27 January 2020

Technical Memorandum

To: Mr. Shannon Cotulla, South Tahoe Public Utility District
Mr. Will Stelter, North Tahoe Public Utility District
Mr. Matt Homolka, Tahoe City Public Utility District

From: Sachiko Itagaki, P.E., Kennedy/Jenks Consultants

Reviewed By: Tim Williams, P.E., Kennedy/Jenks Consultants

Subject: Total District Water Production Requirements within the Boundaries of the Public Utility Districts Located in the California Portion of the Lake Tahoe Basin
KJ 1970003*00

Section 1: Introduction

The South Tahoe Public Utility District (STPUD), the Tahoe City Public Utility District (TCPUD) and the North Tahoe Public Utility District (NTPUD) (individually "District" and collectively "Districts") are performing this long-range study (Study) to determine their potential annual water production needs (existing and incremental increase related to foreseeable future water needs) in the California portion of the Lake Tahoe Basin.

This memorandum documents the Districts' recent historical Water Consumption and Water Production and the approach and data used to develop the Total District Water Production Requirement within each District Boundary based on current Land Use classifications. The California portion of the Lake Tahoe Basin is within El Dorado and Placer Counties and includes the District Boundaries for each of the three Districts. Several Non-District Water Systems are located within each District Boundary as shown on Figure 1.

Nevada County
Placer County

NTPUD Sewer and Water Service Area

Agate Bay Water Company
Tahoe Main Water System
Carnelian Woods Water System
Fulton Water Company
Dollar Hill Water System
Washoe Heights Mutual Water Co
TCPUD Sewer Service Area
TCPUD Water Service Area
Lakeview Water Co
Tahoe Park Water Co
Ward Well Water Co
Skyland/Nielsen Water Co
Talmont Resort Improvement District
Tahoe Pines/Tahoe Swiss Village Water Co
McKinney Estates Water District
Sugar Pine State Park
Glenridge Water Co
Lakeside Water Company
Tahoe Keys Water Company
Lukins Brothers Water Company
STPUD Water Service Area
STPUD Sewer Service Area

Legend

- NTPUD Water Service Area
- NTPUD Sanitary Sewer Service Area
- TCPUD Water Service Area
- TCPUD Sanitary Sewer Service Area
- Water Service Area (Neighboring STPUD)
- STPUD Water Service Area
- STPUD Sanitary Sewer Service Area

Land Use

- Backcountry
- Conservation
- Mixed-Use
- Recreation
- Residential
- Resort Recreation
- Tourist
- Wilderness
- California Counties

N

0 1.5 3
Miles

Kennedy/Jenks Consultants

Water and Sewer Service Area Boundaries and Land Use

1970003.00

Figure 1

1.1 Definition of Terms

For the purpose of this Study, the following terms are used:

Terms	Definitions
2018	1 January 2018 through 31 December 2018.
2018 Unit Water Production	Initial Unit Water Demand plus Unaccounted-for Water.
2018 Water Production Requirement	The Water Production required in the California portion of the Lake Tahoe Basin for Parcels developed as of 2018.
AB 1668 and SB 606	Assembly Bill 1668 and Senate Bill 606 (31 May 2018) establish guidelines for efficient water use and a framework for the implementation and oversight of the new standards, which must be in place by 2022.[1]
APN	Assessor's Parcel Number.
Baseline Unit Water Production	The 2018 Unit Water Production multiplied by a factor to account for recent hydrology as described in Section 3.5.
CCF	A unit of 100 cubic feet.
Current Baseline Water Production Requirement	Represents the Water Production requirement in the California portion of the Lake Tahoe Basin for Parcels developed as of 2018 and is calculated by applying an adjustment factor to the 2018 Water Production Requirement.
District Boundary	The legal boundary of a District that represents the area within which the District may provide its authorized services, which includes the provision of public water and sewer services.
District Water Service Area	Discrete area served by a District's water distribution system that is located within a District Boundary.
eWRIMS	Electronic Water Rights Information Management System maintained by California State Water Resources Control Board, Division of Water Rights. The public Water Rights Records Search can be accessed online.[2]

[1] California State Water Resources Control Board, "California Statutes Making Conservation a California Way of Life." Accessed 12 September 2019. https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/california_statutes.html

[2] California State Water Resources Control Board, Public Water Rights Records Search. Accessed 12 September 2019. https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/EWServlet?Redirect_Page=EWWaterRightPublicSearch.jsp&Purpose=getEWAppSearchPage

Terms	Definitions
Future Baseline Water Production Requirement	The Water Production required to meet the demands of Parcels that are not currently provided water service by a Public Water System, a State Small Water System or an individual/private water supply, or a Parcel with a Water Service Account with no Water Consumption in 2018 (i.e., undeveloped) and that are potentially developable according to the criteria described in Section 4.
GIS	Geographic Information System, a computer software system capable of capturing, storing, checking, and displaying data related to positions on Earth's surface.
Initial Unit Water Demand	Metered Water Demand divided by associated acreage of land. This value does not include Unaccounted-for Water.
Lake Tahoe Basin	The California and Nevada regions or areas bounded peripherally by a divide which naturally drains into Lake Tahoe.
Land Use	Land Use classifications in the Lake Tahoe Basin as determined by the Tahoe Regional Planning Agency (TRPA), which is coordinated with local jurisdictions such as El Dorado and Placer Counties as well as City of South Lake Tahoe to develop general plans. TRPA Land Use classifications, which are the basis for this Study, are the same within El Dorado and Placer Counties. They are described in Section 2.5. Zoning classifications are more refined than Land Use classifications, but El Dorado and Placer Counties have different zoning classifications.
Metered Water Account	A District water account within a District Boundary that is equipped with a water meter and is collecting usage data.
Metered Water Demand	The quantity of water delivered to water service connections with water meters maintained by each District.
Metered Water Production	Water Production Data provided by the Districts or others. These data can be for District and Non-District Water Service Areas.
Non-District Water Service Area or Non-District Water System	The water distribution system area or private well or surface water intake and the Parcels served thereby where a District does not provide water service. Non-District Water Service Areas can be served by other Public Water Systems other than the Districts, State Small Water Systems, a water system not regulated by the State of California, or private water source.

Terms	Definitions
Parcel	An area of land or, in the case of a condominium, separate space, whose boundaries have been established by some legal instrument such as a recorded map or recorded deed and that is recognized as a separate legal real property for purposes of transfer of title.
Public Water System	Pursuant to California Health and Safety Code Section 116275, a system for the provision of water for human consumption that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.[3]
Retired Parcel	A Parcel in which usage, coverage, development rights, or other development potential has been extinguished by TRPA pursuant to the TRPA Code of Ordinances.
SB X7-7	Senate Bill X7-7, the Water Conservation Act of 2009 requires a reduction of urban water use by 20 percent by the year 2020.
State Small Water System	A water system that serves between 5 and 15 water service connections. State Small Water Systems are not considered Public Water Systems.
Tahoe Regional Planning Agency (TRPA)	TRPA is a public agency that provides land use governance over the Lake Tahoe Basin. The Bi-State Compact (Public Law 96-551) is the federal legislation that grants TRPA the authority to adopt environmental quality standards and enforce ordinances for development within the Lake Tahoe Basin.
Total Baseline Water Production Requirement	The sum of the Current Baseline Water Production Requirement and the Future Baseline Water Production Requirement.
Total District Water Production Requirement	The amount of water that needs to be produced by all water providers within each District Boundary to meet Water Consumption and Unaccounted-for Water for current and all potentially developable Parcels that are or could be occupied in accordance with the assumptions described in Sections 3 through 7.

[3] California State Water Resources Control Board, "Information for Public Drinking Water Systems, Public Water Systems, Legal Definitions." Accessed. 19 September 2019. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/waterpartnerships/what_is_a_public_water_sys.pdf

Terms	Definitions
Unaccounted-for Water	Water Production by a District, but not put to direct use, because it is "lost" in transmission to water service connections. Unaccounted-for Water includes, but is not limited to, unauthorized diversion, meter inaccuracies, systemic data handling errors, and/or leaks in the water distribution system. Unaccounted-for Water = Water Production – Water Consumption
Unmetered Water Account	A District water account within a District Water Service Area that is not equipped with a water meter as well as all water accounts in a Non-District Water Service Area.
Unmetered Water Demand	Demand from water service connections that are not metered.
Water Consumption	Metered Water Demand plus Unmetered Water Demand.
Water Production	Water produced by a water service provider including the District(s) and others to serve water service customers. Water Production includes Water Consumption and Unaccounted-for Water.
Water Production Data	The data for monthly ground and surface water production for each District.

1.2 Overview of Study Methodology

Because the scope of this Study spans multiple providers and counties, the selected data analysis approach relied on Metered Water Demand data provided by the Districts, Water Production Data provided by the Districts, Parcel and ownership information from El Dorado and Placer Counties, and Land Use information, also shown on Figure 1, as published by TRPA, which regulates development in the Lake Tahoe Basin. The analysis used GIS software to tie the separately-maintained District, county, and TRPA information using APNs and/or Parcel addresses to develop a single dataset across the California Portion of the Lake Tahoe Basin. The data analysis process included the following steps:

1. Match District-provided Metered Water Demand data, sanitary sewer account data, Parcel information, and TRPA Land Use designations in GIS and identify existing developed Parcels. Reconcile unmatched information.

2. Calculate the Initial Unit Water Demand by aggregating the matched District-provided Metered Water Demand data by TRPA Land Use and dividing by the acreage of the land use designation. Compare the total Metered Water Demand by District with District-provided Water Production data to estimate Unaccounted-for Water. Distribute the Unaccounted-for Water for each TRPA Land Use to the Initial Unit Water Demand to obtain the 2018 Unit Water Production by TRPA Land Use.

3. Develop the 2018 Water Production Requirement based on the following information:

    a. Water Production Data, Metered Water Demand data, Unmetered Water Demand data, and the 2018 Unit Water Production by Land Use for each District.

    b. eWRIMS data from the State Water Resources Control Board for Non-District Water Systems.

    c. Apply the 2018 Unit Water Production to the remaining Parcels within the District Boundaries that are identified to have Water Consumption (e.g., sewer accounts), but are not accounted for in Steps 3a or 3b, above to estimate 2018 Water Production Requirements.

4. Use the previous 10 years of Water Production Data and hydrologic conditions to develop adjustments to the 2018 Water Production Requirement and 2018 Unit Water Production factor to develop a baseline condition and resulting in the Current Baseline Water Production Requirement and Baseline Unit Water Production.

5. Identify the undeveloped Parcels that are potentially developable, i.e., Parcels that do not currently have water service, but may be expected to receive water service in the future. These Parcels were further refined based on Land Capability Scores, classification as Retired Parcels, Residential Individual Parcel Evaluation System (IPES)

scores, and District input to identify those Parcels with a higher probability of development in the future.

6. Apply the calculated Baseline Unit Water Production from Step 4 to those Parcels with a reasonable probability of development identified in Step 5 to calculate the Future Baseline Water Production Requirement.

7. Add the Future Baseline Water Production Requirement to the Current Baseline Water Production Requirement from Step 3 to obtain the Total Baseline Water Production Requirement under current Land Use classifications within each District Boundary.

8. To account for future variability, apply factors for potential future changes including climate, occupancy, Land Use and other changes outside of District control to calculate the Total District Water Production Requirement within each District Boundary.

A more detailed description of each of the above steps is provided in Sections 3 through 7 of this Study. It should be noted that the approach used to develop the Total District Water Production Requirement may be different than the approach developed for planning activities such as Urban Water Management Plans and water master plans. Although this document can be used to inform the update and development of those planning documents and activities, care should be taken to acknowledge the granularity of the data and results as well as the basis for what is considered “future.”

Section 2: Data Sources

This Study involves information from multiple local and regional jurisdictions as well as data maintained by each of the Districts. This Section describes the information gathered and used to calculate the Initial Unit Water Demand and Baseline Unit Water Production.

It is noted that within each of the Districts, there are also Non-District Water Systems operated by public and private entities such as the U.S. Forest Service, California State Parks, regulated utilities, mutual water companies, and private businesses and individuals utilizing private wells and lake and stream intakes. It is assumed that these Non-District Water Systems are provided sewer service by the Districts due to the Porter Cologne Water Quality Control Act that mandates the export of all wastewater out of the Lake Tahoe Basin (California Water Code, Section 13951).

2.1 STPUD District Boundary Data

STPUD provides water and sewer services to the area within the City of South Lake Tahoe and in a portion of the unincorporated area of El Dorado County. There are also three Non-District Water Systems within STPUD's Boundary: Lukins Brothers Water Company (LBWC), Tahoe Keys Water Company (TKWC), and Lakeside Park Association (LPA) as well as several small Non-District Water Systems.

2.1.1 Water Production Data/Metered Water Demand Data/Retired Parcel Data

STPUD provided the following Metered Water Demand, Water Production Data, and Retired Parcel information obtained from TRPA:

- Quarterly Metered Water Demand from January 2009 through January 2019 (received from the District on 24 January 2019). Each Metered Water Account output includes an account number, customer classification, APN, meter number and size, meter read date, and Metered Water Demand in units of CCF. All STPUD non-residential accounts are metered. STPUD has required individual residential water meters for new or remodeled construction since 1993 and is in the process of installing water meters on all non-metered residences as well as other accounts. As of December 2018, STPUD has 12,050 metered connections or 85% of total accounts metered as shown in Table 1 in Section 2.1.3. STPUD is anticipating being fully metered by 2021.

- Water Production Data for STPUD, LBWC, and TKWC in units of million gallons (MG) from October 2005 through September 2018 (received from the District on 24 January 2019). Water Production Data for STPUD wells was provided for January 1996 through December 2018.

- Monthly volume of water sold by STPUD to LBWC in units of CCF from October 2014 through September 2018. Provided by STPUD on 20 March 2019.

- A spreadsheet with individual Metered Water Accounts, Unmetered Water Accounts, and sewer accounts consisting of account numbers, physical and billing addresses, and APN for each account. Provided by STPUD on 19 February 2019.

- A spreadsheet with vacation home rentals registered with the City of South Lake Tahoe as of April 2019. Provided by STPUD on 29 May 2019.

- A list of Retired Parcels provided by TRPA on 17 June 2019.

2.1.2 Sewer Account Data

On 19 February 2019, STPUD provided a spreadsheet with individual sewer accounts consisting of account numbers, physical and billing addresses, and APNs for each account. A portion of the STPUD District Boundary is provided water service by LBWC, TKWC, and LPA as well as other Parcels without Non-District Water System water accounts that use surface water or private groundwater well supply. For 2018, there were 566 Parcels that had sewer only accounts in the STPUD District Boundary that were not provided water service by a Public Water System. Water to these Parcels is believed to be provided by private wells.

2.1.3 Summary of Water Production Data

Table 1 summarizes STPUD's information on annual Water Production and number of water accounts as of 31 December of each year.

Table 1: Summary of STPUD Recent Annual Water Production

Year	Annual Water Production (AFY)	# of Metered Water Accounts	# of Unmetered Water Accounts	# of Water Accounts (Total)
2009	6,918	830	13,067	13,897
2010	6,546	5,125	8,807	13,932
2011	6,026	5,401	8,540	13,941
2012	6,516	5,656	8,274	13,930
2013	6,338	5,734	8,244	13,978
2014	6,009[(a)]	7,046	6,996	14,042
2015	5,241[(a)]	8,382	5,695	14,077
2016	5,507[(a)]	9,000	5,119	14,119
2017	5,624[(a)]	9,693	4,466	14,159
2018	5,941[(a)]	12,050	2,193	14,243

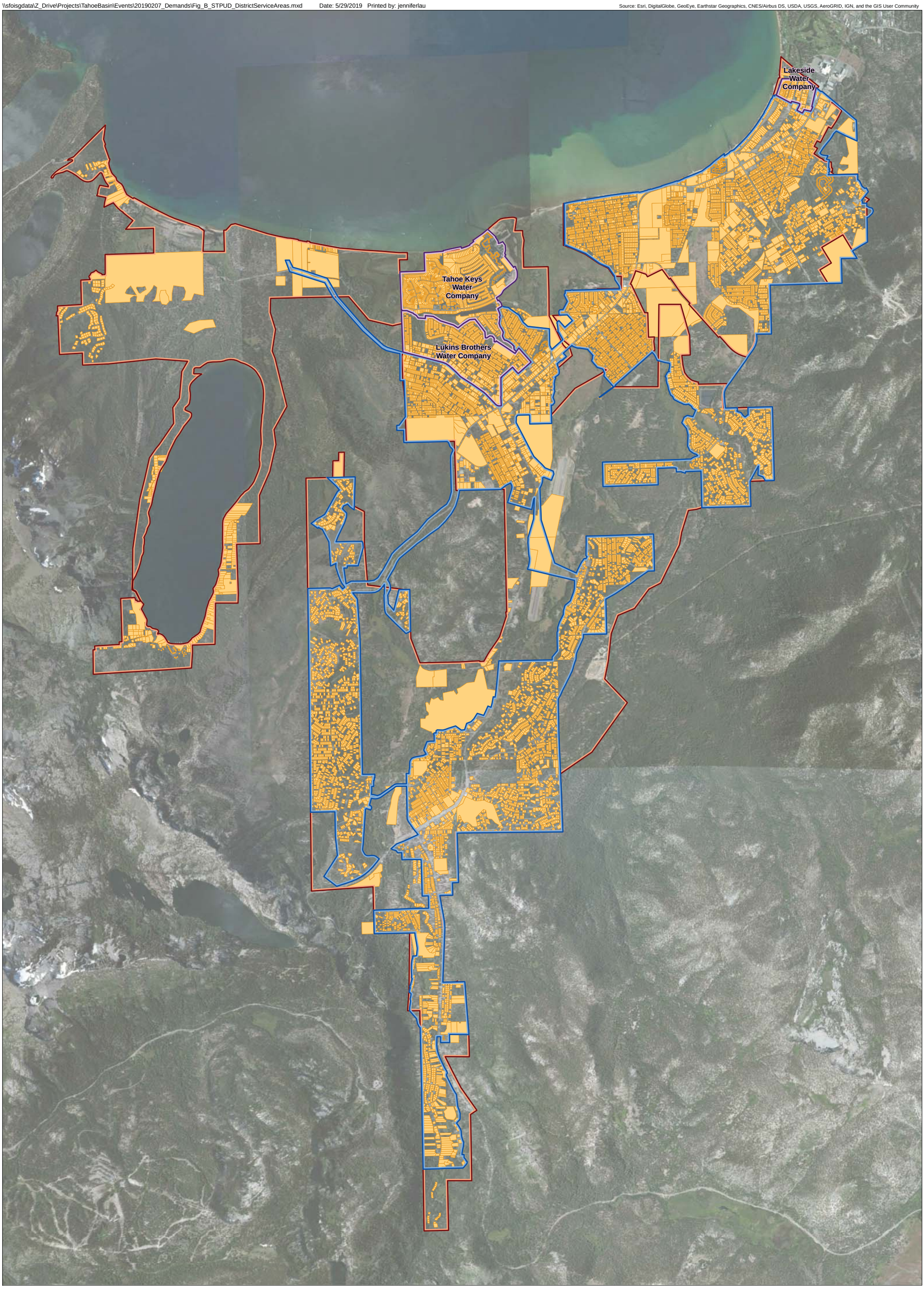
Note:
(a) Includes water supply provided by the District to LBWC pursuant to the mutual aid agreement. For 2018, this amount (about 23 AF) is subtracted from the District's Water Production Data in calculating the 2018 Unit Water Production in Table 5.

2.1.4 GIS Data

STPUD provided GIS shapefiles on 24 January 2019 containing information regarding the spatial location in the District Boundary of the following:

- STPUD Water Service Area (Metered Water Accounts and Unmetered Water Accounts)
- Sewer service area
- Non-District Water Service Areas for LBWC, TKWC, and LPA

As shown on Figure 2, the areas served by the STPUD water and sewer systems are not contiguous since LBWC, TKWC, and LPA provide water service within portions of the STPUD District Boundary. The GIS data was cross-referenced with the Metered Water Demand and sewer account APN information.



Legend

- Non-STPUD Water System Boundary
- STPUD Service Area Boundary
- STPUD Sanitary Sewer Service Area
- Parcels with Accounts

N

0 2,200 4,400

Feet

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South Tahoe Public Utility District
Water and Sewer Service Area Boundaries

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Figure 2

2.2 NTPUD District Boundary Data

NTPUD provides water and sewer services to the unincorporated communities of the North Shore of Lake Tahoe in Placer County including Kings Beach, Tahoe Vista, Brockway Vista, Carnelian Bay, Cedar Flat, and Agate Bay. NTPUD is neighbored by TCPUD to the South and Incline Village General Improvement District to the East. There are three NTPUD water systems within the NTPUD Water Service Area, Dollar Cove, Carnelian Woods, and Tahoe Main. In addition, there are three Non-District Water Service Areas within the NTPUD District Boundary. Of these Non-District Water Service Areas, one is owned and operated by Agate Bay Water Company, and two are owned and operated by Fulton Water Company. Figure 3 shows the NTPUD District Boundary (within which water and sewer service is or may be provided), the NTPUD Water Service Areas, and the three Non-District Water Service Areas.

2.2.1 Water Production Data/Metered Water Demand Data

NTPUD provided the following Metered Water Demand and Water Production Data:

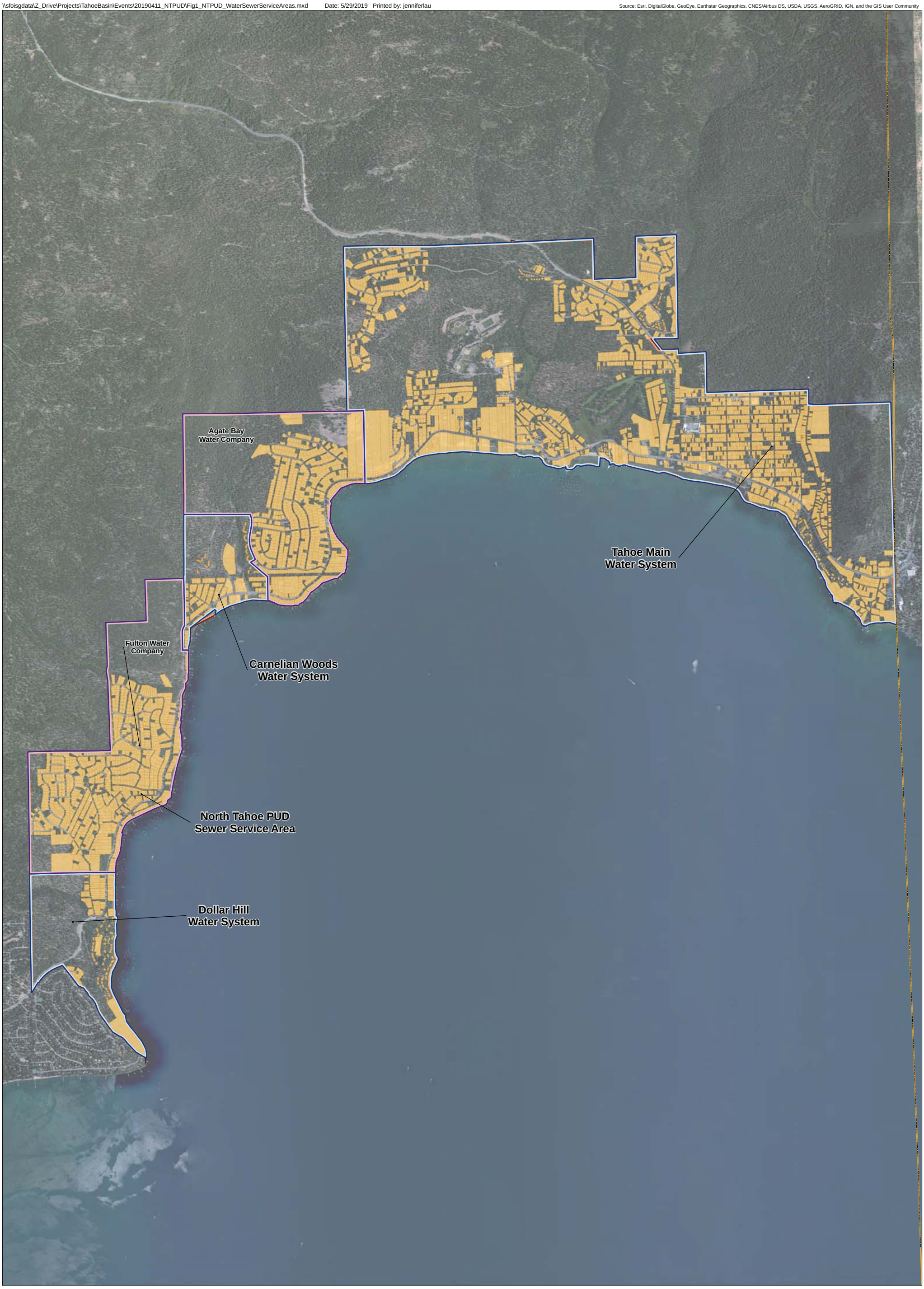
- Monthly Metered Water Demand from January 2010 through December 2018 (received from the District on 28 May 2019). Each meter record includes service code and description, customer number, APN, service address, and Metered Water Demand in units of 1,000 gallons. Parcels that receive water service through NTPUD are fully metered. These data include Metered Water Demand for the Dollar Cove system, supplied through a wholesale purchase agreement connection with TCPUD.

- Overall District Water Production Data in units of million gallons (MG) for each year from January 2008 through December 2018 (received from the District on 31 January 2019).

- Annual volume of water produced by each of the NTPUD production meters, Dollar Cove, Carnelian Well, National Ave. Treatment Plant, and Park Well in units of million gallons (MG) from 1988 through 2016 (received from the District on 1 February 2019). NTPUD receives water from TCPUD through an intertie with TCPUD to supply water to its Dollar Cove system.

2.2.2 Sewer Account Data

NTPUD provided a spreadsheet with individual sewer accounts within the NTPUD District Boundary, consisting of customer identification numbers and physical and billing addresses for each account (received from the District on 22 March 2019). The NTPUD District Boundary includes the Agate Bay Water Company, Fulton Water Company, and other Parcels with surface water rights and/or private wells. For 2018, there were 169 Parcels that had sewer-only accounts in the NTPUD District Boundary. NTPUD is not aware whether those Parcels receive water from Agate Bay Water Company, Fulton Water Company, or other surface water diversions and/or private well.



Legend

- Non-NTPUD Water System Boundary
- NTPUD Water Service Area
- NTPUD Sanitary Sewer Service Area
- Parcels with Accounts

N

0 1,400 2,800

Feet

Kennedy/Jenks Consultants

North Tahoe Public Utility District
Water and Sewer Service Boundaries

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Figure 3

2.2.3 Summary of Water Production Data

Table 2 summarizes NTPUD annual Water Production and number of Metered Water Accounts.

Table 2: Summary of NTPUD Recent Production (AFY)

Year	Water Production (AFY)	# of Metered Water Accounts[a]
2009	1,560	Not Available
2010	1,485	3,453
2011	1,363	3,471
2012	1,386	3,458
2013	1,377	3,460
2014	1,299	3,466
2015	1,037	3,470
2016	1,137	3,472
2017	1,216	3,481
2018	1,195	3,504

Note:

a. All NTPUD water service connections are metered.

2.2.4 GIS Data

On 1 February 2019, NTPUD provided GIS shapefiles containing information regarding the spatial location in its District Boundary of the following:

- District Water Service Areas (Tahoe Main Water System, Carnelian Woods Water System, and Dollar Cove Water System)
- Non-District Water Service Areas (two owned by Fulton Water Company and one owned by Agate Bay Water Company)
- Areas with sewer service only

Figure 3 shows the District Water Service Areas, Non-District Water Service Areas, and District Boundary. The NTPUD-provided GIS data was cross referenced with the Metered Water Demand and APN information provided by NTPUD.

2.3 TCPUD District Boundary Data

TCPUD provides water and sewer services to the unincorporated communities in and around Tahoe City in Placer and El Dorado Counties. TCPUD currently provides water service to eight District Water Service Areas within its District Boundary:

1. Tahoe City (Subregional) Water System
2. Tahoe Truckee Forest Tract Water System
3. Alpine Peaks Water System

4. Timberland Water System (Acquired 1/1/18 – Unmetered)
5. Madden Creek Water System (Acquired 1/1/18 – Unmetered)
6. McKinney/Quail Water System
7. Tahoe Cedars Water System (Acquired 1/1/18 – Unmetered)
8. Rubicon Water System

There are nine Non-District Water Service Areas within the TCPUD District Boundary where TCPUD provides only sewer service:

1. Lakeview Hills Water Company
2. Tahoe Park Water Company
3. Washoe Heights Water Company
4. Talmont Resort Improvement District
5. Ward Well Water Company
6. Skyland/Nielsen Water Company
7. Tahoe Pines/Tahoe Swiss Village Water Company
8. McKinney Estates Water District
9. Glenridge Water Company

There are also other individual Parcels with surface water rights or private well supply that only receive sewer service.

The TCPUD District Boundary is adjacent to the NTPUD District Boundary. TCPUD provides water to supply the NTPUD's Dollar Cove system through a metered intertie. In addition, the TCPUD has metered emergency interties with Tahoe Park Water Company, Tahoe Pines/Tahoe Swiss Village Water Company, and the McKinney Estates Water District.

Figure 4 shows the District and Non-District Water Service Areas and the TCPUD District Boundary.

Tahoe City Public Utility District

Lakeview Water Co

Talmont Resort Improvement District

Washoe Heights Mutual Water Co

Tahoe Park Water Co

Tahoe City Public Utility District

Ward Well Water Co

Tahoe City Public Utility District

Skyland/Nielsen Water Co

Tahoe Pines/Tahoe Swiss Village Water Co

Tahoe City Public Utility District

Tahoe City Public Utility District

McKinney Estates Water District

Tahoe City Public Utility District

Tahoe City Public Utility District

Placer County

El Dorado County

CA State Parks

Glenridge Water Co

Tahoe City Public Utility District

Legend

- TCPUD Water Service Area
- Non-TCPUD Water Service Areas
- TCPUD Sanitary Sewer Service Area
- Parcels with Accounts

N

0 3,200 6,400

Feet

Kennedy/Jenks Consultants

Tahoe City Public Utility District
Water and Sewer Service Areas

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Figure 4

2.3.1 Water Production Data/Metered Water Demand Data

TCPUD provided the following Metered Water Demand and Water Production Data:

- Monthly Metered Water Demand from January 2010 through December 2018 for all Metered Water Accounts within the TCPUD Water Service Areas (received from the District on 1 March 2019). Each meter record includes meter class, service address, tax lot, consumption in units of gallons, and date of meter read. TCPUD's service accounts are fully metered with the exception of the three newly acquired District Water Service Areas (Timberland, Madden Creek, and Tahoe Cedars).

- Water Production Data, which includes treated surface water and groundwater meter data, in units of gallons from January 2008 through December 2018 (received from the District on 1 March 2019). Data beginning in 2010 includes monthly Metered Water Demand and Unaccounted-for Water totals in units of gallons.

- Overall District Water Production Data for each year from 1980 through 2018 in units of millions of gallons (MG) and acre-feet per year (AFY) (received from the District on 1 March 2019). Water Production Data for 2018 of the three newly acquired and unmetered District Water Service Areas (Timberland, Madden Creek, and Tahoe Cedars) was provided separately from the metered system Water Production Data.

2.3.2 Sewer Account Data

TCPUD provided a list of individual sewer accounts consisting of APN, service zip code, and billing zip code for each account (received from the District on 23 April 2019). As shown on Figure 4, TCPUD provides sewer service within its District Boundary to all developed Parcels including Parcels in the TCPUD Water Service Areas and in the Non-District Water Service Areas. For 2018, there were 26 Parcels that had sewer-only accounts in TCPUD District Boundary that were not provided water service by a Public Water System. Water to these Parcels is believed to be provided by private wells.

2.3.3 Summary of Water Production Data

Table 3 summarizes TCPUD information on annual Water Production and number of Metered Water Accounts.

Table 3: Summary of TCPUD Recent Water Production (AFY)

Year	Water Production (AFY)	# of Metered Water Accounts[a]
2009	1,539	Not Available
2010[b]	1,422	2,879
2011	1,292	3,979
2012	1,507	3,985
2013	1,447	4,160
2014	1,210	4,167
2015	1,010	4,166
2016	1,080	4,166
2017	1,189	4,168
2018[c]	1,189	4,170

Notes:
(a) All TCPUD water service connections are metered.
(b) Does not include condominium unit data that is reflected in number of accounts in 2011.
(c) Does not include data in the newly acquired and unmetered District Water Service Areas; Timberland Water System, Madden Creek Water System, and Tahoe Cedars Water System.

2.3.4 GIS Data

TCPUD provided GIS shapefiles on 28 February 2019 containing information regarding the spatial locations of the following:

- Parcel information
- TCPUD District Boundary, which corresponds with the TCPUD sewer service area
- Boundaries of the eight TCPUD Water Service Areas
- Boundaries of the nine Non-District Water Service Areas
- Water meter locations within the TCPUD Water Service Areas

The GIS data provided was cross-referenced with the monthly Metered Water Demand information provided by TCPUD.

2.4 Lake Tahoe Basin Data

The Lake Tahoe Basin is the Lake Tahoe region as defined by the Tahoe Regional Planning Compact or Bi-State Compact, presented in the TPRA *Regional Plan* adopted 12 December 2013. This region includes Lake Tahoe and the adjacent portions of El Dorado and Placer Counties within California and Douglas and Washoe Counties and Carson City within Nevada that drain to Lake Tahoe. This basin area is called the Lake Tahoe Hydrographic Area or the Lake Tahoe Basin. This Study is further limited to the California portion of the Lake Tahoe Basin, as shown on Figure 1.

A portion of the TCPUD District Boundary extends outside of the Lake Tahoe Basin. Water Production and Metered Water Demand data for this area, which consists of the Truckee Forest Tract Water System and developed and potentially developable Parcels outside the Lake Tahoe Basin, were excluded from the analyses presented in this Study.

2.4.1 TRPA

The Bi-State Compact (Public Law 96-551) is the federal legislation that grants TRPA the authority to adopt environmental quality standards and enforce ordinances for development within the Lake Tahoe Basin. Several data sets were obtained from TRPA that were used in this Study.

2.4.1.1 Land Use

TRPA groups Land Use into eight classifications: Backcountry, Conservation, Mixed-Use, Recreation, Residential, Resort Recreation, Tourist, and Wilderness, as described below. On 7 February 2019, the TRPA Land Use GIS shapefile (Final Land Use) was downloaded from the TRPA *Tahoe Open Data* website, http://data-trpa.opendata.arcgis.com/. These data also include Plan Area names, local jurisdiction, and acreage. Figure 1 shows the Land Uses in the Lake Tahoe Basin.

The TRPA Land Use categories, which are a primary source of information for this Study, are described as follows:[4]

- Backcountry: Backcountry areas are designated and defined by the U.S. Forest Service as part of their Resource Management Plans. On these lands, natural ecological processes are a priority and permanent human influences are discouraged.

- Conservation: Conservation areas are non-urban areas with value as primitive or natural area, with strong environmental limitations on use and with a potential for dispersed recreation or low intensity resource management.

- Mixed-Use: Includes a mix of urban land uses including commercial, residential, light industrial, and public services. According to the TRPA Regional Plan, this Land Use designation serves to concentrate higher intensity Land Uses.

- Recreation: Recreation areas are non-urban areas for developed outdoor recreation, park use, or concentrated recreation.

- Residential: Residential Parcels include single-family and multiple-family housing, mobile home parks, and other areas that provide housing.

[4] TRPA Regional Plan, Chapter 2: Land Use Element, Adopted 12 December 2012. Downloaded 4 January 2019.

- Resort Recreation: This Land Use designation is specific to Heavenly Ski Resort Parcels.

- Tourist: Tourist Land Uses include tourist accommodations, services, and intensive recreation.

- Wilderness: Wilderness Districts are designated and defined by the U.S. Congress as part of the National Wilderness Preservation System. Permanent improvements and mechanized uses are prohibited.

Generally, Residential, Mixed-Use, and Tourist Land Use designations are more urbanized Land Uses, while the others are non-urbanized. Section 4.1 describes how Land Uses were used in determining whether a Parcel was expected to develop.

2.4.1.2 Land Capability

In addition to TRPA Land Use assignments, development within the Lake Tahoe Basin is controlled by land coverage and capability restrictions, which limits the amount of land that can be developed with an impervious surface. There are two systems used to determine land capability within the Lake Tahoe Basin (http://www.trpa.org/permitting/land-coverage/), the more generalized Land Capability Scoring System and the Individual Parcel Evaluation System (IPES), which assigns scores only to Residential Parcels. Each of these systems is described below and specific application of the TRPA data to identify potentially developable Parcels is discussed in Section 4.1.

- Land Capability Scoring System: The Land Capability Scoring System applies to all Parcels. This system was developed in the early 1970s and is primarily based on high level USDA soils maps. Each soil type is assigned a score of 1 to 7 based on environmental sensitivity with 1 as the most environmentally fragile. Because this system relies on soils types, Land Capability boundaries do not necessarily align with Parcel boundaries. Current implementation of this system generally prohibits new development on Parcels with Land Capability scores 3 and below. The original mapping is the most complete Land Capability Scoring System currently available. TRPA and the Natural Resource Conservation Service continue to update soil surveys and the original Land Capability scores. If a modification to coverage is proposed, Parcel owners must have a current, site-specific Land Capability Verification for their Parcel.

  The TRPA Land Capability Scoring System GIS shapefile (Land Capability - Bailey) was downloaded in March 2019 from the TRPA *Tahoe Open Data* website, http://data-trpa.opendata.arcgis.com/. These data consist of Bailey Land Capability scores, soils units, and the geographic extent of the Bailey Land Capability scores.

- Individual Parcel Evaluation System (IPES): This system applies only to vacant Residential Parcels on or after 1 July 1987. These vacant Residential Parcels were scored in 1987 and 1988 using eight criteria:

1. Relative Erosion Hazard (450 points maximum)
2. Runoff Potential (200 points maximum)
3. Access (170 points maximum)
4. Stream Environment Zones (110 points maximum)
5. Condition of Basin (70 points maximum)
6. Ability to Revegetate (50 points maximum)
7. Need for Water Quality Improvements in the Vicinity (50 points maximum)
8. Distance from Lake Tahoe (50 points maximum).

The maximum IPES score is 1,150 with the higher IPES score corresponding with a greater development capability. Currently, thresholds for development under the IPES varies by county. In El Dorado County, the IPES threshold for development is a score of 1 and above (i.e., Parcels with scores of 0 cannot be developed), and in Placer County, the IPES threshold for development is a score of 726 and above (i.e., Parcels with scores 726 and less cannot be developed). Placer County is the only county within the Lake Tahoe Basin that utilizes an IPES threshold ≥726 (and therefore has a stricter IPES development requirement) and is actively implementing projects that will allow Placer County Parcels with IPES ≥1 to develop. It is assumed that the Placer County IPES threshold will be changed to ≥1 within the time horizon addressed in this Study.

In March 2019, TRPA provided a spreadsheet of the IPES database for active Parcels within the Lake Tahoe Basin.[5] The spreadsheet includes Parcel information, IPES scores, allowable coverage, and component scores for each of the eight criteria.

2.4.1.3 Retired Parcels

TRPA provided STPUD with a provisional Microsoft Excel spreadsheet on 17 June 2019 with Parcels within the Lake Tahoe Basin that TRPA considers “retired” or not developable (Retired Parcels). The information includes the APN and the source of the information (e.g., California Tahoe Conservancy, the U.S. Forest Service, or TRPA).

2.5 County Zoning Data

Zoning data for Placer and El Dorado Counties were downloaded in March 2019 from the respective county website.[6] County zoning designations are required to be consistent with TRPA Land Uses. The zoning definitions were obtained from the applicable plans and Land Use regulations:

- Placer County (for NTPUD and portions of TCPUD)

[5] Email between jenniferlau@kennedyjenks.com and jmcnamara@trpa.org, 7 March 2019.
[6] Placer County Zoning: http://maps.placer.ca.gov/Html5viewer/Index.html?configBase=http://arcgis/Geocortex/Essentials/REST/sites/LIS_Public/viewers/LIS_Base-Public/virtualdirectory/Resources/Config/Default
El Dorado County Zoning: http://gem.edcgov.us/ugotnet/

  - *Placer County Tahoe Basin Area Plan, Implementing Regulations* (January 2017), downloaded 21 March 2019.
  - TRPA Code of Ordinance Chapters 31 and 37 (effective 9 February 2013), downloaded 4 January 2019.

- El Dorado County (for STPUD and portions of TCPUD)
  - TRPA Code of Ordinance Chapters 31 and 37 (effective 9 February 2013).
  - *Meyers Area Plan* (March 2018), downloaded 21 March 2019.
  - *Tahoe Valley Area Plan/Specific Plan* (22 July 2015), downloaded 21 March 2019.
  - City of South Lake Tahoe Development Code Chapter 6, downloaded 21 March 2019.

Because zoning classifications varied between and within the two counties, the data were used for reference purposes when reviewing Parcels for development potential on a case-by-case basis.

2.6 Water Rights Diversion Data

In addition to the Districts' total Water Production, 2018 and 2017 water rights filings for the Lake Tahoe Basin were obtained from the Electronic Water Rights Information Management System (eWRIMS) database maintained by the State Water Resources Control Board, Division of Water Rights (accessed May 2019).[7]

As reported in eWRIMS, the quantity of water diverted includes water diverted and used, water diverted and stored, and conjunctive use in lieu of surface water.

In addition to private individual water rights holders and the Districts, there are Non-District Water Systems that hold and exercise water rights. In 2018, the other Non-District Water Systems that reported Water Consumption included: Fulton Water Company (within NTPUD District Boundary), Lakeside Park Association (within STPUD District Boundary), Tahoe Park Water Company (within TCPUD District Boundary), and Tahoe Swiss Village Utility (within TCPUD District Boundary). For these Non-District Water Service Areas and for water rights reports made by individual water rights holders, the 2018 eWRIMS reported water diversion/conjunctive use was used to estimate their Water Production in Section 3.3 as the best publicly available data.

2.7 Other Data References

Throughout development of this Study, other references were reviewed and used to understand the context for the data and water demand analysis. These references consist of:

[7] eWRIMS: https://www.waterboards.ca.gov/waterrights/water_issues/programs/ewrims/

2015 Urban Water Management Plans and Water Audits for NTPUD, STPUD, and TCPUD.

Allegro Communication Consulting, *TVS Groundwater Basin Survey of Well Owners*, STPUD, December 2018. Provided 7 February 2019.

California Department of Water Resources, *Annual Inventory of Water Use, Lake Tahoe & Truckee River Basins*, 2016, 2017, and 2018. Downloaded 11 April 2019 and provided 20 November 2019.

California Department of Water Resources California Data Exchange Center, "Water Conditions in California, DWR Bulletin 120," https://cdec.water.ca.gov/snow/bulletin120/index2.html. Downloaded 17 May 2019.

California Department of Water Resources California Data Exchange Center, "Water Year Hydrologic Classification Indices," http://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST. Downloaded 21 May 2019.

Tahoe Regional Planning Agency, *2015 Threshold Evaluation*, December 2016. Downloaded 13 February 2019.

Tahoe Regional Planning Agency, "Parcel Tracker," *Lake Tahoe Info*, https://parcels.laketahoeinfo.org/. Accessed 12 September 2019.

United States Geological Survey National Water Information System, "Daily Data, Gage height, feet," USGS 10337000 LAKE TAHOE A TAHOE CITY CA, https://waterdata.usgs.gov/nwis/inventory/?site_no=10337000&agency_cd=USGS. Downloaded 21 May 2019.

Appendix A contains a summary of District Water Production Data and climatic data in tabular and graphical form.

2.8 Data Usage Hierarchy

As indicated in the previous sections, this Study relied on multiple sources of data to compile the Water Consumption and Production datasets for 2018. The data that was considered most reliable, and therefore used as the basis of the analysis, were those provided by the Districts themselves. Gaps in the District-provided data were then filled in by the best publicly available data from sources such as TRPA and eWRIMS. Finally, remaining data gaps were filled by values calculated/estimated using the two previous categories of information, with input provided by each District staff.

Section 3: Methodology to Determine Current Baseline Water Production Requirement

Calculating the Current Baseline Water Production Requirement by TRPA Land Use classifications required a multi-step process using both GIS analysis functions as well as spreadsheet data analysis of GIS results. The following sections describe the methods used to:

- Process and reconcile existing Metered Water Demand and Land Use data;
- Calculate the Initial Unit Water Demand by Land Use based on the 2018 Metered Water Demand Data and Parcel acreage data;
- Convert the Initial Unit Water Demand to 2018 Unit Water Production amounts by incorporating Unaccounted-for Water based on analyzing Water Production Data versus Metered Water Demand data;
- Estimate the 2018 Water Production Requirement based on adding the Metered Water Production for 2018 for Metered Water Accounts to either the eWRIMS Water Production Data (if available) or to the 2018 Unit Water Production multiplied by the Parcel acreage for Unmetered Water Accounts and developed Parcels within a Non-District Water Service Area;
- Adjust the 2018 Water Production Requirement based on historical trends resulting in an estimation of the Current Baseline Water Production Requirement within each District.

To facilitate comparison with reports issued by the California Department of Water Resources (DWR), calculations were aligned to calendar year (1 January – 31 December) 2018 as the most recent complete year of data in units of AFY.

3.1 District Data Consistency and Reconciliation

The following sections describe the methods used to combine GIS and Metered Water Demand data for 2018 and assign those data to Parcels and Land Use. Metered Water Demand data was subtracted from Water Production Data to calculate Unaccounted-for Water. Metered Water Demand and Metered Water Account data for 2018 were used in this effort as the most complete Metered Water Demand dataset for the Districts, as discussed in the following sections.

3.1.1 STPUD

3.1.1.1 Match Metered Water Demand/Account Data to Parcel Data

Quarterly Metered Water Account data for Parcels with single meters were initially matched with El Dorado County Parcel data using APNs. For those Parcels with multiple meters, quarterly STPUD Metered Water Demand readings were aggregated and matched to APNs based on meter address. STPUD Unmetered Water Accounts and sewer-only accounts within the District Boundary were also matched with APNs. Figure 5 shows the STPUD metered and unmetered accounts for water and sewer. Since not all Metered Water Account, Unmetered Water Account, and sewer account data directly matched El Dorado County Parcel data, the following steps were taken to match as many accounts to Parcels as possible:

1. Initially 10,538 Parcels with a total of 4,669 AFY of Metered Water Demand were geocoded via latitude/longitude, address, or matching APNs between the meters and Parcels based on the available information for each water meter. STPUD and TRPA both use the El Dorado County Parcel GIS information as the basis for property mapping. Since metering of STPUD water accounts is ongoing, not all Metered Water Accounts had a full year (four quarters) of data.

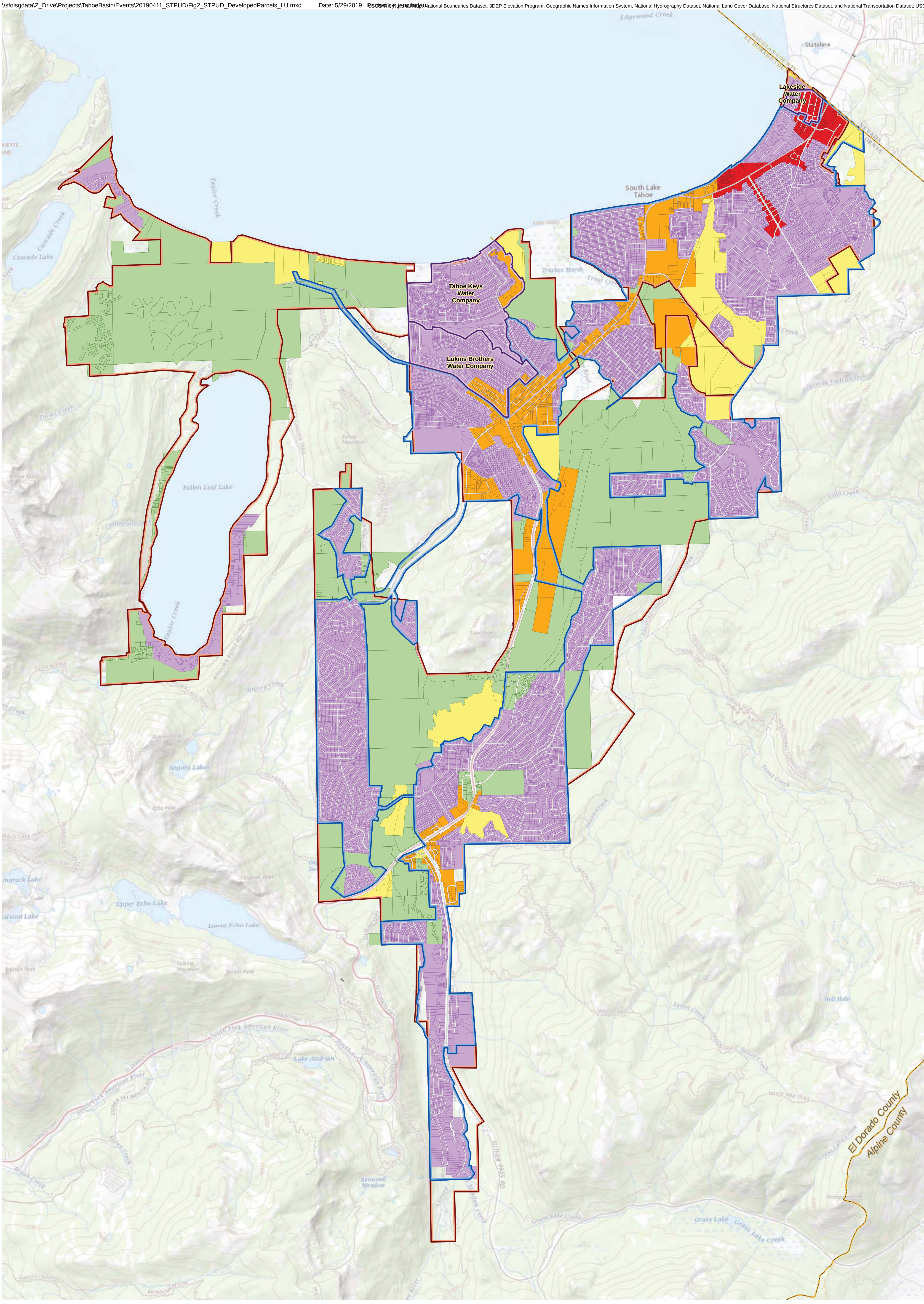
   Examination of the Parcels and Metered Water Account information showed that Parcels with only one meter make up 99% or 10,405 of all Parcels with Metered Water Accounts, and Parcels served by multiple meters make up 1% or 133 of all Parcels with Metered Water Accounts. These meters include different sizes of connections. Aggregation of Metered Water Demand data to their respective Parcels combines the potential water uses by Parcel, regardless of meter type.

2. Where APNs were not provided for a Metered Water Account, address information from the sewer account data from STPUD was used to identify the Parcel through Parcel Tracker.[8]

3. After Steps 1 and 2, only two Metered Water Accounts accounting for 21 AFY of Water Consumption in 2018 and one sewer account were unmatched. This is equal to 0.4% of the District Water Consumption in 2018. The unmatched Metered Water Demand was incorporated into Unaccounted-for Water and allocated by number of Parcels for each type of Land Use.

[8] Tahoe Regional Planning Agency, "Parcel Tracker," *Lake Tahoe Info*, https://parcels.laketahoeinfo.org/. Accessed 12 September 2019.

\\sfoisgdata\Z_Drive\Projects\TahoeBasin\Events\20190411_STPUD\Fig2_STPUD_DevelopedParcels_LU.mxd Date: 5/29/2019 Printed by: jennifer lau Source: The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS



Legend

- Non-STPUD Water System Boundary
- STPUD Service Area Boundary
- STPUD Sanitary Sewer Service Area

Land Use Designation

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

N

0 2,200 4,400
Feet

Kennedy/Jenks Consultants

South Tahoe Public Utility District
TRPA Land Use

1970003.00

Figure 5

3.1.1.2 "0" Consumption Accounts

Parcels with Metered Water Demand data showing no Water Consumption for 2018 make up about 1% of total metered Parcels and were flagged and removed from the 2018 Water Production Requirement and Metered Water Demand data set for estimating Initial Unit Water Demand. Parcels with Metered Water Accounts and no Metered Water Demand data were also removed from the 2018 Water Production Requirement and further categorized by Land Use/zoning classifications for consideration in calculating the Future Baseline Water Production Requirement.

3.1.1.3 Unmetered Water Demand

The Unmetered Water Accounts within the STPUD District Boundary were identified using water and sewer account data as shown on Figure 5. Unmetered Water Accounts within the District Water Service Area were assumed to be served by STPUD. LBWC and TKWC, while unmetered, provide Water Production Data to STPUD as part of groundwater management reporting; this data accounts for currently developed Parcels. LPA Water Production was accounted for using eWRIMS data. All other existing sewer users, such as U.S. Forest Service, or a private well or surface supply, were treated as Unmetered Water Accounts.

3.1.2 NTPUD

3.1.2.1 Match Metered Water Demand/Account Data to Parcel Data

In a method similar to STPUD, monthly Metered Water Demand from NTPUD meter readings were assigned to Parcel numbers based on meter address. Not all Metered Water Demand data directly matched to Parcel data, and the following steps were taken to match water accounts to Parcels as possible:

1. Initially, 3,555 Parcels with a total of 774 AFY of Metered Water Demand were geocoded via latitude/longitude, address, or matching APNs between the meters and Parcels based on the available information for each meter.

2. Inspection of the Parcels and Metered Water Account information showed that Parcels with only one meter make up 91% or 3,115 of all Parcels with Metered Water Accounts, and Parcels served by multiple meters make up 9% or 308 of all Parcels with Metered Water Accounts. These water meters include those for irrigation, fire, and master meters in addition to meters for multiple-family and single-family connections. Therefore, aggregation of Metered Water Demand data to their respective Parcels combines the potential water uses by Parcels, regardless of meter type.

3. According to NTPUD, the last three digits of some sub-APNs might be different from the master APN assigned by Placer County. Therefore, the first nine (9) digits of the APNs for unmatched Metered Water Accounts were extracted and compared with Placer County Parcel data.

4. Remaining unmatched APNs were checked using Parcel Tracker, which list changes in APNs that may have not yet been updated in the NTPUD system.

After Steps 1 through 4 above, only 46 Metered Water Accounts with 11 AFY of recorded Metered Water Demand in 2018 and 19 sewer accounts remain unmatched. This is equal to 1% of District Water Consumption in 2018. The unmatched Metered Water Demand was incorporated into Unaccounted-for Water and allocated by the number of Parcels for each type of Land Use.

3.1.2.2 "0" Consumption Accounts

Parcels with Metered Water Demand data showing no Water Consumption for 2018 make up about 5 % or 173 of total metered Parcels and were flagged and removed from the 2018 Water Production and Metered Water Demand data set for estimating Initial Unit Water Demand. As confirmed by NTPUD, Parcels with active Metered Water Accounts, but no Water Consumption in 2018 will be considered for inclusion in the Future Baseline Water Production Requirement calculation.

3.1.2.3 Unmetered Water Demand

The NTPUD Water Service Area is completely metered; therefore, total District Metered Water Demand is equivalent to District Water Consumption. Furthermore, any Parcel in the Non-District Water Service Area (identified based on sewer accounts that do not have a NTPUD water account) were assumed to be served by Non-District Water Systems and are considered unmetered.

It should be noted that within the NTPUD Water Service Area, there are Metered Water Accounts and meters that serve multiple Parcels, such as the District's facility meter that serves the District's facilities building and the North Tahoe Regional Park, located on adjacent Parcels. These Metered Water Accounts were identified by the District and Metered Water Demand was assigned to Parcels at the direction of the District.

3.1.3 TCPUD

3.1.3.1 Match Metered Water Demand/Account Data to Parcel Data

As with STPUD and NTPUD, monthly TCPUD Metered Water Demand readings were assigned to Parcel numbers based on water account address. Not all Metered Water Accounts directly matched to Parcel data, and the following steps were taken to match those unmatched Metered Water Accounts to Parcels:

1. Initially, 3,445 Parcels with a total of 943 AFY of Metered Water Demand were geocoded via latitude/longitude, address, or matching APNs between Metered Water Accounts and Parcels based on the available information for each meter.

Inspection of the Parcels and Metered Water Account information showed that Parcels with only a single meter make up 97% or 3,917 of all Parcels with Metered Water Accounts, and Parcels served by multiple meters make up 3% or 121 of all Parcels with Metered Water Accounts. Of the Parcels served by multiple meters, only five (0.01%) are served by meters that do not have the same meter classification.

2. Throughout the TCPUD District Boundary, the APNs used by El Dorado County, Placer County, and the geodatabase used different formats. To match the meters and Parcels, the TCPUD geodatabase APNs were modified to add a '0' to the front of the APN to match the format used by both County APNs.

3. TCPUD assisted with matching additional meter and Parcel data by cross-referencing address records with Placer County's "Land Information Search."[9]

4. After Steps 1 through 3 above, only 25 Metered Water Accounts with 13 AFY of Metered Water Demand in 2018 remain unmatched. This is equal to approximately 1% of total Metered Water Demand in 2018. The unmatched Metered Water Demand was incorporated into Unaccounted-for Water and allocated by number of Parcels for each type of Land Use.

3.1.3.2 "0" Consumption Accounts

Parcels with Metered Water Demand data showing no Water Consumption for 2018 make up less than 1% of Parcels with Metered Water Accounts and were flagged and removed from the Metered Water Demand data set for 2018 for estimating Initial Unit Water Demand. According to TCPUD, all but one of these Metered Water Accounts are developed Residential/Mixed Use Parcels that did not use water in 2018. These were moved to the potentially developable category and will be considered for inclusion in the Future Baseline Water Production Requirement calculation. The remaining zero usage account is associated with TCPUD's Water Production interconnection to McKinney Estates Water District. In addition, areas that can be considered common area (e.g., irrigated spaces within a homeowner's association with a separate meter) and showed no Water Consumption for 2018 were added back into the 2018 Water Consumption data set for calculating the 2018 Unit Water Production, since these Parcels are assumed to be associated with an adjacent Parcel with Water Consumption.

3.1.3.3 Unmetered Water Demand

All TCPUD Water Service Areas, excluding the three recent water system acquisitions summarized previously, are completely metered; therefore, total Metered Water Demand is equivalent to Water Consumption. As determined by TCPUD's sewer account data, all developed Parcels within the Timberland Water System, Madden Creek Water System, and the

[9] Placer County's "Land Information Search." Accessed 16 May 2019. http://maps.placer.ca.gov/Html5viewer/Index.html?configBase=http://arcgis/Geocortex/Essentials/REST/sites/LIS_Public/viewers/LIS_Base-Public/virtualdirectory/Resources/Config/Default

Tahoe Cedars Water System are considered as Unmetered Water Accounts but can be accounted for with Metered Water Production data. Metered Water Demand data, to the degree it exists for the other Non-District Water Systems within the TCPUD District Boundary, were not available from TCPUD. As determined by TCPUD sewer account data, all developed Parcels within these other Non-District Water Service Areas are treated as Unmetered Water Accounts.

3.2 Unit Water Production Approach

Both Water Production Data and Metered Water Demand data in this Study are sorted on a calendar year basis. The Districts maintain Metered Water Demand data in different units, so Metered Water Demand data were converted to acre-feet (AF) and AFY as a common unit. As detailed in Section 4.1, Parcels with Metered Water Accounts were assigned the TRPA Land Use classification based on the location of the centroid of the Parcel. Therefore, Initial Unit Water Demand was calculated based on 2018 Metered Water Demand per acre (AFY/acre) by TRPA Land Use classification as discussed in Section 3.2.1, then adjusted with Unaccounted-for Water to estimate 2018 Unit Water Production for each District as described in Section 3.2.2 below. Several methods were evaluated for development of Initial Unit Water Demand and allocation of Unaccounted-for Water for each Land Use classification (see Section 3.2.3).

The Initial Unit Water Demand using TRPA Land Use classifications was selected because it aggregated acreage, Parcel, and Metered Water Demand data in a way that minimized the influence of outlier values, such as condominiums with very small lot sizes (0.01 acres) that have water meters with Metered Water Demand, and therefore produced a reasonable representation of Parcels in each District Water Service Area. Unaccounted-for Water was distributed based on the number of Parcels associated with each Land Use classification to estimate 2018 Unit Water Production.

3.2.1 Analyze Parcels with Metered Water Accounts and Estimate Initial Unit Water Demand by Land Use Classification

Once Metered Water Demand Data were matched to Parcels for each District, Microsoft Excel Pivot Table functions were used on each District's dataset to extract and summarize the total Metered Water Demand and matching Parcel acreage for each Land Use classification. The District total Metered Water Demand was divided by the total District Parcel acreage associated with each Land Use classification to estimate an Initial Unit Water Demand. The results for each District are presented in Section 3.2.4.

3.2.2 Distribution of Unaccounted-for Water to Determine 2018 Unit Water Production by Land Use Classification

Each District has some quantity of Unaccounted-for Water. In order to more accurately calculate the 2018 Unit Water Production Requirement, the Unaccounted-for Water needed to be redistributed through each Land Use classification and added to the Initial Unit Water Demand.

Several methods were evaluated for redistribution of Unaccounted-for Water as discussed in Section 3.2.3. Ultimately, Unaccounted-for Water was distributed in proportion to the number of Parcels with Metered Water Accounts, giving the greatest weight to Residential Parcels, which represents the largest number of water users.

3.2.3 Other Methods Considered But Not Used

Developing 2018 Unit Water Production per Parcel without consideration of acreages was initially considered; however, this method was not used after review of Parcel size showed high variation throughout the California portion of the Lake Tahoe Basin. For example, in some developments individual condominium units had very small Parcels, but also shared a master meter with the common areas of a complex. Those Parcels that were comparably smaller (less than a tenth of an acre) skew the Initial Unit Water Demand in a way that was not representative of the actual water use. In addition, TCPUD's Initial Unit Water Demand, especially for the Residential Land Use classification, deviated from STPUD and NTPUD, and an analysis to better understand the variation in the Initial Unit Water Demand estimate amongst the many metered District Water Service Areas was conducted and is found in Appendix B-1.

Estimating Initial Unit Water Demand per connection by meter type as assigned by each District was also considered. However, review of connection data and GIS data showed high variation between Districts in how connection types were classified, such as multiple-family vs. residential, commercial vs. mixed use, or master meter classifications. This made it difficult to develop a uniform method to apply across the California portion of the Lake Tahoe Basin. An example of this is an analysis for STPUD only, which is found in Appendix B-2.

Several methods for allocation of Unaccounted-for Water were evaluated including allocation proportional to Parcel area, volume of Water Consumption, or by number of Parcels:

- Allocation of Unaccounted-for Water by proportion of Parcel area spread more of the Unaccounted-for Water volume to Land Uses with larger parcels including Recreation and Conservation, which also tended to have lower Metered Water Demand.

- Allocation of Unaccounted-for Water by proportion of Metered Water Demand spread more of the Unaccounted-for Water volume to Land Uses with already higher Initial Unit Water Demand, results in over-estimating the share of overall Water Production assigned to those Land Uses.

- Allocation of Unaccounted-for Water by proportion of number of Parcels with Metered Water Accounts spread more of the Unaccounted-for Water volume to Land Uses that had more Parcels with Metered Water Accounts, which emphasized Unaccounted-For Water for Parcels in the Residential Land Use classification.

Appendix B-3 contains the calculations developed and reviewed in the selection of a methodology to distribute Unaccounted-for Water.

3.2.4 Results of the 2018 Unit Water Production Analysis

3.2.4.1 STPUD

For STPUD, as of December 2018 about 85% of the 2018 water accounts were Metered Water Accounts, as shown on Figure 5. However, not all of the Metered Water Accounts had a full year (four quarters) of data. Therefore, an Initial Unit Water Demand was calculated for only those Parcels with a full 12-months of Metered Water Demand data for 2018. In addition, it was observed that among all 14,065 Parcels with Metered Water Accounts, 107 Parcels (63 acres in total) had Metered Water Demand of zero AFY in 2018. Therefore, the Initial Unit Water Demand for the District was based on all non-zero usage Metered Water Accounts and Parcels with Metered Water Accounts. The Initial Unit Water Demand is equal to the Metered Water Demand divided by the area of Parcels with Metered Water Accounts for each Land Use classification. The Initial Unit Water Demand was then applied to Parcels with Unmetered Water Accounts and zero usage accounts (approximately 3,754 Parcels or 27% of the District's total water accounts) as well as the Metered Water Accounts that had less than 12 months of Metered Water Demand data in 2018 to estimate the 2018 Water Consumption for the District. The results of the Initial Unit Water Demand and Unmetered Water Demand are shown in Table 4.

Table 4: STPUD Initial Unit Water Demand and Water Consumption Summary

Land Use	# of Parcels with Metered Water Accounts	Area of Parcels with Metered Water Accounts (Acres)	Metered Water Demand[(a)] (AFY)	Initial Unit Water Demand (AFY/Ac)	# of Parcels with Unmetered Water Accounts[(b)]	Area of Parcels with Unmetered Water Accounts (Acres)	Unmetered Water Demand (AFY)	Water Consumption (Total) (AFY)
Conservation	14	69	7	0.10	19	37	4	10
Mixed-Use	336	683	522	0.76	131	78	59	581
Recreation	14	469	205	0.44	4	9	4	208
Residential	9,106	2,292	2,474	1.08	4,280	931	1,005	3,479
Resort Recreation	1	60	166	2.77	-	-	-	166
Tourist	132	96	460	4.77	27	28	135	595
Total	**9,603**	**3,670**	**3,832**	**-**	**4,461**	**1,083**	**1,207**	**5,039**

Notes:
(a) Includes Parcels with four quarters of 2018 Metered Water Demand data only.
(b) Includes Parcels with less than four quarters of 2018 Metered Water Demand data.

3.2.4.1.1 Unaccounted-for Water

Total Unaccounted-for Water is the difference between Water Production and Water Consumption. Unaccounted-for Water calculated in this way was about 15% of Water Production. In comparison, the 2017 STPUD Water Audit (required for water suppliers by Section 10608.34 of the California Water Code) calculated Unaccounted-for Water as 20% of Water Production. Unaccounted-for Water was also redistributed into the Initial Unit Water Demand by the number of Parcels for each type of Land Use classification to arrive at a 2018 Unit Water Production for each Land Use classification. The results of the calculation of the 2018 Unit Water Production are shown in Table 5**.**

3.2.4.1.2 Water Production Adjustments

Currently, STPUD has mutual aid agreements with LBWC and TKWC. Based on Water Production Data provided by STPUD for Water Year 2018 (1 October 2017 through 30 September 2018), 23 AFY of groundwater was provided to LBWC. This amount was subtracted from the STPUD Water Production dataset for 2018 and added to LBWC Water Production Data. The District did not supply groundwater to TKWC in 2018.

Table 5: STPUD 2018 Unit Water Production Summary

Land Use	Area within District Water Service Area (Acres)	# of Parcels within District Water Service Area	Water Production (AFY)	Water Consumption (AFY)	Unaccounted-for Water[(a)] (AFY)	2018 Unit Water Production (AF/Ac)
Conservation	105	33		10	2	0.11
Mixed-Use	761	467		581	39	0.80
Recreation	478	18		208	1	0.44
Residential	3,224	13,386		3,479	836	1.34
Resort Recreation	60	1		166	0.05	2.77
Tourist	125	159		595	10	4.85
Total	**4,753**	**14,064**	**5,917[(b)]**	**5,039**	**878**	**1.28**

Notes:
(a) Unaccounted-for Water was distributed among Land Use in proportion to number of Parcels.
(b) Does not include the water supply provided to LBWC pursuant to the mutual aid agreement with the District.

Estimated 2018 Unit Water Production based on STPUD user classification and zoning were also calculated to back check the results of the Initial Unit Water Demand by Land Use classification (see Appendix C).

3.2.4.2 NTPUD

All Parcels within the District Water Service Area are served through Metered Water Accounts. Initial Unit Water Demand by Land Use classification were calculated based on matched

Metered Water Demand data and Parcel data. It was observed that among all 3,616 Parcels with Metered Water Accounts, 173 Parcels (62 acreage in total) had Metered Water Demand of zero AF in 2018. The Initial Unit Water Demand for the District was calculated based on all non-zero usage Metered Water Accounts using the total Metered Water Demand divided by the total acreage by Land Use classification.

3.2.4.2.1 Unaccounted-for Water

Total Unaccounted-for Water is the difference between Water Production and Water Consumption (in this case, District Water Consumption for is equal to Metered Demand for 2018). Unaccounted-for Water according to Metered Water Demand data for 2018 and Water Production Data was about 38% of Water Production. Total Unaccounted-for Water was then allocated based on the number of Parcels of each type of Land Use classification.

3.2.4.2.2 Water Production Adjustments

NTPUD does not sell water to any other water system; however, it does purchase water from TCPUD to serve its Dollar Cove system. Therefore, the TCPUD supply to NTPUD in 2018 of 74 AF was added to the NTPUD Water Production dataset for 2018 and subtracted from TCPUD Water Production dataset for the purpose of calculating the District Water Production Requirement. NTPUD Metered Water Demand includes delivery of the water purchased from TCPUD.

Table 6 provides the results of this analysis for NTPUD.

Table 6: NTPUD Initial Unit Water Demand and 2018 Unit Water Production Summary

Land Use	Metered Water Demand Area (Acres)	# of Parcels with Metered Water Accounts	Metered Water Demand/ Water Consumption (AFY)	Initial Unit Water Demand (AFY/Ac)	Water Production (AFY)	Unaccounted-for Water [a] (AFY)	2018 Unit Water Production (AFY/Ac)
Conservation	30	2	0			0.25	0.01
Mixed-Use	167	521	240	1.43		65	1.82
Recreation	356	16	5	0.01		2	0.02
Residential	805	3077	571	0.71		385	1.19
Resort Recreation	-	-	-	-		-	-
Tourist[b]	-	-	-	-		-	-
Total	**1,358**	**3,616**	**816**	**2.16**	**1,269**	**453**	**0.93**

Notes:
(a) Unaccounted-for Water was distributed among Land Use in proportion to number of Parcels.
(b) At the Direction of District staff, after review of Parcels that fell into the TRPA Land Use classification of Tourist, individual parcels were reassigned to Mixed-Use or Residential based on County Zoning to more accurately represent existing activities on the Parcels.

3.2.4.3 TCPUD

All Parcels within the District Water Service Area are served through Metered Water Accounts, except for Parcels within the three recently acquired Water Service Areas described earlier. Initial Unit Water Demand by Land Use classification was calculated based on matched Metered Water Demand data and Parcel data for TCPUD Metered Water Accounts. Only one Parcel with Metered Water Accounts had zero usage in 2018 and was not included in the Initial Unit Water Demand calculation as described previously.

3.2.4.3.1 Unaccounted-for Water

Total Unaccounted-for Water is the difference between Water Production and Water Consumption/Metered Water Demand (in this case Water Consumption for 2018 is equal to Metered Water Demand for 2018). TCPUD's Unaccounted-for Water, according to the Metered Water Demand dataset for 2018 and Water Production dataset for 2018, was about 4% of Water Production. In comparison, the 2015 TCPUD Water Audit calculated Unaccounted-for Water as 15% of Water Production. Unaccounted-for Water was then allocated based on the number of Parcels for each type of Land Use classification.

3.2.4.3.2 Water Production Adjustments

TCPUD has metered interconnections with four other water systems: NTPUD[10] (for supplemental supply), McKinney Estates Water District[11] (emergency supply), Tahoe Pines/Tahoe Swiss Village Water Co. (emergency supply), and Tahoe Park Water System[12] (emergency supply). Based on Metered Water Demand data for 2018, TCPUD sold a total of 78 AF through these four interconnections. This sold water was subtracted from the TCPUD 2018 Metered Water Demand and Water Production datasets.

Table 7 provides the results of this analysis for TCPUD Metered Water Accounts.

Table 7: TCPUD Initial Unit Water Demand and 2018 Unit Water Production Summary

Land Use	Metered Water Demand Area (Acres)	# of Parcels With Metered Water Accounts	Metered Water Demand/ Water Consumption (AFY)	Initial Unit Water Demand (AFY/Ac)	Water Production (AFY)	Unaccounted-for Water[(a)] (AFY)	2018 Unit Water Production (AFY/Ac)
Conservation	197	20	18	0.09		0.22	0.09
Mixed-Use	110	361	152	1.38		4	1.42
Recreation	181	20	53	0.30		0.22	0.30
Residential[(b)]	1,109	3,592	814	0.73		39	0.77
Resort Recreation	-	-	-	-		-	-
Tourist	7	80	19	2.67		0.9	2.79
Total	**1,604**	**4,073**	**1,056**		**1,101**	**44**	**0.70**

Notes:
(a) Unaccounted-for Water was distributed among Land Use in proportion to number of Parcels.
(b) Calculation of TCPUD Residential Initial Unit Water Demand is based on Metered Water Demand data for all of TCPUD's Metered Water Service Areas. See Appendix B-1 for a breakdown by Water Service Area.

3.2.5 Summary of 2018 Unit Water Production

Table 8 summarizes the 2018 Unit Water Production aggregated by Land Use classification for each of the Districts.

[10] TCPUD UB# 007437-000
[11] TCPUD UB# 008524-000
[12] TCPUD UB# 007116-001

Table 8: Summary of 2018 Unit Water Production by Land Use Classification by District

Land Use	2018 Unit Water Production (AFY/Ac)		
	STPUD	NTPUD	TCPUD
Conservation	0.11	0.01	0.09
Mixed-Use	0.80	1.82	1.42
Recreation	0.44	0.02	0.30
Residential	1.34	1.19	0.77
Resort Recreation	2.77	-	-
Tourist	4.85	-	2.79
Total Area	**1.28**	**0.93**	**0.70**

Based on the summary in Table 8, 2018 Unit Water Production for each Land Use classification varied between the Districts which could be accounted for by acknowledging the following:

1. 2018 Unit Water Production for Residential Land Use is a mix of single- and multiple-family residential water use as well as vacation/seasonal (lower annual occupancy) and full-time residences (higher annual occupancy). The impacts of occupancy on 2018 Unit Water Production is discussed in Section 6.3. The difference in TCPUD's 2018 Unit Water Production from the other Districts is evaluated in Appendix B-1.

2. 2018 Unit Water Production for Mixed-Use Land Use also varies significantly between the Districts. These Parcels can include commercial, industrial, multiple-family and single-family, and public land uses, in addition to the other Land Uses. Each of these Land Uses could result in high variability of water usage.

3. Similar to Mixed-Use, the Tourist Land Use classification could also include higher-density hotels/motels, which could result in a high-variability of Water Consumption depending on the square footage and number of stories in a building. Because of this variability, NTPUD staff reviewed those Parcels within the NTPUD Water Service Area with the Tourist Land Use classification and identified those that should be reassigned to either Mixed-Use or Residential Land Use classifications to better represent current activities on those Parcels.

3.3 Estimation of 2018 Water Production Requirement

To calculate the 2018 Water Production Requirement, the following were used:

1. District-provided Water Production Data for 2018 for a District or Non-District Water Service Area (Metered Water Production),

2. eWRIMS 2018 water diversion data for Non-District Water Systems or individual users, or

3. 2018 Unit Water Production values in Table 8 calculated for the remaining Parcels within a Non-District Water Service Area multiplied by the Parcel acreage by Land Use.

The total Metered Water Production for 2018, eWRIMS data, and the 2018 Unit Water Production is the 2018 Water Production Requirement. Table 9 summarizes the calculation of the 2018 Water Production Requirement, number of Parcels and acreage by Land Use for each District as well as the estimation method applied.

Table 9: 2018 Water Production Requirement

District		Water System/User	# of Parcels with Water Consumption	Area of Parcels with Water Consumption (Acres)	Data Source	2018 Water Production Requirement (AFY)	2018 Water Production Requirement By District (AFY)
STPUD		STPUD	14,078	4,921	Water Production	5,917	7,720
		Lukins Brothers Water Company	989[a]	229[a]	Water Production+STPUD water purchase	255	
		Tahoe Keys Water Company	1,499[a]	314[a]	Production	815	
		Lakeside Park Association	126[a]	37[a]	Reported to eWRIMS	190	
		Other Individual Water Users	556[a]	1,254[a]	Estimated	541	
NTPUD		NTPUD	3,606	1,356	Water Production	1,269	1,987
		Fulton Water Company	895[a]	306[a]	Reported to eWRIMS	342	
		Agate Bay Water Company	634[a]	242[a]	Reported to eWRIMS	341	
		Other Individual Water Users	141[a]	23[a]	Estimated	35	
TCPUD	District Water Service Area	TCPUD	4,009	1,272	Water Production	1,101	2,842
		Timberland	150[a]	86[a]	Water Production	43	
		Madden Creek	189[a]	105[a]	Water Production	136	
		Tahoe Cedars	1,266[a]	291[a]	Water Production	354	
		Other individual Water Users in TCPUD Water Service Areas	35[a]	25[a]	Estimated	17	
	Non-District Water Service Area	Tahoe Park Water Company	430[a]	147[a]	Reported to eWRIMS	477	
		Washoe Heights Water Company	15[a]	6[a]	Estimated	5	
		Talmont Resort Improvement District	330[a]	100[a]	Estimated	77	
		Ward Well Water Company	247[a]	173[a]	Estimated	194	
		Skyland/Nielsen Water Company	122[a]	39[a]	Estimated	30	
		Tahoe Pines/Tahoe Swiss Village Water Company	378[a]	195[a]	Reported to eWRIMS	195	
		McKinney Estates Water District	24[a]	69[a]	Estimated	53	
		Glenridge Water Company	54[a]	24[a]	Estimated	18	
		Lakeview Water Company	10[a]	2[a]	Estimated	4	
		Sugar Pine State Park	9	274	Estimated	87	
		Other Individual Water Users	26[a]	134[a]	Reported to eWRIMS[b]	22[b]	
		Other Individual Water Users			Estimated	31	
					2018 Water Production Requirement for Lake Tahoe Basin (AFY)		**12,548**

Notes:

(a) Based on sewer Parcels.
(b) eWRIMS data for Other Individual Water Users may overlap with Parcels with 2018 Water Production Requirement for Other Individual Water Users. However, based on the above table, eWRIMS data accounts for <1% of the 2018 Water Production Requirement for the Lake Tahoe Basin, and is considered negligible.

3.4 Comparison to 2017 and 2018 DWR Estimates

The 2018 Water Production Requirement was compared to DWR's estimate of water usage for 2017 and 2018 in Table 10. Although DWR uses a different means of estimating Water Consumption, the results are within about 6% of one another. This comparison provides validity to the methods and assumptions used to develop the 2018 Water Production Requirement.

Table 10: Comparison of DWR 2017 and 2018 Annual Inventory of Water Use, Lake Tahoe & Truckee River Basin and 2018 Water Production Requirement

DWR TROA Reportable Water Demand Lake Tahoe Basin (CA only)		
Manner of Use	**2017 AFY**	**2018 AFY**
Municipal & Industrial	11,351	12,021
Golf Course Irrigation	463	515
Snowmaking	0	0
Total Reportable Water Use	**11,814**	**12,536**

2018 Water Production Requirement	
District Boundary	**AFY**
Within STPUD Water Service Area	7,720
Within NTPUD Water Service Area	1,987
Within TCPUD Water Service Area	2,842
2018 Water Production Requirement for Lake Tahoe Basin	**12,548**

3.5 Determining Current Baseline Water Production Requirement from 2018 Analysis

Sections 1 through 3.3 describe the calculation of the 2018 Water Production Requirement for currently developed Parcels based on a snapshot in time using 2018 Water Consumption, 2018 Water Production, and Land Use. 2018 was chosen because it represents the most robust set of metered water data for the Districts, as STPUD is continuing to achieve complete metering of its entire District Water Service Area. Since 2018 is not necessarily representative of a "typical" year, ten years of historical Water Production Data, shown in Table 11 below, were reviewed to evaluate the variability of Water Production over a range of conditions. This period includes the statewide drought emergency declared in California from 2012 through 2016, during which statewide water conservation measures were mandated.

As shown in Table 11, between 2009 and 2018, total Water Production between STPUD, NTPUD, and TCPUD ranged from a low of 7,288 AFY in 2015 to a high of 10,017 AFY in 2009, with a 10-year average Water Production of 8,666 AFY and median Water Production of 8,630 AFY. Both the mean and median values are essentially the same. Potential explanations for the variability in Water Production over this time period include hydrologic impacts,

occupancy patterns, economic conditions, and/or statewide water policy as discussed in Section 7. Given the broad variability of the Water Production Data, some adjustment to the 2018 Unit Water Production is prudent to account for future variability likely to occur in this long-range water planning horizon. The median value of 104% of the 10-year historic Water Production represents an appropriate adjustment factor to the 2018 values to create a baseline which is not overly conservative. The Current Baseline Water Production Requirement represents the Water Production over the last 10 years, assuming that half of the years had higher Water Production while half of the years had lower Water Production.

The application of the 104% adjustment factor to the 2018 Unit Water Production values in Table 8 will result in the Baseline Unit Water Production by Land Use, which represents a reasonable Current Baseline Water Production Requirement based on the current level of development and occupancy within the study area. The Baseline Unit Water Production values are presented in Table 12, which will be used in Section 5 to estimate the Future Water Production Requirement.

Table 11: Summary of Historic Water Production for All Districts

	STPUD		NTPUD		TCPUD		Total		
	Water Production (AFY)	% of 2018 Water Production	Water Production (AFY)	% of 2018 Water Production	Water Production (AFY)	% of 2018 Water Production	Water Production (AFY)	% of 2018 Water Production	Hydrologic Year Type[(a)]
2009	6,918	117%	1,560	131%	1,539	129%	10,017	121%	Normal
2010	6,546	111%	1,485	124%	1,422	120%	9,453	114%	Normal
2011	6,026	102%	1,363	114%	1,292	109%	8,681	105%	Very Wet
2012	6,516	110%	1,386	116%	1,507	127%	9,409	113%	Below Normal
2013	6,336	107%	1,377	115%	1,446	122%	9,159	110%	Normal
2014	6,009	102%	1,299	109%	1,270	107%	8,578	103%	Below Normal
2015	5,241	89%	1,037	87%	1,010	85%	7,288	88%	Below Normal
2016	5,507	93%	1,137	95%	1,080	91%	7,724	93%	Normal
2017	5,624	95%	1,216	102%	1,189	100%	8,030	97%	Very Wet
2018	5,917	100%	1,195	100%	1,189	100%	8,302	100%	Normal
Mean	6,064	102%	1,306	109%	1,294	109%	8,664	104%	
Median	6,018	102%	1,331	111%	1,281	108%	8,630	104%	

Note:
(a) For Tahoe Valley South Groundwater Basin, STPUD 2018 WY Annual Report

Table 12: Summary of Baseline Unit Water Production by Land Use Classification by District

Land Use	Baseline Unit Water Production (AFY/Ac)		
	STPUD	NTPUD	TCPUD
Conservation	0.12	0.04	0.09
Mixed-Use	0.83	1.89	1.47
Recreation	0.46	0.02	0.31
Residential	1.39	1.24	0.80
Resort Recreation	2.89	-	-
Tourist	5.04	-	2.90
Total Area	**1.34**	**0.97**	**0.73**

Application of this 104% adjustment factor to the 2018 Water Production Requirement for all three Districts summarized in Table 9 results in a Current Baseline Water Production Requirement for currently developed Parcels of 13,050 AFY as detailed in Table 13 and summarized in Table 14.

Table 13: Current Baseline Water Production Requirement

District	Water Service Area	Water System/User	Current Baseline Water Production (AFY)	Current Baseline Water Production Requirement By District (AFY)
STPUD		STPUD	6,154	8,029
		Lukins Brothers Water Company	265	
		Tahoe Keys Water Company	848	
		Lakeside Park Association	198	
		Other Individual Water Users	563	
NTPUD		NTPUD	1,319	2,066
		Fulton Water Company	356	
		Agate Bay Water Company	354	
		Other Individual Water Users	37	
TCPUD	District Water Service Area	TCPUD	1,145	2,956
		Timberland	44	
		Madden Creek	149	
		Tahoe Cedars	368	
		Other individual Water Users in TCPUD Water Service Areas	18	
	Non-District Water Service Area	Tahoe Park Water Company	496	
		Washoe Heights Water Company	5	
		Talmont Resort Improvement District	80	
		Ward Well Water Company	202	
		Skyland/Nielsen Water Company	31	
		Tahoe Pines/Tahoe Swiss Village Water Company	202	
		McKinney Estates Water District	55	
		Glenridge Water Company	19	
		Lakeview Water Company	4	
		Sugar Pine State Park	90	
		Other Individual Water Users	23	
		Other Individual Water Users	32	
Current Baseline Water Production Requirement (AFY)				**13,050**

Table 14: Summary of Current Baseline Water Production Requirement by District

District Boundary		Current Baseline Water Production Requirement[(a)] by District (AFY)
STPUD	District Water Service Area	6,154
	Non-District Water Service Area	1,874
	STPUD Total	8,028
NTPUD	District Water Service Area	1,319
	Non-District Water Service Area	747
	NTPUD Total	2,066
TCPUD	District Water Service Area	1,717
	Non-District Water Service Area	1,239
	TCPUD Total	**2,956**
Total Current Baseline Water Production Requirement		**13,050**

Notes:

(a) Current Baseline Water Production Requirement is generated by taking the Water Production values for 2018 in Table 9 and multiplying by the adjustment factor of 1.04 (104%)

Section 4: Identifying Potentially Developable Parcels

The 2018 Water Production Requirement for currently developed Parcels and Parcels for future development requires both assignment of Land Use to Parcels as well as screening Parcels for development potential as discussed in this Section.

4.1 Assigning TRPA Land Use in GIS

The TRPA Land Use shapefile was utilized for assigning Land Use classifications to each Parcel in each District Boundary. The TRPA Land Use shapefile does not indicate Land Use classifications on a Parcel to Parcel basis; rather, it assigns different Land Use classifications to larger general areas. The centroid of each Parcel was assigned the Land Use classification it intersects. This methodology accounts for Parcels that intersect more than one Land Use classification because it assigns the Parcel the Land Use classification that covers the majority of area on the Parcel. Figures 6 through 8 show the Land Use classification assignments within each District Boundary based on the TRPA Land Use classification.

Land Use definitions and density restrictions found in zoning regulations were examined for the purposes of reviewing redevelopment potential. In general, zoning regulations for the California Portion of the Lake Tahoe Basin aligned with the TRPA Code of Ordinances, with additional details or deviation provided in Area Plans and City Codes. The TRPA Land Use classifications and how they were applied in this analysis are:[13]

- Backcountry: Backcountry areas are designated and defined by the U.S. Forest Service. Parcels identified as Backcountry with development were incorporated into the Residential Land Use since the Parcels appeared to be small cabins with water and sewer accounts but were in the Backcountry Land Use. The remaining undeveloped Parcels with Backcountry Land Uses were evaluated by the Districts on a case by case basis to determine whether or not to include.

- Conservation: Conservation areas are non-urban areas with value as primitive or natural areas and have strong environmental limitations on use. The Conservation Land Use areas were evaluated by the Districts on a case-by-case basis to determine whether or not to include in the analysis.

- Mixed-Use: Includes a mix of urban Land Uses including commercial, residential, light industrial, and public services. It is assumed that undeveloped Parcels designated as Mixed-Use will develop.

[13] TRPA Regional Plan, Chapter 2: Land Use Element, Adopted December 12, 2012

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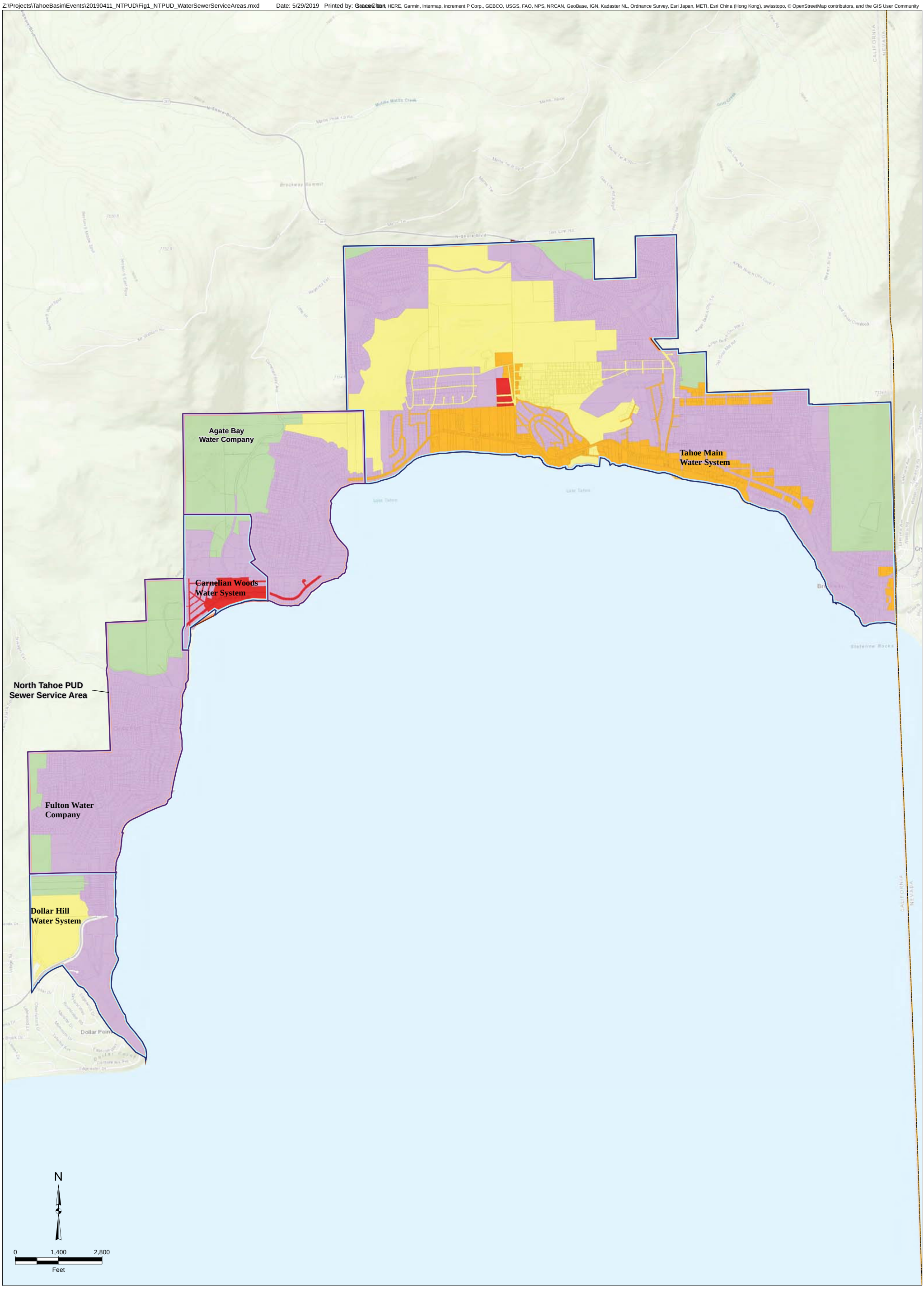

Legend

- Non-NTPUD Water System Boundary (Neighboring)
- NTPUD Water Service Area
- NTPUD Sanitary Sewer Service Area

Land Use Designation

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

Kennedy/Jenks Consultants

North Tahoe Public Utility District
TRPA Land Use

1970003.00

Figure 6

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Lakeview Water Co

Talmont Resort Improvement District

Washoe Heights Mutual Water Co

Tahoe Park Water Co

Ward Well Water Co

Skyland/Nielsen Water Co

Tahoe Pines/Tahoe Swiss Village Water Co

McKinney Estates Water District

CA State Parks

Glenridge Water Co

Placer County

El Dorado County

Legend

- TCPUD Water Service Area
- Non-TCPUD Water Service Areas (Neighboring)
- TCPUD Sanitary Sewer Service Area

Land Use Designation

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

N

0 3,200 6,400

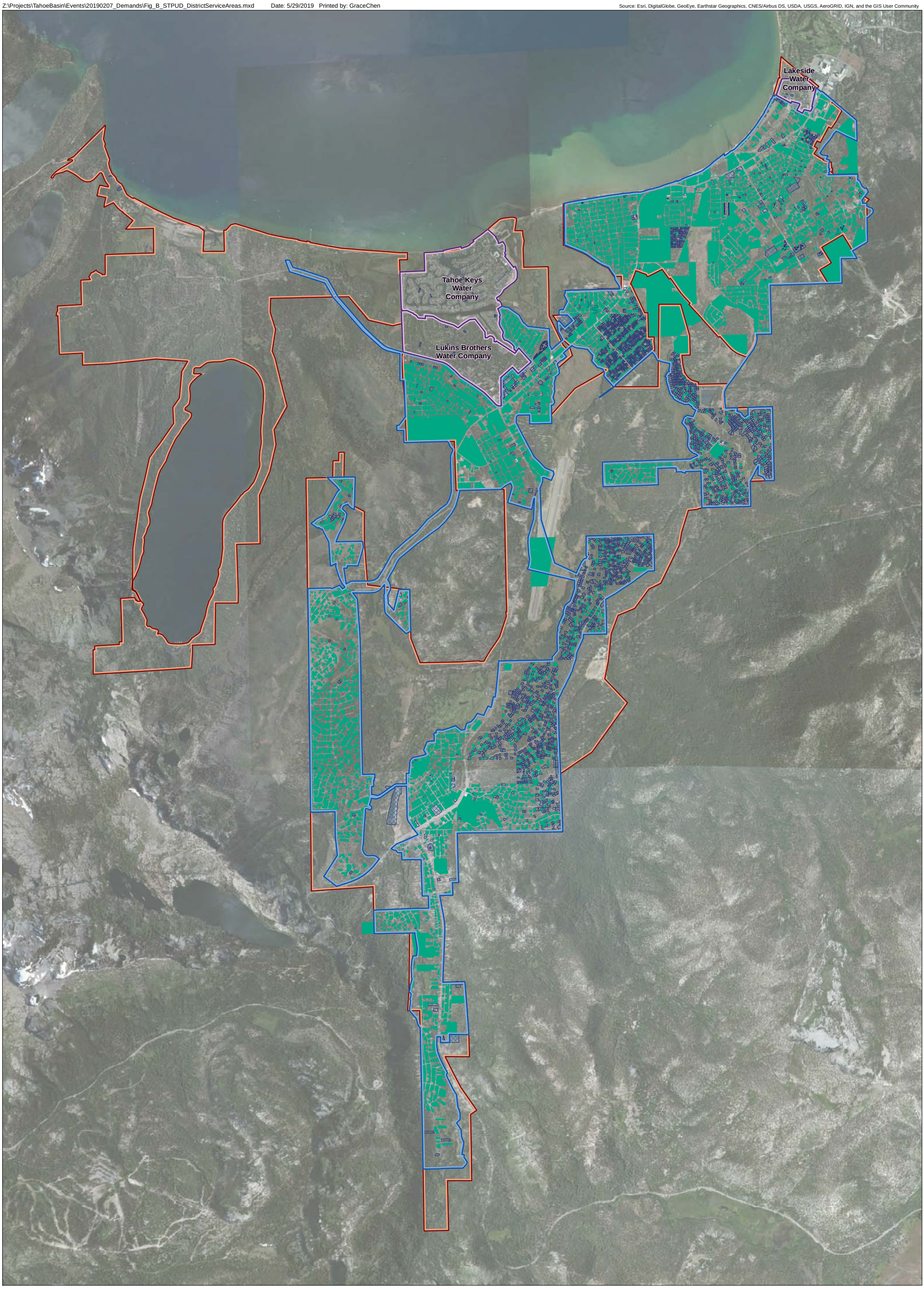
Feet

Kennedy/Jenks Consultants

Tahoe City Public Utility District
TRPA Land Use

1970003.00

Figure 7



Legend

- Non-STPUD Water System Boundary (Neighboring)
- STPUD Water Service Area Boundary
- STPUD Sanitary Sewer Service Area
- Parcels with Metered Accounts
- Parcels without District Metered Accounts

N

0 2,200 4,400

Feet

Kennedy/Jenks Consultants

South Tahoe Public Utility District
Metered and Unmetered Parcels

1970003.00

Figure 8

- Recreation: Recreation areas are non-urban areas for developed outdoor recreation, park use, or concentrated recreation. Parcels designated as recreation Land Uses were evaluated by the Districts on a case by case basis to determine whether or not to include.

- Residential: Residential Parcels include single- and multiple family housing, mobile home parks, and other areas that provide housing. It was assumed that undeveloped Parcels designated as Residential will develop.

- Resort Recreation: This Land Use classification is specific to Heavenly Ski Resort Parcels in the STPUD District Boundary.

- Tourist: Tourist Land Uses include tourist accommodations, services, and intensive recreation. It was assumed that undeveloped Parcels designated as Tourist will develop.

- Wilderness: Wilderness Districts are designated and defined by the U.S. Congress as part of the National Wilderness Preservation System. Permanent improvements and mechanized uses are prohibited; there were no Parcels within any District Boundary that were designated Wilderness.

It should be noted that the Land Uses are not absolute, some Parcels predate the Land Use designations. As an example, cabins with Water Consumption that are located within Parcels designated as Conservation and/or Recreation Land Uses, some of which may be on long-term (99-year) U.S. Forest Service leases.

4.1.1 Zoning

Using the sources indicated in Section 2.5, zoning information was gathered and reviewed for Placer County and El Dorado County (via the Meyers Plan Area, City of South Lake Tahoe Ordinances, and TRPA Basin Area Planning documents). While generalities can be made for planned zoning for each area, it is not known whether current/existing Land Uses align with current zoning regulations (i.e., existing development may have been approved under prior zoning) and there is no easy way to identify the current densities on an existing developed Parcel. In addition, zoning designations varied widely between El Dorado and Placer County and were considered unrefined to be applied across the three Districts as there are geographic specific zoning designations. However, zoning information was taken into consideration by the Districts in the review of the potential developability of some vacant Parcels.

Appendix D contains more detailed information regarding zoning.

4.1.2 Land Capability Scores and IPES Scores

The Land Capability Scoring System is largely based on USDA soils data and do not align with Parcel boundaries, with multiple Land Capability Scores assigned to the same Parcel in several

cases. Therefore, the Land Capability Score located at the centroid of each Parcel was assigned to each Parcel and used in the analysis of future developable Parcels.

Unlike Land Capability Scores, IPES scores are already assigned by Residential Parcel (undeveloped prior to 1989), therefore no processing was needed to align Parcel data and IPES data. It should be noted that the IPES data received from TRPA use “null” values to indicate Parcels that TRPA did not score or the score is not yet in the IPES database. Residential Parcels with IPES scores of “null” were considered to be potentially developable.

4.2 Developable Parcel Identification Approach

The approach to identifying those currently undeveloped Parcels that are likely to proceed to development comprised multiple, iterative steps summarized below and detailed in the sections that follow.

1. It was assumed that Parcels with sewer accounts are developed and were removed from consideration for development. Parcels with no sewer account were considered undeveloped and remained for potential development.

2. Parcels that are designated as a right-of-way were then removed from consideration for development.

3. Throughout the Lake Tahoe Basin, Land Capability Scores 4, 5, 6, and 7 are considered developable, while Land Capability Scores of 1A, 1B, 1C, 2, 3 and Water Body Land Use classifications are severely limited for development. Therefore, the remaining Parcels with Land Capability Scores 1a, 1b, 1c, 2, 3 and Water Body Land Use classifications were then removed from consideration for development.

4. TRPA has identified those Parcels that are retired, meaning they cannot be developed regardless of Land Classification without significant regulatory process, for a variety of reasons. Therefore, the remaining Parcels that are identified by TRPA as a Retired Parcel were then removed from consideration for development.

5. The remaining Parcels that are identified by TRPA as Residential Land Use with an IPES score that is IPES <1 for El Dorado County and for Placer County were then removed from consideration for development. As discussed in Section 2.4.1.2, the IPES<1 filter for Placer County was applied because Placer County is in the process of implementing projects to allow for the adjustment.

6. Finally, each District reviewed the remaining Parcels to consider ownership (public versus private) and development potential. The Districts identified Parcels that they considered undevelopable and these were removed from consideration for development. In general, it was assumed that large Parcels owned by a federal agency or the State of California are unlikely to develop while small infill Parcels in Residential and Mixed-Use Land Uses owned by the state or federal agency could develop if they had made it

through above filters. A limited number of Conservation/Recreation Parcels remained for potential development after District filter.

4.2.1 STPUD Developable Parcels Analysis

Table 15 shows the 8,243 Parcels, totaling 9,317 acres, within the STPUD District Boundary that do not have sewer accounts and are therefore undeveloped. Within the STPUD District Boundary, 3,317 Parcels (40% of total undeveloped Parcels), or 5,050 acres (54% of undeveloped acres), were removed as a result of having Land Capability scores below the developability threshold. In total, there are 4,926 undeveloped Parcels, or 4,266 undeveloped acres within the STPUD District Boundary that have Land Capability Scores of 4 or greater.

Application of the Retired Parcel filter removed an additional 2,009 undeveloped Parcels (41% of undeveloped Parcels with developable Land Capability Scores) or 1,311 undeveloped acres (31% of undeveloped acres with developable Land Capability Scores) from the potentially developable Parcels. In total, there are 2,955 undeveloped Parcels, or 2,917 undeveloped acres that are developable within the STPUD District Boundary after application of the Land Capacity Scores and Retired Parcels.

Within the STPUD District Boundary, application of the IPES scores filter of < 1 (below the developability threshold) for Parcels with Residential Land Use classification removed an additional 74 undeveloped Parcels (3% of undeveloped Parcels with developable Land Capability Scores) or 19 undeveloped acres (0.65% of undeveloped Parcels with developable Land Capability Scores) from the potentially developable Parcels. In total, there are 2,843 undeveloped Parcels, or 2,937 undeveloped acres within the STPUD District Boundary that are considered developable after application of the Land Capability Scores, Retired Parcels and IPES scores.

Parcels owned by a special district, other utility or municipality were removed from consideration for development. Parcels owned by the City of South Lake Tahoe, El Dorado County, Federal government, STPUD, State of California, individual/private owners and Parcels with unknown ownership were investigated by STPUD staff on a case by case basis using the other information related to the Parcel. District staff evaluation removed 130 Parcels/2,286 acres. The developable Parcels remaining within the STPUD District Boundary are 2,713 Parcels across 651 acres.

Figure 10 show the results of the STPUD developable Parcels analysis and Table 15 summarizes the results of the STPUD developable Parcels analysis.

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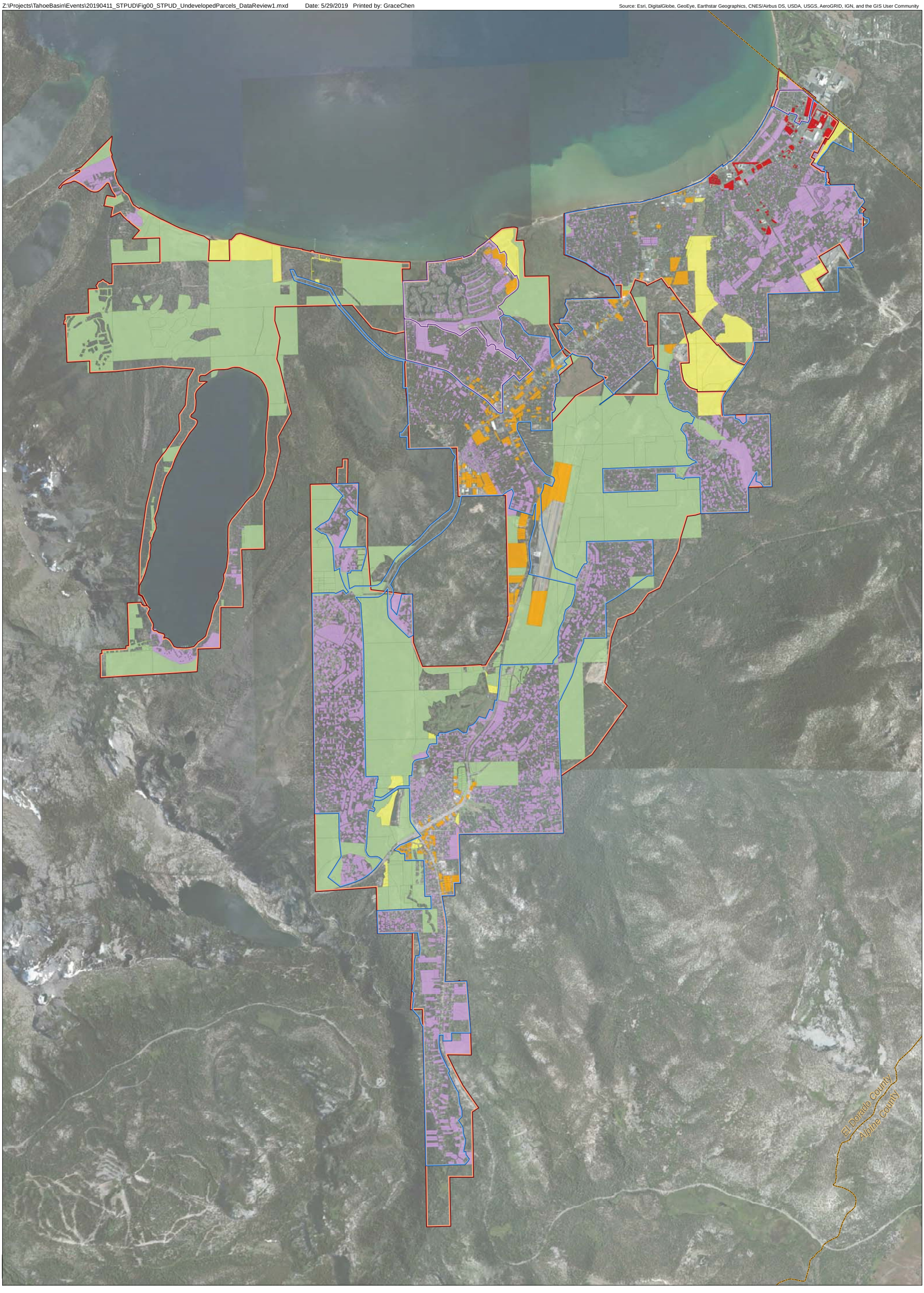
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- Non-STPUD Water System Boundary (Neighboring)
- STPUD Service Area Boundary
- STPUD Sanitary Sewer Service Area

Undeveloped Parcels

Land Use Designation

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

N

0 2,200 4,400

Feet

Kennedy/Jenks Consultants

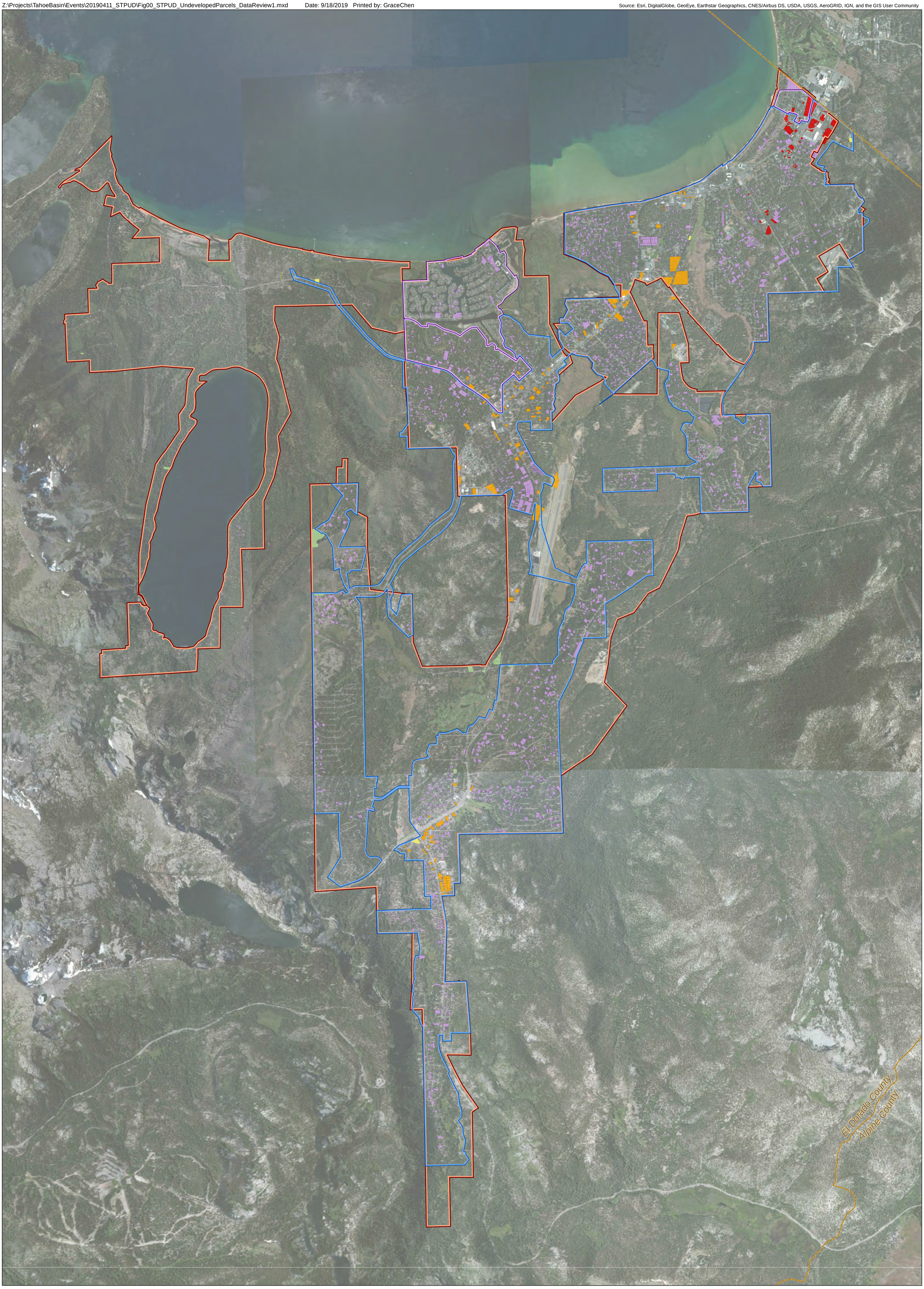
South Tahoe Public Utility District
All Undeveloped Parcels by Land Use

1970003.00

Figure 9

Z:\Projects\TahoeBasin\Events\20190411_STPUD\Fig00_STPUD_UndevelopedParcels_DataReview1.mxd Date: 9/18/2019 Printed by: GraceChen

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- Non-STPUD Water Service Area Boundary
- STPUD Service Area Boundary
- STPUD Sanitary Sewer Service Area/District Boundary

Land Use Designation

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

N

0 2,200 4,400

Feet

Kennedy/Jenks Consultants

Lake Tahoe Basin, California

South Tahoe Public Utility District
Developable Parcels Remaining

1970003.00

Figure 10

Table 15: Developable Parcels Analysis for STPUD

	Backcountry		Conservation		Mixed-Use		Recreation		Residential		Resort Recreation		Tourist		Total Undevelopable Parcels Removed		Total Remaining Developable Parcels	
	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels
All Parcels in STPUD Water Service Area	180	42	6,251	639	1,243	1,174	1,219	130	6,557	23,625	86	7	245	751	-	-	15,781	26,368
Right-of-Way (Removed)	0	0	0	0	0	0	0	0	-19	-1	0	0	0	0	-19	-1	15,762	26,367
Parcels with Metered Water Accounts (Removed)	0	0	-69	-15	-709	-369	-504	-17	-2,411	-9,552	-60	-1	-105	-143	-3,858	-10,097	11,904	16,270
Parcels with Unmetered Water Accounts (Removed)	-2	-1	-7	-21	-107	-240	0	0	-1,475	-6,846	0	0	-58	-360	-1,648	-7,468	10,255	8,802
Parcels with Sewer Only Accounts (Removed)	-7	-25	-614	-266	-11	-5	-85	-34	-222	-229	0	0	0	0	-939	-559	9,317	8,243
Parcels with Bailey 1,2,3 or Water Body (Removed)	-95	-11	-3,124	-186	-198	-184	-319	-51	-1,264	-2,836	-26	-5	-24	-44	-5,050	-3,317	4,266	4,926
Retired Parcels (Removed)	0	0	-646	-83	-30	-56	-30	-8	-604	-1,858	0	0	-1	-4	-1,311	-2,009	2,955	2,917
IPES=0 Residential Parcels (Removed)	0	0	0	0	0	0	0	0	-19	-74	0	0	0	0	-19	-74	2,937	2,843
Parcels Identified by District as Undevelopable (Removed)	-76	-5	-1,762	-43	-67	-25	-274	-10	-99	-36	0	0	-8	-11	-2,286	-130	651	2,713
Total Developable Parcels Remaining	**0.0**	**0**	**29**	**25**	**122**	**295**	**6**	**10**	**444**	**2,193**	**1**	**1**	**50**	**189**				
Grand Total Developable Parcels Remaining																	**651**	**2,713**

4.2.2 NTPUD Developable Parcels Analysis

Figure 11 shows the 1,744 Parcels, totaling 1,622 acres, within the NTPUD District Boundary that are undeveloped (i.e., do not have a water or sewer account). Of these, 480 Parcels (28% of total undeveloped Parcels), or 792 acres (48% of undeveloped acres) were removed as a result of Land Capability scores below the developability threshold. In total there are 1,264 undeveloped Parcels or 870 undeveloped acres within the NTPUD District Boundary that have Land Capability Scores of 4 or greater.

Application of the Retired Parcel filter to NTPUD remaining developable Parcels removed an additional 535 undeveloped Parcels (43% of undeveloped Parcels with developable Land Capability Scores) or 257 undeveloped acres (30% of undeveloped acres with developable Land Capability Scores) from the potentially developable Parcels. In total there are 729 undeveloped Parcels, or 614 undeveloped acres within the NTPUD District Boundary that are developable after application of the Land Capability Scores and Retired Parcels filters.

Within the NTPUD District Boundary, application of a filter to remove IPES scores less than 1 (below the developability threshold) removed an additional eight (8) undeveloped Parcels or one (1) undeveloped acre from the potentially developable Parcels. In total there are 721 undeveloped Parcels, or 612 undeveloped acres, that are developable within the NTPUD District Boundary after application of the Land Capability Scores, Retired Parcels and IPES scores.

Within the NTPUD District Boundary, Parcels assessed by the State Board of Equalization (SBE), easements and privately-owned roads, Parcels owned by a fire district, a special district and a public utility were removed. Parcels within common area, exempt property and Parcels owned by Placer County and the State of California were assessed on a case by case basis by NTPUD staff based on other information related to the Parcel, which removed 30 Parcels accounting for 277 acres. The developable Parcels remaining within the NTPUD District Boundary are 691 Parcels for 335 acres.

Figure 12 show the results of the NTPUD Developable Parcels Analysis and Table 16 summarizes the results of the NTPUD Developable Parcels Analysis.

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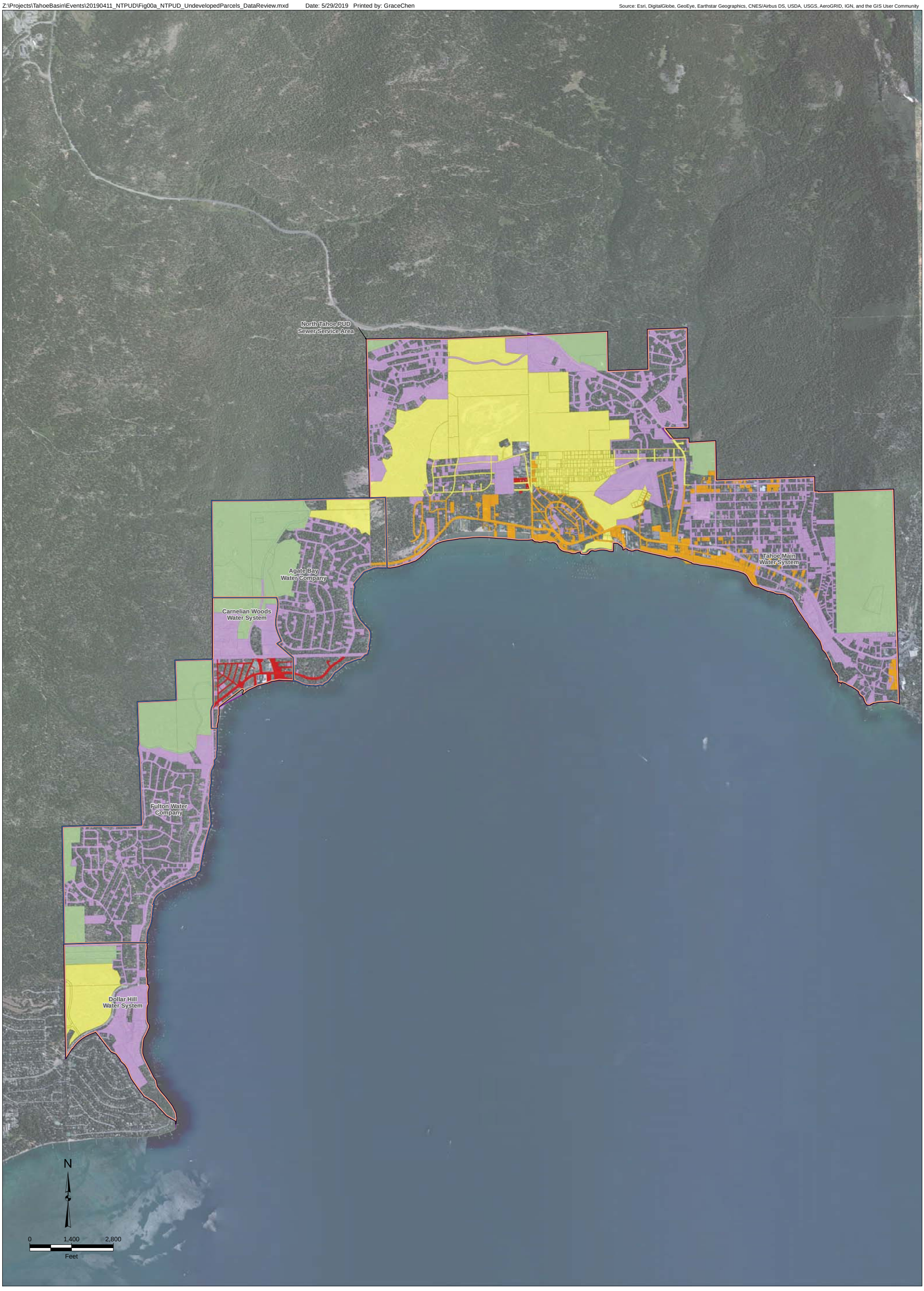
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- Non-NTPUD Water System (Neighboring)
- NTPUD Water Service Area
- NTPUD Sanitary Sewer Service Area

Undeveloped Parcels
LandUse

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

Kennedy/Jenks Consultants

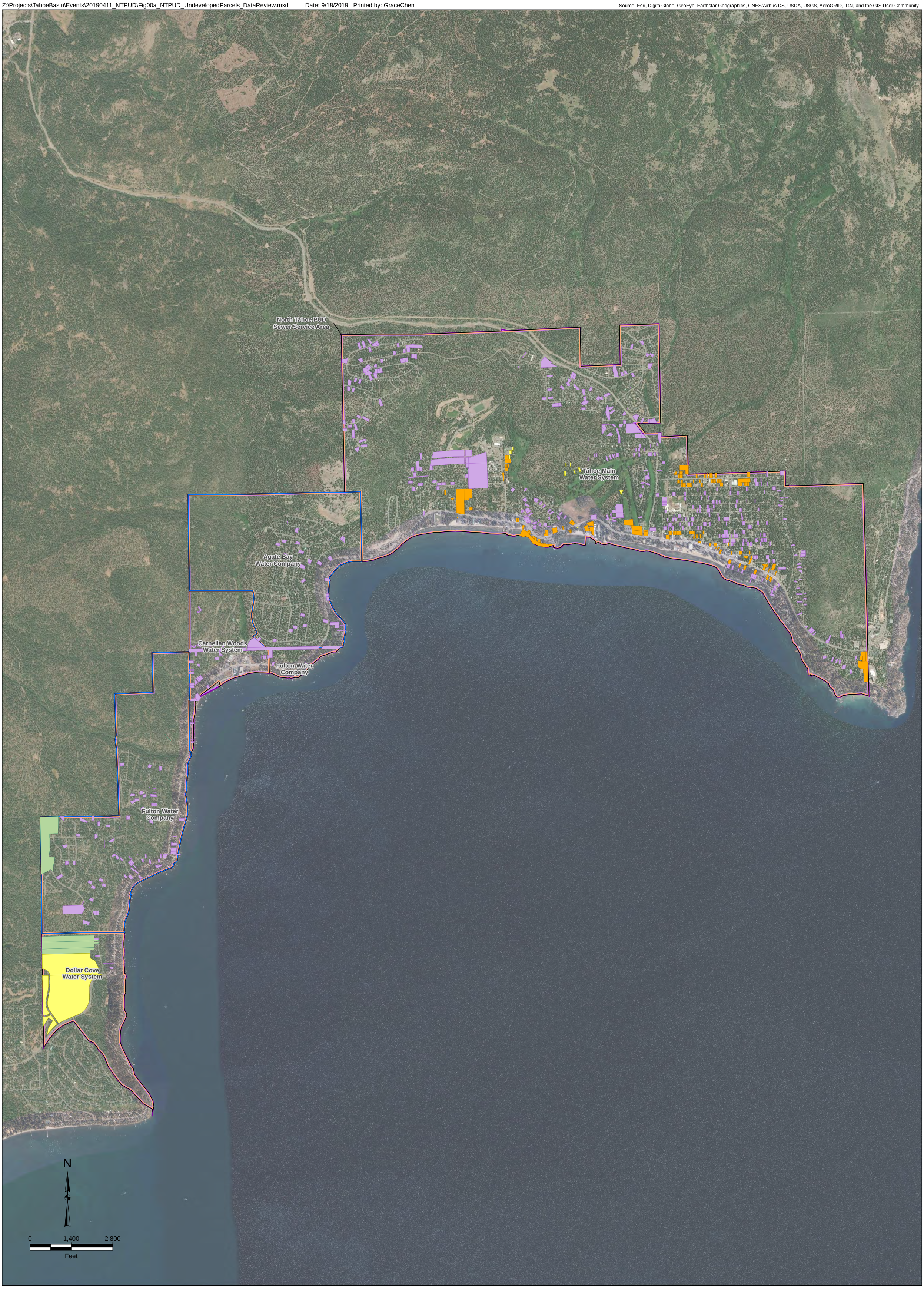
North Tahoe Public Utility District
All Undeveloped Parcels
by Land Use

1970003.00

Figure 11

Z:\Projects\TahoeBasin\Events\20190411_NTPUD\Fig00a_NTPUD_UndevelopedParcels_DataReview.mxd Date: 9/18/2019 Printed by: GraceChen

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- NTPUD Water Service Area Boundary
- Non-NTPUD Water Service Area Boundary
- NTPUD Sanitary Sewer Service Area/District Boundary

Land Use Designation

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

Kennedy/Jenks Consultants

Lake Tahoe Basin, California

North Tahoe Public Utility District
Developable Parcels Remaining

1970003.00
Figure 12

Table 16: Developable Parcels Analysis for NTPUD

	Backcountry		Conservation		Mixed-Use		Recreation		Residential		Resort Recreation		Tourist		Total Undevelopable Parcels Removed		Total Remaining Developable Parcels	
	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels
All Parcels in NTPUD Water Service Area	0	0	737	39	353	830	805	293	2,205	6,052	0	0	21	2	-	-	4,121	7,216
Right-of-Way (Removed)	0	0	-10	-6	-61	-4	-41	-4	-307	-37	0	0	-21	-2	-439	-53	3,682	7,163
Parcels with Metered Water Accounts (Removed)	0	0	-39	-5	-207	-629	-418	-20	-1,355	-4,765	0	0	0	0	-2,019	-5,419	1,662	1,744
Parcels with Bailey 1,2,3 or Water Body (Removed)	0	0	-346	-8	-36	-60	-172	-73	-238	-339	0	0	0	0	-792	-480	870	1,264
Retired Parcels (Removed)	0	0	-91	-3	-3	-10	-93	-181	-70	-341	0	0	0	0	-257	-535	614	729
IPES<1 Residential Parcels (Removed)	0	0	0	0	0	0	0	0	-1	-8	0	0	0	0	-1	-8	612	721
Parcels identified by District as Undevelopable (Removed)	0	0	-209	-12	0	0	0	0	-69	-18	0	0	0	0	-277	-30	335	691
Total Developable Parcels Remaining	**0**	**0**	**43**	**5**	**46**	**127**	**81**	**15**	**165**	**544**	**0**	**0**	**0**	**0**	**0**	**0**		
Grand Total Developable Parcels Remaining																	**335**	**691**

4.2.3 TCPUD Developable Parcels Analysis

Figure 13 shows all 3,372 undeveloped Parcels within the TCPUD District Boundary, which total 13,826 acres. Of these, 1,595 Parcels (47% of total undeveloped Parcels), or 7,638 acres (55% of undeveloped acres), were removed as a result of Land Capability scores below developability threshold. In total there are 1,777 undeveloped Parcels, or 6,188 undeveloped acres within the TCPUD District Boundary that have Land Capability Scores of 4 or greater and are potentially developable.

Within the TCPUD District Boundary, application of Retired Parcel filter to TCPUD remaining developable Parcels removed an additional 529 undeveloped Parcels or 1,346 undeveloped acres from the potentially developable Parcels. In total there are 1,228 undeveloped Parcels, or 4,829 undeveloped acres within the TCPUD District Boundary that are potentially developable after application of the Land Capacity Scores and Retired Parcels.

Application of IPES scores below the developability threshold (IPES <1) to the Residential Land Use Parcels removed an additional 20 undeveloped Parcels or 13 undeveloped acres from the potentially developable Parcels. In total there are 1,228 undeveloped Parcels, or 4,829 undeveloped acres within the TCPUD District Boundary that are potentially developable after application of the Land Capability Scores, Retired Parcels and IPES scores.

Within the TCPUD District Boundary, remaining Parcels were reviewed individually by TCPUD staff to determine their development potential. Public versus private ownership, size and location of Parcel, and accessibility of Parcel were all considered. This review resulted in the removal of 578 Parcels accounting for 4,535 acres. The developable Parcels remaining within the TCPUD District Boundary are 650 Parcels for 294 acres. For the purposes of the developable Parcel analysis, a limited number of Recreation and Conservation lands were included because there is reasonable probability of development on some of these Land Use types within the scope of this Study.

Figure 14 shows TCPUD Developable Parcels Analysis and Table 17 summarizes the results of the TCPUD Developable Parcels Analysis.

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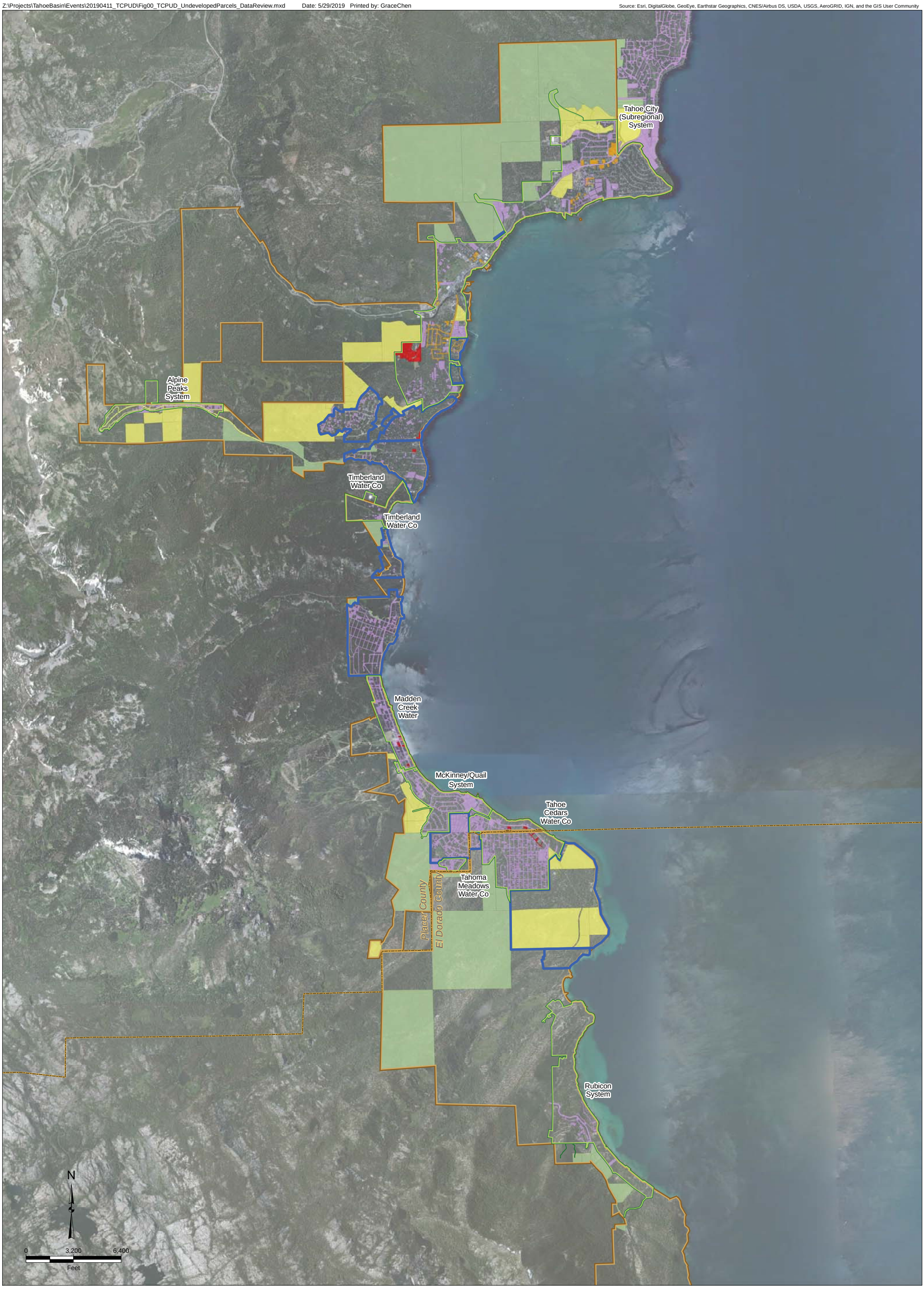

Legend

- TCPUD Water Service Area
- Non-TCPUD Water Service Areas (Neighboring)
- TCPUD Sanitary Sewer Service Area

Undeveloped Parcels
LandUse

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

Kennedy/Jenks Consultants

Tahoe City Public Utility District
All Undeveloped Parcels
By Land Use

1970003.00

Figure 13

Z:\Projects\TahoeBasin\Events\20190411_TCPUD\Fig00_TCPUD_UndevelopedParcels_DataReview.mxd Date: 9/18/2019 Printed by: GraceChen

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- TCPUD Water Service Area Boundary
- Non-TCPUD Water Service Areas Boundary
- TCPUD Sanitary Sewer Service Area/District Boundary

Land Use Designation

- Conservation
- Mixed-Use
- Recreation
- Residential
- Tourist

Kennedy/Jenks Consultants

Lake Tahoe Basin, California

Tahoe City Public Utility District
Developable Parcels Remaining

1970003.00
Figure 14

Table 17: Developable Parcels Analysis for TCPUD

	Backcountry		Conservation		Mixed-Use		Recreation		Residential		Resort Recreation		Tourist		(Blank)		Total Undevelopable Parcels Removed		Total Remaining Developable Parcels	
	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels	Acreage	Parcels
All Parcels in TCPUD Water Service Area	1,326	9	7,086	129	307	480	5,013	260	4,006	9,898	0	0	142	394	4	161	-	-	17,885	11,331
Right-of-Way and Parcels w/ no Land use (Removed)	0	0	-43	-7	-28	-3	-130	-5	-597	-204	0	0	-5	-5	-4	-161	-806	-385	17,079	10,946
Parcels with Metered Water Accounts (Removed)	0	0	-274	-29	-123	-377	-521	-33	-2,258	-6,970	0	0	-77	-165	0.0	0	-3,254	-7,574	13,826	3,372
Parcels with Bailey 1,2,3 or Water Body (Removed)	-1,326	-9	-2,752	-54	-117	-40	-2,843	-155	-585	-1,331	0	0	-15	-6	0.0	0	-7,638	-1,595	6,188	1,777
Retired Parcels (Removed)	0	0	-984	-10	-1	-2	-183	-16	-178	-501	0	0	0.0	0	0.0	0	-1,346	-529	4,842	1,248
IPES < 1 Residential Parcels (Removed)	0	0	0.0	0	0.0	0	0.0	0	-13	-20	0	0	0.0	0	0.0	0	-13	-20	4,829	1,228
Parcels identified by District as Undevelopable (Removed)	0	0	-2,956	-23	-18	-22	-1,329	-47	-210	-299	0	0	-22	-187	0.0	0	-4,535	-578	294	650
Total Developable Parcels Remaining	**0**	**0**	**78**	**6**	**21**	**36**	**7**	**4**	**165**	**573**	**0**	**0**	**24**	**31**	**0.0**	**0**	**0**	**0**		
Grand Total Developable Parcels Remaining																			**294**	**650**

4.3 Results and Findings

After the application of the filter criteria in section 4.2, the remaining Parcels that have a reasonable potential for future development for STPUD, NTPUD, and TCPUD are shown on Figures 10, 12, and 14, respectively. A summary of acreages and Parcels by Land Use classification for future development are shown in Table 18.

Table 18: Summary of Developable Parcels for All Districts

		STPUD			NTPUD			TCPUD			
		District	Non-District	Total	District	Non-District	Total	District	Non-District	Total	Grand Total
Conservation	**Acreage**	6	22	29	24	18	43	1	76	78	**149**
	Parcels	25		25	3	2	5	1	5	6	**36**
Mixed-Use	**Acreage**	110	12	122	44		44	21		21	**187**
	Parcels	264	31	295	126		126	36		36	**457**
Recreation	**Acreage**	4	2	6	81		81	1	6	7	**93**
	Parcels	10		10	15		15	2	2	4	**29**
Residential	**Acreage**	402	42	444	130	37	167	112	53	165	**776**
	Parcels	2062	131	2,193	438	107	545	403	170	573	**3,311**
Resort Recreation	**Acreage**	1		1							**1**
	Parcels	1		1							**1**
Tourist	**Acreage**	39	10	50				23	2	24	**74**
	Parcels	139	50	189				28	3	31	**220**
Total	**Acreage**	**562**	**89**	**651**	**279**	**56**	**335**	**157**	**137**	**294**	**1,280**
	Parcels	**2501**	**212**	**2,713**	**582**	**109**	**691**	**470**	**180**	**650**	**4,054**

Section 5: Total Baseline Water Production Requirement

The Current Baseline Water Production Requirement within the District Boundaries is estimated to be 13,050 AFY as described in Section 3 (see Tables 13 and 14). The Future Baseline Water Production Requirement associated with undeveloped Parcels is based on the Baseline Unit Water Production, calculated in Section 3.5, Table 12, applied to the potentially developable Parcels described in Section 4 and listed in Table 18. The sum of the Current Baseline Water Production Requirement and the Future Baseline Water Production Requirement is the Total Baseline Water Production Requirement, detailed in this Section.

5.1 Future Baseline Water Production Requirement Based on Baseline Unit Water Production

In order to estimate the Future Baseline Water Production Requirement, the total Parcel acreage of potentially developable Parcels was sorted by Land Use classification for each District Water Service Area and Non-District Water Service Area. The Baseline Unit Water Production calculated in Section 3.5 for each Land Use was then multiplied by the potentially developable acreage for that Land Use to calculate the Future Baseline Water Production Requirement. Tables 19 through 21 present these calculations for each District, and Table 22 aggregates the Future Baseline Water Production Requirement calculated for the Lake Tahoe Basin.

Table 19: STPUD: Calculation of Future Baseline Water Production Requirement

Land Use	Water Service Area	Acres	Baseline Unit Water Production (AFY/Acre)	Future Baseline Water Production Requirement (AFY)
Conservation	District	6	0.12	0.76
	Non-District	22		3
Mixed-Use	District	110	0.83	92
	Non-District	12		10
Recreation	District	4	0.46	2
	Non-District	2		0.69
Residential	District	402	1.39	559
	Non-District	42		59
Resort Recreation	District	0.75	2.89	2
	Non-District			
Tourist	District	39	5.04	199
	Non-District	10		52
Total Area	District	**562**	1.34	**855**
	Non-District	**89**		**124**

Table 20: NTPUD: Calculation of Future Baseline Water Production Requirement

Land Use	Water Service Area	Acres	Baseline Unit Water Production (AFY/Acre)	Future Baseline Water Production Requirement (AFY)
Conservation	District	24	0.01	0.21
	Non-District	18		0.16
Mixed-Use	District	44	1.89	83
	Non-District			
Recreation	District	81	0.02	2
	Non-District			
Residential	District	130	1.24	160
	Non-District	37		46
Resort Recreation	District			
	Non-District			
Tourist	District			
	Non-District			
Total Area	District	**279**	0.97	**245**
	Non-District	**56**		**46**

Table 21: TCPUD: Calculation of Future Baseline Water Production Requirement

Land Use	Water Service Area	Acres	Baseline Unit Water Requirement (AFY/Acre)	Future Baseline Water Production Requirement (AFY)
Conservation	District	1	0.09	0.14
	Non-District	76		7
Mixed-Use	District	21	1.47	31
	Non-District			
Recreation	District	0.59	0.31	0.18
	Non-District	6		2
Residential	District	112	0.80	89
	Non-District	53		42
Resort Recreation	District			
	Non-District			
Tourist	District	23	2.90	66
	Non-District	2		4
Total Area	District	**157**	0.73	**186**
	Non-District	**137**		**56**

Table 22: Future Baseline Water Production Requirement

Water Service Area		Future Baseline Water Production Requirement (AFY)	(AFY)
STPUD	District	855	979
	Non-District	124	
NTPUD	District Water	245	292
	Non-District	46	
TCPUD	District	186	242
	Non-District	56	
	Total	**1,512**	**1,512**

5.2 Total Baseline Water Production Requirement (Developed and Undeveloped Parcels)

Table 23 provides a summary of the Total Baseline Water Production Requirement calculation for each District Boundary based on the Current Baseline Water Production Requirement from Table 14 and the Future Baseline Water Production Requirement from Table 22.

Table 23: Total Baseline Water Production Requirement

Water Service Area		Current Baseline Water Production Requirement (AFY)	Future Baseline Water Production Requirement (AFY)	Total Baseline Water Production Requirement (AFY)
STPUD	District	6,154	855	7,009
	Non-District	1,874	124	1,998
	STPUD Total	**8,028**	**979**	**9,007**
NTPUD	District	1,319	245	1,565
	Non-District	747	46	793
	NTPUD Total	**2,066**	**292**	**2,358**
TCPUD	District	1,717	186	1,903
	Non-District	1,239	56	1,295
	TCPUD Total	**2,956**	**242**	**3,198**
	Total	**13,050**	**1,512**	**14,562**

Section 6: Adjustments to Total Baseline Water Production Requirement

As noted in Section 5, there is an inherent variability to Water Consumption and Water Production, which is a function of: climate, occupancy characteristics, economic conditions, and drought policy.

Specifically, between 2009 and 2018, the following events occurred, any of which singularly and collectively could result in the variability of the historic Water Production (2009 – 2018):

- The 2007 – 2009 Great Recession in the United States with economic recovery through 2014.

- The 2012 – 2016 water year drought in California, which is recorded as the driest 4-year period since 1895, according to the Public Policy Institute of California.[14] In January 2014, California Governor Edmund Gerald Brown, Jr. declared a State of Emergency due to drought, urging 20% reduction in water use, which was increased to a mandatory 25% reduction in April 2015 by Executive Order.[15]

- The Water Conservation Act of 2009 (Senate Bill X7-7) enacted statewide water conservation requirements, namely 20% reduction in water use by 2020. Beginning with the 2010 Urban Water Management Plan cycle, urban water suppliers were required to report per capita water use, as well as calculate the 20% reduction target.

Additionally, the Lake Tahoe Basin is a significant tourist destination that experiences highly seasonal variations in occupancy, consisting of a combination of primary and secondary residences that can span a large range of occupancy depending on owner preference, long-term or short-term (vacation) rental scenarios, economic situation, and weather. The occupancy rates are very difficult to estimate on an on-going basis and a detailed analysis to predict future occupancy conditions is outside the scope of this study.

The following sections describe potential impacts of these factors to the Total Baseline Water Production Requirement.

6.1 Historical Bookends

The 10 years of historic Water Production Data in Table 11 indicated that 2009 is the 10-year high Water Production year at 120% above 2018, or 116% of the adjusted baseline discussed in

[14] Public Policy Institute of California, "California's Latest Drought," July 2016, https://www.ppic.org/publication/californias-latest-drought/.

[15] California Department of Water Resources, "California's Emergency Drought Declaration is Lifted," July 2016, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Water-Basics/Drought/Files/Resources/Californias-Emergency-Drought-Declaration-is-lifted.pdf

Section 3.5. The year 2009 represents a condition where normal conditions existed, economic downturn had not fully impacted the Lake Tahoe Basin or Northern California, and no mandatory conservation was in place. Other, longer-term high Water Production years include 1981, when 2,124 AF of Water Production was recorded for the NTPUD, which is 178% of the 2018 NTPUD Water Production of 1,195 AF, or 163% of the 10-year average NTPUD Water Production of 1,306 AF.

6.2 Future Climatic Variability

The El Dorado County Water Agency (EDCWA) is preparing a county-wide estimate of future water needs. As part of their analysis, they have compiled information on changes to evapotranspiration within El Dorado County. Upon review of a map that EDCWA provided, the Lake Tahoe area is within reference evapotranspiration (ETo) Zone 5. EDCWA provided a summary table of ETo rates under a range of climate change scenarios as presented in Table 24 below.

Table 24: Current and Climate Change Scenario Reference Evapotranspiration (ETo) Rates for ETo Zone 5

		Climate Change Scenarios				
	Current	Central Tendency	Hot-Dry	Hot-Wet	Warm-Dry	Warm-Wet
Inches	47	51	53	52	50	49
% of Current	100%	108%	113%	110%	107%	104%

Source: 26 August 2019 Meeting Materials

In addition to the variability in Water Production under historic conditions discussed in Section 6.1, the information in Table 24 suggests that future climatic conditions could account for increases in irrigation needs on the order of 7-10 percent or more. The expected weather patterns include warmer springs and autumn seasons which will lengthen the irrigation period, and therefore potentially increase Water Consumption.

6.3 Potential Impact of Occupancy Changes

6.3.1 Occupancy Analysis Approach

As a vacation and second-home destination, the Lake Tahoe Basin has a high variability in occupancy. An analysis of Metered Water Account data for each District identified that residential meters with no Metered Water Demand in any single quarter occurs frequently in the existing metered Parcels and can be associated with lower occupancy Parcels. Some conversion of lower to higher occupancy should be assumed to account for the changes in how a homeowner might use a Parcel or to account for changes in ownership that might occur in the future. If the Parcels with lower occupancy had higher Metered Water Demand associated with higher occupancy, an increase in Water Production could be expected. The analysis described

below is intended to provide insight on the magnitude of the potential increased Water Production needs associated with occupancy changes.

The occupancy analysis for the existing residential Metered Water Accounts for each District included the following steps:

1. Aggregating monthly Residential Land Use Metered Water Demand data into quarterly data as a common timeline, since not all Districts have monthly data.

2. Removing data from quarters in 2018 with no Metered Water Demand from the occupancy analysis, as these could skew the lower occupancy Water Production estimate. Each District had some Metered Water Accounts with zero Metered Water Demand in 2018, as discussed in Section 3.1.

3. Sort the non-zero Metered Water Demand data into those with all quarters of Metered Water Demand greater than zero hundred cubic feet (CCF) and greater than five CCF and those with at least one quarter of Metered Water Demand less than five CCF. Based on a review of Metered Water Demand data and discussion with District staff, 5 CCF was assigned as the minimum Metered Water Demand threshold of a Parcel with higher (full-time) occupancy.

4. Calculate Metered Water Demand-per-Parcel, percentage of Parcels, and percentage of Metered Water Demand for each District.

5. Conduct a sensitivity analysis to evaluate the Metered Water Accounts for existing Residential Land Use and potential changes to Water Consumption associated with conversion of lower occupancy to higher occupancy.

Results of Steps 1 through 4 are presented in Section 6.3.2 and for Step 5 in Section 6.3.3.

6.3.2 Occupancy Analysis Results

Tables 25 through 27 show the occupancy analysis for each of the three Districts.

Table 25: STPUD Residential Occupancy Analysis

	Metered Water Demand for 2018			
	Entire Year: Non-Zero Metered Water Demand	All Quarters: > 0 CCF per Quarter [a]	All Quarters: > 5 CCF per Quarter [b] (Higher Occupancy)	All Quarters: >1 CCF and < 5 CCF per Quarter (Lower Occupancy)
# of Residential Parcels	9,874	8,214	5,579	4,295
Total Metered Water Demand (CCF)	1,111,394	1,038,190	907,062	204,332
Metered Water Demand per Parcel (CCF)	113	126	163	48
% Parcel		83%	57%	43%
% Metered Water Demand		93%	82%	18%

Notes:
(a) 0 CCF Criteria filters out Parcels with any quarter in 2018 with Metered Water Demand of 0 CCF
(b) 5 CCF Criteria filters out Parcels with any quarter in 2018 with Metered Water Demand less than 5 CCF

Table 26: NTPUD Residential Occupancy Analysis

	Metered Water Demand for 2018			
	Entire Year: Non-Zero Metered Water Demand	All Quarters: > 0 CCF per Quarter [a]	All Quarters: > 5 CCF per Quarter [b] (Higher Occupancy)	All Quarters: >1 CCF and < 5 CCF per Quarter (Lower Occupancy)
# of Residential Parcels	2,966	2,460	1,509	1,457
Total Metered Water Demand (CCF)	236,056	223,547	182,187	53,869
Metered Water Demand per Parcel (CCF)	80	91	121	37
% Parcel		83%	51%	49%
% Metered Water Demand		95%	77%	23%

Notes:
(a) 0 CCF Criteria filters out Parcels with any quarter in 2018 with Metered Water Demand of 0 CCF
(b) 5 CCF Criteria filters out Parcels with any quarter in 2018 with Metered Water Demand less than 5 CCF

Table 27: TCPUD Residential Occupancy Analysis

	Metered Water Demand for 2018			
	Entire Year: Non-Zero Metered Water Demand	All Quarters: > 0 CCF per Quarter [(a)]	All Quarters: > 5 CCF per Quarter [(b)] (Higher Occupancy)	All Quarters: >1 CCF and < 5 CCF per Quarter (Lower Occupancy)
# of Residential Parcels	3,567	3,226	1,637	1,930
Total Metered Water Demand (CCF)	354,740	336,053	226,816	127,924
Metered Water Demand per Parcel (CCF)	99	104	139	66
% Parcel		90%	46%	54%
% Metered Water Demand		95%	64%	36%

Notes:
(a) 0 CCF Criteria filters out Parcels with any quarter in 2018 with Metered Water Demand of 0 CCF
(b) 5 CCF Criteria filters out Parcels with any quarter in 2018 with Metered Water Demand less than 5 CCF

In general, although the specific percentages vary by District the higher occupancy Parcels have a much higher percentage of Metered Water Demand compared to the absolute number of Parcels that they represent.

6.3.3 Estimated Increase in Water Production from Change in Occupancy

There is a reasonable potential for lower-to-higher occupancy changes to occur in the existing Residential Land Use Parcels. Factors contributing to this likely conversion include increased visitation from part-time residents who find that telecommuting is a viable option, increasing ease of vacation rental of second-home Parcels (Airbnb, VRBO, etc.), conversion to full-time rentals or full-time occupancy because of changes in ownership or economic condition. The Districts have no means of predicting this conversion, but they can produce estimates of the future conversion. Tables 28 to 31 provide a range of conversions for each District and in total and provide insight on the magnitude of potential Water Production increases based on 2018 data associated with changes in occupancy both in absolute terms as well as in terms of percentage of existing residential use, which represents the highest proportion of water needs for all of the Districts.

Depending on the percentage of lower occupancy Parcels that convert to higher occupancy, even a conversion of 20% of the lower occupancy Parcels could result in an overall three-District increase of about 8% of Metered Water Demand for the Residential Land Use. This is a conservative value as this analysis only includes Metered Water Accounts for Residential Land Use Parcels and total Water Consumption includes both Metered Water Accounts and Unmetered Water Accounts. It should be noted that this analysis is based on 2018 Metered Water Demand data and does not include consideration of the 104% adjustment to achieve the Total Baseline Water Production Requirement.

Table 28: STPUD Occupancy Conversion

		Number of Parcels		Total Metered Water Demand			Additional Demand Over Lower Occupancy Demand (AFY)	% of 2018 Water Production Requirement (Residential)
		Lower Occupancy	Higher Occupancy	Lower Occupancy (AFY)	Higher Occupancy (AFY)	With Conversion of Lower Occupancy (AFY)		
Current LOWER Occupancy		4,475	-	-	606	180	786	180
20%	convert to higher	3,580	895	485	506	991	385	9%
40%	convert to higher	2,685	1,790	364	1,012	1,376	770	18%
50%	convert to higher	2,238	2,238	303	1,265	1,568	962	22%
60%	convert to higher	1,790	2,685	242	1,518	1,760	1,154	27%
80%	convert to higher	895	3,580	121	2,024	2,145	1,539	36%
100%	convert to higher	-	4,475	-	2,530	2,530	1,924	45%

Table 29: NTPUD Occupancy Conversion

		Number of Parcels		Total Metered Water Demand			Additional Demand Over Lower Occupancy Demand (AFY)	% of 2018 Water Production Requirement (Residential)
		Lower Occupancy	Higher Occupancy	Lower Occupancy (AFY)	Higher Occupancy (AFY)	With Conversion of Lower Occupancy (AFY)		
Current LOWER Occupancy		1,457	-	-	124	-	124	-
20%	convert to higher	1,166	291	99	81	180	56	6%
40%	convert to higher	874	583	74	162	236	112	12%
50%	convert to higher	729	729	62	202	264	140	15%
60%	convert to higher	583	874	49	242	292	168	18%
80%	convert to higher	291	1,166	25	323	348	224	24%
100%	convert to higher	-	1,457	-	404	404	280	30%

Table 30: TCPUD Occupancy Conversion

		Number of Parcels		Total Metered Water Demand			Additional Demand Over Lower Occupancy Demand (AFY)	% of 2018 Water Production Requirement (Residential)
		Lower Occupancy	Higher Occupancy	Lower Occupancy (AFY)	Higher Occupancy (AFY)	With Conversion of Lower Occupancy (AFY)		
Current LOWER Occupancy		1,930	-	294	-	294	-	0%
20%	convert to higher	1,544	386	235	123	358	64	8%
40%	convert to higher	1,158	772	176	246	422	128	15%
50%	convert to higher	965	965	147	307	454	160	19%
60%	convert to higher	772	1,158	117	368	486	192	23%
80%	convert to higher	386	1,544	59	491	550	256	30%
100%	convert to higher	-	1,930	-	614	614	320	38%

Table 31: STPUD, NTPUD, TCPUD Occupancy Conversion

		Number of Parcels		Total Metered Water Demand			Additional Demand Over Lower Occupancy Demand Only (AFY)	% of 2018 Water Production Requirement (Residential)
		Lower Occupancy	Higher Occupancy	Lower Occupancy (AFY)	Higher Occupancy (AFY)	With Conversion of Lower Occupancy (AFY)		
Current LOWER Occupancy		7,862	-	1,024	180	1,204	180	0%
20%	convert to higher	6,290	1,572	819	710	1,528	505	8%
40%	convert to higher	4,717	3,145	614	1,419	2,033	1,010	17%
50%	convert to higher	3,931	3,931	512	1,774	2,286	1,262	21%
60%	convert to higher	3,145	4,717	409	2,129	2,538	1,515	25%
80%	convert to higher	1,572	6,290	205	2,838	3,043	2,019	33%
100%	convert to higher	-	7,862	-	3,548	3,548	2,524	41%

6.4 Potential Changes Associated with Future Densification

Potential densification of existing uses, including the addition of accessory dwelling units within single-family residential or conversion of low-rise motels or apartments to high rise hotels, or apartments/condominiums, are allowable under current zoning or could be allowable under future zoning. District staff indicated that while allowable, these types of use densification are not likely to result in significant increases in Water Production in the foreseeable future when compared to the variability associated with warmer climates and increases in occupancy.

6.5 Aggregated Adjustment to Total Baseline Water Production Requirement

Based on the above discussion, it appears that historic bookends and potential future increases in evapotranspiration that represent a range of climate conditions could result, conservatively, in variability on the order of 10-15% of total Water Production needs. Occupancy changes, which are difficult to predict, could also result in an increase of 8% of the Residential Land Use Water Production needs if even 20% of lower occupancy Parcels convert to higher occupancy. In addition, there are other less quantifiable factors including economic, fire response needs, and zoning changes that could contribute to an increase in Water Production. Therefore, an adjustment to the Total Baseline Water Production Requirement of 20% is a reasonable upward bound to estimate the Total District Water Production Requirement that is consistent with circumstances that have a reasonable probability of occurring.

Section 7: Estimate of Total District Water Production Requirement

Applying a 20% increase to the Total Baseline Water Production Requirement, presented in Table 23, results in an overall Total District Water Production Requirement of almost 17,500 AFY as summarized in Table 32.

For comparison, the Total District Water Production Requirement in Table 32 has been measured against estimates previously prepared under different names and using different methods, including in the following documents:

- *Draft: Environmental Impact Report, Policy for Water Allocation in the Lake Tahoe Basin*, California State Water Resources Control Board, July 1984. (SWRCB, 1984)

- *Report on Water Use and Water Rights*, California State Water Resources Control Board, Lake Tahoe Basin, October 1979. (SWRCB, 1979)

- "Statement of North Tahoe Public Utility District, Tahoe City Public Utility District, and South Tahoe Public Utility District to State Water Resources Control Board Regarding Draft Policy for Water Allocation in the California Portion of the Lake Tahoe Basin and Draft Environmental Impact Report: Policy for Water Allocation in the Lake Tahoe Basin," Brown and Caldwell, November 1984. (Brown and Caldwell, 1984)

The equivalent Total District Water Production Requirement reported in each of the above documents is presented in Table 33. As a percentage of the Total District Water Production Requirement calculated in this Study, the greatest variation from previous estimates is between the Brown and Caldwell, 1984 estimate and the Total District Water Production Requirement at 2,824 AFY or 16%. Furthermore, the Total District Water Production Requirement was less than all three previous estimates, which is consistent with historic water requirements. These comparisons provide validity to the methods and assumptions used to develop the Total District Water Production Requirement.

Table 32: Total District Water Production Requirement

District		Water System/User	Adjusted Current Baseline Water Production Requirement (AFY)	Adjusted Future Baseline Water Production Requirement (AFY)	Total District Water Production Requirement (Subtotal) (AFY)
STPUD		STPUD	7,385	1,025	**10,808**
		Lukins Brothers Water Company	319	34	
		Tahoe Keys Water Company	1,018	28	
		Lakeside Park Association	237	62	
		Other Individual Water Users	676	24	
		STPUD DISTRICT BOUNDARY SUBTOTAL	**9,634**	**1,174**	
NTPUD		NTPUD	1,583	294	**2,829**
		Fulton Water Company	427	30	
		Agate Bay Water Company	425	25	
		Other Individual Water Users	44	-	
		NTPUD DISTRICT BOUNDARY SUBTOTAL	**2,479**	**350**	
TCPUD	District Water Service Area	TCPUD	1,374	149	**3,839**
		Timberland	53	4	
		Madden Creek	170	18	
		Tahoe Cedars	441	53	
		Other individual Water Users in TCPUD Water System Boundaries	22	-	
	Non-District Water Service Area	Tahoe Park Water Company	595	8	
		Washoe Heights Water Company	6	-	
		Talmont Resort Improvement District	96	7	
		Ward Well Water Company	242	25	
		Skyland/Nielsen Water Company	37	2	
		Tahoe Pines/Tahoe Swiss Village Water Company	243	10	
		McKinney Estates Water District	67	3	
		Glenridge Water Company	23	-	
		Lakeview Water Company	4	-	
		Sugar Pine State Park	108	1	
		Other Individual Water Users (eWRIMS)	27	-	
		Other Individual Water Users (estimated)	39	12	
		TCPUD DISTRICT BOUNDARY SUBTOTAL	**3,547**	**292**	
Total District Water Production Requirement			**15,660**	**1,816**	**17,476**

Table 33: Comparison of Total Water Production Requirement

	Proposed Allocation			
District	SWRCB, 1979	SWRCB, 1984	Brown/Caldwell, 1984	Total District Water Production Requirement
NTPUD	2,890	3,018	3,920	2,829
TCPUD	4,010	4,201	4,330	3,839
STPUD	12,100	12,493	12,050	10,808
Total	**19,000**	**19,712**	**20,300**	**17,476**

7.1 Water Conservation Requirements

Each District will continue to comply with water conservation requirements established by the State of California. During the 2020 Urban Water Management Plan Update, each District will confirm continued compliance with California's Senate Bill X7-7 (SB X7-7) requirements, as applicable. Both indoor and outdoor water usage in 2018 are inherently embedded in the 2018 Unit Water Production values in Section 3.2.5.

The 2018 Unit Water Production values used in this report were not analyzed to address the 2018 California Assembly Bill 1668 (AB 1668) and Senate Bill 606 (SB 606), which establishes water use limits with the goal of making water conservation a way of life and regulations are being developed for this legislation. The lack of defined regulations and the large seasonal and annual variability in outdoor water use result in it being unclear how this legislation will impact the water use in the Districts. As with SB X7-7, the Districts will comply with AB 1668/SB 606 requirements, as applicable.

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Appendix A: Summary of District Production and Climatic Data

There is an inherent variability to water consumption and Water Production which is a function of: climate, occupancy characteristics, economic conditions, and drought policy. Appendix A presents a summary of District water production and climatic data in tabular and graphical form to facilitate the understanding of climate and production variability.

The 10-years of historic Water Production data in Table 17 indicated that 2009 is the 10-year high Water Production year at 120% above 2018, or 116% of the baseline. 2009 represents a condition where normal conditions existed, economic downturn had not fully impacted the Lake Tahoe area/Northern California, and no mandatory conservation was in place. Other, longer term high Water Production years include 1981, when in the NTPUD service area, 2,124 AF of Water Production was recorded, which is 178% of the 2018 NTPUD Water Production of 1,195 AF, or 163% of the 10-year average NTPUD Water Production of 1,306 AF.

For instance, water scarcity associated with climate change and water resiliency in the Lake Tahoe Basin, may make this a desirable location, forcing greater year-round population growth in the area.

Figure 1 provides a historical perspective on water consumption and Lake Tahoe water level, which is a surrogate for hydrologic condition. The water level of Lake Tahoe varies with snowpack or precipitation; higher water levels occur with higher snowpack conditions.

Figure 2 shows annual production for 2009-2018 as a % of 2018 production; 2018 is the year with the most complete data for all three Districts.

Table 1 breaks down Production and % of 2018 for each of the three Districts, and in total as well as presenting the hydrologic year type for each of the last ten years.

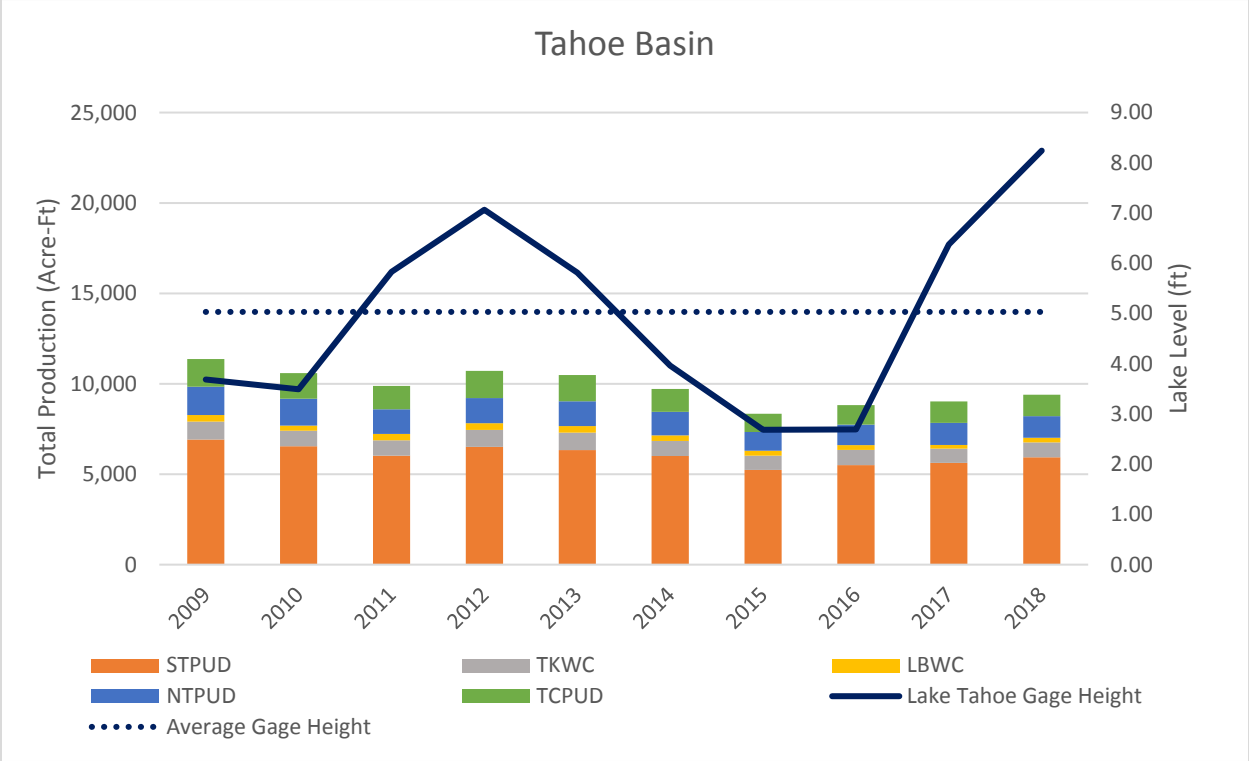

Figure 1: District Production and Climatic Data

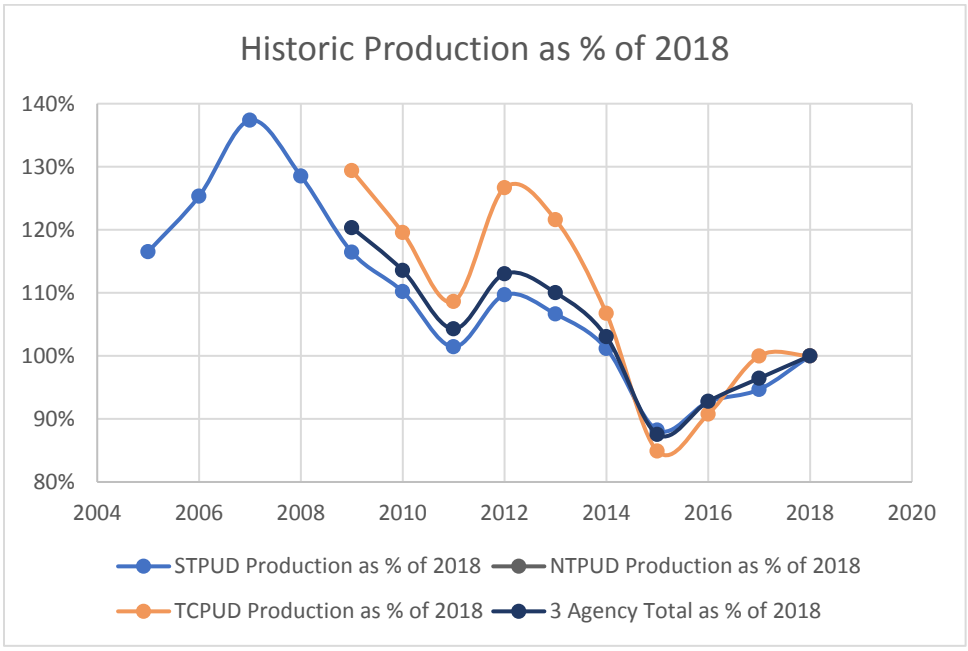

Figure 2: Historic Production as % of 2018

Table 1: Summary of Historic Total Water Production for all Districts

	NTPUD		STPUD		TCPUD		Total		
	Production (AFY)	% of 2018 Production	Production (AFY)	% of 2018 Production	Production (AFY)	% of 2018 Production	Production (AFY)	% of 2018 Production	Hydrologic Year Type[(1)]
2009	1,560	131%	6,918	116%	1,539	129%	10,017	120%	Normal
2010	1,485	124%	6,546	110%	1,422	120%	9,453	114%	Normal
2011	1,363	114%	6,026	101%	1,292	109%	8,681	104%	Very Wet
2012	1,386	116%	6,516	110%	1,507	127%	9,409	113%	Below Normal
2013	1,377	115%	6,336	107%	1,446	122%	9,159	110%	Normal
2014	1,299	109%	6,009	101%	1,270	107%	8,578	103%	Below Normal
2015	1,037	87%	5,241	88%	1,010	85%	7,288	88%	Below Normal
2016	1,137	95%	5,507	93%	1,080	91%	7,724	93%	Normal
2017	1,216	102%	5,624	95%	1,189	100%	8,030	96%	Very Wet
2018	1,195	100%	5,941	100%	1,189	100%	8,325	100%	Normal
Mean	1,306	109%	6,066	102%	1,294	109%	8,666	104%	
Median	1,331	111%	6,018	101%	1,281	108%	8,630	104%	

Note:

(1) For Tahoe Valley South Groundwater Basin, STPUD 2018 WY Annual Report

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Appendix B: Alternative Unit Demand Analysis

During the preparation of the analysis, separate smaller analyses on a more limited data set, usually a single District, were conducted to understand the data and the effects of alternative analyses on the results.

Appendix B-1 was a more detailed Initial Unit Water Demand analysis for TCPUD for the residential land use classification since TCPUD's Initial Unit Water Demands deviated from STPUD and NTPUD. This analysis is to better understand the variation in the Initial Unit Water Demand estimate amongst the many small water systems in only the TCPUD water service area was conducted.

Appendix B-2 is an analysis of STPUD's Initial Unit Water Demand analysis on a District meter—type basis.

Appendix B-3 is an analysis of the allocation of Unaccounted for Water by three methods; proportional to Land Use area, to Initial Unit Water Demand by Land Use, or by number of Parcels by Land Use classification.

Appendix B-1 Unit Demand Analysis for TCPUD

Calculation of TCPUD Residential Unit Water Demand based on Metered Demand data for each of TCPUD's metered District Water Service Areas finds that the residential Initial Unit Water Demands (i.e. without Unaccounted-for Water) of the different TCPUD metered Water Service Areas range from 0.27 AFY/Acre, for the McKinney-Quail Water Service Area to 0.98 AFY/Acre for the Tahoe City (Sub-regional) Water Service Area as shown in Table 2. The wide range of residential Initial Unit Water Demands for each of the TCPUD's Water Service Areas is most likely indicative of the high variability of occupancy rates as there are many second homes and vacation rentals and smaller parcel acreage within the TCPUD Boundary. Metered Demand Timberland, Madden Creek, Tahoe Cedars are not completely metered in these analyses and therefore have much more limited data.

Residential Estimated Unit Water Production can be a mix of single and multiple family residential water.

Table 2: TCPUD Connection Based Unit Demand Analysis

Water System	Land Use	Metered Parcel Area (Acre)	# of Metered Parcels	Metered Demand (AFY)	Initial Unit Demand (AFY/Ac)
Tahoe City (Subregional) System	Mixed Use	107.44	354	151.52	1.41
	Recreation	78.21	10	18.87	0.24
	Residential	613.91	2,342	602.53	0.98
	Tourist	6.92	79	19.27	2.78
Alpine Peaks System	Residential	29.46	96	13.79	0.47
Madden Creek Water System	Tourist	0.35	1	0.14	0.39
McKinney/Quail System	Recreation	0.95	4	0.25	0.27
	Residential	139.55	497	97.55	0.70
Rubicon System	Conservation	2.35	3	0.54	0.23
	Residential	279.36	579	93.63	0.34
Tahoe Park Water Company	Residential	2.29	3	2.20	0.96
Tahoma Meadows Water Company	Residential	13.62	45	3.74	0.27
Timberland Water Company	Residential	0.18	1	0.11	0.64
Ward Well Water Company	Residential	6.44	1	0.13	0.02
Unknown Water Systems	Conservation	194.01	16	17.2	0.09
	Recreation	94.62	4	34.26	0.36
	Residential	9.06	3	0.69	0.08

Appendix B-2 Estimating Initial Unit Water Demand by Connection Size for STPUD

Estimating Initial Unit Water Demand per connection by connection size as assigned by the District was also conducted for STPUD as shown in Table 3 . However, this method was no longer considered after review of connection data and GIS data showed high variation between connection classification types, such as multiple family vs. residential, commercial vs. mixed use, or master meter classifications. This made it difficult to develop a uniform method to apply to across the Districts.

Table 3: STPUD Unit Demand by Meter Connection

Meter Size	# of Connections	Consumption (CCF)	Consumption (AFY)	Initial Demand (AFY/Connection)
3/4"	45,758	1,041,198.19	2,390.27	0.05
1"	3,496	165,059.04	378.92	0.11
1.5"	836	104,464.12	239.82	0.29
2"	857	381,838.04	876.58	1.02
3"	126	59,450.26	136.48	1.08
4"	139	123,555.86	283.65	2.04
6"	39	48,235.28	110.73	2.84
8"	52	19,918.81	45.73	0.88
10"	5	90,307.00	207.32	41.46
Grand Total	**51,308**	**2,034,026.60**	**4,669.49**	**0.09**

Appendix B-3 Allocation of Unaccounted for Water

Several methods for allocation of Unaccounted for Water were evaluated including allocation proportional to Land Use area, to Initial Unit Water Demand by Land Use, or by number of Parcels by Land Use classification. Examination of the results of these three methods indicated that, at higher percentages of Unaccounted for Water, there was a disproportionate increase from the Initial Unit Water Demand to the Estimated Unit Water Production when using the Land Use area because some Land Use classifications, such as recreation or conservation, could have large land areas in single Parcels with nominal water usage. Therefore, Land Use area was not used as a means of allocating Unaccounted for Water. Distribution of Unaccounted for Water proportional to demands by Land Use acreage potentially under predicts the Estimated Unit Water Production, especially for Land Uses like residential that represent the majority of the Land Use and were therefore not used as a means of allocating Unaccounted for Water. The results of the more detailed analyses are presented in Tables 4, 5, and 6 for each District.

Table 4: STPUD Water Loss Allocation

Step 1. Intermediate Unit Demands based on STPUD "Non-Zero" metered accounts by Land Use						Step 2. Calculate Consumption by Unmetered Accounts by Land Use			Step 3. Total Area, Parcels, Demand			Step 4. Water Loss Calculation		Step 5. Distribute Water Loss						Step 6. Unit Demand Calculations		
	Metered Accounts with Demand ("Non-Zero", "Non-Duplicate")					Unmetered Accounts			Meter (Non-Zero, Non Duplicate) + Unmetered			Total		Distribute by Land Use Area %		Distribute by Land Use Demand %		Distribute by # Parcel %		Land Use Area%	Land Use Demand %	# Parcel %
Land Use	Acreage	# of Parcels	Revised Demand (CCF)	Revised Demand (AFY)	Unit Demand (AFY/Ac)	Acreage	# of Parcels	Demand (AFY)	Total Acreage	# of Parcels	Total Demand (AFY)	CY 2018 Total Production (AFY)	Total Estimated Loss (AFY)	STPUD Water Loss (AFY)	Total Demand (AFY)	STPUD Water Loss (AFY)	Total Demand (AFY)	STPUD Water Loss (AFY)	Total Demand (AFY)	Unit Demand (AFY/Ac)	Unit Demand (AFY/Ac)	Unit Demand (AFY/Ac)
Conservation	69.46	15	2,866.38	6.58	0.09	36.40	19	3.45	105.86	34	10.03			22.74	32.77	2.09	12.12	2.47	12.50	0.31	0.11	0.12
Mixed-Use	708.82	371	231,639.27	531.77	0.75	52.25	96	39.20	761.07	467	570.97			163.48	734.45	119.05	690.02	33.90	604.87	0.97	0.91	0.79
Recreation	477.45	16	89,839.64	206.24	0.43	0.07	2	0.03	477.52	18	206.27			102.57	308.85	43.01	249.28	1.31	207.58	0.65	0.52	0.43
Residential	2,465.06	9,874	1,111,393.59	2,551.41	1.04	758.88	3,512	785.46	3,223.94	13,386	3,336.87			692.52	4,029.39	695.76	4,032.64	971.67	4,308.54	1.25	1.25	1.34
Resort Recreation	59.86	1	72,330.84	166.05	2.77	0.00	0	0.00	59.86	1	166.05			12.86	178.91	34.62	200.67	0.07	166.12	2.99	3.35	2.78
Tourist	103.68	141	219,593.87	504.12	4.86	21.02	18	102.20	124.69	159	606.32			26.79	633.10	126.42	732.74	11.54	617.86	5.08	5.88	4.95
Grand Total	**3,884.33**	**10,418**	**1,727,663.59**	**3,966.18**	**-**	**868.61**	**3,647**	**930.33**	**4,752.94**	**14,065**	**4,896.51**	**5,917.47**	**1,020.96**	**1,020.96**	**5,917.47**	**1,020.96**	**5,917.47**	**1,020.96**	**5,917.47**	**1.25**	**1.25**	**1.25**

Table 5: NTPUD Water Loss Allocation

Step 1. Intermediate Unit Demands based on NTPUD "Non-Zero" metered accounts by Land Use						Step 2. Water Loss Calculation		Step 3. Distribute Water Loss						Step 4. Unit Demand Calculations		
	Metered Accounts with Demand ("Non-Zero")					Total		Distribute by Land Use Area %		Distribute by Land Use Demand %		Distribute by # Parcel %		Land use Area %	Land Use Demand %	# Parcel %
Land Use	Acreage	Parcels	Demand (1000 Gal)	Demand (AFY)	Intermediate Unit Demand (AFY/Ac)	CY2018 Total Production (AFY)	Total Estimated Loss (AFY)	NTPUD Water Loss (AFY)	Total Demand (AFY)	NTPUD Water Loss (AFY)	Total Demand (AFY)	NTPUD Water Loss (AFY)	Total Demand (AFY)	Unit Demand (AFY/Ac)	Unit Demand (AFY/Ac)	Unit Demand (AFY/Ac)
Conservation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixed-Use	132.03	433	70,809	217.30	1.65			63.84	281.14	120.49	337.80	57.24	274.54	2.13	2.56	2.08
Recreation	126.25	6	1,648	5.06	0.04			61.04	66.10	2.80	7.86	0.79	5.85	0.52	0.06	0.05
Residential	653.11	2928	176,449	541.50	0.83			315.77	857.27	300.26	841.76	387.06	928.56	1.31	1.29	1.42
Resort Recreation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tourist	24.51	56	17,010	52.20	2.13			11.85	64.05	28.95	81.15	7.40	59.60	2.61	3.31	2.43
Grand Total	**935.90**	**3423**	**265,916**	**816.07**	**-**	**1,268.56**	**452.50**	**452.50**	**1,268.56**	**452.50**	**1,268.56**	**452.50**	**1,268.56**	**1.36**	**1.36**	**1.36**

Table 6: TCPUD Water Loss Allocation

Step 1. Intermediate Unit Demands based on NTPUD "Non-Zero" metered accounts by Land Use						Step 2. Water Loss Calculation		Step 3. Distribute Water Loss						Step 4. Unit Demand Calculations		
	Metered Accounts with Demand ("Non-Zero")					Total		Distribute by Land Use Area %		Distribute by Land Use Demand %		Distribute by # Parcel %		Land use Area %	Land Use Demand %	# Parcel %
Land Use	Acreage	Parcels	Demand (Gal)	Demand (AFY)	Intermediate Unit Demand (AFY/Ac)	CY2018 Total Production (AFY)	Total Estimated Loss (AFY)	TCPUD Water Loss (AFY)	Total Demand (AFY)	TCPUD Water Loss (AFY)	Total Demand (AFY)	TCPUD Water Loss (AFY)	Total Demand (AFY)	Unit Demand (AFY/Ac)	Unit Demand (AFY/Ac)	Unit Demand (AFY/Ac)
Conservation	196.35	19	5,779,140.00	17.74	0.09			5.53	23.26	0.75	18.48	0.21	17.94	0.12	0.09	0.09
Mixed-Use	107.44	354	49,372,661	151.52	1.41			3.02	154.54	6.37	157.89	3.89	155.41	1.44	1.47	1.45
Recreation	173.78	18	17,394,662	53.38	0.31			4.89	58.27	2.24	55.63	0.20	53.58	0.34	0.32	0.31
Residential	1,093.86	3,567	265,364,285	814.37	0.74			30.78	845.15	34.25	848.62	39.24	853.61	0.77	0.78	0.78
Resort Recreation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tourist	7.27	80	6,322,558	19.40	2.67			0.20	19.61	0.82	20.22	0.88	20.28	2.70	2.78	2.79
Grand Total	**1,578.71**	**4,038**	**344,233,306**	**1,056.41**	**0.669162**	**1,100.84**	**44.42**	**44.42**	**1,100.84**	**44.42**	**1,100.84**	**44.42**	**1,100.84**	**0.70**	**0.70**	**0.70**

Appendix C: STPUD Unit Demand Based on District User Classification and Zoning

Unit Water Demands based on STPUD user classification and zoning were also calculated to back check the results of the Initial Unit Water Demand by Land Use classification as found in Tables 7 and 8. As indicated in the notes, District-assigned user classification was not used because assigning an Initial Unit Demand based on the "blank" user classification to the unmetered accounts would result in an estimated demand for the unmetered accounts greater than the production. The Initial Unit Demand associated with zoning presented in Table 8 is for STPUD in El Dorado County; the high variability and granularity in zoning classification between El Dorado and Placer Counties (shown in Appendix C) made this approach to the analysis impractical.

Table 7: Unit Demand Based on User Classification

Classification	Metered Parcel Area (Acre)	# of Metered Parcels	Metered Demand (AFY)	Initial Unit Demand (AFY/Ac)
(Blank)	2.66	4	16.62	6.25
COMM	702.34	323	694.39	0.99
GOV	640.05	57	207.87	0.32
MFD	350.16	916	710.64	2.03
MHT	72.51	63	383.64	5.29
SFD	2,116.61	9,055	1,953.02	0.92
Total	**3,884.33**	**10,418**	**3,966.18**	**1.02**

Note:

(1) Since the most of the unmetered water accounts have blank user classification and the related unit demand is very high, the projection of water demand for unmetered accounts turns out to be greater than the total production.

Table 8: Unit Demand Based on Zoning

Zoning	Metered Parcel Area (Acre)	Unmetered Parcel Area (Acre)	# of Metered Parcels	Metered Demand (AFY)	Initial Unit Demand (AFY/Ac)	Unmetered Demand (AFY/Ac)	Water Loss[(a)] (AFY)	Adjusted Unit Demand (AFY/Ac)
0	3.89	-	6	2.21	0.57	-	0.53	0.71
COM	378.72	40.64	246	624.75	1.65	67.04	25.94	1.71
IND	194.12	18.24	132	175.35	0.90	16.47	14.79	0.97
MFR	198.98	36.30	826	427.02	2.15	77.90	92.25	2.54
MSC	796.54	65.02	51	480.55	0.60	39.23	5.70	0.61
RES	2,299.13	724.78	9,155	2,089.31	0.91	658.64	1,114.08	1.25
#N/A	12.95	-	2	5.53	0.43	-	0.18	0.44
Total	**3,884.33**	**884.98**	**10,418**	**3,804.73**	**-**	**876.60**	**1,253.47**	**1.24**

Appendix D: Zoning

Tables 1 thru 7 present the zoning information that was gathered and reviewed for Placer County and El Dorado County (via the Meyers Plan Area, City of South Lake Tahoe Ordinances, TRPA Basin Area Planning documents, and the El Dorado County General Plan Land Use Element). Zoning designations varied widely between El Dorado and Placer County and were considered too granular to be applied across the three Districts as there are geographic specific zoning designations. However, zoning information was taken into consideration by the Districts in the review of the potential developability of some vacant Parcels.

Table 1. Placer County: Residential/Tourist Zoning, Placer County Tahoe Basin Area Plan, Implementing Regulations (Accessed 21 March 2019)

		Minimum Lot Size	SF	MF	Multi Person	Residential/ Nursing	Employee Housing	Mobile Home	B&B	Hotel, Motel, etc (<10% w/kitchens)	Hotel, Motel, etc. (≥10% w/kitchens)	Timeshare	Developed Campgrounds	RV Park
	Water System	sq. ft.	Units per Parcel	Units per Acre	Units per Acre	Persons per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre
Cedar Flat Subdistrict	Fulton WC	10,000	1											
Flick Point/Agate Bay Subdistrict	Fulton WC	10,000	1											
Dollar Point Subdistrict	NTPUD Dollar Cove	10,000	1											
Highlands Subdistrict	NTPUD Dollar Cove	10,000	1	15	15									
Lake Forest Subdistrict	NTPUD Dollar Cove	10,000	1						10					
Lake Forest Glen Subdistrict	NTPUD Dollar Cove	10,000	1	15	15									
Brockway Subdistrict	NTPUD Main	10,000	1						10					
Carnelian Bay Subdivision Subdistrict	NTPUD Main	10,000	1											
Carnelian Woods Subdistrict	NTPUD Main	10,000	1											
Kings Beach Residential Subdistrict	NTPUD Main	10,000	1	15	15			8						
Kingswood East Subdistrict	NTPUD Main	10,000	1									15		
Kingswood West Subdivision	NTPUD Main	10,000	1											
Tahoe Estates Subdistrict	NTPUD Main	10,000	1											
Tahoe Vista Residential Subdistrict	NTPUD Main	10,000	1	15	25	25		10					8	
Tahoe Vista Subdivision Subdistrict	NTPUD Main	10,000	1											10
Woodvista Subdistrict	NTPUD Main	10,000	1											
Alpine Peaks Subdistrict	TCPUD Main	10,000	1											
Chambers Landing Subdistrict	TCPUD Main/McKinney Estates Water District	10,000	1											
Fairway Tract Subdistrict	TCPUD Main	10,000	1											
Fairway Tract Northeast Subdistrict	TCPUD Main	10,000	1	8	8	25	15							
Fairway Tract South Subdistrict	TCPUD Main	10,000	1				15		10	40	15			
Homewood/Residential Subdistrict	TCPUD Main	10,000	1											
Mark Twain Tract Subdistrict	TCPUD Main	10,000	1											
McKinney Tract Subdistrict	TCPUD Main	10,000	1											
Rocky Ridge Subdistrict	TCPUD Main	10,000	1						8	20	8			
Sunnyside/Skyland Subdistrict	TCPUD Main	10,000	1											
Tahoe Park/Pineland Subdistrict	TCPUD Main	10,000	1											
Tahoe Pines Subdistrict	TCPUD Main	10,000	1											
Talmont Subdistrict	TCPUD Main	10,000	1											
Tavern Heights Subdistrict	TCPUD Main	10,000	1	8					8					
Tahoma Residential Subdistrict	TCPUD McKinney/Quail	10,000	1	8	15				8					
Timberland Subdistrict	TCPUD Timberland	10,000	1											

Table 2. Placer County : Mixed Use Zoning, Placer County Tahoe Basin Area Plan, Implementing Regulations (Accessed 21 March 2019)

		SF	MF	Multi Person	Residential/ Nursing	Employee Housing	B&B	Hotel, Motel, etc	Hotel, Motel, etc (<10% w/kitchens)	Hotel, Motel, etc. (≥10% w/kitchens)	Timeshare	Developed Campgrounds	Group Facilities	RV Park
	Water System	Units per Parcel	Units per Acre	Units per Acre	Persons per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Sites per Acre	Persons per Acre	Units per Acre
GREATER TAHOE CITY														
Town Center	TCPUD Main	1	25	25	25	25	40	40			40	8	25	10
Neighborhood	TCPUD Main	1	25	25	25	25	40	40			15		25	
Service	TCPUD					25								
Neighborhood Tourist	TCPUD Main	1	25	25	25	25	40	40			40	8	25	10
Recreation	TCPUD	1				15						8	25	10
Mixed Used Neighborhood Dollar Hill	NTPUD Dollar Cove	1	15		25									
Mixed Use Neighborhood Lake Forest Glen	NTPUD Dollar Cove	1	15											
NORTH TAHOE EAST														
Mountainside Town Center	NTPUD Main	no new	25	25	25	25	40	40			40			
Lakeside Town Center	NTPUD Main	no new	25	25	25	25	40	40			40			
Residential	NTPUD Main	no new	25	25		25	40	40			40			
Tourist	NTPUD Main	no new	15	25			40	40			40			
Waterfront Recreation	NTPUD Main	no new	25	25		25								
NORTH TAHOE WEST														
Gatewate West	NTPUD Main	1	15	25		See other residential	10		40	15	See other tourist	8	25	10
Community Center West	NTPUD Main	1	15	25	25	See other residential	10		40	15	See other tourist			
Community Center East	NTPUD Main	1	15			See other residential	10		40	15	See other tourist			
Gateway East	NTPUD Main	1	15	25	25	See other residential	10		40	15	See other tourist			
Neighborhood Center	NTPUD Main	1	15			15	10		40	15	15			
WEST SHORE														
Tahoma Village Center	Tahoe Cedars WC	1	8		25	See other residential	10		20	15				
Homewood Village Center	TCPUD Main	1	8			8	10		20	15				
Sunnyside Village Center	TCPUD Main	1	8			15 (MF only)	10		20	15		8		10

Table 3. Placer County: Other Development Standards, Placer County Tahoe Basin Area Plan, Implementing Regulations (Accessed 21 March 2019)

			Minimum Lot Size	SF	MF	Employee Housing	Mobile Home	Summer Home	B&B	Hotel, Motel, etc (<10% w/kitchens)	Hotel, Motel, etc. (≥10% w/kitchens)	Timeshare	Developed Campgrounds	Group Facilities	Commercial Corner Lots	Commercial Interior Lots
	Water System	Land Use	sq. ft.	Units per Parcel	Units per Acre	Units per Acre	Units per Acre	Units per Parcel	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Persons per Acre	sq. ft.	sq. ft.
Fairway Service Subdistrict	TCPUD	Industrial	10,000	1	15	See other residential									6,000	5,000
Kings Beach Industrial Subdistrict	NTPUD Main	Industrial	10,000												6,000	5,000
Lake Forest Commercial Subdistrict	NTPUD Dollar Cove	Conservation		1	15	See other residential			10	40	15	40				
Tahoe City Industrial Subdistrict	TCPUD Main	Industrial			15	See other residential	8								6,000	5,000
Tahoe Vista Industrial Subdistrict	NTPUD Main	Industrial													6,000	5,000
Blackwood Subdistrict	TCPUD Main	Conservation		1									8			
Burton Creek Subdistrict	TCPUD Main	Conservation		1		4 multi-residential		1					8	25		
Lower Ward Valley Subdistrict	TCPUD Main	Conservation		1									8			
Martis Peak Subdistrict	NTPUD Main	Conservation						1					8	25		
McKinney Lake Subdistrict	TCPUD Main	Conservation						1					8			
Watson Creek Subdistrict	Fulton WC/TCPUD Main	Conservation						1					8	25		
Fish Hatchery Subdistrict	NTPUD Dollar Cove	Recreation		1									8			
Lower Truckee Subdistrict	TCPUD Main	Recreation		1				1								
North Tahoe High School Subdistrict	Tahoe Main/NTPUD Main	Recreation		1									8	25		
North Tahoe Recreation Area Subdistrict	Tahoe Main/NTPUD Main	Recreation											8	25		
Snow Creek Subdistrict	Tahoe Main/NTPUD Main	Recreation		1									8	25		
Upper Ward Valley Subdistrict	TCPUD Main	Recreation		1									8			
Granlibakken Subdistrict	TCPUD Main			1	15	See other residential				40	15					

Table 4. Placer County: Other Development Standards, Placer County Tahoe

Lot Area	Maximum Secondary Residence Floor Size
Acres	sq. ft.
0-2.29	840
2.3-4.99	1,000
5+	1,200

Table 5. El Dorado County: Meyers Area Plan Zoning, Meyers Area Plan (Accessed 21 March 2019)

		Max Height	Minimum Lot Size Non Residential	Minimum Lot Size Residential	SF	MF	Residential/ Nursing	B&B	Hotel, Motel, etc	Developed Campgrounds	Group Facilities	RV Park
	Water System	Ft	sq. ft.	sq. ft.	Units per Parcel	Units per Acre	Persons per Acre	Units per Acre	Units per Acre	Sites per Acre	Persons per Acre	Units per Acre
Meyers Community Center District	STPUD Main	42	5,000	6,000		20	25	10	30		25	
Meyers Industrial District	STPUD Main	TRPA Code Chapter 37	10,000									
Upper Truckee Residential/Tourist District	STPUD Main	42, TRPA Code Sec. 37.4	5,000	6,000	1 (<1 acre), 2 (>1 acre)	15		10	30		25	
Meyers Recreation District	STPUD Main	TRPA Code Sec. 37.4								8	25	10
Upper Truckee River Corridor District	STPUD Main	TRPA Code Sec. 37.4								8		

Table 6. El Dorado County: South Lake Tahoe Zoning, TRPA Code of Ordinance, 31.3 Maximum Density, Table 31.3.2-1 (Accessed 4 January 2019)

		Max Height	Minimum Lot Size Non Residential	Minimum Lot Size Residential	SF	MF	Multi Person	Residential/ Nursing	Mobile Home	Summer Home	B&B	Hotel, Motel, etc	Hotel, Motel, etc (<10% w/kitchens)	Hotel, Motel, etc. (≥10% w/kitchens)	Time-share	Developed Campgrounds	Group Facilities	RV Park
	Water System	Ft	sq. ft.	sq. ft.	Units per Parcel	Units per Acre	Units per Acre	Persons per Acre	Units per Acre	Units per Parcel	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Units per Acre	Sites per Acre	Persons per Acre	Units per Acre
					1 (<1 acre) 2 (>1acre)	15		25	8	1	10		40	15		8	25	10
SLT Development Code Chapter 6	STPUD																	
SLT Residential	STPUD			6000	1 (<1 acre) 2 (>1acre)	15		25	8	1	10		40	15				
SLT Commercial/Public Service	STPUD		10000															
SLT Recreation	STPUD		435,600 (10 acres)													8	25	10
SLT Conservation	STPUD		435,600 (10 acres)															
Tahoe Valley Plan Area	STPUD																	
Town Center Core	STPUD	45	10000	6000	1 (<1 acre) 2 (>1 acre)	25						40			40			
Town Center Mixed-Use Corridor	STPUD	42 36 (Hwy 50 frontage)	10000	6000	1 (<1 acre) 2 (>1 acre)	25						40			40			
Town Center Gateway District	STPUD	36	10000	6000	1 (<1 acre) 2 (>1 acre)	25			8		10	40			40			
Town Center Neighborhood Professional	STPUD	36	10000	6000	2	25	25	25	8		10	40						
Town Center Healthcare District	STPUD	42	10000	6000	1 (<1 acre) 2 (>1 acre)	25	25	25				40						
Commercial Mixed-Use Service	STPUD	TRPA Code Section 37.4	10000	6000	1 (<1 acre) 2 (>1 acre)	25	25		8									
Open Space	STPUD																	

Table 7. El Dorado County: Zoning, El Dorado County General Plan, Land Use Element (Amended September 2018) (Accessed 17 September 2019)

TABLE 2-2
LAND USE DENSITIES AND RESIDENTIAL POPULATION RANGES

Land Use Designation	Units Per Acre	Persons Per Housing Unit[1]	Persons Per Acre
Multifamily Residential	5 – 24	2.3	11.5 - 55.2
High-Density Residential	1 – 5	2.8	2.8 - 19.6
Medium-Density Residential	1 – 0.2	2.8	2.8
Low-Density Residential	0.20 - 0.1[3]	2.8	0.56 - 0.28
Rural Residential	0.1 – 0.025	2.8	0.28 - 0.07
Agricultural Lands	0.05	2.8	0.14
Natural Resource	0.025 – 0.00625	2.8	0.07 - 0.0175
Commercial	20/10[2]	2.3	46/23
Research & Development	–	–	–
Industrial	–	–	–
Open Space	–	–	–
Public Facilities	–	–	–
Tourist Recreational	–	–	–

Notes:
1 1990 U.S. Census
2 Maximum of 20 units per acre in Community Regions; maximum of 10 units per acre in Rural Centers
3 Policy 5.2.3.5 requires an average of 5-acre minimum parcels if ground water dependent. Parcel may be subdivided to create one new parcel not less than 4.5 acres in size under this policy as allowed by