Memorandum

Garald L. Barber, Sole Proprietor
P.O. Box 1976
Colorado Springs, CO 80901

To: Craig Dossey, Mark Gephardt

CC: Forsgren Associates, Inc.

From: Gary Barber

Date: December 4, 2018

Re: Review of Revised Water Master Plan Document

Mr. Dossey & Mr. Gephardt:

In anticipation of the Planning Commission hearing, I revisited the draft Water Master Plan document. As shown in the box below, my first set of comments to the Plan expressed concern about the characterization of the longevity of the Denver Basin aquifers in Regions 2 & 3. This concern is particularly true for the pie-chart graphics comparing supply and demand for the years 2040 and 2060.

7. Page 58, second paragraph: "*The gap analysis presented herein does not take into consideration any reduction in current supplies for factors such as declining water levels in the Denver Basin aquifer or climate change. Any reduction in existing water supplies would increase the gap for El Paso County.*"

8. Page 58, third paragraph, graphics pages 59 & 60: "*However, the northern regions of the County are heavily reliant on Denver Basin, and designated basin groundwater. The economic viability of those sources is expected to decline over time, increasing the gap beyond these projections.*" In 2040, Regions 2 & 3 are the only portions of the County showing surplus water supply and in 2060 only Region 2 is shown with a surplus. Defining the terms supply and surplus may help qualify these tables with respect to the 100-year statutory pumping limit of Denver Basin aquifer wells.

9. Page 61, first paragraph: "*Denver Basin groundwater is being mined, but by working together we can help this resource last for generations to come.*" Consider adding a clarifying statement about reuse, conjunctive use and aquifer storage & recovery to buttress this assertion. These strategies are highlighted later in this section.

Shown is Figure 4-8 as presented in the Plan. The X-axis depicts a timeline that shows a second well is needed at about the 40th year of pumping and a third well after about 60 years of pumping the nontributary aquifer. Attached are examples of a couple of Region 2 wells completed in the Arapahoe aquifer that have been pumping since 1972 and 1982 respectfully. Therefore, with regard to declining well yield, these wells (and likely many others) are somewhere in the "2nd Well" range and approaching the need for the 3rd Well. The aquifer conditions in Region 3 are similar with respect to declining well yields, given the thinner and tighter-grained nature of the Denver Basin aquifer in that region.

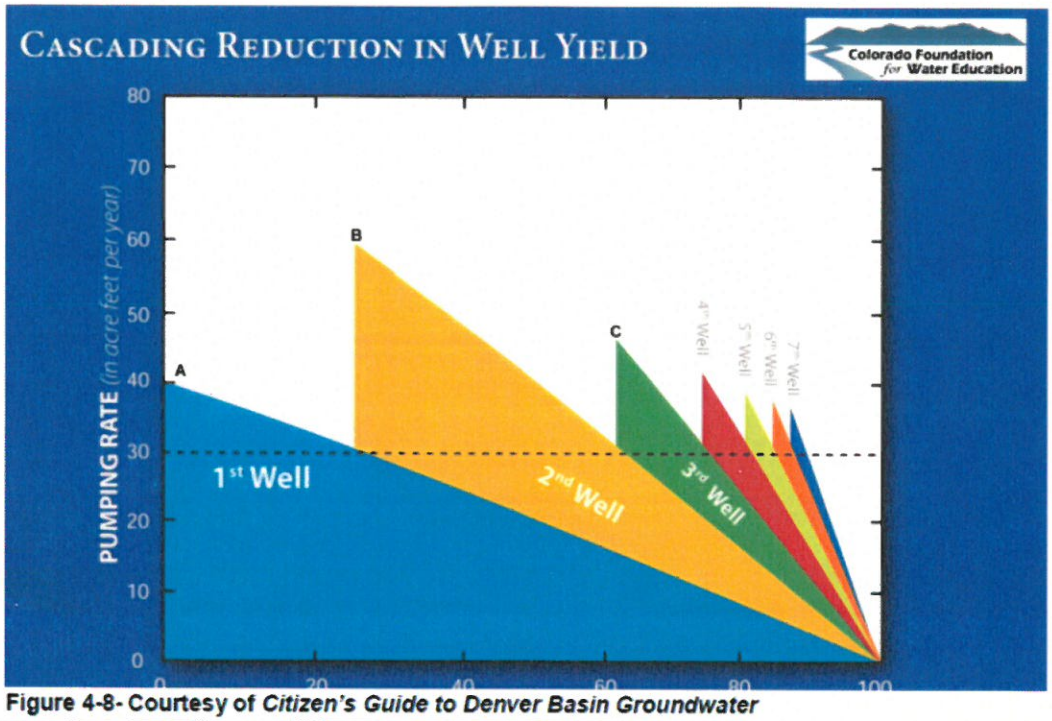


Figure 4-8- Courtesy of *Citizen's Guide to Denver Basin Groundwater*

Page 60 shows the relationship between supply and demand in the year 2040, with year 2060 shown on page 61. Table 5-3, Current Demand and Current Supplies by El Paso County Region is followed by a statement in the body of the text regarding the dependency on the Denver Basin aquifer:

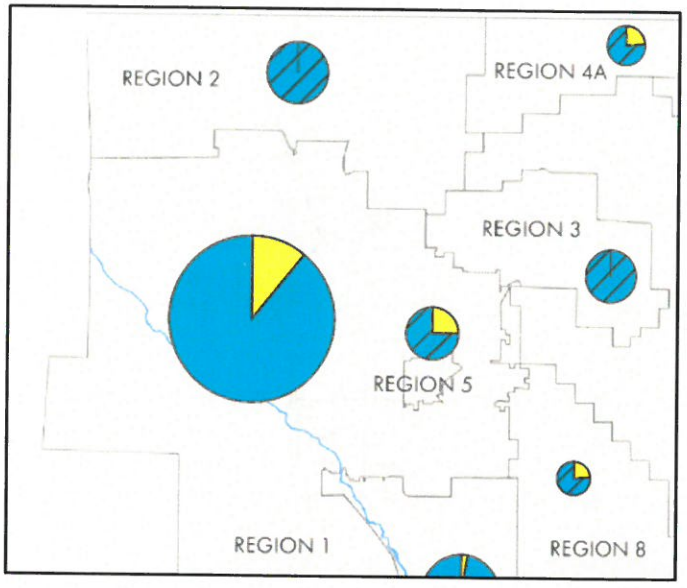
> Further, as previously described, current and future water supplies in Regions 2, 3, 4a, 4b, 4c, 5, 6, and 8 include a large share of nonrenewable Denver Basin groundwater. Depending on local aquifer conditions, it may not be economically sustainable to continue heavy reliance on those supplies over the long term. Any reduction in use of those water supplies would only serve to increase the water supply needs for El Paso County. The needs analysis presented herein does not account for reduction in current supplies for factors such as declining water levels in the Denver Basin aquifers, reduced well production, or climate change. With respect to water demands however, the needs analysis also does not account for water-saving measures that may be implemented to reduce water consumption.

Figure 5.10 on page 64 and Table 5.4 depict the relationship between supply and demand in the year 2040. Similarly, Figure 5.11 on page 64 and Table 5.5 depict the relationship between supply and demand in the year 2060. Both tables include a footnote explaining that the Denver Basin aquifer may not be a reliable source in the future.

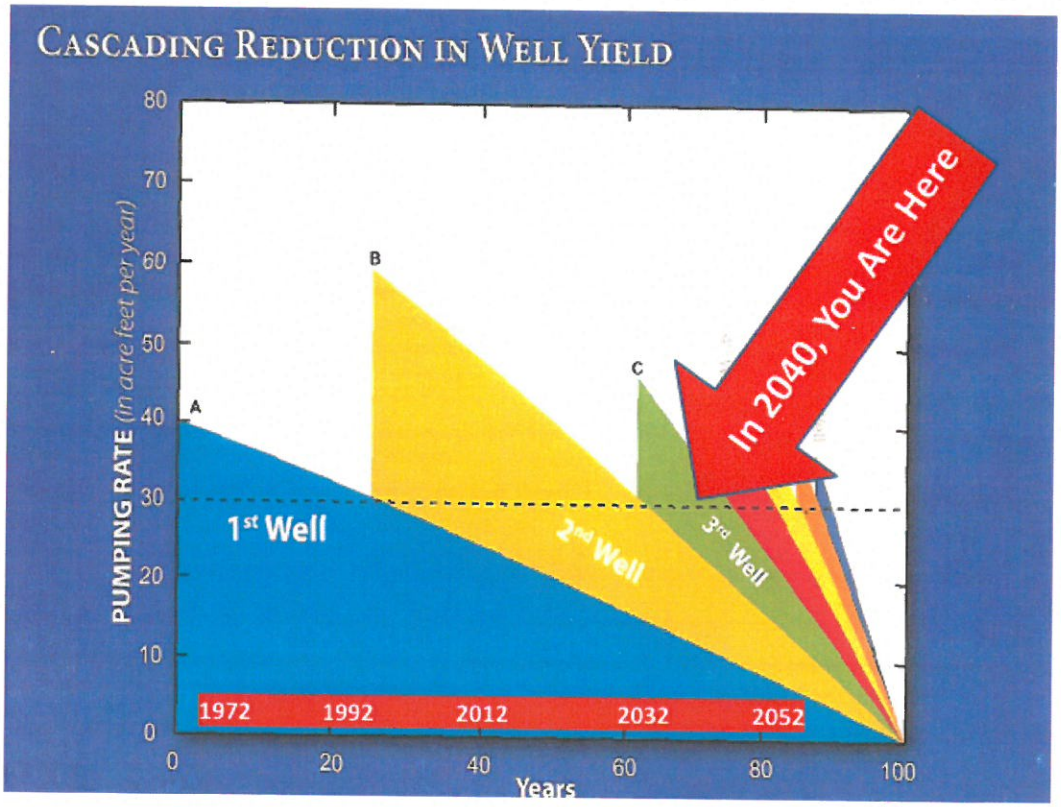
The visual representation of the conditions in 2040 and 2060 indicate no water supply problems in Regions 2 & 3, but a shortfall in Region 1, the Colorado Springs Utilities service area. Granted, the cross hatching is shown in the legend as Denver Basin dependent and the asterisk offers the disclaimer to the future availability of water supply in these regions.

> **Water production from Denver Basin wells in this region may not be economically sustainable in the long term, depending on local aquifer conditions.*

However, applying the timeline since pumping began in the Denver Basin in Region 2 to the decline in well yield depiction in Figure 4-8, the comparison of demand to supply shows a need for significant capital investment. This capital investment does not produce new water supplies, it merely sustains pumping of current sources. After about 2030, the cost curve goes up like a hockey stick to add the 4th Well, the 5th Well, etc..



Recommendation: Rather than depict Regions 2 & 3 in "blue" with a cross hatch and footnotes, either pick a new color altogether or show them as yellow. The tables could similarly include some declaration that it is reasonable to assume that somewhere in the next 20 years many existing wells in the Denver Basin will become uneconomic to continue pumping. Therefore, available supplies are reduced in 2040 by 30% and in 2060 by 50%. The graphics can then show that shortfall in a fashion similar to Region 1. In other words, YES, we need more water and we have 20+ years to figure it out.



UNDERGROUND WATER RIGHT

NAME OF WELL: Donala Well No. 1.

LOCATION OF WELL: Part of Lot 1, Block 2, Donala Subdivision No. 1, El Paso County, Colorado, more particularly described as follows:

That portion of the Northwest Quarter of the Southwest Quarter, of Section 6, Township 12 South, Range 66 West of the 6th P.M., more particularly described as follows:

Commencing at the Southwest Corner of Northwest Quarter of the Southwest Quarter of said Section 6; thence North 0°05'09" West on the West line of said Section 6 a distance of 421.53 feet; thence North 89°54'51" East a distance of 20.49 feet to the Point of Beginning, said point also being the most Westerly corner of the described tract; thence North 41°34'53" East a distance of 25 feet; thence South 48°25'07" East a distance of 40 feet; thence South 41°34'53" West a distance of 25 feet, thence North 48°25'07" West a distance of 40 feet to the Point of Beginning; containing 0.02 acres more or less.

DEPTH: 1,154 feet.

PRIORITY DATE: April 11, 1972, provided, however, that this right shall be junior to all priorities awarded in cases filed prior to 1975, and otherwise junior as provided in CRS 1973, 37-92-306.

AMOUNT OF WATER: 0.888 c.f.s., or 400 g.p.m.

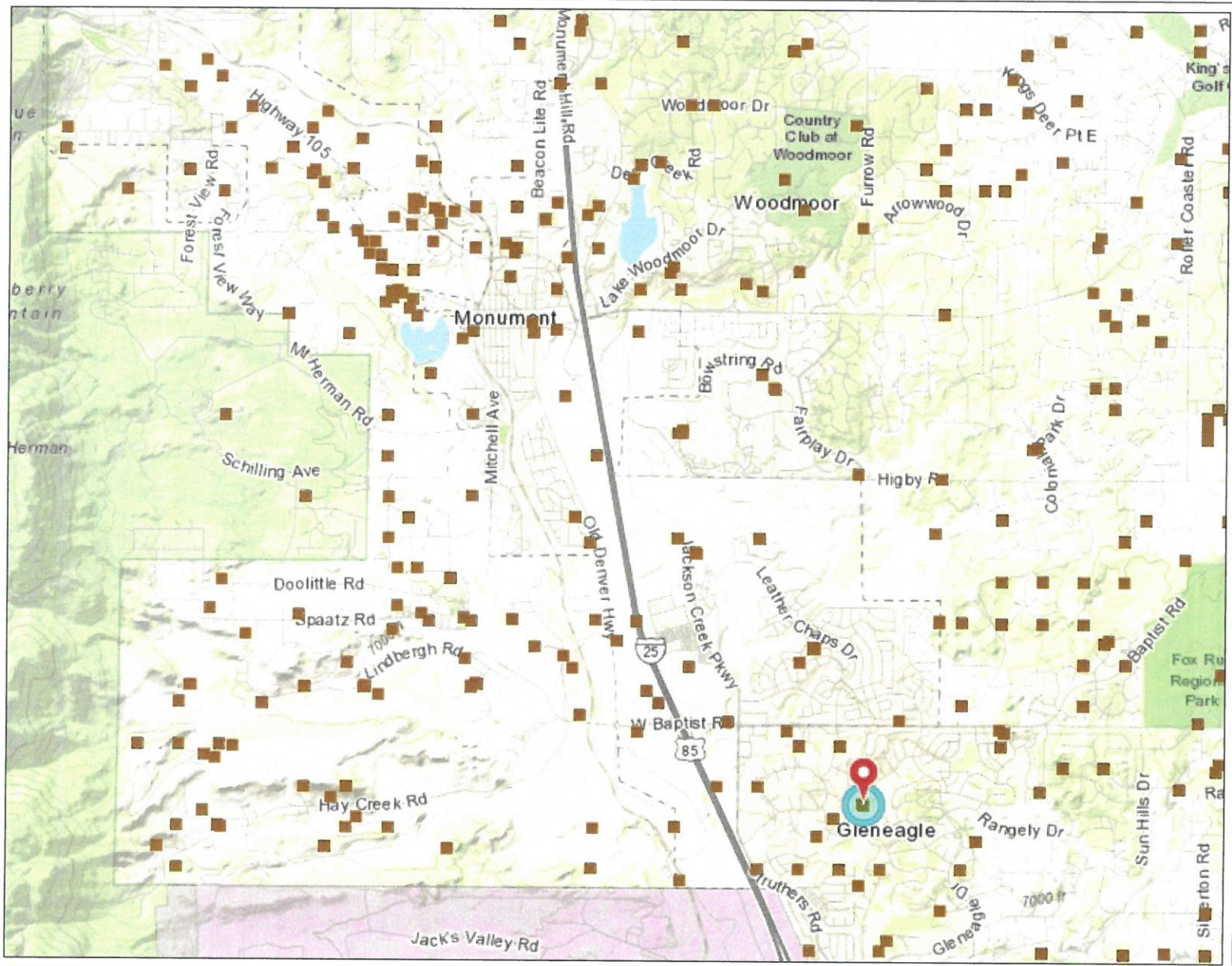
USE OF WATER: Municipal.

STATE ENGINEER'S WELL NUMBER: 016140-F.

MEANS OF DIVERSION: Well and pump.

CDSS
Colorado's Decision Support Systems

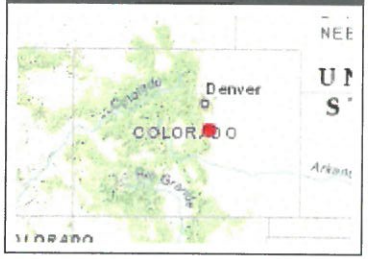
Map Viewer



Legend

- Final Permit
- Ground Water
- County

Location



Notes

ARAPAHOE WELL SUPPLYING GLENEAGLE SUBDIVISION, FIRST USE PRIOR TO 1972

1.77 0 0.89 1.77 Miles

1: 56,128

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appropriation date of December 8, 1982. Water may be used for the purposes and in the manner set forth in Paragraph 15.

25. Names and Legal Descriptions of Location of Wells (all in Township 11 South, Range 67 West of the 6th P.M. in El Paso County, Colorado):

(a) Monument Well A-1: NE 1/4 of the NE 1/4, Section 15, being 750 feet from the North line and 500 feet from the East line of said Section 15.

(b) Monument Well LFH-1: NE 1/4 of the NE 1/4, Section 15, being 750 feet from the North line and 600 feet from the East line of said Section 15.

26. Depth and Source:

(a) Monument Well A-1 will draw water entirely from the Arapahoe aquifer, and its depth shall be to full penetration of said aquifer, estimated to lie at the interval from 1230 feet to 1750 feet below the land surface.

(b) Monument Well LFH-1 will draw water entirely from the Laramie-Fox Hills aquifer, and its depth shall be to full penetration of said aquifer, estimated to lie at the interval from 2020 feet to 2290 feet below the land surface.

27. Date of Appropriation: December 8, 1982.

28. Amount of water:

(a) Flow Rates. Monument Well A-1 will withdraw water at the rate of 250 gpm (0.556 cfs). Monument Well LFH-1 will withdraw water at the rate of 150 gpm (0.333 cfs).

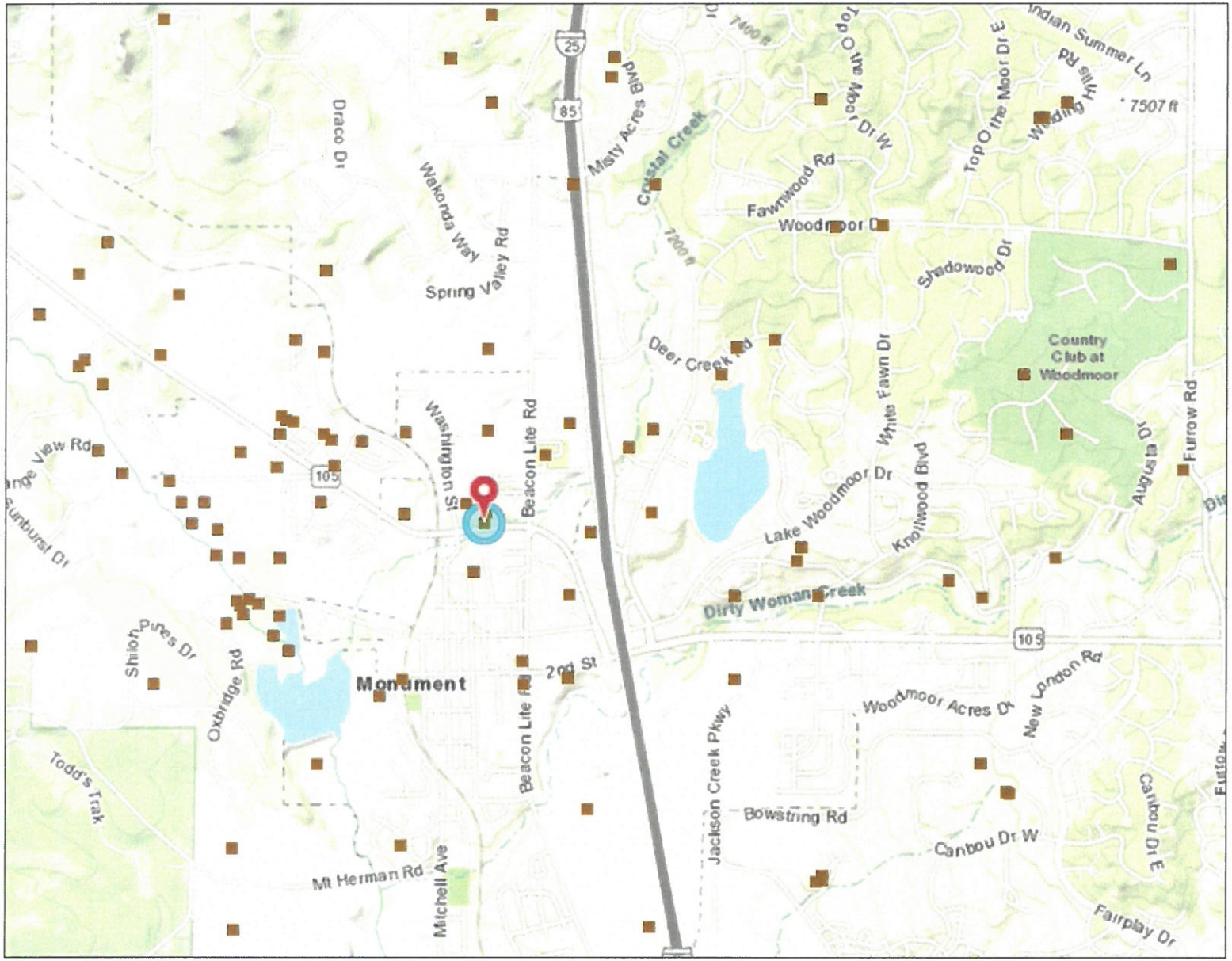
(b) Volumetric Limitations. The above flow rates are limited by the provision that subject to provisions of Paragraph 14 Monument shall not withdraw more than the following average annual amounts of water from each of the aquifers under the water rights granted herein:

Arapahoe	398	acre feet
Laramie-Fox Hills	182	acre feet

(c) The pumping rates for each well described above may exceed the nominal pumping rates set forth herein to the extent necessary to withdraw the full allocation of water from the Arapahoe and Laramie-Fox Hills aquifers pursuant to paragraph 14 hereof.

CDSS
Colorado's Decision Support Systems

Map Viewer



Legend

- Final Permit
- Ground Water
- County

Location

Notes

DENVER BASIN WELL SUPPLYING TOWN OF MONUMENT, FIRST USE 1982

4,677 0 2,339 4,677 Feet

1: 28,064

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