

Water Use Factor Technical Memorandum

TECHNICAL MEMORANDUM

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SUBJECT: City of Lincoln 2023 Water Use Factors Development Methodology



In 2021, West Yost developed water use factors for the City of Lincoln (City) using 2019 water consumption data. Currently, the City is in the process of completing their 2024 Water Master Plan Update (WMPU). As part of the work for the WMPU, West Yost has updated the water use factors using 2023 water consumption data. This technical memorandum (TM) details the update of and presents the recommended City's water use factors.

DEVELOPMENT OF WATER USE FACTORS

Since 2019, the COVID pandemic occurred which altered how people work, with many continuing to work remotely from home. In addition, customers have continued to conserve water. These changes have had an impact on water consumption trends. To capture the changes, new unit water use factors were developed using the 2023 water consumption data.

The City projects future system demands using land-use based unit water use factors. To develop these factors, the City provided West Yost with the following data:

- 2023 metered water consumption data in a spreadsheet with meter IDs,
- Spatially-located water meter locations, and
- City of Lincoln existing zoning land use and parcel information in Geographic Information System (GIS).

Water use factors were then determined by using the following methodology:

- Metered water consumption data was filtered to exclude rate descriptions that do not represent potable water consumption (i.e., reclaim water, hydrant water, and null). In addition, accounts which did not include a full year's worth of data were excluded from the analysis.
- Annual 2023 water consumption data were linked to the spatially-located water meters using register number.

- Spatially-located metered water consumption was then linked to the parcel file with the City’s land use designations by using a spatial join.

This methodology allowed West Yost to develop water use factors for land use designations used in the City’s current General Plan. The following sections discuss the methodologies for updating residential and non-residential unit water demand factors.

General Methodology

Unit water demand factors were developed using 2023 meter data and existing land use information in GIS format. The City’s metered water consumption data was spatially joined to the GIS parcels. Some records were manually linked to land use data if the meter was located outside of its respective parcel. The unit water demand factor for each land use designation was calculated by dividing the total metered water consumption by the associated dwelling units or the parcel area per land use for residential and non-residential land uses, respectively. Figure 1 shows the spatial distribution of linked meter data. Figure 2 shows the land use areas used to develop the unit water demand factors.

The parcel area calculation did not include streets and therefore resulted in “net” unit water use factors. The “net” unit water use factors were then adjusted to account for streets so they could be applied to the gross acreage information provided by City staff for future development.¹ The following sections describe the updated unit water use factors by land use designation.

Unit Water Use Factors

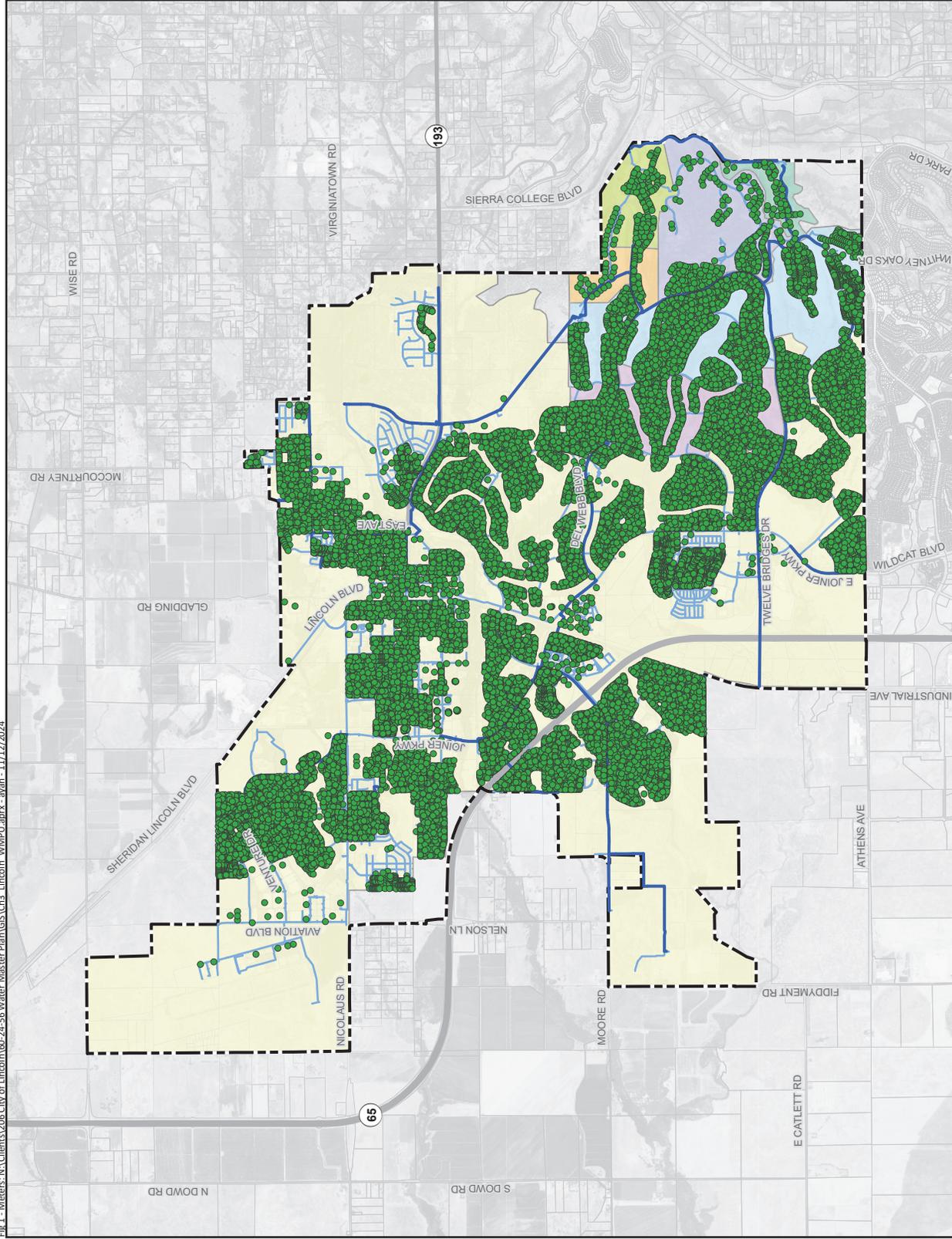
Unit water use factors were developed by joining the spatially-located metered water consumption data and the land use data. Single-family residences (Low Density Estates, Low-Density Residential, and Medium-Density Residential) are typically served by a single meter. High-Density Residential and non-residential land uses may have multiple meters. To calculate residential unit water use factors, the total annual water use was divided by the associated total dwelling unit counts² for the parcels with 2023 water use. To calculate the non-residential unit water use factors, the total annual water use was divided by the total parcel acreage per respective land use. As described in the following sections, some adjustments were made to include or exclude water use from select meters and parcel acreage as necessary to develop water use factors which are representative of water use expected in future development.

In 2021, each unit use factor was increased by 5 percent to be conservative and account for variability in annual water use. This 5 percent increase was not applied to the unit use factors developed in this TM due to the State Water Board’s adoption of the 2018 Water Conservation Legislation to Making Water Conservation a California Way of Life (Senate Bill [SB] 606 and Assembly Bill 1668) on July 3, 2024, which requires water purveyors to calculate and be held to annual urban water use objectives to improve water use efficiency.

¹ The gross acreage within the existing City limits is 15,425 acres, and the net acreage within the City limits assigned to an existing or planned land use is 13,798 acres. Therefore, a factor of 1.12 (15,425 acres divided by 13,798 acres) was used to convert from net acreage to gross acreage.

² Mintier & Associates and Matrix Design Group, Inc. March 2008. *City of Lincoln General Plan 2050*. Table 4-1. General Plan Land Use Designations and Development Standards.

Fig. 1 - Meters: N:\Clients\2016 City of Lincoln\60-24-56 Water Master Plan\GIS\Ch3_Lincoln_WMPL\mapx - avam - 11/12/2024



- Spatially Located Water Meters
- ▭ City Limit
- Existing Pipelines
 - Distribution Pipeline (<18-inch)
 - Transmission Pipeline (≥18-inch)
- Pressure Zones
 - 375 Zone
 - 475 Zone
 - 575 Zone
 - 610 Zone
 - 650 Zone
 - 750 Zone
 - 775 Zone

Notes:
 1. GIS meter shapefile provided by the City of Lincoln in 2024.
 2. Meters shown in this figure represent metered potable water used only for the purpose of developing unit water use factors and does not represent all of the City's water meters.

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 Water Master Plan Update

Spatially Located Water Meters

Figure 1

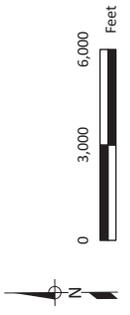
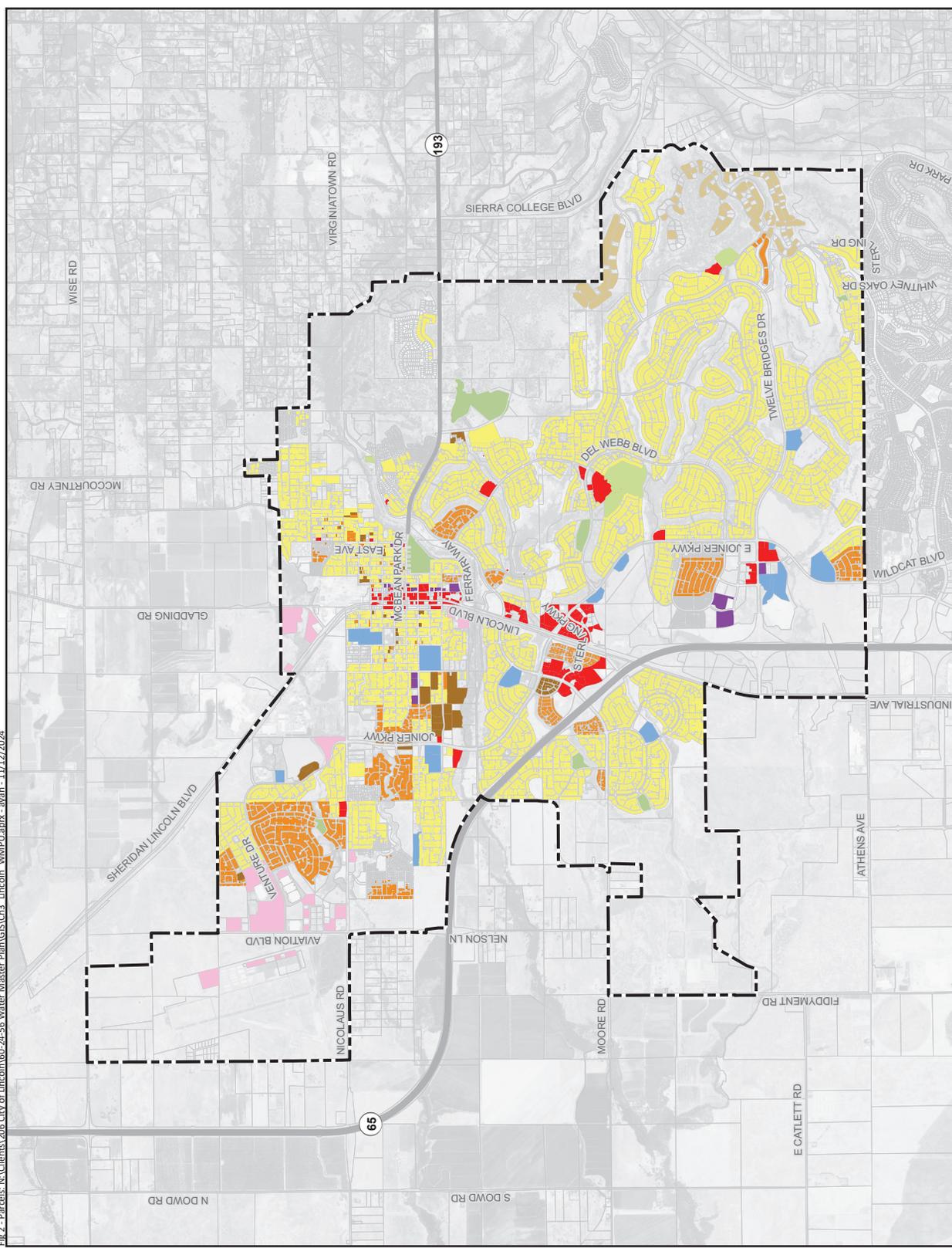


Fig. 2 - Parcels: N:\Clients\2016 City of Lincoln\60-24-56-Water Master Plan\GIS\Ch3_Lincoln_WMPL\amx - ryan - 11/12/2024



City Limit

Zoning

- Country Estates
- Low Density Estates
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Business and Professional
- Industrial
- Public Facilities
- Parks and Recreation

- Notes:**
1. GIS zoning and land use shapefiles provided by the City of Lincoln in 2024.
 2. Zoning is only shown for parcels which were used to calculate acreage in the unit water use factor development.
 3. Land use for meters originally categorized as open space were revised by the City. The parcels for these meters were manually drawn in, and therefore, the land use shown is not an exact match to the City's Zoning Map.
 4. Mixed Use land use is not shown since the associated parcel has not been developed, and therefore, was not used to calculate the unit water use factor.
 5. Recommended unit use factors for Public Facilities, and Parks and Recreation were not based on the parcels shown.
 6. Parks and Recreation zoning shown represents the total park area served by a meter and in some cases can include multiple parcels, some of which may not directly have a meter.

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Parcels Used in Water Use Factor Calculations

Figure 2

Low Density Estates

The 2021 water use factor update listed a Country Estates land use. However, recent Specific Plans have included a Low Density Estates designation as a planned land use with similar characteristics as the Country Estates. For this update, a single Low Density Estates water use factor was developed to represent the Low Density Estates and Country Estates land use designations. The Low Density Estates land use designation represents residential parcels with a density of up to 2 dwelling units per acre (du/ac) and Country Estates land use designation represents residential parcels with a density of 1 to 2.9 du/ac. Low Density Estates parcels tend to include large multi-story homes on lots of 20,000 square feet or greater, with large yards and extensive landscaping. Similar to Low Density Estates, Country Estates parcels tend to be large parcels with large single-family homes. It was assumed that there is a single dwelling unit on each existing Low Density Estates parcel. A Low Density Estates unit use factor of 1.46 acre-feet per dwelling unit (af/du) was calculated from the 2023 meter consumption data and is recommended for the City to adopt. This represents an increase of approximately 7 percent from the 2021 calculated unit use factor.

Low Density Residential

The Low Density Residential land use designation represents residential parcels with a density of 3 to 5.9 du/ac. Low Density Residential land use consists of traditional single-family homes on individual lots. It was assumed that there was a single dwelling unit on each existing Low Density Residential parcel. A Low Density Residential unit use factor of 0.39 af/du was calculated from the 2023 meter consumption data and is recommended for the City to adopt. This represents a decrease of approximately 3 percent from the 2021 calculated unit use factor.

Medium Density Residential

The Medium Density Residential land use designation represents residential parcels with a density of 6 to 12.9 du/ac. Medium Density Residential land use consists of traditional single-family homes on lots which are slightly smaller than those of Low Density Residential use. It was assumed that 10 dwelling units, the median of the Medium Density Residential dwelling unit range, was on each existing Medium Density Residential parcel. The calculated unit use factor using the 2023 meter consumption data was approximately 30 percent lower than the 2021 calculated unit use factor. While the City has seen a decrease in water demands, it was decided a more conservative approach to account for demand variability be used to calculate the unit use factor. A Medium Density Residential unit use factor of 0.30 af/du was calculated based on the average from the 2021 and 2023 meter consumption data and is recommended for the City to adopt. This represents a decrease of approximately 16 percent from the 2021 calculated unit use factor.

High Density Residential

The High Density Residential land use designation represents residential parcels with a density of 13 to 20 du/ac or greater. The High Density Residential land use designation includes higher density living styles, such as condominiums, townhouses, triplexes and fourplexes, and multi-family residential units. It was assumed that 17 dwelling units, the median of the High Density Residential dwelling unit range, was on each existing High Density Residential parcel. The calculated unit use factor using the 2023 consumption data was approximately 24 percent lower than the 2021 calculated unit use factor. While the City has seen a decrease in water demands, it was decided a more conservative approach to account for demand variability be used to calculate the unit use factor. A High Density Residential unit use factor of 0.18 af/du was calculated based on the average from the 2021 and 2023 meter consumption data and is

recommended for the City to adopt. This represents a decrease of approximately 12 percent from the 2021 calculated unit use factor.

Commercial

A single Commercial water use factor was developed to represent the Neighborhood Commercial and Community Commercial land use designations. The calculated unit use factor using the 2023 consumption data was approximately 28 percent lower than the 2021 calculated unit use factor. While the City has seen a decrease in water demands, it was decided a more conservative approach to account for demand variability be used to calculate the unit use factor. A Commercial unit use factor of 1.45 acre-feet per acre (af/ac) was calculated based on the average from the 2021 and 2023 meter consumption data and is recommended for the City to adopt. This represents a decrease of approximately 14 percent from the 2021 calculated unit use factor.

Business and Professional

A single Business and Professional water use factor was developed to represent the Business and Professional and Employment Center land use designations. These land use types include offices and other buildings associated with professional services. The calculated unit use factor using the 2023 consumption data was approximately 48 percent lower than the 2021 calculated unit use factor. While the City has seen a decrease in water demands, it was decided a more conservative approach to account for demand variability be used to calculate the unit use factor. A Business and Professional unit use factor of 1.15 af/ac was calculated based on the average from the 2021 and 2023 meter consumption data and is recommended for the City to adopt. This represents a decrease of approximately 24 percent from the 2021 calculated unit use factor.

Mixed Use

The Mixed Use land use designation represents developments that physically and functionally provide space to integrate residential and commercial use. Generally, mixed use developments are anticipated to consist of buildings with commercial use on the first floor and residential use on all floors above the first. There is currently only one meter associated with the Mixed Use land use designation, and that respective area has yet to be developed. Since there is no current consumption data associated with this land use, an updated unit water use factor from the City's consumption data could not be developed. Therefore, it is recommended for the City to continue to use the previously developed Mixed Use unit use factor of 2.00 af/ac from the 2021 water use factor update, which was developed based on other agencies in the Central Valley with similar climates.

Industrial

A single Industrial land use designation was developed to represent the Industrial, Light Industrial, and Industrial Planned Development land use designations. To remain consistent with the 2021 water use factor update, water use and parcel acreage for Sierra Pacific Industries sawmill plant and Gladding McBean clay plant have been excluded from the calculations since these large manufacturing plants have above average industrial water use and are not representative of future Industrial developments within the City. Additionally, the water use and parcel acreage at 466 Airport Road were also excluded from the analysis as it was assumed that the large parcel acreage does not accurately represent the extent of water use serving the parcel. An Industrial unit use factor of 0.47 af/ac was calculated from the 2023 meter consumption data and is recommended for the City to adopt. This represents an increase of approximately 10 percent from the 2021 calculated unit use factor.

Public Facilities

The Public Facilities land use designation represents public facilities, churches not associated with a residence, and schools. Water use and parcel acreage associated with the City Wastewater Treatment Facility was excluded from the calculations as it was assumed that the large parcel acreage does not accurately represent the extent of water use serving the parcel. The unit use factor calculated from the 2023 consumption data was significantly lower than the 2021 water use factor. To be conservative, it is recommended for the City to continue using the previous Public Facilities unit use factor of 1.80 af/ac from the 2021 water use factor update, which was developed based on other agencies in the Central Valley with similar climates.

Parks and Recreation

The Parks and Recreation land use designation represents irrigated public parks and areas maintained for recreation, such as sports fields, courts, and playgrounds. The unit use factor calculated from the 2023 meter consumption data was significantly lower than the 2021 water use factor. To be conservative, it is recommended for the City to continue using the previous Parks and Receptions unit use factor of 3.55 af/ac from the 2021 water use factor update, which kept the same factor developed in the 2017 Water Master Plan.

RECOMMENDED WATER USE FACTORS

Table 1 summarizes the recommended unit water use factors for the City to use for future water system planning and compares them with the factors previously developed and adopted in 2021. Low Density Residential, Medium Density Residential, High Density Residential, Commercial, and Business and Professional water use factors saw a decrease from the previous factors, which is consistent with water conservation trends observed throughout the Central Valley and may be a result of the efforts outlined in the City's 2020 Urban Water Management Plan. Low Density Estates (previously Country Estates) and Industrial water use factors saw slight increases in water use by 7 and 10 percent, respectively. Mixed Use, Public Facilities, and Parks and Recreation water use factors did not change. Based on the work completed to develop these water use factors, they are appropriate for the City to adopt and use in projecting future water demands.

Table 1. Recommended Unit Water Demand Factors				
Water Use Factor	General Plan Land Use Designation(s)	af/du/yr	af/ac/yr	Change from 2021 Water Use Factor TM, Percent^(a)
Residential				
Low Density Estates	Low Density Estates	1.46	--	+7%
	Country Estates			
Low Density Residential	Low Density Residential	0.39	--	-3%
Medium Density Residential	Medium Density Residential	0.30	--	-16%
High Density Residential	High Density Residential	0.18	--	-12%
Non-Residential				
Commercial	Neighborhood Commercial	--	1.45	-14%
	Community Commercial	--		
Business and Professional	Business and Professional	--	1.15	-24%
	Employment Center	--		
Mixed Use ^(b)	Mixed Use	--	2.00	No change
Industrial	Industrial	--	0.47	+10%
	Light Industrial	--		
	Industrial Planned Development	--		
Public Facilities ^(c)	Public Facilities	--	1.80	No change
Parks and Recreation ^(c)	Parks and Recreation	--	3.55	No change
<p>(a) Unit water use factors developed in 2021 included an additional factor of 5 percent to be conservative and account for variability in annual water use. This factor is not applied to the current recommended water use factors due to the 2018 Water Conservation Legislation to Making Water Conservation a California Way of Life adopted by the State Water Board on July 3, 2024.</p> <p>(b) The City did not have any Mixed Use consumption during the 2023 year, therefore, it is recommended for the City to continue using the Mixed Use unit water use factor developed in 2021.</p> <p>(c) The calculated Public Facilities and Parks and Recreation water use factors were significantly lower than the 2021 unit water use factor. To be conservative, it is recommended for the City to continue using the previous Public Facilities and Parks and Recreation unit use factors.</p>				