

Potter Valley Field Reconnaissance and Irrigation System Data Acquisition

Date: May 2025
Project name: Potter Valley Water Supply Reliability Study
Attention: Stephen Maples/Sonoma County Water Agency
Client: Sonoma County Water Agency
Prepared by: Craig Cooledge/Jacobs
Reviewed by: Jason Smesrud/Jacobs
Nate Brown/Jacobs

1. Introduction

In support of Sonoma County Water Agency 's (Sonoma Water's) Potter Valley Water Supply Reliability Study (Reliability Study), this technical memorandum provides an overview of Potter Valley field reconnaissance and a subsequent irrigation system data acquisition effort. Field reconnaissance and data acquisition support characterization of existing agricultural operations and irrigation delivery systems in Potter Valley.

2. Background

For over 100 years, Potter Valley has received imported water from the Pacific Gas & Electric Company's (PG&E's) Potter Valley Project (PVP), which transfers water from the Eel River into the headwaters of the East Fork Russian River. PG&E's Federal Energy Regulatory Commission license to operate the PVP has expired, and there is uncertainty around the quantity and timing of future Eel River water transfers into the Russian River. Figure 1 shows the study area for the Reliability Study.

The Potter Valley Irrigation District (PVID) currently uses a portion of imported PVP water for agricultural purposes in Potter Valley via an ongoing water supply agreement with PG&E under its own water rights license. The remaining water not used by PVID is abandoned and flows down the East Fork of the Russian River into Lake Mendocino. These waters are a critical source for Russian River water users in Mendocino, Sonoma, and Marin Counties, and for the ecosystems along the Russian River.

The Reliability Study aims to support future water supply reliability planning for Potter Valley through evaluating hydrogeologic conditions, historical and current agricultural water use and irrigation practices and evaluating potential future agricultural water supply, storage, and demand management strategies in Potter Valley.

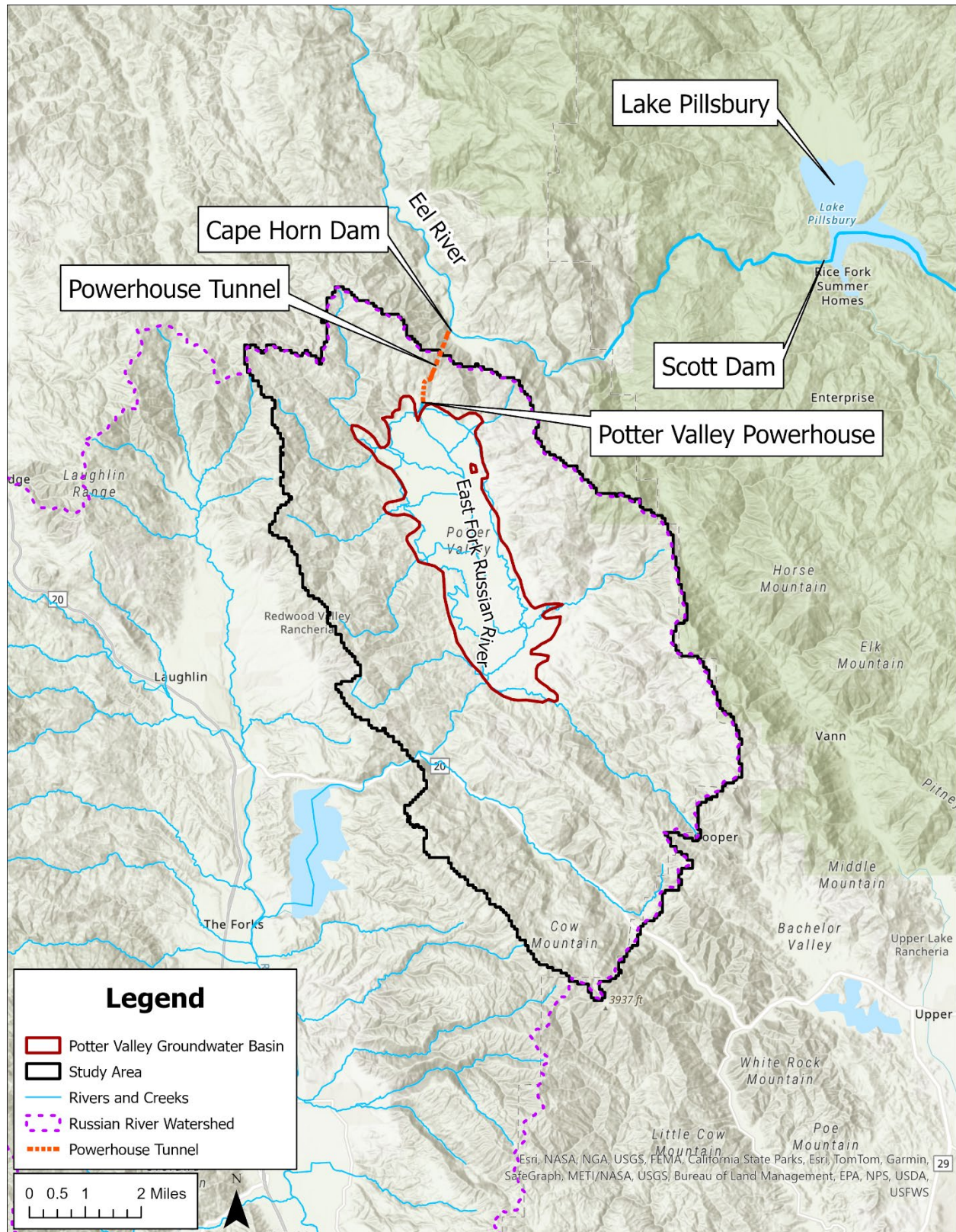


Figure 1. Study Area

To support Reliability Study objectives, Jacobs undertook field reconnaissance and data acquisition, collecting information critical to characterizing existing basin hydrology and for evaluating past, present, and potential future water management strategies. The following sections describe field reconnaissance and data acquisition efforts.

3. Field Reconnaissance

On April 24, 2023, Sonoma Water hosted a Reliability Study kickoff meeting at their offices in Santa Rosa, California. Staff members from Jacobs, Sonoma Water, PVID attended, along with a consultant for the Mendocino County Inland Water and Power Commission. During the kickoff meeting, Reliability Study background and context were discussed. Additionally, the project team, project needs and key elements of success, project approach, and task overview and schedule were discussed. Finally, the team agreed to meet at the PVID district office the following day to conduct field reconnaissance.

On April 25, 2023, Jacobs staff met with Sonoma Water and PVID staff and board members at the PVID district office to conduct field reconnaissance via a driving tour of Potter Valley. The team visited key PVID infrastructure locations and discussed historical and current PVID agricultural operations with PVID staff and local landowners.

Field reconnaissance helped Jacobs staff better understand PVID's agricultural operations and relevant infrastructure PVID uses to provide water to local agricultural users. Based on field reconnaissance, Jacobs staff drafted a list of data needs to support Reliability Study objectives. The following section describes data acquisition efforts, and how data were interpreted in support of the Reliability Study.

4. Data Acquisition

4.1 Process

Data acquisition was undertaken to gather information that might help characterize hydrogeologic and hydrologic conditions, and both historical and current agricultural operations in Potter Valley. Moving forward, this information will help characterize PVID land and water use, improve the existing hydrogeologic conceptual model, and support development of the Potter Valley Integrated Flow Model (PVIFM). These in turn will help inform Reliability Study decision making.

The team developed a list of data needs to assist data acquisition. Data were either acquired by Jacobs staff from publicly available sources or through requests for information from Sonoma Water and PVID staff.

Jacobs selected a study period of water years 2000 through 2022 to ensure sufficient detail. This selected period provides a long enough period of record to help Jacobs characterize hydrologic conditions and agricultural operations in Potter Valley.

4.2 Results

Table 1 is a summary of data needs, data acquired, and data sources. During the data acquisition effort, acquired data were compiled and evaluated for completeness and accuracy in reflecting PVID's agricultural operations.

Jacobs had a follow-on discussion with PVID staff to discuss data received, and to ensure that Jacob's interpretation of the data was accurate. Such information is critical for characterizing agricultural operations, which will be reflected in the PVIFM. Figure 2 is a map of PVID with relevant infrastructure and inflow locations to PVID's conveyance system. Locations and details highlighted in Figure 2 are also provided in Table 1 in relation to data needs and data acquired.

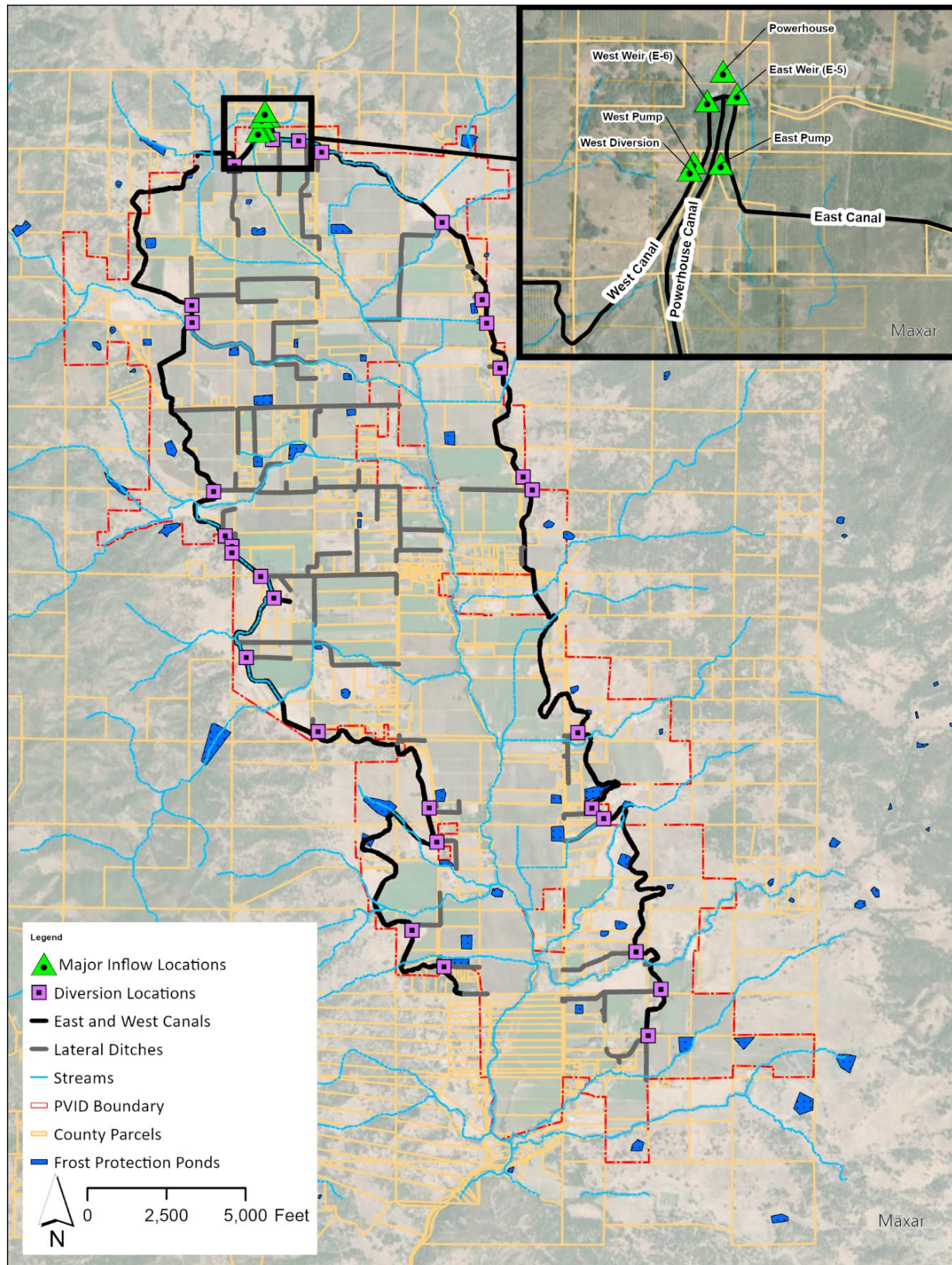


Figure 2. Potter Valley Irrigation District Conveyance Infrastructure

Table 1. Summary of Data Needs, Data Acquired, and Data Source

Data Need	Data Acquired	Data Source
<p>Geographic information systems (GIS) datasets related to PVID infrastructure including:</p> <ul style="list-style-type: none"> ▪ Polygon shapefile of PVID service area, customer parcels ▪ Polyline shapefile of canals, laterals, pipelines ▪ Point shapefile of diversion/delivery locations. 	<p>Jacobs acquired general GIS-related datasets from publicly available sources that help characterize PVID infrastructure. These datasets include Mendocino County parcel data and hydrography of the Potter Valley, including major creeks and rivers and the PVID East and West Canals.</p> <p>In addition to publicly available sources, McMillen Jacobs Associates, Inc. (McMillen Jacobs) provided AutoCAD files in .DWG format. These AutoCAD files were based on material developed for <i>Potter Valley Irrigation District Water Supply Alternatives</i> (McMillen Jacobs 2021).</p> <p>McMillen Jacobs' files included linework of PVID canals, laterals, flumes, pipelines, and other conveyance features, the PVID district boundary, and customer parcels, some of which are shown in Figure 2.</p>	PVID
<p>Van Arsdale diversions to PG&E powerhouse (daily or monthly) representing the total inflow of surface water from the PVP to Potter Valley.</p>	<p>Jacobs received daily reports from PVID that characterize flow from the PVP into Potter Valley. One attribute of the daily reports included was an "E-16 Total." Through discussions with PVID, this term has been interpreted to represent total flows into the Powerhouse diversion tunnel at a location known as E-16. E-16 is where diversion takes place at the Cape Horn Dam, and that provides water to the Potter Valley Powerhouse. Daily reports are available for 1999 through 2022.</p>	PVID
<p>PVID diversions into the East and West Canals (daily or monthly) to evaluate total water flowing into PVID's canal system.</p>	<p>From the same daily reports describing flow data for total inflows to E-16, there are two terms that represent flows into the East and West Canals. The first term, called "PG&E CEDC for E-5 and E-6" has been interpreted to represent water diverted at locations E-5 and E-6 into PVID East and West Canals from the Powerhouse during the irrigation season. Additionally, the daily reports include a term called "License 5246 Use at Diversion," which has been interpreted to represent the total volume of water removed from the Powerhouse Canal at the East Pump, the West Pump, and the West Diversion (Figure 2). The sum of these two terms represents total PVID water use diverted into the East and West Canals. Daily reports including these two attributes are available for 1999 through 2022.</p>	PVID

Data Need	Data Acquired	Data Source
Annual PVID <i>Water Use Report</i> summaries.	<p>Jacobs received an initial PVID <i>Water Use Report</i> summary, and requested additional data covering 2000 through 2022. Jacobs ultimately received the following attributes for the 2000 through 2022 period:</p> <ul style="list-style-type: none"> ▪ Total acre-feet (AF) diverted ▪ Total water sold (AF and \$) ▪ Water purchased from PG&E (AF and \$) ▪ Frost water (AF) ▪ PVID-requested water (AF) ▪ Irrigation season begin and end dates 	PVID
Annual cropping and irrigation method data for each customer parcel to assess cropping trends.	<p>Jacobs received PVID Land Status Reports for 2010 through 2022. The Land Status Reports include the following information:</p> <ul style="list-style-type: none"> ▪ Customer name, parcel, and physical address ▪ Total parcel acres and current acres charged stand by ▪ Relevant PVID gate number ▪ Current acres being irrigated by crop type ▪ Information on how the acreage is irrigated (flood, sprinkler, or drip irrigation) 	PVID
PVID irrigation deliveries to each customer parcel (daily or monthly) to evaluate water deliveries by crop type.	<p>Jacobs received monthly delivery data representing total deliveries from the East and West Canals. Summarizing deliveries at the individual parcel scale is challenging to discern from PVID's records because the delivery data are organized by customer, and a single customer may irrigate several different parcels with an unknown distribution of irrigation water across these parcels.</p> <p>In addition to delivery data received from PVID, Jacobs acquired publicly available consumptive use data from the OpenET platform (OpenET 2023) that can help quantify water use. OpenET provides monthly satellite-based evapotranspiration data in raster format at a spatial resolution of 30 meters by 30 meters for the entire extent of the Potter Valley watershed. Monthly evapotranspiration data were downloaded for 2017 through 2021.</p>	PVID and OpenET
Measured flow data at points in the distribution system for use estimating canal seepage and spills to drains.	<p>Through discussions with PVID staff, Jacobs was determined there are no points in the PVID system where canal seepage losses or spills to drains have been directly measured. Jacobs will need to evaluate PVID's water balance to derive an estimate for total system loss.</p>	PVID

Data Need	Data Acquired	Data Source
Measured flow data downstream of PVID and upstream from Lake Mendocino in the East Fork Russian River to help characterize potential spills of water from PVID conveyance systems that flow to Lake Mendocino.	Jacobs acquired daily and monthly streamflow data from the US Geological Survey (USGS) gauge 11461500 on the East Fork Russian River near Calpella, California. This gauge location is near the southern end of Potter Valley downstream from PVID, and upstream from Lake Mendocino. It is the only location with measured streamflow downstream of PVID. Although streamflow data for this location will help quantify total streamflow leaving Potter Valley, gauged flows also include contributions from Cold Creek, which may contribute considerable streamflow to the East Fork Russian River. Thus, Cold Creek stream flows need to be accounted for to estimate potential spills to the East Fork Russian River from PVID canals.	USGS
Measured flow data along tributary creeks that flow into Potter Valley to help characterize surface water inflows to the Potter Valley groundwater basin.	Jacobs acquired 15-minute streamflow data from four streamflow gauges along tributary creeks from the Center for Western Weather and Water Extremes (CW3E). Streamflow data are available for Boyes Creek, White Creek, Mewhinney Creek, and Cold Creek. While the period of record for these gauges is short, they will help to quantify and characterize tributary creek inflows to the Potter Valley groundwater basin.	CW3E
On-farm storage pond locations, capacities, operation, construction, and sources of water in Potter Valley.	Jacobs has not acquired specific details about ponds throughout Potter Valley from PVID. However, discussions about pond details have taken place with PVID staff; most ponds are unlined and are typically used for storing frost water.	PVID
Most recent PVID capital improvement plan.	Through discussions with PVID, Jacobs learned there is a capital improvement plan and reserve fund policy in place that is intended to address emergency scenarios. A 10-year plan is in place and is updated on an annual basis to identify infrastructure needs throughout the district. Jacobs received a copy of the 10-year plan and a description of projects planned for 2023.	PVID

4.3 Findings

Jacobs compiled and summarized daily, monthly, and annual reports, along with publicly available data, into water year annual summaries to characterize PVID land and water used for water years 2000 through 2022 (Table 2). These datasets provide a high-level summary of the total amount of surface water being diverted into PVID canals and the total amount of water being turned out to customers through irrigation deliveries.

When coupled with other data sources, this information will help to develop basin water budgets and support subsequent estimates of conveyance efficiencies.

Table 2. Potter Valley Irrigation District Summary Land and Water Use by Water Year in Acre-Feet

Water Year	PG&E CEDC for E-5 & E-6	License 5246 Use at Diversion	Total PVID Use	East & West Canal Deliveries	Irrigated Lands Consumptive Use
2000	7,148	9,713	16,861	No Data	No Data
2001	13,658	5,153	18,811	No Data	No Data
2002	7,546	9,332	16,878	No Data	No Data
2003	6,537	8,846	15,383	No Data	No Data
2004	13,955	4,938	18,893	No Data	No Data
2005	6,637	6,541	13,178	No Data	No Data
2006	6,812	8,671	15,482	10,774	No Data
2007	13,331	2,970	16,301	11,732	No Data
2008	12,388	5,711	18,099	13,203	No Data
2009	13,317	2,832	16,149	11,608	No Data
2010	9,945	2,768	12,713	8,698	No Data
2011	29,732	1,991	31,723	9,633	No Data
2012	12,275	3,384	15,659	11,833	No Data
2013	15,290	4,403	19,693	13,187	No Data
2014	11,702	6,722	18,424	13,111	No Data
2015	8,246	9,615	17,861	13,562	No Data
2016	6,832	9,414	16,245	11,451	No Data
2017	6,596	8,091	14,687	10,069	11,615
2018	6,778	8,145	14,923	10,384	11,411
2019	5,495	6,386	11,880	8,620	11,977
2020	6,909	8,540	15,448	10,796	11,087
2021	6,090	1,678	7,768	8,713	12,130
2022	12,335	1,634	13,969	9,272	No Data

From the PVID Land Status Reports for 2010 through 2022, Jacobs compiled detailed cropping information into total PVID-irrigated acreage by crop category (Table 3). Note that in 2016, PVID Land Status Reports format changed to include fallow and grazing crop categories. In 2019, the format changed again to include a cannabis crop category. With the inclusion of these new crop categories, increases in total irrigated area also occurred in 2016 and 2019. It is unclear whether these incremental increases in irrigated lands in 2016 and 2019 resulted from new lands being put into service in PVID or if the increases were only reflective of a change in irrigated area accounting.

Overall, land use conditions in PVID appear to be relatively stable from 2010 through 2022 with no major shifts in cropping distribution. In 2022, 39% of irrigated area was in grapes, 55% was in pasture, hay, and grazing, and the remaining 6% was in other crops or fallow.

As shown in Table 3, “farm crops” comprise a small portion of crops grown in Potter Valley. “Farm crops” may refer to any type of plant grown for food, feed, or industrial purposes. At this time, it is unclear specifically what types of plants may fall into this category in Potter Valley.

Table 3. Potter Valley Irrigation District Irrigated Area by Crop Type (Acres)

Year	Fallow	Grazing	Grapes	Pears	Pasture/Hay	Farm Crops	Cannabis	Total Area
2010	No Data	No Data	2,018	209	2,525	71	No Data	4,823
2011	No Data	No Data	2,018	209	2,525	72	No Data	4,823
2012	No Data	No Data	2,018	209	2,525	72	No Data	4,823
2013	No Data	No Data	1,966	208	2,571	67	No Data	4,812
2014	No Data	No Data	1,966	208	2,571	67	No Data	4,812
2015	No Data	No Data	1,966	208	2,571	67	No Data	4,812
2016	190	449	1,979	205	2,658	84	No Data	5,565
2017	171	549	2,140	195	2,406	80	No Data	5,541
2018	171	549	2,140	195	2,398	80	No Data	5,533
2019	107	663	2,157	195	2,323	77	37	5,558
2020	107	693	2,137	195	2,327	77	37	5,572
2021	100	966	2,198	143	2,159	51	37	5,653
2022	91	926	2,198	143	2,161	74	27	5,620

In addition to PVID Land Status Reports, spatial data of irrigated crops are available from LandIQ through the California Department of Water Resources Land Use Viewer (DWR 2025). Figure 3 is a map of the 2018 LandIQ irrigated crop areas within the Potter Valley. While the land use categories are slightly different than those used in PVID’s crop reports, the LandIQ dataset confirms the predominant crop categories in Potter Valley as being Pasture and Vineyards.

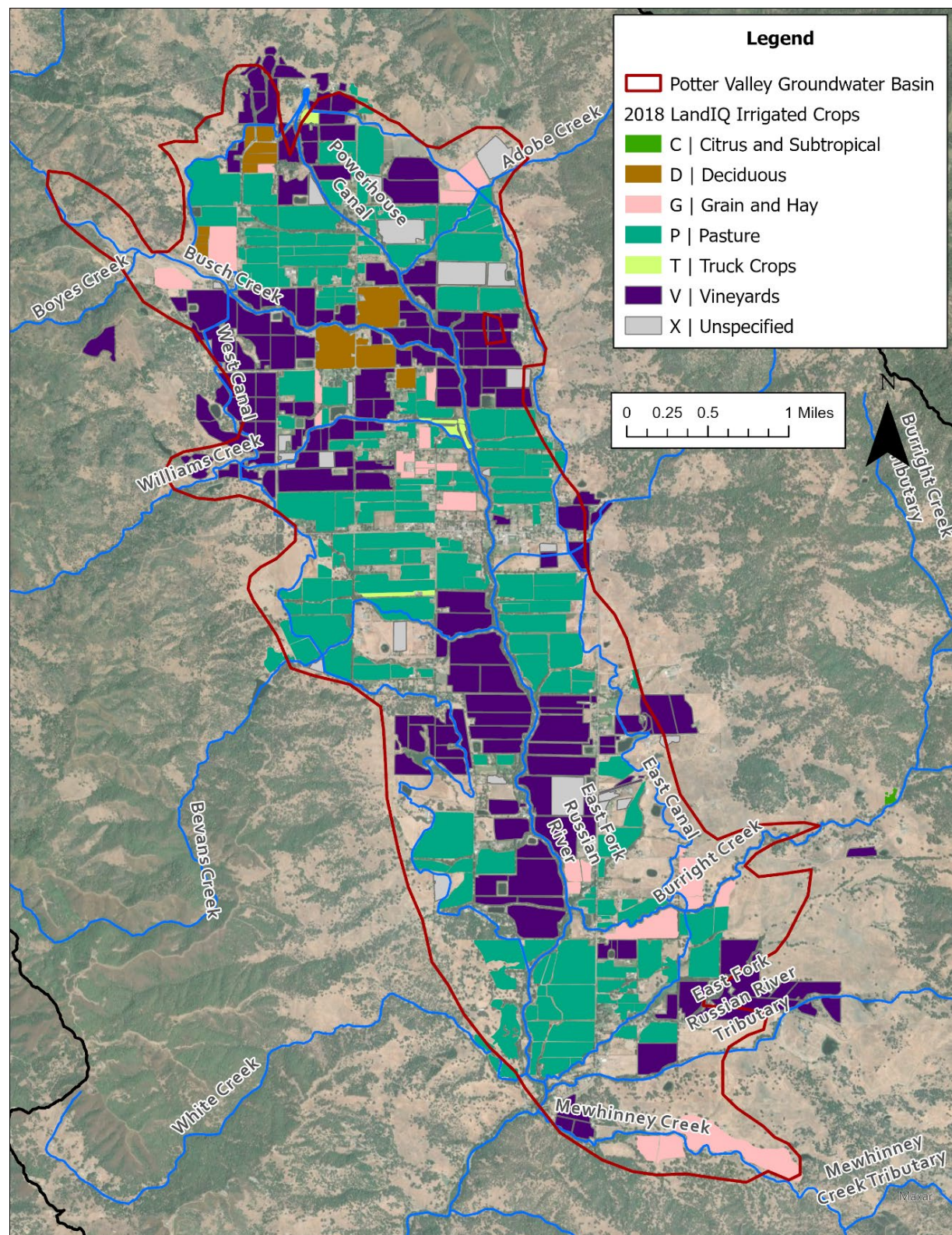


Figure 3. Potter Valley 2018 Land Use Conditions

Source: Data acquired from DWR 2025

5. Next Steps

Jacobs will develop further documentation about how data were collected and analyzed as part of reconnaissance efforts, and will include it in future PVIFM documentation. Jacobs will use collected data to support development of the PVIFM, which will include a simplified representation of PVID's irrigation water operations.

Important aspects of the irrigation water operations, such as a simulation of PVID's primary canals with seepage and spill losses, irrigation demands and surface water deliveries to meet demands, and routing of deep percolation and tailwater runoff at the field level will be incorporated into the PVIFM. These are the primary water budget terms controlled by PVID's operations that influence Potter Valley groundwater conditions and the resulting surface- and groundwater budgets.

6. References

California Department of Water Resources (DWR). 2025. [CADWR Land Use Viewer](https://gis.water.ca.gov/app/CADWRLandUseViewer/?page=home).
<https://gis.water.ca.gov/app/CADWRLandUseViewer/?page=home>.

McMillen Jacobs Associates (McMillen Jacobs). 2021. *Potter Valley Irrigation District Water Supply Alternatives*. Prepared for Two-Basin Solution Partners. Technical Memorandum. November.

OpenET. 2023. [OpenET—Filling the Biggest Data Gap in Water Management](https://openetdata.org/).
<https://openetdata.org/>.