M E M O R A N D U M

To: Alysa Keller, Legislative Counsel Bureau
From: Jason King, State Engineer
Date: April 19, 2016
Re: Legislative Commission Sub-Committee to Study Water

Below please find brief white papers that address four areas of concern the State Engineer believes would be useful for the Sub-Committee's consideration in managing Nevada's water resources.

TOOLS FOR MANAGING OVER-APPROPRIATED GROUNDWATER BASINS

Currently, the water law provides limited processes for addressing the issue of over-appropriated groundwater basins – namely curtailment by priority or designation as a Critical Management Area (CMA), which provides for the development of a groundwater management plan (GMP) by water users in the basin. See NRS 534.037. One problem with the CMA statute as currently written is that any petition for approval of a GMP must be signed by a majority of the holders of permits or certificates to appropriate water in the basin that are on file in the Office of the State Engineer. It is not clear what is meant by "majority." If one person holds 5 permits, does that person get five votes? If one person holds one permit, but that permit is for the majority of water in the basin, does that person get one vote? Another issue is that, as currently written, the law does not provide for input by domestic well owners and they have no vote for the approval of a GMP. However, in some basins there are more domestic wells than water right permits, so if given one vote each, they would be a majority. Additionally, if curtailment is to occur, the use of water by domestic well owners not in priority will be curtailed entirely leading to the argument that the domestic well owners should also have a "say" in the GMP. Another problem, and perhaps the biggest, is that it is not clear what tools are available for use under a GMP. For example, there has been statewide discussion regarding the "use it or lose it" provisions so central to the Prior Appropriation Doctrine and whether those provisions of the water law could be suspended under a GMP. It is not clear whether the provisions of that doctrine, such as forfeiture, can be waived for conservation of water under a GMP. It cannot be over stated, GMPs need clearly established tools that can be employed in bringing groundwater basins back into hydrologic balance that may be outside the current water law.

EXHIBIT K - WATER
Document consists of 10 pages.
Entire exhibit provided.
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Another very important aspect of this issue is the ability of the Office of the State Engineer to recognize and approve GMPs in severely over-appropriated groundwater basins **OUTSIDE** of a CMA basin designation. Currently, there is no provision in the water law for the implementation of a GMP without the CMA designation. Even without a GMP, the State Engineer needs new tools to prevent waste and/or overuse of water in over-appropriated basins. This also applies to basins in hydrologic balance in times of drought.

Senate Bill 81 of the 2015 session was an attempt to achieve this goal. It was refined through the various workshops that were held with various stakeholders and is believed to have been a good start at accomplishing the goal of providing additional tools for use in a GMP. However, it failed to pass.

The State Engineer encourages this committee to consider legislation that continues to refine Nevada water law and provide flexibility in the development and acceptance of Groundwater Management Plans, whether in a Critical Management Area or not.

CONJUNCTIVE WATER MANAGEMENT

Surface Water and Groundwater Have Historically Been Managed as Separate Sources

Surface water and groundwater may have a natural hydrologic connection; however, in Nevada, with a few exceptions, surface water and groundwater have historically been managed as separate sources of water. This separate management appears to be a relic of the history of how water was developed in the state and the policy focus that the use of water was beneficial for the growth of the state; however, current science and events are challenging this management scheme.

Of course, the early history of water development in Nevada focused on the use of surface water. By the late 1800s, the mining industry had collapsed and our governors looked to cure Nevada's economic ills through reclamation of desert land to provide an economy partially based on agriculture. It was not until 1907 that issues regarding the use of groundwater begin to emerge. When the first flowing well was drilled to support the settlement of Las Vegas[1] and uncapped artesian wells were permitted to flow freely onto the desert floor, large quantities of water were wasted. This intensive groundwater use led to steady declines in spring flows and groundwater levels throughout Las Vegas Valley and by 1908 spring flows began to wane.[2] But history does not demonstrate concern with the loss of spring flow.

1 Michael Pavelko, David Wood and Randell Laczniak, *Las Vegas, Nevada, Gambling with water in the Desert*, USGS, p. 52, 1964.
2 *Ibid.*

Up until 1909, little attention was paid to groundwater other than the use of water for Carey Act agricultural projects and artesian wells in areas such as Las Vegas and Pahrump. During this time, the general water law still only applied to surface water, but, after 1911, the State Engineer started to report on the availability of groundwater to support Carey Act projects.

By 1912, there were approximately 125 wells in the Las Vegas Valley discharging nearly 15,000 acre-feet per year and 60% percent of these wells were flowing-artesian wells.[3] So, in 1913, legislation was enacted providing for conservation of underground waters by requiring casing and capping of artesian wells. This is the first formulation of Nevada Revise Statute Chapter 534. This was the year the legislature also enacted a new general water law that provided that all water, both surface water and groundwater, was subject to appropriation.

Even with the enactment that allowed for the appropriation of groundwater, little attention was paid to groundwater other than the areas with artesian water sources. Through 1918 only 109 applications had been filed to appropriate groundwater,[4] so certainly there is no concern with the use of groundwater affecting surface-water supplies.

In the early 1930s, State Engineer Malone wrote about the groundwater/surface-water connection and stated that while the rain or snow that entered into the groundwater supply was not subject to evaporation or transpiration losses, this underground water has outlets, such as springs or wetlands. But he also stated that the rainfall that penetrates deeply enough became part of the underground supply and you could estimate the probable quantity of groundwater that can be used from the area by estimating the cover growth of indicator plants.[5] This is a discharge analysis that can be used to estimate the perennial yield of a groundwater basin, which became the management concept to appropriate groundwater in Nevada. This is a demonstration of the thinking that these resources were to be managed as separate sources of water.

State Engineer Malone stated that valley floor springs and water mounds are good indicators that the groundwater reservoirs under these valleys are filled and some of that water is "escaping" through springs and that the pumping of water from an artesian supply will reduce "losses" of water through natural outlets and result in a greater available groundwater supply. If agriculture and the economy of the state were going to expand, it had to be through the use of groundwater. By the early 1930s, the State Engineer wrote that groundwater now formed practically the only potential future water supply for Nevada. He recognized the

3 *Ibid.*
4 Hugh A. Shamberger, *Evolution of Nevada' Water Laws, As Related to the Development and Evaluation of the State's Water Resources from 1866 to 1960,* State of Nevada, Dept. of Conservation and Natural Resources, Division of Water Resources, USGS, p. 33, 1991.
5 State of Nevada, *Biennial Report of the State Engineer*, 1929-1930.

connection between groundwater and surface-water discharge, but also indicated that the development of groundwater was Nevada's future.[6]

Around this same time, the State Engineer was instructed to designate administrative underground areas and subareas, and to only issue permits if there was a positive determination that there was unappropriated water in the area. So, by 1935, there were designated areas (a reflection of the hydrographic basin approach), the use of a perennial yield based on a discharge analysis (a determination that groundwater was a separate source of water), and the policy decision that the development of Nevada's groundwater resources was to be encouraged for the good of the entire state.

Today, after several years of drought, challenges have been raised that the use of groundwater is impacting senior surface-water rights, which presents an issue the State Engineer encourages the Committee to explore. Water in Nevada is managed using the Prior Appropriation Doctrine, which generally follows the principle of 'first in time, first in right.' Application of the doctrine to conjunctively manage surface and groundwater systems is more difficult than the application of the doctrine exclusively to surface-water systems for which it was initially adopted. The diversion of surface water upstream will impact downstream users in an amount nearly equal to the rate of diversion and often within a relatively short period of time. The effect of groundwater pumping propagates through an aquifer in all directions. Ultimately, the effects of groundwater pumping may reach a surface-water source and result in depletion of that source. The rate of depletion is often less than the rate at which groundwater is pumped and extends over a longer period of time. Because of this often slow-to-develop connection between groundwater and surface water, water use pursuant to existing groundwater rights may conflict with senior surface-water rights.

The State Engineer believes that legislation addressing conjunctive water management is imperative to Nevada's future. It is also important to recognize that the Legislature has declared that it is the policy of this State to encourage the State Engineer to consider the best available science in rendering decisions concerning the available surface-water and groundwater resources in Nevada. NRS 533.024. Therefore, before any conjunctive water management would be implemented, significant scientific work must precede it. While the State Engineer believes the Prior Appropriation Doctrine already provides the authority to consider whether the use of groundwater is impacting a senior water right on a surface-water source, what is lacking is a statutory acknowledgment that the two water sources can be hydrologically connected; and therefore, the State Engineer seeks guidance from the Legislature on tools that can be used to address this connectivity problem that are more balanced and equitable for all, rather than just completely prohibiting the use of water by the junior groundwater users.

6 State of Nevada, *Biennial Report of the State Engineer*, 1931-1934.

In order to facilitate the discussion, a distinction must first be made between conjunctive water use and conjunctive water management. The concepts of conjunctive water use and conjunctive water management are distinct, but intertwined. Conjunctive water use is a management approach that recognizes the hydrologic connection between the surface-water and groundwater source and tries to utilize the entire supply more efficiently. For example, use of groundwater by a farmer to supplement a limited surface-water supply in order to get a full growing season is conjunctive water use. A regional water management program that stores surface water below ground during wet years and then pumps groundwater during dry years is also conjunctive water use. The conjunctive water use concept is used to improve the overall availability and reliability of water.

Conjunctive water management is a concept that engages the principles of conjunctive water use, using surface water and groundwater in combination to improve water availability and reliability, and manages the two sources as one in the application of the Prior Appropriation Doctrine. Conjunctive water management requires the use of scientific studies to support water management. Determining what effect groundwater use may have on a surface-water source can be quite difficult and requires expertise in this type of analysis. Conjunctive water management requires monitoring and the evaluation of data to develop local management policies to understand the geology of the aquifer systems, to understand how and where surface water replenishes groundwater and how and where groundwater supports surface-water flows. A goal of conjunctive water management is to allow continued injurious groundwater pumping, so long as the negative impacts to the senior surface-water right holders are mitigated.

Nevada has no statutory provisions that provides for conjunctive management of surface water and groundwater. There is no single consensus on the appropriate implementation of a conjunctive water management program and no single document provides key parameters and standards for successful policies and programs. Nevada can look to other states programs or laws for guidance; however, Nevada must decide for itself what kind of program would work here. The ultimate goal would be to balance and optimize the use of surface-water and groundwater resources while recognizing that economic impacts will be felt. A conjunctive water management program will look at the physical water, economics, water laws, and social elements of such a program with the ultimate goal of improved water management in the particular region. The focus may need to be on local to regional scale programs rather than state-wide programs. For Nevada, the first area that has been drawn into focus is whether groundwater use along the Humboldt River may be affecting the base flow of the river.

A review of what has been done in a few other states is worthy of consideration. These states have found that where surface water and groundwater are connected they need to be managed together and have developed legislation and rules that allows them to manage the surface water and groundwater together while still respecting the Prior Appropriation Doctrine.

Colorado – In 1969, Colorado passed "The Water Rights Determination and Administration Act." Colorado's Revised Statute (C.R.S.) 37-92-102 provides that tributary groundwater be included with the surface water when determining priority under the Prior Appropriation Doctrine. "[I]t is the policy of the State of Colorado to integrate the appropriation, use, and administration of underground water tributary to a stream with the use of surface water in such a way to as maximize the beneficial use of all of the waters of this state." Case law has created a presumption that all groundwater is tributary to the surface stream unless it proved or provided by statute otherwise. *Bd. Of County Comm'rs v. Park County Sportsmen's Ranch, LLP*, 45 P.3d 693, 702 (Colo. 2002). The State Engineer is not suggesting that Nevada should go that far. However, Colorado has established a system of augmentation to allow junior groundwater users to continue to exercise their water rights by having a plan in place to replace the water used that negatively impacts a senior surface-water user, but the plan must be in place prior to a senior surface-water right holder's call for the use of its water right. Nevada's issues on the Humboldt River are past this point.

Idaho – Idaho accomplished conjunctive water management through the rulemaking process. *See* Idaho Administrative Code 37.03.11 "Rules for Conjunctive Management of Surface and Ground Water Resources." These rules apply to groundwater sources from which the diversion and use of groundwater or changes in groundwater recharge affect the flow in a surface-water source or which the use of groundwater by a groundwater right holder affects the groundwater supply available to the holders of other groundwater rights. Idaho's rules allow for mitigation not only to surface-water right holders, but other groundwater right holders. The rules clearly provide that the optimal development of the State's water resources is in the public interest. They provide for delivery calls, but also apply the principle of the "futile call doctrine." However, although a call may be futile, the rules may require mitigation or staged or phased curtailment of a junior-priority use if the diversion and use of the junior-priority water right causes material injury, even though not immediately measureable, to the senior-priority surface or groundwater right. This applies in instances where the hydrologic connection may be remote, the resource is large and no direct immediate relief would be achieved if the junior-priority water use was discontinued. The Idaho rules provide a very specific process of petition that requires information, measurements, data or study results to support the claim of material injury. The petition must also provide the specific names, addresses and description of water rights alleged to be causing material injury. The matter then becomes a contested case before the Department of Water Resources. The rules provide factors in determining material injury and for the submission of mitigation plans.

In 2014, due to drought, the Idaho Department of Water Resources informed the groundwater users within the Eastern Snake Plain Aquifer that their rights might be curtailed. As the data was gathered, they were subsequently notified to curtail groundwater pumping. Mitigation was not enough to address the call by the senior surface-water users. This was a strict application of the Prior Appropriation Doctrine.

Other states that can be looked to for examples are Utah, Washington and Oregon, but each state approaches the concept in a unique manner. The goal for Nevada would hopefully be one that would allow continued groundwater use while addressing ways to make the senior surface-water right holders whole. Any such program must be individually tailored to the stream system and groundwater resources involved. Tools that might be considered are aquifer storage and recovery programs, State-approved augmentation programs, forbearance agreements, direct financial compensation, and water banking programs.

The State Engineer encourages this committee to consider legislation to address conjunctive water management of Nevada's surface-water and groundwater resources.

ADAPTIVE WATER MANAGEMENT

Adaptive management is a concept used in resource development, which has been described as learning by doing. It has been used in business, agriculture, water resource management, fisheries and forestry settings. It is a structured process for decision making in the face of uncertainty with the focus being the reduction in that uncertainty as the understanding of the particular system improves. You learn from what you do and then change management practices accordingly. The aim of the process is to allow the approval of water right applications, with the idea that over time, as information is collected and analyzed, the diversion under the subject water rights can be moved and/or decreased such that conflicts are avoided. The process recognizes that predictions will never be perfect, nothing is absolutely certain, and many questions can only be answered by experiment and experience.

Adaptive management is a systematic approach for improving natural resource management with the emphasis being the collection of information that leads to improvements in resource management from the incorporation of what is learned into the ongoing management scheme. The aim of the process is reducing uncertainty over time from the monitoring of the system under consideration. Adaptive management is a scientific process and, as knowledge is gained, models can be updated and optimal management strategies derived. Key elements of adaptive management address the importance of design and experimentation, the crucial role of learning from policy experiments, the iterative link between knowledge and action, the integration and legitimacy of knowledge from various sources, and the need for responsive institutions. A growing body of professional literature,

reflecting a diverse body of interest and experience in application of adaptive management, has now developed.[7]

It is particularly useful when dealing with complex environmental/resource management problems. For example, no one can with absolute certainty know how a groundwater system will react in response to the pumping and whether there will be impacts to existing water rights or not. This is even more true in large basins where little pumping has occurred. Unless the water is pumped (and many times at large volumes), and data collected and the science improved, the uncertainty in the use of Nevada's resources remains. However, challenges have been raised to the use of the groundwater at all in the face of the uncertainty, which in effect means that the use of Nevada's groundwater is held hostage to the uncertainty. It is claimed that more and more data is needed before decisions can be made about the use of Nevada's water, but that data is unobtainable without actual pumping and use of the groundwater, which requires a water right and a beneficial use of the water. Without adaptive management, attempts to appropriate Nevada's resources could be stymied. It allows for the use of water while trying to find a balance between long-term knowledge gained to protect and utilize the resource and achieving the best short-term outcomes based on current knowledge. It allows for mitigation to avoid conflicts based on knowledge gained in the face of initial uncertainty.

NRS 533.3705 currently allows the State Engineer to limit the initial use of water to a quantity that is less than the total amount approved under the application and provides that the use of an additional amount of water may be authorized by the State Engineer at a later date if additional evidence demonstrates to the satisfaction of the State Engineer that the additional amount of water is available and may be appropriated in accordance with Nevada water law. Adaptive Resource Management should allow for augmentation or mitigation to avoid conflicts with existing rights to maximize the beneficial use of a shared and limited resource. Nevada water law needs to be clarified related to the State Engineer's inherent authority to provide for adaptive management through the implementation of monitoring, management and mitigation plans (3M Plans).

The State Engineer encourages this committee to consider legislation to clarify that adaptive water management is a tool that can be employed in the appropriation, development and use of Nevada's waters. Additionally, prior to issuing a water right permit, NRS 533.370(2) requires the State Engineer make a determination that the proposed water right will not conflict with existing rights. As part of the adaptive management process, the State Engineer encourages this committee to consider legislation that allows *mitigation* of a potential conflict

7 George H. Stankey, Roger N. Clark, Bernard T. Bomann, *Adaptive Management of Natural Resources: Theory, Concepts, and Management Institution*s, U.S. Dept. of Agriculture, Forest Service, General Technical Report PNW-GTR-654, p. 6 (2005).

to avoid the conflict, thereby allowing the full development of the available water resources in the state.

Since 1953, the State of Utah has had the following statute:

> **73-3-23. Replacement of water**
> In all cases of appropriations of underground water the right of replacement is hereby granted to any junior appropriator whose appropriation may diminish the quantity or injuriously affect the quality of appropriated underground water in which the right to the use thereof has been established as provided by law. No replacement may be made until application in writing has been made to and approved by the state engineer. In all cases replacement shall be at the sole cost and expense of the applicant and subject to such rules and regulations as the state engineer may prescribe. The right of eminent domain is hereby granted to any applicant for the purpose of replacement as provided herein.

A similar statute could be crafted in Nevada to read:

> **NRS 533.370(X). Mitigation of Conflicts**
> When considering the approval of a water right application, the right of mitigation is hereby granted to any appropriator whose appropriation may conflict with an existing water right, domestic well or vested claim. The mitigation measure negates the conflict. No mitigation may be made until application in writing has been made to and approved by the state engineer. In all cases replacement shall be at the sole cost and expense of the applicant and subject to such rules and regulations as the state engineer may prescribe.

DOMESTIC WELLS

The State Engineer encourages this committee to consider legislation to provide an exception to the current law that would require complete curtailment of junior priority domestic wells if curtailment by priority was required in a groundwater basin.

Nevada Revised Statute § 534.110(6) provides that except as otherwise provided in subsection 7 (Critical Management Areas), the State Engineer shall conduct investigations in any basin or portion thereof where it appears that the average annual replenishment to the groundwater supply may not be adequate for the needs of all permittees and all vested-right claimants, and if the findings of the State Engineer so indicate, the State Engineer may order that withdrawals, including, without limitation, withdrawals from domestic wells, be restricted to conform to priority rights. Subsection 7 also provides that if an area has been designated as a Critical Management Area for at least 10 consecutive years, the State Engineer shall order that withdrawals, including, without limitation, withdrawals from domestic wells, be restricted in that basin to conform to priority rights, unless a groundwater management plan has been approved for the basin pursuant to NRS 534.037.

This statute requires that, in times of curtailment, the State Engineer is required to regulate water use by priority including domestic well use. The State Engineer believes that it would be held unthinkable to restrict people from water use inside their homes and therefore would like to see this provision amended to restrict outdoor use only in times of curtailment.