Blue Diamond
Water Conservation Plan

OVERVIEW

In May 1992, the Las Vegas Valley Water District (District) took over operation and maintenance of the Blue Diamond public water system. In 1994, the District entered into a water supply agreement with the owner of a nearby mine, James Hardie Gypsum, which transferred rights to 150 acre-feet of water from James Hardie Gypsum to the District for use in the Blue Diamond area.

It is estimated that the Village of Blue Diamond has approximately 439[*] residents. The Blue Diamond public water system serves approximately 118 customer accounts, the majority of which are residential.

Physical Setting

Blue Diamond is located in the extreme southwestern Las Vegas Valley, approximately 15 miles southwest of Las Vegas and about 3 miles northwest of the intersection of State Routes 160 and 159. The Village of Blue Diamond lies within the Red Rock Canyon National Conservation Area, which provides for certain development standards. The Village lies in the extreme southwestern portion of the Las Vegas Valley hydrographic basin.

Water Sources and Allotment:

As noted above, the District has existing permitted water rights totaling 150 acre-feet for use in the Blue Diamond area. Based on current usage patterns in the Village of Blue Diamond, approximately 90% of the supply is committed.

Climate

Blue Diamond experiences a desert climate with hot summers and cool winters. Summer temperatures generally stay in the high 90s, while winter temperatures remain around the low 40s. The area averages over 290 days of sunshine and approximately 5 inches of precipitation per year.

Water System

The Blue Diamond public water system is supplied by two groundwater wells, Blue Diamond North (BDN) and Blue Diamond South (BDS). Both wells were drilled in the 1950s and reach a depth of 75 feet. These wells are not owned by the District, but by CertainTeed Corporation, formerly known as the James Hardie Gypsum Mine. The wells are configured to provide water to both the mine and the Blue Diamond public water system. Storage capacity for the public system is 261,000 gallons in two tanks located on a hillside immediately south of the Village. The booster pump that provides water to the storage tanks is also owned by the Hardie Mine. Pumping runs intermittently on an as-needed basis.

[*] Clark County Department of Comprehensive Planning, Southern Nevada Consensus Population Estimate, July 2007, http://www.co.clark.nv.us/comprehensive_planning/Advanced/Demographics/2007/2007PlacePopulationEstimates.pdf

Because of the wells' location within the state-protected Red Rock Canyon National Conservation Area, potential contaminants to the Blue Diamond water system are few.

CONSERVATION PLAN

Background

Nevada Revised Statutes (NRS) requires each water supplier that provides water for municipal, industrial or domestic purposes to adopt a water conservation plan. Senate Bill 62, passed in the 2005 Nevada legislative session, added a provision requiring conservation plans to be updated every five years. The law was again modified in the 2007 legislative session to require specific water savings estimates and pricing criteria in each plan. The Blue Diamond Water Conservation Plan was developed both to meet this requirement and to promote more efficient water use by current and future residents.

Groundwater is the sole natural resource used to meet water demands in Blue Diamond. Methods critical to managing and extending this physical resource include water conservation, prudent land use practices and a sustainable approach to any development. Conservation provides an additional resource by freeing up water that was previously consumed inefficiently or wasted. In one sense, it is the cheapest source of water available to the community. It is also a resource over which the community has almost complete control, because future availability depends more on individual customer efforts and less on influences outside the community.

To this end, the Blue Diamond Service Rules allow the District to reject, rescind, reduce or terminate current or proposed uses of water where such uses:

a) Are contrary to the District's obligation to ensure reasonable use including, but not limited to, compliance with rules for water efficiency, drought, conservation and the use of non-potable water for irrigation.
b) May encumber or impair the District's ability to maintain an adequate level of service to other customers.
c) Compromise public health, welfare or safety due to circumstances that limit the available water supply to the Blue Diamond Water System.

Growth potential in the Village of Blue Diamond is very limited given the community's isolated location and its proximity to environmentally sensitive areas such as the Spring Mountain Ranch State Park and Red Rock Canyon National Conservation Area. As a result, the potential for further increases in water demands is very small.

Water Management

All water delivery systems experience some degree of system loss. The benchmark system loss commonly used in the industry as an indicator of efficient operation is about 10%. Blue Diamond's unaccounted for water is currently estimated at about 33%. This loss can be attributed to a number of factors, including system leaks tied to old or aging infrastructure, variations in meter accuracy and water theft.

The District is working on a capital improvement plan to improve the system's existing infrastructure. However, Blue Diamond is a financially self-sustaining system with a very small customer base, meaning it has little economy of scale with which to absorb large capital costs. Consequently, any proposed improvements will depend primarily on

the acquisition of grant funding or other sources to offset the costs to the community and its residents.

All Blue Diamond customers have a water meter. Water meters help identify customer water use, volumes and patterns. This information is a valuable tool in helping to plan future infrastructure needs for the area as well as in identifying system leaks and losses. While all meters are functioning properly with minimal maintenance, there is an opportunity to upgrade existing meters with technology that will identify leaks on the customer's property, therefore saving the system additional water.

Subject to available grant funding and additional study, the District will explore the installation of automatic meter reading systems to all existing water meters. This can assist in identifying water leaks or water loss at the water user's location, and can quantify overall water loss in the Blue Diamond Water System by comparing production quantities with end user quantities. Customers can use consumption information to better manage their water use.

Blue Diamond also has 16 Permalog units installed in the area. Permalog units are typically installed on water valve nuts located within the main distribution system. During the night, Permalog units "listen" for leak sounds that travel along water pipes. If no leak is detected, a signal is transmitted to the District to indicate the system is normal. However, when a possible leak is detected, the Permalog unit transmits a notification to the District that there is a possible leak in the system. This allows the District to identify and correct leaks early and also ensure that necessary repairs can occur under regular maintenance activities. Early leak detection helps minimize the amount of water that is lost within the system.

As described in the next section, improving the system's infrastructure over time may yield a substantial amount of water savings for the water system and increase overall system efficiency. For this reason, long-term capital improvements will remain the District's top priority in trying to improve the Blue Diamond Water System.

Conservation Effectiveness Measures

The District maintains water pumping and consumption records for the Blue Diamond Water System, which are retrieved through the District's Supervisory Control and Data Acquisition (SCADA) system. SCADA provides reliable, real-time, high speed communications over wide areas. The system monitors data from various sensors throughout the Las Vegas Valley and transmits real-time data back to the District for analysis and review. Using baseline and post-implementation data, the District will calculate water conservation estimates, which will be communicated to the community.

The "gallons per capita per day" (GPCD) metric is used by some communities to measure water consumption and as a general means of establishing conservation goals and water-use benchmarks for tracking purposes. A variety of factors influence per capita use, including climate, demographics, building density, and local business or industrial water use. In calculating total system GPCD for the Blue Diamond Water System, the District combines residential and commercial deliveries and system water losses. Blue Diamond's total system GPCD is calculated by first dividing the total

annual system use by the estimated population of the Blue Diamond system, then dividing by the days in a year (365). Population figures are taken from the Clark County Department of Comprehensive Planning's Southern Nevada Consensus Population Estimate, July 2007.

For baseline purposes, Table 1 provides the current estimated GPCD for the Blue Diamond water system.

Table 1. Blue Diamond Water System – Total System GPCD

Year	Usage	Population	GPCD
2006	43,592,000	439	272

For the Blue Diamond Water System, a number of challenges exist with calculating a usable GPCD for conservation purposes. First, some residents that are included in the population figures may rely on domestic wells rather than the community's public water system. Because there is no documented data outlining the number of people who occupy Blue Diamond homes served by domestic wells versus the public water system, the GPCD number in Table 1 is accordingly imprecise. In addition, research indicates that population estimates for the area vary significantly depending on the source or methodology used. The population estimate used for this plan is taken from the most recent Clark County estimate, but it is possible the actual number is significantly higher or lower, which would affect the resulting GPCD.

Third, Blue Diamond's estimated system loss has a significant influence on estimated GPCD, which, in conjunction with the potential variances in the population data, creates greater uncertainty when using the GPCD in Table 1 as a benchmark for tracking overall performance to conservation goals. Upgraded infrastructure and more efficient meters will decrease the amount of system loss that the system currently experiences, thereby providing a more accurate GPCD for the system in the future. However, the timing and likelihood of such changes (particularly major capital improvements) is subject to funding considerations that have yet to be resolved. Until then, it is possible that little or no GPCD improvement will be seen if the large system losses continue, even with significant conservation efforts by individual residents.

Lastly, the largest single water use on the system is a community park operated by Clark County. The park provides a large, multipurpose recreational area for Blue Diamond residents and other visitors. Currently, the park's irrigation accounts for an estimated 10% of the system's total water consumption. While a certain GPCD reduction may be achieved through more efficient watering practices at the park (or even landscape conversion), it is possible that such opportunities will be limited, given the park's role in contributing to the overall community's quality of life, scenic appeal and residential environment.

Table 2 demonstrates the various influences these issues may have on the system's estimated GPCD.

Table 2. Blue Diamond Water System – Estimated Actual GPCD

Variables	Year 2006 Usage	Population	GPCD
All system production included	43,592,000	439	272
If system loss reduced to 10%	33,565,404	439	209
System loss to 10% and not including park irrigation	28,935,404	439	181

The first row provides the total system GPCD with all system production and estimated losses included. The second row calculates a provisional actual GPCD if the estimated 33% of unaccounted for water were reduced to the industry standard 10%.[†] The third row provides a provisional actual GPCD if current system loss were reduced to the industry standard 10% and the park's irrigation consumption were excluded from the system calculation[‡].

The greatest opportunity for GPCD reduction will come from improving the Blue Diamond Water System. GPCD reduction will largely depend on the availability of funding available to make these improvements. As funding becomes available, the District will update and improve the water system, thereby making it more water efficient. Although public education and outreach is an integral part of any water conservation plan, it is difficult to quantify the savings yielded from aggressive outreach activities. To this end, the District estimates that system improvements combined with more aggressive conservation outreach and education will yield a 10% reduction in GPCD over a ten-year time frame. As the system's infrastructure is updated and replaced and residents respond to conservation messaging, the Blue Diamond Water System's should experience a reduction in daily water use to approximately 245 GPCD (a reduction in per capita daily use of 27 gallons over the period). The conservation measures on the following page indicate the estimated GPCD water savings goals in bold.

Several opportunities still exist to work with the residents of Blue Diamond to promote further water conservation and reductions in the community's GPCD. The following section outlines different programs the District has available to encourage increased water efficiency (and greater water savings) in Blue Diamond.

[†] To calculate this, the overall 2006 system loss is used as the baseline (33% of 43,592,000 gallons, which is 14,385,360 gallons). To reduce that to a "10% loss," the 14,385,360 gallons is multiplied by 30.3% -- the relative proportion represented by the industry standard 10% compared to the actual 33% estimated. This results in 4,358,764 gallons.

[‡] Blue Diamond County Park Consumption for 2006 = 4,630,000 gallons.

WATER CONSERVATION MEASURES

At a minimum, the District uses the following measures to promote water conservation among customers, including customers in Blue Diamond (estimates of reductions estimated to be achieved through the implementation of each measure is included in brackets):

1) Perform Indoor Water Audit Survey and Fixtures Retrofit [3 GPCD]. Indoor and outdoor water use audits are available to assist Blue Diamond residents in identifying leaks and high water use areas within the home. The audits provide tools and reference materials that aid in water conservation, including high efficiency water devices.

Based on Southern Nevada Water Authority (SNWA) conservation estimates, approximately 93 homes in the Blue Diamond area were built prior to 1994. Originally introduced in 1992 and amended in 1993, NRS Chapter 278 establishes building codes that require more efficient water fixtures. The codes include limitations on water flow on shower fixtures, toilets and faucets. If left without retrofitting, homes built prior to 1994 may be using inefficient fixtures and appliances. Updating toilets, faucets and showerheads can help conserve water and save homeowners' money. Table 3 identifies common household fixtures and their associated water efficient rates of flow before retrofit and post retrofit, assuming they are retrofitted with water-efficient fixtures.

Additionally, small changes in lifestyle can provide substantial water savings. For example, a five-minute shower uses approximately 10-25 gallons of water, whereas a full bath tub requires about 70 gallons of water. According to the Environmental Protection Agency, turning off the water while brushing teeth in the morning and night can save over 200 gallons of water each month.

Table 3.

Fixture	Non-Efficient	Efficient	Estimated Savings
Toilet	3.5 – 7.0 gallons per flush	1.3 gallons per flush	1.2 - 6.7 gallons per flush
Pool	50 – 70 gallons per square foot lost to evaporation	5 - 7 gallons per square foot lost to evaporation	90% savings
Shower	Varies	2.0 – 2.5 gallons per minute	2,000 gallons of water annually saved when two faucets / showerheads are replaced
Sink	Varies	1.5 gallons per minute (bathroom) 2.2 gallons per minute (kitchen and laundry)	
Washing Machines	41 gallons per load	28 gallons per load	13 gallons per load
Dishwashers	9 – 12 gallons per load	4 – 7 gallons per load	Up to 8 gallons per load

2) Encourage regular maintenance of water fixtures and appliances [3 GPCD].
The District will also encourage Blue Diamond residents to proactively ensure their faucets and fixtures are not leaking. According to the United States Environmental Protection Agency, leaky faucets that drip at a rate of one drip per second waste more than 3,000 gallons of water each year. To check for leaks, residents are encouraged to read their water meter before and after a two-hour period when no water is being used. If the meter does not read exactly the same, it may be due to a leak. Additionally, leaky toilets can waste approximately 200 gallons of water each day. To check if a toilet has a leak, residents are encouraged to place a drop of food coloring in the tank. If the color shows in the toilet without flushing, the toilet is leaking.

Copies of "Detecting and Silencing Leaks", a video that provides residents with step-by-step instructions about finding and fixing leaks, are available to residents upon request. The free video was produced by the SNWA in both DVD and VHS formats.

3) Public Outreach [3 GPCD].

A) Youth Education – For over eight years, the SNWA has operated a youth education program that offers water conservation information to students in the Clark County School District. As part of this program, the SNWA has partnered with the newly opened Springs Preserve to provide a quarterly newsletter, *Desert Discovery*, to students in Blue Diamond. *Desert Discovery* is an educational newspaper for school children (K-5) that provides information on water and environmental issues, including conservation.

B) Library Display – Displays and literature will be established at the Blue Diamond Library to address a variety of issues, including conservation.

C) *Water Watch* Newsletter – The District will continue to publish its quarterly *Water Watch* newsletter, which educates Blue Diamond residents on water system issues as well as provides tips to encourage water conservation and efficiency in the Blue Diamond area.

4) Encourage pool owners to utilize a pool cover [3 GPCD].
An exposed pool can lose up to 50 gallons of water per square foot per year to evaporation. Pool covers reduce evaporation by 90 percent, limit windblown debris and conserve energy. Blue Diamond pool owners are encouraged to cover their pools to conserve water and save money on their water bills. There are approximately 6 pools that have been identified in the Blue Diamond area.

5) Encourage residents to replace sprinkler irrigation with drip systems when watering trees and shrubs [4 GPCD].
The residential landscapes of Blue Diamond feature mature trees and shrubs that provide shade, absorb carbon dioxide, reduce soil erosion, provide homes for wildlife, decrease energy use, lessen noise pollution, lower air temperatures and reduce storm runoff. While trees and shrubs provide a host of benefits, they can also be a source of inefficient watering practices. Instead of using sprinklers,

Blue Diamond residents are encouraged to utilize drip systems to water trees and shrubs. Drip systems are substantially more water efficient than sprinklers because they limit the amount of water wasted and provide a deeper soak than sprinklers. Residents are also encouraged to visit snwa.com for more information about drip emitters or visit the Springs Preserve, which offers classes on the installation of drip irrigation systems.

6) Encourage the use of Smart Controllers and rain sensors [4 GPCD].
Watering during rainy periods can give a landscape more water than it needs, causing soil over-saturation and wasteful runoff. By turning off the sprinklers on days surrounding a heavy rain, homeowners can save approximately 500 gallons of water in one day.

Water "smart" irrigation controllers automatically adjust watering schedules based upon water conditions. These controllers use sensors and weather information to manage watering times and frequency. As environmental conditions change, the controller increases or decreases watering frequency. Smart controllers reduce outdoor water use by an average of 15 to 30 percent.

Through the collaborative efforts of the District and Clark County Department of Parks and Recreation, the park in Blue Diamond is now equipped with a rain sensor that senses precipitation and shuts off the irrigation system to the park. This technology will save the park and the Blue Diamond Water System substantial water resources during rain events.

7) Encourage the removal of ornamental turf [4 GPCD].
The SNWA conducted a five-year study that documented substantial water use reductions by converting turf grass to xeric and/or drought-tolerant plant material. The study found that residents in Southern Nevada annually applied an average of 73 gallons of water per square foot of turf, but just 17.2 gallons annually per square foot after converting turf areas to "water smart" landscape plantings. Consequently, it is estimated that landscape conversions can save approximately 55 gallons of water per square foot converted annually.

The residents of Blue Diamond will be encouraged to convert unused, ornamental turf to more water efficient landscapes. Residents can visit snwa.com for plant ideas, a list of water-smart landscapers and sample landscape designs for ideas to get their project started.

8) Evaluate future options for a tiered rate [TBD if implemented].
Blue Diamond water rates are currently set at $1.55 per thousand gallons. The amount of water customers use has a direct correlation to the amount paid for water service. The District recognizes that other types of pricing structures, including increasing block rates, provide financial incentives for the largest water users to implement more aggressive conservation measures. The District will continue to assess the water system's funding, infrastructure and conservation needs to identify opportunities in the future to implement tiered rate structures, when appropriate.

9) Work with local partners to encourage conservation in the area [3 GPCD]. The District will continue to work with local, state and federal partners to encourage and promote sustainable measures and best water conservation practices among businesses and residents in the Blue Diamond area.

Other Conservation Measures

Water Reuse. Treating effluent wastewater provides an opportunity for reuse in cases where a potable source is not required (for example, irrigation). The Clark County Water Reclamation District operates a gravity flow collection system for Blue Diamond. The treatment facility discharges to a primary evaporative pond and occasionally to one of the two secondary evaporative ponds located in the area. Currently, there is no water reuse in Blue Diamond, as there are no large areas of irrigated turf in the area (outside of the community park) that would benefit from highly treated wastewater.

Emergency Response

In the event of a water supply emergency within the Blue Diamond Water System, the District will respond in accordance with its Emergency Response Plan. This includes making all reasonable efforts to minimize impacts when water service is interrupted and taking steps to minimize the long-term effects of an emergency to operations. The Emergency Response Plan provides for a number of options and tools for responding to emergency activities, including:

- 24-hour maintenance and response
- 24-hour emergency response line
- Delivering bottled water to customers impacted by an interruption to normal water service
- Use of reasonable efforts to notify residents of any emergency water supply conditions, including phone calls, mailers, fliers, signs, email or any combination thereof

DROUGHT CONTINGENCY

In the event of a continued and sustained drought where water levels within the Blue Diamond wells reach depths that are critically low, the District will focus on reducing non-essential uses and waste, including limiting highly visible uses of water even if they produce nominal efficiency gains. The following specific measures are potential options for the Blue Diamond Water System's use in the event of a drought emergency.

1) Mandatory Watering Restrictions

Implementing appropriate watering restrictions that would limit or prohibit landscape watering in order to preserve system supplies and reduce operational demands on the system's wells. The nature and duration of the restrictions would be dictated by the situation.

2) Outdoor Water Use Restrictions

Implementing restrictions (limiting or restricting) for the washing of personal vehicles on residential properties. If limited, a positive shut-off nozzle would be required.

3) Landscape Development Codes

Landscape development codes could be implemented to limit the amount of turf allowed for installation in new homes.

5) Drought Surcharge

Drought surcharges are temporary pricing measures intended to encourage reduction in water consumption during drought conditions. Drought surcharges are a pricing strategy based on the economic law of demand that states as the price of a resource increases, the demand for the resource decreases, thereby balancing resources with customer demands.

The District could implement a drought surcharge, which could be modified as needed based upon the community's performance in meeting water demand reduction goals.

6) Supplement Water Resources

The District recognizes the need for ensuring a reliable water source for the Blue Diamond community. At present usage levels, the system has access to an unused groundwater supply equal to about 10% of its current demands. This available unused supply is expected to remain steady in the future, given the limited potential for growth in the area and the ongoing emphasis on conservation. To offset the impacts of severe drought, the District has options to supplement Blue Diamond's existing water resources, including the use of bottled water, water truck deliveries, well deepening, and even temporarily or permanently connecting Blue Diamond's infrastructure to the District's Las Vegas Valley service area.

IMPLEMENTATION STEPS

The District, as the owner and operator of the Blue Diamond Water System, is committed to conservation and sustainability as part of its strategic planning process. Education of the customer base through speaker presentations, printed materials and distribution of low-flow devices will be the first step towards increasing water efficiency in the Blue Diamond area. Given the relative status of the system and variables such as system loss, a long-term target of 15% improved water efficiency (based on the total system GPCD) seems an appropriate goal over the next five years. This would attempt to reduce the current 272 GPCD to approximately 231 by 2013, through a combination of conservation efforts and general system improvements (if funded).

It is expected that the greatest water savings will be achieved through identifying and minimizing unaccounted water losses in the system. Efforts are ongoing to identify and replace older infrastructure and technologies in the Blue Diamond water system, and the District is currently in the process of identifying funding opportunities to cover the high costs of infrastructure replacement and updated leak-detection technologies installation. Given the small customer base from which costs must be recovered, any schedule for replacing older infrastructure in the Blue Diamond water system will remain entirely dependent on securing grant funding for the necessary improvements.

Until then, education and outreach is ongoing with quarterly Water Watch newsletters distributed quarterly to Blue Diamond customers; monthly bill inserts that feature useful information to make informed decisions about watering practices, conservation tips and general water-related information; and meetings with the local citizens advisory council and residents. In addition, the District continues to work closely with Clark County representatives to ascertain opportunities for improving the watering schedule for the community park.

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