



Technical Memorandum

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Date: September 9, 2021
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Department of Public Works—Environmental Services
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Works—Environmental Services
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Subject: **Water Levels Technical Memorandum**

1.0 Introduction

1.1 Overview

This “Water Levels Technical Memorandum” describes the groundwater elevation data collection efforts within the Eel River Valley Basin (ERVB), and associated findings, for inclusion in the Eel River Valley Groundwater Sustainability Plan (GSP). Data collection efforts included:

1. Measurement of static groundwater levels through the collection of depth-to-water measurements in at least 75 wells within the ERVB, once in Fall 2020 and again in Spring 2021
2. Collection of continuous groundwater levels through the purchase and installation of 35 pressure transducers in County monitoring wells throughout the ERVB

The purpose of this work is to provide data on the seasonal variations of groundwater levels within the principal aquifers of the ERVB, as well as to support the calibration of numerical modelling (currently in development).

1.2 Summary of Previous Work and Existing Water Level Data

As far back as the early 1950s, the California Department of Water Resources (DWR) has monitored groundwater levels biannually within nine (9) wells in the ERVB. Of those wells, five (5) continue to be monitored as part of the California Statewide Groundwater Elevation Monitoring (CASGEM) program. These five (5) wells, all located within the lower Eel River Valley, provide the best long-term record of groundwater levels for the ERVB.

As part of a Proposition 1: Sustainable Groundwater Management (SGM) Grant Program, two large-scale depth-to-water (DTW) measurement campaigns were carried out, one in Fall 2016 and one in Spring 2017. Additionally, pressure transducers were installed at multiple locations throughout the ERVB—within five (5) newly developed County monitoring wells, four (4) locations within the Eel River, one (1) location within the Van Duzen River, and three (3) private wells—to continuously



monitor the surface water and groundwater levels over the course of the 2017 water year, after which transducers within two (2) of the County monitoring wells and two (2) river stations were left to continue monitoring indefinitely. Biannual DTW measurements have been collected in 14 of the 15 County monitoring wells (nine [9] well locations, six [6] of which are paired wells) and in most municipal wells since Fall 2016 (SHN, 2016). Biannual DTW measurements have not been collected at monitoring well MW-3 due to the well being dry during each monitoring campaign.

2.0 Fall 2020 and Spring 2021 Static Groundwater Level Measurement Campaigns

2.1 Well Selection

SHN collaborated with the County and the Humboldt County Resource Conservation District (HCRCD) to develop a list of at least 75 targeted wells for groundwater level measurements. In addition to the 15 County monitoring wells (installed in 2016) and the municipal wells, which are currently monitored biannually, private irrigation and domestic wells were accessed through the efforts of the County and HCRCD, who coordinated with volunteer landowners. To maintain consistency with the previous groundwater level measurement campaigns (in Fall 2016 and Spring 2017), a special effort was made to include the wells that had been measured during those events. Additional private wells were sought to fill data gaps in the monitoring well network and to obtain a greater variety of well depths, particularly wells screened below depths of 150 feet, where possible. All wells included in the Fall 2020 and Spring 2021 sampling campaigns are shown on Figures 1 and 2, respectively (Appendix 1).

The geographic area of interest for data collection of static groundwater levels was generally focused on the low-gradient alluvial plains of the Eel and Van Duzen rivers, areas underlain by alluvial deposits of variable thickness that form the primary aquifer within the ERVB. Most wells within the alluvial valleys have total depths of less than 150 feet below ground surface and are screened within either the shallow alluvial aquifer or near-surface occurrences of the Carlotta aquifer (GHD, 2021a). Groundwater within the shallow water-bearing units underlying these alluvial valleys is understood to be laterally connected, allowing groundwater levels to be directly compared across the region.

Deeper wells that are screened within confined or semi-confined portions of the lower alluvial aquifer or the Carlotta aquifer are not common within the alluvial valleys. Wells tapping into these deeper aquifers are mostly found where the shallow alluvium is comprised of thick deposits of silts and clays, such as in the vicinity of Ferndale, along the base of the Wildcat hills, and in portions of the coastal plain near Loleta. Stratigraphy at depth is complex, often laterally discontinuous; unique aquifers in which groundwater levels can be confidently, directly comparable across broad areas is rare.

2.2 Field Methods

Two data collection field campaigns were carried out, one in Fall 2020 and one in Spring 2021, scheduled to coincide as closely as possible with the DWR field measurements of CASGEM wells. Though chloride sampling was carried out as part of the same field effort, details of that work are described in the "Saltwater Intrusion Technical Memorandum," prepared under separate cover.



Fieldwork was organized and divided amongst multiple teams, each including at least one (1) staff person from SHN and one (1) staff person from either HCRCO or the County, many of whom had participated in the 2016/2017 campaigns. In general, teams were assigned geographic areas with consideration of familiarity with landowners and access in that area. One team focused on wells that required specialized chloride sampling equipment, and another team focused on visiting the municipal supply wells. An initial overall kick-off meeting with all teams was conducted to review the data collection needs, field equipment, field forms, and review any safety concerns. Daily individual team meetings were subsequently conducted as necessary to review progress and coordinate any changes in assignments.

In preparation for the fieldwork, a tabulated list of wells was developed that included location, ownership and contact information, access and coordination needs, and any known well attributes. Information from the 2016/2017 campaigns was reviewed and incorporated. Each team maintained a copy of the tabulated list of wells and updated information as necessary.

Each team completed daily field reports chronicling the sites visited and activities for the day. Two data collection forms were used during the measurement campaign: 1) a "DTW" sheet to inventory the recorded groundwater level measurements for the day, and 2) a "Well Information" sheet to collect/update the important site-specific information for each well/measurement location. Using Solocator (a geolocation photo application for a phone/tablet), photographs were taken of each well and surrounding area, reference locations for DTW measurements (where necessary), and other relevant site features to aid in ensuring consistency with future measurements.

Groundwater level measurements were collected using a DTW meter equipped with a sensor probe and flat measuring tape. Suspended by the flat tape, the probe was sent down the inside of the well casing; it sounded an alarm when water was registered. The DTW was then read and recorded (to the nearest 0.01 foot) on the flat tape at a measurement reference point typically on the top or side of the well casing (cutout). DTW-measurement reference points were described and the distance from the ground surface to the measurement reference point was recorded.

During the Fall 2020 campaign, each of the municipal water supplier wells were visited to document site conditions and observe DTW measurements. Some of the municipal wells are sealed and DTW data was recorded with fixed or portable acoustic sounders (Riverside Community Service District, Bear River Band of the Rohnerville Rancheria), or a pressure gauge (Del Oro Water Company).

2.3 Data Compilation and Processing

All field data sheets were compiled and reviewed for consistency and completeness. Well locations were identified on aerial imagery in ArcGIS with the aid of geolocated photographs collected in the field, as necessary. Final well locations have an estimated accuracy of 10 feet and the latitude and longitude coordinates using the North American Datum 1983 (NAD83; decimal degrees) were exported from ArcGIS, then entered into excel spreadsheets. Ground surface elevations at each well location were referenced on the one-meter digital elevation model (DEM) derived from the United States Geological Survey (USGS) Light Detection and Ranging (LiDAR) dataset collected in July 2018 (GHD, 2021a).



DTW measurements were converted into groundwater surface elevations using the following formula:

$$\text{WSE} = (\text{GSE} + \text{D}) - \text{DTW}$$

Where:

WSE = Water Surface Elevation (ft)

GSE = Ground Surface Elevation (ft)

D = Distance from the ground surface to the measurement reference point (ft)

DTW = Depth to Water (ft)

All groundwater-level data was entered into DWR spreadsheets developed for upload to the CASGEM program. Well information for each location sampled was also compiled along with photographs of well locations, sampling locations, and reference locations.

2.4 Fall 2020 Results

The Fall 2020 measurement campaign was conducted during the week of October 26, 2020. DTW measurements were collected in 98 wells, which encompassed 14 County monitoring wells, 23 municipal wells (supply and monitoring), and 61 private wells. An inventory of all wells from which groundwater level measurements were collected during the Fall 2020 campaign is provided as Table 1 (Appendix 2), showing well locations, depths (if known), and the aquifer(s) in which the well is interpreted to be screened. Groundwater level data provided in the table includes the measured DTW (below ground surface) and the calculated groundwater surface elevation (feet referenced to the North American Vertical Datum 1988 [NAVD88]).

For the purposes of comparing aquifer-specific groundwater levels and the preparation of groundwater-elevation contour maps, it was necessary to separate wells screened within the shallow interconnected aquifers from those screened within deeper water-bearing units, confined and semi-confined, of the lower alluvium or the underlying Carlotta formation (GHD, 2021b). Available well completion reports were reviewed for wells known to be deeper than 100 feet to evaluate stratigraphy, depth of well screen, and construction details. Although many deep wells have screened intervals within isolated water bearing zones, typical well-construction practices locally (DWR Database) have included backfilling most of the well's annular space with sand/gravel to within 20 to 50 feet of the ground surface, which effectively hydraulically connects the upper unconfined alluvial aquifer to the deeper confined aquifers within the Carlotta Formation. Where this condition is recorded or suspected, the groundwater levels were not contoured separately. Where well completion reports could not be identified with confidence or where depths are not known, the groundwater level data point was assumed to be associated with the shallow aquifer system.

A groundwater-contour map of Fall 2020 groundwater levels within the shallow interconnected aquifers (Alluvial and near-surface and unconfined Carlotta aquifers) is included as Figure 3 (Appendix 1). The contoured areas were confined to the low-lying alluvial valleys and fluvial terraces. To develop contours, a composite groundwater surface was first generated from the individual elevations at each well in ArcGIS using the nearest neighbor interpolation method. The surface is contoured at 10-foot intervals (NAVD88), and for presentation on the figures, the elevations are also color-graded. The groundwater surface is most accurate where wells are located and interpolated in areas without data. Groundwater elevations from wells that are interpreted to be representative of



deeper water-bearing units, both confined and semi-confined, are mapped on Figure 4 (Appendix 1). DTW measurements collected from three (3) CASGEM wells by DWR on October 29, 2020, are also included in Figure 3 (Appendix 1) and Table 1 (Appendix 2).

2.5 Spring 2021 Results

The Spring 2021 measurement campaign was conducted during the week of April 5, 2021. DTW measurements were collected in 88 wells, which included 14 County monitoring wells, 18 municipal wells (supply and monitoring), and 56 private wells. Some wells measured in Fall 2020 were not repeated in Spring 2021 due to duplicity (wells immediately adjacent to others), issues with accessibility, discontinued participation, and the fact that not all municipal wells were measured/reported during the Spring timeframe. Additionally, a few new wells were sampled that had not been part of the Fall 2020 campaign. An inventory of all wells from which groundwater level measurements were collected during the Spring 2021 campaign is provided as Table 2 (Appendix 2). A groundwater-contour map of Spring 2021 groundwater levels measured within wells interpreted to be screened in the Alluvial aquifer is included as Figure 5 (Appendix 1) and those interpreted to be screened within deeper aquifers, including lower Alluvial aquifers and/or the Carlotta, is included as Figure 6 (Appendix 1). DTW measurements collected from five (5) CASGEM wells by DWR on March 30, 2021, are also provided in Figures 5 and 6 (Appendix 1 and Table 2 (Appendix 2)).

3.0 Continuous Groundwater Levels

3.1 Well Selection

A network of 23 new County monitoring wells (19 well locations, four [4] of which are paired wells) was installed during the months of April, May, and June 2021. The new wells were not completed in time for inclusion into either static groundwater level measurement campaign, but instead were grouped with wells considered for continuous monitoring. With the addition of the 23 new wells, the County currently has a total of 38 groundwater monitoring wells throughout the ERVB. One (1) of the 2016 County monitoring wells (MW-3d) is observed to remain dry much of the year, leaving 37 candidate wells for the continuous groundwater-level monitoring program. Two (2) of the wells (MW-7s and -7d) have had transducers continuously monitoring groundwater levels since October 2019, so those were left in place, and the remaining 35 candidate wells were chosen to be outfitted with new transducers.

The County monitoring wells provide the best opportunity for collecting high-quality, continuous groundwater elevation data—they have been properly designed and constructed for the purposes of monitoring groundwater levels and have all been installed within the County road right-of-way, making them easy to access for data downloads and maintenance. Continuous groundwater level data from this well network will provide the most value as it has been strategically developed (locations, screened depths) to evaluate groundwater conditions relevant to the sustainability indicators.

3.2 Transducer Setup and Installation

Thirty-five (35) transducers were purchased for deployment. The transducers selected for use are the Solinst Levellogger 5 model M30. The M30 is rated for submergence to a total depth 30 meters (98.4 feet) with an accuracy of 0.064 feet. The transducers were programmed using Solinst



Levellogger Software (version 4.5.3) and were set to record data (groundwater level and temperature) on 30-minute intervals. The transducer memory stores 150,000 records and at a 30-minute interval will be capable of storing approximately 8.5 years' worth of data.

Transducers were installed in each well by suspension from a stainless-steel cable connected to the well cap. Cable lengths were designed to ensure that the transducer will remain submerged through observed or anticipated seasonal groundwater fluctuations. A static depth to groundwater was collected within each well using an electronic DTW meter at the time of installation so that groundwater levels can be adjusted to actual groundwater elevations during future data processing and analysis. A table of well locations that are currently being monitored continuously is provided as Table 3 (Appendix 2), and a map showing the well locations is provided as Figure 7 (Appendix 1).

3.3 Future Data Retrieval and Processing

The transducer data will be downloaded, processed, and analyzed as necessary to support the final development of the groundwater sustainability plan and into the future at intervals set forth in the monitoring network section of the GSP. The next planned data retrieval for all transducers is in Fall 2021 as part of the biannual DTW measurement campaign for the County monitoring wells. Raw groundwater level data downloaded from each transducer will be barometrically compensated to remove the influence of barometric changes on the level data. Barometric data is being recorded on a Solinst Barologger currently stored in Ferndale and will be used for compensation within the Solinst software. The level data will then be converted to actual groundwater elevations using manual DTW measurements taken in the field during installation and/or during data retrieval. Groundwater elevation data can then be tabulated and plotted on hydrographs for analysis.

4.0 Summary of Findings

Review of the groundwater-contour mapping for the alluvial valleys indicates that water consistently flows westward throughout the year. Groundwater gradients are steepest in the Van Duzen River Valley, which reflects the topography through that part of the basin. The Van Duzen River Valley has a relatively steep topographic profile compared to the Eel River Valley, with elevations ranging from approximately 50 feet near the confluence with the Eel River to 300 feet where the Van Duzen River enters the ERVB. The hydraulic gradient between MW-11 and MW-3d (through the alignment of the Van Duzen alluvial valley) is 0.002 ft/ft (feet per foot), whereas the hydraulic gradient between MW-3d and CASGEM Well 23181 (through the alignment of the lower Eel River Valley) is 0.0008 ft/ft.

Changes in groundwater-surface elevations at individual locations between the Fall 2020 and Spring 2021 measurement campaigns range from 0.4 feet to 8.3 feet, with the largest swings occurring within the southeastern portions of the Lower Eel River Valley where groundwater is recharged by both the Eel River and the upland areas on the southern margin of the valley. The 2020 water year (Fall 2020-Spring 2021) is classified as critically dry water year type according to DWR. This range is slightly smaller than that observed during normal rain years when maximum elevation swings are usually above 10 feet.

Appendix 3 presents hydrographs for the five (5) active CASGEM wells and the 2016 County wells. The Fall 2020 and Spring 2021 groundwater-surface elevations measured within the CASGEM wells are some of the lowest on record, due to the particularly dry winters over the last two seasons. In most of the County monitoring wells, this drought condition can be seen reflected in lower-than-normal groundwater levels during the last two spring measurements (on the order of 2 to 4 feet



lower than normal), but the drought condition is not as prominently reflected in fall measurements (less than 1 foot below normal). Spring groundwater levels are primarily influenced by the amount of recharge the aquifer(s) receive over the course of the winter season, which is heavily influenced by surface waters of the Eel and Van Duzen Rivers (SHN, 2019). The Fall levels tend to stabilize at a base level that is likely controlled by the groundwater in storage within the adjacent upland areas and the upper portions of the Van Duzen watershed which would be slower to respond to drought conditions.

In conclusion, consecutive dry years may lead to lower-than-normal spring groundwater levels, but an equal lowering of the Fall groundwater levels is not generally observed. This condition is also apparent in the long-term records for many of the CASGEM wells, where the Spring levels vary significantly relative to the magnitude of variations in the Fall.

5.0 References

- California Department of Water Resources. (NR). "DWR Online Well Completion Report" Database. Red Bluff, CA:DWR Northern Region, accessed at: [Well Completion Reports \(ca.gov\)](https://www.water.ca.gov/water-safety-and-security/well-completion-reports)
- GHD Inc. (2021a). Hydrogeologic Concept Model Technical Memorandum. Eureka, CA:GHD
- . (2021b). Terrain Data and Imagery Technical Memorandum. Eureka, CA:GHD.
- SHN. (2016). "Eel River Valley Groundwater Basin, Sustainability Plan Alternative." Eureka, CA:SHN.
- . (2019). "Preliminary Analysis of Surface Water/Groundwater Interaction Monitoring; Eel River Valley Groundwater Basin." Eureka, CA:SHN.

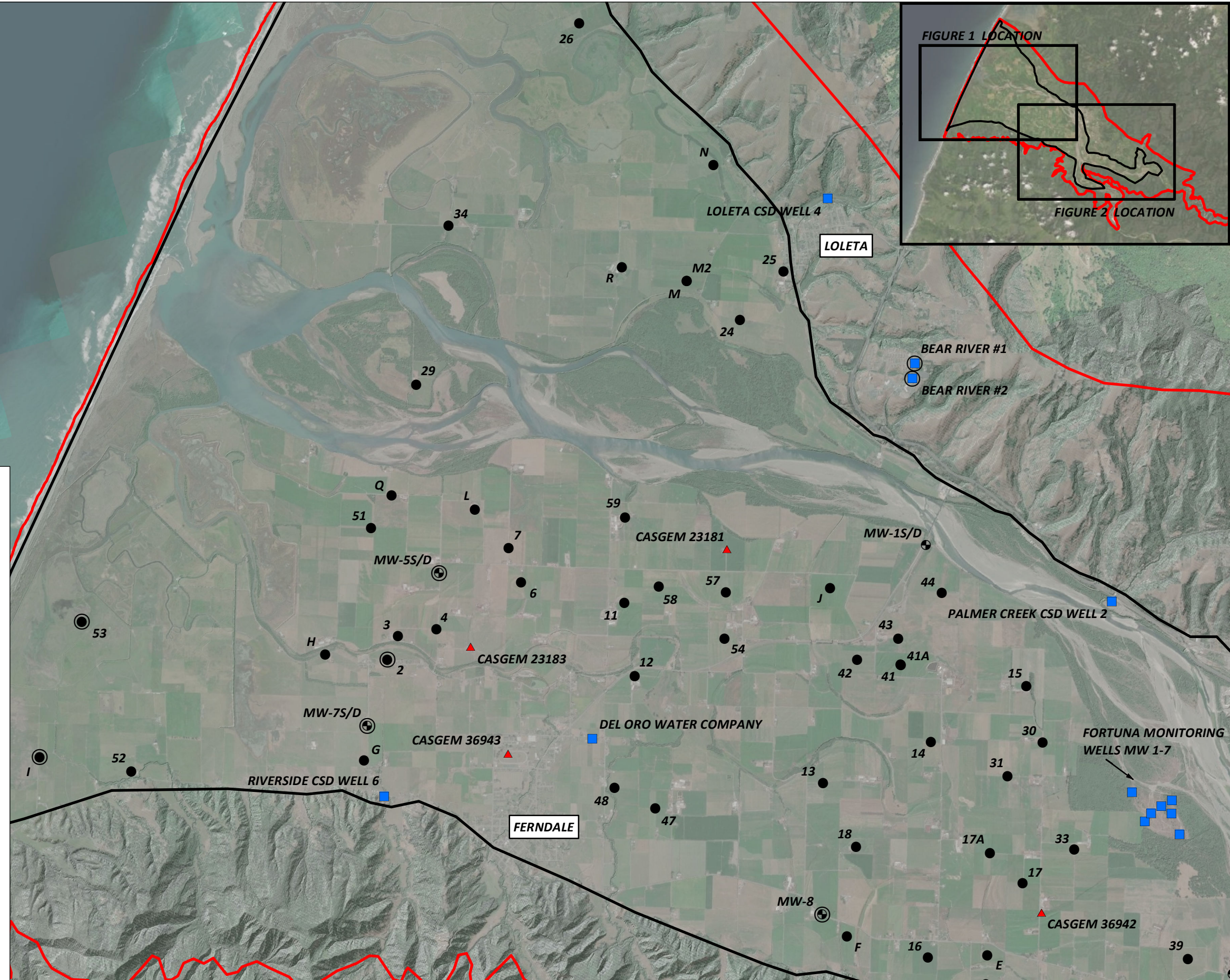
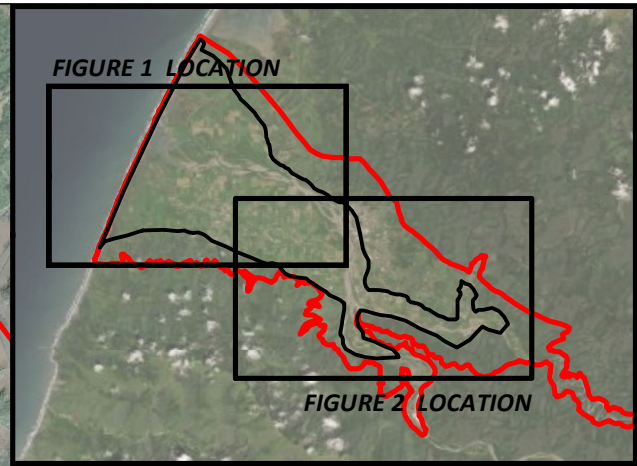
- Appendices:
1. Figures
 2. Tables
 3. Hydrographs



Figures

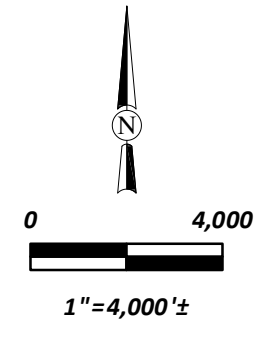
1

MAP SHOWING INVENTORY OF WELLS USED FOR FALL 2020 AND/OR SPRING 2021 WATER LEVEL MEASUREMENT CAMPAIGN



EXPLANATION

- ▲ CASGEM WELLS
- ⊕ COUNTY WELLS
- MUNICIPAL WELLS
- PRIVATE WELLS
- ALLUVIAL VALLEY (SEE NOTE)
- EEL RIVER VALLEY GROUNDWATER BASIN (#1-010)
- INDICATES WELLS THAT HAVE WATER LEVELS REPRESENTATIVE OF DEEPER AQUIFERS, INCLUDING LOWER ALLUVIAL AQUIFERS OR CARLOTTA



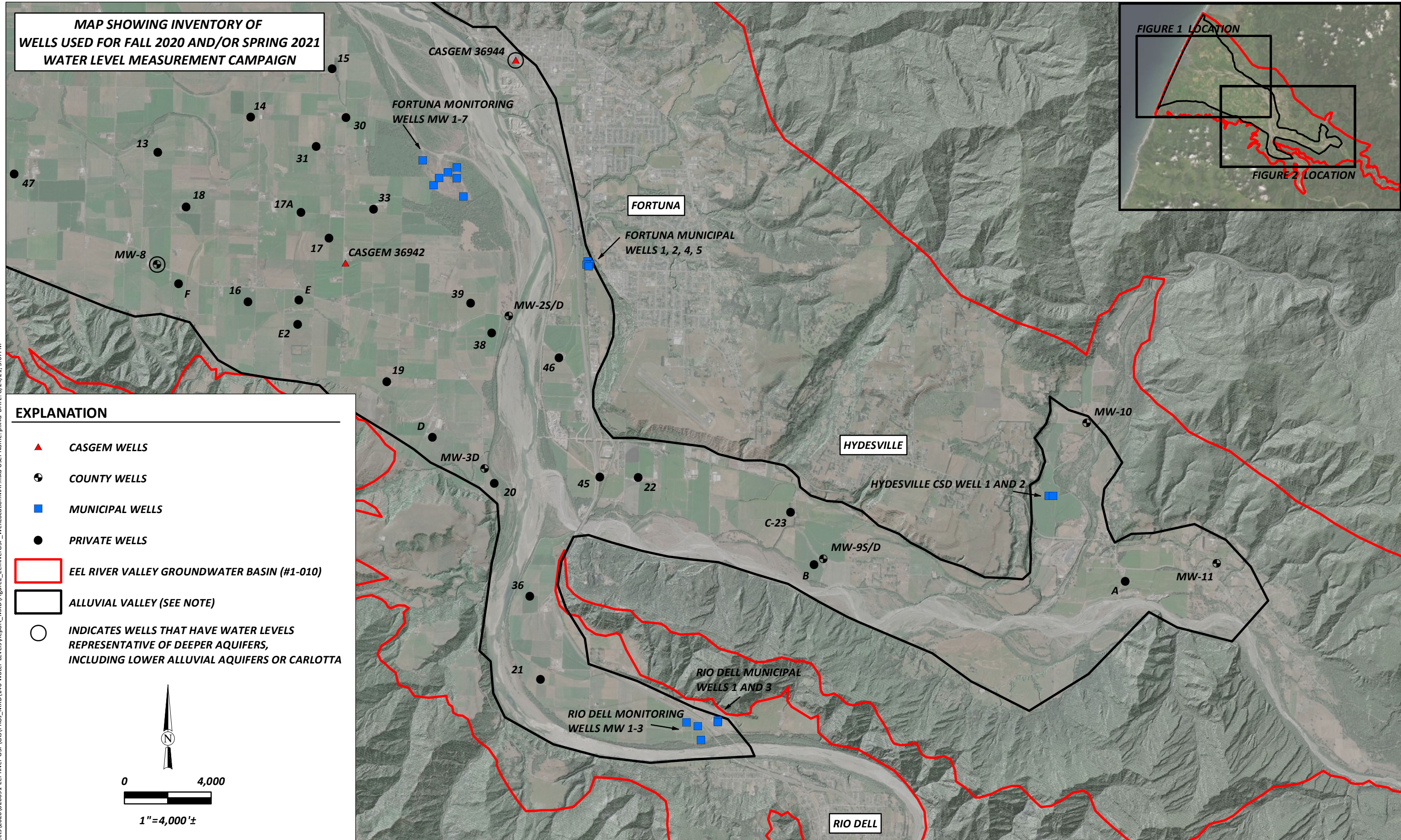
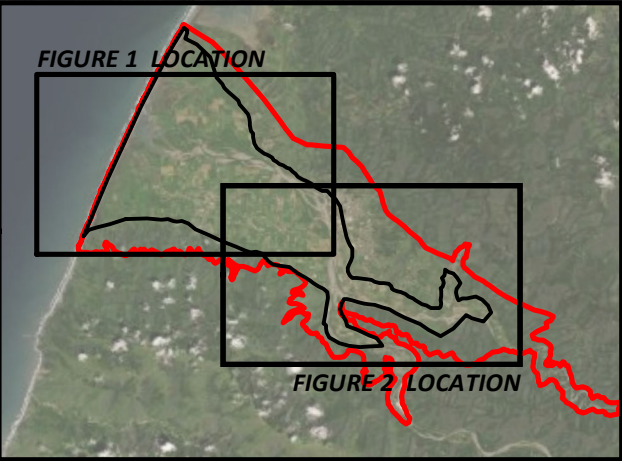
NOTE: THE LOW-LYING ALLUVIAL AND FLUVIAL TERRACE SURFACES CONSTITUTED THE PRIMARY AREA OF INTEREST FOR THE CURRENT GROUNDWATER LEVELS STUDY



Humboldt County Public Works Eel River Valley Groundwater Basin Humboldt County, California	Wells Used for Fall 2020 and/or Spring 2021 Elevation Measurements SHN 020091.140
August 2021	Figure1_EelRiverGSP_WellLocationMAP
	Figure 1

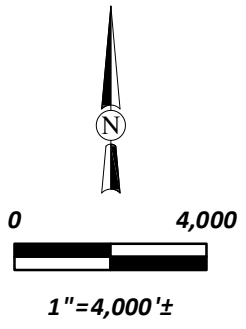
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MAP SHOWING INVENTORY OF WELLS USED FOR FALL 2020 AND/OR SPRING 2021 WATER LEVEL MEASUREMENT CAMPAIGN



EXPLANATION

- ▲ CASGEM WELLS
- ⊕ COUNTY WELLS
- MUNICIPAL WELLS
- PRIVATE WELLS
- EEL RIVER VALLEY GROUNDWATER BASIN (#1-010)
- ALLUVIAL VALLEY (SEE NOTE)
- INDICATES WELLS THAT HAVE WATER LEVELS REPRESENTATIVE OF DEEPER AQUIFERS, INCLUDING LOWER ALLUVIAL AQUIFERS OR CARLOTTA



NOTE: THE LOW-LYING ALLUVIAL AND FLUVIAL TERRACE SURFACES CONSTITUTED THE PRIMARY AREA OF INTEREST FOR THE CURRENT GROUNDWATER LEVELS STUDY



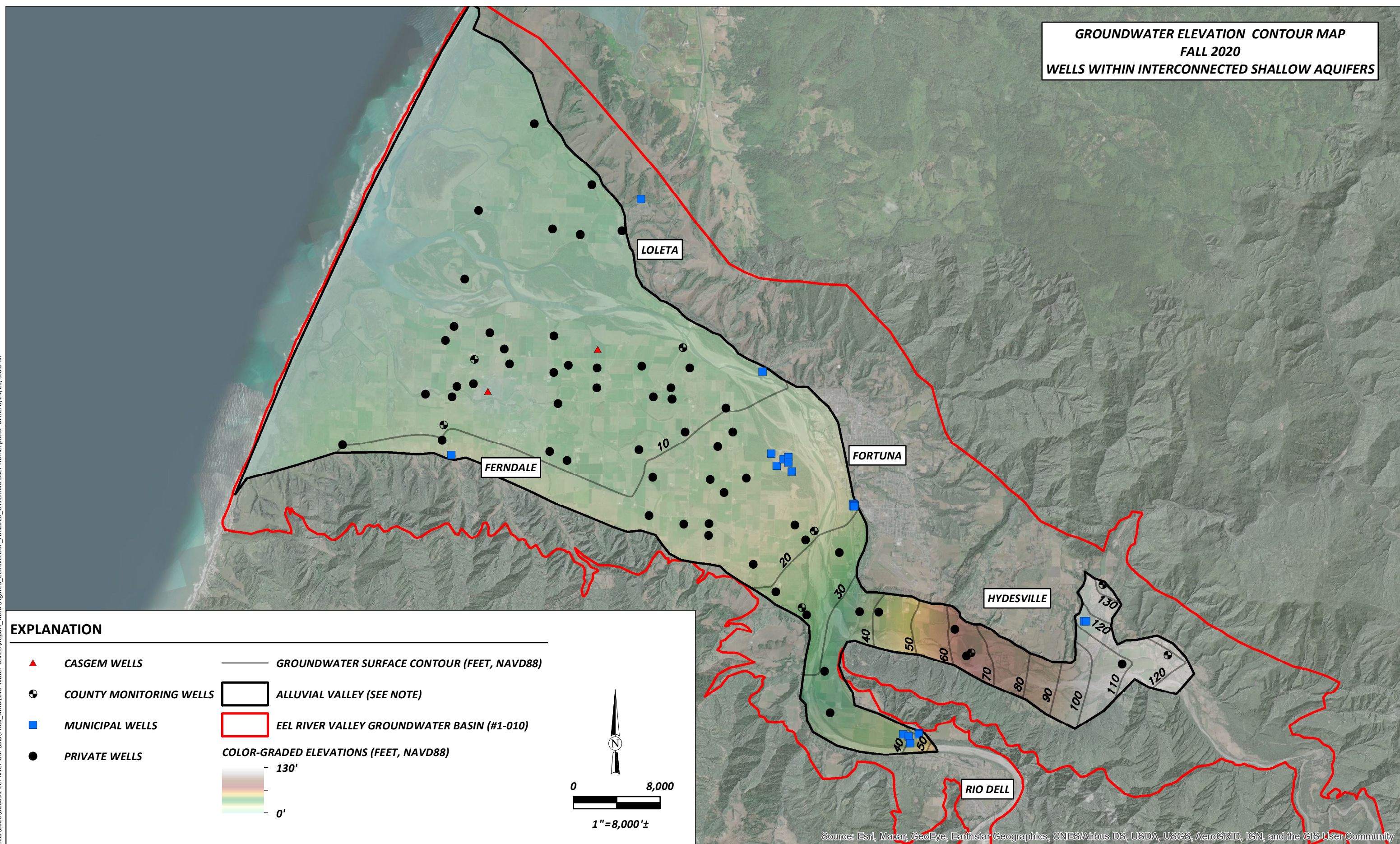
Humboldt County Public Works
Eel River Valley Groundwater Basin
Humboldt County, California

Wells Used for Fall 2020 and/or Spring 2021
Elevation Measurements
SHN 020091.140

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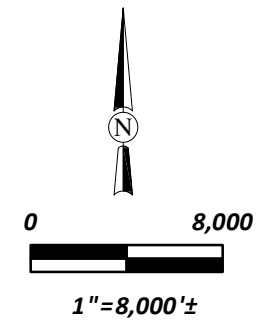
**GROUNDWATER ELEVATION CONTOUR MAP
FALL 2020
WELLS WITHIN INTERCONNECTED SHALLOW AQUIFERS**

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EXPLANATION

- ▲ CASGEM WELLS
- ⊕ COUNTY MONITORING WELLS
- MUNICIPAL WELLS
- PRIVATE WELLS
- GROUNDWATER SURFACE CONTOUR (FEET, NAVD88)
- ALLUVIAL VALLEY (SEE NOTE)
- ▭ EEL RIVER VALLEY GROUNDWATER BASIN (#1-010)
- COLOR-GRADED ELEVATIONS (FEET, NAVD88)
 - 130'
 - 0'



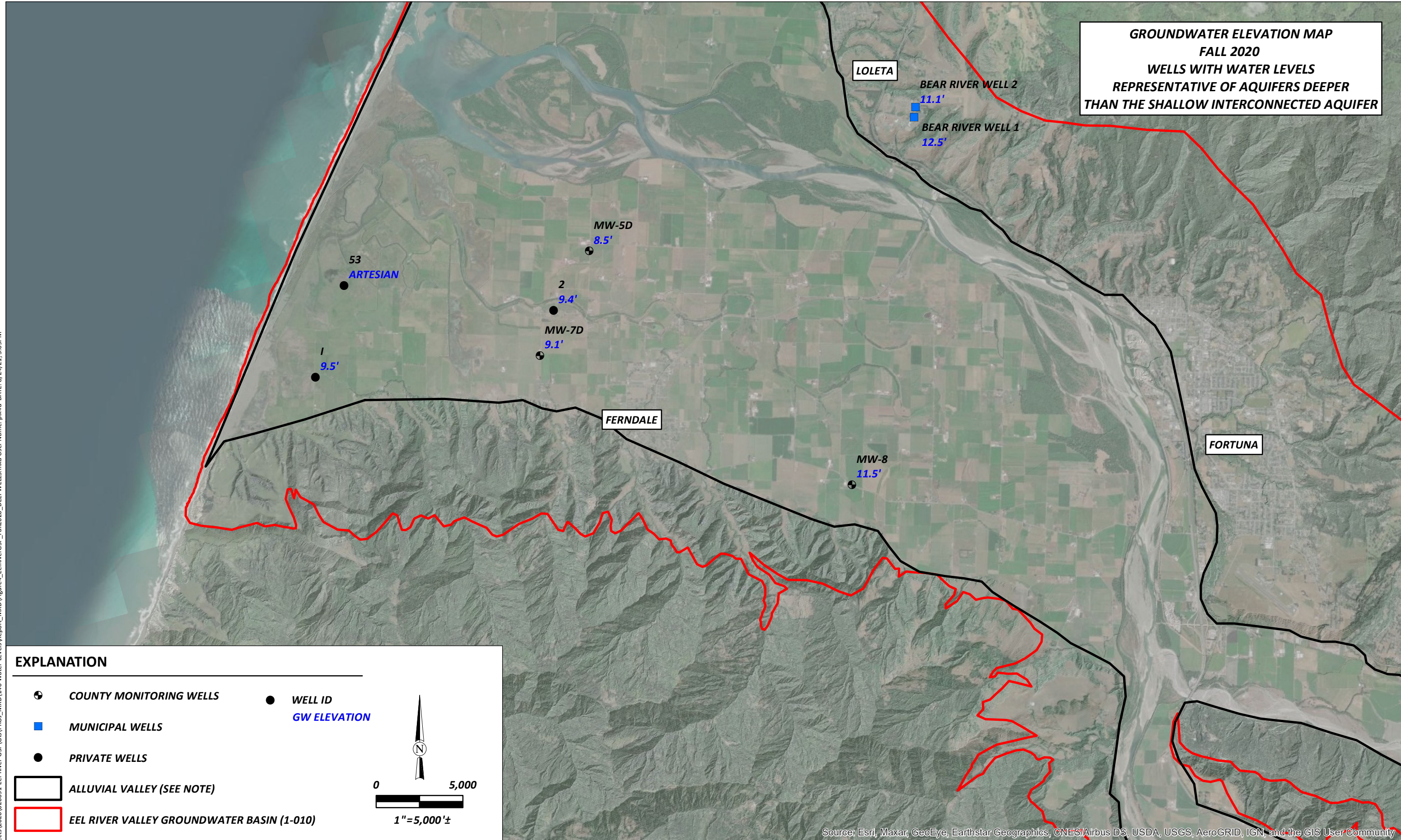
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES: -FALL 2020 WATER LEVEL MONITORING CAMPAIGN CONTOUR MAP BASED ON DEPTH TO WATER MEASUREMENTS COLLECTED OCTOBER 26-30, 2020
-THE LOW-LYING ALLUVIAL AND FLUVIAL TERRACE SURFACES CONSTITUTED THE PRIMARY AREA OF INTEREST FOR THE CURRENT GROUNDWATER LEVELS STUDY



Humboldt County Public Works Eel River Valley Groundwater Basin Humboldt County, California		Groundwater Elevation Contour Map Shallow Aquifers Fall 2020 SHN 020091.140
August 2021	Figure3_EelRiverGSP_Fall2020_GWC	Figure 3

**GROUNDWATER ELEVATION MAP
FALL 2020
WELLS WITH WATER LEVELS
REPRESENTATIVE OF AQUIFERS DEEPER
THAN THE SHALLOW INTERCONNECTED AQUIFER**



EXPLANATION

- COUNTY MONITORING WELLS
- MUNICIPAL WELLS
- PRIVATE WELLS
- ALLUVIAL VALLEY (SEE NOTE)
- EEL RIVER VALLEY GROUNDWATER BASIN (1-010)
- WELL ID
- GW ELEVATION

0 5,000
1" = 5,000' ±

NOTES: -FALL 2020 WATER LEVELS BASED ON DEPTH TO WATER MEASUREMENTS COLLECTED OCTOBER 26-30, 2020
-THE LOW-LYING ALLUVIAL AND FLUVIAL TERRACE SURFACES CONSTITUTED THE PRIMARY AREA OF INTEREST FOR THE CURRENT GROUNDWATER LEVELS STUDY



Humboldt County Public Works
Eel River Valley Groundwater Basin
Humboldt County, California

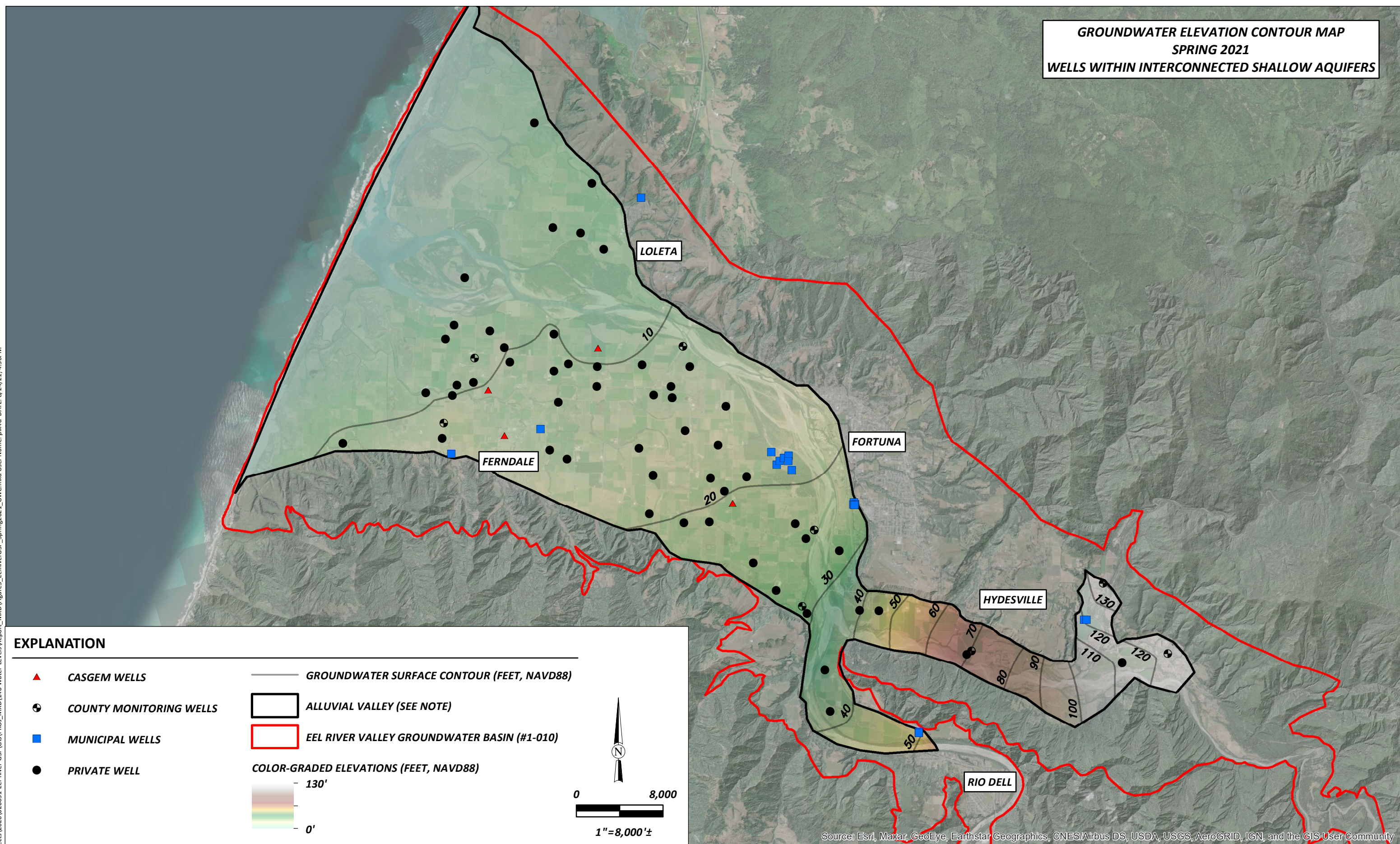
Groundwater Elevation Map
Deep Aquifers Fall 2020
SHN 020091.140

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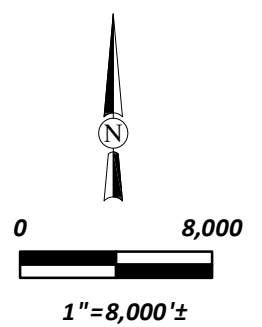
**GROUNDWATER ELEVATION CONTOUR MAP
 SPRING 2021
 WELLS WITHIN INTERCONNECTED SHALLOW AQUIFERS**

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EXPLANATION

- ▲ CASGEM WELLS
- ⊕ COUNTY MONITORING WELLS
- MUNICIPAL WELLS
- PRIVATE WELL
- GROUNDWATER SURFACE CONTOUR (FEET, NAVD88)
- ▭ ALLUVIAL VALLEY (SEE NOTE)
- ▭ EEL RIVER VALLEY GROUNDWATER BASIN (#1-010)
- COLOR-GRADED ELEVATIONS (FEET, NAVD88)
- 130'
- 0'



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

NOTES: -SPRING 2021 WATER LEVEL MONITORING CAMPAIGN CONTOUR MAP BASED ON DEPTH TO WATER MEASUREMENTS COLLECTED APRIL 5-9, 2021
 -THE LOW-LYING ALLUVIAL AND FLUVIAL TERRACE SURFACES CONSTITUTED THE PRIMARY AREA OF INTEREST FOR THE CURRENT GROUNDWATER LEVELS STUDY

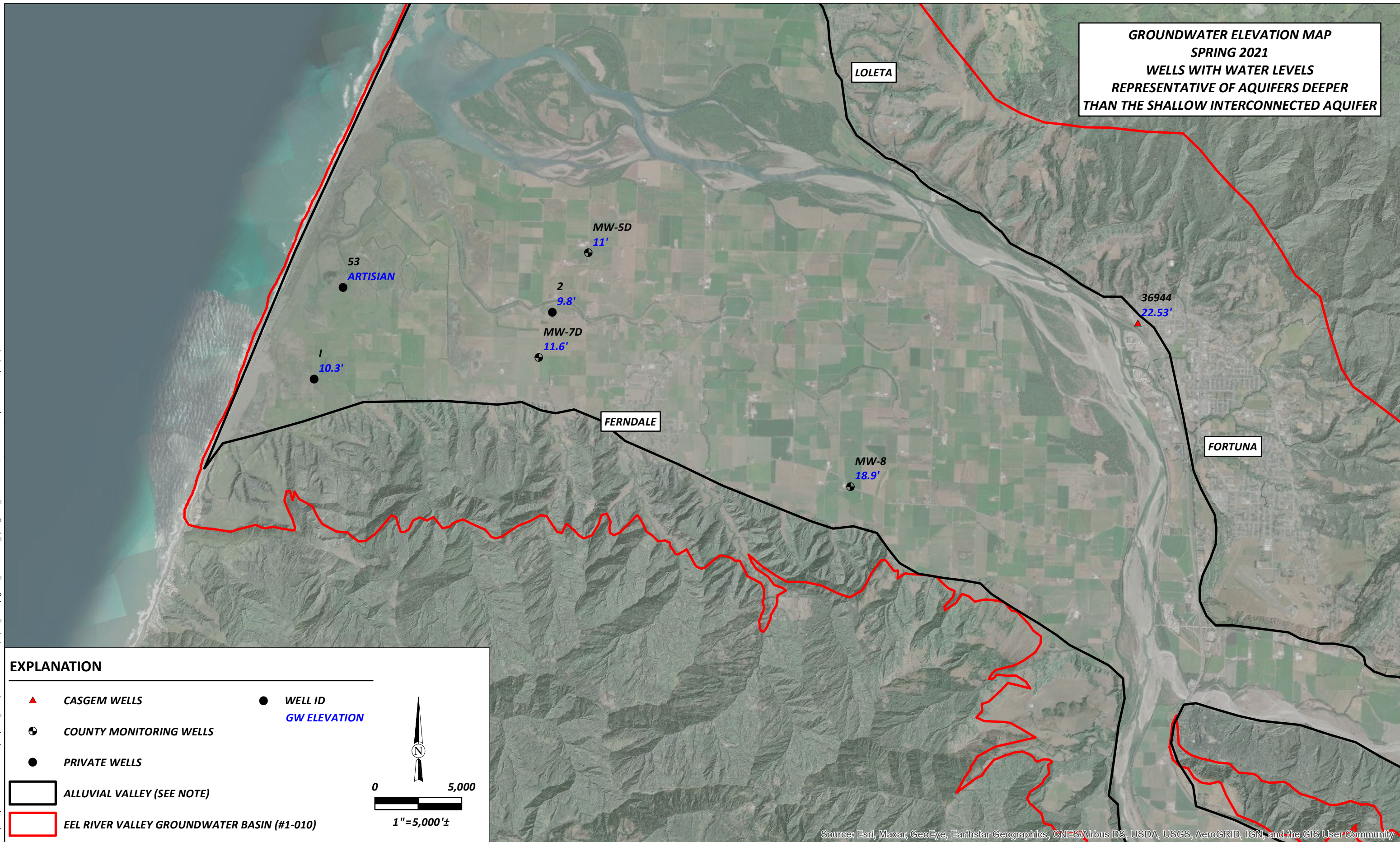


Humboldt County Public Works
 Eel River Valley Groundwater Basin
 Humboldt County, California
 August 2021

Groundwater Elevation Contour Map
 Shallow Aquifers Spring 2021
 SHN 020091.140
 Figure 5

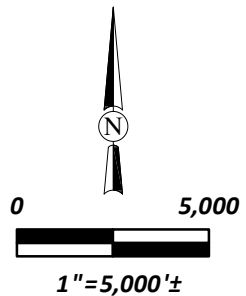
**GROUNDWATER ELEVATION MAP
 SPRING 2021
 WELLS WITH WATER LEVELS
 REPRESENTATIVE OF AQUIFERS DEEPER
 THAN THE SHALLOW INTERCONNECTED AQUIFER**

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EXPLANATION

- ▲ CASGEM WELLS
- WELL ID
GW ELEVATION
- + COUNTY MONITORING WELLS
- PRIVATE WELLS
- ALLUVIAL VALLEY (SEE NOTE)
- EEL RIVER VALLEY GROUNDWATER BASIN (#1-010)

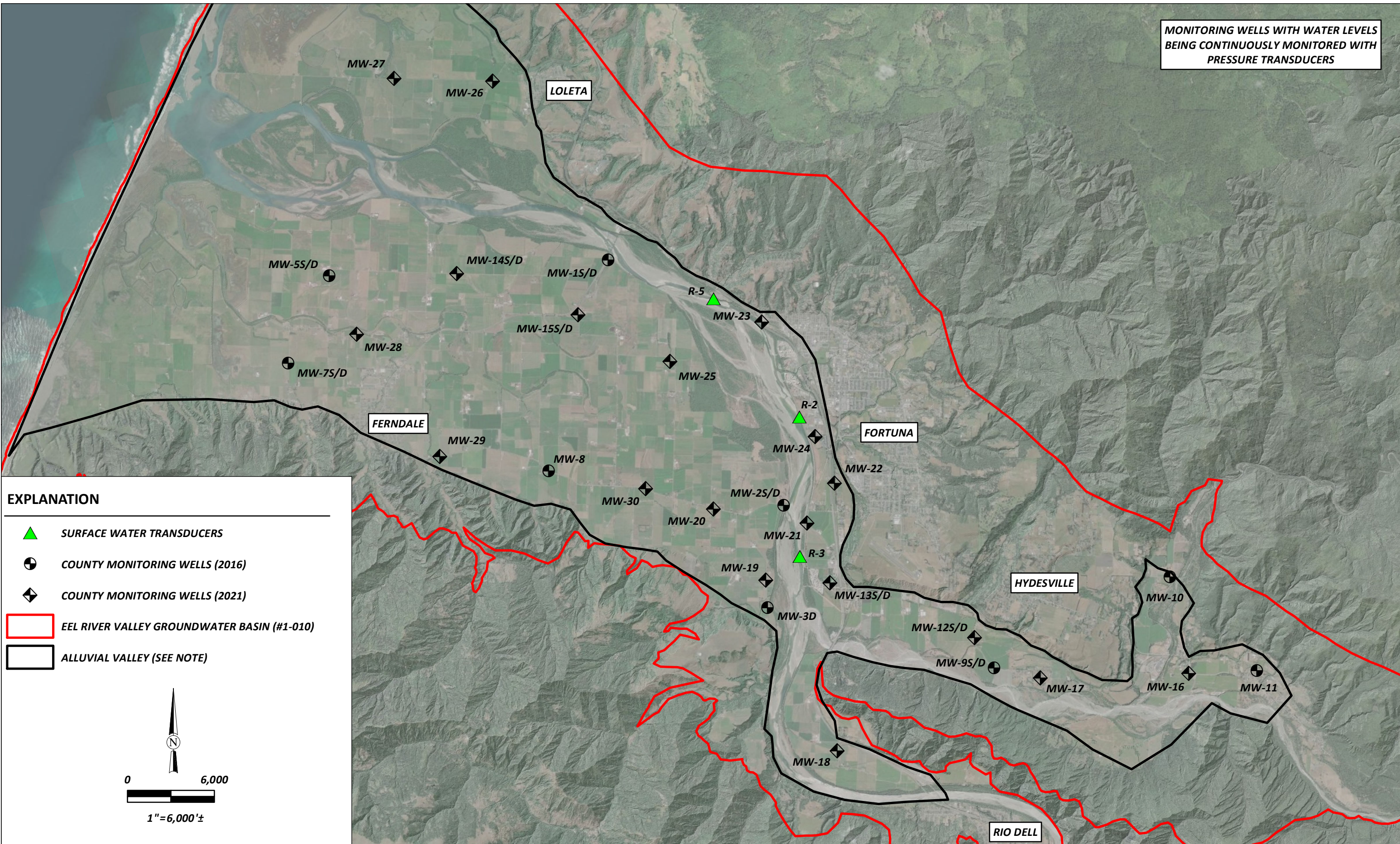


NOTES: -SPRING 2021 WATER LEVELS BASED ON DEPTH TO WATER MEASUREMENTS COLLECTED APRIL 5-9, 2021
 -THE LOW-LYING ALLUVIAL AND FLUVIAL TERRACE SURFACES CONSTITUTED THE PRIMARY AREA OF INTEREST FOR THE CURRENT GROUNDWATER LEVELS STUDY



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

MONITORING WELLS WITH WATER LEVELS BEING CONTINUOUSLY MONITORED WITH PRESSURE TRANSDUCERS



EXPLANATION

- SURFACE WATER TRANSDUCERS
- COUNTY MONITORING WELLS (2016)
- COUNTY MONITORING WELLS (2021)
- EEL RIVER VALLEY GROUNDWATER BASIN (#1-010)
- ALLUVIAL VALLEY (SEE NOTE)

0 6,000
1" = 6,000'±

NOTE: THE LOW-LYING ALLUVIAL VALLEY AND FLUVIAL TERRACE SURFACES CONSTITUTED THE PRIMARY AREA OF INTEREST FOR THE CURRENT GROUNDWATER LEVELS STUDY



Humboldt County Public Works
Eel River Valley Groundwater Basin
Humboldt County, California

County Monitoring Wells with Transducers
SHN 020091.140

Path: \\leureka\projects\2020\020091-Eel-River-Gsp\GIS\PROJ_MXD\140-Water-Levels\Report_MXD\Figure7_TransducerLocations.mxd User Name: pix4d DATE: 8/24/21, 4:52PM

Tables

2

Appendix 2 Water Level Tables

Table 1 and Table 2, below, provide details on the water levels measured in the Fall 2020 and Spring 2021 sampling campaigns, respectively. Table 3 provides details on the transducer installation in the 2016 and 2021 County Monitoring Well networks.

Table 1 Fall 2020 Groundwater Elevations						
Well ID	Well Location ¹ (Lat/Long NAD83)	Well Depth ² (feet BGS)	Screened Aquifer	Measurement Date & Time	Depth to Water (feet BGS)	Water Surface Elevation (feet NAVD88)
COUNTY MONITORING WELLS						
MW-1s	40.6097, -124.20513	35	Alluvial	10/29/2020 10:30	23.90	8.6
MW-1d	40.6097, -124.20512	60	Alluvial	10/28/2020 10:30	23.90	8.6
MW-2s	40.56403, -124.15996	35	Alluvial	10/29/2020 13:39	29.60	19.3
MW-2d	40.56403, -124.15996	60	Alluvial	10/29/2020 13:41	29.40	19.5
MW-3d	40.5446, -124.16337	60	Alluvial	10/29/2020 13:57	47.90	25.4
MW-5s	40.60535, -124.27432	110	Alluvial	10/28/2020 15:30	9.13	6.2
MW-5d	40.60535, -124.27432	210 ³	L. Alluvial/Carlotta	10/28/2020 13:30	6.88	8.5
MW-7s	40.58859, -124.28398	40	Alluvial	10/30/2020 9:00	4.63	15.3
MW-7d	40.58859, -124.28398	240 ³	L. Alluvial/Carlotta	10/29/2020 16:22	10.75	9.1
MW-8	40.5694, -124.21857	150 ³	L. Alluvial/Carlotta	10/29/2020 13:25	31.80	11.5
MW-9s	40.5342, -124.1068	25	Alluvial	10/29/2020 12:20	11.10	66.6
MW-9d	40.5342, -124.1068	48	Alluvial	10/29/2020 12:22	11.40	66.3
MW-10	40.55221, -124.06362	29	Alluvial/Carlotta	10/29/2020 12:39	20.40	134.1
MW-11	40.53484, -124.04151	46	Carlotta	10/29/2020 12:54	31.30	116.0
MUNICIPAL WELLS						
City of Rio Dell Well 1	40.51345, -124.12369	80	Alluvial	10/28/2020 10:22	42.30	40.1
City of Rio Dell Well 3	40.5132, -124.12367	110	Alluvial	10/28/2020 10:29	42.90	40.7
Rio Dell Infiltration MW 1	40.51308, -124.12885	-	Alluvial	10/28/2020 10:45	46.00	39.1
Rio Dell Infiltration MW 2	40.51264, -124.12699	-	Alluvial	10/28/2020 10:51	40.50	41.1
Rio Dell Infiltration MW 3	40.51092, -124.12641	-	Alluvial	10/28/2020 10:58	26.00	40.7
City of Fortuna Well 1	40.57116, -124.14714	115	Alluvial	10/28/2020 13:14	29.60	18.3
City of Fortuna Well 2	40.57082, -124.14675	103	Alluvial	10/28/2020 13:20	25.20	18.8
City of Fortuna Well 4	40.57071, -124.14733	-	Alluvial	10/28/2020 13:32	30.50	18.0
City of Fortuna Well 5	40.57054, -124.14696	100	Alluvial	10/28/2020 13:23	29.00	18.2
Fortuna Disposal MW 1	40.58033, -124.17303	29	Alluvial	10/29/2020 13:34	23.68	14.8
Fortuna Disposal MW 3	40.58201, -124.17074	30	Alluvial	10/29/2020 13:58	23.75	14.9
Fortuna Disposal MW 4	40.58267, -124.16924	29	Alluvial	10/29/2020 13:02	24.15	14.7
Fortuna Disposal MW 5	40.58343, -124.17495	29	Alluvial	10/29/2020 13:40	23.94	12.8
Fortuna Disposal MW 6	40.57899, -124.16802	30	Alluvial	10/29/2020 13:20	27.44	15.4
Fortuna Disposal MW 7	40.58126, -124.16924	29	Alluvial	10/29/2020 13:14	24.79	14.9
Loleta CSD Well 4	40.64706, -124.22039	-	Carlotta	10/28/2020 12:20	8.50	10.4
Bear River Well 1	40.62777, -124.20765	695 ³	Carlotta	10/28/2020 14:10	307.35	12.5
Bear River Well 2	40.6294, -124.2074	695 ³	Carlotta	10/28/2020 14:41	325.80	11.1
Del Oro Water Company	40.58777, -124.25191	166 ⁴	L. Alluvial/Carlotta	10/26/2020 10:30	26.29	6.4
Riverside CSD Well 6	40.58094, -124.28133	105	Carlotta	10/27/2020 10:30	38.83	15.6
Palmer Creek CSD Well 2	40.60411, -124.17847	65	Alluvial	10/27/2020 11:37	34.60	8.4
Hydesville CSD Well 1	40.54288, -124.06969	50	Alluvial/Carlotta	10/27/2020 12:45	18.70	115.5
Hydesville CSD Well 2	40.54287, -124.06897	50	Alluvial/Carlotta	10/27/2020 12:50	18.10	116.3
PRIVATE WELLS						
2	40.5958, -124.28137	260 ³	Carlotta	10/29/2020 15:38	4.77	9.4
3	40.59845, -124.27988	26	Alluvial	10/27/2020 11:00	10.71	5.6
4	40.59923, -124.27445	80	Alluvial	10/27/2020 10:28	8.44	6.4
6	40.60455, -124.26258	40	Alluvial	10/27/2020 15:18	11.45	6.0
7	40.60825, -124.26447	40	Alluvial	10/27/2020 16:14	9.27	6.3
11	40.60265, -124.2478	69	Alluvial	10/27/2020 14:15	17.07	5.6
12	40.59475, -124.24607	60	Alluvial	10/28/2020 11:20	18.93	7.5
13	40.58363, -124.21889	45	Alluvial	10/28/2020 13:33	25.98	9.8
14	40.58838, -124.20366	66	Alluvial	10/26/2020 15:45	27.41	9.7
15	40.59473, -124.19031	55	Alluvial	10/27/2020 13:11	28.32	10.0
16	40.56498, -124.20332	55	Alluvial	10/28/2020 12:13	28.95	12.3
17	40.57334, -124.19013	-	Alluvial	10/26/2020 14:19	25.55	13.1
17A	40.5765, -124.19488	100	Alluvial	10/26/2020 14:30	26.26	12.2
18	40.5768, -124.21398	41	Alluvial	10/28/2020 13:09	23.36	10.3
19	40.55533, -124.17992	100	Alluvial	10/28/2020 11:08	34.89	18.0
20	40.54277, -124.16168	110	Alluvial	10/27/2020 16:25	39.26	26.5
21	40.51813, -124.15319	60	Alluvial	10/26/2020 13:27	38.96	32.9



Well ID	Well Location ¹ (Lat/Long NAD83)	Well Depth ² (feet BGS)	Screened Aquifer	Measurement Date & Time	Depth to Water (feet BGS)	Water Surface Elevation (feet NAVD88)
22	40.54399, -124.13783	60	Alluvial	10/26/2020 12:14	26.78	42.2
25	40.63903, -124.22633	43	Alluvial	10/29/2020 11:05	28.60	3.3
26	40.66543, -124.25638	40	Alluvial	10/28/2020 15:06	0.14	5.5
29	40.62574, -124.27822	30	Alluvial	10/29/2020 9:47	10.28	4.6
30	40.58866, -124.18779	45	Alluvial	10/27/2020 13:45	25.04	10.5
31	40.5849, -124.19264	60	Alluvial	10/27/2020 13:32	26.50	11.5
33	40.5771, -124.18288	-	Alluvial	10/26/2020 15:00	33.23	13.5
34	40.64312, -124.2742	26	Alluvial	10/28/2020 13:48	7.56	3.7
36	40.52861, -124.15531	-	Alluvial	10/27/2020 11:22	39.93	31.0
38	40.56184, -124.16272	-	Alluvial	10/27/2020 14:58	32.12	19.3
39	40.56554, -124.16636	-	Alluvial	10/28/2020 10:50	30.18	18.0
41	40.5967, -124.20829	-	Alluvial	10/28/2020 15:52	20.77	8.2
41A	40.59668, -124.20824	-	Alluvial	10/28/2020 15:55	20.74	8.6
42	40.59712, -124.21448	-	Alluvial	10/28/2020 15:30	18.20	8.3
43	40.59951, -124.20871	-	Alluvial	10/28/2020 16:06	24.36	7.4
44	40.60464, -124.20268	-	Alluvial	10/29/2020 10:37	22.85	7.3
45	40.54392, -124.14421	-	Alluvial	10/26/2020 12:40	22.57	35.1
46	40.55891, -124.15144	-	Alluvial	10/27/2020 12:25	30.48	22.8
47	40.58043, -124.24267	-	Alluvial	10/29/2020 12:15	29.85	8.1
48	40.58258, -124.24852	-	Carlotta	10/29/2020 11:20	35.15	7.9
51	40.61003, -124.28413	-	Alluvial	10/26/2020 14:26	4.34	6.0
52	40.58293, -124.31736	180 ⁴	L. Alluvial/Carlotta	10/28/2020 10:21	22.22	10.0
53	40.59888, -124.32502	265 ³	Carlotta	-	Artesian	-
54	40.59905, -124.23342	-	Alluvial	10/26/2020 14:28	19.84	7.3
57	40.60407, -124.23342	-	Alluvial	10/26/2020 13:55	15.04	6.4
58	40.60449, -124.24299	-	Alluvial	10/26/2020 13:06	16.29	7.0
59	40.61192, -124.24805	-	Alluvial	10/26/2020 12:30	16.00	5.8
A	40.53229, -124.05658	50	Alluvial/Carlotta	10/26/2020 11:08	11.55	107.7
B	40.53349, -124.10832	45	Alluvial	10/27/2020 10:45	12.25	66.0
C-23	40.54005, -124.11242	80	Alluvial	10/26/2020 11:55	28.05	61.9
D	40.54844, -124.17214	140 ⁴	Alluvial/Carlotta	10/27/2020 16:10	67.14	20.5
E	40.56538, -124.19488	45	Alluvial	10/28/2020 11:32	34.01	12.9
E2	40.56227, -124.19498	-	Alluvial	10/28/2020 11:50	28.02	14.2
F	40.56706, -124.21491	50	Alluvial	10/28/2020 12:46	28.51	10.9
G	40.58478, -124.28431	160 ⁴	Carlotta	10/27/2020 13:06	23.80	10.2
H	40.59622, -124.29022	70	Alluvial	10/26/2020 15:08	8.28	5.1
I	40.58423, -124.33046	200 ³	Carlotta	10/26/2020 11:53	0.57	9.5
J	40.60483, -124.21858	50	Alluvial	10/28/2020 12:45	16.90	7.4
L	40.61237, -124.26943	40	Alluvial	10/27/2020 16:47	9.17	5.4
M	40.63779, -124.24012	-	Alluvial	10/28/2020 14:20	10.80	5.0
M2	40.63775, -124.24012	-	Alluvial	10/28/2020 14:17	11.48	5.0
N	40.65039, -124.23674	45	Alluvial	10/28/2020 14:49	3.41	5.8
Q	40.61364, -124.28136	60	Alluvial	10/26/2020 15:40	8.56	4.3
R	40.63905, -124.24939	40	Alluvial	10/28/2020 15:50	7.04	4.9
CASGEM WELLS						
36943	40.58594, -124.26387	240 ⁴	L. Alluvial/Carlotta	10/29/2020 12:00	23.2	7.02
23183	40.5974, -124.26960	42	Alluvial	10/29/2020 12:00	10.4	5.81
23181	40.60875, -124.23349	45	Alluvial	10/29/2020 12:00	18.0	0.22

¹Well locations based on a combination of geo-tagged field photos and aerial imagery.

²Well depths are based on well completion reports, if available, or landowner knowledge.

³Water levels at this location are interpreted to be associated with lower, confined or semi-confined aquifers.

⁴Screened interval and/or sand/gravel backfill materials intercept shallow water bearing units and therefore water levels are contoured with the shallow interconnected aquifers on Figure 3.

Table 2 Spring 2021 Groundwater Elevations						
Well ID	Well Location ¹ (Lat/Long NAD83)	Well Depth ² (feet BGS)	Screened Aquifer	Measurement Date & Time	Depth to Water (feet BGS)	Water Surface Elevation (feet NAVD88)
COUNTY MONITORING WELLS						
MW-1s	40.6097, -124.20512	35	Alluvial	4/5/2021 15:57	21.41	11.1
MW-1d	40.6097, -124.20512	60	Alluvial	4/7/2021 13:40	21.17	11.4
MW-2s	40.56403, -124.15996	35	Alluvial	4/5/2021 14:30	26.44	22.5
MW-2d	40.56403, -124.15996	60	Alluvial	4/7/2021 11:55	25.83	23.1
MW-3d	40.5446, -124.16337	60	Alluvial	4/5/2021 14:00	44.82	28.4
MW-5s	40.60535, -124.27432	110	Alluvial	4/7/2021 10:09	6.32	9.0
MW-5d	40.60535, -124.27432	210 ³	L. Alluvial/Carlotta	4/7/2021 9:15	4.30	11.0
MW-7s	40.58859, -124.28398	40	Alluvial	4/6/2021 8:55	1.95	17.9
MW-7d	40.58859, -124.28398	240 ³	L. Alluvial/Carlotta	4/6/2021 9:00	8.24	11.6
MW-8	40.5694, -124.21857	150 ³	L. Alluvial/Carlotta	4/6/2021 13:50	24.44	18.9
MW-9s	40.5342, -124.1068	25	Alluvial	4/8/2021 18:05	7.34	70.4
MW-9d	40.5342, -124.1068	48	Alluvial	4/8/2021 18:09	7.35	70.4
MW-10	40.55221, -124.06362	29	Alluvial/Carlotta	4/8/2021 17:15	16.15	138.4
MW-11	40.53484, -124.04151	46	Carlotta	4/8/2021 16:47	24.63	122.7
MUNICIPAL WELLS						
City of Rio Dell Well 1	40.51345, -124.12369	80	Alluvial	4/8/2021 12:00	35.30	47.1
City of Rio Dell Well 3	40.5132, -124.12367	110	Alluvial	4/8/2021 12:00	34.90	48.7
City of Fortuna Well 1	40.57116, -124.14714	115	Alluvial	4/7/2021 14:00	26.60	21.3
City of Fortuna Well 2	40.57082, -124.14675	103	Alluvial	4/7/2021 14:00	22.10	21.9
City of Fortuna Well 4	40.57071, -124.14733	-	Alluvial	4/7/2021 14:00	27.70	20.8
City of Fortuna Well 5	40.57054, -124.14696	100	Alluvial	4/7/2021 14:00	26.20	21.0
Fortuna Disposal MW 1	40.58033, -124.17303	29	Alluvial	4/9/2021 17:07	19.36	19.1
Fortuna Disposal MW 2	40.58123, -124.17214	30	Alluvial	4/9/2021 17:32	20.11	18.5
Fortuna Disposal MW 3	40.58202, -124.17074	30	Alluvial	4/9/2021 17:28	19.95	18.7
Fortuna Disposal MW 4	40.58267, -124.16924	29	Alluvial	4/9/2021 17:25	20.58	18.2
Fortuna Disposal MW 5	40.58343, -124.17495	29	Alluvial	4/9/2021 17:38	19.61	17.1
Fortuna Disposal MW 6	40.57899, -124.16802	30	Alluvial	4/9/2021 17:15	23.65	19.2
Fortuna Disposal MW 7	40.58126, -124.16924	29	Alluvial	4/9/2021 17:20	21.01	18.7
Loleta CSD Well 4	40.64706, -124.22039	-	Carlotta	3/24/2021 12:00	6.00	12.9
Del Oro Water Company	40.58777, -124.25191	166 ⁴	L. Alluvial/Carlotta	4/5/2021 11:30	21.09	11.6
Riverside CSD Well 6	40.58094, -124.28133	105	Carlotta	4/6/2021 11:00	38.07	16.3
Hydesville CSD Well 1	40.54288, -124.06969	50	Alluvial/Carlotta	4/8/2021 12:00	13.20	121.0
Hydesville CSD Well 2	40.54287, -124.06897	50	Alluvial/Carlotta	4/8/2021 12:00	12.20	122.2
PRIVATE WELLS						
2	40.5958, -124.28137	260 ³	Carlotta	4/5/2021 15:48	4.31	9.8
3	40.59845, -124.27988	26	Alluvial	4/5/2021 11:03	7.72	8.6
4	40.59923, -124.27445	80	Alluvial	4/5/2021 11:55	4.88	9.9
6	40.60455, -124.26258	40	Alluvial	4/5/2021 14:47	7.15	10.3
7	40.60826, -124.26447	40	Alluvial	4/5/2021 13:44	5.65	9.9
11	40.60265, -124.2478	69	Alluvial	4/5/2021 13:24	12.43	10.2
12	40.59475, -124.24607	60	Alluvial	4/7/2021 9:09	13.28	13.2
13	40.58363, -124.21889	45	Alluvial	4/5/2021 11:30	18.98	16.8
14	40.58838, -124.20366	66	Alluvial	4/7/2021 9:59	21.24	15.8
15	40.59473, -124.19031	55	Alluvial	4/7/2021 10:19	23.39	14.9
16	40.56498, -124.20332	55	Alluvial	4/5/2021 12:08	20.78	20.5
17	40.57334, -124.19013	-	Alluvial	4/5/2021 13:16	19.13	19.5
17A	40.5765, -124.19488	100	Alluvial	4/5/2021 13:02	19.60	18.9
18	40.5768, -124.21398	41	Alluvial	4/5/2021 11:45	15.91	17.7
19	40.55533, -124.17992	100	Alluvial	4/5/2021 15:36	29.42	23.5
20	40.54277, -124.16168	110	Alluvial	4/7/2021 11:42	36.69	29.1
21	40.51813, -124.15319	60	Alluvial	4/6/2021 14:57	34.78	37.1
22	40.54399, -124.13783	60	Alluvial	4/6/2021 13:30	22.04	46.9
24	40.63378, -124.23233	80	Alluvial	4/7/2021 11:35	12.38	7.1
26	40.66543, -124.25638	40	Alluvial	4/6/2021 13:25	-0.95	6.6
29	40.62574, -124.27822	30	Alluvial	4/6/2021 14:55	11.68	3.2
31	40.5849, -124.19264	60	Alluvial	4/5/2021 14:29	20.50	17.5
33	40.5771, -124.18288	-	Alluvial	4/5/2021 14:04	27.50	19.2
36	40.52861, -124.15531	-	Alluvial	4/6/2021 14:33	37.06	33.9
38	40.56184, -124.16272	-	Alluvial	4/7/2021 11:06	28.68	22.8
39	40.56554, -124.16636	-	Alluvial	4/7/2021 10:49	26.10	22.1
41	40.5967, -124.20829	-	Alluvial	4/6/2021 11:28	15.17	13.8

Well ID	Well Location ¹ (Lat/Long NAD83)	Well Depth ² (feet BGS)	Screened Aquifer	Measurement Date & Time	Depth to Water (feet BGS)	Water Surface Elevation (feet NAVD88)
41A	40.59668, -124.20824	-	Alluvial	4/6/2021 11:32	15.11	14.2
42	40.59712, -124.21448	-	Alluvial	4/6/2021 11:12	12.51	14.0
43	40.59951, -124.20871	-	Alluvial	4/6/2021 11:40	19.05	12.8
44	40.60464, -124.20268	-	Alluvial	4/6/2021 10:48	18.96	11.2
45	40.54392, -124.14421	-	Alluvial	4/6/2021 13:51	18.18	39.5
46	40.55891, -124.15144	-	Alluvial	4/6/2021 14:10	27.32	25.9
47	40.58043, -124.24267	-	Alluvial	4/5/2021 10:45	24.66	13.3
48	40.58258, -124.24853	-	Carlotta	4/5/2021 16:24	30.37	12.7
51	40.61003, -124.28413	-	Alluvial	4/5/2021 10:23	2.39	8.0
52	40.58294, -124.31736	180 ⁴	L. Alluvial/Carlotta	4/5/2021 10:25	20.22	12.0
53	40.59888, -124.32502	265 ³	Carlotta	-	Artesian	-
54	40.59905, -124.23342	-	Alluvial	4/6/2021 9:19	14.64	12.5
57	40.60407, -124.23342	-	Alluvial	4/6/2021 9:41	10.52	10.9
58	40.60449, -124.24299	-	Alluvial	4/6/2021 10:05	11.99	11.3
59	40.61192, -124.24805	-	Alluvial	4/5/2021 14:24	11.35	10.5
A	40.53229, -124.05658	50	Alluvial/Carlotta	4/6/2021 13:09	7.58	111.7
B	40.53349, -124.10832	45	Alluvial	4/6/2021 12:42	8.45	69.8
D	40.54844, -124.17214	140 ⁴	Alluvial/Carlotta	4/7/2021 11:23	62.62	25.1
E	40.56538, -124.19488	45	Alluvial	4/5/2021 12:40	26.40	20.5
F	40.56706, -124.21491	50	Alluvial	4/5/2021 11:06	20.21	19.2
G	40.58478, -124.28431	160 ⁴	Carlotta	4/6/2021 11:50	21.37	12.6
H	40.59622, -124.29022	70	Alluvial	4/5/2021 14:12	6.14	7.3
I	40.58423, -124.33046	200 ³	Carlotta	4/5/2021 16:26	-0.19	10.3
J	40.60483, -124.21858	50	Alluvial	4/5/2021 15:25	12.14	12.1
L	40.61238, -124.26943	40	Alluvial	4/6/2021 9:02	6.78	7.7
M2	40.63775, -124.24012	-	Alluvial	4/7/2021 11:21	9.80	6.6
N	40.65039, -124.23674	45	Alluvial	4/7/2021 12:42	1.86	7.3
Q	40.61364, -124.28136	60	Alluvial	4/5/2021 13:18	6.16	6.7
R	40.63905, -124.24939	40	Alluvial	4/6/2021 14:05	1.90	10.1
CASGEM WELLS						
36942	40.5702, -124.18740	30	Alluvial	3/30/2021 12:00	22.80	21.43
36943	40.58594, -124.26387	240 ³	L. Alluvial/Carlotta	3/30/2021 12:00	19.00	11.22
36944	40.59644, -124.15992	496 ⁴	Carlotta	3/30/2021 12:00	33.70	22.53
23183	40.5974, -124.26960	42	Alluvial	3/30/2021 12:00	6.10	10.11
23181	40.60875, -124.23349	45	Alluvial	3/30/2021 12:00	13.70	4.52

¹Well locations based on a combination of geo-tagged field photos and aerial imagery.

²Well depths are based on well completion reports, if available, or landowner knowledge.

³Water levels at this location are interpreted to be associated with lower, confined or semi-confined aquifers.

⁴Screened interval and/or sand/gravel backfill materials intercept shallow water bearing units and therefore water levels are contoured with the shallow interconnected aquifers on Figure 5.

Table 3		
Transducer Locations and Serial Numbers		
MW Location	Transducer Serial Number	Install Date
MW-1s	005-2135537	5/19/2021
MW-1d	005-2135526	5/19/2021
MW-2s	005-2135522	5/20/2021
MW-2d	005-2135541	5/20/2021
MW-3d	005-2135540	5/20/2021
MW-5s	005-2135534	5/20/2021
MW-5d	005-2135205	5/20/2021
MW-7s	0012067002	10/9/2019
MW-7d	0102045352	10/9/2019
MW-8	005-2135196	5/20/2021
MW-9s	005-2135535	5/20/2021
MW-9d	005-2135533	5/20/2021
MW-10	005-2137984	7/8/2021
MW-11	005-2137958	7/8/2021
MW-12s	005-2135201	6/4/2021
MW-12d	005-2135524	6/4/2021
MW-13s	005-2135532	6/4/2021
MW-13d	005-2135203	6/4/2021
MW-14s	005-2135190	5/28/2021
MW-14d	005-2135530	5/28/2021
MW-15s	005-2135536	5/28/2021
MW-15d	005-2135520	5/28/2021
MW-16	005-2135528	6/21/2021
MW-17	005-2135538	6/21/2021
MW-18	005-2135539	6/24/2021
MW-19	005-2135202	6/28/2021
MW-20	005-2135527	6/24/2021
MW-21	005-2135192	6/24/2021
MW-22	005-2135189	6/24/2021
MW-23	005-2137905	6/23/2021
MW-24	005-2137989	6/24/2021
MW-25	005-2137899	6/16/2021
MW-26	005-2137947	6/17/2021
MW-27	005-2138153	6/24/2021
MW-28	005-2137954	6/24/2021
MW-29	005-2137955	6/24/2021
MW-30	005-2137906	6/24/2021

Well locations shown on Figure 7.

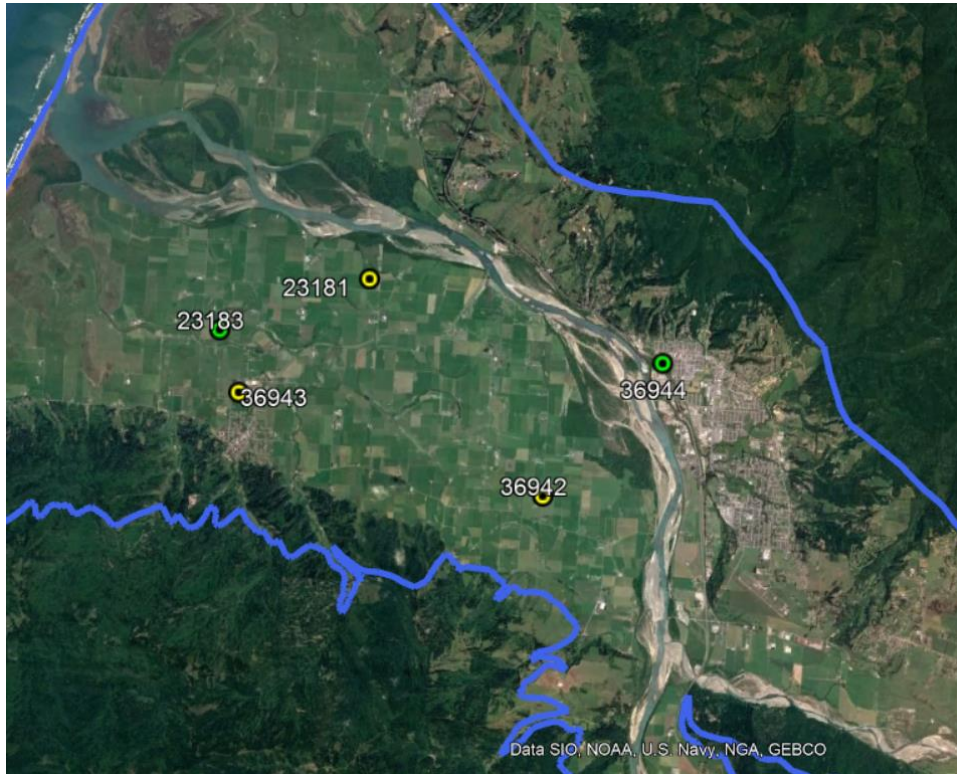


Hydrographs

3

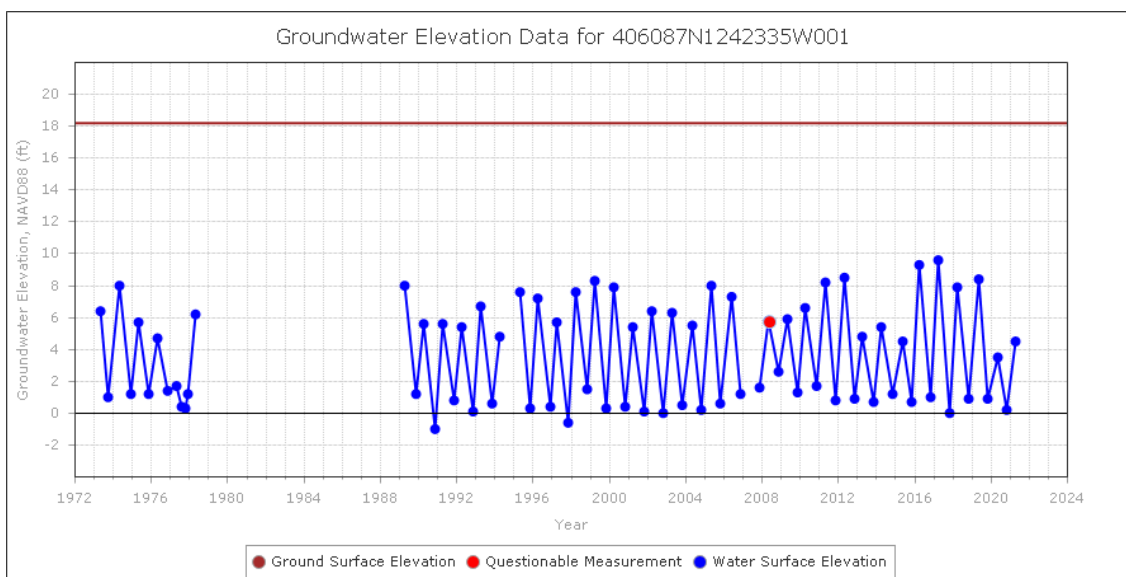
CASGEM Wells

The CASGEM wells represent the best historical records of water levels within the ERVB. There are 9 total wells that have water level records, most of which span multiple decades. There are 5 CASGEM wells currently being monitored by DWR bi-annually (see map below). All CASGEM wells are located within the lower Eel River Valley. Hydrographs for the 5 active CASGEM wells are shown below.

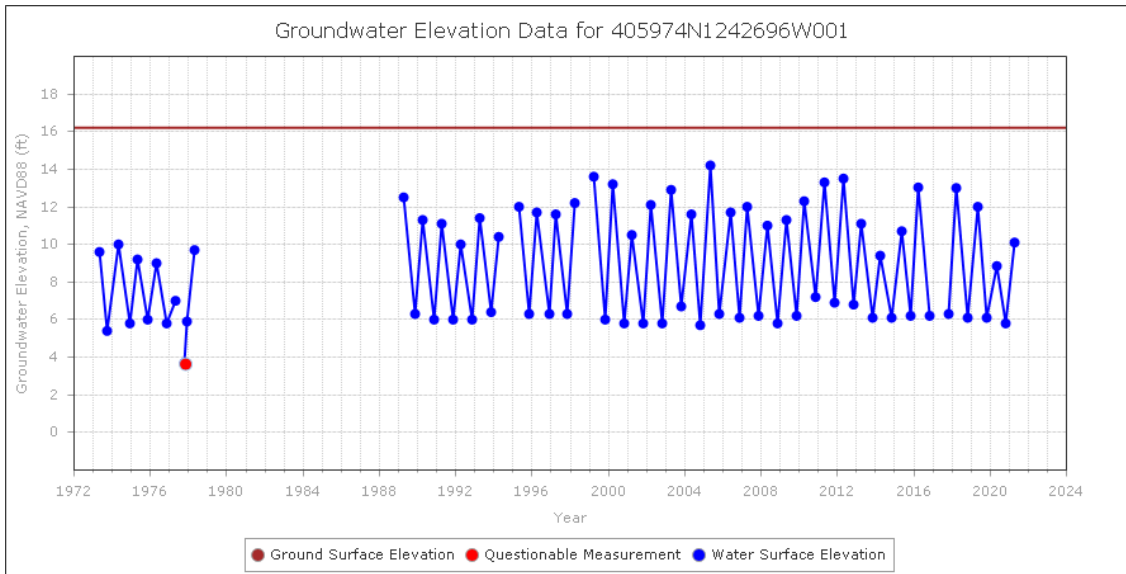


Map showing CASGEM wells currently being monitoring biannually by DWR.

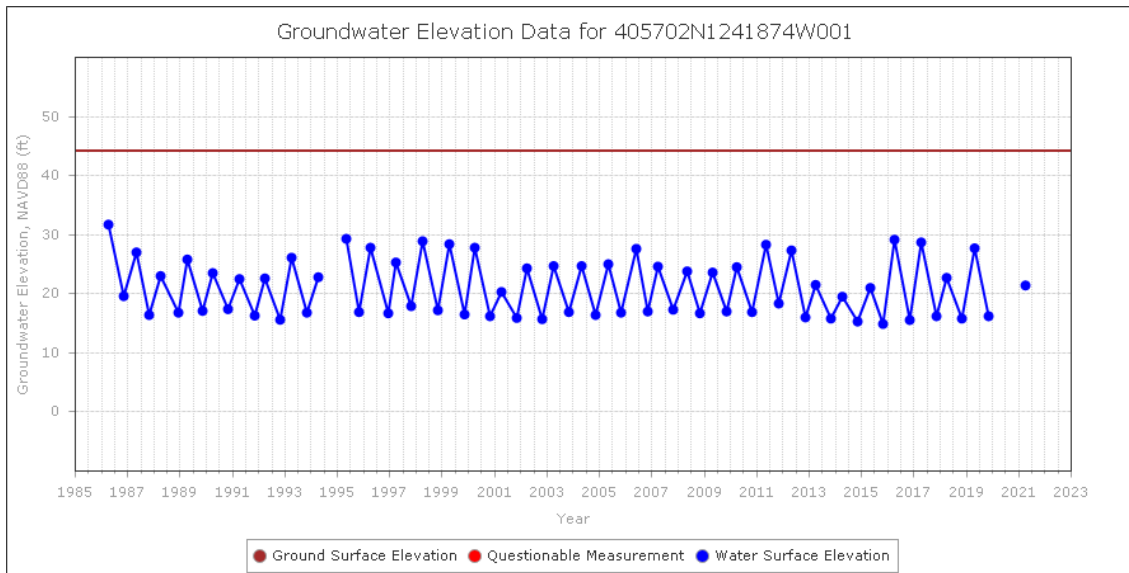
CASGEM Well 23181



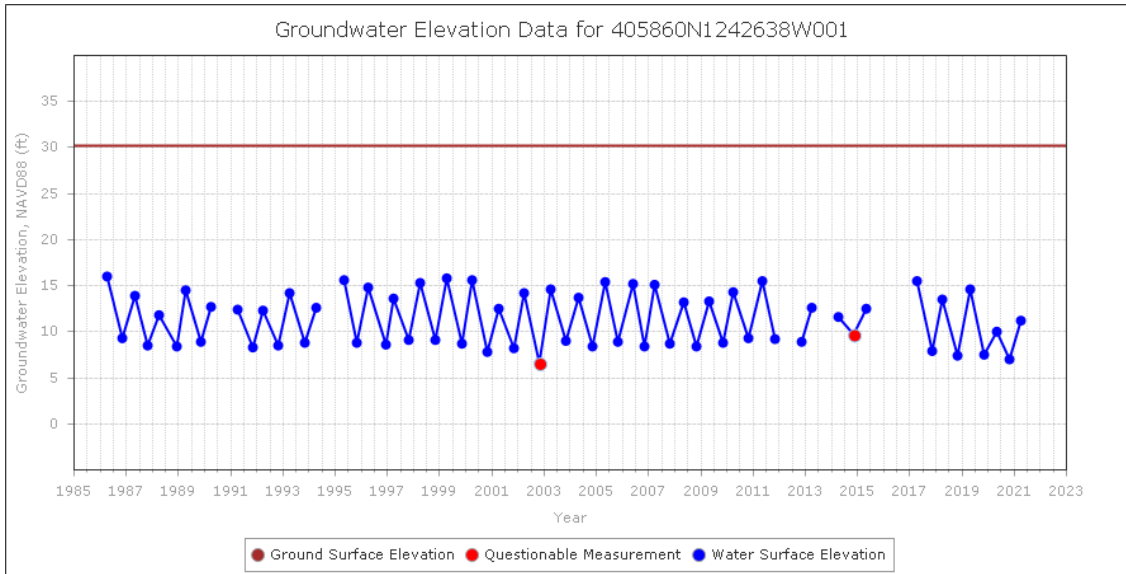
CASGEM Well **23183**



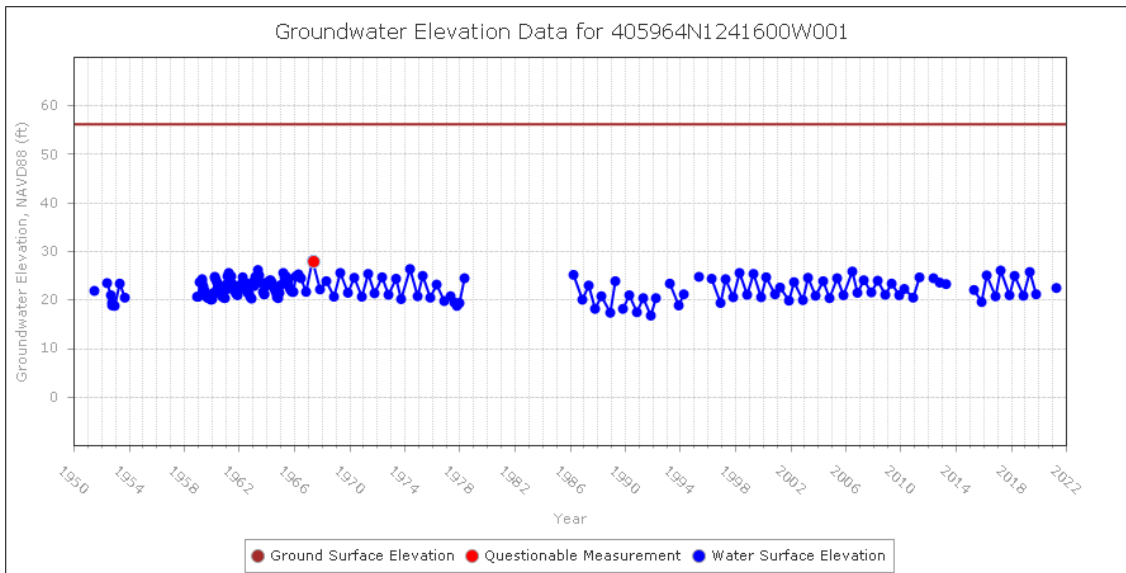
CASGEM Well **36942**



CASGEM Well **36943**



CASGEM Well **36944**



2016 County Monitoring Wells

15 monitoring wells (9 locations with 6 dual-well installations) were installed in 2016 and groundwater levels have been measured bi-annually since that time, with some wells that have intervals of continuous monitoring, primarily focused on assessing GW/SW relationships.



Map of County monitoring wells installed in Fall 2016

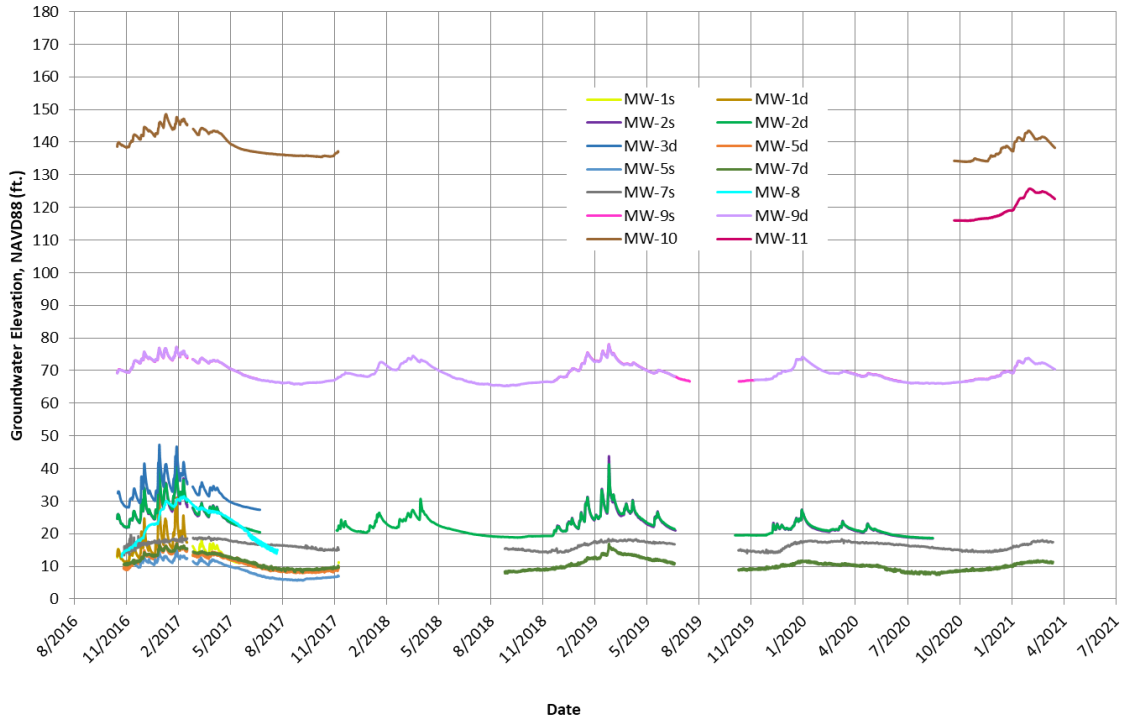
Table F-1 Eel River Valley Monitoring Well Details Eel River Valley Groundwater Basin, Groundwater Sustainability Plan Alternative							
Monitoring Well ID	Installation Date	Primary Well Purpose	Borehole Depth (feet)	Well Diameter (inches)	Screened Interval (feet BGS ¹)	Ground Surface Elevation (feet NAVD88 ²)	Drilling Method
MW-1S	10/26/16	SW/GW ³	60	1	30-35	23.26	DP ⁴ /HSRA ⁵
MW-1D					55-60		
MW-2S	10/24/16	SW/GW	60	1	30-35	43.89	DP/HSRA
MW-2D					55-60		
MW-3S	10/26/16	SW/GW	56	1	30-35	58.00	DP/HSRA
MW-3D					55-60		
MW-5S	11/4/16	chloride testing	220	2	100-110	13.16	MUD ROTARY
MW-5D					200-210		
MW-7S	11/2/16	chloride testing	300	2	30-40	18.92	MUD ROTARY
MW-7D					240-250		
MW-8	10/31/16	Monitoring ⁶	160	2	120-130	44.16	MUD ROTARY
MW-9S	10/27/16	SW/GW	48	1	20-25	73.59	DP/HSRA
MW-9D					43-48		
MW-10	10/28/16	monitoring	29	1	24-29	145.96	DP/SFA ⁷
MW-11	10/28/16	monitoring	46	1	41-46	148.76	DP/HSRA

1. BGS: below ground surface
 2. NAVD88: North American Vertical Datum of 1988
 3. SW/GW: surface water-groundwater monitoring
 4. DP: direct push continuous core
 5. HSRA: hollow stem rotary auger
 6. Monitoring: groundwater elevation monitoring
 7. SFA: solid flight auger

2016 County monitoring well network (from 2016 Groundwater Sustainability Plan Alternative)

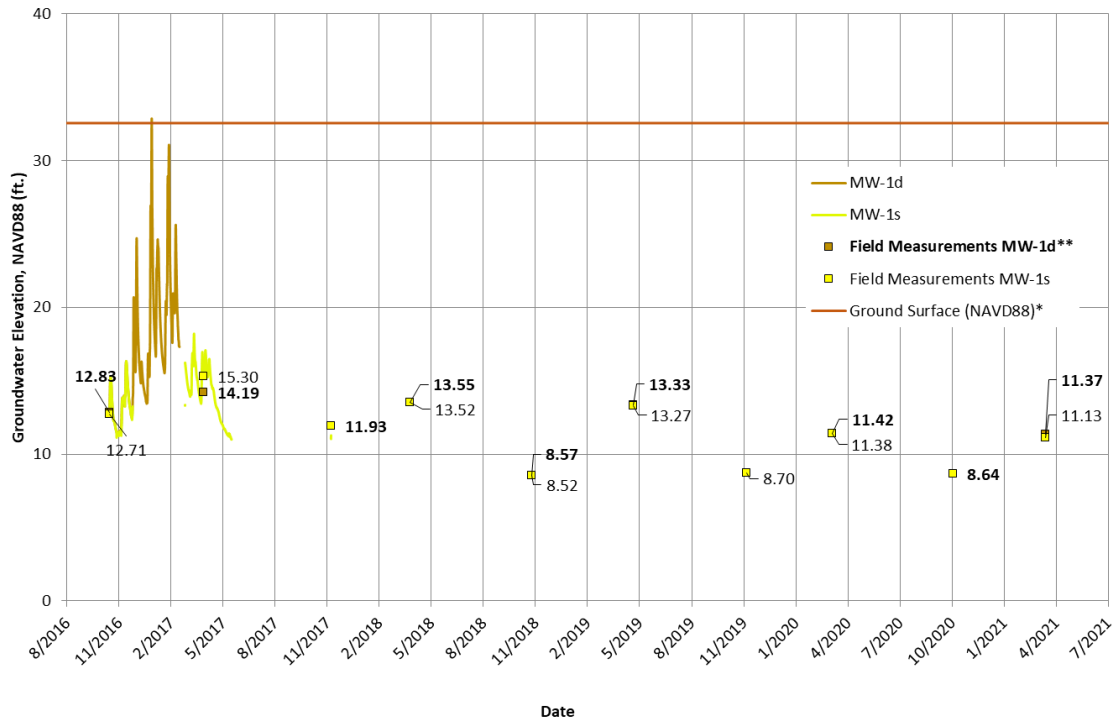


Continuous Groundwater Elevation Data for 2016 County Monitoring Wells



*Ground surface elevation based on project DEM (2018 USGS LiDAR)

Groundwater Elevation Data for MW-1S/D

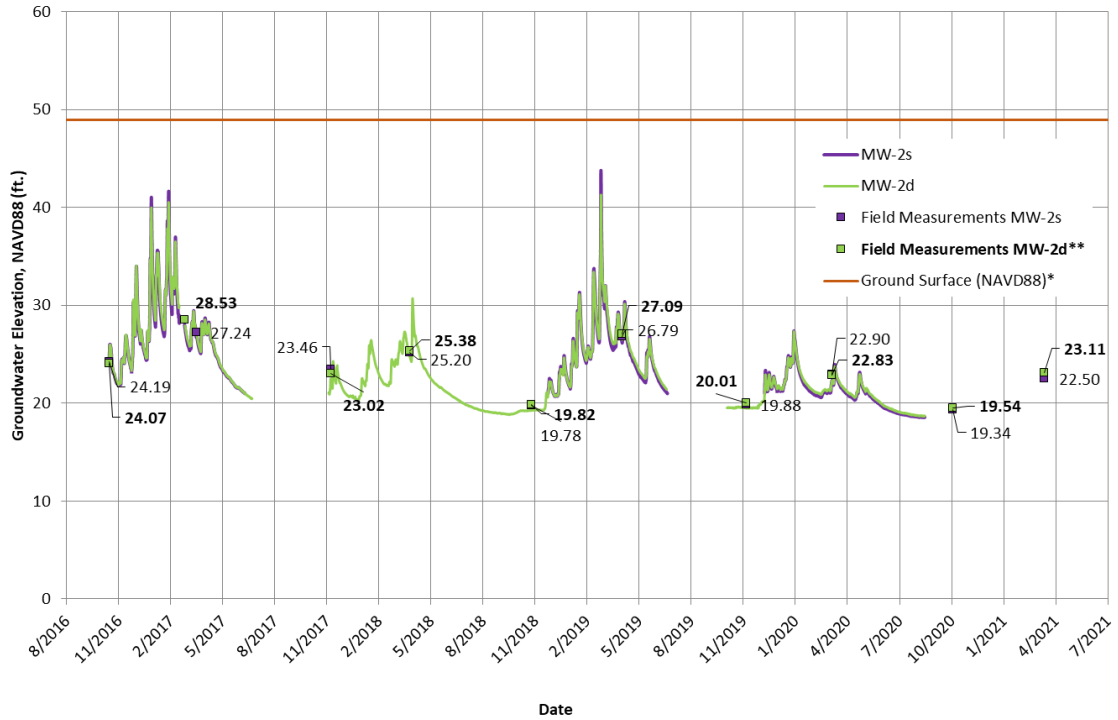


*Ground surface elevation based on project DEM (2018 USGS LiDAR)

**MW-1d field measurement data labels are bolded.

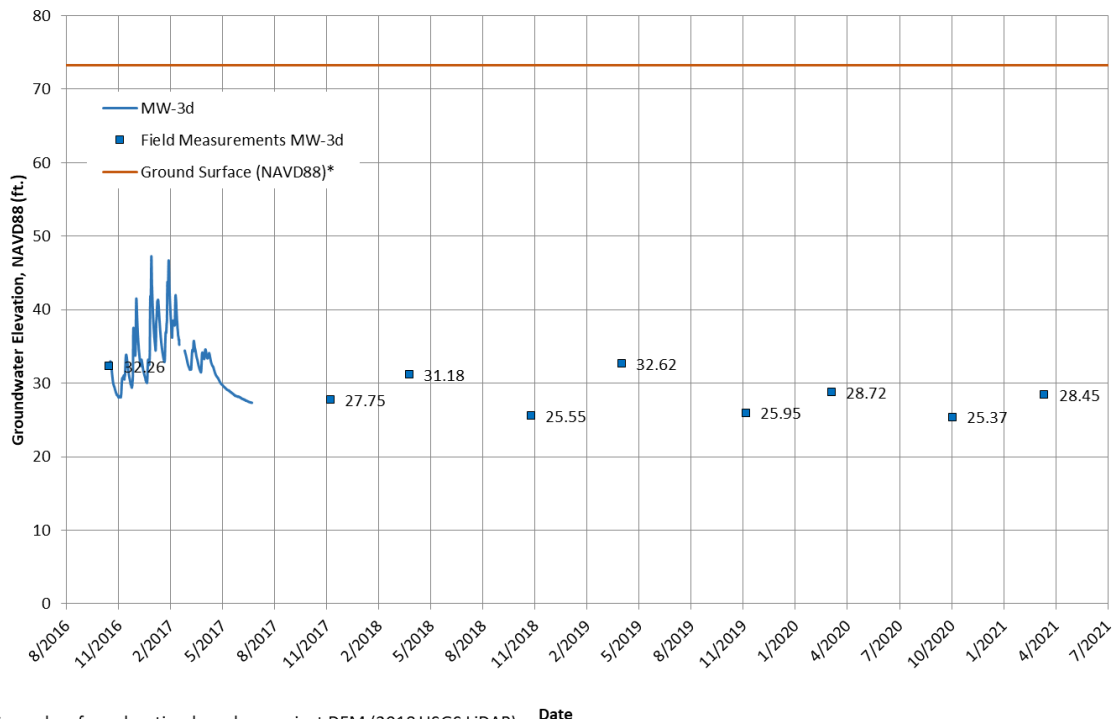


Groundwater Elevation Data for MW-2S/D



*Ground surface elevation based on project DEM (2018 USGS LiDAR)
 **MW-2d field measurement data labels are bolded.

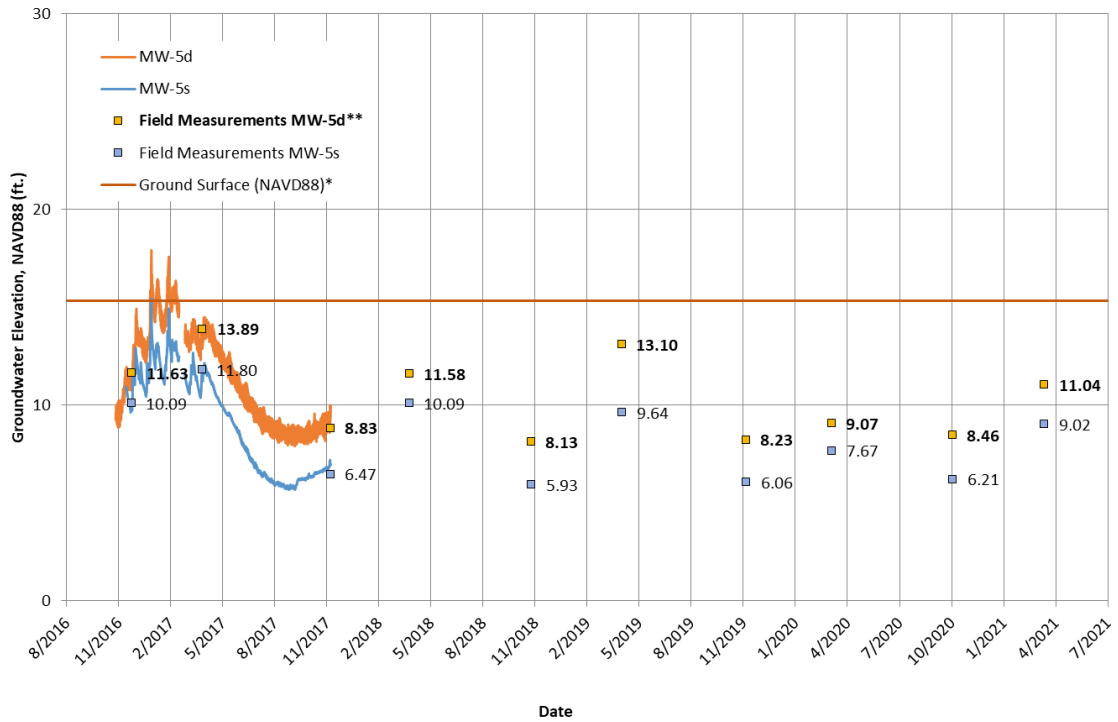
Groundwater Elevation Data for MW-3D**



*Ground surface elevation based on project DEM (2018 USGS LiDAR)
 **No data is reported for MW-3s because it is typically dry.

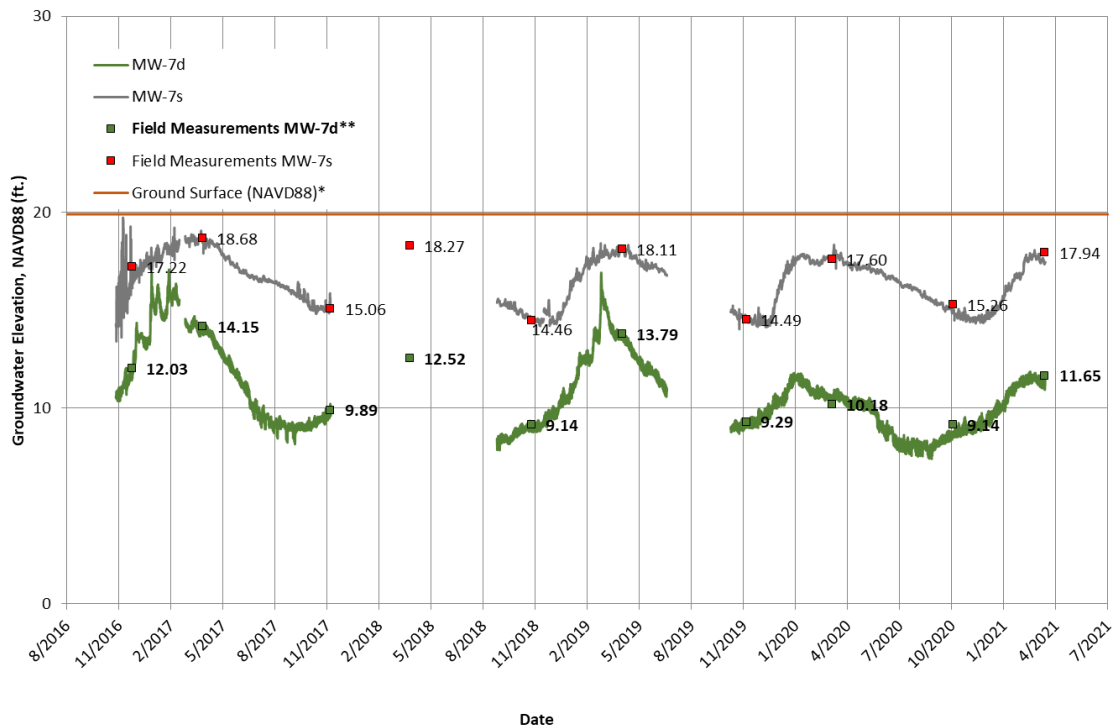


Groundwater Elevation Data for MW-5S/D



*Ground surface elevation based on project DEM (2018 USGS LiDAR)
 **MW-5d field measurement data labels are bolded.

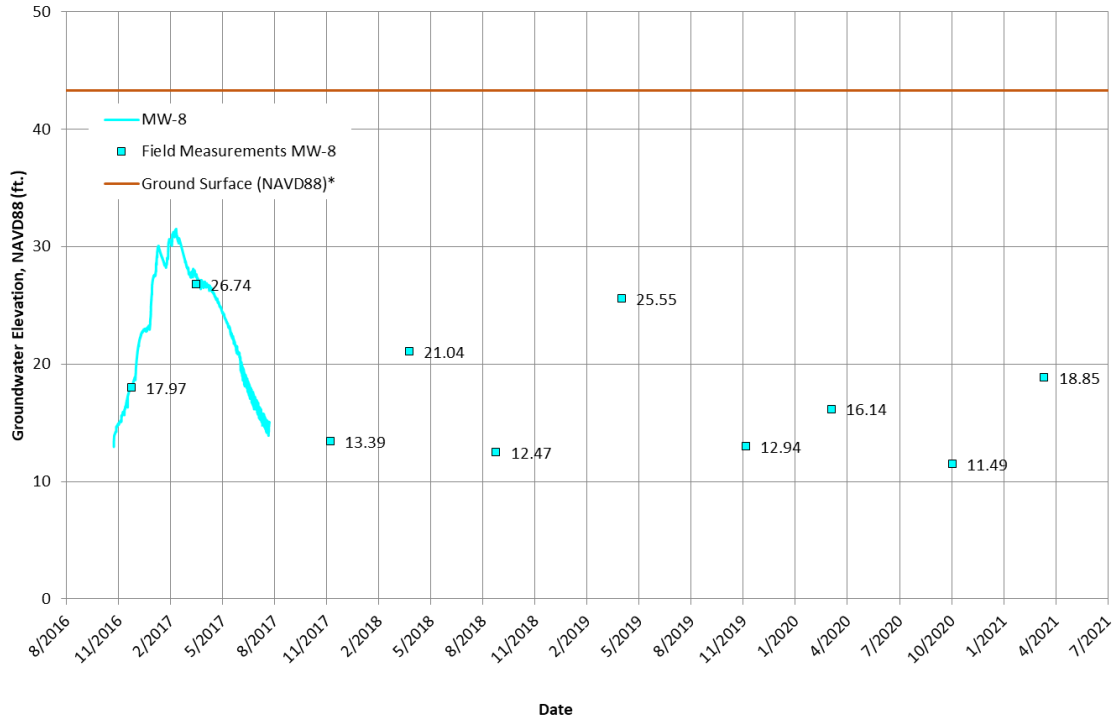
Groundwater Elevation Data for MW-7S/D



*Ground surface elevation based on project DEM (2018 USGS LiDAR)
 **MW-7d field measurement data labels are bolded.

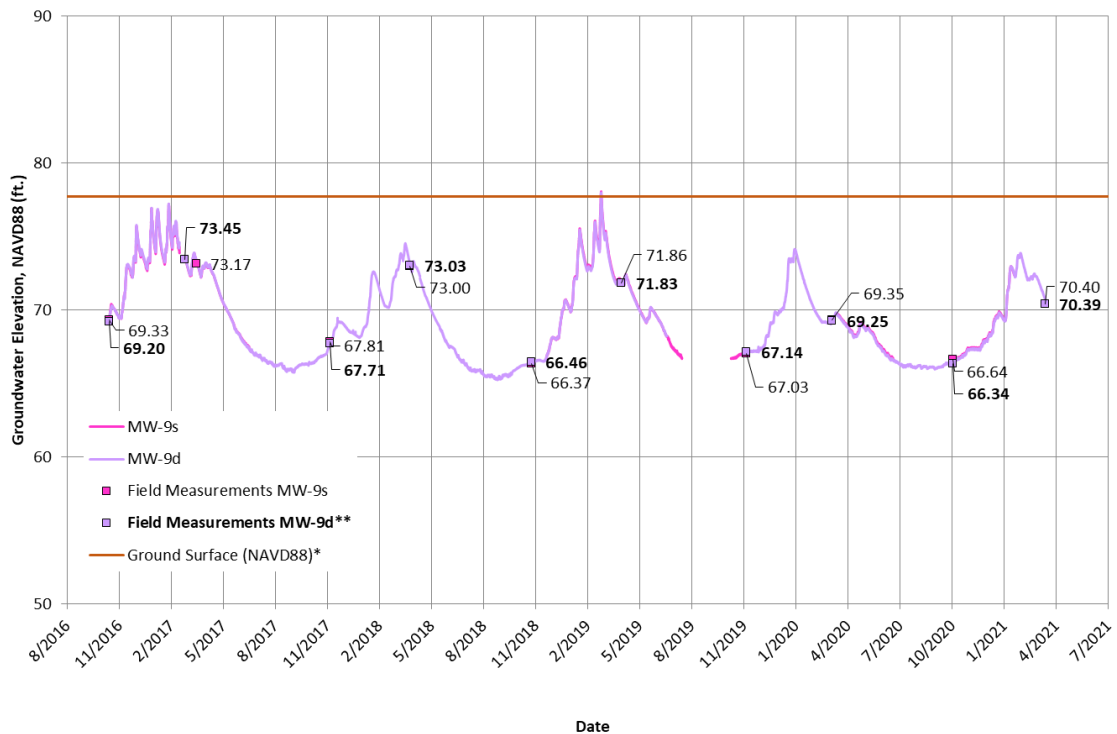


Groundwater Elevation Data for MW-8



*Ground surface elevation based on project DEM (2018 USGS LiDAR)

Groundwater Elevation Data for MW-9S/D

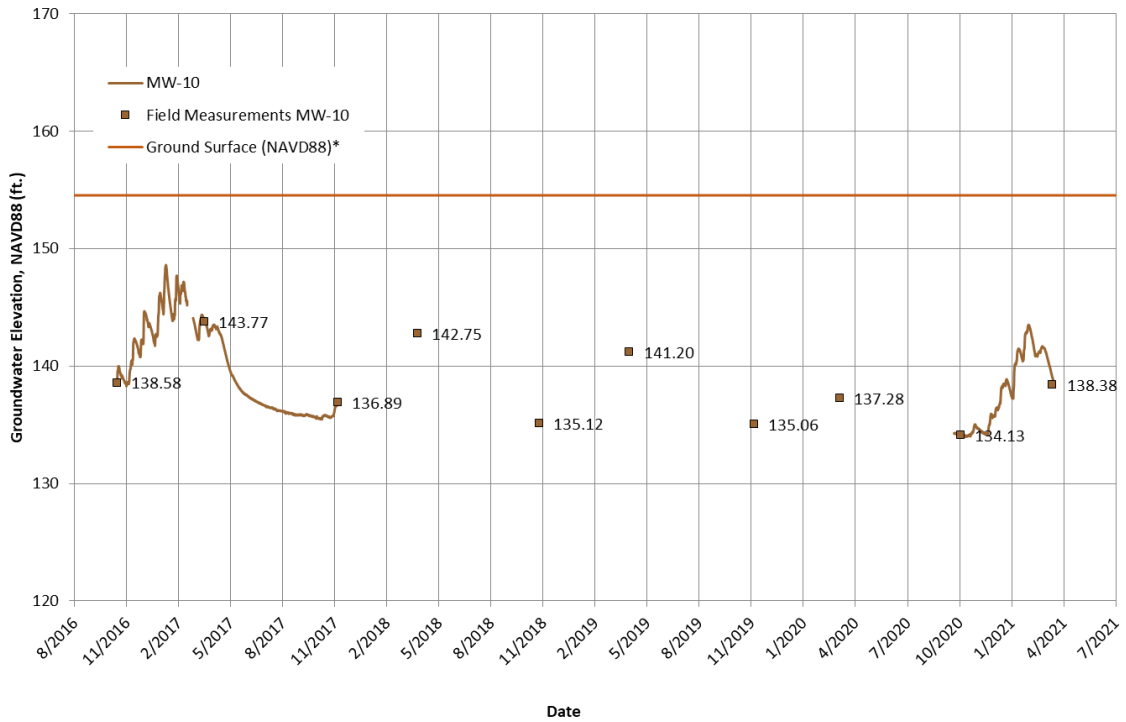


*Ground surface elevation based on project DEM (2018 USGS LiDAR)

**MW-9d field measurement data labels are bolded.

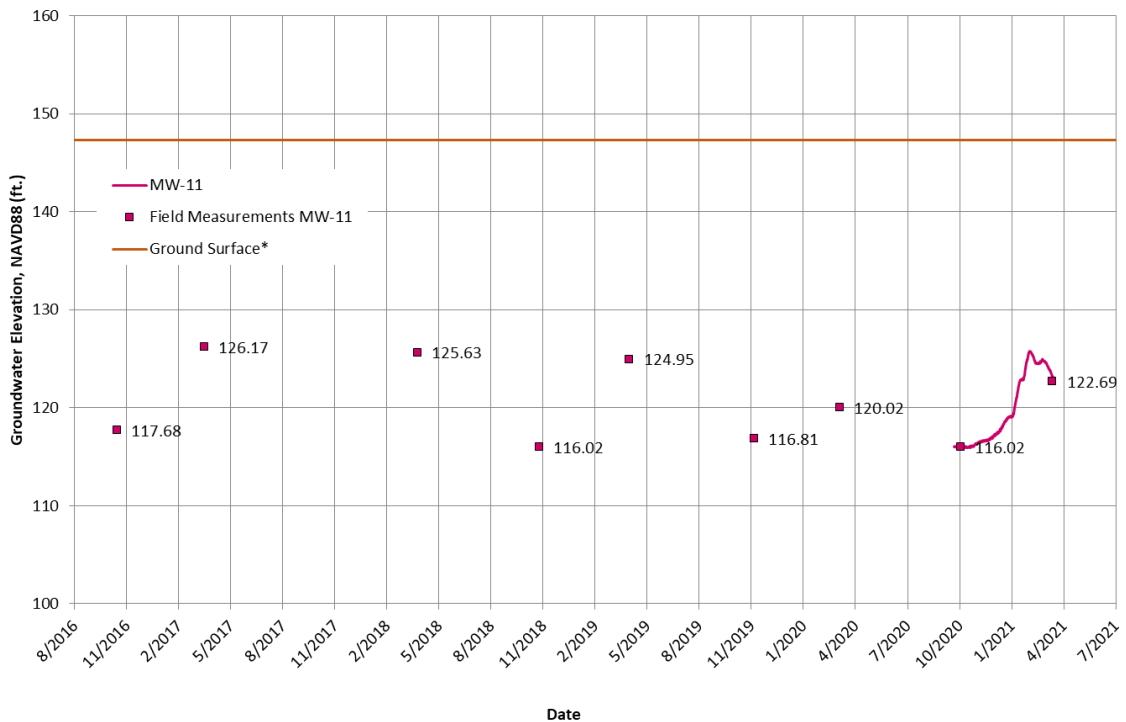


Groundwater Elevation Data for MW-10



*Ground surface elevation based on project DEM (2018 USGS LiDAR)

Groundwater Elevation Data for MW-11



*Ground surface elevation based on project DEM (2018 USGS LiDAR)

