

**FOURTH FIVE-YEAR REVIEW REPORT FOR
NEWMARK GROUNDWATER CONTAMINATION SUPERFUND SITE
SAN BERNARDINO, CALIFORNIA**



PREPARED BY

U.S. Army Corps of Engineers

Seattle District

FOR

U.S. Environmental Protection Agency

Region 9

Approved by:
DANA BARTON

Dana Barton, Assistant Director
California Site Cleanup and Enforcement Branch
Superfund and Emergency Response Division
U.S. Environmental Protection Agency, Region 9

Date:

Digitally signed by DANA BARTON
Date: 2023.09.12 09:54:00 -07'00'

Executive Summary

This is the fourth Five-Year Review of the Newmark Groundwater Contamination Superfund Site located in San Bernardino, California. The purpose of this Five-Year Review is to review information to determine if the remedy is and will continue to be protective of human health and the environment.

The Newmark Groundwater Contamination Superfund (Newmark) site is located in San Bernardino, California. The Site includes an area of approximately 23 square miles that is bounded to the east/northeast by the San Andreas Fault and the San Bernardino Mountains, to the west/southwest by the Loma Linda fault and Lytle Creek, to the south by a boundary approximated by 7th Avenue in downtown San Bernardino, and to the East-by-East Twin Creek.

The Newmark site covers part of the Bunker Hill Basin, an essential groundwater aquifer for the City of San Bernardino. Groundwater is the major source of drinking water for the City of San Bernardino, the City of Riverside, and surrounding communities. The contaminants of concern include tetrachloroethene and trichloroethene.

The Newmark site includes three Operable Units: the Newmark, Muscoy and Source. In August 2015, EPA issued a final Record of Decision for Newmark and Muscoy, selecting the existing interim remedies as the final remedy. The Source Operable Unit consists of the remaining areas outside of the Newmark and Muscoy Operable Units and does not currently have a selected remedy.

The major components of the final remedy for the Newmark and Muscoy Operable Units include a network of 14 current groundwater extraction wells which collectively pump approximately 20,000 gallons per minute of contaminated groundwater to three separate treatment plants for the removal of volatile organic compounds by granular activated carbon. The treated water is delivered to the City of San Bernardino's distribution system for further chlorine treatment to meet drinking water permit requirements before supplying to users. Over 100 groundwater monitoring wells are used to monitor the extent, hydraulic control, and cleanup progress of groundwater contaminated with volatile organic compounds. Institutional controls prevent the use of Site-related contaminated groundwater.

The treatment systems within Newmark and Muscoy are successfully capturing contaminated groundwater with each aquifer zone meeting the remedial action objectives of inhibiting migration of the groundwater contamination into clean portions of the aquifer and protecting downgradient municipal wells. The mass removal at the treatment plants continue to show progress toward restoring the aquifer to its beneficial use as a municipal and domestic water supply, while the institutional controls in place are effective in preventing exposure to contaminated groundwater. The area-wide groundwater model for this Site will be updated through 2016 and will need to be updated regularly since it is a key element in the Institutional Controls Groundwater Management Program used to analyze potential impacts of new and modified production wells and changes in artificial recharge practices. Exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection remain valid, and no changes to applicable or relevant and appropriate requirements have occurred that affect protectiveness.

The remedy at the Newmark and Muscoy Operable Unit on the Newmark Superfund Site is currently protective of human health and the environment. The extraction and treatment plants are operating as intended and institutional controls are in place preventing exposure to contaminated groundwater. In order to be protective in the long-term, the Groundwater Model should be updated to assist with ensuring capture with decreasing groundwater levels and maintaining institutional controls.

Contents

Executive Summary	i
List of Figures v	
List of Tables v	
List of Acronyms and Abbreviations.....	vi
1. Introduction	1
1.1. Background.....	3
1.2. Physical Characteristics.....	3
1.3. Hydrology.....	4
1.3.1. Regional Hydrogeology	4
1.3.2. Site-Specific Hydrogeology.....	4
2. Remedial Actions Summary	5
2.1. Basis for Taking Action	5
2.2. Remedy Selection.....	5
2.3. Remedy Implementation	8
2.3.1. Newmark Operable Unit Remedy	8
2.3.2. Muscoy Operable Unit Remedy	10
2.3.3. Institutional Controls	10
2.4. System Operations/Operation and Maintenance	11
2.4.1. Operations and Maintenance Requirements	11
3. Progress Since the Last Five-Year Review	11
3.1. Previous Five-Year Review Protectiveness Statement and Issues	11
3.2. Work Completed at the Site During this Five-Year Review Period	12
4. Five-Year Review Process.....	12
4.1. Community Notification, Involvement and Site Interviews	12
4.1.1. Five-Year Review Public Notice	12
4.1.2. Site Interviews	13
4.2. Data Review.....	13
4.2.1. Groundwater	13
4.2.2. Groundwater – Mass Remaining Estimates	23
4.2.3. Sustainability.....	30
4.3. Site Inspection	30

5. Technical Assessment	30
5.1. Question A: Is the remedy functioning as intended by the decision documents?....	30
5.2. Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Remedy Selection Still Valid?	31
5.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?	31
6. Issues/Recommendations.....	32
7. Protectiveness Statement	33
8. Next Review.....	33
Appendix A: List of Documents Reviewed.....	34
Appendix B: Site Chronology	36
Appendix C: Data Review.....	37
Appendix D: Applicable or Relevant and Appropriate Requirements Assessment ...	67
Appendix E: Public Notice	70
Appendix F: Interview Forms	71
Appendix G: Site Inspection Report and Photos	76

List of Figures

Figure 1. Location Map.....	3
Figure 2. Detailed Map of the Newmark Groundwater Contamination Superfund Site Remedy System.....	9
Figure 3. Groundwater levels at USGS monitoring station showing a decrease in water levels since 1991 and operation of Newmark and Muscoy Pump and Treatment Systems.....	14
Figure 4. Capture Zones based on Particle Tracking in the Deep Aquifer for the Newmark Plume for March 2018 and March 2022.	16
Figure 5. Capture Zones based on Particle Tracking in the Muscoy Shallow Aquifer for February 2018 and February 2022.....	17
Figure 6. Newmark North Plant Extraction Well Network.....	21
Figure 7. Newmark Plume Front Plant Extraction Well Network.	22
Figure 8. Muscoy Plume Extraction Well Network	22
Figure 9. Rate of Mass Reduction: 2013 to 2022.....	24
Figure 10. Reduction in PCE Plume Extent.	25
Figure 11. PCE Plume at and above 5 µg/L.....	26
Figure 12. PCE Plume at and above 0.5 µg/L.....	29

List of Tables

Table 1. Five-Year Review Summary Form	2
Table 2. Groundwater Cleanup Levels from 2015 Final Record of Decision	6
Table 3. Summary of Flow Performance Criteria ¹	7
Table 4. Summary of Contaminant Performance Criteria ¹	7
Table 5. Status of Recommendations from the 2018 Five-Year Review.....	12
Table 6. Summary of Mann-Kendall Trend Analysis for PCE, February 2018 to May 2022. .	20
Table 7. Historical and Current Status of Extremely Impaired Source Extraction Wells	27
Table 8. Issues and Recommendations Identified in the Five-Year Review	32
Table 9. Protectiveness Statement	33

List of Acronyms and Abbreviations

3DVA	3D variable analysis
µg/L	micrograms per Liter
City	City of San Bernardino
DTSC	California Department of Toxic Substances Control
EIS	Extremely-Impacted Source
EPA	United States Environmental Protection Agency
Site	Newmark Groundwater Contamination Superfund Site
USACE	United States Army Corps of Engineers
PCE	Tetrachloroethene
TCE	Trichloroethene

1. Introduction

The purpose of a five-year review is to evaluate the implementation and performance of a remedy to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, five-year review reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act Section 121, 40 Code of Federal Regulation Section 300.430(f)(4)(ii) of the National Contingency Plan and EPA policy.

This is the fourth Five-Year Review for the Newmark Groundwater Contamination Superfund Site. (Site). The triggering action for this statutory review is the completion of the previous Five-Year Review, signed on September 26, 2018. This Five-Year Review has been prepared because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

The Newmark site includes three Operable Units; the Newmark, Muscoy and Source Operable Units. The boundary of the Source Operable Unit is identical to that of the Newmark site; therefore, it geographically encompasses the smaller Newmark and Muscoy Operable Units within its boundary. For the purpose of this Five-Year Review, the Site is defined as the Newmark and Muscoy Operable Units and only evaluates the remedy components defined in the Final 2015 RODs.

EPA selected remedies for the Newmark and Muscoy Operable Units, in the 2015 Newmark Groundwater Contamination Record of Decision. EPA is in the process of selecting a final remedy for the remaining Northwest Area of the Source Area Operable Unit¹.

The Newmark Groundwater Contamination Superfund Site Five-Year Review was led by Region 9 Remedial Project Managers Sharissa Singh and Kuceli Mari. Participants included Cynthia Wetmore and Cynthia Ruelas, EPA Region 9 Superfund Five-Year Review Coordinators, and, from the U.S. Army Corps of Engineers (USACE): Marlowe Laubach, environmental engineer; Travis Kelsay, geologist; Kris Addis, geologist; and Helen Sanchez, civil engineer. The review began on November 7, 2022.

¹ The Northwest Area of the Source OU was historically referred to as the “*Northwest Source Area*” or “*NWSA*.” For the purposes of the future Source OU-related uses, the name has been changed to “*Northwest Area of the Source OU*” or “*Northwest Area*.”

Table 1. Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Newmark Groundwater Contamination Superfund Site		
EPA ID: CAD981434517		
Region: 9	State: CA	City/County: San Bernardino
SITE STATUS		
National Priorities List Status: Final		
Multiple Operable Units? Yes	Has the site achieved construction completion? No	
REVIEW STATUS		
Lead agency: EPA		
Author name: Sharissa Singh, EPA RPM		
Author affiliation: EPA Region 9		
Review period: 11/7/2022 - 6/6/2023		
Date of site inspection: 4/4/2023		
Type of review: Statutory		
Review number: 4		
Triggering action date: 9/26/2018		
Due date (five years after triggering action date): 9/26/2023		

1.1. Background

The Newmark Groundwater Contamination Superfund Site encompasses 23 square miles within the Upper Santa Ana River Basin (also known as the Bunker Hill Basin) in San Bernardino, California (Figure 1). Site groundwater contamination impacts the drinking water resource in the region. The contaminants of concern include tetrachloroethene (PCE) and trichloroethene (TCE).

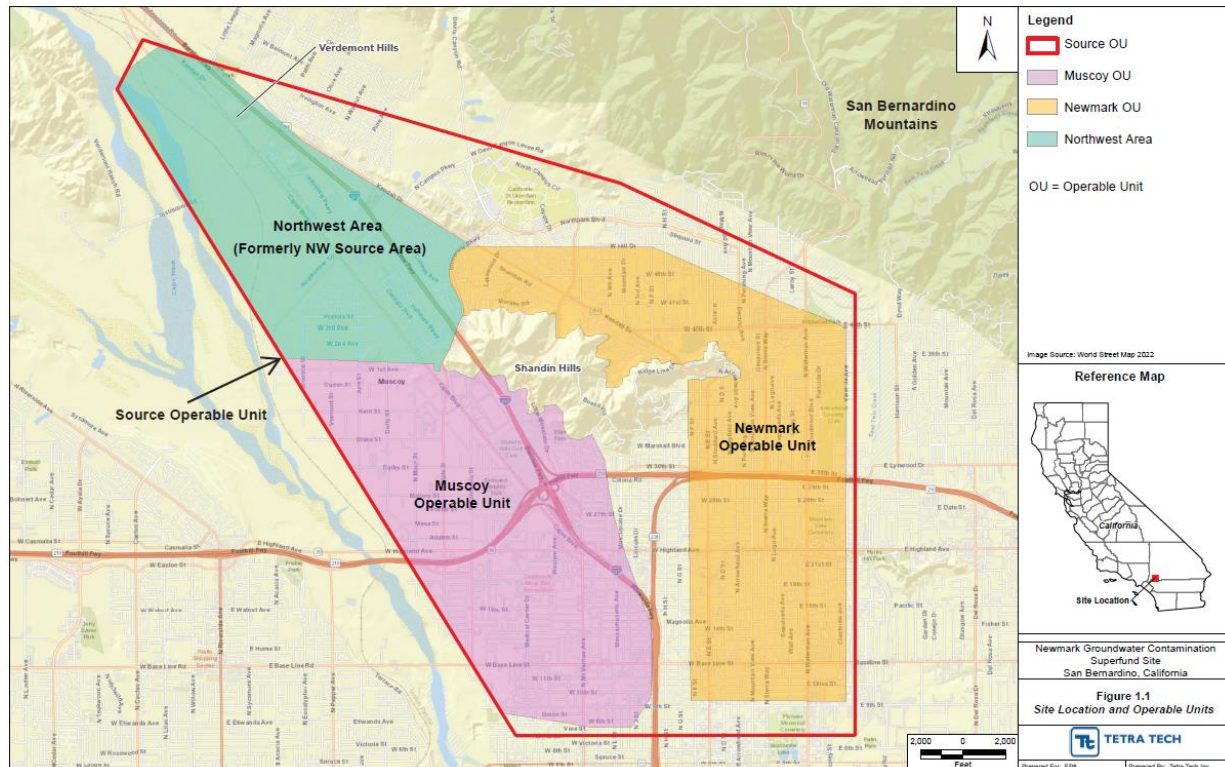


Figure 1. Location Map

1.2. Physical Characteristics

Groundwater contamination at the Site impacts the drinking water resource in the 100-square mile Bunker Hill Basin aquifer, a primary source of drinking water for cities located in inland Southern California. Bunker Hill Basin is bounded by the San Bernardino and San Gabriel Mountains to the north, the Crafton Hill and badlands on the southeast, and by a hydrogeological barrier formed by the San Jacinto fault along the southwest. Waters flowing from all parts of the aquifer join in a confined "artesian zone" before leaving the basin, where the Santa Ana River crosses the San Jacinto fault line.

Urban development within the Site area has replaced much of the native landscape. The part of the Site covered by the Newmark and Muscoy areas is currently used for light industrial, commercial, and residential purposes. There is no indication that land use in the area will change.

1.3. Hydrology

1.3.1. Regional Hydrogeology

Coarse erosional material (alluvial and river channel deposits) has accumulated in this area of the basin to depths of 400 feet to over 1,900 feet. A very important geologic feature impacting the flow dynamics of groundwater in the area is the Shandin Hills. Shandin Hills is a structurally compressive feature created by Southern California tectonic forces that have caused bedrock to buckle upwards and surface as hills and mountains. Groundwater that encounters this feature will flow to the east or west of this feature, depending on water levels, before resuming a southward path toward the Santa Ana River.

Most of the western portion of the basin is an unconfined aquifer. In the lowest area of the basin (the south-central portion around the Santa Ana River), several extensive clay layers have formed an aquitard, overlying and capping the water-bearing sand and gravel aquifers. This confined portion of the aquifer produces a large supply of water for nearby communities. The southern area of the Site transitions into this confined region. According to the San Bernardino Municipal Water District, the Bunker Hill Basin is capable of storing approximately 5 million acre-feet (1.6 trillion gallons) of groundwater and producing 250,000 acre-feet (81 billion gallons) of groundwater per year, making this groundwater resource very important to the viability of the region.

1.3.2. Site-Specific Hydrogeology

The alluvial deposits in the Newmark and Muscoy areas consist mostly of sand, gravel, boulders, and occasional discontinuous clay lenses. These clay lenses increase in thickness and number toward the south and the central portion of the basin. The alluvium in the Newmark Operable Unit area was divided into three depositional sequences (EPA 1993):

- The northern depositional sequence, located north of the Shandin Hills.
- The middle or transition depositional sequence, located from the northeast edge of Shandin Hills and extending south to approximately west of Perris Hill.
- The southern depositional sequence, located near the 16th Street well and extending south.

The northern depositional sequence forms a single, unconfined aquifer consisting of predominantly coarse-grained sediments. Sediments in the northern depositional sequence consist primarily of sand, gravel, and boulders with little or no clay. Depth to groundwater ranges from 100 to 220 feet below ground surface and fluctuates with season.

The middle depositional sequence forms a single unconfined aquifer consisting primarily of coarse-grained sediments with minor discontinuous fine grained (silt and clay) lenses. It consists mostly of sand and silt with significant intervals of gravel and boulders. Some thin clay lenses were found in this area and are concentrated between 185 to 550 feet below ground surface. Depth to groundwater ranged from 100 to 300 feet below ground surface and fluctuates with season.

The southern depositional sequence forms separate aquifers: an upper unconfined aquifer and a lower confined aquifer. It consists of silt, sand, and gravel with many clay lenses. A clay confining layer divides

groundwater into unconfined and confined flow regimes. A 200- to 300-foot zone of interfingering clay lenses located approximately 75 feet below ground surface demarcates the boundary between the upper unconfined aquifer and lower confined aquifer. Depth to groundwater in this area of the Site is 50 to 180 feet below ground surface and fluctuates with season.

2. Remedial Actions Summary

2.1. *Basis for Taking Action*

In 1980, the California Department of Health Services (now the California Department of Toxic Substances Control) found PCE, TCE, freons, and decay byproducts from these compounds in large portions of the groundwater within the Bunker Hill Basin, which provides drinking water to the San Bernadino community. The discovery of these contaminants resulted in the closing of 20 water supply wells within a 6-mile radius of the Site. The presence of groundwater contamination concentrations above federal drinking water standards provided the basis for taking action.

2.2. *Remedy Selection*

EPA selected remedial actions at the Site through issuance of an Interim Record of Decision for the Newmark Operable Unit in 1993, and an Interim Record of Decision for the Muscoy Operable Unit in 1995. EPA issued a Final Record of Decision for the Newmark and Muscoy Operable Units in August 2015. The final remedy addresses the groundwater contamination at the Newmark and Muscoy Operable Units by adopting the components and performance requirements of the two interim groundwater containment remedies implemented through previous decision documents. It also updated the remedial action objectives.

The following remedial action objectives have been established for the Newmark and Muscoy Operable Units:

- Inhibit migration of groundwater contamination into clean portions of the aquifer;
- Limit the flow of additional contamination into the Newmark Operable Unit plume area;
- Protect downgradient municipal supply wells south and southwest of the Shandin Hills;
- Restore the aquifer (Site groundwater) to its designated beneficial use as an existing municipal and domestic water supply;
- Protect the public from coming into contact with contaminated groundwater; and
- Protect the function and effectiveness of the treatment remedy.

The major components of the final remedy for the Newmark and Muscoy Operable Units include:

- Two Extraction Well Networks and Multiple Granular Activated Carbon Treatment Plants – Fourteen groundwater extraction wells are located in the eastern and southern areas of the Site. These wells pump contaminated groundwater at approximately 20,000 gallons per minute to three

treatment plants to remove volatile organic compounds using granular activated carbon. The City conveys the treated water to its distribution system for further treatment to meet drinking water permit requirements.

- Monitoring Wells – The extent, hydraulic control, and cleanup progress of Site-related volatile organic compound groundwater contamination is monitored using a network of over 100 monitoring wells.
- Institutional Controls – A City ordinance requires a permit for any new, non-municipal well, or change in existing well pumping or injection conditions, to prevent spread of contamination and restrict public access to contaminated groundwater.

The EPA also established groundwater cleanup levels for each contaminant of concern in the 2015 Final Record of Decision (Table 2).

Table 2. Groundwater Cleanup Levels from 2015 Final Record of Decision

Chemical	Cleanup Levels (µg/L)	Basis for Cleanup Level
PCE	5	Federal Drinking Water Level
TCE	5	Federal Drinking Water Level

The 2015 ROD identified compliance with California Department of Public Health Drinking Water Division Policy Memo 97-005 as a performance standard to address extremely impaired sources of groundwater where the Newmark Site is located. Per the terms of this policy, if groundwater supply wells are used to provide drinking water, the extracted water must meet water well permit limits of non-detect for contaminants prior to distribution. For the Newmark Site, compliance with the well permit requirements mean that TCE and PCE concentrations must be 0.5 µg/L or below prior to distribution. All extraction wells associated with the three treatment systems for the Newmark and Muscoy Operable Unit plumes are designated as Extremely Impacted Source (EIS) wells because they are part of the drinking water supply.

The 2015 ROD kept all the Interim RODs remedial action objectives and did not change the performance standards set out in the 2005 Consent Decree. Based on the remedial action objectives in the Interim Record of Decisions, the 2005 Consent Decree Statement of Work includes Operations and Maintenance requirements with measurable performance criteria to facilitate enforcement of the Consent Decree (Tables 3 and 4). These criteria are based on both flow capturing analyses and contaminant concentration, taking into consideration the Newmark plume “impaired source” classification as a Drinking Water source in the Drinking Water Permit requiring cleanup to non-detect for impaired drinking water source.

Table 3. Summary of Flow Performance Criteria¹

Operating Conditions ²	Extraction Well Network	Particle Capture Criteria ³
Operations Within the Maximum Target Extraction Rate ⁴	Newmark Plume Front Extraction Well Network	90% particle capture or greater based on a three-month rolling average
	Muscoy Plume Extraction Well Network - Shallow Plume	80% particle capture or greater based on a three-month rolling average
	Muscoy Plume Extraction Well Network - Intermediate/Deep Plume	85% particle capture or greater based on a three-month rolling average
Transition Phase and/or Non-Routine Phase Operations ⁵	Newmark Plume Front Extraction Well Network	85% particle capture or greater based on a three-month rolling average
	Muscoy Plume Extraction Well Network - Shallow Plume	75% particle capture or greater based on a three-month rolling average
	Muscoy Plume Extraction Well Network - Intermediate/Deep Plume	80% particle capture or greater based on a three-month rolling average

Notes:

- (1) Modified from Operation and Sampling Analysis Plan (Stantec, 2009a) Table 8-4.
- (2) Combined flow rate at which the Newmark Plume Front or Muscoy Plume extraction well network is operating.
- (3) Minimum percentage of particles placed across the subject contaminant plume (as defined by the 2.5 µg/L PCE concentration contour) that are required to be captured per monthly flow performance analysis.
- (4) Maximum Target Extraction Rate: The annual Target Extraction Rate plus 10%.
- (5) Described in Baseline Mitigation Plan (BMP) (Stantec, 2009b).

Table 4. Summary of Contaminant Performance Criteria¹

Wells Designated for Contaminant Performance		Suspended Wells	
Newmark Plume Front Extraction Well Network	MW-012A/B/C, MW-013A/B/C, MW-014A/B/C, MW-015A/B/C	None	
Muscoy Plume Extraction Well Network	MW-135A/B/C, MW-136A/B/C, MW-137A/B/C, MW-138A/B/C, MW-139A/B/C, MW-141A	MW-135A, MW-137A, MW-138A, MW-141A	
Criteria	PCE Drinking Water MCL ² (µg/L)	TCE MCL ² (µg/L)	Immediate Action
Increasing Trend	Based on Analysis	Based on Analysis	Increase Monitoring to Quarterly
> ½ MCL	2.5	2.5	Increase Monitoring to Quarterly
> MCL	5	5	Evaluate Mitigation Measures

Notes:

- (1) Modified from Operation and Sampling Analysis Plan (Stantec, 2009a) Table 8-9.
- (2) The Maximum Contaminant Level for Drinking Water (MCL) presented is based on the most conservative (lowest) value presented in Federal and/or State regulations.

2.3. *Remedy Implementation*

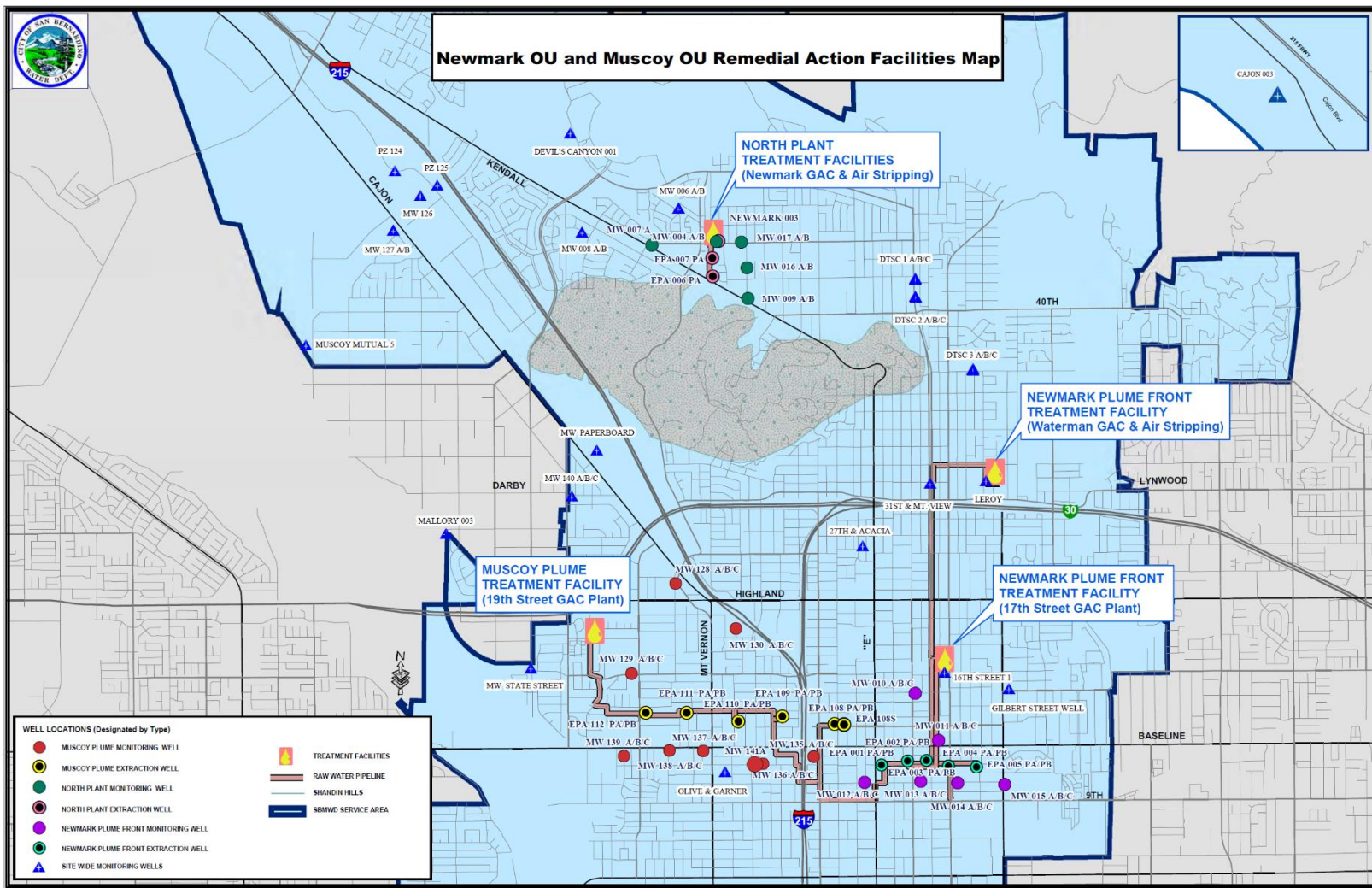
2.3.1. Newmark Operable Unit Remedy

EPA completed construction of the interim remedy for the Newmark Operable Unit in 1998. Components of the remedy include:

- Construction of groundwater extraction and treatment facilities at two locations (the Newmark Plant in the northern portion, and the Waterman Plant in the southern portion of the Newmark Operable Unit);
- Treatment of extracted groundwater using granular activated carbon at the Newmark Plant and the Waterman Plant;
- Pipelines to bring contaminated water from three northern and four southern extraction wells to the treatment plants; and
- Monitoring wells to assess the performance of the remedy.

The San Bernardino Municipal Water Department uses the treated groundwater as potable water per Water Supply Permit number 03-13-009P-002 issued by the California Department of Public Health. In October 2000, the Newmark area interim remedy became operational and functional, and the City began operation and maintenance under a Cooperative Agreement with EPA.

Following the completion of the 19th Street Water Treatment Plant (part of the Muscoy remedy), the flow from one Newmark area extraction well (EPA 001) was conveyed for treatment to the 19th Street Water Treatment Plant. Extraction well EPA 003 was connected to the 17th Street Treatment Plant (Figure 2). The extraction well networks treated at the Waterman and 17th Street Treatment Plants are referred to as the Newmark Plume Front. In 2007, the water distribution was re-configured to allow the Newmark Plume Front to be treated by the Waterman plant. The 17th Street Treatment Plant is currently offline, but remains available for future use, if needed.



Source: City of San Bernardino 2022. 2nd Semi-Annual 2021 Progress Report

Figure 2. Detailed Map of the Newmark Groundwater Contamination Superfund Site Remedy System

2.3.2. Muscoy Operable Unit Remedy

From 2001 to 2005, EPA installed the Muscoy Operable Unit groundwater extraction and treatment system. Components include:

- Five extraction wells in the southern portion of the Muscoy Operable Unit;
- Treatment of extracted groundwater using granular activated carbon at the 19th Street Water Treatment Plant;
- Pipelines connecting one Newmark area extraction well to the 19th Street Water Treatment Plant;
- Pipelines from the Muscoy extraction well system to the 19th Street Water Treatment Plant; and
- A monitoring well network to assess the performance of the remedy.

EPA declared the Muscoy groundwater treatment system operational and functional on September 28, 2007. The operation and maintenance for the Muscoy interim remedy started on October 1, 2007. The Drinking Water Permit was modified to include the Muscoy system treated water as potable water.

2.3.3. Institutional Controls

EPA established institutional control requirements in the 2004 Explanation of Significant Differences for the Newmark and Muscoy areas to “assure that the Newmark and Muscoy extraction and treatment systems remain effective in meeting the objectives of capturing contaminated groundwater and inhibiting the migration of groundwater contamination into clean portions of the aquifer.” The City has implemented the institutional controls through a City Ordinance, while the water purveyors operating wells within the Bunker Hill Basin have adopted a groundwater management agreement.

On March 20, 2006, the City adopted an ordinance placing requirements on any new domestic well drilled within the Site management zone (San Bernardino Municipal Code, Title 13.25, ordinance MC-1221, passed on March 30, 2006). The City ordinance requires entities that propose to install or modify a production well, or to modify artificial recharge practices within a designated management zone, to submit a permit application (or functional equivalent) detailing the location, construction, and pumping rate of the proposed well, or the location and volume of water of a proposed artificial recharge activity.

The City and several local water purveyors adopted an Institutional Controls Groundwater Management Program on June 30, 2010. The Institutional Controls Groundwater Management Program is intended to be the functional equivalent of the City Ordinance for the water purveyors that are parties to the agreement. The objective of the City Ordinance and Institutional Controls Groundwater Management Program is to avoid spreading contaminated water into clean drinking water wells by simulating, in advance, the impact of any new well construction, changes to existing municipal well construction or changes in artificial recharge practices to the performance of the Site remedy. To facilitate this, the City developed the Newmark Groundwater Flow Model to analyze the potential impacts of new and modified production wells, and changes in artificial recharge practices.

The Institutional Controls Groundwater Management Program group meets every two months as part of the regularly scheduled Basin Technical Advisory Committee meetings. Issues pertaining to the Institutional Controls Groundwater Management Program are discussed on an as needed basis.

Periodically, updates are provided to the Basin Technical Advisory Committee by San Bernardino Municipal Water District and Valley District on the status of the Newmark Groundwater Flow Model.

The Newmark Groundwater Flow Model has not been updated since the 2018 Five-Year Review.

2.4. System Operations/Operation and Maintenance

2.4.1. Operations and Maintenance Requirements

The final Newmark and Muscoy Operations and Maintenance Plan (City of San Bernardino, 2008) describes the operational parameters, monitoring frequencies, and preventative maintenance frequencies for all the treatment systems and their associated components.

The monitoring network at the Site evaluates the performance of the groundwater extraction system, monitors the groundwater contaminant plume, and monitors the groundwater flow direction to ensure proper placement of the extraction and monitoring wells. The monitoring wells and piezometers associated with the extraction well networks are sampled semiannually for volatile organic compounds. Site-wide monitoring wells are sampled annually and analyzed for volatile organic compounds.

3. Progress Since the Last Five-Year Review

3.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statements from the 2018 Five-Year Review for the Newmark Groundwater Contamination Superfund Site stated the following:

“The remedy at the Newmark Operable Unit is protective of human health and the environment. The extraction and treatment systems in place remove groundwater contaminants and limit further contaminant migration. Institutional controls are in place and effective in preventing exposure to contaminated groundwater.”

“The remedy at the Muscoy Operable Unit currently protects human health and the environment because the extraction and treatment systems in place remove groundwater contaminants and limit further contaminant migration. Institutional Controls are in place and effective in preventing exposure to contaminated groundwater.”

The 2018 Five-Year Review included one issue and recommendation (Table 5).

Table 5. Status of Recommendations from the 2018 Five-Year Review

Operable Unit #	Issue	Recommendations	Current Status	Current Implementation Status Description
Muscoy	The potential for incomplete capture is an issue for the shallow Muscoy aquifer due to decreasing groundwater levels over the past 15 years.	Develop and implement a plan to ensure plume capture in the shallow Muscoy aquifer during low groundwater conditions.	Ongoing	EPA continues to work with the San Bernardino Municipal Water District to update the Newmark Groundwater Flow Model. Additional evaluations were completed and presented to EPA with respect to plume capture in the shallow Muscoy aquifer.

3.2. Work Completed at the Site During this Five-Year Review Period

From June 2017 through June 2022, the treatment systems processed 27,595 million gallons of contaminated groundwater. The cumulative contaminant mass removed from 2000 to June 2022 is 3,961 pounds.

During this review period San Bernardino Municipal Water District reported that they operated the extraction well networks out of compliance with flow performance criteria on several occasions, as described in the Progress Reports (2018-2022). The out-of-compliance episodes were noted as being due to an extraction well, or multiple extraction wells, being down for maintenance at various times throughout the review period. Stantec representatives indicated that the piezometers at extraction wells EPA 109, located near MW-136A, and EPA 112, located near MW-139A, were not accurately reading water levels because the piezometers installed within gravel pack connect all three aquifer zones. Stantec estimated that inaccurate water level readings were affecting the calculation for percent capture, resulting in a higher theoretical capture than actual conditions (Stantec, verbal communication 2018). Stantec indicated that San Bernardino Municipal Water District plans to install new extraction wells and piezometers at wells EPA 109 and EPA 112 to improve water level measurement accuracy and calculations for capture analysis in the shallow Muscoy aquifer.

4. Five-Year Review Process

4.1. Community Notification, Involvement and Site Interviews

4.1.1. Five-Year Review Public Notice

EPA issued a public notice in the *Inland Empire News* on May 10, 2023, announcing the third Five-Year Review of the Newmark Groundwater Superfund Site and inviting the public to learn about the process and submit any comments to EPA. EPA did not receive any comments. The results of the review and the report will be made available at the Site information repository located at John M. Pfau Library, 5500 University Pkwy, San Bernardino, California, and at the EPA Superfund Records Center.

4.1.2. Site Interviews

During the Five-Year Review process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The results of these interviews are summarized below. The complete interview forms are presented in Appendix F.

Mr. Steve Miller, City of San Bernardino Municipal Water District Director of Water Utility, stated that the remedy is functioning as intended and is performing well. Targeted volatile organic compounds are being removed from the groundwater and concentrations are decreasing in extraction wells and downgradient monitoring wells. Treated water meets state and federal drinking water standards. Mr. Miller notes decreases in groundwater levels due to prolonged drought impact the overall efficiency of the treatment systems. Mr. Miller notes that continued water level decline impacts the long-term ability of the remedy to extract groundwater from the shallow aquifer.

Mr. Mark Eisen, Stantec consultant for the San Bernardino Municipal Water District, stated that the systems are operating as expected with routine equipment maintenance and replacement. Pump/motor failure downtime has increased in the last five years due to supply chain issues.

Ms. Michelle Micucci, California's Department of Toxic Substances Control Project Manager, acknowledged that volatile organic compounds were detected in several municipal water supply wells within the northern San Bernardino/Muscoy region. Generally, PCE and TCE concentrations in groundwater have been reduced to at or below their federal or state drinking water standards.

4.2. Data Review

4.2.1. Groundwater

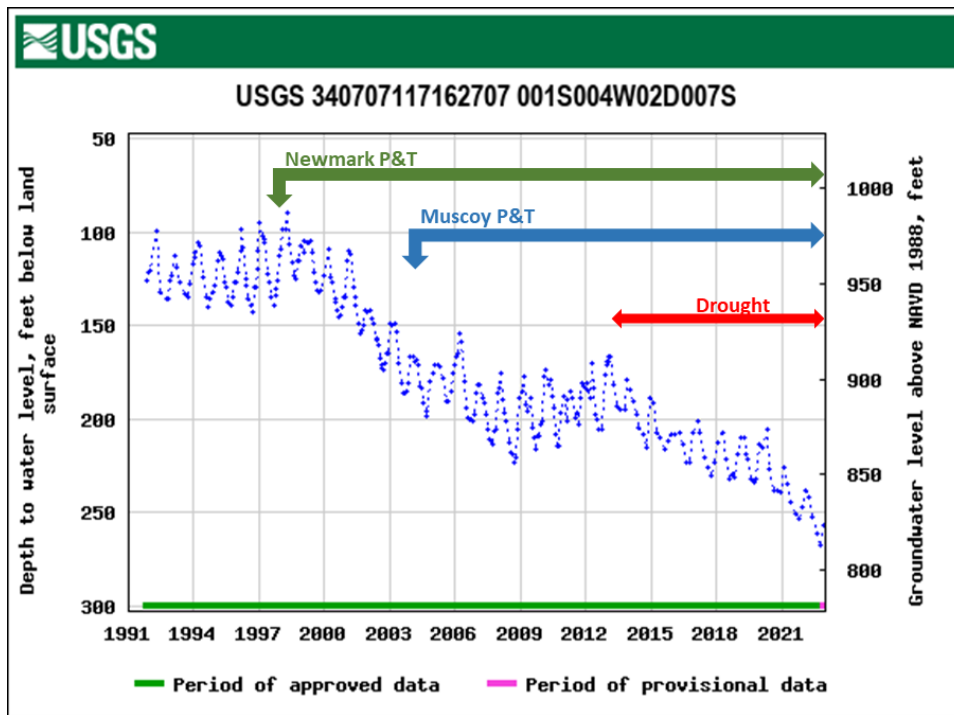
Data review for groundwater included reviewing the ten City of San Bernardino Progress Reports developed during the review period for meeting the remedial action objectives: 1) inhibiting migration of the groundwater contamination into clean portions of the aquifer, 2) limiting additional contamination from continuing to flow into the Newmark plume, 3) protecting downgradient municipal wells, and 4) restoring the aquifer to its beneficial use. With isolated exceptions, the remedy is successful in capturing groundwater containing contaminant concentrations greater than the federal drinking water standard within each aquifer zone, meeting the remedial action objectives. However, the groundwater model is not currently up to date for this five-year review. The model is meant to provide insight into future impacts from changing site conditions such as declining water levels and extraction rates.

Inhibiting Migration of Groundwater Contamination

In absence of a groundwater model to reflect current groundwater elevations and pumping conditions, EPA evaluated contaminant migration based on PCE concentrations and groundwater elevations to demonstrate potential migration.

Groundwater levels have been decreasing since the Newmark Treatment System startup (Figure 3). In some areas of the Site, groundwater levels have decreased more than 100 feet in the past 15 years. During

the review period, California experienced drought conditions. Groundwater levels reflected these drought conditions, which is typical of arid environments. If contamination currently remains adsorbed to the soil in the vadose zone and groundwater levels increase in the future, then there is the potential for contaminant concentrations to rebound. In addition, the decrease in groundwater levels impacts the performance of the extraction wells as groundwater levels fall below optimal screen intervals and ultimately decreasing efficiency. However, San Bernardino Municipal Water District monitors changes in performance and makes necessary adjustments to meet performance criteria. To address the decreasing groundwater level on the Muscoy plume, San Bernardino Municipal Water District is exploring recharging the basin upgradient of the Muscoy operable unit. San Bernardino Municipal Water District continues to manage extraction well performance by installing packers in the extraction wells to isolate intervals within the water bearing zones that demonstrate greater volume of flow.



Source: USGS National Water Information System: Web Interface. Accessed 12-Dec-2022. (<https://nwis.waterdata.usgs.gov/nwis>).

Figure 3. Groundwater levels at USGS monitoring station showing a decrease in water levels since 1991 and operation of Newmark and Muscoy Pump and Treatment Systems.

Performance Criteria

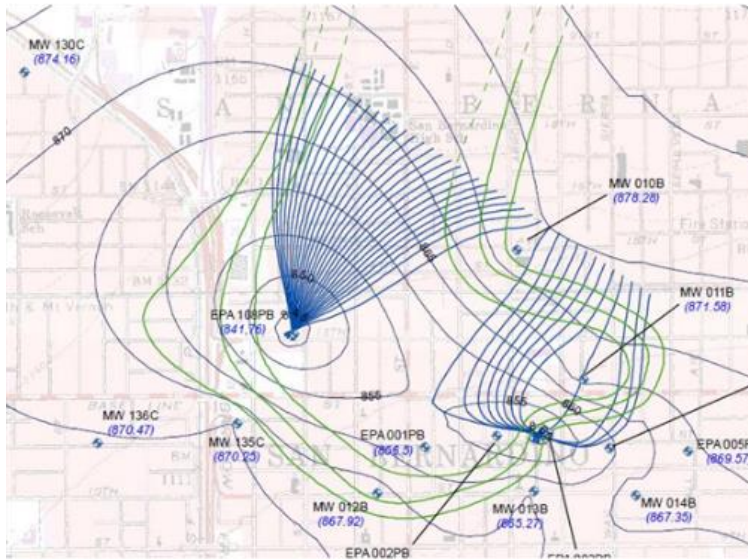
Two sets of criteria are to be evaluated periodically based on the data collected during the operation and monitoring of the treatment facilities: 1) flow performance and 2) contaminant performance. These criteria determine if the project is meeting the established remedial action objectives.

Flow performance is determined by analyzing water levels over 3-month periods to ensure an inward cone of depression and groundwater modeling demonstrating capture analysis to determine if the system is meeting the following target capture rates of 90 percent particle capture for Newmark, 80 percent for the Muscoy shallow aquifer, and 85 percent for the Muscoy deep aquifer (Tables 3 and 4 above). This methodology is highly sensitive to the water levels for the shallow aquifer and intermediate zone at each of the extraction wells.

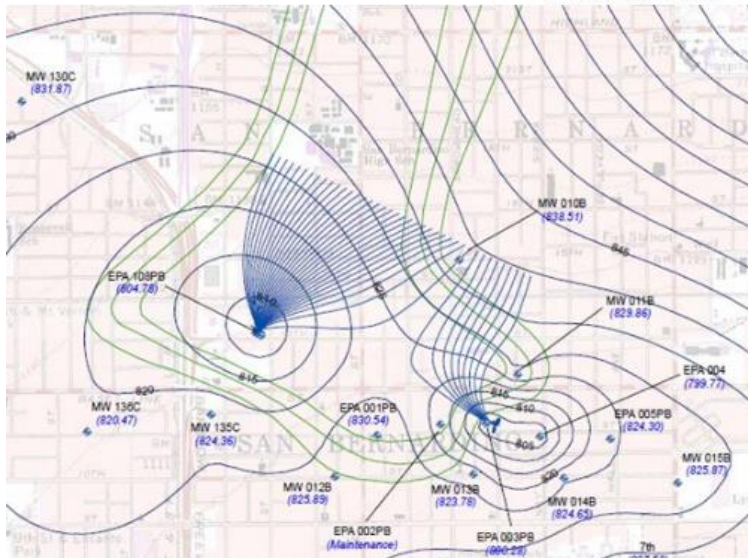
Flow Performance Evaluation

The Newmark plume appears stable during the review period. USACE reviewed capture analysis performed by the City of San Bernadino Municipal Water District for the Newmark extraction system. The City of San Bernadino Municipal Water District evaluates capture analysis using particle tracking across the PCE plumes. The percent capture is then compared to the flow performance criteria (Tables 3 and 4). The PCE plume (green contour lines) in the Newmark Plume Front deep aquifer has remained fairly consistent when comparing 2018 and 2022 data (Figure 4) and demonstrates containment.

March 2018



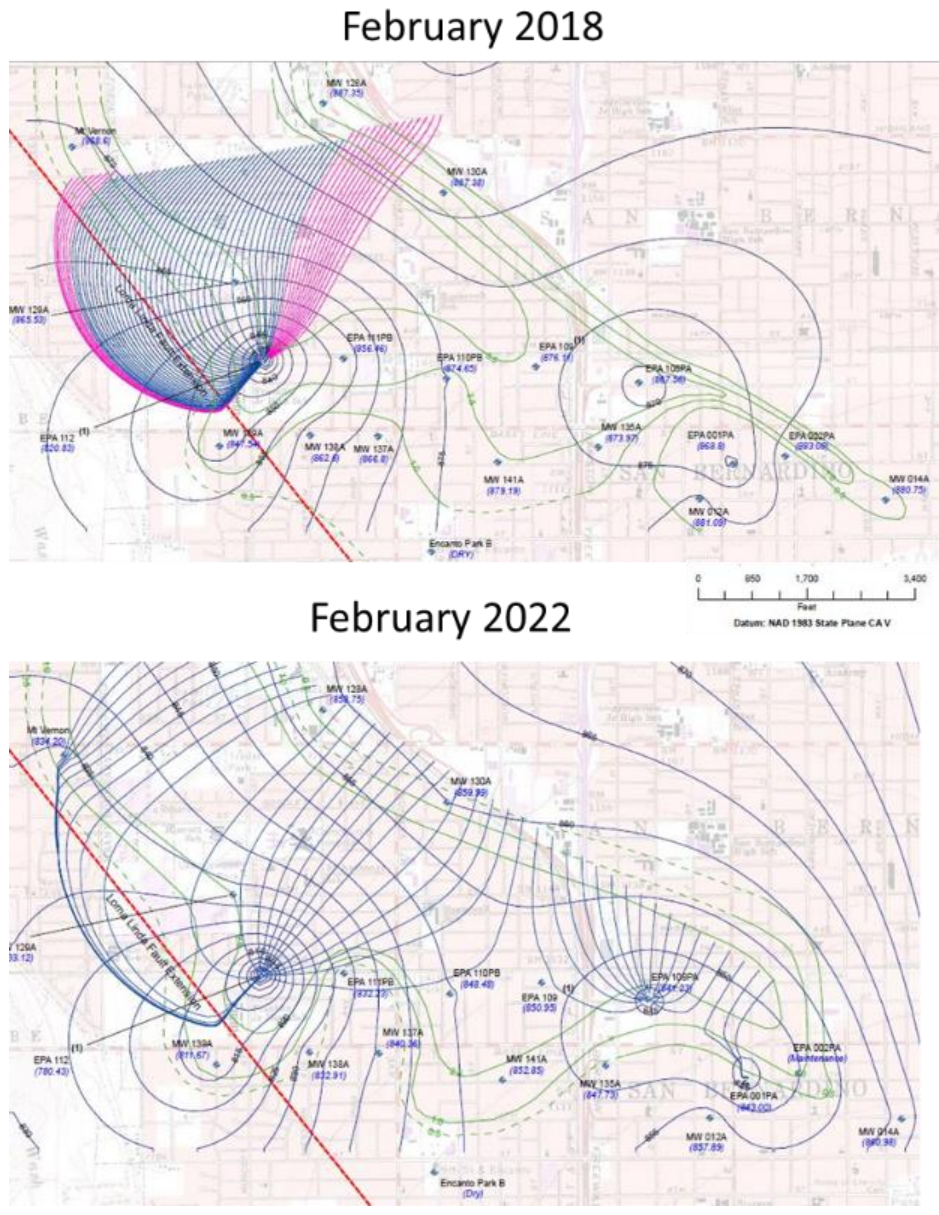
March 2022



Source: City of San Bernadino Water Department

Figure 4. Capture Zones based on Particle Tracking in the Deep Aquifer for the Newmark Plume for March 2018 and March 2022.

The PCE plume (green contour lines) in the Muscoy shallow aquifer has remained stable during the review period. The particle flow path (blue lines) and the concentric gray circles represent groundwater elevation decreasing towards the extraction well demonstrate capture by the extraction well system (Figure 5). This suggests that the remedial action objective of inhibiting migration of groundwater contamination into clean portions of the aquifer is met.



Source: City of San Bernardino Water Department

Figure 5. Capture Zones based on Particle Tracking in the Muscoy Shallow Aquifer for February 2018 and February 2022

Containment Performance – Monitoring Network

As mentioned in Section 3.2, San Bernardino Municipal Water District reported that they operated the extraction well networks out of compliance with flow performance criteria on several occasions, as described in the Progress Reports (2018-2022). San Bernardino Municipal Water District plans to install new extraction wells and piezometers at wells EPA 109 and EPA 112 to improve water level measurement accuracy and calculations for capture analysis in the shallow Muscoy aquifer. Accurate data are essential for determination of plume capture and accurate groundwater monitoring. Until the new extraction wells and piezometers are installed, and an updated model is created for each five-year review period, this remains a limiting factor to determining complete capture.

San Bernardino Municipal Water District samples the downgradient monitoring wells either quarterly or annually, depending on their historical concentrations and trends. Mann-Kendall trend analysis is included in each progress report from 1988 to present time, and for a five-year period to present time for each downgradient monitoring well. The five-year trend analysis for PCE in all the select monitoring wells did not have an increasing trend. For TCE, MW-012A is the only monitoring well with an increasing trend, though concentrations remain below the federal drinking water standard.

USACE independently assessed how well the remedy is inhibiting migration of groundwater contamination by performing Mann-Kendall trend analysis on PCE concentration data between 2018 and 2022 for the Newmark and Muscoy Operable Units (Table 6). To assess the Newmark North Treatment Plant facilities effectiveness in limiting contaminant mass entering the Newmark Plume from the upgradient source area, USACE used Mann-Kendall statistics to evaluate one municipal well (MW-008B) and two monitoring wells (MW-007A/B), all located upgradient; five monitoring wells located downgradient (MW-004B, MW-009A/B, MW-016B, MW-017B); and four municipal wells located downgradient (DTSC 003C, 30th & Mt. View, 31st & Mt. View, 27th & Acacia) of the Newmark Plume Front Plant. No wells have an increasing trend wells upgradient and downgradient of the Newmark North Treatment Plant; however, MW-007A does have a probably increasing trend for PCE, but its concentrations are below the federal drinking water standard. By comparing the upgradient and downgradient concentrations it is evident that the Newmark North Plant is performing as designed and reducing mass requiring treatment at the downgradient Newmark Plume Front Plant.

To assess whether the Newmark Plume Front Treatment facility is inhibiting migration of groundwater contamination into clean portions of the aquifer, USACE used Mann-Kendall statistics to evaluate six monitoring wells immediately upgradient and downgradient of the Newmark Plume Front extraction system (MW-010A/C, MW-011C, MW-012A/B, MW-014A – Figure 2). Concentrations of PCE in all four wells have decreasing or stable trends. One well, MW-012A, had TCE values greater than those of the PCE concentrations. Concentrations of TCE for MW-012A were increasing during the review period, though under the federal drinking water standard.

To assess whether the Muscoy Plume Treatment facility is inhibiting migration of groundwater contamination into clean portions of the aquifer, USACE used Mann-Kendall statistics to evaluate two municipal wells located upgradient (MW-140B/C), five monitoring wells immediately upgradient (MW-

128A/B, MW-129A, MW-130A/B), and ten wells downgradient of the Muscoy Plume extraction system (MW-135A/B/C, MW-136A/B, MW-137A/C, MW-138A, MW139A, MW-141A). With the exception of MW-130B, PCE concentrations in these groundwater monitoring wells are below the federal drinking water standard of 5 µg/L. PCE concentration in MW-130B has been decreasing over the last five years and has been below the federal drinking water standard since November 15, 2021. Concentrations of PCE in 16 of the 17 wells (including A/B/C depths) had decreasing, stable, or no trend. Although the analysis indicated that concentrations are increasing at MW-135C, located in the furthestmost southeast downgradient edge of the Muscoy shallow aquifer (Figure 2), the PCE concentrations in this well remain below the federal drinking water standard.

A key objective of the remedy is to protect the municipal supply wells south and southwest of the Shandin Hills. Well Olive & Garner is a municipal well located downgradient of the Newmark and Muscoy Treatment Facilities. This well was selected for trend analysis to identify if contaminants are migrating past either treatment facility during operation or during periods when the treatment facility was not operational due to maintenance. Concentrations in this well have fluctuated between 0.23 µg/L and 1.20 µg/L for PCE over the last five years but have a stable trend and concentrations below the federal drinking water standard.

Table 6. Summary of Mann-Kendall Trend Analysis for PCE, February 2018 to May 2022.

Well	Number of Exceedances/ Sampling Events	Concentration Trend
Upgradient Muscoy Extraction wells		
MW-128A	0/9	Stable
MW-128B	0/9	ND
MW-129A	0/9	Decreasing
MW-130A	0/9	Stable
MW-130B	7/9	Decreasing
MW-140B	0/5	Stable
MW-140C	0/5	Decreasing
Muscoy Plume - Shallow		
MW-135A	0/18	Decreasing
MW-136A ⁵	0/11	Stable
MW-137A	0/18	No Trend
MW-138A	0/18	Decreasing
MW-139A	0/18	No Trend
MW-141A	0/18	Stable
Muscoy Plume - Intermediate		
MW-135B	0/18	Stable
MW-136B	0/9	Stable
Muscoy Plume - Deep		
MW-135C	0/9	Increasing
MW-137C	0/9	No Trend
Downgradient Muscoy Extraction Wells		
Olive & Gardiner	0/5	Stable
Upgradient Newmark North Plant		
MW-007A	0/9	Probably Increasing
MW-007B	0/9	Decreasing
MW-008B	0/5	Stable
Newmark North Plant - Shallow		
MW-009A	0/9	Decreasing
Newmark North Plant - Intermediate		
MW-004B	0/9	Probably Decreasing
MW-009B	0/9	Stable
MW-016B	0/9	Decreasing
MW-017B	0/9	No Trend
Downgradient Newmark North Plant/Upgradient Newmark Plume Front		
DTSC 003C	0/5	Decreasing
30th & Mt. View	0/5	Stable
31st & Mt. View	0/4	Stable
27th & Acacia	0/5	Decreasing
Newmark Plume Front Shallow		
MW-010A	0/9	Stable
MW-012A	0/18	Stable
MW-014A	0/9	Stable
Newmark Plume Front Intermediate		
MW-012B	0/18	Decreasing
Newmark Plume Front - Deep		
MW-010C	0/9	Stable
MW011C	0/9	Decreasing

Extraction Rates and Contaminant Removal

The cumulative mass removals are reported to be 555 pounds from the Newmark North Treatment Plant; 215.80 pounds from the 17th Street Treatment Plant (this plant is currently no longer treating remedy water); 1,109.50 pounds from the Waterman Treatment Plant; and 2,080.30 pounds from the 19th Street North Treatment Plant (Figures 8, 9 and 10).

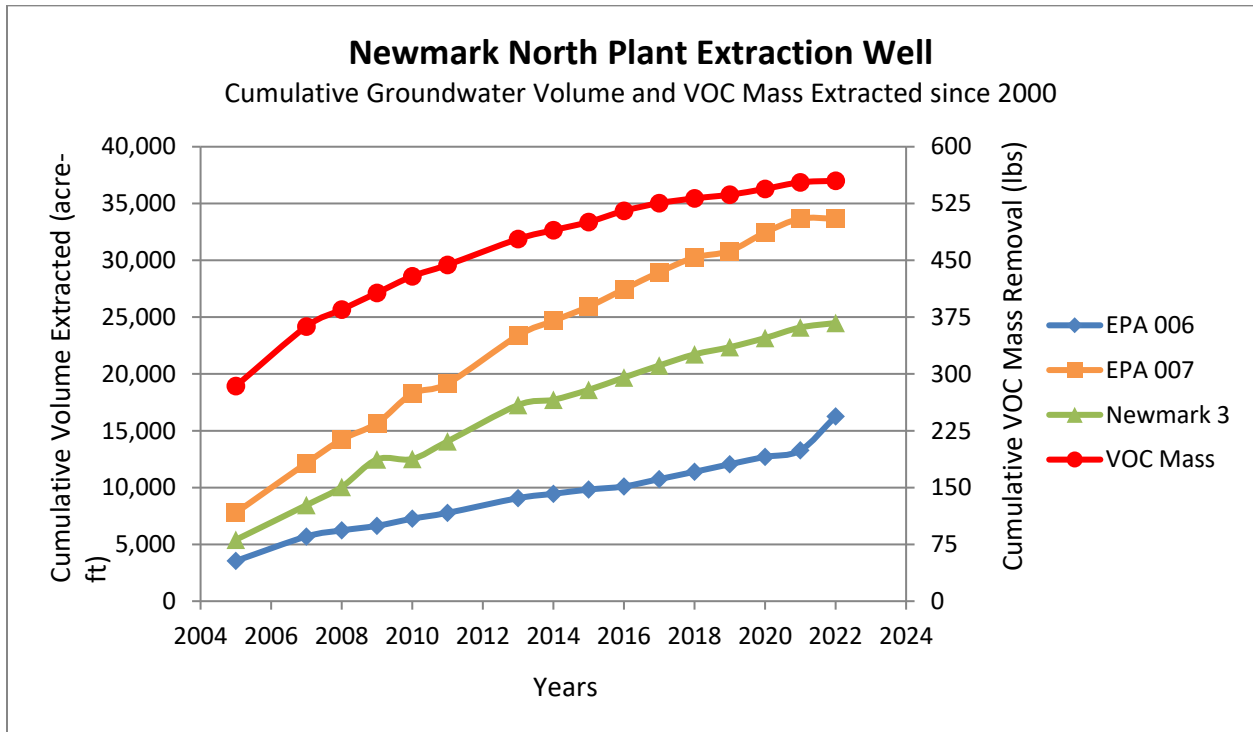


Figure 6. Newmark North Plant Extraction Well Network.

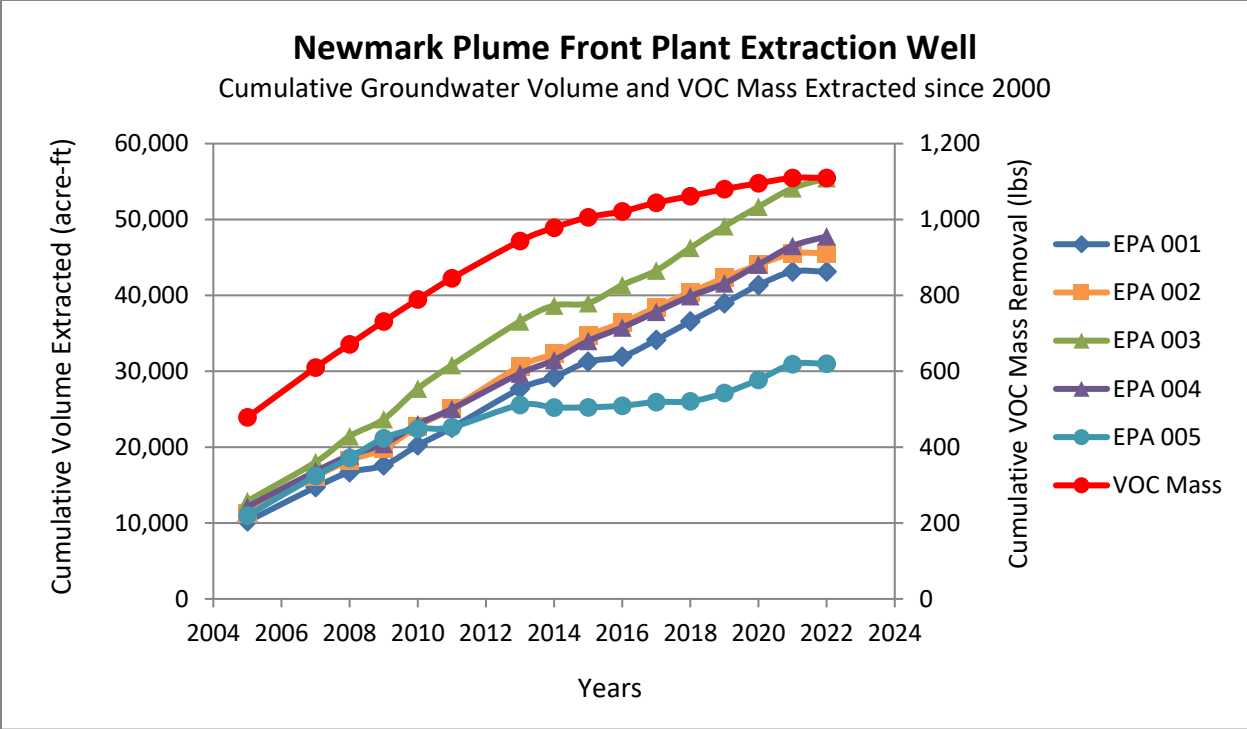


Figure 7. Newmark Plume Front Plant Extraction Well Network.

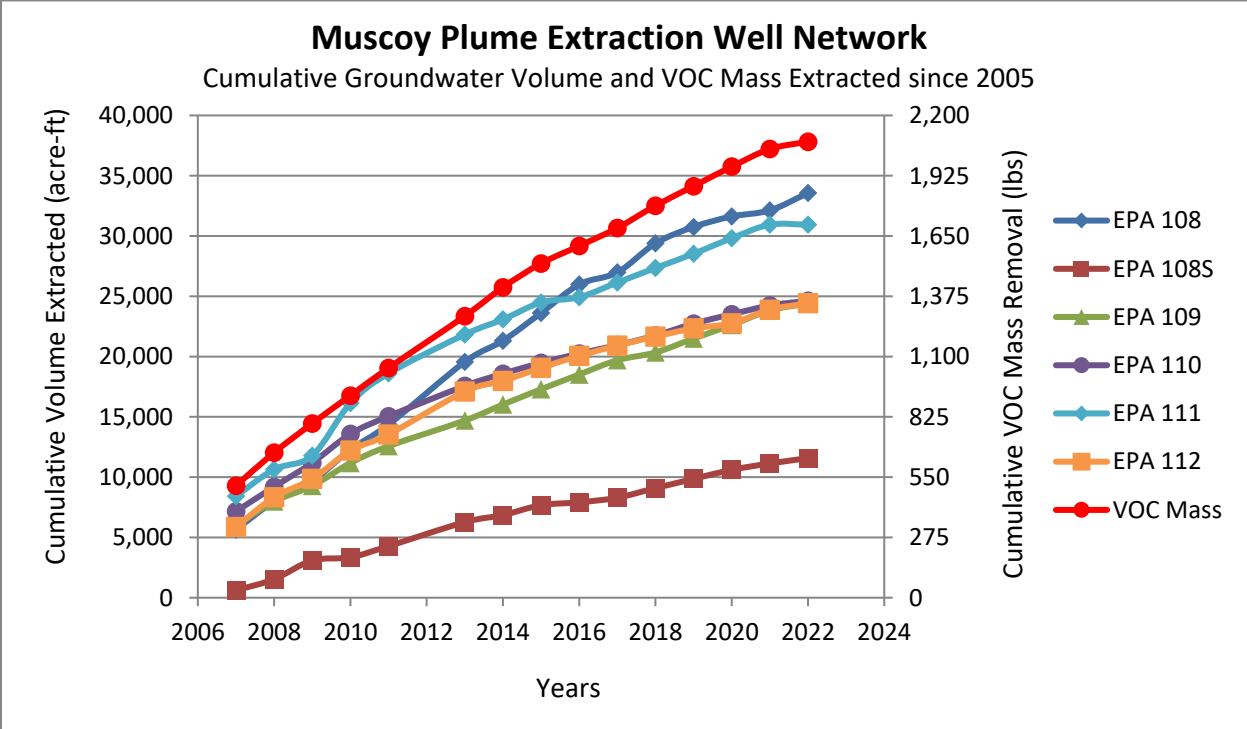


Figure 8. Muscoy Plume Extraction Well Network

4.2.2. Groundwater – Mass Remaining Estimates

EPA estimated the residual PCE mass at concentrations equal to and greater than 5 µg/L based on the results of integrated 3D variability analysis (3DVA) modeling of the PCE plume from 1997 to 2012. The approach was updated in 2019, and more recently in 2022.

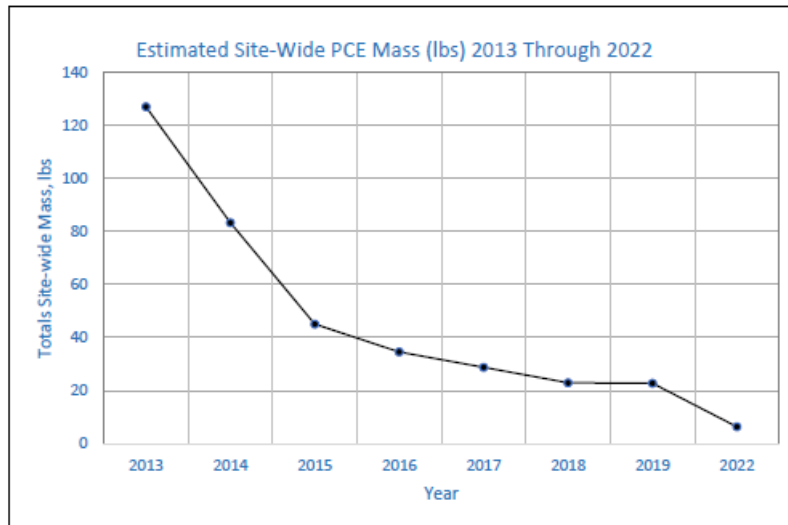
In addition, EPA recently evaluated residual mass using statistical trend methods to estimate mass remaining for the Federal Drinking Water standard (5 µg/L) and for the Extremely-Impacted-Source (EIS) criteria of non-detect (0.5 µg/L). Pursuant to the California Department of Public Health Drinking Water Division Policy Memo 97-005 and the 2015 ROD (EPA 2015), all extraction wells associated with the three treatment systems for the Newmark and Muscoy Operable Units plumes are designated as EIS wells because they serve as part of the drinking water supply.

Estimate of Mass Remaining – (PCE at 5 µg/L)

In 2012, EPA evaluated whether the Source Operable Unit is continuing to migrate to the Newmark and Muscoy plumes. EPA estimated the residual PCE mass at concentrations equal to and greater than 5 µg/L for a period from 1997 to 2012 using 3DVA modeling of the PCE plume. EPA updated the 3DVA model in 2019 and 2022.

From 1997 to 2022, site-wide mass reduced of PCE above 5 µg/L from approximately 9,000 lbs to approximately 6.4 lbs, a reduction of approximately 99.9 percent. In addition, there was significant reduction in plume area. While data indicate that the remaining low concentration PCE mass in the Source Operable Unit is approaching an asymptotic state; the additional order-of-magnitude reduction from 2019 (approximately 23 lbs) to 2022 (approximately 6.4 lbs) shows that mass reduction is still occurring at the site. Additional evaluation also showed that the 6.4 lbs of site-wide residual PCE mass was distributed between overburden (approximately 4.7 lbs) and bedrock (approximately 1.7 lbs). PCE present in bedrock is a condition unique to the Northwest Area due to the relatively shallow depth to bedrock compared to the depth in downgradient areas of the plume in the Newmark and Muscoy Operable Units, where most wells are screened at depths ranging up to several hundreds of feet bgs. The continuous reduction in size, concentration and mass of the plume indicates successful mass removal, limited additional contributions of contamination to the Newmark and Muscoy plumes, and continues progress towards meeting the remedial action objective of restoring the aquifer to its beneficial use at the federal drinking water standard.

Estimated Site-Wide PCE Mass 2013 Through 2022 (Pounds)										
Monitoring Year	2013	2014	2015	2016	2017	2018	2019	2022		
								Based on NGFM* Lithology	Based on Revised Lithology in Northwest Area	
PCE Mass at Concentration Equal to and Greater than 5 µg/L (MCL)	127	83	45	35	29	23	23	7.4	6.4 (Total)	4.7 (Overburden)
% Reduction from Prior Year		~34.6%	~45.8%	~22%	~17%	~20.7%	0%	~68%	~72%	N/A



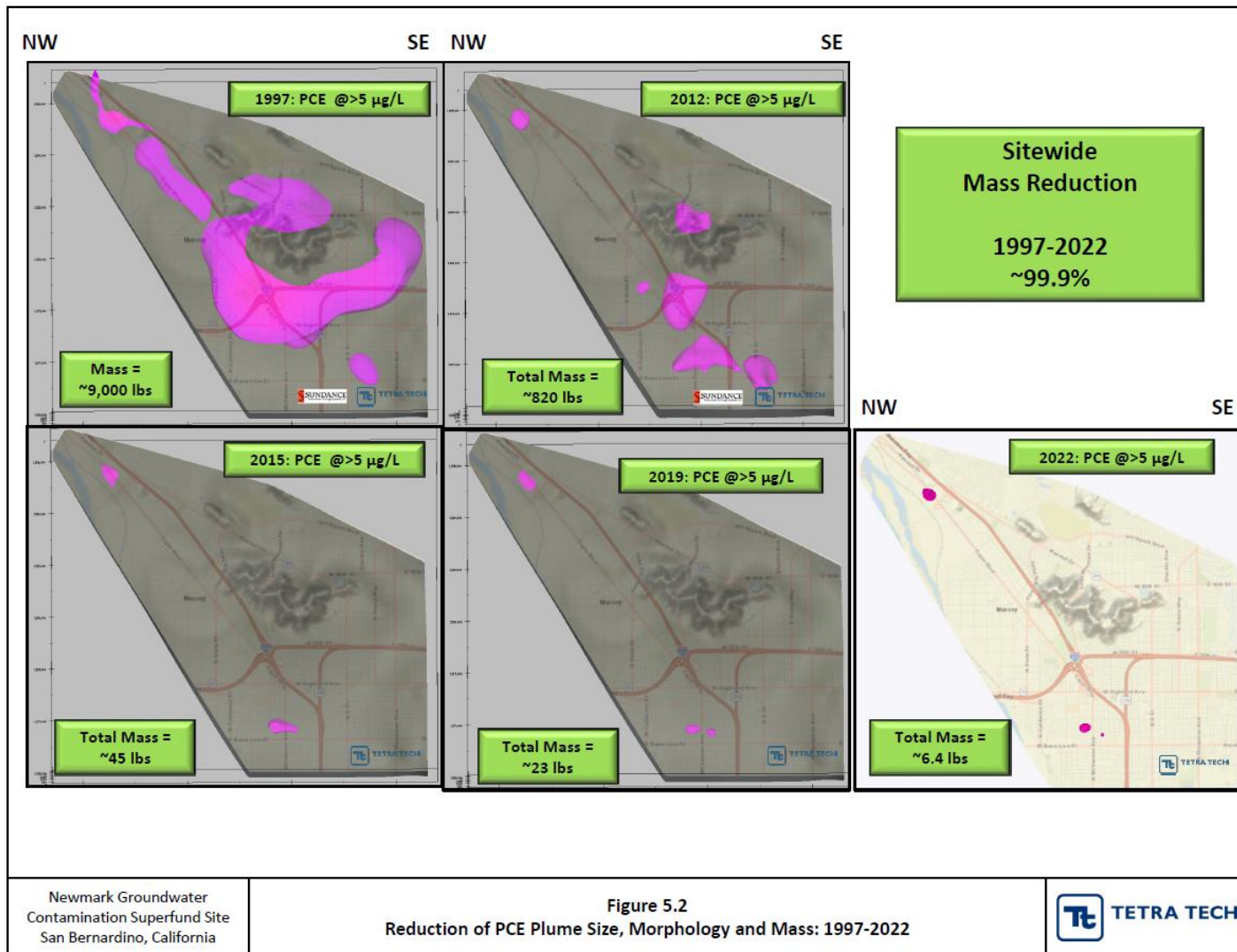
- Rate of mass reduction approaching asymptotic state in 2017 to 2019
- Continued mass reduction between 2019-2022
- Asymptotic state related to mass in low hydraulic conductivity (K) zones
 - Overburden
 - Weathered and Unweathered Bedrock

*NGFM = Newmark Groundwater Flow Model

Newmark Groundwater Contamination Superfund Site San Bernardino, California	Figure 5.3 Reduction of Site-Wide PCE Mass: 2013-2022	
--	--	--

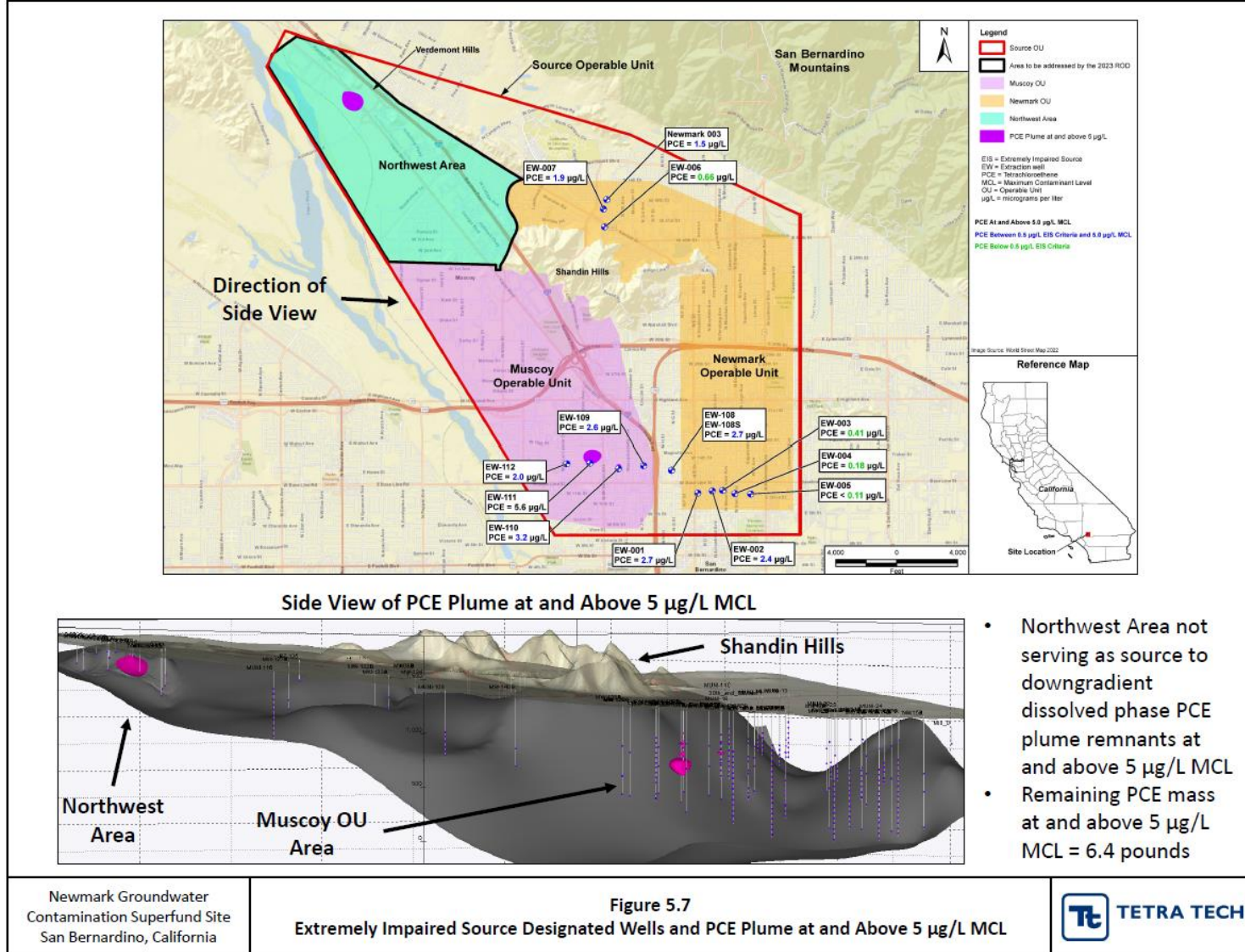
Source: EPA, 2023, Remedial Investigation and Focused Feasibility Study, Newmark Groundwater Contamination Superfund Site, Source Operable Unit

Figure 9. Rate of Mass Reduction: 2013 to 2022.



Source: EPA, 2023, Remedial Investigation and Focused Feasibility Study, Newmark Groundwater Contamination Superfund Site, Source Operable Unit

Figure 10. Reduction in PCE Plume Extent.



Source: EPA, 2023, Remedial Investigation and Focused Feasibility Study, Newmark Groundwater Contamination Superfund Site, Source Operable Unit

Figure 11. PCE Plume at and above 5 µg/L

Estimate of Mass Remaining – (PCE at 0.5 µg/L)

Pursuant to the California Department of Public Health Drinking Water Division Policy Memo 97-005 and the 2015 ROD, all extraction wells associated with the three treatment systems for the Newmark and Muscoy Operable Unit plumes are EIS-designated wells because they serve as part of the drinking water supply; therefore, the groundwater in these areas must be restored to non-detect levels (0.5 µg/L). The following treatment system and EIS-designated wells are identified as extremely impacted source wells.

- Newmark Treatment System (Newmark North Area) – extraction wells EPA 006, EPA 007, and Newmark 003;
- Waterman Treatment System (Newmark Plume Front) – extraction wells EPA 001, EPA 002, EPA 003, EPA 004, and EPA 005; and
- 19th Street North Treatment System (Muscoy Operable) – extraction wells EPA 108, EPA 108S, EPA 109, EPA 110, EPA 111, and EPA 112.

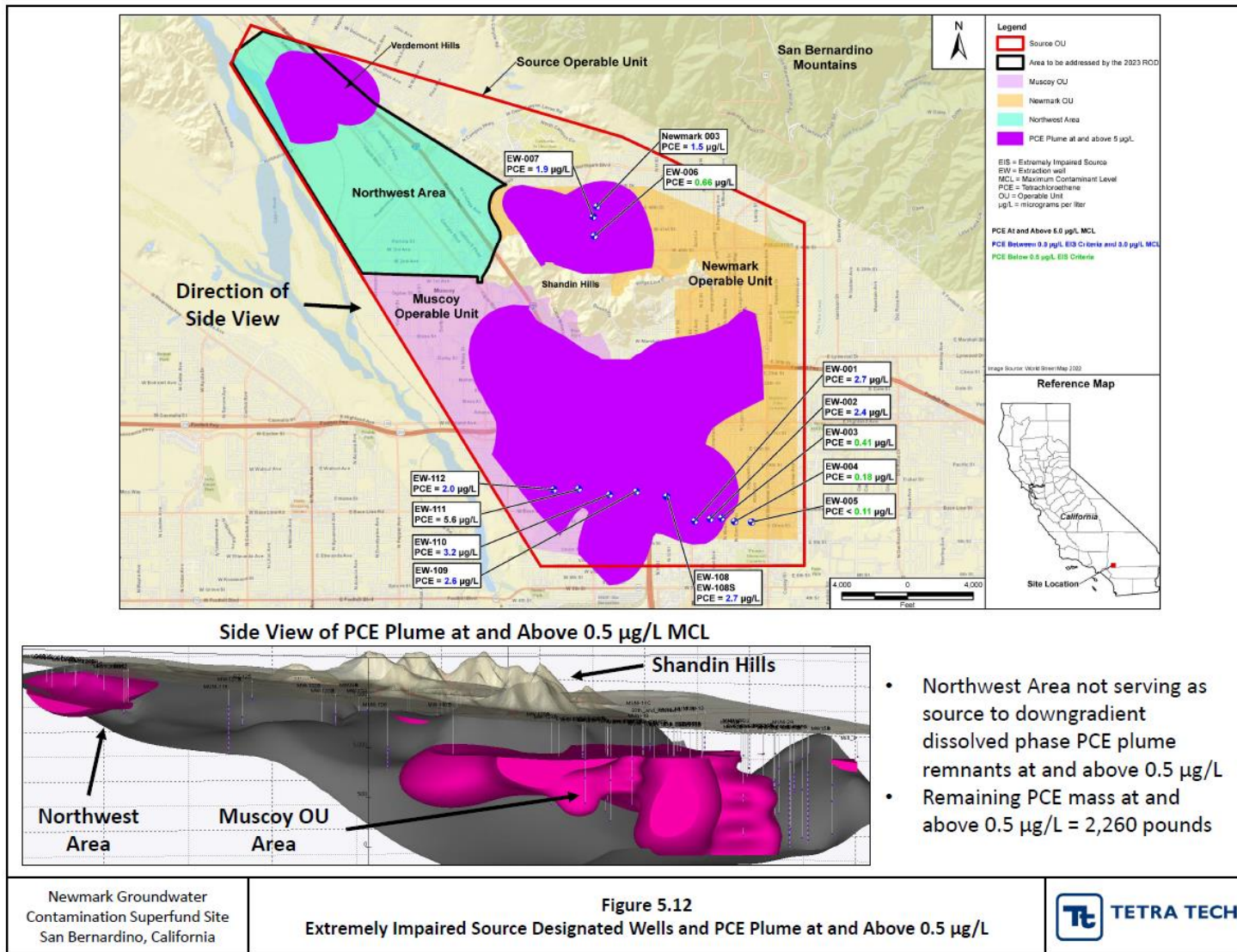
In 2022, EPA computed, plotted and compared the current concentration trends for the EIS-designated wells against the federal drinking water standard, the ROD clean-up requirement (5 µg/L), and the EIS criteria (0.5 µg/L). The results of statistical analyses of contaminant concentration trends and projections for the 14 extraction wells within the Source Operable Unit with EIS-designations are summarized in Table 7.

Table 7. Historical and Current Status of Extremely Impaired Source Extraction Wells

Well ID	PCE Concentration Versus MCL			PCE Concentration Versus EIS Criteria			
	< 5.0 µg/L?	Year Achieved	Number of Years < MCL	< 0.5 µg/L?	Current Concentration (µg/L)	Year Achieved	Number of Years < EIS or Trend
EW-001	Yes	2011	>10	No	2.7	NA	Downward
EW-002	Yes	2014	>8	No	2.4	NA	Downward
EW-003	Yes	2004	>18	Yes	0.41	2020	2
EW-004	Yes	1998	24	Yes	0.18	2010	12
EW-005	Yes	1998	24	Yes	<0.11	2011	11
EW-006	Yes	2000	22	No	0.66	NA	Downward
EW-007	Yes	2005	17	No	1.9	NA	Downward/Flat
EW-108	Yes	2003	19	No	2.7	NA	Flat/Downward
EW-108S	Yes	2013	9	No	1.9	NA	Downward
EW-109	Yes	2006	16	No	2.6	NA	Flat
EW-110	Yes	2017	5	No	3.2	NA	Downward/Upward
EW-111	No	NA	NA	No	5.6	NA	Flat/Upward
EW-112	Yes	2014	8	No	2	NA	Flat/Downward
Newmark 003	Yes	2010	12	No	1.5	NA	Upward

Thirteen of the 14 extraction wells have statistically met the federal drinking water standard. The exception is EW-111; however, no concentrations have been observed below the federal drinking water standard. The current PCE trend estimate is close to, but slightly below, the 5 µg/L Federal Drinking Water standard, and projected to reduce further over time.

Eleven of the EIS-designated wells have PCE in groundwater remaining at concentrations at and above the 0.5 µg/L EIS criterion. Concentrations of PCE in groundwater in the three of the wells EW-003, EW-004, and EW-005, have all decreased to below the 0.5 µg/L EIS criterion. EPA and San Bernardino Municipal Water District have agreed to propose the removal of the EIS-designations via a permit modification.



Source: EPA, 2023, Remedial Investigation and Focused Feasibility Study, Newmark Groundwater Contamination Superfund Site, Source Operable Unit

Figure 12. PCE Plume at and above 0.5 µg/L

4.2.3. Sustainability

The Government Accountability Office published a study in 2019 summarizing risks to EPA Superfund sites across the country. The Newmark Contaminated Groundwater Superfund Site was identified as having a flooding risk. Flooding at the Site would impact the operation of the groundwater extraction and treatment systems in the form of physical damage to system components and power interruption. These impacts would result in a loss of a drinking water source to millions of users and the mobilization of contaminants in groundwater beyond the influence of the treatment systems.

The State of California produced vulnerability assessments in 2018 for the state and regional areas (www.CAL-Adapt.org, California, 2018), evaluating the impacts to the following climate change related hazards: extreme heat, wildfire, flooding, drought, severe weather, extreme wind, mudslides and landslides, air quality, human health, and ecological hazards. Applicable hazards to the Site include flooding, drought, extreme wind, extreme heat and severe weather. Flooding, extreme wind, extreme heat, and severe weather could result in physical damage to the groundwater extraction and treatment systems and power interruption. As noted in Section 4.2.1, drought could continue to affect the groundwater levels impacting the extraction wells. Extreme weather in the form of excess precipitation can increase groundwater levels, mobilizing contamination sorbed to soils in the vadose zone.

4.3. Site Inspection

The inspection of the Site was conducted on April 4, 2023. In attendance were Helen Sanchez, USACE, Kuceli Mari, EPA, and Steve Miller, Director of Water Utility, City of San Bernardino. The purpose of the inspection was to assess the condition of the remedy and verify that the remedy is operating as intended.

The group inspected the Newmark Plume Front Treatment Facility (17th Street GAC Plant) which was offline, the Newmark Plume Front Treatment Facility (Waterman GAC & Air Stripping), and the North Plant Treatment Facility (Newmark GAC & Air Stripping). The facilities were well-maintained and showed no property nuisance and no vandalism in its area. The Site inspection group also inspected ten injection wells and the wells were all secured.

5. Technical Assessment

5.1. Question A: *Is the remedy functioning as intended by the decision documents?*

The remedy at the Site is functioning as intended by the decision documents. The remedial action objectives include limiting contaminant migration, reducing contaminant concentrations in groundwater, and protecting the public from contact with the contaminated groundwater. Based on the data analysis performed for this review, the treatment systems within the Newmark and Muscoy operable units are successfully capturing contaminated groundwater with each aquifer zone, meeting the remedial action objectives of inhibiting migration of the groundwater contamination into clean portions of the aquifer and protecting downgradient municipal wells.

The mass removal at the treatment plants shows continued progress towards restoring the aquifer to its beneficial use as municipal and domestic water supply. However, the potential for incomplete capture is an issue for the shallow Muscoy aquifer. Groundwater levels have decreased 100 feet or more in some areas of the Newmark and Muscoy operable units over the last 20 years. The decrease in groundwater level, in conjunction with the downtime of several extraction wells, has negatively affected flow performance of the extraction wells within the shallow Muscoy aquifer.

To address the decreasing groundwater level on the Muscoy Plume, San Bernardino Municipal Water District monitors changes in performance and makes necessary adjustments to meet performance criteria. A groundwater model, updated every five years, will assist with the capture analysis evaluating impacts of declining groundwater levels.

The institutional controls are in place and effective in preventing exposure to contaminated groundwater. However, an updated groundwater model is a key element in the Institutional Controls Groundwater Management Program used to analyze potential impacts to contaminant migration due to new and modified production wells and changes in artificial recharge practices.

5.2. Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Remedy Selection Still Valid?

Exposure assumptions, cleanup levels, and remedial action objectives used at the time of the remedy selection are still valid. The exposure assumptions in considered in selecting the remedy was for residents and industrial/commercial workers potentially exposed to Site contaminants through ingestion, dermal contact, and inhalation. These exposure pathways are still valid. These assumptions are still valid because the land use at the Site has not changed. Toxicity data were not evaluated because cleanup levels are not risk-based. Changes in standards have occurred during this review period. However, these changes were primarily administrative changes that do not impact the protectiveness of the remedy. EPA reviewed the depth of groundwater within the Newmark and Muscoy operable units to determine whether vapor intrusion is a concern at the Site. Groundwater depths are greater than 100 feet below ground surface. Therefore, vapor intrusion is not a concern at the Site.

5.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that call into question the protectiveness of the remedy.

6. Issues/Recommendations

Table 8. Issues and Recommendations Identified in the Five-Year Review

Issues and Recommendations Identified in the Five-Year Review:				
Operable Unit(s): Newmark/Muscoy	Issue Category: Remedy Performance			
	Issue: Groundwater modeling is a tool to identify potential areas of concern based on existing site conditions and is used by the Institutional Controls Management Program to assess migration of contaminated groundwater toward drinking water wells. The groundwater model is out of date and not representative of current conditions.			
	Recommendation: Update the Groundwater Flow Model to assist with ensuring capture with decreasing groundwater levels and maintaining institutional controls.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No		City of Bernardino	EPA	10/31/2024

Issues and Recommendations Identified in the Five-Year Review:				
Operable Unit(s): Newmark/Muscoy	Issue Category: Other			
	Issue: As progress is made in restoring the aquifer, municipal extractions wells, currently designated as Extremely-Impacted Source (EIS), have seen concentrations of PCE decrease to 0.5 µg/L and below			
	Recommendation: As EIS wells meet the EIS designation removal criterion, the need for blending of these wells should be reevaluated. If blending of the EIS designated wells is deemed unnecessary, San Bernardino Municipal Water District should propose amendments to the Division of Drinking Water permit to remove the EIS designations from the associated extraction well(s) and connect the wells to directly to San Bernardino Municipal Water District's water distribution system.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	No	Other	EPA	10/31/2025

7. Protectiveness Statement

Table 9. Protectiveness Statement

Protectiveness Statement	
<i>Operable Unit:</i> Newmark	<i>Protectiveness Determination:</i> Short-term Protective
<i>Protectiveness Statement:</i> The remedy at the Newmark Operable Unit at the Newmark Superfund Site is currently protective of human health and the environment. The extraction and treatment plants are operating as intended and institutional controls are in place preventing exposure to contaminated groundwater. In order to be protective in the long-term, the Groundwater Model should be updated to assist with ensuring capture with decreasing groundwater levels and maintaining institutional controls	

Protectiveness Statement	
<i>Operable Unit:</i> Muscoy	<i>Protectiveness Determination:</i> Short-term Protective
<i>Protectiveness Statement:</i> The remedy at the Muscoy Operable Unit at the Newmark Superfund Site is currently protective of human health and the environment. The extraction and treatment plants are operating as intended and institutional controls are in place preventing exposure to contaminated groundwater. In order to be protective in the long-term, the Groundwater Model should be updated to assist with ensuring capture with decreasing groundwater levels and maintaining institutional controls	

8. Next Review

The next Five-Year Review report for the Newmark Contaminated Groundwater Superfund Site is required five years from the completion date of this review.

Appendix A: List of Documents Reviewed

- California Department of Public Health Drinking Water Division. 1997. Policy Memo 97-005 Policy Guidance for Direct Domestic Use of Extremely Impaired Sources. November 5, 1997.
- City of San Bernardino Municipal Water Department. 2009. City of San Bernardino Municipal Water Department, Muscoy and Newmark Operable Units, Final Operation and Maintenance Plan. September 2009.
- City of San Bernardino Municipal Water Department. 2018a. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 1st Semi-Annual Report 2018 No 56. October.
- City of San Bernardino Municipal Water Department. 2018b. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 2nd Semi-Annual Report 2018 No 57. April.
- City of San Bernardino Municipal Water Department. 2019a. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 1st Semi-Annual Report 2019 No 58. September.
- City of San Bernardino Municipal Water Department. 2019b. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 2nd Semi-Annual Report 2019 No 59. March.
- City of San Bernardino Municipal Water Department. 2020a. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 1st Semi-Annual Report 2020 No 60. September.
- City of San Bernardino Municipal Water Department. 2020b. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 2nd Semi-Annual Report 2020 No 61. March.
- City of San Bernardino Municipal Water Department. 2021a. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 1st Semi-Annual Report 2021 No 62. August.
- City of San Bernardino Municipal Water Department. 2021b. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 2nd Semi-Annual Report 2021 No 63. March.
- City of San Bernardino Municipal Water Department. 2022a. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 1st Semi-Annual Report 2022 No 64. September.
- City of San Bernardino Municipal Water Department. 2022b. Progress Report for Newmark Groundwater Contamination Superfund Remedial Action: Newmark/Muscoy Operable Unit 2nd Semi-Annual Report 2022 No 65. March.
- EPA (United States Environmental Protection Agency). 1993. Remedial Investigation and Feasibility Study Report for the Newmark Operable Unit. March.
- EPA. 2015. Record of Decision, Newmark Groundwater Contamination Superfund Site, Newmark and Muscoy Operable Units, San Bernardino, California. August.

- EPA. 2018. Third Five-Year Review Report for Newmark Groundwater Contamination Superfund Site, September.
- EPA. 2021. Site-Wide 3DVA Update and Remedial Progress Evaluation. Newmark Groundwater Contamination Superfund Site, CA. Presentation to EPA Region 9. August 10, 2021.
- Stantec. Personal and Email Communication, February 2018.
- State of California (California), 2018. Fourth Climate Change Assessment, <https://climateassessment.ca.gov/>. August 2018.
- USGS National Water Information System: Web Interface. Accessed 12-Dec-2022. (<https://nwis.waterdata.usgs.gov/nwis>).

Appendix B: Site Chronology

Event	Date
Initial discovery of contamination	1980
State funds interim treatment facilities for contaminated City production wells	1986
Newmark Site placed on the NPL	1989
Remedial Investigation/Feasibility Study Report for Newmark Operable Unit completed	1993
Newmark Operable Unit Interim ROD signed	1993
Remedial Investigation/Feasibility Study Report for Muscoy Operable Unit completed	1994
Muscoy Operable Unit Interim ROD signed	1995
Newmark treatment systems on-site construction complete	1998
Newmark Operable Unit operational and functional	2000
Remedial design completed for Muscoy Operable Unit and construction started (treatment plant)	2003
Explanation of Significant Differences for Newmark and Muscoy Operable Units	2004
Consent Decree with City of San Bernardino signed	2005
Passage of City Ordinance restricting construction of new water supply wells by non-municipal entities	2006
Muscoy Operable Unit operational and functional	2007
First Five-Year Review	2008
Second Five-Year Review	2013
Newmark groundwater 3D Visualization Analysis Technical Memorandum	2014
Newmark Groundwater Contamination Final ROD Signed (includes Newmark and Muscoy Operable Units)	2015
Third Five-Year Review	2018

Appendix C: Data Review

The data review for groundwater includes the Newmark and Muscoy Operable Units. Although the Source Operable Unit may be discussed, no evaluation of the Source area is completed because a final remedy has not been selected or implemented. Generally, the remedy is successful in meeting the remedial action objectives for the site. Each Remedial Action Objective is broken down in sections discussed below.

Containment – Extraction Network

The extraction wells in the Newmark and Muscoy operable units are being operated under the San Bernardino Municipal Water District's water supply permit administered by the State Water Resources Control Board Division of Drinking Water (Permit). Per the terms of the Permit, San Bernardino Municipal Water District is required to treat PCE and TCE in groundwater to 0.5 µg/L standard. This standard is in accordance with Policy Memo 97-005 Policy Guidance for Direct Domestic Use of Extremely Impaired Sources. Therefore, persistence of PCE and TCE in most of the extraction wells at concentrations between 0.5 µg/L and 5 µg/L indicate that remedial operations will continue for several years into the future before the aquifer is capable of producing drinking water that will not require treatment. USACE independently assessed the remedial operations of the Newmark and Muscoy Operable Unit extraction wells, by performing Mann-Kendall trend analysis on PCE and TCE concentration data between 2020 and 2022. With the exception of EPA-111, PCE in groundwater currently being produced from the extraction wells is below the federal drinking water standard of 5 µg/L. TCE in groundwater currently being produced from the extraction wells is below the federal drinking water standard of 5 µg/L.

All three extraction wells in the Newmark North extraction well network are below the non-detect limit (0.5 µg/L) for TCE. Conversely, PCE concentrations are between 0.5 µg/L and 5 µg/L for all three extraction wells. The concentration trends of EPA 006 and EPA 007 were stable and no trend, respectively. The Newmark 3 concentration trend is increasing over the last two years (Table C-1).

All five extraction wells in the Newmark Plume Front extraction well network were below the non-detect limit (0.5 µg/L) for TCE. PCE concentrations are between 0.5 µg/L and 5 µg/L for two wells, EPA 001 and EPA 002, with stable and decreasing concentration trends, respectively (Table C-1).

All six extraction wells in the Muscoy Plume extraction well network were between 0.5 µg/L and 5 µg/L for TCE. With the exception of EPA 111, PCE concentrations are between 0.5 µg/L and 5 µg/L. PCE and TCE concentration trends are decreasing, stable, or no trend (Table C-1). In 2016, EPA 111 failed after experiencing prolonged excessive drawdown. Chemical well rehabilitation successfully resolved the problem and well performance has been reestablished. PCE observed from extraction well EPA 111 has been relatively stable since 2014.

MANN-KENDALL ANALYSIS FOR FOURTH NEWMARK FIVE-YEAR REVIEW

Background

Capture analysis was evaluated using USACE performed Mann-Kendall trend analysis to evaluate recent PCE and TCE trends at the 95 percent significance level at several key monitoring wells at the Newmark Groundwater Superfund Site in San Bernardino, California. The trend testing utilized analytical data from the key down-gradient monitoring wells since the data evaluation conducted in the last Five-Year Review; therefore, data was from the period of 2018 to 2022. EPA and San Bernardino Municipal Water District have reported on trend analysis for data collected prior to 2013.

Performance Criteria

Two sets of criteria are to be evaluated periodically based on the data collected during the operation and monitoring of the treatment facilities: 1) flow performance and 2) contaminant performance. These criteria determine whether the project is meeting the established remedial action objectives.

Flow performance is determined by analyzing water levels over 3-month periods to ensure an inward cone of depression and MODFLOW particle capture modeling demonstrating capture analysis to determine if the system is meeting the following target capture rates of 90 percent particle capture for Newmark, 80 percent for the Muscoy shallow aquifer, and 85 percent for the Muscoy deep aquifer (Tables 3 and 4 above). This methodology is highly sensitive to the water levels for the shallow aquifer and intermediate zone at each of the extraction wells.

Contaminant performance is evaluated by groundwater sample collection from monitoring well clusters located down-gradient of the extraction well networks, laboratory analysis of the samples for volatile organic compound concentrations, and trend analysis to compare the results to established criteria. Wells that exceed 1 µg/L are monitored quarterly. Wells that are below 1 µg/L for volatile organic compounds for eight consecutive quarters of monitoring are monitored annually or semi-annually. If a well exceeds 1 µg/L at any time after it has been taken off the quarterly sampling schedule, then the quarterly schedule will be reinstated for that well.

Compliance summaries for flow performance and contaminant performance are given in each Operations and Maintenance Progress Report. Monitoring well performance criteria are shown in Tables 3 and 4 above.

Flow Performance Evaluation

USACE evaluates capture analysis using particle tracking across the PCE plumes (from the 2.5 µg/L contours). The contaminant concentration contours are generated using the chemical concentration data from the designated sampling event. The percent capture is then compared to the flow performance criteria as described in Tables 3 and 4.

USACE reviewed capture analysis performed by the City of San Bernadino Municipal Water District for the Newmark extraction system (EPA 001-005) semi-annually (since 2012). The PCE plume (green contour lines) in the Newmark Plume Front intermediate aquifer has remained fairly consistent (blue concentric circles) during the past five years (Figure 4) and demonstrates containment.

Mann-Kendall Analysis

The Mann-Kendall test is a non-parametric test for identifying trends in time-series data. The test compares the relative magnitudes of sample data rather than the data values themselves. One benefit of this test is that the data does not need to conform to any one distribution type. Data reported as non-detects can be included by assigning them a common value that is smaller than the lowest detected value in the dataset, although the number of non-detects should not be greater than 50 percent of the sample size (n).

Mann-Kendall Results

The following paragraphs summarize the Mann-Kendall analysis results for the extraction system performance for Newmark Superfund Site.

Table C-1. Mann-Kendall Trend Analysis for PCE, February 2018 to May 2022.

Well	Clean up Level (µg/L)	Number of Exceedances/Sampling Events ¹	Maximum Concentration (µg/L)	Date of Highest Concentration	Mann-Kendall Statistics (S) ²	Coefficient of Variation (COV) ³	Confidence Factor (CF) ⁴	Concentration Trend	Comments
Upgradient Muscoy Extraction Wells									
MW-128A	5	0/9	0.74	21-May-18	-5	0.32	68.3%	Stable	
MW-128B	5	Not Applicable due to 80% non-detect values							
MW-129A	5	0/9	4.20	21-May-18	-18	0.41	96.2%	Decreasing	
MW-130A	5	0/9	1.20	21-May-19	-11	0.20	84.6%	Stable	
MW-130B	5	7/9	8.20	21-May-18	-23	0.23	99.1%	Decreasing	
MW-140B	5	0/5	1.30	21-May-19	-2	0.07	59.2%	Stable	
MW-140C	5	0/5	3.80	21-May-18	-8	0.23	95.8%	Decreasing	
Muscoy Plume - Shallow									
MW-135A	5	0/18	2.30	21-May-18	-81	0.26	>99.9%	Decreasing	
MW-136A ₅	5	0/11	0.68	21-May-18	-2	0.34	62.5%	Stable	
MW-137A	5	0/18	1.70	27-Feb-20	9	0.44	66.6%	No Trend	
MW-138A	5	0/18	1.20	29-Aug-19	-52	0.22	97.4%	Decreasing	
MW-139A	5	0/18	1.90	21-May-18	34	0.12	89.3%	No Trend	Most recent date

Well	Clean up Level (µg/L)	Number of Exceedances/Sampling Events ¹	Maximum Concentration (µg/L)	Date of Highest Concentration	Mann-Kendall Statistics (S) ²	Coefficient of Variation (COV) ³	Confidence Factor (CF) ⁴	Concentration Trend	Comments
									of max concentration noted
MW-141A	5	0/18	2.50	19-May-20	-22	0.15	78.4%	Stable	Most recent date of max concentration noted
Muscoy Plume - Intermediate									
MW-135B	5	0/18	1.10	29-Aug-19	-17	0.38	80.6%	Stable	
MW-136B	5	0/9	0.80	20-Nov-19	-5	0.17	76.5%	Stable	
Muscoy Plume - Deep									
MW-135C	5	0/9	0.39	15-Nov-21	25	0.51	100.0%	Increasing	
MW-137C	5	0/9	0.62	20-Nov-19	4	0.27	61.9%	No Trend	
Downgradient Muscoy Extraction Wells									
Olive & Garner ⁶	5	0/5	1.60	12-Apr-16	-6	0.53	88.3%	Stable	

Well	Clean up Level (µg/L)	Number of Exceedances/Sampling Events ¹	Maximum Concentration (µg/L)	Date of Highest Concentration	Mann-Kendall Statistics (S) ²	Coefficient of Variation (COV) ³	Confidence Factor (CF) ⁴	Concentration Trend	Comments
Upgradient Newmark North Plant									
MW-007A	5	0/9	3.10	15-Nov-21	11	0.53	93.2%	Probably Increasing	
MW-007B	5	0/9	1.30	21-May-18	-22	0.21	98.8%	Decreasing	
MW-008B	5	0/5	0.93	22-May-19	-6	0.11	88.3%	Stable	
Newmark North Plant - Shallow									
MW-009A	5	0/9	3.10	21-May-18	-18	0.60	98.4%	Decreasing	
Newmark North Plant - Intermediate									
MW-004B	5	0/9	0.84	16-Nov-20	-14	0.28	91.0%	Probably Decreasing	
MW-009B	5	0/9	3.10	21-May-18	-11	0.10	84.6%	Stable	
MW-016B	5	0/9	1.70	19-May-20	-18	0.11	96.2%	Decreasing	Most recent date of max concentration noted
MW-017B	5	0/9	0.92	16-May-22	6	0.29	88.3%	No Trend	

Well	Clean up Level (µg/L)	Number of Exceedances/Sampling Events ¹	Maximum Concentration (µg/L)	Date of Highest Concentration	Mann-Kendall Statistics (S) ²	Coefficient of Variation (COV) ³	Confidence Factor (CF) ⁴	Concentration Trend	Comments
Downgradient Newmark North Plant / Upgradient Newmark Plume Front									
DTS C 003C	5	0/5	1.20	22-May-18	-8	0.38	95.8%	Decreasing	
30th & Mt. View	5	0/5	1.90	16-Apr-19	-3	0.38	67.5%	Stable	Most recent date of max concentration noted
31st & Mt. View	5	0/4	2.10	16-Apr-19	-1	0.29	50.0%	Stable	
27th & Acacia	5	0/5	2.30	16-Apr-19	-8	0.37	95.8%	Decreasing	
Newmark Plume Front - Shallow									
MW-010A	5	0/9	0.59	21-May-19	0	0.28	37.5%	Stable	
MW-012A	5	0/18	0.30	27-Aug-20	-2	0.08	62.5%	Stable	
MW-014A	5	0/9	0.66	21-May-18	-13	0.14	89.0%	Stable	
Newmark Plume Front - Intermediate									
MW-012B	5	0/18	1.50	28-Feb-18	-126	0.38	>99.9%	Decreasing	
Newmark Plume Front - Deep									
MW-010C	5	0/9	0.45	21-May-18	-1	0.26	50.0%	Stable	
MW-011C	5	0/9	3.90	21-May-18	-24	0.33	99.4%	Decreasing	

Notes:

¹ Samples used during the Mann-Kendall Statistical analysis are from May 2017 to May 2022.

² The Mann-Kendall Statistic (S) measures the trend of the data. The S statistic is the sum of the differences between sequential sampling events, for the full population of sampling events conducted at a single sampling location (e.g., a monitoring well) for a selected chemical constituent (e.g., benzene). Positive values indicate an increase of concentration over time, whereas negative values indicate a decrease in concentration over time.

³ The Coefficient of Variation (COV) is a statistical measure of how the individual data points vary about the mean value. The COV for the dataset is the ratio of the standard deviation to the mean. The COV, provides a general indicator of the degree of variability in the concentrations at a particular monitoring location over time. The COV is used to distinguish between a “No Trend” result (significant scatter in concentration trend vs. time) and a “Stable” result (limited variability in concentration vs. time) for datasets with no significant increasing or decreasing trend.

⁴ The Confidence Factor (CF) is the statistical confidence that the constituent concentration is increasing. The CF value modifies the S Statistic calculation to indicate the degree of confidence in the trend result, as in “Decreasing” vs. “Probably Decreasing” or “Increasing” vs. “Probably Increasing.” Additionally, if the confidence factor is quite low, due either to considerable variability in concentrations vs. time or little change in concentrations vs. time, the CF is used to apply a preliminary “No Trend” classification, pending consideration of the COV.

⁵ Samples evaluated from May-2017 to May-2022 to meet minimum sampling events required for calculating Mann-Kendall Trend.

⁶ Samples evaluated from Apr-2016 to Jul-2019 to meet minimum sampling events required for calculating Mann-Kendall Trend.

Upgradient Muscoy Plume Treatment Facility (19th Street GAC Plant)

USACE performed trend analysis on two municipal wells (MW-140B/C) and five monitoring wells upgradient (MW-128A/B, MW-129A, MW-130A/B) of the Muscoy Plume extraction system. Three

wells (MW-129A, MW-130B, and MW-140C) resulted in decreasing trends. Three wells (MW-128A, MW-129A, and MW-140B) resulted in stable trends. One well (MW-128B) did not have sufficient sampling data above the non-detect value to establish a trend during the last five years, but concentrations have increased above the non-detect value to 1.7 µg/L in May 2022. In the last five years, PCE concentrations in MW-130B have exceeded the federal drinking water standard; however, PCE concentrations have been decreasing over the last five years and have been below the federal drinking water standard since 15-Nov-2021 (Figure C-1).

Muscoy Plume Treatment Facility (19th Street GAC Plant) – Shallow / Intermediate / Deep Aquifers

USACE performed trend analysis on ten wells (MW-135A/B/C, MW-136A/B, MW-137A/C, MW-138A, MW-139A, MW-141A) downgradient of Muscoy Plume extraction system (Figures C-2 through C-4). Two wells (MW-135A and MW-138A) resulted in decreasing trends. Four wells (MW-136A, MW-141A, MW-135B, and MW-136B) resulted in stable trends. Three wells (MW-137A, MW-139A, and MW-137C) resulted in no trend. One well (MW-135C) resulted in an increasing trend. The maximum concentration of PCE in MW-135C, located in the furthestmost southeast downgradient edge of the Muscoy shallow aquifer (Figure 2), was 0.39 µg/L in November 2021, below the federal drinking water standard of 5 µg/L. The increase in concentration coincides with noted repeated EPA 108 temporary outages (motor/pump failures) and an EPA 108S equipment failure in May 2021.

Downgradient Muscoy Plume Treatment Facility (19th Street GAC Plant)

Well Olive & Garner is a municipal well located downgradient of the Newmark and Muscoy Treatment Facilities. This well was selected for trend analysis to identify if contaminants are migrating past either treatment facility during operation or during periods when the treatment facility was not operational due to maintenance. Concentrations in the well over the past five years have fluctuated between 0.23 µg/L and 1.20 µg/L for PCE, which is below the federal drinking water standard of 5 µg/L, with a stable trend (Figure C-5), indicating that the Newmark and Muscoy Treatment Facilities are effective in protecting the municipal supply wells south and southwest of the Shandin Hills.

Upgradient Newmark North Plant (Newmark GAC/Air Stripping)

USACE performed trend analysis on one municipal well (MW-008B) and two monitoring wells (MW-007A/B) upgradient of the extraction system in the Newmark North Plant (Figures C-6 through C-8). One well (MW-008B) resulted in a stable trend. One well (MW-007B) resulted in a decreasing trend. One well (MW-007A) resulted in a probable increasing trend. The maximum concentration of PCE in MW-007A, located upgradient the extraction well system, was 3.10 µg/L in November 2021, below the federal drinking water standard of 5 µg/L.

Newmark North Plant (Newmark GAC/Air Stripping) – Shallow / Intermediate Aquifers

USACE performed trend analysis on five wells (MW-004B, MW-009A/B, MW-016B, and MW-017B) downgradient of the extraction system in the Newmark North Plant system (Figures C-7 and C-8). Two

wells (MW-009A and MW-016B) resulted in decreasing trends. One well (MW-004B) resulted in a probably decreasing trend. One well (MW-009B) resulted in a stable trend. One well (MW-017B) resulted in no trend.

Downgradient Newmark North Plant (Newmark GAC/Air Stripping) / Upgradient Newmark Plume Front (17th Street GAC Facility)

USACE performed trend analysis on four wells (DTSC 003C, 30th & Mt. View, 31st & Mt. View, and 27th & Acacia, Figure C-9) downgradient of the extraction system in the Newmark North Plant system and upgradient Newmark Plume Front. Two wells (DTSC 003C and 27th & Acacia) resulted in decreasing trends. Two wells (30th & Mt. View and 31st & Mt. View) resulted in stable trends.

Newmark Plume Front (17th Street GAC Facility) – Shallow / Intermediate / Deep Aquifers

USACE performed trend analysis on six wells (MW-010A/C, MW-011C, MW-012A/B, and MW-014A, Figures C-10 through C-12) downgradient of the Newmark Plume Front extraction system. Two wells (MW-011C and MW-012B) resulted in decreasing trends. Four wells (MW-010A, MW-010C, MW-012A, and MW-014A) resulted in stable trends. MW-012A did have TCE values greater than those of the PCE concentrations. This was the single exception to TCE following PCE behavior, noted in the first paragraph of Section 4.2, therefore Mann-Kendall trend analysis was completed to capture the TCE trend in this well. Concentrations of TCE for MW-012A were increasing during the review period, though below the federal drinking water standard.

Capture analysis / Aquifer Plume Migration

USACE reviewed San Bernardino Municipal Water District's capture analysis figures from 2018 through 2022. Capture analysis was evaluated using particle tracking across the PCE plumes (from the 2.5 µg/L contours.) The contaminant concentration contours are generated using the chemical concentration data from the designated sampling event.

Capture zone analysis was performed for the Newmark extraction system (EPA 001-005) semi-annually (since 2012) during Operations and Maintenance by San Bernardino Municipal Water District. Capture zone analysis from June 2018 to June 2022 for the Newmark Plume Front aquifer are shown in Figures C-13 through C-17. The PCE plume (green contour lines) in the Newmark Plume Front intermediate aquifer has migrated down-gradient relative to the extent of the capture zone (blue concentric circles) during the past five years near MW-012B.

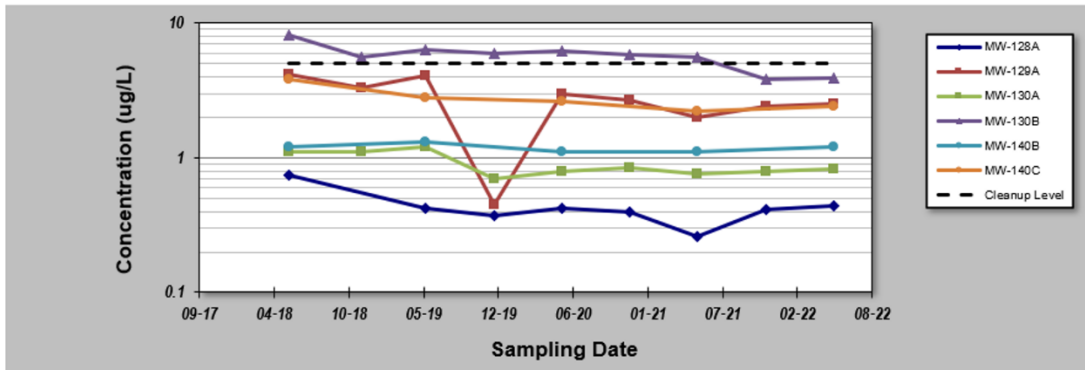
Capture zone analysis was performed for the Newmark extraction system (EPA 108-112) semi-annually (since 2012) during Operations and Maintenance by San Bernardino Municipal Water District. Capture zone analysis in June 2018 to June 2022 for the Muscoy Plume shallow aquifer are shown in Figures C-18 through C-22. The PCE plume (green contour lines) in the Muscoy Plume shallow aquifer has migrated down-gradient relative to the extent of the capture zone (blue concentric circles) during the past five years near MW-141A and MW-135A. This suggests that the remedial action objective of inhibiting migration of groundwater contamination into clean portions of the aquifer may not continue to be met in

the shallow and intermediate aquifers unless steps are taken to ensure capture of the Newmark Plume front and Muscoy Plume.

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 01-Dec-22 Job ID: Upgradient Muscoy Extraction Wells
 Facility Name: Newmark Groundwater Superfund Site Constituent: Tetrachloroethylene (PCE)
 Conducted By: Travis Kelsay Concentration Units: ug/L

Sampling Point ID:		MW-128A	MW-129A	MW-130A	MW-130B	MW-140B	MW-140C
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	21-May-18	0.74	4.2	1.1	8.2	1.2	3.8
2	28-Nov-18	ND	3.3	1.1	5.6		
3	21-May-19	0.42	4.1	1.2	6.3	1.3	2.8
4	20-Nov-19	0.37	0.45	0.7	6		
5	19-May-20	0.42	3	0.8	6.2	1.1	2.6
6	16-Nov-20	0.4	2.7	0.85	5.8		
7	17-May-21	0.26	2	0.76	5.6	1.1	2.2
8	15-Nov-21	0.41	2.4	0.79	3.8		
9	16-May-22	0.44	2.5	0.82	3.9	1.2	2.4
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.32	0.41	0.20	0.23	0.07	0.23
Mann-Kendall Statistic (S):		-5	-18	-11	-23	-2	-8
Confidence Factor:		68.3%	96.2%	84.6%	99.1%	59.2%	95.8%
Concentration Trend:		Stable	Decreasing	Stable	Decreasing	Stable	Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

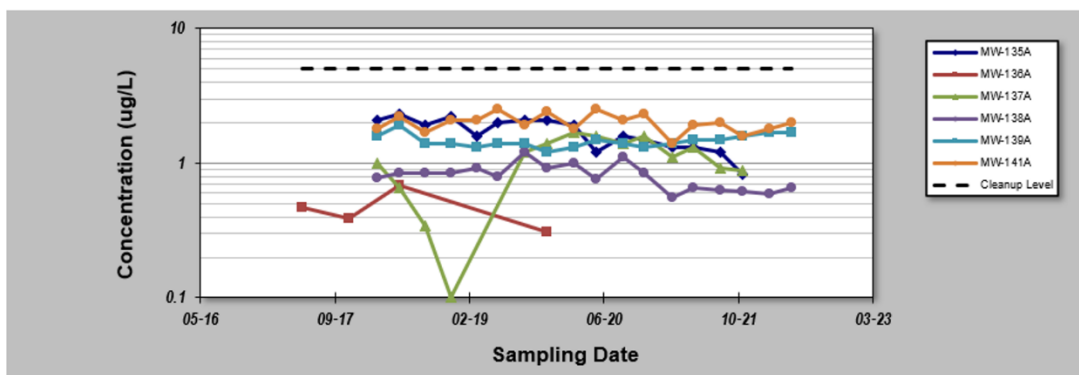
Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-1. Mann-Kendall Analysis for Upgradient Muscoy Plume Treatment Facility (19th Street GAC Plant).

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 01-Dec-22 Job ID: Muscoy Plume - Shallow
 Facility Name: Newmark Groundwater Superfund Site Constituent: Tetrachloroethylene (PCE)
 Conducted By: Travis Kelsay Concentration Units: ug/L

Sampling Point ID:							
MW-135A MW-136A MW-137A MW-138A MW-139A MW-141A							
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	22-May-17		0.47				
2	15-Nov-17		0.39				
3	28-Feb-18	2.1		1	0.77	1.6	1.8
4	21-May-18	2.3	0.68	0.66	0.85	1.9	2.2
5	23-Aug-18	1.9		0.34	0.84	1.4	1.7
6	28-Nov-18	2.2	ND	0.1	0.84	1.4	2.1
7	5-Mar-19	1.6		ND	0.91	1.3	2.1
8	21-May-19	2	ND	ND	0.79	1.4	2.5
9	29-Aug-19	2.1		1.2	1.2	1.4	1.9
10	20-Nov-19	2.1	0.31	1.4	0.92	1.2	2.4
11	27-Feb-20	1.9		1.7	1	1.3	1.8
12	19-May-20	1.2	ND	1.6	0.76	1.5	2.5
13	27-Aug-20	1.6		1.4	1.1	1.4	2.1
14	16-Nov-20	1.5	ND	1.6	0.85	1.3	2.3
15	25-Feb-21	1.3		1.1	0.55	1.4	1.4
16	17-May-21	1.3	ND	1.3	0.66	1.5	1.9
17	26-Aug-21	1.2		0.91	0.63	1.5	2
18	15-Nov-21	0.83	ND	0.88	0.61	1.6	1.6
19	24-Feb-22	ND		ND	0.59	1.7	1.8
20	16-May-22	ND	ND	ND	0.66	1.7	2
21							
22							
23							
24							
25							
Coefficient of Variation:		0.26	0.34	0.44	0.22	0.12	0.15
Mann-Kendall Statistic (S):		-81	-2	9	-52	34	-22
Confidence Factor:		>99.9%	62.5%	66.6%	97.4%	89.3%	78.4%
Concentration Trend:		Decreasing	Stable	No Trend	Decreasing	No Trend	Stable



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

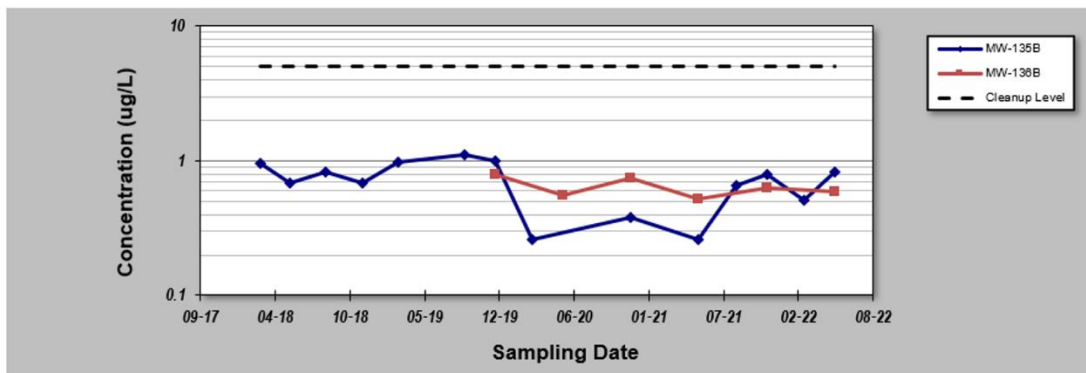
Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-2. Mann-Kendall Analysis for Muscoy Plume Treatment Facility (19th Street GAC Plant) – Shallow Aquifer.

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **01-Dec-22** Job ID: **Muscoy Plume - Intermediate**
 Facility Name: **Newmark Groundwater Superfund Site** Constituent: **Tetrachloroethylene (PCE)**
 Conducted By: **Travis Kelsay** Concentration Units: **ug/L**

Sampling Point ID:		MW-135B	MW-136B				
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	28-Feb-18	0.96					
2	21-May-18	0.69	ND				
3	23-Aug-18	0.83					
4	28-Nov-18	0.68	ND				
5	5-Mar-19	0.98					
6	21-May-19	ND	ND				
7	29-Aug-19	1.1					
8	20-Nov-19	1	0.8				
9	27-Feb-20	0.26					
10	19-May-20	ND	0.56				
11	27-Aug-20	ND					
12	16-Nov-20	0.38	0.75				
13	25-Feb-21	ND					
14	17-May-21	0.26	0.52				
15	26-Aug-21	0.66					
16	15-Nov-21	0.8	0.63				
17	24-Feb-22	0.51					
18	16-May-22	0.83	0.59				
19							
20							
Coefficient of Variation:		0.38	0.17				
Mann-Kendall Statistic (S):		-17	-5				
Confidence Factor:		80.6%	76.5%				
Concentration Trend:		Stable	Stable				



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

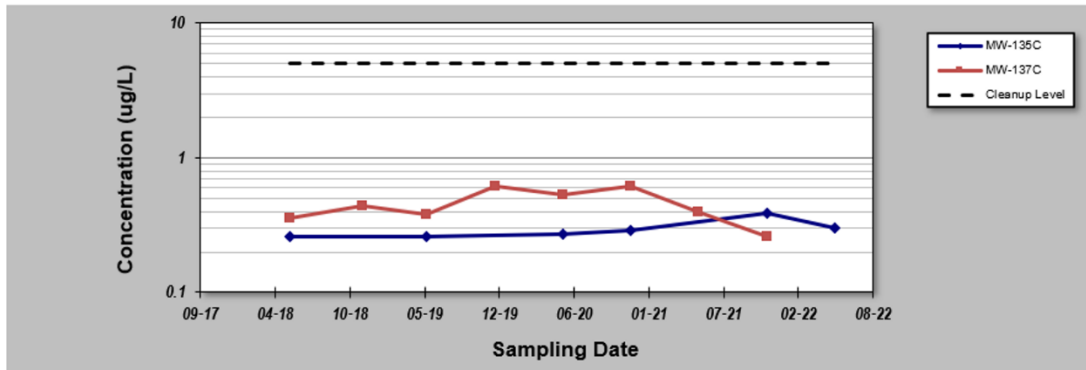
Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-3. Mann-Kendall Analysis for Muscoy Plume Treatment Facility (19th Street GAC Plant) – Intermediate Aquifer.

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **01-Dec-22** Job ID: **Muscoy Plume - Deep**
 Facility Name: **Newmark Groundwater Superfund Site** Constituent: **Tetrachloroethylene (PCE)**
 Conducted By: **Travis Kelsay** Concentration Units: **ug/L**

Sampling Point ID:		MW-135C	MW-137C				
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	21-May-18	0.26	0.36				
2	28-Nov-18	ND	0.44				
3	21-May-19	0.26	0.38				
4	20-Nov-19	ND	0.62				
5	19-May-20	0.27	0.53				
6	16-Nov-20	0.29	0.61				
7	17-May-21	ND	0.4				
8	15-Nov-21	0.39	0.26				
9	16-May-22	0.3	ND				
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.51	0.27				
Mann-Kendall Statistic (S):		25	4				
Confidence Factor:		100.0%	61.9%				
Concentration Trend:		Increasing	No Trend				



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

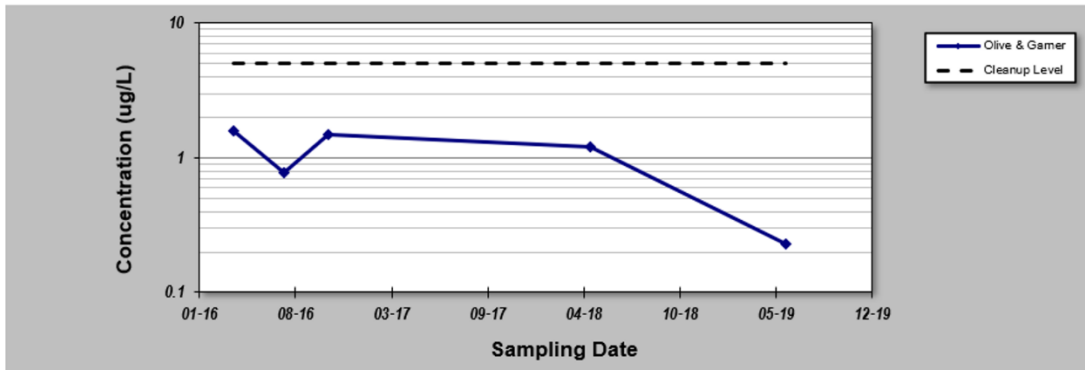
Figure C-16. Mann Kendall Analysis for Muscoy Plume Treatment Facility (19th Street GAC Plant) –Deep Aquifer

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **01-Dec-22** Job ID: **Downgradient Muscoy Extraction Wells**
 Facility Name: **Newmark Groundwater Superfund Site** Constituent: **Tetrachloroethylene (PCE)**
 Conducted By: **Travis Kelsay** Concentration Units: **ug/L**

Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	12-Apr-16	1.6					
2	26-Jul-16	0.77					
3	25-Oct-16	1.5					
4	24-Apr-18	1.2					
5	4-Jun-19	0.23					
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Coefficient of Variation: **0.53**
 Mann-Kendall Statistic (S): **-6**
 Confidence Factor: **88.3%**
 Concentration Trend: **Stable**



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.
 Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

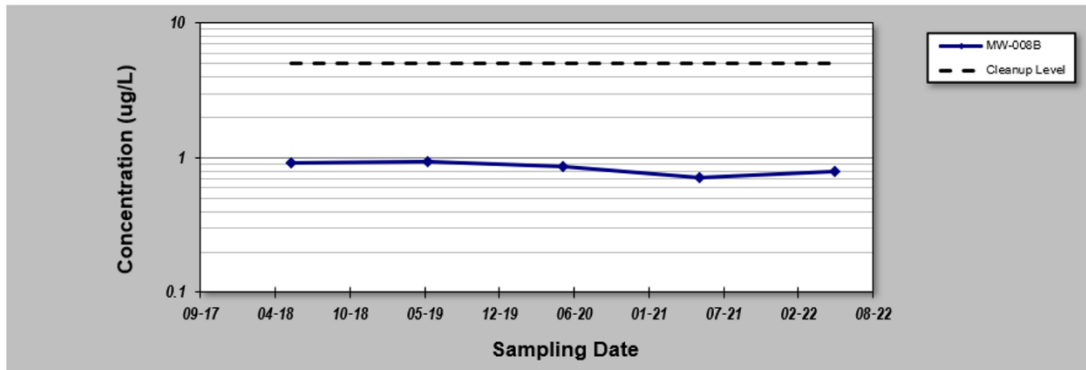
Figure C-5. Mann-Kendall Analysis for Downgradient Muscoy Plume Treatment Facility (19th Street GAC Plant).

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 01-Dec-22	Job ID: Upgradient Newmark North Plant
Facility Name: Newmark Groundwater Superfund Site	Constituent: Tetrachloroethylene (PCE)
Conducted By: Travis Kelsay	Concentration Units: ug/L

Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	22-May-18	0.92					
2	22-May-19	0.93					
3	20-May-20	0.86					
4	18-May-21	0.71					
5	17-May-22	0.8					
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Coefficient of Variation:	0.11
Mann-Kendall Statistic (S):	-6
Confidence Factor:	88.3%
Concentration Trend:	Stable



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

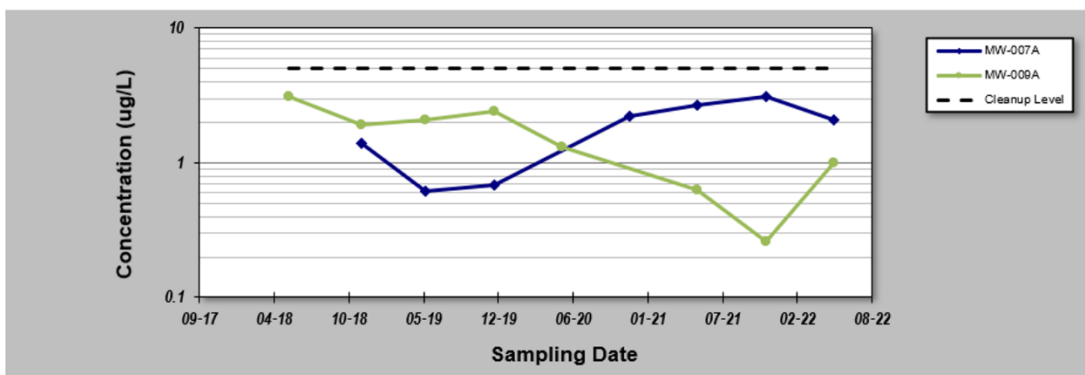
Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-6. Mann-Kendall Analysis for Upgradient Newmark North Plant (Newmark GAC/Air Stripping).

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **01-Dec-22** Job ID: **Newmark North Plant - Shallow**
 Facility Name: **Newmark Groundwater Superfund Site** Constituent: **Tetrachloroethylene (PCE)**
 Conducted By: **Travis Kelsay** Concentration Units: **ug/L**

Sampling Point ID:		MW-007A	MW-009A				
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	21-May-18	ND	3.1				
2	28-Nov-18	1.4	1.9				
3	21-May-19	0.62	2.1				
4	20-Nov-19	0.68	2.4				
5	19-May-20	ND	1.3				
6	16-Nov-20	2.2	ND				
7	17-May-21	2.7	0.63				
8	15-Nov-21	3.1	0.26				
9	16-May-22	2.1	1				
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.53	0.60				
Mann-Kendall Statistic (S):		11	-18				
Confidence Factor:		93.2%	98.4%				
Concentration Trend:		Prob. Increasing	Decreasing				



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

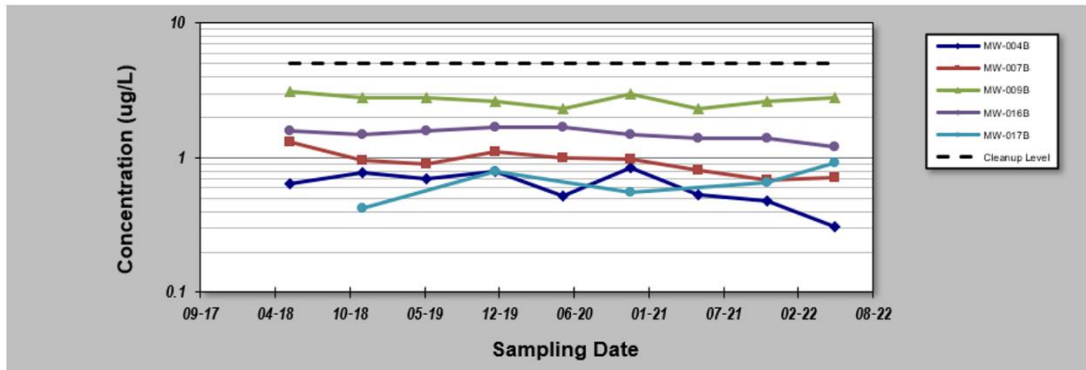
Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-7. Mann-Kendall Analysis for Newmark North Plant (Newmark GAC/Air Stripping) – Shallow Aquifer.

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **01-Dec-22** Job ID: **Newmark North Plant - Intermediate**
 Facility Name: **Newmark Groundwater Superfund Site** Constituent: **Tetrachloroethylene (PCE)**
 Conducted By: **Travis Kelsay** Concentration Units: **ug/L**

Sampling Point ID:		MW-004B	MW-007B	MW-009B	MW-016B	MW-017B		
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)						
1	21-May-18	0.64	1.3	3.1	1.6	ND		
2	28-Nov-18	0.78	0.95	2.8	1.5	0.42		
3	21-May-19	0.7	0.89	2.8	1.6	ND		
4	20-Nov-19	0.79	1.1	2.6	1.7	0.79		
5	19-May-20	0.52	1	2.3	1.7	ND		
6	16-Nov-20	0.84	0.97	3	1.5	0.55		
7	17-May-21	0.53	0.81	2.3	1.4	ND		
8	15-Nov-21	0.48	0.68	2.6	1.4	0.65		
9	16-May-22	0.31	0.72	2.8	1.2	0.92		
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.28	0.21	0.10	0.11	0.29		
Mann-Kendall Statistic (S):		-14	-22	-11	-18	6		
Confidence Factor:		91.0%	98.8%	84.6%	96.2%	88.3%		
Concentration Trend:		Prob. Decreasing	Decreasing	Stable	Decreasing	No Trend		



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

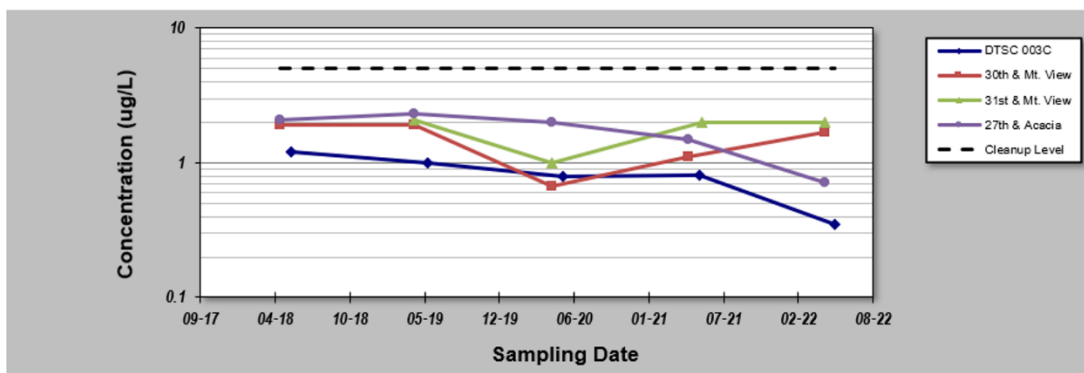
Figure C-8. Mann-Kendall Analysis for Newmark North Plant (Newmark GAC/Air Stripping) – Intermediate Aquifer.

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 01-Dec-22 Job ID: Down/Upgrad. Newmark N. Plant/Plume Front
 Facility Name: Newmark Groundwater Superfund Site Constituent: Tetrachloroethylene (PCE)
 Conducted By: Travis Kelsay Concentration Units: ug/L

Sampling Point ID: DTSC 003C 30th & Mt. View 31st & Mt. View 27th & Acacia

Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)			
1	24-Apr-18		1.9		2.1
2	22-May-18	1.2			
3	16-Apr-19		1.9	2.1	2.3
4	22-May-19	1			
5	21-Apr-20		0.67	1	2
6	20-May-20	0.8			
7	20-Apr-21		1.1		1.5
8	18-May-21	0.81			
9	25-May-21			2	
10	19-Apr-22		1.7	2	0.71
11	17-May-22	0.35			
12					
13					
14					
15					
16					
17					
18					
19					
20					
Coefficient of Variation:		0.38	0.38	0.29	0.37
Mann-Kendall Statistic (S):		-8	-3	-1	-8
Confidence Factor:		95.8%	67.5%	50.0%	95.8%
Concentration Trend:		Decreasing	Stable	Stable	Decreasing



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

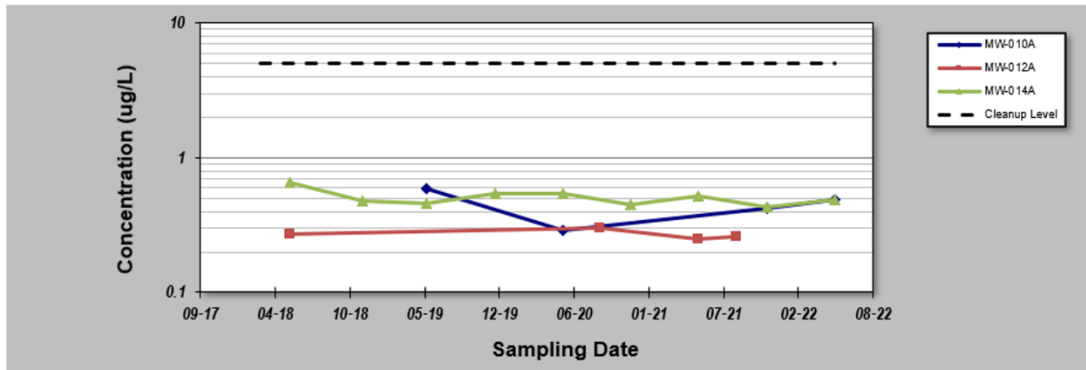
ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.
 Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-9. Mann-Kendall Analysis for Downgradient Newmark North Plant (Newmark GAC/Air Stripping) / Upgradient Newmark Plume Front (17th Street GAC Facility).

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **01-Dec-22** Job ID: **Newmark Plume Front - Shallow**
 Facility Name: **Newmark Groundwater Superfund Site** Constituent: **Tetrachloroethylene (PCE)**
 Conducted By: **Travis Kelsay** Concentration Units: **ug/L**

Sampling Point ID:		MW-010A	MW-012A	MW-014A			
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	28-Feb-18		ND				
2	21-May-18		0.27	0.66			
3	23-Aug-18		ND				
4	28-Nov-18	ND	ND	0.48			
5	5-Mar-19		ND				
6	21-May-19	0.59	ND	0.46			
7	29-Aug-19		ND				
8	20-Nov-19	ND	ND	0.54			
9	27-Feb-20		ND				
10	19-May-20	0.29	ND	0.54			
11	27-Aug-20		0.3				
12	16-Nov-20	ND	ND	0.45			
13	25-Feb-21		ND				
14	17-May-21	ND	0.25	0.52			
15	26-Aug-21		0.26				
16	15-Nov-21	0.42	ND	0.43			
17	24-Feb-22		ND				
18	16-May-22	0.49	ND	0.49			
19							
20							
Coefficient of Variation:		0.28	0.08	0.14			
Mann-Kendall Statistic (S):		0	-2	-13			
Confidence Factor:		37.5%	62.5%	89.0%			
Concentration Trend:		Stable	Stable	Stable			



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S=0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

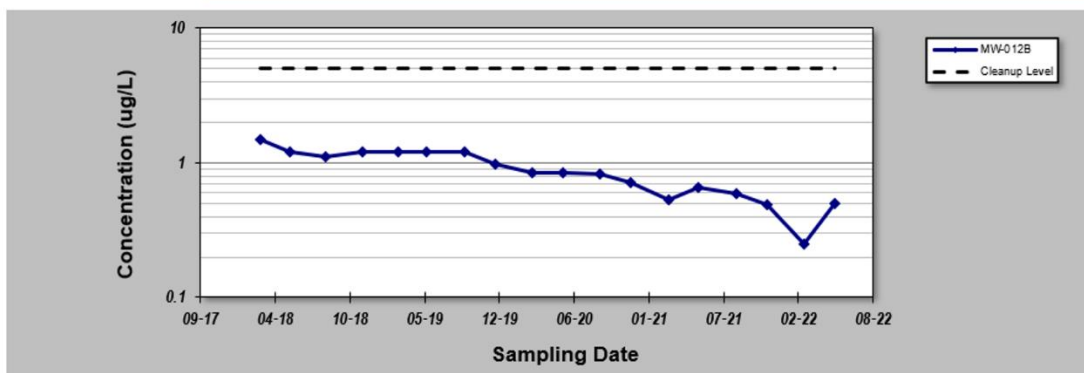
ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-10. Mann-Kendall Analysis for Newmark Plume Front (17th Street GAC Facility) – Shallow Aquifer.

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 01-Dec-22		Job ID: Newmark Plume Front - Intermediate	
Facility Name: Newmark Groundwater Superfund Site		Constituent: Tetrachloroethylene (PCE)	
Conducted By: Travis Kelsay		Concentration Units: ug/L	
Sampling Point ID: MW-012B			
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)	
1	28-Feb-18	1.5	
2	21-May-18	1.2	
3	23-Aug-18	1.1	
4	28-Nov-18	1.2	
5	5-Mar-19	1.2	
6	21-May-19	1.2	
7	29-Aug-19	1.2	
8	20-Nov-19	0.97	
9	27-Feb-20	0.84	
10	19-May-20	0.84	
11	27-Aug-20	0.83	
12	16-Nov-20	0.71	
13	25-Feb-21	0.53	
14	17-May-21	0.65	
15	26-Aug-21	0.59	
16	15-Nov-21	0.49	
17	24-Feb-22	0.25	
18	16-May-22	0.5	
19			
20			
Coefficient of Variation:		0.38	
Mann-Kendall Statistic (S):		-126	
Confidence Factor:		>99.9%	
Concentration Trend:		Decreasing	



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

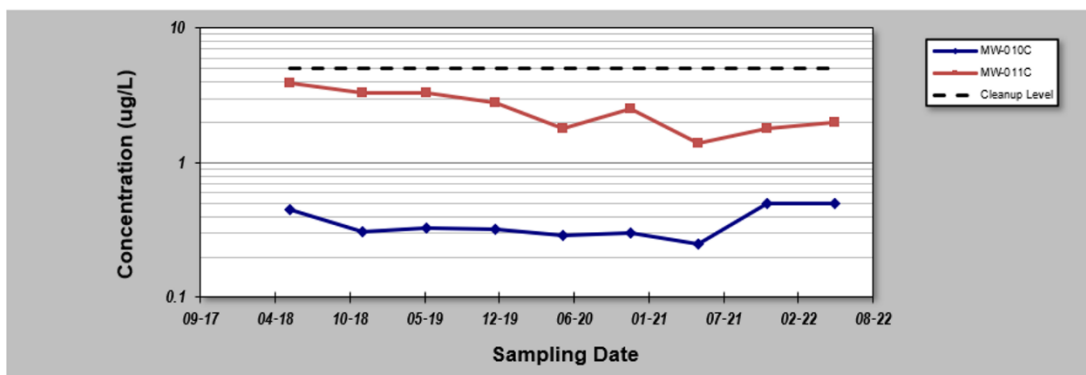
Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-11. Mann-Kendall Analysis for Newmark Plume Front (17th Street GAC Facility) – Intermediate Aquifer.

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 01-Dec-22 Job ID: Newmark Plume Front - Deep
 Facility Name: Newmark Groundwater Superfund Site Constituent: Tetrachloroethylene (PCE)
 Conducted By: Travis Kelsay Concentration Units: ug/L

Sampling Point ID:		MW-010C	MW-011C				
Sampling Event	Sampling Date	TETRACHLOROETHYLENE (PCE) CONCENTRATION (ug/L)					
1	21-May-18	0.45	3.9				
2	28-Nov-18	0.31	3.3				
3	21-May-19	0.33	3.3				
4	20-Nov-19	0.32	2.8				
5	19-May-20	0.29	1.8				
6	16-Nov-20	0.3	2.5				
7	17-May-21	0.25	1.4				
8	15-Nov-21	0.5	1.8				
9	16-May-22	0.5	2				
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.26	0.33				
Mann-Kendall Statistic (S):		-1	-24				
Confidence Factor:		50.0%	99.4%				
Concentration Trend:		Stable	Decreasing				



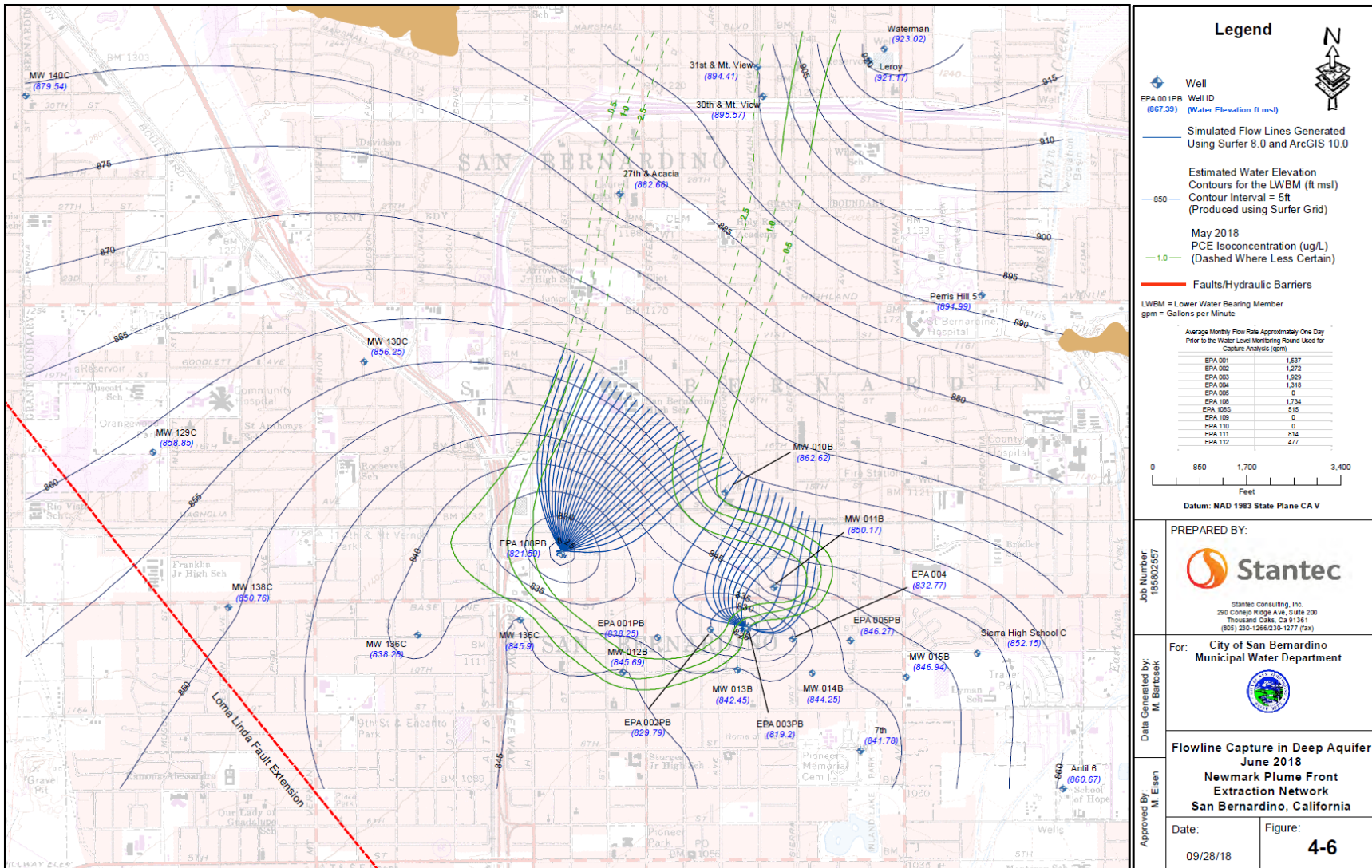
- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
 GSI Environmental Inc., www.gsi-net.com

ND = Non-Detect. The analyte was analyzed for, but not detected above the reported sample quantitation limit.

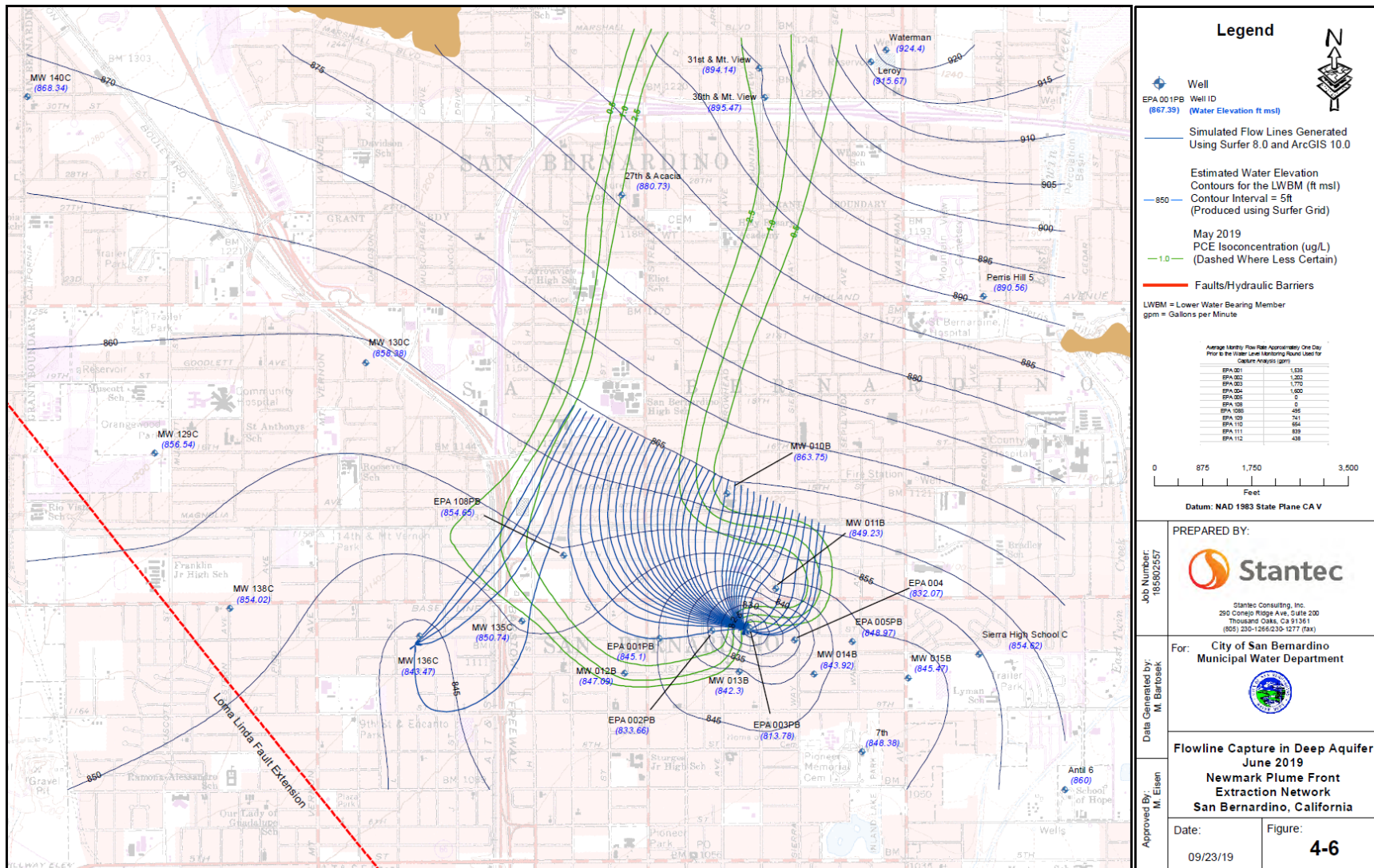
Red value = (1) The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample or (2) The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

Figure C-12. Mann-Kendall Analysis for Newmark Plume Front (17th Street GAC Facility) – Deep Aquifer.



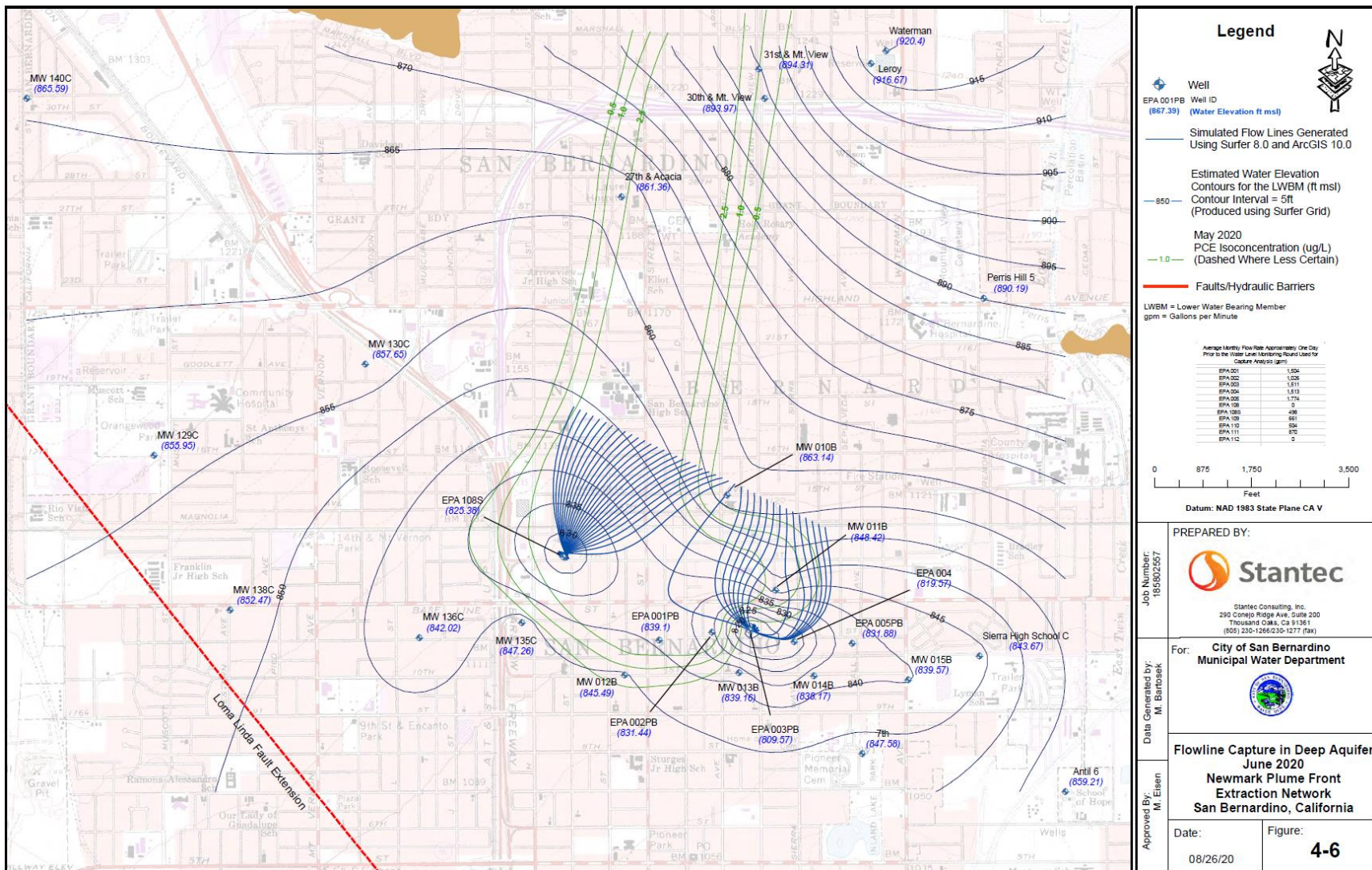
Source: City of San Bernardino 2018. 1st Semi-Annual 2018 Progress Report.

Figure C-13. Groundwater flow lines demonstrating capture of PCE plume within the intermediate Newmark Plume Front aquifer during June 2018.



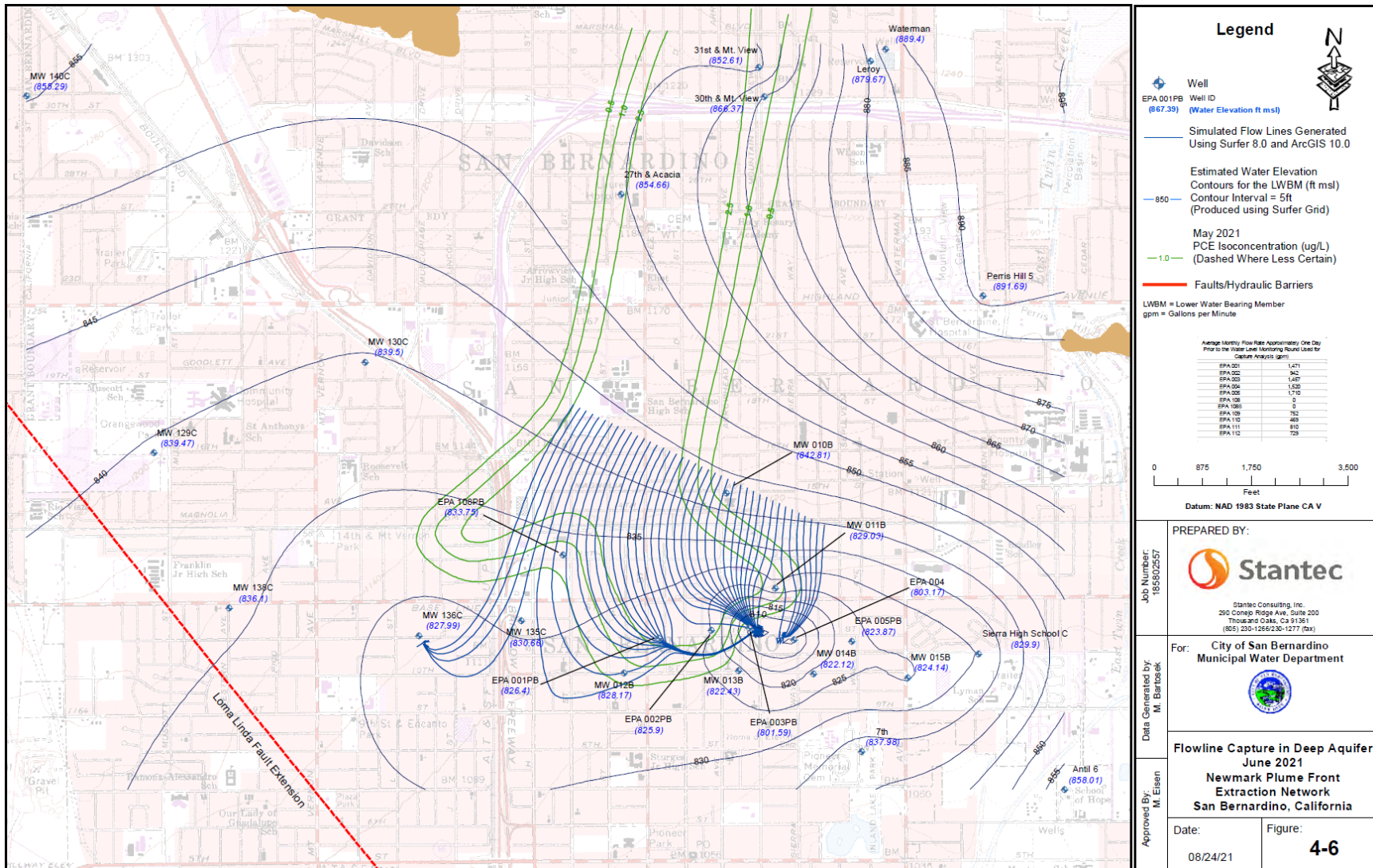
Source: City of San Bernardino 2019. 1st Semi-Annual 2019 Progress Report.

Figure C-14. Groundwater flow lines demonstrating capture of PCE plume within the intermediate Newmark Plume Front aquifer during June 2019.



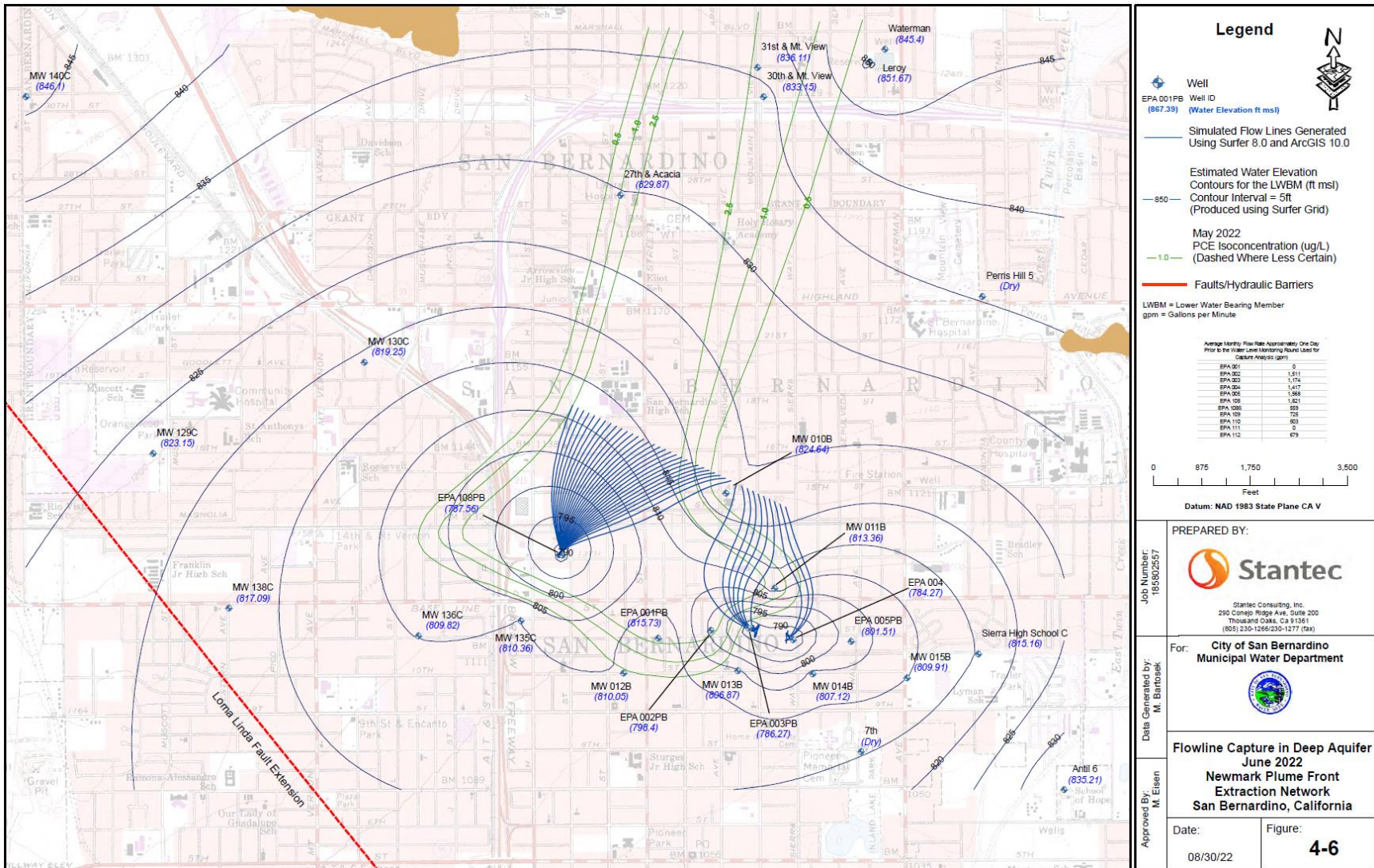
Source: City of San Bernardino 2020. 1st Semi-Annual 2020 Progress Report.

Figure C-15. Groundwater flow lines demonstrating capture of PCE plume within the intermediate Newmark Plume Front aquifer during June 2020.



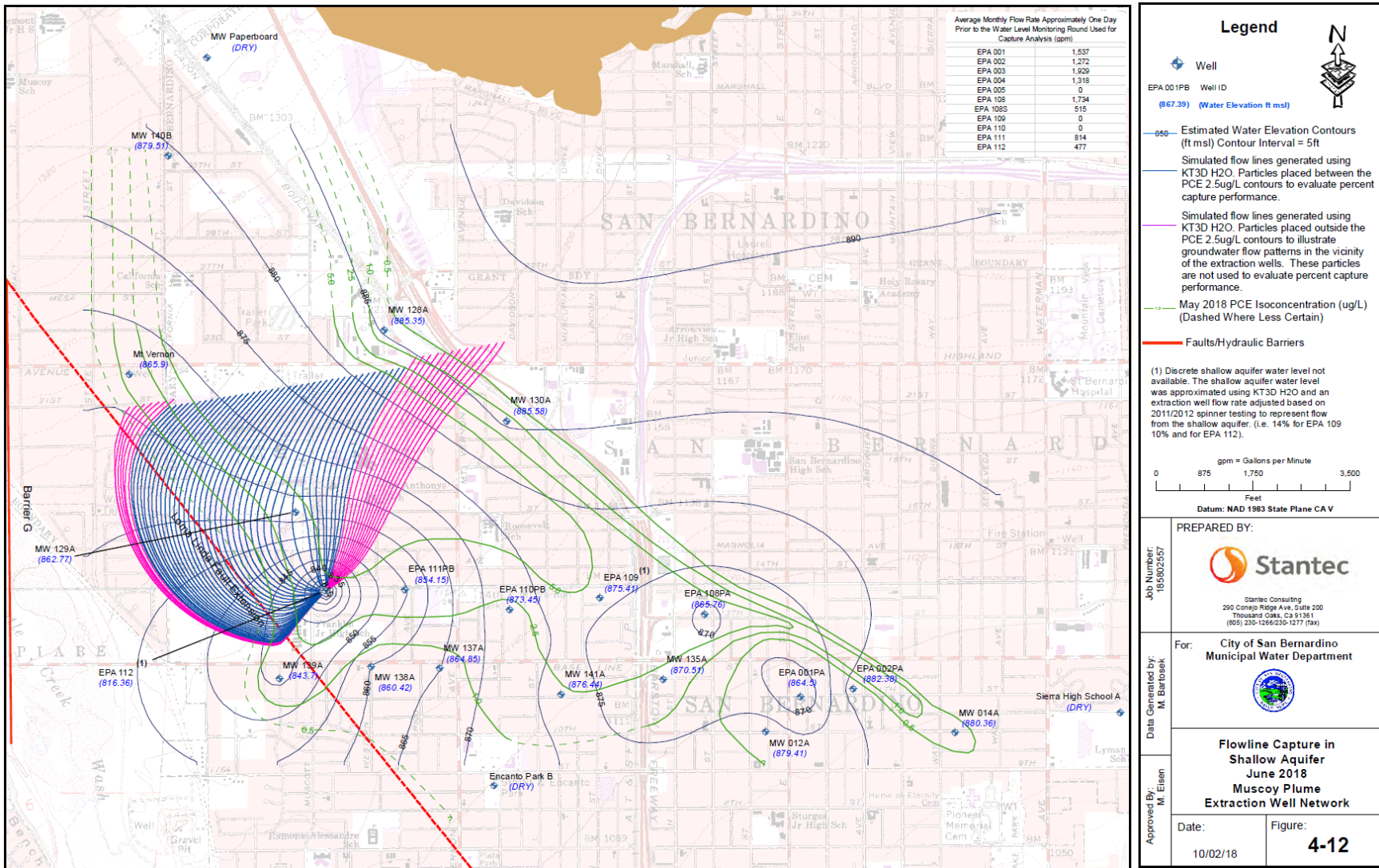
Source: City of San Bernardino 2021. 1st Semi-Annual 2021 Progress Report.

Figure C-16. Groundwater flow lines demonstrating capture of PCE plume within the intermediate Newmark Plume Front aquifer during June 2021.



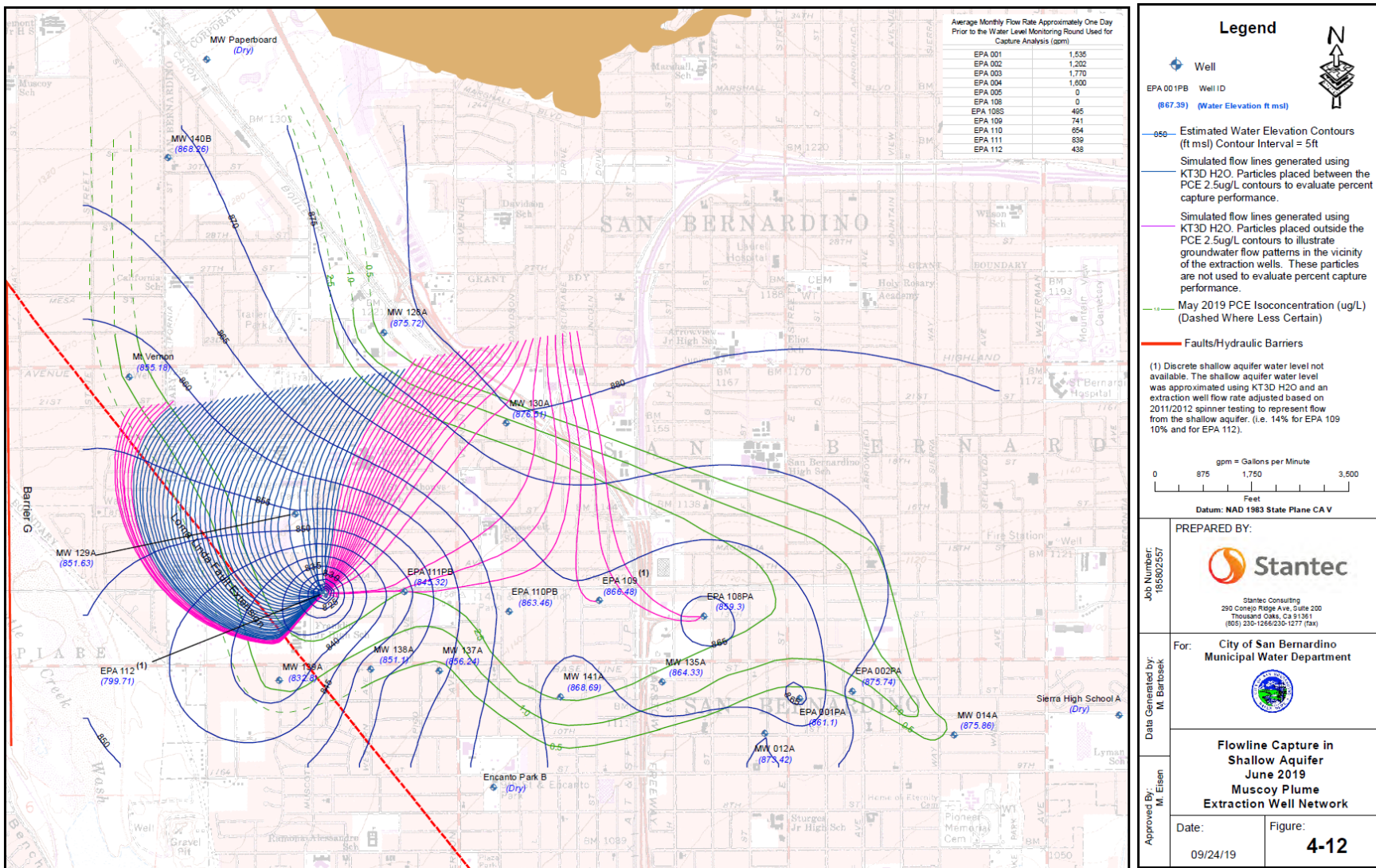
Source: City of San Bernardino 2022. 1st Semi-Annual 2022 Progress Report.

Figure C-17. Groundwater flow lines demonstrating capture of PCE plume within the intermediate Newmark Plume Front aquifer during June 2022.



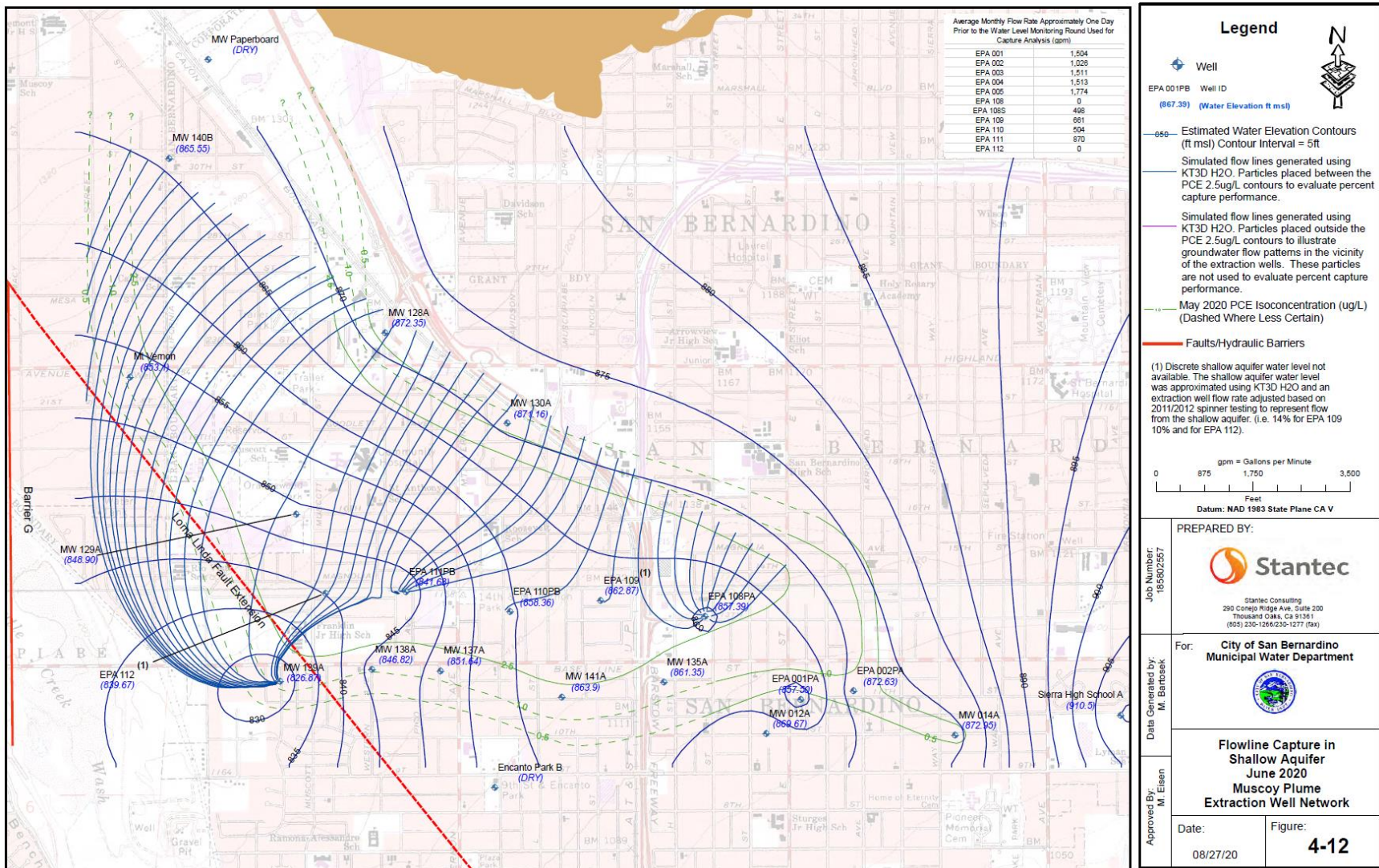
Source: City of San Bernardino 2018. 1st Semi-Annual 2018 Progress Report.

Figure C-18. Groundwater flow lines demonstrating capture of PCE plume within the shallow Muscoy Plume aquifer during June 2018.



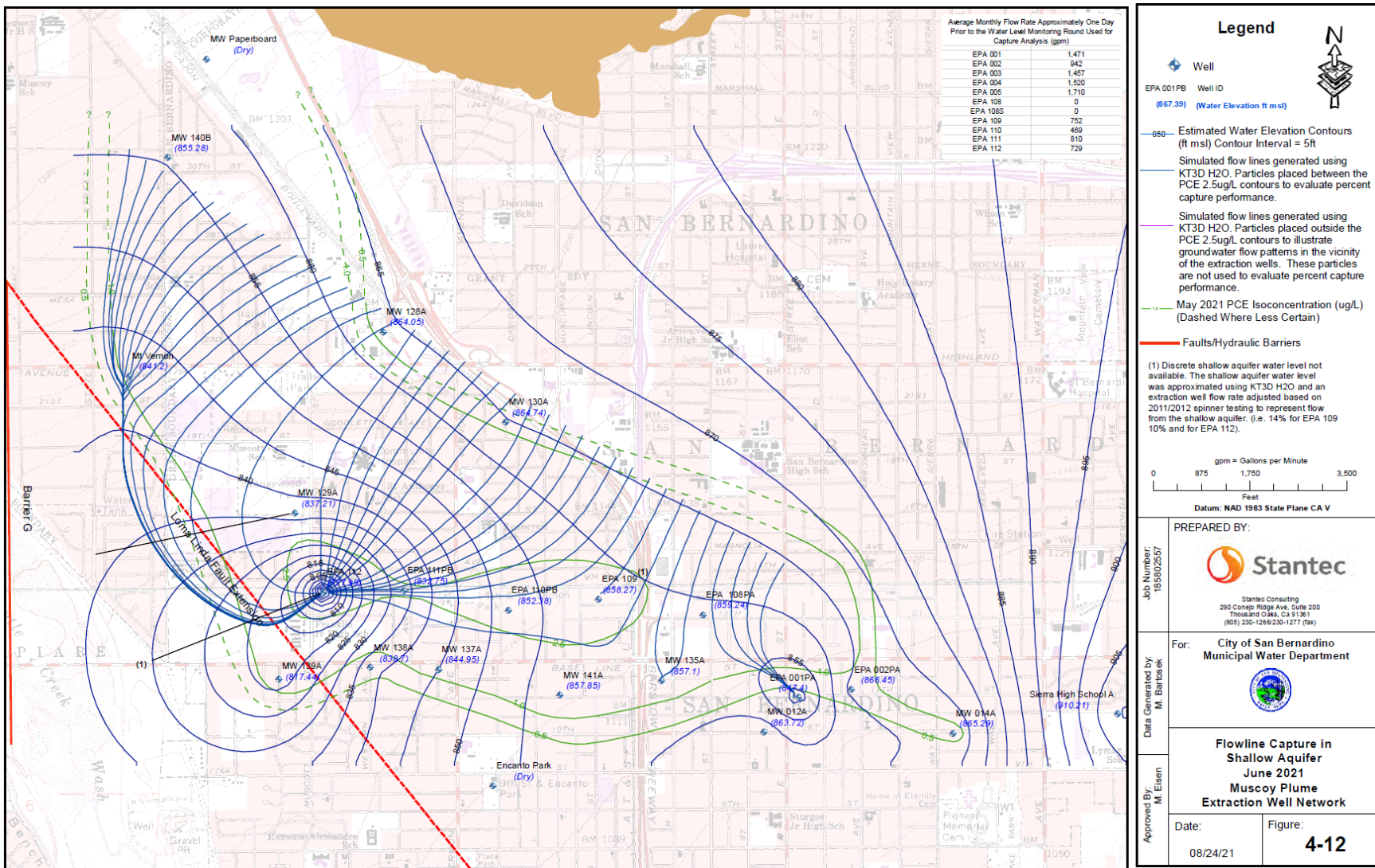
Source: City of San Bernardino 2019. 1st Semi-Annual 2019 Progress Report.

Figure C-19. Groundwater flow lines demonstrating capture of PCE plume within the shallow Muscoy Plume aquifer during June 2019.



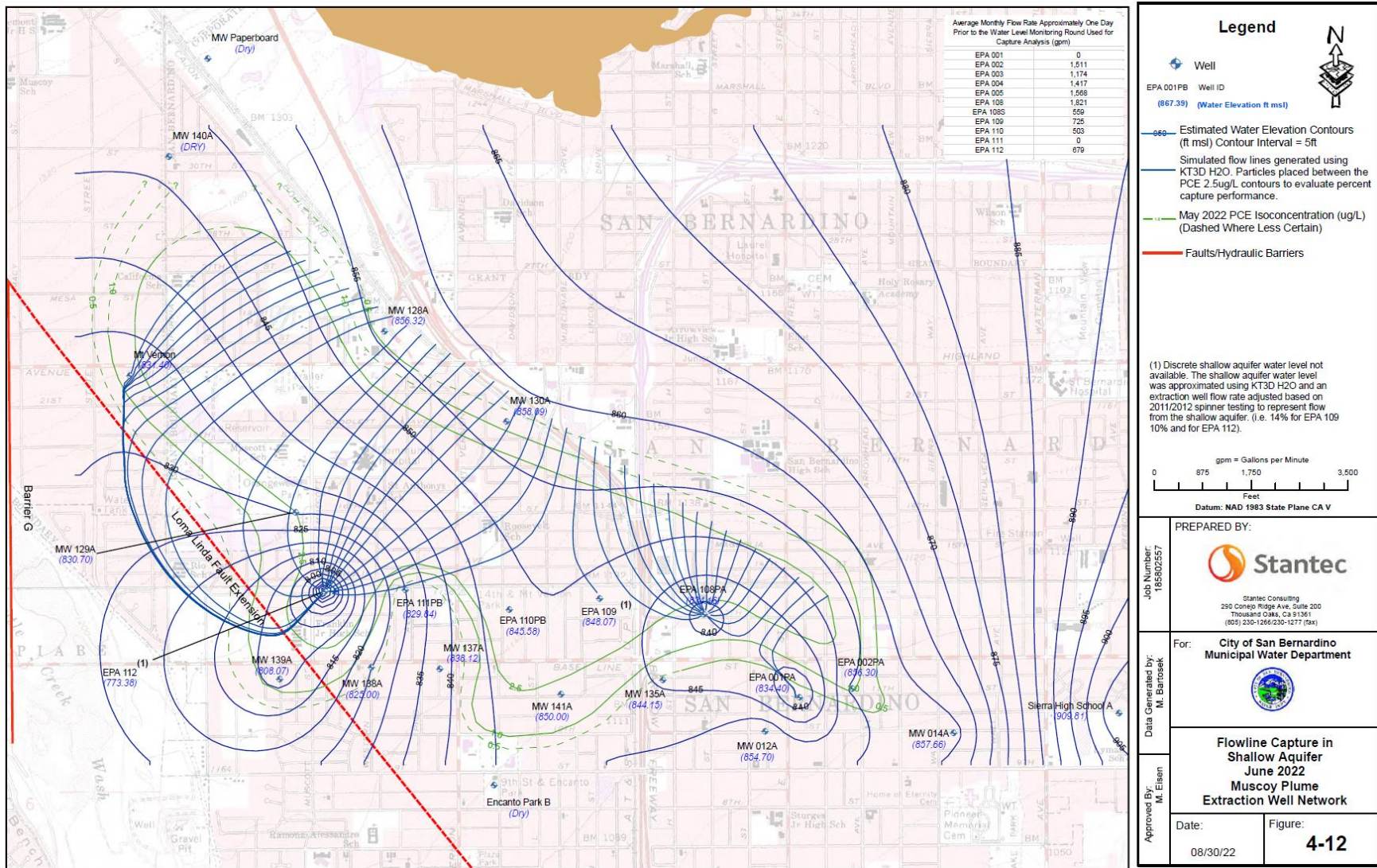
Source: City of San Bernardino 2020. 1st Semi-Annual 2020 Progress Report.

Figure C-20. Groundwater flow lines demonstrating capture of PCE plume within the shallow Muscogy Plume aquifer during June 2020.



Source: City of San Bernardino 2021. 1st Semi-Annual 2021 Progress Report.

Figure C-21. Groundwater flow lines demonstrating capture of PCE plume within the shallow Muscoy Plume aquifer during June 2021.



Source: City of San Bernardino 2022. 1st Semi-Annual 2022 Progress Report.

Figure C-22. Groundwater flow lines demonstrating capture of PCE plume within the shallow Muscoy Plume aquifer during June 2022.

Appendix D: Applicable or Relevant and Appropriate Requirements Assessment

Section 121 (d)(2)(A) of Comprehensive Environmental Response, Compensation, and Liability Act specifies that Superfund remedial actions must meet any Federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Comprehensive Environmental Response, Compensation, and Liability Act site.

Changes (if any) in ARARs are evaluated to determine if the changes affect the protectiveness of the remedy. Each ARAR and any change to the applicable standard or criterion are discussed below.

Chemical-specific ARARs identified in the 2015 ROD for groundwater were evaluated (Table D-1).

Table D-1. Summary of Groundwater Chemical-Specific ARAR Changes

Chemical	2015 Cleanup Levels (µg/L)	Basis for Cleanup Level	Current Regulations (µg/L)		ARARs More or Less Stringent than Cleanup Levels?
			State	Federal	
PCE	5	Federal and State Drinking Water Standard	5	5	No changes
TCE	5	Federal and State Drinking Water Standard	5	5	No changes

Federal and State laws and regulations other than the chemical-specific ARARs discussed in Table D-1 that have been promulgated or changed since the 2015 ROD are described in Table D-2. There have been no revisions to laws or regulations that affect the protectiveness of the remedy.

The following action- or location-specific ARARs have not changed in the past five years, and therefore do not affect protectiveness:

- California Code of Regulations, Title 22, Division 4, Chapter 15, Article 1, 64401 et seq
- Title 22, Division 4, Chapter 15, Articles 4, 4.5, and 5.5 sections 64431 et seq
- Water Quality Control Plan, Bunker Hill Basin (Basin Plan): 23 CCR Division 4, Chapter 1, Article 6, Section 3950
- Water Code Sections 13140 and 13240
- Clean Air Act, 42 USC 7401 et seq

- California Health and Safety Code 39000 et seq
- South Coast Air Quality Management District Regulation XIV, Rule 1401
- South Coast Air Quality Management District Rules 1301, 1303, 1304.1-1309, 1311-1311, 1401
- South Coast Air Quality Management District Rules 401, 402, 403
- California Hazardous Waste Control Act, Health and Safety Code, Division 20, Chapter 6.5; 22 CCR Section 66261.31
- 22 California Code of Regulations, Title 22, Sections 66264.600 and .603 and 66264.111 - .115

Table D-2. Summary of ARAR Changes for Site in the Past Five Years

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Recent Amendment Date
Standards Applicable to Generators of Hazardous Waste CCR Div. 4.5, Chapter 11, Articles 1, 3, and 5, Section 66261 Chapter 12, Articles 1-4, Sections 66262, 66264	2015 Final ROD	Establishes standards for generators of RCRA and California hazardous wastes.	Changes do not affect protectiveness.	Change to administrative filing deadlines	January 1, 2021
South Coast Air Quality Management District Rules 1302, 1304, 1310	2015 Final ROD	Rule 1302 provides definitions for the Regulation XIII – New Source Review Rule 1304 provides exemptions to the modeling requirement in Rule 1303 for specific sources Rule 1310 establishes specific analysis and reporting requirements.	Changes do not affect protectiveness.	Administrative changes	Rule 1302 amended December 4, 2020 Rule 1304 amended November 5, 2021 Rule 1310 amended March 2019

Appendix E: Public Notice

WEDNESDAY, MAY 12, 2021

SOUTH CENTRAL CALIFORNIA NEWS GROUP • INLAND EMPIRE | NEWS

CLIMATE

Half of U.S. West is out of the drought, but not fully recovered

By Brittany Peterson
The Associated Press

More than a nearly half of the U.S. West has emerged from drought this spring, but the welcome wet conditions haven't entirely replenished the region, scientists said Tuesday.

Hydrologists from the National Oceanic and Atmospheric Administration said deep snowpack across much of the West will bring shorter-term relief but the equally deep "bathtub rings" at Lake Powell and Lake Mead reservoirs are a reminder of the long road to bringing supply and demand in balance.

This winter brought beautiful and persistent snow from the Sierra Nevada to the Rocky Mountains, stunning residents in their homes with a return to precipitation records and pulling a large swath of the region out of drought. The quantity of precipitation is impressive, but the fact that it snowed around this late in the season is perhaps more rare, said Joseph Casada, NOAA's western regional climate services director.

"With climate warming, the odds for such a long-lived anomaly of cold over a large area like the West — the odds for that just go down and down," Casada said.

Continued slow melt helps reduce the risk of flooding and delays the onset of the worst wildfire danger in the region. Meanwhile, all that rain and snow means a California provide 100% of the water required by cities and farms for their first three years, and is flooding farmland with surplus runoff to replenish previous groundwater.

The big question is how much of the winter's snow will bring to the Colorado River, which has been depleted by climate change, rising demand and overuse.

A May forecast by the Colorado Basin River Forecast Center said up to 11 million acre-feet of water, or 17% of average, could flow into Lake Powell, a massive reservoir that stores Colorado River water for Arizona, Nevada, California, Mexico and dozens of tribes. That amount could be less depending on how much water the U.S. Bureau of Reclamation spreads among upstream reservoirs.

According to the Bureau's 24-month operating plan, Lake Powell could rise to about 3,500 feet by mid-summer, up 60 feet from its current state. That's a level that hasn't been seen since 2003.

The robust winter takes some pressure off the system and gives

states a bit more room to reach an agreement on how to implement water cuts, said Jennifer Pitt of the National Audubon Society, who is working to cut overflows throughout the basin.

As Lake Powell and Lake Mead hit record low levels last summer, the U.S. Bureau of Reclamation told states they would need to cut their water use by 15% to 30%.

"If everybody plays a part in solving the problem and we don't place the problem entirely on any one user or one sector or one geography then by spreading the pain, maybe it hurts a little less all the way around," Pitt said.

Fentanyl

PROSECUTIONS

Local communities

Now, Rodner is the special agent in charge of the DEA's Los Angeles office. On Tuesday, he said he couldn't believe more than three decades later he'd still be talking about fentanyl.

"It's crazy," he said. Rodner and about two dozen other law enforcement leaders from across the Southern California area Tuesday announced a string of cases they've filed over the past year in federal court targeting dealers accused of selling fentanyl-laced like drug epidemics with fentanyl to unsuspecting users.

Fentanyl is a synthetic opioid that's easy to produce and far more powerful than either the painkillers found in some prescription drugs or actual heroin. Rodner noted that for illicit drug manufacturers the process for making fentanyl is as easy as mixing certain chemicals together by hand.

"There's no heat, no fumes!" Rodner said from the Spring Street Courthouse in downtown L.A. He said the ease of making fentanyl is a big part of why it has become so popular for drug cartels, which can add fentanyl to other drugs to increase their power or to

manufacture like versions of other drugs.

The U.S. attorney's office in Los Angeles has filed at least 12 cases recently against suspects accused of dealing fentanyl to victims who later died.

The case involves charges against a North Hollywood man arrested last week for a 2021 death that police suspect was the result of an accidental fentanyl overdose.

Federal prosecutors said in that case, a 19-year-old from La Cañada Flintridge bought drugs from 34-year-old Heriberto Galvan of North Hollywood on Dec. 4, 2021. The victim was found dead in his car the next day according to prosecutors. It's not clear why law enforcement arrested Galvan more than a year after the man's death.

Galvan is expected to appear in court on July 11.

Many local district attorney's offices have been part of an increasingly fraught political debate over whether to charge dealers with murder if they are found to have sold fentanyl to victims who later die. Since 2021, Riverside County District Attorney Mike Martin has charged almost two dozen people with murder who police said distributed fentanyl to victims who later died. But L.A. County District Attorney George Gascón's office

has come out again at filing murder charges against fentanyl dealers.

In the state Legislature, several bills to increase penalties against fentanyl dealers have repeatedly been killed in the committee process. Progressive lawmakers have argued that increasing penalties against low-level drug dealers is reminiscent of the war on drugs of the 1970s and '80s, in which hundreds of thousands of people were jailed on low-level drug charges.

In federal court, however, U.S. Attorney Martin Estrada said his office has been pursuing stiff penalties against similar suspects.

Last week, in a case brought by Estrada's office, a judge sentenced Jason Sobell, a 39-year-old Laguna Hills man, to 30 years in prison for distributing fentanyl to a man who later died of an accidental overdose.

Estrada said federal law allows prosecutors to charge suspects with distribution of fentanyl regardless of whether the suspects knew they were dealing fentanyl.

"Under our statutes, if someone sells a drug and that results in the death of a person, we don't need to prove that there was any knowledge that was fentanyl," Estrada said. "We

just need to prove the individual sold a drug, a controlled substance, and that drug then resulted in the death of another person."

Estrada said he believed an issue selling controlled painkillers such as oxycodone or Percocet knows

there's a very high risk of what they're selling could be fentanyl.

"So they're on notice," he said.

In court records for the case against Sobell, prose-

cutors said text messages showed Sobell agreed to sell the victim, only identified as "J.M.," cocaine and heroin. There was no information about whether Sobell knew the drugs he was selling contained fentanyl.



U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) has started an online public notice for the information regarding the ongoing National Groundwater Cleanup Program for the site located at 11111 S. Main Street, San Bernardino, California. The site is also known as the "Site" and is located in San Bernardino, California.

Public Notice: EPA is providing this information to the public to inform them of the ongoing National Groundwater Cleanup Program for the site located at 11111 S. Main Street, San Bernardino, California.

What is included in this notice?

- A description of the site and technology used for the cleanup.
- A list of the site's and technology used for the cleanup.
- A list of the site's and technology used for the cleanup.

What is not included in this notice?

- A description of the site and technology used for the cleanup.
- A list of the site's and technology used for the cleanup.
- A list of the site's and technology used for the cleanup.

What is the purpose of this notice?

The purpose of this notice is to provide information about the ongoing National Groundwater Cleanup Program for the site located at 11111 S. Main Street, San Bernardino, California. The purpose of this notice is to provide information about the ongoing National Groundwater Cleanup Program for the site located at 11111 S. Main Street, San Bernardino, California.

What is the purpose of this notice?

The purpose of this notice is to provide information about the ongoing National Groundwater Cleanup Program for the site located at 11111 S. Main Street, San Bernardino, California. The purpose of this notice is to provide information about the ongoing National Groundwater Cleanup Program for the site located at 11111 S. Main Street, San Bernardino, California.

What is the purpose of this notice?

The purpose of this notice is to provide information about the ongoing National Groundwater Cleanup Program for the site located at 11111 S. Main Street, San Bernardino, California. The purpose of this notice is to provide information about the ongoing National Groundwater Cleanup Program for the site located at 11111 S. Main Street, San Bernardino, California.

Appendix F: Interview Forms

<i>Five-Year Review Interview Record</i>			
Site:	Newmark Contaminated Groundwater	EPA ID No:	CAD981434517
Interview Questionnaire			
Date: 2/17/2023			
(Fill in the components below, one line per person if multiple persons are providing responses)			
Name	Organization	Title	Email
	DTSC	Michelle Micucci	714-816-1979 Michelle.micucci@dtsc.ca.gov
(Record responses to the questions below)			
<p>1) What is your role in the project (e.g. property owner, groundwater user, drinking water provider, impacted adjacent property, consultant)? DTSC Project Manager</p> <p>2) How do you interact with the Superfund Project Manager regarding concerns with the cleanup?</p> <p>3) Do you have evidence or prior knowledge that a public or private well, water system, or aquifer has been designated contaminated by any government or health agency? Please describe. Volatile organic compounds (VOCs) contaminants are in several municipal water-supply wells within the northern San Bernardino/Muscoy region. EPA placed this site on the NPL list in 1990.</p> <p>4) Do you review any of the published data/reports and what is your overall impression of the project? (If the answer is no continue on to question 12). Yes, Newark has 14 extraction wells to inhibit further migration of the VOC contamination</p> <p>4) When you are reviewing the monitoring data, are there any trends that show contaminant levels decreasing? PCE and TCE concentrations in groundwater have been reduced to at or below Maximum Contaminant Levels (MCL). MW139A and MW012A have increased in PCE recently.</p> <p>6) Is the cleanup functioning as expected and how well is it performing?</p> <p>7) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the recovery of the existing contamination or how the cleanup will be conducted? No</p> <p>8) Do you have any comments, suggestions, or recommendations regarding the project? There have been conversations that there is PCE contamination coming from outside contributor.</p> <p>9) Do you wish to be included in the contact roster for receiving additional data reports or Five-Year Reports? yes</p>			
Additional Site-Specific Questions			
<i>[If needed]</i>			

Five-Year Review Interview Record					
Site:	Newmark Contaminated Groundwater			EPA ID No:	CAD981434517
Interview Questionnaire					
Date: 03/30/2023					
(Fill in the components below, one line per person if multiple persons are providing responses)					
Name	Organization	Title	Telephone	Email	
Steve Miller	City of San Bernardino Municipal Water District	Director of Water Utility		steve.miller@sbmwd.org	
(Record responses to the questions below)					
<p>1) What is your role in the project (e.g. property owner, groundwater user, drinking water provider, impacted adjacent property, consultant)? <i>I provide oversight and administrative support services as part of the SBMWD Team with respect to the Newmark Groundwater Contamination Superfund Site (NGCSS) Newmark and Muscoy Operable Unit (OU) Remedial Action (RA) operations, maintenance, and performance.</i></p> <p>2) How do you interact with the Superfund Project Manager regarding concerns with the cleanup? <i>We have quarterly to semi-annual meetings to discuss RA status and issues. We also submit a semi-annual progress report to both the EPA and DTSC project managers.</i></p> <p>3) Has a private well or a non-public water system ever served the property? Can you provide details? <i>The service area impacted by the NGCSS lies within a significant portion of the SBMWD water supply service area. SBMWD's responsibilities are limited to operation and maintenance (O&M) of SBMWD supply wells and Newmark OU and Muscoy OU RA extraction wells completed in the area of NGCSS impacts. There likely have been private wells located within the NGCSS area of impacted groundwater. SBMWD is not familiar with the details and status of potential private well operations.</i></p> <p>4) Do you have evidence or prior knowledge that a public or private well, water system, or aquifer has been designated contaminated by any government or health agency? Please describe. <i>Impacts to SBMWD water systems are well documented through the Administrative Record for the NGCSS which is maintained by EPA.</i></p> <p>5) Do you review any of the published data/reports and what is your overall impression of the project? (If the answer is no continue on to question 12). <i>I do review the O&M data for the NGCSS. The project is doing very well as it continues to operate effectively. It is removing volatile organic compounds from the basin as intended, Consent Decree obligations are being met, and the Water Department has been proactive and efficient in operating and maintaining the system.</i></p> <p>6) When you are reviewing the monitoring data, are there any trends that show contaminant levels decreasing? <i>Yes, there are a few extraction wells and downgradient monitoring wells that have demonstrated decreasing PCE and/or TCE concentrations in groundwater samples. For instance, the PCE/TCE trend for groundwater samples collected from Newmark Plume Front extraction EPA 001 and EPA 002 during extraction operations appear to show a downward trend. PCE/TCE trend for groundwater samples extracted from adjacent Newmark Plume Front extraction EPA 003 and EPA 004 appear to be stable at concentrations below 0.5 mg/L. Mann-Kendall statistical analysis of PCE and/or TCE trends in downgradient monitoring wells MW-135A and MW-138A indicate a downward trend over the last five years. It should be noted when considering trends that SBMWD's State Water Supply Permit requires treatment of remedy extracted water to less than 0.5 mg/L prior to entering the drinking water distribution system.</i></p> <p>7) Is the cleanup functioning as expected and how well is it performing? <i>Yes, the remedy is functioning as intended and is performing very well. Targeted volatile organic compounds are being removed from the groundwater basin and product water meets state and federal drinking water standards.</i></p> <p>8) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.</p>					

Yes, there is continuous O&M. Water Department operators visit each remedy facility multiple times each day for visual inspections, water quality sampling, routine maintenance, and routine data logging/tracking. Operational schemes, monitoring, and security are enhanced through the Water Department's Supervisory Control and Data Acquisition (SCADA) system

9) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? Please describe changes and impacts.

No, there have been no significant changes in these operational areas, with the exception of the water level monitoring frequency change discussed under Item 11,

10) Have there been unexpected O&M difficulties at the site in the last five years (e.g. fence damage, vandalism, storm damage)? If so, please give details.

The prolonged drought in Southern California caused groundwater levels to decrease in the basin. Decreasing water levels affect the overall efficiency of the system. Although we have not reached the point where the decrease is requiring modification to the design of the wells, we continue to monitor and target wells that show significant decreases in efficiency for rehabilitation.

Also, since the onset of the COVID pandemic in 2020, there have been supply chain related delays in procuring replacement pumping equipment for the extraction wells. This has resulted in increased extraction well downtime related to planned and unplanned replacement of pumping equipment.

11) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and desired results or improved efficiency (e.g. better warning system for groundwater wells, repair/replace outdated equipment).

The Water Department constantly monitors the remedy operation to ensure the most efficient operation of the system. We have reduced monitoring well water level monitoring frequency from daily to monthly, thereby eliminating the need for maintaining pressure transducers in the monitoring wells. The pressure transducer have become less reliable in recent years. Relying on manual water level readings only will provide more reliable data for performance analysis while reducing O&M costs.

12) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the recovery of the existing contamination or how the cleanup will be conducted?

No, we are not aware of any changes to laws and regulations that impact the remedy operation.

13) Do you have any comments, suggestions, or recommendations regarding the project?

The project/remedy has been performing very well. The Water Department will continue to efficiently operate the remedy and meet all Consent Decree obligations

14) Do you wish to be included in the contact roster for receiving additional data reports or Five Year Reports?

Yes

Additional Site-Specific Questions

[If needed]

Five-Year Review Interview Record			
Site:	Newmark Contaminated Groundwater	EPA ID No:	CAD981434517
Interview Questionnaire			
Date: 03/29/23			
(Fill in the components below, one line per person if multiple persons are providing responses)			
Name	Organization	Title	Email
Mark Eisen	Stantec	Consultant for SBMWD	mark.eisen@stantec.com
(Record responses to the questions below)			
<p>1) What is your role in the project (e.g. property owner, groundwater user, drinking water provider, impacted adjacent property, consultant)? <i>I provide hydrogeological consultation services as part of the SBMWD Team with respect to the Newmark Groundwater Contamination Superfund Site (NGCSS) Newmark and Muscoy Operable Unit (OU) Remedial Action (RA) operations, maintenance, and performance.</i></p> <p>2) How do you interact with the Superfund Project Manager regarding concerns with the cleanup? <i>We have quarterly to semi-annual meetings to discuss RA status and issues. We also submit a semi-annual progress report to both the EPA and DTSC project managers.</i></p> <p>3) Has a private well or a non-public water system ever served the property? Can you provide details? <i>The service area impacted by the NGCSS lies within a significant portion of the SBMWD water supply service area. SBMWD's responsibilities are limited to operation and maintenance (O&M) of SBMWD supply wells and Newmark OU and Muscoy OU RA extraction wells completed in the area of NGCSS impacts. There likely have been private wells located within the NGCSS area of impacted groundwater. I am not familiar with the details and status of potential private well operations.</i></p> <p>4) Do you have evidence or prior knowledge that a public or private well, water system, or aquifer has been designated contaminated by any government or health agency? Please describe. <i>Impacts to SBMWD water systems are well documented through the Administrative Record for the NGCSS which is maintained by EPA.</i></p> <p>5) Do you review any of the published data/reports and what is your overall impression of the project? (If the answer is no continue on to question 12). <i>I do regularly review O&M data for the NGCSS. The NGCSS Newmark OU and Muscoy OU RA O&M project is well run by the SBMWD Team. SBMWD staff do an excellent job operating the RA as part of their water systems. The fact that the primary function of SBMWD is running water systems contributes greatly to the successful operations of the RA.</i></p> <p>6) When you are reviewing the monitoring data, are there any trends that show contaminant levels decreasing? <i>Yes, there are a few extraction wells and downgradient monitoring wells that have demonstrated decreasing PCE and/or TCE concentrations in groundwater samples. For instance, the PCE/TCE trend for groundwater samples collected from Newmark Plume Front extraction EPA 001 and EPA 002 during extraction operations appear to show a downward trend. PCE/TCE trend for groundwater samples extracted from adjacent Newmark Plume Front extraction EPA 003 and EPA 004 appear to be stable at concentrations below 0.5 µg/L. Mann-Kendall statistical analysis of PCE and/or TCE trends in downgradient monitoring wells MW-135A and MW-138A indicate a downward trend over the last five years. It should be noted when considering trends that SBMWD's State Water Supply Permit requires treatment of remedy extracted water to less than 0.5 µg/L prior to entering the drinking water distribution system.</i></p> <p>7) Is the cleanup functioning as expected and how well is it performing? <i>The remedy systems are operating as expected from a facilities standpoint. Equipment maintenance and replacement has all been relatively routine in nature. There has been an increase in pump/motor failure downtime in the last 5 years compared to the previous 5 year periods due to supply chain issues (see Item 10). The treatment systems have been very reliable. The Newmark OU RA has performed very well from the perspective of maintaining adequate extraction rates and meeting inhibition and contaminant performance criteria. The hydrogeologic conditions in the Newmark OU are very favorable for exceeding performance criteria. The Muscoy OU RA has been more challenging as the Muscoy OU hydrogeology is more complex in nature. A westward shift in flow direction in the Muscoy OU Shallow Aquifer has created additional challenges. However, flow performance and contaminant performance data indicate the criteria established for performance have generally been met.</i></p> <p>8) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities. <i>SBMWD provides a continuous presence for O&M of the RA systems. SBMWD operators are on duty 24 hours a day. The entire RA pumping and treatment system is continuously monitored through a SCADA system which uses radio telemetry to transmit data from each extraction well and treatment site to a central computer server. If equipment shuts down, operators are automatically notified. Operators visit the RA facilities periodically throughout the day to perform manual checks of the extraction and treatment systems.</i></p> <p>9) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last</p>			

five years? Please describe changes and impacts. *With the exception of the water level monitoring frequency change discussed under Item 11, there have not been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years.*

10) Have there been unexpected O&M difficulties at the site in the last five years (e.g. fence damage, vandalism, storm damage)? If so, please give details. *Since the onset of the COVID pandemic in 2020, there have been supply chain related delays in procuring replacement pumping equipment for the extraction wells. This has resulted in increased extraction well downtime related to planned and unplanned replacement of pumping equipment.*

11) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and desired results or improved efficiency (e.g. better warning system for groundwater wells, repair/replace outdated equipment). *Yes. We have reduced monitoring well water level monitoring frequency from daily to monthly, thereby eliminating the need for maintaining pressure transducers in the monitoring wells. The pressure transducer have become less reliable in recent years. Relying on manual water level readings only will provide more reliable data for performance analysis while reducing O&M costs.*

12) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the recovery of the existing contamination or how the cleanup will be conducted? *No*

13) Do you have any comments, suggestions, or recommendations regarding the project? *Water levels continue to decline in the Muscoy OU treating the long-term ability of the Muscoy remedy to extract groundwater from the Shallow Aquifer. Currently, there are no artificial recharge basins located upgradient of the Muscoy OU. SBMWD has identified an appropriate location for siting recharge basins. The owner of the property originally showed interest pursuing a leasing arrangement for using the identified land for artificial recharge purposes. However, they have since not returned our calls and have leased the property to a commercial entity.*

14) Do you wish to be included in the contact roster for receiving additional data reports or Five Year Reports? *Yes*

Additional Site-Specific Questions

[if needed]

Appendix G: Site Inspection Report and Photos

1. INTRODUCTION

a. Date of Visit: 04 April 2023

b. Location: San Bernardino, CA

c. Purpose: A site visit was conducted to visually inspect and document the conditions of the remedy, the site, and the surrounding area for inclusion into the Five-Year Review Report.

d. Participants: _

Helen Sanchez USACE-SPL, Project Engineer

Kuceli Mari EPA, RPM

Steve Miller Director of Water Utility, City of San Bernardino

2. SUMMARY

A site visit was completed at the Newmark Groundwater Contamination Superfund Site in the City of San Bernardino on 4 April 2023. The weather was sunny and in the 70s. The site visit lasted from approximately 9:00 to 2:00 p.m. which included a walk-through of the treatment facilities, extraction wells, Vulcan study area, and surroundings.

3. DISCUSSION

The inspection began in the office building with background provided of the facility. Following, the City of San Bernardino Water Department led the tour. The group first visited the Newmark Plume Front Treatment Facility (17th Street GAC Plant) which was offline. The Newmark Plume Front Treatment Facility showed no property nuisance and no vandalism in its area. The group then toured the Newmark Plume Front Treatment Facility (Waterman GAC & Air Stripping). Mr. Miller noted that the employees have access to the SCADA system electronically and at the facility itself. Other than common challenges of increased pricing for materials for the facility during COVID, there were no other impediments for the routine working order of the facility. Additional small parts were bought as backup in case the supply chain was impacted during those times as well.

The group then toured the following facility of North Plant Treatment Facility (Newmark GAC & Air Stripping). The facility showed no property nuisance in its surroundings. The SCADA system showed the current operation in working order. The flowmeters showed to be functioning operational mode. The group walked over to see the reservoir area which was secured by a fence within the property. The group

also observed to the chemical storage room located within the facility as well. Following afterwards, the group visited the Muscoy Plume Treatment Facility (19th Street GAC Plant). The group toured the treatment system for the Muscoy groundwater plume, which included viewing the SCADA system in functioning order. There were no signs of vandalism or trespassing at this facility.

The group had also visited the following extraction wells: EPA 001, EPA 002, EPA 003, EPA 005, EPA 112, EPA 111, EPA 110, EPA 109, EPA 108, EPA 108S for security, accessibility, and functionality. All wells were online and functioning except for EPA 108 and EPA 108S which were temporarily offline for safety reasons. Also, EPA 006 and EPA 007 extraction wells were less accessible due to homeless encampments nearby and photos were taken from inside the vehicle.

The Vulcan Recharge Basin proposed area was also visited by the group located north of the Muscoy Plume Treatment Facility. There was a pilot study that was conducted to determine the recharge rate from the proposed area of the Vulcan Materials Company and the recharge penetration rate was found to be calculated at 3 feet per day. There is current ongoing discussion on determining whether the proposed area will be used for purposes of a recharge basin.

<i>No.</i>	<i>Photo</i>	<i>Caption</i>
1		<i>EPA 001 Well</i>
2		<i>EPA 002 Well</i>

3



*EPA 003
Well*

4



*EPA 004
Well*

5



*EPA 005
Well*

6

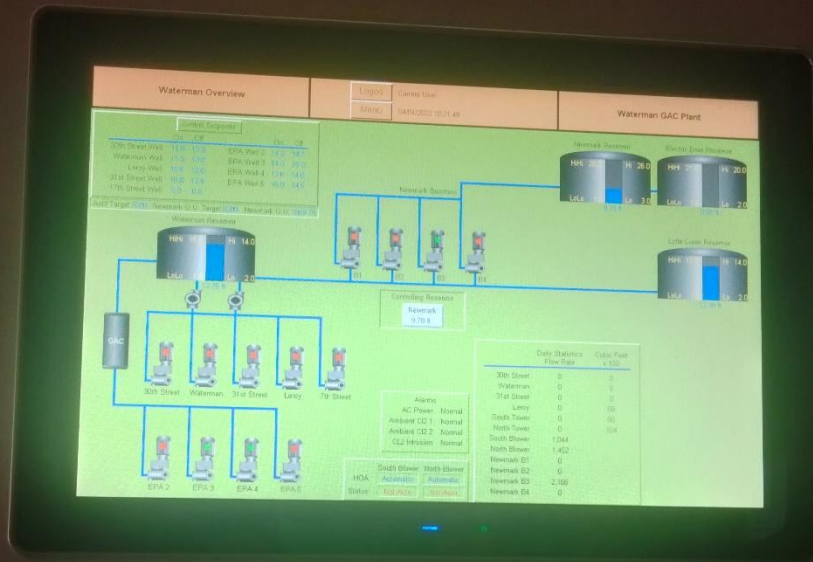


*Newmark
Plume
Front
Treatment
Facility
(17th Street
GAC
Plant)*

7



*Newmark
Plume
Front
Treatment
Facility
(Waterman
GAC &
Air
Stripping)*



SCADA System at Newmark Plume Front Treatment Facility (Waterman GAC & Air Stripping)

9



*North
Plant
Treatment
Facility
(Newmark
GAC &
Air
Stripping)*

10



SCADA System at North Plant Treatment Facility (Newmark GAC & Air Stripping)

11



EPA 007

12



EPA 006

13



Vulcan
Area

14



Muscoy Plume Treatment Facility (19th Street GAC Plant)

15



SCADA System at Muscoy Plume Treatment Facility (19th Street GAC Plant)

16



EPA
112







