blue Oat Grass (Groundcovers)—water use: Low

[Hypericum calycinum](#)/Jacob's Ladder or Aaron's Beard (Groundcovers)—water use: Low

[Juniperus horizontalis](#)/Groundcover Junipers (Groundcovers)—water use: Low

[Lathyrus latifolius](#)/Perennial Sweet Pea (Groundcovers)—water use: Low

[Lonicera species](#)/Honeysuckle (Groundcovers)—water use: Low

[Panicum virgatum](#)/Switch Grass (Groundcovers)—water use: Low

[Polygonum species](#)/Polygonum (Groundcovers)—water use: Low

[Santolina species](#)/Lavender Cotton (Groundcovers)—water use: Low

[Vinca minor](#)/Dwarf Periwinkle (Groundcovers)—water use: Low

[Wisteria sinensis](#)/Chinese Wisteria (Groundcovers)—water use: Low

[Zauschneria californica](#)/California Fuschia (Groundcovers)—water use: Low

[Calmagrostis x acutiflora](#)/Feather Reed Grass (Groundcovers)—water use: Moderate

[Campsis radicans](#)/Red Trumpet Creeper (Groundcovers)—water use: Moderate

[Cerastium tomentosum](#)/Snow in Summer (Groundcovers)—water use: Moderate

[Delosperma cooperi](#)/Hardy Purple Ice Plant (Groundcovers)—water use: Moderate

[Hedera helix](#)/Ivy (Groundcovers)—water use: Moderate

[Helianthemum nummularium](#)/Sunrose (Groundcovers)—water use: Moderate

[Mahonia repens](#)/Creeping Mahonia (Groundcovers)—water use: Moderate

[N/A](#)/Northern seacats (Groundcovers)—water use: moderate

[Phlox subulata](#)/Moss Pink (Groundcovers)—water use: Moderate

[Potentilla neumanniana](#)/Cinquefoil (Groundcovers)—water use: Moderate

[Sedum species](#)/Stonecrop (Groundcovers)—water use: Moderate

[Thymus species](#)/Thyme (Groundcovers)—water use: Moderate

SHRUBS

[Artemisia tridentata var. tridentata](#)/Big Sagebrush (Shrubs)—water use: Very Low

[Atriplex canescens](#)/Four Wing Saltbrush (Shrubs)—water use: Very Low

[Chrysothamnus nauseosus](#)/Rubber Rabbitbrush (Shrubs)—water use: Very Low

[Amelanchier species](#)/Serviceberry or Juneberry (Shrubs)—water use: Low

[Aronia species](#)/Chokeberry (Shrubs)—water use: Low

[Berberis species](#)/Barberry (Shrubs)—water use: Low

[Caragana species](#)/Peashrub (Shrubs)—water use: Low

[Caryopteris x clandonensis](#)/Blue Mist Spiraea (Shrubs)—water use: Low

[Chaenomeles speciosa](#)/Flowering Quince (Shrubs)—water use: Low

[Cytisus species](#)/Broom (Shrubs)—water use: Low

[Elaeagnus commutata](#)/Silverberry (Shrubs)—water use: Low

[Euonymus species](#)/Euonymus (Shrubs)—water use: Low

[Forestiera neomexicana](#)/New Mexico Privet (Shrubs)—water use: Low

[Genista species](#)/Dwarf Broom (Shrubs)—water use: Low

[Hibiscus syriacus](#)/Rose of Sharon (Shrubs)—water use: Low

[Ligustrum species](#)/Privet (Shrubs)—water use: Low

[Lonicera tatarica](#)/Tatarian Honeysuckle (Shrubs)—water use: Low

[Mahonia aquifolium](#)/Oregon Grape (Shrubs)—water use: Low

[Pinus mugo](#)/Mugo Pine (Shrubs)—water use: Low

[Prunus species](#)/Bush Cherry (Shrubs)—water use: Low

[Pyracantha coccinea](#)/Firethorn or Pyracantha (Shrubs)—water use: Low

[Rhus species](#)/Sumac (Shrubs)—water use: Low

[Ribes aureum](#)/Golden Currant (Shrubs)—water use: Low

[Shepherdia argentea](#)/Silver Buffaloberry (Shrubs)—water use: Low

[Symphoricarpos albus](#)/Snowberry (Shrubs)—water use: Low

[Syringa vulgaris](#)/Common Lilac (Shrubs)—water use: Low

[Yucca species](#)/Yucca (Shrubs)—water use: Low

[Acer circinatum](#)/Vine Maple (Shrubs)—water use: moderate

[Amorpha canescens](#)/Leadplant (Shrubs)—water use: moderate

[Buddleia species](#)/Butterfly Bush (Shrubs)—water use: Moderate

[Catalpa x Chilopsis](#)/Chitalpa (Shrubs)—water use: moderate

[Ceratoides lanata](#)/Winterfat (Shrubs)—water use: moderate

[Cercocarpus ledifolius](#)/Mt. Mahogany (Shrubs)—water use: moderate

[Chamaebatiaria millifolium](#)/Fernbush (Shrubs)—water use: moderate

[Chilopsis linearis](#)/Desert or Flowering Willow (Shrubs)—water use: moderate

[Cotoneaster species](#)/Cotoneaster (Shrubs)—water use: Moderate

[Cowania mexicana](#)/Cliffrose (Shrubs)—water use: moderate

[Fallugia paradoxa](#)/Apache Plume (Shrubs)—water use: moderate

[Forsythia species](#)/Forsythia (Shrubs)—water use: Moderate

[Hamamelis x intermedia](#)/Witch Hazel (Shrubs)—water use: Moderate

[Hesperaloe parviflora](#)/Red Yucca (Shrubs)—water use: moderate

[Juniperus chinensis](#)/Sea Green Juniper (Shrubs)—water use: Moderate

[Kerria japonica](#)/Kerria (Shrubs)—water use: Moderate

[Kolkwitzia amabilis](#)/Beautybush (Shrubs)—water use: moderate

[Philadelphus virginialis](#)/Mock Orange (Shrubs)—water use: Moderate

[Picea glauca var. albertiana 'Conica'](#)/Dwarf Alberta Spruce (Shrubs)—water use: Moderate

[Pinus contorta 'Latifolia'](#)/Lodgepole Pine (Shrubs)—water use: moderate

[Potentilla fruticosa](#)/Shrubby Potentilla (Shrubs)—water use: Moderate

[Purshia tridentata](#)/Bitterbrush (Shrubs)—water use: moderate

[R. frangula 'Asplenifolia'](#)/Fernleafed buckthorn (Shrubs)—water use: Moderate

[R. frangula 'Columnaris'](#)/Tall Hedge Buckthorn (Shrubs)—water use: Moderate

[Rhamnus frangulia](#)/Sea buckthorn (Shrubs)—water use: Moderate

[Rosa species](#)/Hardy Shrub Roses (Shrubs)—water use: Moderate

[Spiraea species](#)/Spiraea (Shrubs)—water use: Moderate

[Symphoricarpa x chenaultii](#)/Coralberry 'Hancock' (Shrubs)—water use: Moderate

[Thuja occidentalis](#)/American Arborvitae (Shrubs)—water use: Moderate

[Viburnum species](#)/Viburnum (Shrubs)—water use: Moderate

TREES

[Acer ginnala](#)/Amur Maple (Trees)—water use: Deep Water 10-14 days

[Ailanthus altissima](#)/Tree of Heaven (Trees)—water use: Deep Water 10-14 days

[Calocedrus decurrens](#)/Incense Cedar (Trees)—water use: Deep Water 10-14 days

[Catalpa species](#)/Catalpa (Trees)—water use: Deep Water 10-14 days

[Cedrus atlantica glauca](#)/Blue Atlas Cedar (Trees)—water use: Deep Water 10-14 days

[Celtis occidentalis](#)/Hackberry (Trees)—water use: Deep Water 10-14 days

[Crataegus species](#)/Hawthorn (Trees)—water use: Deep Water 10-14 days

[Elaeagnus angustifolia](#)/Russian Olive (Trees)—water use: Deep Water 10-14 days

[Gleditsia triacanthos inermis](#)/Honeylocust (Trees)—water use: Deep Water 10-14 days

[Juniperus species](#)/Tree Juniper (Trees)—water use: Deep Water 10-14 days

[Maackia amurensis](#)/Maackia (Trees)—water use: Deep Water 10-14 days

[Maclura pomifera](#)/Osage Orange (Trees)—water use: Deep Water 10-14 days

[Malus hybrids](#)/Crabapple (Trees)—water use: Deep Water 10-14 days

[Pinus species](#)/Pine (Trees)—water use: Deep Water 10-14 days

[Platanus acerifolia](#)/Sycamore (Trees)—water use: Deep Water 10-14 days

[Quercus species](#)/Oak (Trees)—water use: Deep Water 10-14 days

[Robinia species](#)/Locust (Trees)—water use: Deep Water 10-14 days

[Sequoiadendron giganteum](#)/Giant Redwood (Trees)—water use: Deep Water 10-14 days

[Ulmus parvifolia](#)/Chinese elm (Trees)—water use: Deep Water 10-14 days

[Zelkova serrata](#)/Zelkova (Trees)—water use: Deep Water 10-14 days

[Aesculus hippocastanum](#)/Common Horsechestnut (Trees)—water use: Deep Water 7-10 days

[Carpinus betulus](#)/Hornbeam (Trees)—water use: Deep Water 7-10 days

[Cotinus coggygria](#)/Smoke Tree (Trees)—water use: Deep Water 7-10 days

[Cupressus glabra](#)/Arizona Cypress (Trees)—water use: Deep Water 7-10 days

[Fraxinus species](#)/Ash (Trees)—water use: Deep Water 7-10 days

[Ginkgo biloba](#)/Maidenhair Tree (Trees)—water use: Deep Water 7-10 days

[Koelreuteria paniculata](#)/Golden Rain Tree (Trees)—water use: Deep Water 7-10 days

[Laburnum watereri](#)/Golden Chain Tree (Trees)—water use: Deep Water 7-10 days

[Liquidambar styraciflua](#)/Sweetgum (Trees)—water use: Deep Water 7-10 days

[Liriodendron tulipifera](#)/Tulip Tree (Trees)—water use: Deep Water 7-10 days

[Malus domestica](#)/Fruiting Apple Tree (Trees)—water use: Deep Water 7-10 days

[Morus alba](#)/Mulberry (Trees)—water use: Deep Water 7-10 days

[Phellodendron amurense](#)/Amur Cork Tree (Trees)—water use: Deep Water 7-10 days

[Picea species](#)/Spruce (Trees)—water use: Deep Water 7-10 days

[Pistacia chinensis](#)/Chinese Pistache (Trees)—water use: Deep Water 7-10 days

[Prunus species](#)/Plum or Cherry (Trees)—water use: Deep Water 7-10 days

[Pyrus Species](#)/Pear (Trees)—water use: Deep Water 7-10 days

[Sophora japonica](#)/Japanese Pagoda Tree (Trees)—water use: Deep Water 7-10 days

[Sorbus species](#)/Mountain Ash (Trees)—water use: Deep Water 7-10 days

[Thuja occidentalis](#)/Arborvitae (Trees)—water use: Deep Water 7-10 days

[Tilia species](#)/Linden (Trees)—water use: Deep Water 7-10 days

[Gymnocladus dioica](#)/Kentucky Coffee Tree (Trees)—water use: Moderate

[Juniperus monosperma](#)/Singleseed Juniper (Trees)—water use: moderate

[Pinus edulis](#)/Pinon Pine (Trees)—water use: moderate

APPENDIX D – WATER CONSERVATION WEBSITES

WATER

- www.amsa-cleanwater.org
- www.energystar.gov

DROUGHT

- DroughtMonitor@ndmc.unl.edu

LANDSCAPE

- www.usda.gov/news/garden.htm
- www.tmwlandscapeguide.com/landscape_guide/interactive/index.php

EDUCATION

- www.wateruseitwisely.com
- www.washoeet.dri.edu/

INSTITUTIONAL

- www.douglascountynv.gov/sites/main/index.cfm
- www.lvwd.com
- www.snwa.com
- www.co.washoe.nv.us/water_dept/rwpc/regionalplm
- www.tmh20.com
- www.cabq.gov
- www.ci.phoenix.az.us/WATER/wtrteach.html
- www.owue.water.ca.gov/leak/faq/faq.cfm

LEAK DETECTION

- www.who.int/docstore/water_sanitation_health/leakage/begin.html

**Indian Hills General Improvement District
WATER USE RESTRICTION ORDINANCE NO. 001**

Summary of Ordinance: An ordinance incorporating herein water use limitations relating to a water conservation plan; defining terms re: water use limitations, declaration of shortage together with other matters properly relating thereto.

TITLE

AN ORDINANCE INCORPORATING WATER USE RESTRICTIONS IN THE INDIAN HILLS GENERAL IMPROVEMENT DISTRICT, PROVIDING FOR DEFINITIONS AND PENALTIES: DECLARATION OF WATER SHORTAGE; INCORPORATING WATER RATES PROVIDED WITHIN AND OUTSIDE THE BOUNDARIES OF THE INDIAN HILLS GENERAL IMPROVEMENT DISTRICT; TOGETHER WITH OTHER MATTERS PROPERLY RELATING THERETO.

THE BOARD OF TRUSTEES OF THE INDIAN HILLS GENERAL IMPROVEMENT DISTRICT DOES ORDAIN:

Section 1: Declaration of Purpose:

1. The Board of Trustees of the District recognizes the importance and appropriateness of conserving domestic water, which purpose requires the imposition of certain restrictions on use in certain circumstances in order to prevent unnecessary use or waste.
2. In order to assure that the District can provide adequate supplies of water to its citizens, the Board of Trustees may, after a declaration of water shortage is made as provided herein, additionally restrict the use of water for certain irrigation or household purposes, and/or limit the time within which water may be used for those purposes. In furtherance of that goal, the Board enacts this ordinance pursuant to its authority granted by NRS 318.170.

Section 2: Definitions:

As used in this ordinance the following words or phrases are defined as follows:

1. "**Board**" means the Board of Trustees of the Indian Hills General Improvement District.
2. "**Declaration**" means the declaration of water shortage by the Board when it appears to a majority of the Board that either insufficient water is available to meet the reasonable needs and requirements of the District, or that there is insufficient potable water for human consumption as determined by the Nevada State Health Department or the Douglas County Health Officer.
3. "**District**" means the Indian Hills General Improvement District.
4. "**District Agent**" means the District manager, engineer maintenance supervisor, or Board member.
5. "**Household Purposes**" means the purposes for which a person uses water inside a residence, and excluding all outside irrigation uses.
6. "**Irrigate**" means, but is not limited to, irrigate, water, moisten, sprinkle, soak, waterlog, flow, wet or any supply of water to land by natural or artificial means for other than household purposes.

Adopted June 9, 1999

**Indian Hills General Improvement District
WATER USE RESTRICTION ORDINANCE NO. 001**

7. **"User"** means, but is not limited to, the record owner of the property or location as such owner is defined by the records of the Douglas County Assessor, or a tenant residing at such location.

8. **"Water Waste"** means, but is not limited to; violation of the water use restrictions, or the careless consumption of water as evidenced by irrigation overflowing or puddling on a property and/or flowing from property into gutters, streets, gullies, neighboring property or washes for more than 30 (thirty) minutes.

Section 3: Water Use Restrictions in the event of a Declaration of water shortage:

1. Upon declaration by the Chairman of the Board, after a majority vote of the Board, taken at a regularly held meeting, at a specially called meeting or after a telephone canvass of Board members by the District agent, the Board may impose any or all of the following restrictions:

- A. Require that irrigation be conducted only as may be permitted by the decision of the Board at the time of the Declaration of Shortage.
- B. Prohibit the use of water for other than household purposes.

Section 4: Non-emergency Restrictions:

- 1. Without declarations by the Board of a water shortage, and continuously in effect, in no event shall a water user irrigate or use water for other than household purposes between the hours of 12:00 noon to 4:00 p.m.
- 2. In no event shall a water user waste water in violation of this ordinance as water uses are defined in Section 2 herein.
- 3. In no event shall a water user irrigate during high-wind periods, defined as continuous winds in excess of an average speed of 15 miles per hour.

Section 5: Exemptions:

- 1. The Board may exempt the following uses of water:
 - A. Lawns which have been planted within thirty (30) days of the date restrictions are imposed.
 - B. Professional gardeners or landscapers when performing professional services.
 - C. Flower and vegetable gardens

Section 6: Penalties:

1. Any user found by the agent of the District to be in violation of this ordinance, may, in addition to being subject to all rights and remedies of the District at law, be subject to the following:

During one watering season:

- A. **First violation:** A user found to be in violation of these provisions shall be warned by the District agent, orally or in writing.
- B. **Second violation:** A user found to be in violation of these provisions on a second occasion shall be warned by certified mail or served in person by the District agent.

Adopted June 9, 1999

**Indian Hills General Improvement District
WATER USE RESTRICTION ORDINANCE NO. 001**

C. **Succeeding violation:** A user found to be in further violations of these provisions shall have water service discontinued and a fine of \$50.00 (fifty dollars) shall be assessed. The water service shall be resumed upon receipt of the \$50.00 fee.

D. Each and every day of violation of this ordinance is deemed to be a separate and succeeding violation.

2. Nothing contained herein shall prevent the District agent, without notice to any resident, from entering a property and halting water waste, or, if the entrance to the property is not possible, from causing water service to the property to be halted.

3. It is the intention of the Board of Trustees of the Indian Hills General Improvement District that any and all penalties delineated herein shall be paid by the user in violation.

Section 7: Appeals:

1. Any person aggrieved by the actions of the District agent in the enforcement of this ordinance, may appeal such action to the Board.

2. An appeal may be taken within ten days after written notice of the action of the agent of the District by paying to the District the fee of \$25.00 (twenty-five dollars), in addition to any fee or penalty assessed pursuant to this ordinance, and filing a written statement of the reasons why the action of the agent of the District is in error.

3. The Board shall hear the appeal within forty-five (45) days after the filing of the statement of the reasons. The Board shall give the appellant three (3) days written notice of the date, time and place of the hearing.

4. Any person who fails to file a written statement with the District within three (3) days after notice of the action of the agent of the District waives his right to appeal.

5. Upon a person's failure to timely file for appeal, or upon final action by the Board with respect to an appeal, the Board may pursue any of its rights and remedies contained at law or in this ordinance.

Section 8: Severability:

1. It is declared to be the intention of the District that the sections, paragraphs, sentences, clauses and phrases of this code are severable, and if any phrase, clause, sentence, paragraph, or section of this code is declared unconstitutional or invalid by the valid and final judgment or decree of a court of competent jurisdiction, such unconstitutionality or invalidity shall not affect any of the remaining phrases, clauses, sentences, paragraphs and sections of this code.

Adopted June 9, 1999

HOW TO READ YOUR WATER METER

Locate Your Meter

Most water meters will be located outside in front of your house next to the curb on the street under a steel or concrete lid.

Reading Your Meter

There are two basic types of meters; a dial with a needle that measures in tenths of a cubic foot and a digital meter that measures from 100,000 down to 1 cubic foot. Most meters also have a small triangle on the face called a flow indicator. It will move when there is water passing through it. Read your meter from left to right.

Measuring Water Use Activities

It is possible to measure the water use of certain activities. These activities include but are not limited to the following:

- Shower or bath use.
- Watering the lawn.
- Washing clothes or dishes.
- Flushing a toilet
- Washing a car

To measure the water use of an activity, do the following (in order):

1. Make sure all water off. This includes all faucets (inside and out), appliances, swamp coolers, or icemakers.
2. Write down the meter reading to two decimal places.
3. Perform the activity. Be sure to measure the amount of time in minutes that the activity required.
4. At the end of the activity read the meter again. Subtract the first meter reading from the second one. The result is the amount of water used for the activity in cubic feet. To convert to gallons multiply the result by 7.48. To determine how many gallons per minute were used divide the gallon amount by the number of minutes the activity required. You should now have the water used amount in *gallons per minute*.

Detecting Leaks

1. Make sure all water off. This includes all faucets (inside and out), appliances, swamp coolers, or icemakers.
2. Write down the meter reading and time of day to the minute.
3. Wait at least an hour before reading the meter a second time. Make sure no water is used during the test. Read the meter at the end of the test and record the time to the minute. If the flow indicator is moving during the test you may have a leak.

4. Subtract the first meter reading from the second. Multiply the remainder by 7.48. The result is the amount of water in gallons that passed through the meter during the test period. Also record the time duration of the test.
5. Divide the amount of water by the number of minutes in the test. The result is the amount of water that went through the meter in *gallons per minute*.
6. To measure amount lost over time multiply the gallons per minute by the following:
 - 1,440 for gallons per day.
 - 43,920 for gallons per month.
 - 527,040 for gallons per year.
7. Locating a leak is a process of elimination. Shut off one toilet at a time at the wall. Go to the meter and check to see if the flow indicator (triangle) is still moving. If the triangle has stopped you have discovered the leak. If not go on to the next one and repeat the above steps.
8. Check your sprinkler system. Shut off the system at the anti siphon valve and check the meter.
9. Check your main service line. You will need to shut off the valve between your house and the meter. If the meter stops the leak is between the meter and the valve.
10. These steps can be repeated for every fixture and fitting in your home. In the event you cannot locate the leak, you should call a professional plumber to find and fix it.