



TECHNICAL MEMORANDUM

TO: El Paso County Planning and Development Department
FROM: Alexandra Kordick, P.E., SGM
DATE: July 11, 2019
RE: **Saddlehorn Ranch Potable Water Demand Analysis**

This memorandum presents analysis, results, and recommendations for potable water infrastructure design for the Saddlehorn Ranch Development.

I. Public Water System Service Area

The Saddlehorn Ranch Development is comprised of 816 acres, located generally east of Curtis Road and south of Judge Orr Road, wholly within El Paso County. The proposed development is residential, and at buildout will consist of 224 single family residences. Residential lot sizes are approximately 2.5 acres. The public water system will be provided by the Saddlehorn Ranch Metropolitan District Nos. 1-3 (the "District").

The residential development will be phased, beginning with Filing 1, comprised of 52 single family residences on 174 acres. The water treatment facilities will be constructed to meet both the initial development and the full buildout demands of the system.

II. Demand Analysis

Residential water demands were generated from the El Paso County Water Master Plan which reported an average water use of 190 gallons per capita per day¹ (gpcd) for single family homes on ¼ - ½ acre lots. The average lot size at Saddlehorn Ranch is 2.5 acres; the covenants for the development dictate "*landscaping on the lots be primarily comprised of native landscaping, and that only limited areas of a lot may be landscaped with a more formal, manicured type landscaping.*" All irrigated areas must be approved in writing by the board. Since the irrigated land per lot will be limited to a similar ~¼ to ½ acre, this demand was applied. An average household size of 3 people per home was utilized; the US census bureau reports the average household size in El Paso County between 2013 to 2017 is 2.63 people per home². Saddlehorn Ranch anticipates home owners will keep livestock. Water demands for 2 horses per home and 8 chickens per home are included in the total demand forecast.

¹ El Paso County. 2019. El Paso County Water Master Plan. An Element of the County Master Plan for the El Paso County Planning and Community Development Department. February 2019. Prepared by Forsgren Associates Inc.

² US Census Department. <https://www.census.gov/quickfacts/fact/table/elpasocountycolorado>

The system was sized to appropriately handle the initial demands from the first phase of development (Filing 1) and the full buildout of the community. A peaking factor (PF) of 2.65 is used to scale the Average Daily Demand (ADD) to the Maximum Daily Demand (MDD). This peaking factor is seen in the Briargate and Templeton pressure zones within the Colorado Spring Utilities service area³. These two pressure zones are the most proximal to the site and are the best representation of a similar demand profile. Demands are summarized in **Table 1**. The daily demand per household equates to 595 gpd/household.

Table 1 Saddlehorn Ranch Water Demands.

Phase	Houses	Average Household Size			Demands			ADD (gpd) ^a	PF ³ (MDD: ADD)	MDD (gpd)
		Number of People	Number of Horses	Number of Chickens	Per Capita Demand (gpcd) ¹	Equine Demand (gpcd) ^{4,5}	Poultry Demand (gpcd) ^{4,5}			
Filing 1	52	3	2	8	190	12	0.06	30,913	2.65	81,919
Buildout	224	3	2	8	190	12	0.06	133,164	2.65	352,883

^a) gpd = gallons per day

The projected peak hourly flow (PHF) for the community was obtained by multiplying the ADD by peaking factor of 3.5. This equates to PHFs of

- Filing 1 = 75.1 gpm
- Buildout = 328.0 gpm

This peaking factor is supported by data from other Colorado communities as shown in **Table 2**.

Table 2 Peak Hourly Flow Peaking Factors from Other Colorado Communities.

Municipality	PF (PHF:ADD)
City of Cortez	2.98
City of Glenwood Springs	2.71
City of Craig	3.2
Saddlehorn Ranch (applied PF)	3.5

III. Application of Demands for Infrastructure Design

The max PHF of 328 gpm is lower than the required flows for fire suppression (1,000 gpm for 60 minutes⁶), thus the fire suppression flowrates shall be used to size the pipes and equipment within the distribution system. This fire suppression flowrate is the largest flow the system could experience.

³ Colorado Springs Utilities. 2015. Water Use Efficiency Plan. Water Services Division Planning, Engineering and Resource Management Department Water Conservation Section

⁴ USGS. 2010. Estimated Withdrawals and Use of Water in Colorado, 2005. Scientific Investigations Report 2010-5002. Ivahnenko, T., Flynn, J. Reston, VA.

⁵ EPA. 1991. Manual of Individual and Non-Public Water Supply Systems. EPA Office of Water (WH-550) EPA 570/9-91-004. May 1991.

⁶2015 International Fire Code. 2014. International Code Council.

A storage tank will contain fire suppression water, as well as a volume of water equal to or greater than the difference between the PHF and the MDD, and additional emergency water and dead storage water. Since the PHF, and fire suppression can be withdrawn from storage the water treatment equipment will be sized to for the MDD.

IV. Water Availability/Water Rights

The existing water supply consists of two groundwater wells; the Arapaho Well and Laramie-Fox Well. **Table 3** below summarizes details of the existing wells. Both wells are located within the Upper Black Squirrel Designated Ground Water Basin. The wells are considered non-tributary wells and are currently permitted for water production for domestic, irrigation, commercial, industrial, recreation, and stock use under permits numbers 66937-F and 66938-F and approved water rights determinations of 458-BD and 457-BD respectively.

Table 3 Existing Well Information

Property	Well No. 1 Arapaho Well	Well No. 2 Laramie- Fox Well
CDWR Permit No.	66937-F	66938-F
CDWR Construction Permit No.	276134	276133
Approximate Existing Grade (ft)	6,770	6,770
Aquifer	Arapaho	Laramie Fox
Top of Screen BEG ¹ (ft)	938	1,736
Bottom of Screen BEG (ft)	1,380	1,977
Approximate Total Depth BEG (ft)	1,390	2,035
Static Water Level BEG (ft)	660	1,280
Dynamic Water Level BEG (ft)	1,094	1,597
Reported 2008 Production Rate (gpm)	150	250
Water Right No.	458-BD	457-BD
Maximum Approved Pumping Rate (gpm)	1,000	500
Maximum Approved Annual Withdrawal (acre-feet)	1,600	800

¹ Below Existing Grade

Groundwater within Designated Basins is administered by the Colorado Groundwater Commission not the water courts. The State Engineers Office mandates that non-tributary withdrawals must sustain a 100-year aquifer life. Thus, limiting the total annual withdrawals from designated basins to 1 percent of the total recoverable water underlying the land, but El Paso County requires that withdrawals sustain a 300-year aquifer life, and limits total annual withdrawals to 0.333 percent of total recoverable water underlying the land.

In 2004, the Office of State Engineer, Designated Basins Branch issued determinations of the water underlying a 6,995-acre parcel that includes the current site. Based on a pro rata allocation by acreage the amount of water available is summarized below in **Table 4** (adapted from JDS-Hydro.2019⁷).

⁷ JDS Hydro. 2019. Water Resources and Wastewater Report for Saddlehorn Ranch Subdivision. April. Prepared for ROI Property LLC. Prepared by JDS Hydro Consultants Inc. Colorado Springs, CO.

Table 4 Available Water Rights

Aquifer	2004 Determination (acre-feet) ^a	Pro Rata Determination (acre-feet/acre)	Water Underlying the Site (acre-feet) ^b	Site Water Available Under 300-year Withdrawal Rule	
				(acre-feet/year)	(gpd)
Arapaho	271,953	38.88	24,383	81.28	72,560
Laramie-Fox	234,742	33.56	21,047	70.16	62,632
Total	506,695	72.44	45,430	151.44	135,192

a) 6,995-acre parcel

b) Assuming a 627.17-acre site (conservatively less than the actual 816 acre site so available water may be underpredicted.)

The total site available water is 135,192 gpd, this is greater than the predicted average daily demand (**Table 1**) of 134,947 gpd, thus the system has the sufficient water rights to meet demands.

Site pumping tests are necessary to ensure the physical water is available to meet demands. In 2008, pumping tests revealed production rates of 150 gpm (12-hour test) and 250 gpm (24-hour test) in the Arapaho and Laramie Fox wells respectively (**Table 3**). The total predicted production from 2008 of 400 gpm is sufficient to meet the MDD of 248 gpm. However, current production rates seen in nearby wells are significantly lower than those reported in 2008. The well capacity under current conditions should be assessed by 24-hour drawdown tests and step testing in both wells.