WATERSHED SANITARY SURVEY

Inverness Public Utility District

Inverness, Marin County, California

December 2022

The requirements for a watershed sanitary survey are contained in Title 22 of the California Code of Regulations, Section 64665.

PHYSICAL AND HYDROLOGICAL DESCRIPTION OF THE WATERSHED

Watershed Physical Characteristics

The Inverness watershed composes 580 acres of mostly pristine area covered with mixed forest cover. The overall watershed is comprised of three smaller watersheds identified as First Valley, Second Valley, and Third Valley. The diversions in the watershed are entirely upslope from the town of Inverness. The watershed is bounded to the north by Tomales Bay State Park, to the west by the Point Reyes National Seashore, to the east by the town of Inverness, and to the south by the North Marin Water District. The highest-elevation portion of the watershed is on the west side along the ridge top boundary with the National Seashore at approximately 1200foot elevation.

There has never been any farming, industry, or residential activity throughout most of the watershed within modern history. There is a network of roads in the watershed, mostly built in the 1940's and 50's with plans for future development; however, all development plans ended with the formation of the Inverness Public Utility District (District). Most of the original roads have been allowed to return to forest and only a few fire protection access roads remain. There is one house past the watershed gate, and it is located below all the District intakes. Most of the watershed land is owned by District, the State Park system, or the National Park system. Vehicle access in the watershed lands is limited by a locked gate. The watershed lands are open for low impact recreational use like hiking, biking and even the occasional horse. No camping is allowed. Erosion from the paths and roadways are a potential problem. The roads are maintained routinely by the District staff to minimize erosion.

Vegetative cover in the watershed includes stands of bishop pine forests, California bay laurel, mixed hardwoods, and coastal shrubs, with alder stands along the lower drainages

District draws from 8 upper-watershed diversions (small concrete spring boxes). There are also 2 lower diversions and 3 wells that are used). A few of the upper diversions (D6, D7 & D8) and the lower diversions (L2 & L2 have some minimal residential development within the watershed area but are far from the actual sources with limited potential for NPSP. All wells are treated as surface water and combined with water from the diversions to feed into the filter plants. The District generally shuts down filter plant operations during periods of moderate to heavy rainfall to reduce turbidity loading on the ultra and nano filtration units.

Exhibit 1 shows the DISTRICT's boundaries, watershed, roads, and facilities.

Hydrology and Rainfall

District's watershed receives an average of 37.5 inches of rain per year (see Exhibit 2), and days of dense coastal fog. Local rainfall records have been maintained since 1925. Maximum recorded rainfall in one year was 72.91 inches, minimum recorded rainfall in one year was 15.51 inches, and dry year rainfall averages in the mid-20 inches per year.

The critical months for water availability (streamflow) are usually August through October, as shown in Exhibit 2. During relatively dry years, streamflow has been marginally adequate but have been sufficient during the rest of the year. During periods of low streamflow, District supplements the yield from the High Intakes with water obtained from the three wells and two Low Intakes.

The streamflow data presented in Exhibit 2 do not represent the total water availability of the Inverness system, because of the additional approximately 58,000 gpd available from the three wells and the two Low Intakes

Geology and Soils

According to the Marin County Soil Survey, the watershed soils are primarily Sheridan Variant coarse sandy loam complex on 50-75% slopes; to a lesser extent, the same soils also exist on more moderate slopes. Surface layer is 0-15 cm deep over quartz-diorite (decomposed granite). Bedrock is 20-40 inches. Runoff can be rapid, and the hazard of water erosion is high. Slopes tend to be unstable. Substantial slope failures have occurred along the entire Inverness Ridge during sustained heavy rainfall periods when soils are saturated.

SUMMARY OF SOURCE WATER QUALITY MONITORING DATA

Description of Sampling Program

The District's sampling and monitoring program conforms to requirements determined for the district by DHS (Now known as SWRCB or State Water Resources Control Board) for surface water systems.

Monitoring: An overview of monitoring that is conducted on a periodic basis is provided below:

- **Turbidity**
  At both treatment plants, raw water turbidity is monitored and recorded continuously. In addition, raw water (pre-filtration) samples are collected twice a month for analysis of Coliform and E. coli counts and submitted directly to the State electronically by the laboratory. Treatment plants are usually shut down during periods of heavy rainfall to reduce loading on the membrane filtration units.
- **Primary Inorganics**. Testing is required annually and usually conducted in October. This group is comprised of Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Fluoride, Mercury, Nickel, Selenium, Perchlorate and Thallium.
- **Nitrate/Nitrite**. Nitrate (as NO3) is tested annually. Nitrite (as N) is tested once every three years.

- **Secondary Standards**. Testing is required annually (exception noted below) for the following: Bicarbonate, Calcium, Carbonate, Chloride, Color, Copper, Foaming Agents (MBAS), Hydroxide, Iron, Magnesium, Manganese, Odor, Silver, Sodium, Specific Conductance, Sulfate, Total Alkalinity, Total Dissolved Solids, Total Hardness, Turbidity, Zinc, and pH. *Exception*: MTBE (Secondary) is tested once every three years.
- **Radioactivity**. Gross Alpha was tested in 2016. Next testing is November 2025.
- **Volatile Organic Chemicals**. Testing is required once every three years for the following: 1,1,1-Trichloroethane, 1,1,2,2-Tetrachoroethane, 1,1,2-Trichloroethane, 1,1-Dichloroethane, 1,1-Dichloroethylene, 1,2,4-Trichlorobenzene, 1,2-Dichlorobenzene, 1,2-Dichloroethane, 1,2-Dichloropropane, 1,3-Dichloropropene, 1,4-Dichlorobenzene, Benzene, Carbon Tetrachloride, Dichloromethane, Ethylbenzene, Monochlorobenzene, Styrene, Tetrachloroethylene, Toluene, Trichloroethylene, Trichlorofluoromethane, Trichlorotrifluoroethane (Freon 113), Vinyl Chloride, Xylenes (total), cis-1,2-Dichloroethylene, and trans-1,2-Dichloroentylene. Next testing is August 2024. MTBE (Primary) is also tested once every three years.
- **Synthetic Organic Chemicals**. The following are required to be tested once every three years.: Atrazine and Simazine. Last tested: November 2021 next testing: 2024. The following are required to be tested once every nine years in August: 2, 4, 5-TP (Silvex), 2, 4-D, and Dalapon. Next testing is August 2024
- **Asbestos (source water)**. Asbestos in the source water was tested in 1993. Based on those results, non-vulnerability was established, and further testing was waived until the 2002-2010 compliance cycle. In a letter dated September 21, 2006, Department of Health Services noted that the District is not eligible for a source monitoring waiver for asbestos. Last testing, November 2015; next testing: November 2024 (every nine years).
- **Vanadium.** The District's sources are not vulnerable to vanadium contamination and further monitoring for vanadium was waived (DHS letter dated May 20, 2002).
- **Gross Alpha**. Every 9 years.
- **Total Organic Carbon (TOCs. Tested quarterly.)**

DESCRIPTION OF ACTIVITIES AND POTENTIAL SOURCES OF CONTAMINATION

Description of Activities

Known use of the watershed area is limited to day hiking and bicycle riding. There are no agricultural, mining, or timber harvesting activities in the watershed. Animal populations are limited to indigenous species, including various birds and small mammals, such as coastal deer, coyote, and bobcat.

Summary of Sources of Potential Contamination

Sources

Potential biological vectors include only area hikers, occasional domestic pets, and native wildlife. Native wildlife is typical of that found in California coastal foothills, including a variety of birds and small mammals, rabbits, coyote, bobcats, and deer. Beavers have not been observed in this watershed. Watershed land use does not include mining, grazing, timber harvesting, or residential activity.

Potential Contaminants

The District water supply has evidenced no significant levels of contaminants of concern. Accordingly, the District has been granted various monitoring waivers by DHS. (Now known as SWRCB or State Water Resources Control Board).

DESCRIPTION OF SIGNIFICANT CHANGES SINCE LAST SURVEY WHICH COULD AFFECT QUALITY OF SOURCE WATER

Significant Changes

No significant changes have occurred in the water shed since the last watershed sanitary survey that would affect source water quality. In fact, the only major changes since 1982 were of natural origin because of heavy rainfall events producing landslide activity.

WATERSHED CONTROL AND MANAGEMENT PRACTICES

Watershed Control

Land Ownership and Control

Approximately 80% of the watershed is owned either by the State of California (Tomales Bay State Park) or District. The remainder is National Park lands or privately owned with very limited possibility of any development, and with controlled access. District and the State Parks Department work closely together regarding issues concerning the watershed.

Road access to the watershed area is via locked gates. Trail access other than by roads is limited, and use of the watershed roads by equestrians occurs infrequently. The most significant use of the watershed area is by day hikers (almost exclusively residents), and there have been virtually no problems with uncontrolled domestic pets, litter, overnight camping, or other abuses. The water system's main treatment plant and operations office is located immediately adjacent to the entrance into the watershed that is used most frequently by the public and consequently allows activity monitoring.

No chemical vegetative or invertebrate control procedures (herbicides or pesticides) are used in the watershed. Erosion control activities are limited to those described below in management practices.

Watershed Management Practices

Management of the watershed area primarily consists of clearing fallen trees, roadside vegetation clearing and erosion control on the watershed roads and trails that provide access to the district's diversion sources and public pedestrian passage. Larger management activities have involved culvert replacements, debris removal and diversion repair following landslide activity during major storms.

Fire Management

District staff are also trained members of the Inverness Fire Department and district vehicles have emergency radio capabilities and access to the department's Wildland firefighting engine.

Review of Physical Condition and Protection of Source Intakes

Source intakes consist of low concrete and rock diversion structures that are generally constructed on exposed bedrock. All the diversion structures have some means (valved pipe) for flushing silt and can spill high flows. The areas around each of the diversions are fenced and locked to preclude access.

Diversion sites are inspected regularly, the catchment basins are cleaned frequently, and maintenance needs are addressed as soon as they are discovered. Diversion sites that are used only seasonally are "buttoned up" at the end of the usage season and are thoroughly rehabilitated at the beginning of the usage season. Year-round sources are also rehabilitated at least once a year. District's Board of Directors has always been strongly supportive of preventive maintenance programs and has been consistently willing to budget necessary funding for a proactive preventive maintenance approach to all system operations.

EVALUATION OF SYSTEM'S ABILITY TO MEET SURFACE WATER REQUIREMENTS AND RECOMMENDATIONS FOR CORRECTIVE ACTIONS

Description of Existing System

The system currently serves 518 customer connections. The water supply is obtained primarily from streams, with a small increment during periods of low streamflow from wells. The stream supply is obtained by means of a series of ten diversions (eight High Intakes and two Low Intakes); the eight High Intakes provide gravity flow to the treatment plants and the two Low Intakes utilize pumps to move the water to the treatment facilities. There are also three wells that are utilized as supplemental supply during periods of inadequate rainfall or in the event of emergency (all three of these wells are classified as being under the influence of surface water, and their yield is mixed with raw water from surface sources before it reaches the treatment plant).

Water treatment is provided by two treatment plants (see Exhibit 1). The First Valley Plant at 275 Perth Way, and the smaller Third Valley plant at 13275 Sir Francis Drake Blvd. Both plants utilize ultra and nano filtration, which allows the district to comply with current and possible future surface water treatment requirements.

Both plants are equipped with continuous monitoring and recording of intake (raw) water turbidity, treated water turbidity, and chlorine residual. Both plants are monitored by the District's SCADA system and equipped with automatic telephone dialer systems that receive signals from the monitoring equipment and initiate a programmed series of telephone calls to the water system office and to water system personnel when high turbidity, low chlorine, or equipment malfunction or shutdown is detected. If a detected abnormality is not acknowledged and corrected, the plant is shut down automatically.

A propane-powered 30-KW emergency power generator is permanently installed at the treatment plant in First Valley. The unit can provide sufficient power to keep the entire plant operating. Propane is provided from a 500-gallon on-site tank. The smaller Third Valley plant utilizes a portable generator.

The District has approximately 465,000 gallons of finished water storage in tanks to allow for continued domestic supply and fire protection in the event of any watershed problems affecting the treatment plants.

Water system personnel visit facilities in the watershed frequently (almost daily during much of the year). In addition, safety, and maintenance inspections of system facilities are conducted quarterly, and deficiencies are noted.

Major maintenance of all system facilities in the watershed is performed annually, including cleaning out all catchment basins, checking all facilities for deficiencies, testing collection lines for leaks, etc. Roads in the watershed are maintained on a regular basis, and major erosion control work is performed as needed.

There is no potential for any industrial or agricultural development or development with the probability of impacting water quality in the District watershed.

Recommendations for Corrective Actions
SWRCB District 25 staff toured the District facilities and the watershed in February 2022 with no recommendations for the watershed and only a few recommendations for IPUD treatment facilities and those were corrected shortly after the visit.

This report was prepared by the staff of the Inverness Public Utility District and written by James K. Fox, Chief of Operations

December 2022

LIST OF EXHIBITS

No. *Subject*

Exhibit 1

Inverness Location Map: District Boundaries, Watershed, Roads & Water System Facilities

Exhibit 2

Rainfall, Streamflow and Production Data, 1983 – 2021

WATERSHED SANITARY SURVEY - Exhibit 1
Inverness Public Utility District
Inverness, Marin County, California
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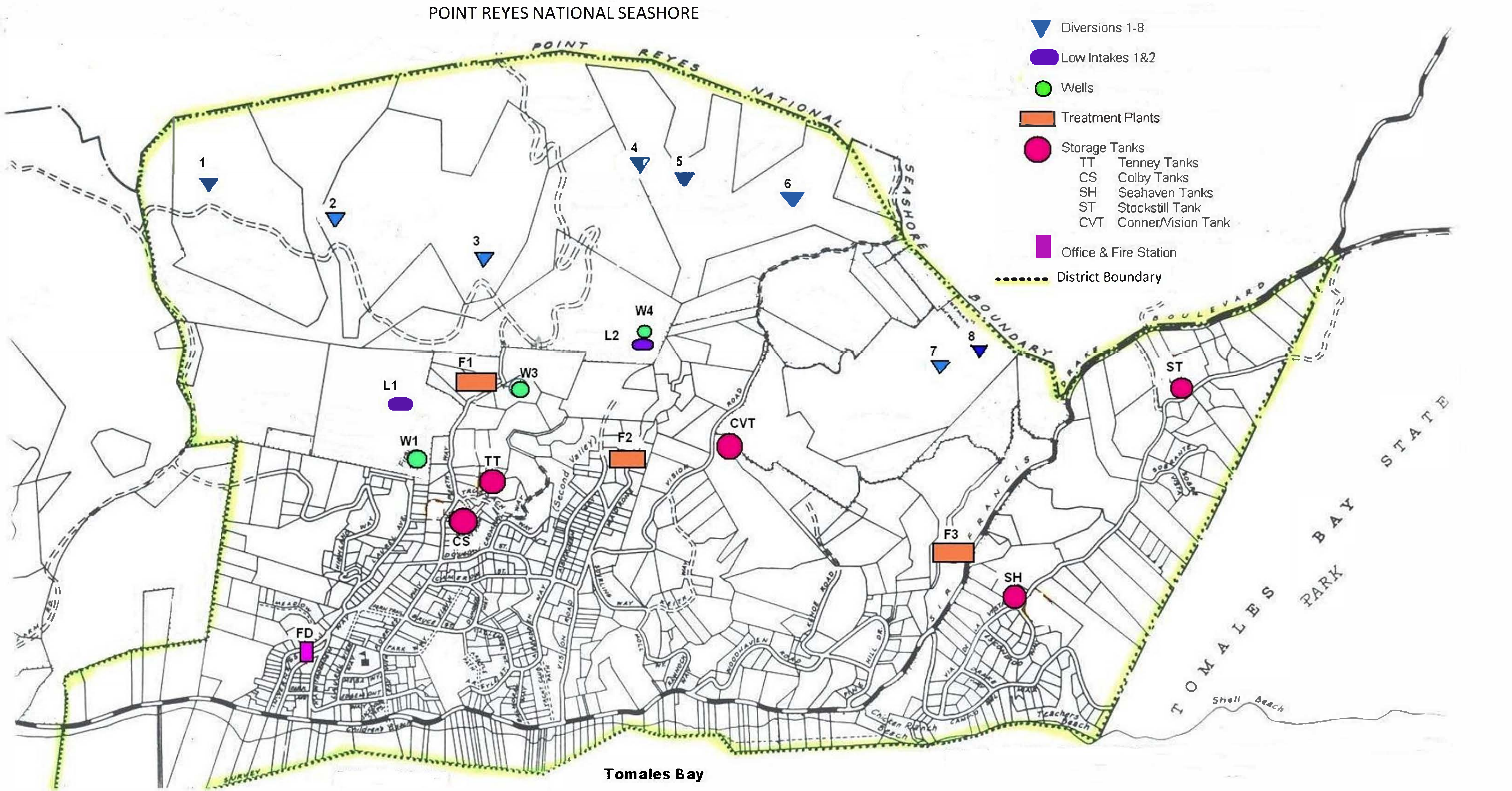

INVERNESS PUBLIC UTILITY DISTRICT BOUNDARY AND WATER SYSTEM FACILITIES

EXHIBIT 2 - Rainfall, Streamflow and Production Data

Year	Rainfall	Rainfall	Rainfall	August	August	September	September	October	October
	[1]	[2]	[3]	Streams	Product	Streams	Product.	Streams	Product.
2013	30.0	80%	2.48	126,720	103,903	138,240	87,170	110,000	87,461
2014	26.1	70%	1.01	110,900	93,522	164,000	80,784	144,000	71,264
2015	29.4	78%	1.72	100,000	96,403	93,000	83,116	92,160	67,741
2016	35.1	94%	1.81	180,000	94,848	132,500	90,616	400,000	74,800
2017	55.0	147%	6.76	231,840	103,890	154,000	98,496	180,000	85,300
2018	29.0	77%	0.67	178,560	102,510	Unavailable	93,930	149,040	80,900
2019	53.2	142%	1.66	267,840	104,300	208,800	92,297	172,080	92,848
2020	23.1	62%	1.24	120,960	95,971	91,440	86,380	74,800	84,580
2021	15.5	41%	0.39	79,200	75,700	57,600	70,239	361,440	48,200

[1] Total inches of rainfall in previous year (July-June).

[2] Annual percent of normal (defined as 37.5 inches).

[3] Total inches of rainfall during August-October of indicated year.

Streams: Streamflows at High Intakes, in gpd (this collection system configuration became effective in 1983). For 1983-1987, each streamflow figure shown is the average for the month; for 1988 on, the figure shown is for the end of the month.

Product: Average daily production (total produced water) in gpd; derived by dividing total production (gals) for the month by the number of days in the month.