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Semi-Annual Plume Status Report

Chino Airport Plumes
October 2023

CONTAMINANTS

The County of San Bernardino Department of Airports (County) identifies four primary volatile organic compound (VOC) contaminants associated with the Chino Airport groundwater plume: trichloroethene (TCE), 1,2,3-trichloropropane (1,2,3-TCP), cis-1,2-dichloroethene (cis-1,2-DCE), and 1,2-dichloroethane (1,2-DCA) with TCE and 1,2,3-TCP being the most frequently detected contaminants at the highest concentrations. For each of the four primary contaminants, the table below lists the California maximum contaminant level (MCL) and the maximum concentrations detected in groundwater samples from wells within the plume over the last five years.

Table 1. Maximum Concentration of Contaminants of Concern between July 2018 to June 2023

Contaminant	MCL, micrograms per liter (µgl)	Max Concentration, µgl	Sample Date	Well
TCE	5	860	April 2023	CAMW30
1,2,3-TCP	0.005	22	April 2023	CAMW13-I
cis-1,2-DCE	6	26	April 2023	CAMW30
1,2- DCA	0.5	1.4	June 2020	CAMW56

Secondary contaminants of concern include 1,1-dichloroethene (1,1-DCE), carbon tetrachloride, 1,4-dioxane, tert-butyl alcohol (TBA), and 1,4-dichlorobenzene.

LOCATION

The Chino Airport is located in the southwestern portion of the Chino Basin within the City of Chino. Exhibit 1 shows the spatial extent of the TCE and 1,2,3-TCP plumes in groundwater, as delineated by both the Chino Basin Watermaster (Watermaster) for the *2022 State of the Basin Report* and the County for their *Semiannual Groundwater Monitoring Report – Winter and Spring 2022*.[1,2] The delineations prepared

[1] West Yost. (2023). *Optimum Basin Management Program – 2022 State of the Basin Report*. Prepared for the Chino Basin Watermaster. June 2023.

[2] Tetra Tech. (2023). *Semiannual Groundwater Monitoring Report-Winter and Spring 2022*. Prepared for the County of San Bernardino Department of Airports. February 10, 2023.

by Watermaster show the spatial extent of the plume with detectable concentrations of TCE and 1,2,3-TCP based on the five-year maximum concentrations measured over the period of July 2017 to June 2022. The delineations by the County show the area where TCE concentrations are greater than or equal to the MCL of 5 micrograms per liter (µgl), and where 1,2,3-TCP concentrations are greater than or equal to the MCL of 0.005 µgl, based on concentrations measured during the 2022 winter and spring sampling events and data provided by Chino Basin Desalter Authority (CDA) for the desalter wells within the plume.

The County characterizes West and East plumes, originating from two different source areas at the Chino Airport. TCE and 1,2,3-TCP concentrations are higher within the West plumes than the East plumes, and the extent of the West plumes is also much longer. The West and East TCE plumes have been interpreted as comingling within the airport boundaries since 2017. The West and East 1,2,3-TCP plumes were shown to be comingled within the airport property for the first time in 2021.

TCE and 1,2,3-TCP Plumes

The extent of the West TCE Plume with detectable TCE concentrations greater than 0.5 µgl is about 2.5 miles long. The plume extends south-southwest approximately two miles from the source area to just north of Pine Avenue and then turns southeast extending another 0.6 miles in this direction terminating south of Pine Avenue. The change in direction of the plume in this area may be associated with the location of the Central Avenue Fault that forms a local groundwater barrier and historical pumping at irrigation wells. The source of the smaller East TCE Plume is approximately 1,500 feet northeast of the source of the West TCE Plume. The East TCE Plume comingles with the West TCE Plume on the airport property and extends southeast from the source area about 0.8 miles towards CDA well I-20. The known lateral extent of TCE at concentrations above the MCL covers an area of approximately 785 acres.

The extent of the West 1,2,3-TCP Plume with detectable 1,2,3-TCP concentrations greater than 0.005 µgl follows the same general path as the West TCE Plume and extends about 2.9 miles southwest past Pine Avenue and follows the same pathway as the West TCE Plume, turning southeast for approximately 0.6 miles just east of Euclid Avenue. The smaller East 1,2,3-TCP Plume is approximately 0.7 miles lengthwise trending south and comingles with the West 1,2,3-TCP Plume on airport property. The known lateral extent of 1,2,3-TCP in groundwater above the MCL currently covers an area of approximately 1,940 acres.

Over time, the vertical and lateral extents of the plumes have changed in response to groundwater production at nearby wells and other hydrological factors. Since monitoring began, groundwater production at the CDA wells along the western Chino Airport boundary has increased the vertical thickness of the West Plumes by more than 100 feet, and the pumping at CDA wells I-20 and I-21 has drawn the East plumes laterally in a southeast direction. Additionally, detections of 1,2,3-TCP in 2022 indicated that the low concentration portion of the 1,2,3-TCP plume south of Pine Avenue may exist further to the south, compared to earlier interpretation. Updated plume delineations by the County and by Watermaster indicate that the plume extends approximately 0.3 miles further south than in previous delineations.

REGULATORY ORDERS

- Cleanup and Abatement Order (CAO) No. 90-134 for the County of San Bernardino Department of Airports, Chino Airport—Issued to the County to address the groundwater contamination originating from the Chino Airport.
- CAO No. R8-2008-0064 for the San Bernardino County Department of Airports, Chino Airport—Required the County to define the lateral and vertical extent of the plume offsite from the Chino Airport and prepare a remedial action plan (RAP).

- CAO No. R8-2017-0011 for the San Bernardino County Department of Airports, Chino Airport—Required the County to respond to Santa Ana Regional Water Quality Control Board (Santa Ana Water Board) comments on the draft Feasibility Study and submit a final Feasibility Study. Additionally, it required the County to submit a final RAP within 60 days of the Santa Ana Water Board approval of the Final Feasibility Study and implement the RAP.

REGULATORY AND MONITORING HISTORY

In 1990, the Santa Ana Water Board issued CAO No. 90-134 to address groundwater contamination originating from the Chino Airport. From 1991 to 1992, ten inactive underground storage tanks and 310 containers of hazardous waste were removed, and 81 soil borings were drilled and sampled on the Chino Airport property. From 2003 to 2005, nine onsite monitoring wells were installed and used to collect groundwater quality samples. In 2007, the County conducted its first offsite groundwater characterization effort, which included 22 cone penetrometer tests (CPT) and direct push borings from which water quality samples were collected. In 2008, the Santa Ana Water Board issued CAO No. R8-2008-0064, requiring the County to define the lateral and vertical extent of the plume offsite and to prepare a RAP. From 2009 to 2012, 33 offsite monitoring wells were installed at 15 locations to characterize the extent of the contamination downgradient from the Chino Airport property. From 2013 to 2014, the County conducted an extensive investigation of 20 areas of concern identified for additional characterization of the soil and groundwater contamination associated with the Chino Airport. The investigative work included: piezocone-penetrometer tests, vertical-aquifer-profiling (VAP) borings with depth-discrete groundwater sampling, soil-gas probe sampling, high-resolution soil sampling and analysis, real-time data analysis, and three-dimensional contaminant distribution modeling. Following the completion of this investigative work, from September 2014 through February 2015, an additional 33 groundwater monitoring wells were installed in 17 locations on and adjacent to the Chino Airport property.

The County completed a draft feasibility study in August 2016, identifying remedial action objectives for groundwater contaminants originating from the Chino Airport and evaluating remediation alternatives for mitigation.[3] On January 11, 2017, the Santa Ana Water Board issued CAO R8-2017-0011 to the County, which superseded CAO R8-2008-0064. The order required that the County: (1) submit a final feasibility study within 60 days of receiving the Santa Ana Water Board's comments on the draft feasibility study, (2) submit a final RAP within 60 days of the Santa Ana Water Board approval of the final feasibility study, (3) implement the RAP in accordance with a Santa Ana Water Board-approved schedule, and (4) prepare and submit technical reports and work plans as the Santa Ana Water Board deems necessary. The County submitted the final feasibility study on May 15, 2017.[4] The preferred remedial action identified was a groundwater pump-and-treat system to provide hydraulic containment and treatment of both the West and the East Plumes. The Santa Ana Water Board approved the final feasibility study on June 7, 2017 and requested that a RAP be prepared.

[3] Tetra Tech. (2016). *Draft Feasibility Study Chino Airport San Bernardino County, California*. Prepared for the County of San Bernardino Department of Airports. August 2016.

[4] Tetra Tech. (2017). *Final Feasibility Study Chino Airport San Bernardino County, California*. Prepared for the County of San Bernardino Department of Airports. May 2017.

On December 18, 2017, the County submitted a draft interim remedial action plan (IRAP).[5] The IRAP was considered "interim" because the County is moving forward on an interim basis to initiate the remedial action as soon as possible, with the opportunity to evaluate and modify the remedy in the future. The draft IRAP identified a combination of institutional controls, monitored natural attenuation, and groundwater extraction and ex-situ treatment as the best remedial alternative. From April 2018 to January 2019 a CEQA analysis was completed for the proposed remedial strategy.[6] During this time, the Santa Ana Water Board and County went through a series of comments and response to comments on the draft IRAP. Modifications were made to the draft IRAP and the Final IRAP was submitted to the Santa Ana Water Board on May 18, 2020.[7] The Final IRAP was approved by the Santa Ana Water Board on November 4, 2020.

In April and May 2020, the County installed a cluster of three downgradient wells to monitor the increasing concentrations of TCE in wells located along the southeastern plume boundary. While the County was reviewing and finalizing the IRAP, they were simultaneously working on a Human Health and Screening Ecological Risk Assessment (HHERA) to support to the IRAP by identifying remedial actions to protect human health and the environment.[8] A draft of the HHERA was submitted to the Santa Ana Water Board for review in August 2018. The Santa Ana Water Board and the Office of Environmental Health Hazard Assessment reviewed the report and identified several data gaps. The Santa Ana Water Board requested that the County produce a work plan to address these data gaps, including additional shallow soil and soil gas sampling to evaluate the potential presence of VOCs and other contaminants. In July 2021, the Santa Ana Water Board approved the HHERA Data Gap Workplan and in September 2021, the results of the investigation were published in *The Supplemental Vapor Intrusion and Shallow Soil Investigation Report*.[9,10] The report concluded that no further investigation of shallow soils or soil gas was needed in several of the areas investigated, two of the areas investigated may require land-use controls, and one area will require additional investigation. On April 26, 2022, the Santa Ana Water Board provided comments on the report, requesting soil gas sampling at additional locations to determine the lateral and vertical extent of the TCE plume and the potential for vapor intrusion at various buildings. On March 14, 2023, the Santa Ana Water Board approved the *Work Plan for Focused Supplemental Investigation at Areas of Concern EE, HH, and J/K* to perform soil, soil gas, and groundwater sampling at the additional locations.[11]

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[5] Tetra Tech. (2017). *Draft Interim Remedial Action Plan Chino Airport, San Bernardino County, California*. Prepared for the County San Bernardino Department of Airports. December 2017.

[6] Filing of the Notice of Determination for the Mitigated Negative Declaration was completed on January 29, 2019.

[7] Tetra Tech. (2020). *Final Interim Remedial Action Plan Chino Airport San Bernardino County, California*. Prepared for the County of San Bernardino Department of Airports. May 18, 2020.

[8] Tetra Tech. (2018). *Human Health and Screening Ecological Risk Assessment Chino Airport San Bernardino County, California*. Prepared for the County of San Bernardino Department of Airports. August 8, 2018.

[9] Tetra Tech. (2021). F*inal Work Plan for Supplemental Data Collection for Vapor Intrusion and Shallow Soil, Chino Airport, San Bernardino County, California*. Prepared for the County of San Bernardino Department of Airports. April 9, 2021.

[10] Tetra Tech. (2021). *Supplemental Vapor Intrusion and Shallow Soil Investigation Report, Chino Airport, San Bernadino County, California*. Prepared for the County of San Bernardino Department of Airports. September 2021.

[11] Tetra Tech. (2023). *Work Plan for Focused Supplemental Investigation at Areas of Concern EE, HH, and J/K, Chino Airport, San Bernadino County, California*. Prepared for the California Regional Water Quality Control Board, Santa Ana Region. January 3, 2023.

In January 2022, the County completed construction of six piezometers at four locations in the Prado Basin riparian habitat area southwest of the airport (see Exhibit 1) to monitor potential impacts to shallow groundwater from pumping at the proposed County extraction wells.[12,13]

REMEDIAL ACTION

As described in the IRAP, remedial action for the TCE and 1,2,3-TCP plumes will consist of a groundwater pump-and-treat system, institutional controls, and monitored natural attenuation. The groundwater pump-and-treat system well network will include a total of twenty-two wells located across ten extraction well sites (EW-1 through EW-10) both onsite and offsite. Due to the depth of the plume, each extraction well site will consist of up to three individual extraction wells to focus extraction at different depths. Exhibit 1 shows the location of the ten proposed extraction well sites.

To assist in the design of the groundwater pump-and-treat system, the County installed two of the extraction well sites (EW-2 and EW-5) in 2018, along with twelve piezometers and eleven monitoring wells, and conducted aquifer pumping tests at these locations. The findings were submitted to the Santa Ana Water Board on June 19, 2019 and used by the County to refine the design of the system.[14]

Altogether, the extraction wells are predicted to produce 1,700 gallons per minute (gpm) of groundwater, with individual wells ranging from 20-150 gpm each. The extraction well network will also include existing CDA wells I-16, I-17, and I-18 to pump up to an additional 500 gpm of groundwater, and potentially CDA wells I-20 and I-21 if treatment is required.

Extracted groundwater will be conveyed via a pipeline network to the main raw water influent line to the existing CDA Chino-I Desalter facility, where it will be treated for VOCs (including 1,2,3-TCP and TCE) at a new granular activated carbon (GAC) treatment system constructed at the CDA's existing Chino-I Desalter facility (South GAC system). The South GAC system is designed to treat a total flow of 2,325 gpm from the County extraction wells and CDA wells I-16, I-17, I-18, and can be expanded to 3,125 gpm for CDA wells I-20 and I-21 if needed. Other treatment processes may also be added as needed to treat increasing concentrations of constituents or if there are new regulatory limits. The CDA designed and constructed the treatment system and is operating it, and the County is providing the funding. An additional treatment system, the North GAC Treatment System was also constructed by CDA to treat water from four CDA wells (I-I through I-4) that produce from the lower aquifer; however, this system is not associated with the County's remedial action.

Once treated at the South GAC system, water will be conveyed to the existing Chino-I Desalter that uses reverse osmosis and ion exchange to treat for nitrates and total dissolved solids (TDS), both of which are regional contaminants and not associated with Chino Airport operations or plumes. Treated water will be discharged for use as potable municipal water supply.

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[12] Tetra Tech. (2021). *Work Plan for Installation of Piezometers for Riparian Area Monitoring, Chino Airport*, *San Bernardino County, California*. Prepared for the County of San Bernardino Department of Airports. May 17, 2021.

[13] Tetra Tech. (2022). *Riparian Area Piezometer Installation Report, Chino Airport Groundwater Assessment, San Bernadino County, California*. Prepared for the County of San Bernadino Department of Airports. October 28, 2022.

[14] Tetra Tech. (2019). *Well Installation, Well Destruction, and Aquifer Pumping Test Report, Chino Airport, San Bernardino County, California*. Prepared for the County of San Bernardino Department of Airports. June 19, 2019.

On December 8, 2021, the County submitted the *Final Preliminary Well Design Report* for the pump-and-treat system for remediation of the plume and began working on a remedial action work plan (RAWP) to provide a detailed description of the remediation and construction activities associated with the implementation of the remedial action, including the construction and installation of the extraction wells, pipelines for conveyance of extracted groundwater, and the groundwater treatment system.[15] The 2022 RAWP was submitted to the Santa Ana Water Board on July 22, 2022.[16]

The RAWP divides the construction of the pump-and-treat system into two phases: Phase 1 includes the construction of onsite extraction wells and conveyance piping, as well as five monitoring wells; and Phase 2 includes the construction of offsite extraction wells and conveyance piping. During Phase 1, five extraction wells at three onsite well sites (EW-1, EW-3, and EW-4) will be installed. Five extraction wells at two onsite well sites (EW-2 and EW-5) have already been installed. Once the conveyance system is constructed and tested, wells will go into operation as they are constructed, developed, tested, and approved by State Water Resources Control Board Division of Drinking Water (DDW). Because the 2022 RAWP only addresses Phase 1 construction, an addendum to the RAWP will be submitted at a later date for Phase 2 construction of the remaining extraction wells at five offsite well sites and conveyance piping.

MONITORING AND REPORTING

Currently the County conducts quarterly, annual, or biennial water quality monitoring at 89 site-related monitoring wells and four on-site agricultural wells to monitor the plume extents. The sampling frequency is determined by well classification (i.e., background wells, horizontal or vertical extent wells, seasonal/increasing trend wells, and guard wells). The County also conducts quarterly water-level monitoring at the 89 site-related monitoring wells, five extraction wells, 12 onsite piezometers (two of which were destroyed in June 2023), and six riparian habitat area piezometers. All water quality data collected by the County are posted on the State Water Resources Control Board's GeoTracker website.[17] Conclusions from the monitoring program can also be found in the semi-annual reports posted on GeoTracker. The most recent monitoring report, the *Semiannual Groundwater Monitoring Report-Summer and Fall 2022*, was submitted to the Santa Ana Water Board on August 16, 2023.[18] Additionally, in cooperation with the CDA, the County has been sampling extraction wells and selected proxy monitoring wells since fall 2021 to submit baseline water quality data to DDW for compliance with the Policy Memo 97-005 and CDA's drinking water permit. As of October 2023, the data is also being submitted to the Santa Ana Water Board and will be available on GeoTracker.

Watermaster also collects groundwater quality samples from private wells in the plume area and at its HCMP-4 monitoring well, located in the southern end of the plume. Additionally, the CDA collects groundwater quality samples from its production wells; these data are shared with Watermaster and the County. Watermaster uses data from the County, CDA, and its own sampling to perform an independent characterization of the areal extent and concentration of the TCE and 1,2,3-TCP plumes.

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[15] Tetra Tech. (2021). *Final Preliminary Well Design Report, Chino Airport, San Bernardino County, California.* Prepared for the County of San Bernardino Department of Airports. December 8, 2021.

[16] Tetra Tech. (2022). *Remedial Action Work Plan, Chino Airport, San Bernardino County, California.* Prepared for the County of San Bernardino Department of Airports. July 22, 2022.

[17] https://geotracker.waterboards.ca.gov/profile_report?global_id=SL208634049

[18] Tetra Tech. (2023). *Semiannual Groundwater Monitoring Report-Summer and Fall 2022*. Prepared for the County of San Bernardino Department of Airports. August 16, 2023.

RECENT ACTIVITY

On May 5, 2023, the County submitted a *Sampling and Analysis Plan (SAP) Update*.[19] The original SAP was prepared in 2002 and describes the quality assurance and quality control (QA/QC) procedures that will be followed during sample collection, sample analysis, and data reporting for samples collected during ongoing remedial investigations, site mitigation/cleanup activities, and monitoring. The update was prepared to provide guidance for field operations and environmental sampling activities. The SAP will continue to be updated as necessary as site conditions and activities change and updates become available for analytical methods, field procedures, screening levels, and guidelines for data validation.

The summer and fall groundwater monitoring events were conducted in August and November 2022 in accordance with the updated SAP. During the summer 2022 sample event 21 wells were sampled for water quality and during the fall 2022 sample event 24 wells were sampled for water quality. During these sample events, 112 monitoring wells, extraction wells, and piezometers were measured for groundwater elevation. The following describes key conclusions presented in the 2022 summer and fall groundwater monitoring report:

- Groundwater elevation data continue to show two predominant gradients and slope directions of shallow groundwater in the plume area: 1) towards the east-southeast beneath the airport property, and 2) towards the south and southwest offsite with average groundwater elevations decreasing in the summer and increasing in the fall. Overall, groundwater elevation data was consistent with past monitoring events.
- TCE was detected above the MCL in 6 of the 45 wells sampled with a maximum concentration of 110 µgl at well CAMW3. 1,2,3-TCP was detected above the MCL in 9 of the 45 wells with a maximum concentration of 10 µgl at CAMW32. Cis-1,2-DCE was detected above the MCL in 1 of the 45 wells. All remaining detected VOCs had concentrations below applicable screening levels.
- Increasing concentrations of 1,2,3-TCP have been observed in wells located along the southwestern plume boundary at the toe of the plume in well cluster CAMW24. CAMW24 will continue to be monitored quarterly for changes in detected concentrations and trends.

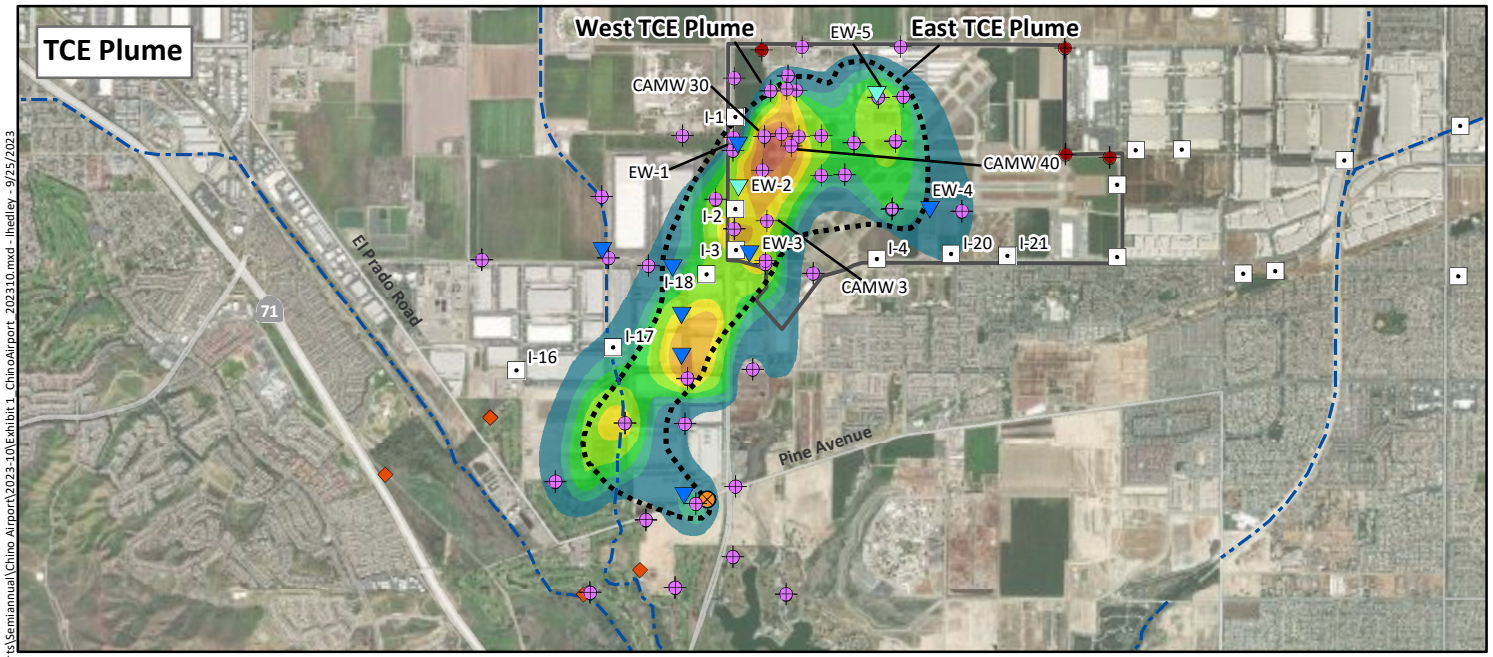
The most recent winter and spring groundwater monitoring events were conducted in January and April 2023. During these sample events, 112 monitoring wells, extraction wells, and piezometers were measured for groundwater elevation. During the winter sampling event, 20 wells were sampled and during the spring event 88 wells were sampled for water quality. Reporting of this data is currently in progress.

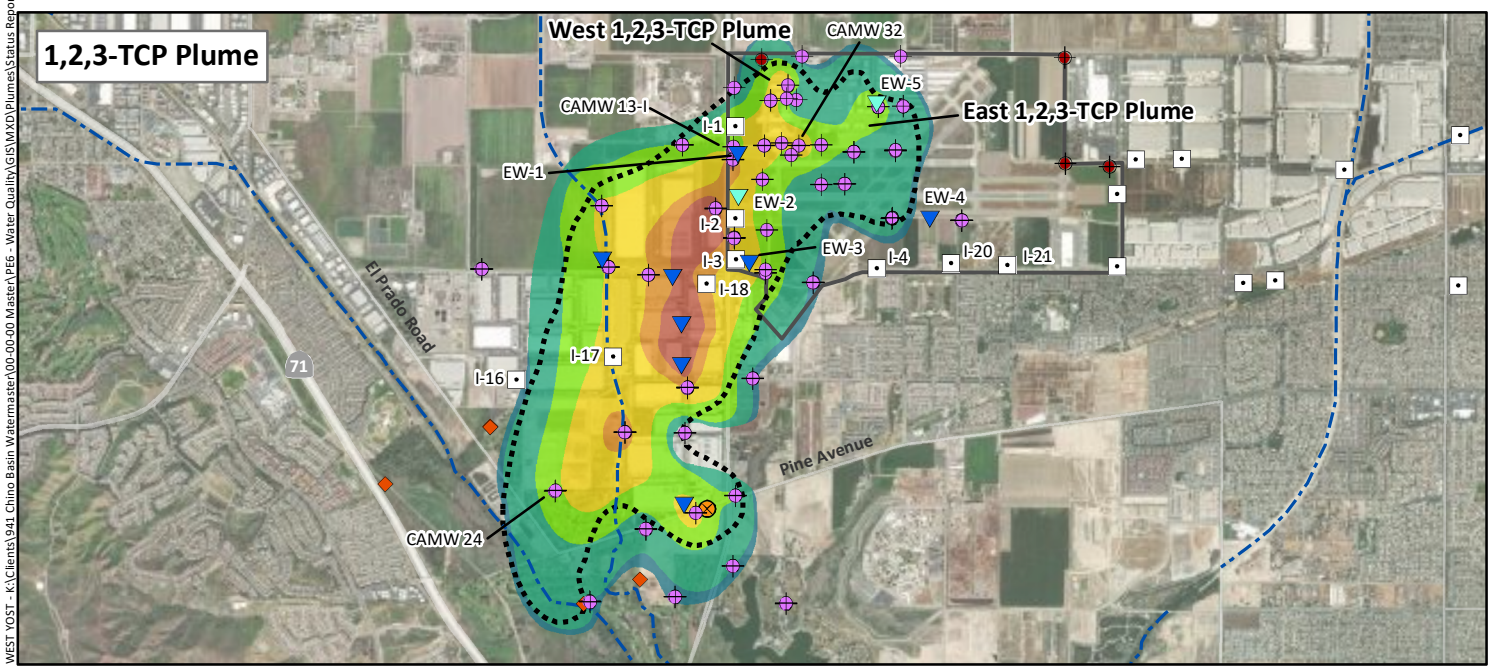
On April 25, 2023, CDA wells I-17 and I-18 began pumping and treatment of groundwater from these wells commenced at the South GAC System at Chino-I Desalter. CDA well I-17 has been offline since 2017 and CDA well I-18 has never been in operation. CDA well I-16 was already in operation prior to April. Additionally, CDA wells I-1 and I-3 began pumping on April 25, 2023 and treatment of groundwater from these wells began at the North GAC Treatment System (not associated with the County's remedial action).

[19] Tetra Tech. (2023). *Sampling and Analysis Plan Update, Chino Airport, San Bernardino County, CA*. Prepared for the County of San Bernardino Department of Airports. May 5, 2023.

In June 2023, two piezometers were destroyed in preparation of the Phase 1 installation activities and in July 2023 construction of the remaining County onsite extraction wells as part of the RAWP commenced. Construction is scheduled to be completed by 2025.

Property rights are currently in the process of being acquired for the construction of the off-site extraction wells and conveyance pipeline as part of Phase 2. The final design for the wells and pipeline should be finished during the fourth quarter of 2023 and construction is expected to begin in 2024 and be complete by 2027.





Maximum Concentration (µgL)
July 2017 - June 2022

TCE
- 0.5 to ≤ 5
- > 5 to ≤ 10
- > 10 to ≤ 20
- > 20 to ≤ 50
- > 50 to ≤ 100
- > 100 to ≤ 200
- > 200 to ≤ 500
- > 500

MCL = 5 µgl

1,2,3-TCP
- > 0.0025 to ≤ 0.005
- > .005 to ≤ .05
- > .05 to ≤ .5
- > 0.5 to ≤ 5
- >5 to ≤10
- > 10

1,2,3-TCP MCL = 0.005 µgl

(Delineated by Watermaster in the 2022 State of the Basin Report)

Approximate Extent of TCE (>5 µgl) or 1,2,3-TCP (>0.005 µgl) Plume
(Delineated by the County of San Bernardino for the Winter/Spring 2022 Groundwater Monitoring Report)

County of San Bernardino Monitoring Well
(Some locations have multiple well casings at various depths)

Former Agricultural Well

Piezometer Near Prado Basin Habitat

HCMP Monitoring Well 4

Extraction Well Cluster Constructed in 2018

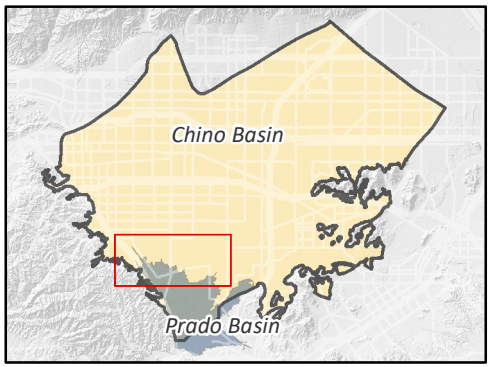
Location of Future Extraction Well Cluster

CDA Production Well

Wells are labeled by well name if mentioned in the report

Chino Airport Boundary

Streams & Flood Control Channels



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Chino Basin Watermaster
Semi-Annual Plume Report

CHINO BASIN WATERMASTER
Partners in Basin Management

Chino Airport

TCE and 1,2,3-TCP Plumes

Exhibit 1