

**WATER SUPPLY PLAN REPORT  
INDEPENDENCE  
ELBERT COUNTY, COLORADO**

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December 14, 2016  
**Updated April 18, 2017**  
Job No. 923.1

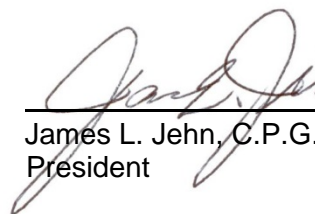
*Jehn Water Consultants, Inc.*

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Gina L. Burke  
Vice President



James L. Jehn, C.P.G.  
President



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## **EXECUTIVE SUMMARY**

Independence is a proposed 920 home community in Elbert County. The development plans include maintaining the original homestead to be used as a community area as well as adding a new school, police and fire stations, parks and open space. The water demands for the development will be met by a central well system for potable demands and a reuse treatment facility to meet all irrigation demands. The estimated potable demands for the development are approximately 293 acre-feet per year (af/yr) and the irrigation demands are approximately 156 af/yr. The two-pipe system will provide for a more sustainable water use as it reduces the total water demands for the development by not utilizing potable water for irrigation.

All of the ground water underlying Independence has been quantified and decreed in Case No. 2006CW59. The total water rights decreed equal 1,557.3 af/yr, based on a 100-year aquifer life. Per the 300-year aquifer life County requirement, the total water available to meet the demands is 519.1 af/yr. Independence is proposing to utilize mainly the deeper Denver and Arapahoe aquifer water rights, totaling 298.2 af/yr to meet development demands. This leaves approximately 80% of the ground water rights, available as decreed to the development of the Independence property, in the ground and unused as all irrigation demands will be met through the recycle system. The Independence Water Supply Plan, discussed in detail in this Report, provides proof of an adequate, dependable water supply and shows that Independence is a conscientious development plan protecting the water rights in Elbert County.

## **I. INTRODUCTION**

The Independence development is proposed to be located in portions of Sections 14 and 15, Township 7 South, Range 65 West, 6<sup>th</sup> P.M. (Figure 1) and is anticipated to include 920 homes, a community center at the existing homestead, parks, the possibility of a police substation and a fire station, a school site and ancillary uses. This Report presents the studies and analyses to provide Elbert County with the necessary information regarding the quantity, quality, and dependability of the water supply for the proposed Independence development in support of the preliminary and final plat application. Projected demands for Independence are estimated and the source of the water supply to meet the proposed demands is presented within this Water Supply Plan Report.

## **II. WATER DEMAND**

Independence's water supply system will be a two-pipe system, and as such, the demands for Independence are split between potable and non-potable demands to maximize sustainability. The non-potable irrigation demands will be met through a reuse system, whereby the wastewater from in-house uses will be treated to a level acceptable for irrigation use around residences and schools. The potable demands will include in-house uses for the 920 homes, as well as a school, homestead, police and fire stations, and parks. The non-potable supply system will meet all the irrigation demands within the proposed development including residential, homestead, police and fire stations, parks and school fields. Outside of the residential lots, school fields, homestead and parks, the landscaping is planned to be mainly naturalistic consisting of drought-tolerant sod, native grasses and vegetation, so the rural open character of the area will be preserved. Table 1 provides the estimated demands for Independence.

The water demands for the residences and irrigation are provided in Table 1. BrightView Design Group has put together an irrigation analysis for Independence which is included in Attachment A of this Report. The overall water demands for the Independence development, as outlined in Table 1, are estimated to be 448.64 af/yr, of which approximately 292.85 af/yr is for potable in-house uses and 155.79 af/yr is to meet irrigation demands. Also shown in Table 1 (in red) is the amount of return flows from the potable use, approximately 277.57 af/yr at full build-out, that will be available to meet the irrigation demand of 155.79 af/yr.

### III. WATER SUPPLY

The Independence property, as shown on Figure 1, is underlain by all five of the Denver Basin aquifers: Upper Dawson, Lower Dawson, Denver, Arapahoe and Laramie-Fox Hills aquifers. All of the water rights within each aquifer, underlying the property, were quantified and adjudicated in Case No. 2006CW59, Division 1 Water Court. Table 2 provides a summary of the decreed water rights by aquifer, totaling 1,557.3 af/yr. As noted in Table 2, the water rights available to Independence also include a decreed augmentation plan for the use of the nontributary Upper Dawson aquifer. Pursuant to that plan, a total of 75 af/yr can be utilized to meet development demands from the Upper Dawson aquifer. Per the *Guidelines and Regulations for Areas and Activities of State Interest*, if Independence relies solely on ground water, it must provide a water supply to meet a 300-year aquifer life. Table 2 shows the adjustment of the decreed 100-year aquifer life amounts to the 300-year County requirement. A total of 519.1 af/yr (33% of the total water underlying the property) is available to meet demands within the Independence development and meets the County's 300-year aquifer life. With a total ground water demand of 292.85 af/yr, the Independence development has water sufficient to satisfy a 532 year supply.

Independence's water supply system will include central wells and a two-pipe delivery system. One system to deliver potable water for in-house demands and the second to deliver treated effluent to meet irrigation demands. Therefore, the only demands that need to be met by the Denver Basin central wells are the in-house potable demands.

As the Denver Basin aquifers, in the vicinity of Independence, are utilized by individual homeowners and Towns, the quality of the water contained in the Denver Basin aquifers are not of issue to meet the demands within Independence.

#### **IV. WELL INTERFERENCE**

The majority of all wells within a one-mile radius of the Independence property are completed in the Upper and Lower Dawson aquifers. To reduce the effects on those neighboring wells, Independence is proposing to meet the majority of the potable demands outlined in Table 1 with their water rights in the deeper Denver and Arapahoe aquifers. The full depth of those aquifers are estimated to be 1,945 feet below ground surface for the Denver aquifer and approximately 2,490 feet below ground surface for the Arapahoe aquifer. In order to determine the potential impact on neighboring wells within the Denver and Arapahoe aquifers, we reviewed the data available in the Division of Water Resource's well database (Hydrosource). Within a one-mile radius of the Independence property line there were six partially completed Denver aquifer wells and no Arapahoe aquifer wells. Figure 2 shows the location of the six Denver aquifer wells in relation to Independence.

To address concerns of impacts of pumping at Independence on the six partially completed Denver wells, a worst case pumping scenario was modeled whereby all of the Denver aquifer ground water (157.7 af/yr) was pumped over 100-years at a constant rate of 98 gpm. Since there are two proposed Well Facilities, we ran two separate models with each pumping the full amount from that Facility. Figure 3 provides the results of modeling a Denver aquifer well pumping at Independence for 100 years may have a total potential drawdown of about 3.6 feet in the vicinity of the six neighboring wells if the well is completed at Well Facility No. 1. Figure 4 shows approximately 2.1 ft of potential drawdown at the neighboring wells if the Independence well is completed and pumped at the Well Facility No. 2 location. This equates to an average of 0.036 ft/yr of effect from Well Facility No. 1 and 0.021 ft/yr if all the water is pumped from Well Facility No. 2, of which both drawdown amounts are immeasurable in a well and considered an insignificant amount of interference.

A second pumping scenario was completed where we analyzed the combined pumping at both Well Facility Nos. 1 and 2. This pumping scenario was modeled to reflect all of the Denver aquifer ground water (157.7 af/yr) being pumped over 100-years, split equally between the two well sites, with each well pumping a constant rate of 49 gpm (about 79 af per site). The results

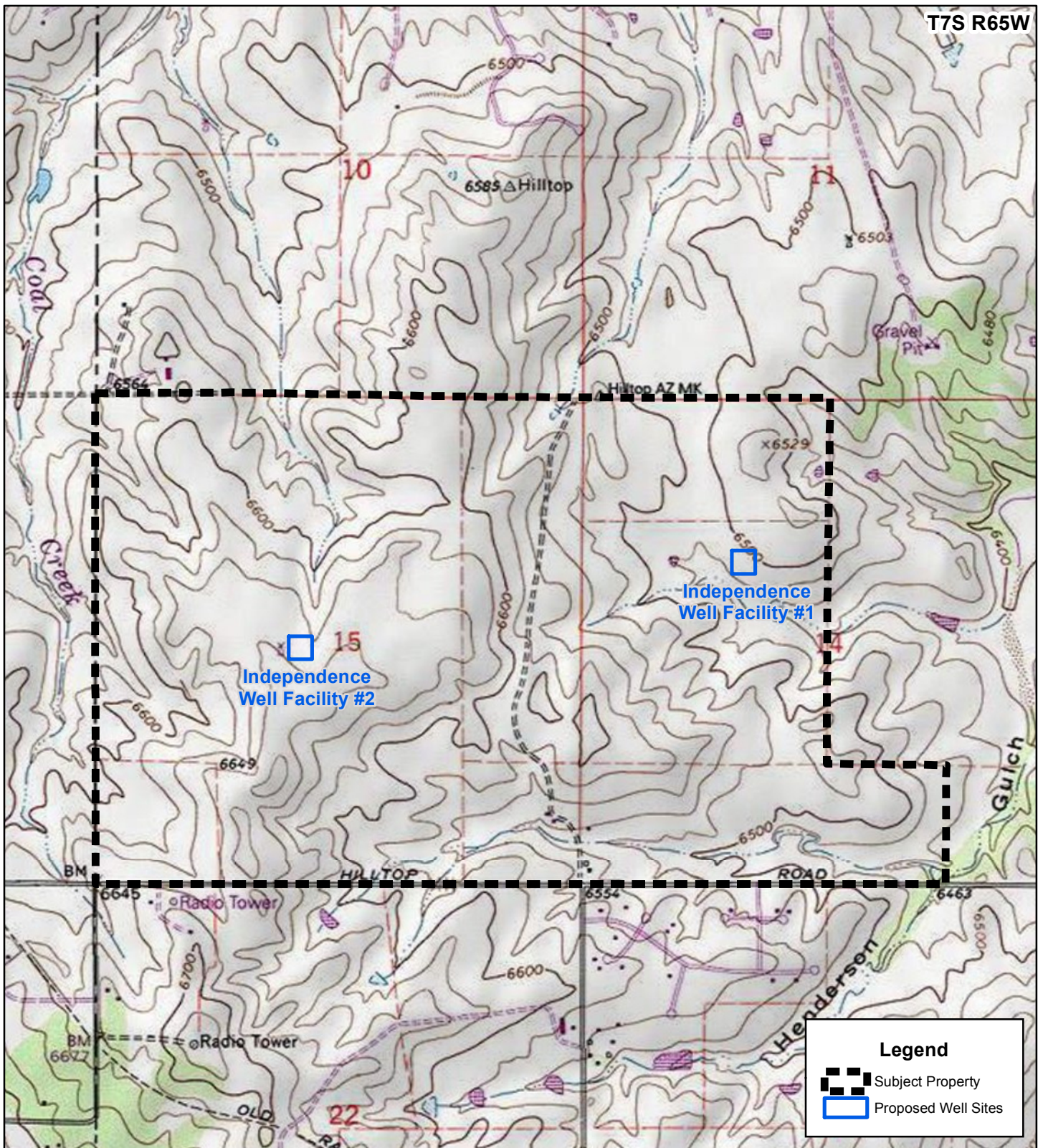


showed that after pumping 49 gpm for 100 years from each well site, the total potential drawdown in the vicinity of the six neighboring wells may be 1.8 ft from Well Facility No. 1 and 1.1 ft from Well Facility No. 2. The combined total would be 2.9 ft after 100 years of pumping which equates to 0.029 ft/yr. This drawdown is immeasurable in a well and considered an insignificant amount of interference.

## **V. CONCLUSIONS**

The proposed Independence Development has a sufficient and abundant water supply from the Denver Basin aquifers underlying the property to meet the proposed demands. This includes the reduction of the decreed ground water rights to meet Elbert County's 300-year aquifer life regulation as well as constructing a two-pipe water supply system that will allow Independence to use the Denver Basin aquifer water rights pumped from the Denver and Arapahoe aquifers twice, first for potable supply, then once treated, for irrigation, thus increasing the sustainability of their Denver Basin water. Total potable demands to be met by Denver Basin ground water are estimated to be 292.85 af/yr. In addition, approximately 155.79 af/yr of irrigation demands will be met from the reuse facility. The pumping of 292.85 af/yr will be utilized to meet 448.64 af/yr of total demands within the Independence development while leaving approximately 80% of the total ground water decreed underlying the property in the ground.

The Independence Water Supply Plan analyses discussed in this Report provide proof of an adequate and dependable water supply. It is our professional opinions that this Water Supply Plan provides the evidence required by Elbert County as proof that an adequate water supply in regard to quantity, quality and dependability is available to meet the demands at Independence for the next 300 years.



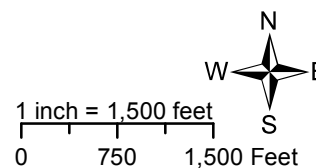
Sources:  
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 DWR Well Permit Database  
 Esri USA Topo Maps

Projection:  
 UTM NAD83

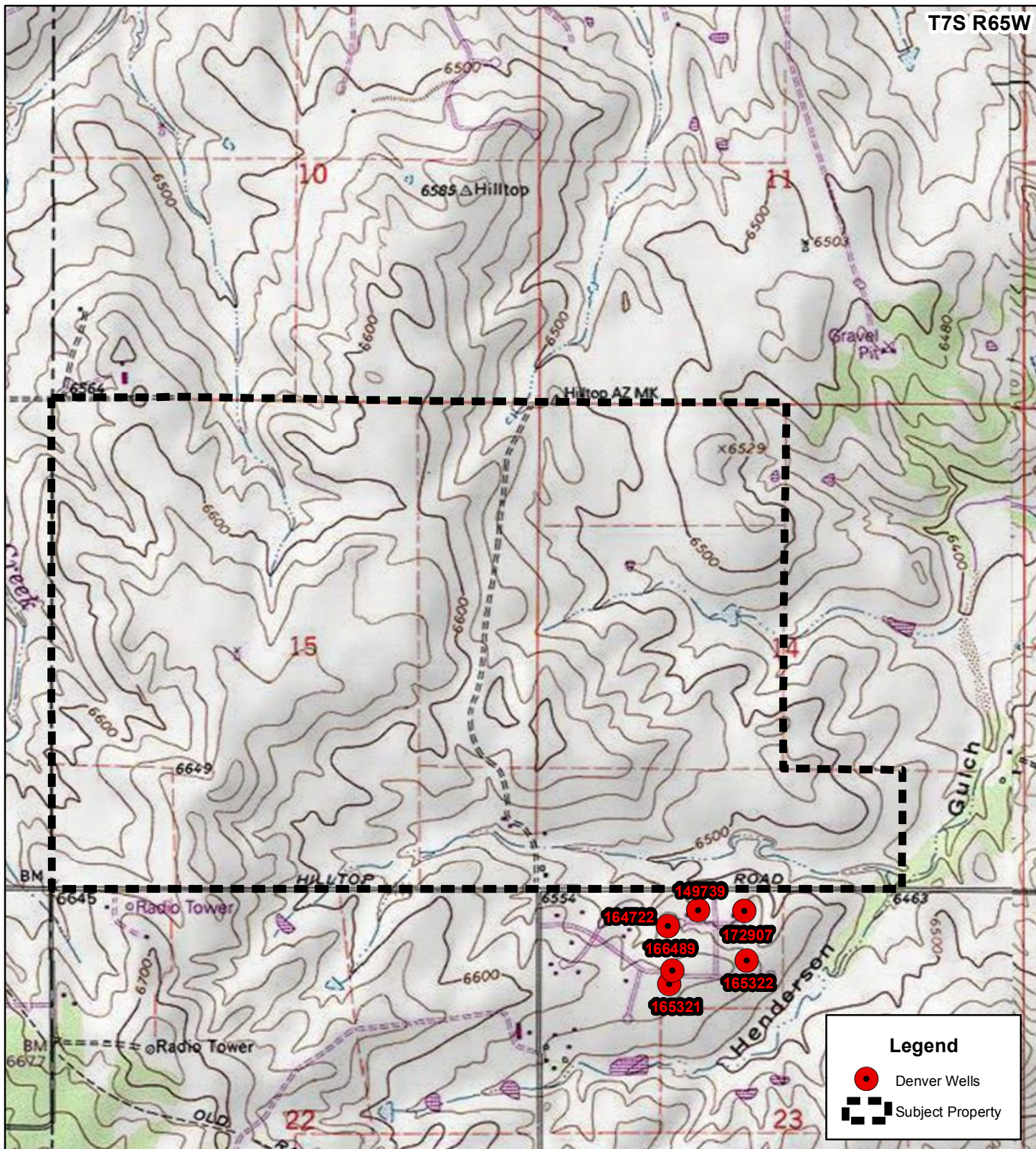
Job No. 923.1  
 Prepared By: HLB 10/06/2016  
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# Independence



**Figure 1**



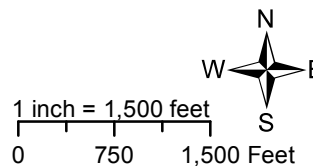
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 Property Description: 06CW59  
 DWR Well Permit Database  
 Esri USA Topo Maps

Projection:  
 UTM NAD83

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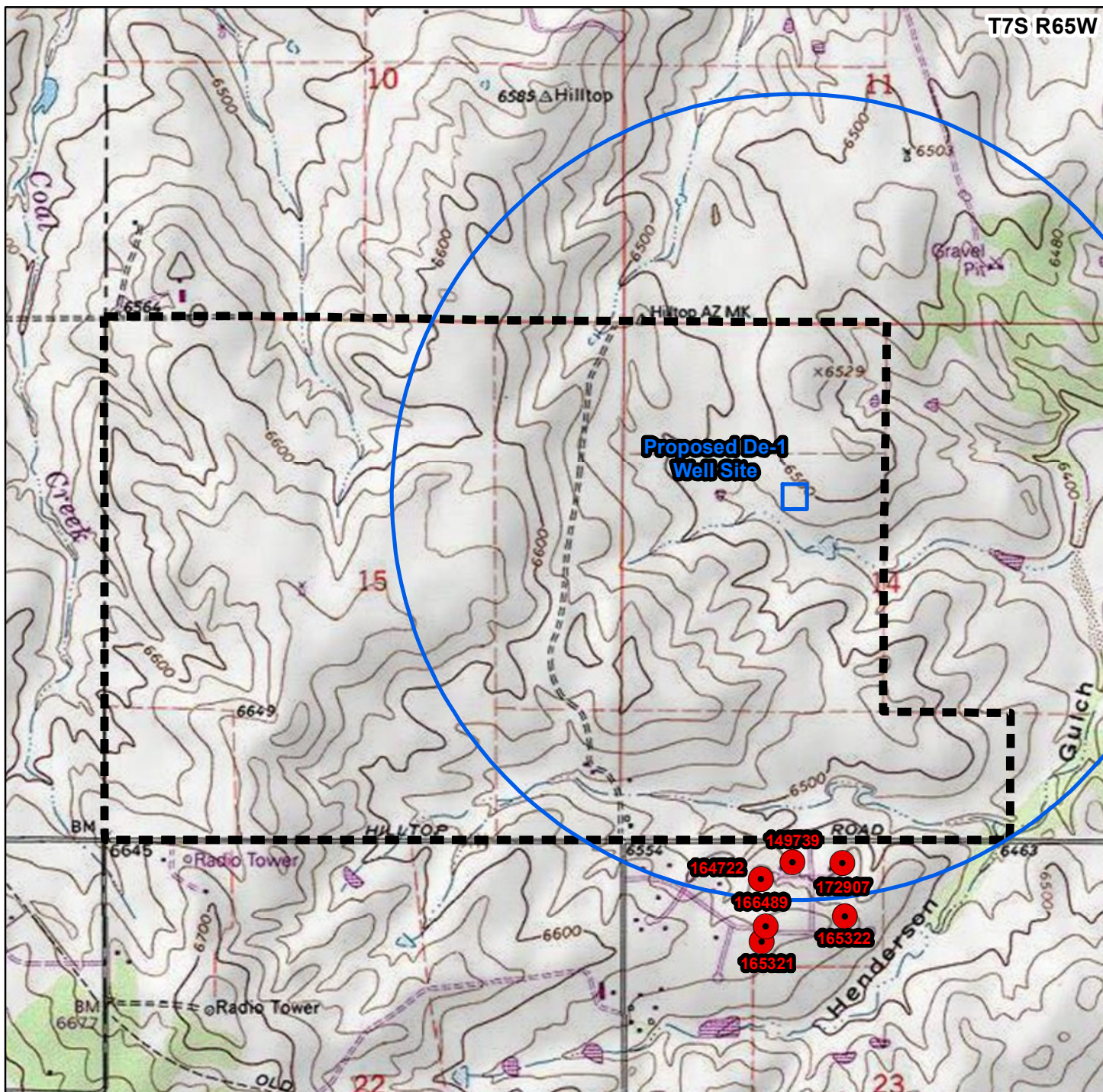
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# Independence Denver Aquifer Wells



**Figure  
 2**

Every effort has been made to ensure the accuracy of the data provided. This should be used for mapping purposes only and should not be considered a survey instrument.



Legend

- Subject Property
- Proposed Independence Well Facility #1
- Water Level Drawdown at Partially Completed Wells at 100 years, due to pumping at Well Facility #1: -3.6'
- Denver Wells

\*Individual well simulations at max volume

Sources:

Property Description: 06CW59  
 DWR Well Permit Database  
 Esri USA Topo Maps

Projection:  
 UTM NAD83

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**Independence  
 Denver Aquifer  
 Well Simulation  
 Proposed Well Facility #1**

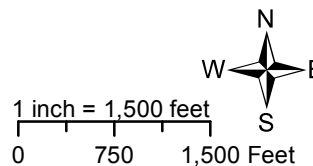
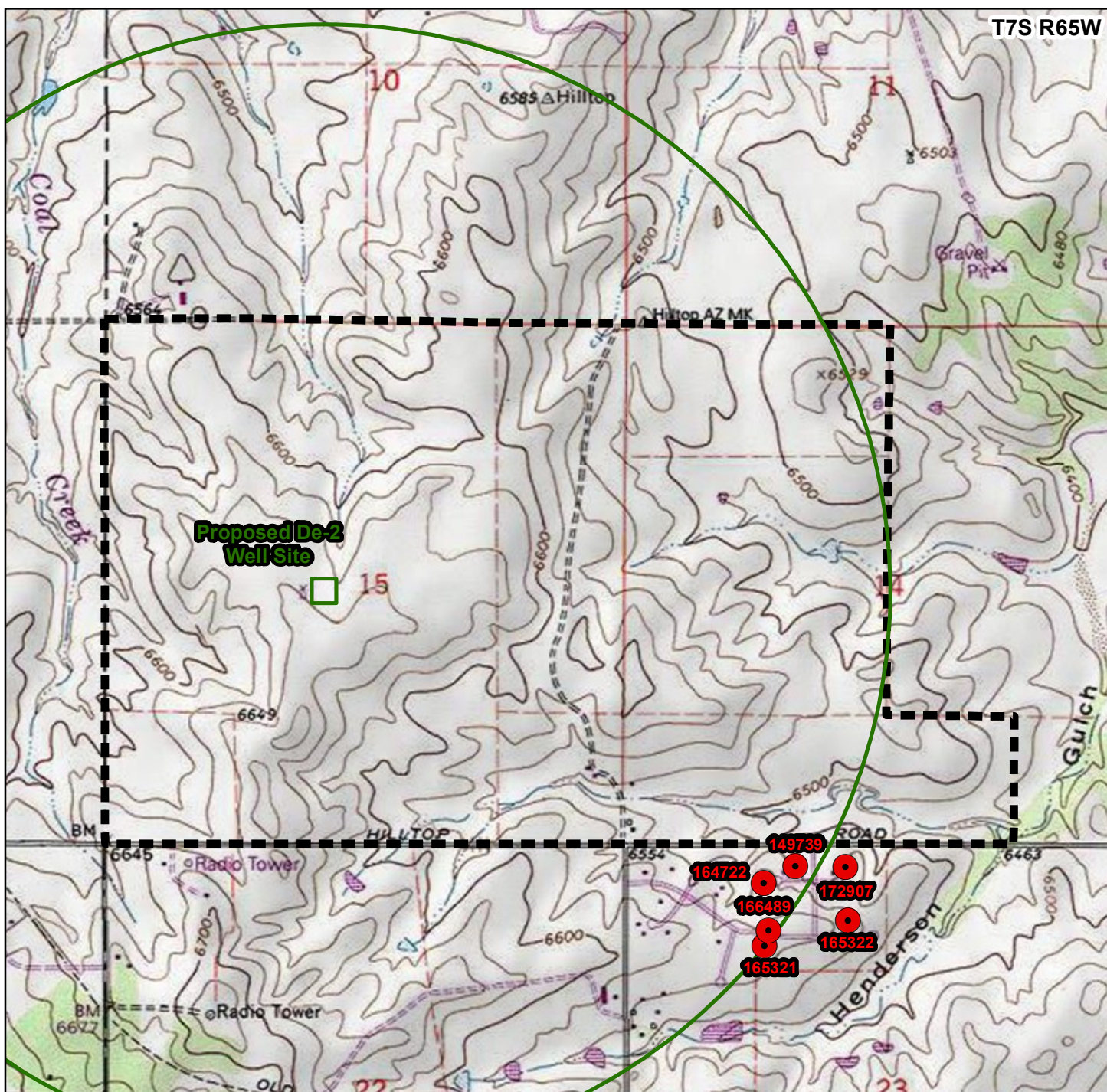


Figure  
3



Legend

- Subject Property
- Proposed Independence Well Facility #2
- Water Level Drawdown at Partially Completed Wells at 100 years, due to pumping at Well Facility #2: -2.1'
- Denver Wells

\*Individual well simulations at max volume

Sources:  
 Property Description: 06CW59  
 DWR Well Permit Database  
 Esri USA Topo Maps

Projection:  
 UTM NAD83

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**Independence  
 Denver Aquifer  
 Well Simulation  
 Proposed Well Facility #2**

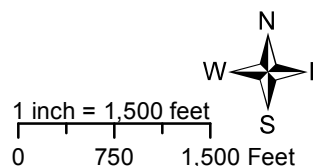


Figure  
4



**TABLE 2**  
**INDEPENDENCE - WATER AVAILABLE**  
*Decreed in Case No. 2006CW59*

Aquifer	Acreage	Average Sat Thick ft	Sy	100-year Appropriation af/yr	SEO Status	Notes
	1,012					
Upper Dawson		180	0.20	288.3 75.0 1.0	NNT  Exempt	Requires an approved Augmentation Plan Approved Augmentation Plan or Exempt Wells Permit No. 92652
Lower Dawson		50	0.20	101.2	NT	
Denver		275	0.17	473.1	NT	
Arapahoe		245	0.17	421.5	NT	
Laramie-Fox Hills		180	0.15	273.2	NT	75 af/yr reserved for Aug Plan
			Total	1,557.3	<b>519.1</b>	<b>af/yr 300-year supply (County Req)</b>
			Total NT	1269.0	<b>423</b>	<b>af/yr 300-year supply (County Req)</b>
			Total Den/Arap	894.6		