HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: B.F. Goodrich
EPA ID No. CAN000905945

Contact Persons

Site Investigation: Dawn Richmond, EPA Region 9

Documentation Record: Christina Marquis, Weston Solutions, Inc.

Pathways, Components, or Threats Not Scored

Surface Water Pathway

Site surface runoff is directed from buildings to ground surfaces across the site. There is no property-wide engineered site drainage system. Stormwater run-off from the site eventually discharges into Lytle Creek. Lytle Creek, an ephemeral waterway, flows northwest to southeast approximately 2 miles northeast of the site. Mean annual precipitation in San Bernardino is 16.4 inches (Ref. 4, p. 17; Ref. 27, p. 12; Ref. 5, p. 55). Scoring the surface water pathway would not significantly affect the listing decision.

Soil Exposure Pathway

The soil exposure pathway was not scored because there are currently no known resident individuals, sensitive environments, or resources on or within 200 feet of sources at the site (Ref. 4, pp. 32-33). Scoring the pathway would not significantly affect the listing decision.

Air Migration Pathway

The air pathway was not scored because there is no documented observed release to the atmosphere, and scoring the potential to release to air would not significantly affect the listing decision.

HRS DOCUMENTATION RECORD

Name of Site: **B.F. GOODRICH**

EPA Region: 9 Date Prepared: September 2008

Street Address of Site*: 3196 North Locust Avenue

City, County, State, Zip Code: Rialto, San Bernardino County, California, 92377

General Location in the State: Southern California

Topographic Map: Devore, California, 1966, photorevised 1988 (Ref. 3)

Latitude: 34^{o} 09' 13.26" North Longitude: 117^{o} 24 ' 59.64" West

The site location is equivalent to the recorded location of soil gas sample SG-BP-13, collected by GeoSyntec during a 2004 Remedial Investigation (RI) sampling event. This coordinate was selected because it is the sampling location with the highest concentration of TCE within the former Goodrich Burn Pit (Source 1) (Ref. 5, pp. 16, 62, 85, 95; Ref. 7, p. 40; Ref. 23; Ref. 49).

Scores

Air Pathway	Not scored
Ground Water Pathway	100.00
Soil Exposure Pathway	Not scored
Surface Water Pathway	Not scored
HRS SITE SCORE	**50.00**

*The street address coordinates, and contaminant locations presented in this HRS documentation record identify the general area in which the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw})	100.00	10,000
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	NS	
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS	
2c.	Surface Water Migration Pathway Score (S_{sw} Enter the larger of lines 2a and 2b as the pathway score.	NS	
3.	Soil Exposure Pathway Score (S_s (from Table 5-1, line 22)	NS	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root	50.00	

GROUND WATER MIGRATION PATHWAY SCORESHEET
REF.1, TABLE 3-1

Factor Categories and Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer:		
1. Observed Release	550	550
2. Potential to Release:		
2a. Containment	10	_
2b. Net Precipitation	10	_
2c. Depth to Aquifer	5	_
2d. Travel Time	35	_
2e. Potential to Release [lines 2a x (2b + 2c + 2d)]	500	_
3. Likelihood of Release (higher of lines 1 and 2e)	550	550
Waste Characteristics:		
4. Toxicity/Mobility	a	10,000
5. Hazardous Waste Quantity	a	100
6. Waste Characteristics	100	32
Targets:		
7. Nearest Well	50	50
8. Population:		
8a. Level I Concentrations	b	104,600
8b. Level II Concentrations	b	0
8c. Potential Contamination	b	548
8d. Population (lines 8a + 8b + 8c)	b	105,148
9. Resources	5	0
10. Wellhead Protection Area	20	0
11. Targets (lines 7 + 8d + 9 + 10)	b	105,198
GROUND WATER MIGRATION SCORE FOR AN AQUIFER		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500][c]	100	100
GROUND WATER MIGRATION PATHWAY SCORE		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100	100

[a]Maximum value applies to waste characteristics category.
[b]Maximum value not applicable.
[c]Do not round to nearest integer.

ACRONYMS

AMSL	above mean sea level
Bgs	below ground surface
EPA	U.S. Environmental Protection Agency
μg/L	micrograms analyte per liter ground water
MVSL	Mid-Valley Sanitary Landfill
NE	Not Evaluated
NP	Not Provided
NS	Not Scored
RI	Remedial Investigation
TCE	trichloroethene
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
WCLC	West Coast Loading Company
WVWD	West Valley Water District

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Ref.
No. Description of the Reference

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SITE DESCRIPTION

The B.F. Goodrich site is located on a 160-acre parcel formerly owned by the Goodrich Corporation (Goodrich) in the City of Rialto, California. The 160-acre parcel is bordered on the north by Casa Grande Drive, on the west by the extension of North Alder Avenue, on the south by the extension of Summit Avenue, and on the east by North Locust Avenue (Ref. 4, pp. 32-33; Ref. 5, pp. 25-26). The Goodrich parcel has been subsequently subdivided into smaller parcels, and there are currently at least 12 property owners within the 160 acres (Ref. 5, pp. 25-26, 81).

The B.F. Goodrich site includes two sources and releases of trichloroethene (TCE) and other hazardous substances and associated ground water contamination, which poses a hazard to people (Ref. 6, pp. 9-10, 27, 69, 86-87; Ref. 20, p. 3; Ref. 21, p. 5; Ref. 26, pp. 2, 4, 7-8, 22, 27; Ref. 49; Ref. 64, pp. 6-9; Ref. 65, pp. 6-15; Ref. 66, pp. 6-10; Ref. 67, pp. 6-8; Ref. 68, pp. 6-8; Ref. 73, pp. 27, 32, 39, 45, 48, 54, 58, 61, 63, 65, 73, 75, 78, 79; Ref. 77, p. 3; Ref. 79; Ref. 82). The site sources include burn pits used for disposal of waste and TCE (Source 1) and historical operations that resulted in additional TCE releases and the source of the release has not been identified (Source 2). Therefore, the source of the release has been scored as an unallocated source (Source 2).

Prior to 1941, the 160-acre Goodrich parcel was native brush land (Ref. 34, p. 2). In December 1941, the U.S. Army acquired 2,821.75 acres in the area, including the 160-acre Goodrich parcel (Ref. 34, pp. 2, 4; Ref. 35). The facility, known as the Rialto Ammunition Storage Point, was operated by the U.S. Army from approximately 1941 to 1945 for the storage and transport of ordnance and explosives (Ref. 5, p. 27; Ref. 34, pp. 2, 5; Ref. 35). Between 1941 and 1945, the U.S. Army constructed numerous storage bunkers and railroad sidings protected by earthen berms in the site vicinity (Ref. 34, pp. 2, 5; Ref. 37, p. 7). The railroad sidings extended across what later became the 160-acre Goodrich parcel, and the storage bunkers were located to the south in what is now part of the Mid-Valley Sanitary Landfill (MVSL) (CAN000906011) (Ref. 13, p. 10; Ref. 37, pp. 7, 28).

In 1950, West Coast Loading Company (WCLC) acquired the 160-acre parcel. WCLC operated on the property from 1950 to 1957 manufacturing illuminating mortar shells, photo flash cartridges, pistols, and parachute flares (Ref. 28, pp. 17, 35; Ref. 29, p. 9; Ref. 37, pp. 6-7; Ref. 39, pp. 5, 8; Ref. 45, pp. 4-18). In addition, WCLC dried thousands of pounds of ammonium perchlorate to specified moisture contents for Grand Central Rocket, Co. in Redlands, California (Ref. 29, pp. 11-24; Ref. 45, pp. 4-5). Perchlorate salts were used and stored on the property as part of these operations (Ref. 45, pp. 4-18). The WCLC plant consisted of over 70 scattered small buildings, most of which were constructed of corrugated steel over a light wooden framework (Ref. 28, p. 35; Ref. 29, p. 26; Ref. 39, p. 8). This type of construction was used because it precluded the accumulation of large amounts of explosives in one area and minimized damage from flying debris if an explosion did occur (Ref. 28, p. 35; Ref. 39, p. 8; Ref. 45, pp. 4-18).

In April 1955, an explosion occurred in the building where photoflash powder was placed into the inner photoflash cartridges. There was no resulting fire from the explosion, and no need to use water. During the plant's operating history, at least one fatality and some serious injuries occurred (Ref. 28, p. 35; Ref. 37, p. 7; Ref. 39, p. 8; Ref. 45, pp. 3-4; Ref. 55, p. 76).

In July 1957, WCLC merged into Kwikset Locks, Inc. (Ref. 5, p. 27; Ref. 6, p. 19; Ref. 28, p. 13; Ref. 29, p. 9). In 1957, B.F. Goodrich Tire and Rubber Company (later known as the B.F. Goodrich Company and currently known as the Goodrich Corporation), purchased the 160-acre parcel from WCLC to relocate its Army Ordnance Research Project from Brecksville, Ohio (Ref. 5, p. 27; Ref. 6, p. 19; Ref. 28, pp. 13, 35, 40; Ref. 37, p. 7). Using the existing structures with minor modifications, Goodrich began manufacturing solid rocket propellant and atmospheric sounding rockets, while also continuing research and development for various U.S. Army and Air Force programs (Ref. 6, p. 19; Ref. 28, pp. 12-13, 36, 40; Ref. 37, pp. 7-8; Ref. 40, p. 8).

Goodrich employees transferred to Rialto in September 1957 were originally employed at the B.F. Goodrich Research Center in Brecksville, Ohio (Ref. 28, pp. 35-36, 40; Ref. 55, pp. 10-12). The center's purpose was to support both the B.F. Goodrich Tire & Rubber Co. of Akron and the B.F. Goodrich Chemical Co. of Cleveland, and included work on contracts with the U.S. Army Ordnance Division in research and development of solid rocket propellants. When Goodrich decided to begin manufacturing solid propellant rockets, it was deemed necessary to move the plant out of the Brecksville neighborhood where only limited amounts of explosive materials were permitted (Ref. 28, pp. 35-36, 40).

Initial Goodrich projects on the 160-acre Goodrich parcel included solid rocket propellant research and development for Edwards Air Force Base (Ref. 28, p. 36; Ref. 55, p. 12; Ref. 57, p. 19). Later work included contracts with the Naval Ordnance Test Station in China Lake, including work on the Loki and Sidewinder Missiles (Ref. 28, p. 36; Ref. 53, p. 14; Ref. 55, p. 20; Ref. 57, p. 22). Goodrich also had contracts with a number of small companies in Southern California and Arizona to develop atmospheric sounding rockets (Ref. 28, p. 36). These operations included extensive use of ammonium perchlorate as an oxidizer (Ref. 28, p. 40; Ref. 43, pp. 1, 95; Ref. 55, p. 30; Ref. 57, pp. 19-20, 22; Ref. 59, p. 34; Ref. 61, p. 34). Specific tasks included grinding oxidizers, mixing propellant, pouring propellant into motor casings, and static-firing solid propellant rocket motors (Ref. 28, p. 40; Ref. 53, pp. 51, 95, 123-124; Ref. 57, p. 27).

During Goodrich solid rocket motor manufacturing operations, solvents, including TCE, were used to clean every vessel, including the mixers, and casings (Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 117, 177; Ref. 56, pp. 60, 68, 87-88; Ref. 57, pp. 107, 123-124; Ref. 58, pp. 103, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117). In early 1963, it was discovered that the cast propellant in the Sidewinders was cracking, and the program was discontinued (Ref. 55, pp. 133-134). The defective propellant was subsequently cleaned out of the Sidewinder casings. Removal of the propellant may have involved the use of high-pressure water and solvents, possibly TCE (Ref. 55, p. 71; Ref. 56, pp. 161-163; Ref. 57, pp. 147, 150-151; Ref. 58, p. 77). Propellant was observed on the bare ground around the concrete pad on which the removal operation was conducted (Ref, 54, pp. 24-25; Ref. 57, p. 153).

Waste materials from manufacturing and development operations, including excess propellant from the mixers, excess oxidizer, trimmings from the final castings, and propellant wastes from R&D activities were burned in an on-site burn pit (Ref. 55, pp. 28-30, 177, 182, 192; Ref. 59, pp. 63-64; Ref. 61, p. 51). In addition, rags used for cleaning with solvents, and liquid waste solvents, including TCE, were disposed in the burn pit (Ref. 55, pp. 61-63, 119-120, 177, 186; Ref. 56, pp. 70-71, 87-88, 145; Ref. 57, pp. 121, 123; Ref. 58, pp. 104-105). The burn pit was typically used one to four times a week (Ref. 57, pp. 131-132). Occasionally, the waste materials would sit in the burn pit for a day or two before being ignited (Ref. 57, p. 129). The burn pit was located near the southeast corner of the Goodrich facility, and was not covered or lined (Ref. 55, p. 88; Ref. 57, p. 132; Ref. 58, p. 111). More than one burn pit or other type of on-site disposal may have been used, some at currently unknown locations within the 160-acre Goodrich parcel. Subsequent occupants of the 160-acre parcel appear to have continued use of some of these on-site disposal locations (Ref. 28, pp. 40-41; Ref. 27, p. 11; Ref. 37, p. 14; Ref. 38, pp. 5, 12; Ref. 42, pp. 2-3; Ref. 43; Ref. 44, p. 1; Ref. 47; Ref. 48; Ref. 50; Ref. 51, p.1).

Goodrich ended its operations at the 160-acre Goodrich parcel in 1964 (Ref. 5, p. 27; Ref. 6, p. 19; Ref. 28, pp. 12-13, 17, 35-36, 40; Ref. 37, pp. 6-9; Ref. 39, pp. 5, 9; Ref. 40, pp. 8-9). In June 1966, Goodrich sold the 160-acre parcel to Clipper Pyrotechnic Corporation (Ref. 4, pp. 32-33; Ref. 6, p. 19; Ref. 28, pp. 12-13, 18; Ref. 30, pp. 9-12; Ref. 31, pp. 23-24, 26, 30; Ref. 32, p. 19; Ref. 33, pp. 12-18; Ref. 37, pp. 5, 8-9; Ref. 40, p. 9).

From approximately 1966 through 1985, Apollo Manufacturing manufactured fireworks containing perchlorate on the 160-acre Goodrich parcel. In 1968, two explosions occurred at the Apollo Manufacturing plant. In December 1980, a fire occurred in a storage building of the plant, and in 1985, there was a fire in a waste pit used by the plant (Ref. 33, pp. 20-30; Ref. 37, p. 6; Ref. 43; Ref. 44, p. 1; Ref. 46).

Currently, the 160-acre parcel is divided among numerous owners and tenants. Two fireworks companies, Pyro Spectaculars, Inc. (CAN000905987) and American Promotional Events - West, Inc. (APE – West) (CAN000905989) occupy the northern 62 acres. The southern 98 acres are largely occupied by Rialto Concrete Products (RCP) and B&B Plastic Recycling, Inc. (Ref. 4, pp. 32-33; Ref. 5, p. 26; Ref. 6, p. 19; Ref. 28, pp. 12-13, 18; Ref. 30, pp. 9-12; Ref. 31, pp. 23-24, 26, 30; Ref. 32, p. 19; Ref. 33, pp. 12-18; Ref. 37, pp. 5, 8-9; Ref. 38, pp. 1, 3; Ref. 40, p. 9).

American West Marketing, Red Devil, APE-West, Pyro Spectaculars, and Astro Pyrotechnics have all burned wastes within the 160-acre Goodrich parcel, although the precise locations of the burning activities are unclear (Ref. 27, pp. 46-47, 50, 56; Ref. 31, pp. 40-48; Ref. 33, p. 34; Ref. 38, pp. 5, 12; Ref. 41, pp. 3-4; Ref. 48). According to the former president of Pyrotronics, a large burn pit built and used by Goodrich to dispose of and burn defective munitions, including blasting caps and grenades, was present on the property when it was purchased by Clipper. Pyrotronics continued to use this burn pit for disposal and burning of fireworks waste products until directed to cease using it in the early 1970s. Subsequently, a separate concrete pit, dubbed the "swimming pool," was built and used by Pyrotronics and its affiliated entities for the disposal of fireworks waste (Ref. 42, pp. 2-3). In 1971, the California Regional Water Quality Control Board - Santa Ana Region issued Waste Discharge Requirements Order 71-39 to Apollo Manufacturing, in which it was stated that Apollo proposed to discharge 150 gallons per day of industrial wastes into impervious evaporation ponds located on company property (Ref. 50). In 1978, Order 78-96 stated that Apollo was discharging approximately 3,000 gallons per day of industrial wastes to septic tank/subsurface disposal systems (Ref. 51, p. 1).

As of January 1984, Pyro Spectaculars was disposing of up to 20 aerial shells per month in a pond owned by Pyrotronics (Ref. 27, p. 46). Ingredients of the shells included potassium perchlorate (Ref. 27, p. 46). In March 1985, after significantly reducing manufacturing activities, Pyrotronics removed approximately 3.9 tons of sludge from an impervious pond on the property that had been used for storage of waste generated by production. The sludge had been transported to a Treatment, Storage, and Disposal Facility, and Pyrotronics requested permission from San Bernardino County to dispose of the remaining solid waste by burning (Ref. 33, p. 34; Ref. 47).

When a predecessor of RCP wished to purchase the former Apollo Manufacturing property in approximately 1987, their lender required that the concrete waste pond be removed (Ref. 43; Ref. 52, pp. 1, 6). When dry, materials in the pond were known to auto-ignite (Ref. 43). At least one grenade was observed in the pit (Ref. 44, p. 1). When the contents of the pit were burned in December 1987, numerous secondary explosions within the waste were observed (Ref. 44, p. 1). The pit was raked with the bucket of a backhoe to ensure that no unstable ordnance remained under the surface, and then filled with native soil (Ref. 44, p. 1). This feature is now referred to as the "McLaughlin Pit" (Ref. 7, p. 29).

TCE and perchlorate have been detected in monitoring wells located on and directly downgradient of the 160-acre Goodrich parcel (Ref. 5, pp. 18, 87-90, 98, 171-177; Ref. 6, pp. 85, 87, 118; Ref. 7, pp. 8, 11-12, 25, 42-43; Ref, 10, pp. 5, 7, 15; Ref. 11, pp. 6, 9, 13, 17; Ref. 15; Ref. 16, pp. 14, 52-130; Ref. 17, pp. 14, 39-57, 159-197, 215-244; Ref. 24, pp. 27, 30, 33, 36, 57-58, 62-71, 73; Ref. 25, pp. 55-57, 58-60, 64-65, 71-81, 83). TCE has been detected in drinking water wells owned by the City of Rialto, West Valley Water District (WVWD), and the City of Fontana, which are located downgradient of the 160-acre Goodrich parcel (Ref. 26, pp. 2, 4, 7-8, 22, 27; Ref. 49; Ref. 64, pp. 6-9; Ref. 65, pp. 6-15; Ref. 66, pp. 6-10; Ref. 67, pp. 6-8; Ref. 68, pp. 6-8; Ref. 73, pp. 27, 32, 39, 45, 48, 54, 58, 61, 63, 65, 73, 75, 78, 79; Ref. 77, p. 3). The City of Rialto and WVWD have closed production wells downgradient of the 160-acre parcel due to the presence of TCE and perchlorate (Ref. 20, p. 3; Ref. 21, p. 5; Ref. 79; Ref. 82).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Name of source: Goodrich Burn Pit   Number of source: 1

Source Type: Other

Description and Location of Source (Ref. 7, p. 40; Ref. 49):

During Goodrich operations, waste materials from manufacturing and development operations, including excess propellant from the mixers, excess oxidizer, trimmings from the final castings, and propellant wastes from R&D activities were burned in a burn pit located on the 160-acre Goodrich parcel (Ref. 55, pp. 28-30, 177, 182, 192; Ref. 59, pp. 63-64; Ref. 61, p. 51). Rags used for cleaning with solvents were disposed in the burn pit (Ref. 55, pp. 61-63, 119-120, 177, 186; Ref. 56, pp. 70-71, 87-88, 145; Ref. 57, pp. 121, 123; Ref. 58, pp. 104-105). In addition, used TCE was poured into the burn pit for disposal (Ref. 55, pp. 119-120, 177, 186; Ref. 56, pp. 70-71, 145; Ref. 57, p. 121). The burn pit was typically used one to four times a week (Ref. 57, pp. 131-132). Occasionally, the waste materials would sit in the burn pit for a day or two before being ignited (Ref. 57, p. 129). The burn pit was located near the southeast corner of the Goodrich facility, and was not covered or lined (Ref. 55, p. 88; Ref. 57, p. 132; Ref. 58, p. 111). The suspected location of the former burn pit is shown on Reference 5, page 85 (Area C), on Reference 7, page 40, and on Reference 49.

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

Former Goodrich employees have indicated the disposal of solvents, including TCE, in the burn pit (Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 61-63, 71, 117, 119-120, 177, 186; Ref. 56, pp. 60, 68, 70-71, 87-88, 145, 161-163; Ref. 57, pp. 107, 121, 123-124, 147, 150-151; Ref. 58, pp. 103-105, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117). Rags used for cleaning with solvents were disposed in the burn pit (Ref. 55, pp. 61-63, 119-120; Ref. 56, pp. 87, 145; Ref. 61, p. 71). In addition, used TCE was poured into the burn pit for disposal (Ref. 55, pp. 119-120, 186; Ref. 56, pp. 68-70, 87, 145; Ref. 57, p. 121; Ref. 58, pp. 103-105). The burn pit was not covered or lined (Ref. 57, p. 132; Ref. 58, p. 111).

To fulfill the requirements of the EPA pursuant to its Unilateral Administrative Order 2003-11, Goodrich conducted RI activities at the 160-acre Goodrich parcel from May 2004 through January 2005. Activities included sampling of soil gas at 61 selected on-site locations (Ref. 5, p. 15). A total of 14 borings were advanced, and 28 soil gas samples were collected, at the suspected area of the former burn pit to total depths of 12 feet below ground surface (bgs). Soil gas samples were collected at 6 feet bgs, and at the total depth of each boring (Ref. 5, pp. 8, 16, 33-34, 63). Soil gas samples, duplicate samples, and ambient air samples were collected and directly handed, under standard chain-of-custody documentation, to an on-site mobile laboratory, Centrum Analytical of Riverside, California, for Volatile Organic Compound (VOC) analysis by EPA Method 5030/8260B (Ref. 5, p. 35). TCE was detected at 3 locations within the former burn pit at a maximum concentration of 1.7 micrograms per liter (µg/L) in sample SG-BP-13 (Ref. 5, pp. 16, 62; Ref. 7, p. 40). Soil gas sampling locations are shown on Reference 5, page 85, and Reference 7, page 40.

TCE has been detected in ground water immediately downgradient of the burn pit. Specifically, TCE has been detected in monitoring wells CMW-01 and CMW-02. TCE has never been detected in monitoring well PW-1, which is located northwest and upgradient of the burn pit (Ref. 5, pp. 87-90, 98, 171-177; Ref. 6, pp. 85, 87, 118; Ref. 7, pp. 11-12, 25, 42-43; Ref. 11, pp. 6, 9, 13, 17; Ref. 15; Ref. 17, pp. 14, 39-57, 159-197, 215-244).

List of Hazardous Substances Associated with Source

TCE

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Containment Description	Containment Factor Value	References
Gas release to air: Air pathway not evaluated.	Not Scored	
Particulate release to air: Air pathway not evaluated.	Not Scored	
Release to ground water: Former Goodrich employees have indicated the use and disposal of solvents, including TCE, on site. Rags used for cleaning with solvents were disposed in the burn pit. In addition, used TCE was poured into the burn pit for disposal. The burn pit was not covered or lined. TCE has been detected in ground water immediately downgradient of the burn pit. Specifically, TCE has been detected in monitoring wells CMW-01 and CMW-02. TCE has never been detected in monitoring well PW-1, which is located northwest and upgradient of the burn pit.	10	Ref. 5, pp. 87-90, 98, 171-177; Ref. 6, pp. 85, 87, 118; Ref. 7, pp. 11-12, 25, 42-43; Ref. 11, pp. 6, 9, 13, 17; Ref. 15; Ref. 17, pp. 14, 39-57, 159-197, 215-244; Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 61-63, 71, 117, 119-120, 177, 186; Ref. 56, pp. 60, 68, 70-71, 87-88, 145, 161-163; Ref. 57, pp. 107, 121, 123-124, 132, 147, 150-151; Ref. 58, pp. 103-105, 111, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117
Release via overland migration and/or flood: Surface water pathway not evaluated.	Not Scored	

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1.1. Hazardous Constituent Quantity

The information available is not sufficient to adequately determine Tier A, hazardous constituent quantity; therefore it is not possible to adequately determine a hazardous constituent quantity for the Goodrich Burn Pit (Ref. 1, pp. 61-62, Section 2.4.2.1.1). Scoring proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, p. 62, Section 2.4.2.1.2).

Hazardous Constituent Quantity Assigned Value: NE

2.4.2.1.2. Hazardous Wastestream Quantity

The information available is not sufficient to adequately determine Tier B, hazardous wastestream quantity; therefore it is not possible to adequately determine a hazardous wastestream quantity for the Goodrich Burn Pit (Ref. 1, p. 62, Section 2.4.2.1.2). Scoring proceeds to the evaluation of Tier C, volume (Ref. 1, p. 62, Section 2.4.2.1.3).

Hazardous Wastestream Quantity Assigned Value: NE

2.4.2.1.3. Volume

The burn pit was typically used one to four times a week (Ref. 57, pp. 131-132). Former Goodrich employees have indicated the disposal of solvents, including TCE, in the burn pit (Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 61-63, 71, 117, 119-120, 177, 186; Ref. 56, pp. 60, 68, 70-71, 87-88, 145, 161-163; Ref. 57, pp. 107, 121, 123-124, 147, 150-151; Ref. 58, pp. 103-105, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117). Rags used for cleaning with solvents were disposed in the burn pit (Ref. 55, pp. 61-63, 119-120; Ref. 56, pp. 87, 145; Ref. 61, p. 71). In addition, used TCE was poured into the burn pit for disposal (Ref. 55, pp. 119-120, 186; Ref. 56, pp. 68-70, 87, 145; Ref. 57, p. 121; Ref. 58, pp. 103-105). The burn pit was not covered or lined (Ref. 57, p. 132; Ref. 58, p. 111).

The information available is not sufficient to adequately determine Tier C, volume; therefore it is not possible to adequately determine a volume for the Goodrich Burn Pit (Ref. 1, Section p. 62, 2.4.2.1.3). However, the volume is known to be greater than zero.

Volume Assigned Value: >0

2.4.2.1.4. Area

Tier D, Area is not applicable to source type Other (Ref. 1, Section p. 62, 2.4.2.1.4, Table 2-5).

Area Assigned Value: 0

2.4.2.1.5. Source Hazardous Waste Quantity Value

According to the HRS, the highest of the values assigned to the source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), Volume (Tier C), and Area (Tier D) should be assigned as the source hazardous waste quantity value (Ref. 1, p. 62, Section 2.4.2.1.5).

Highest assigned value assigned from Ref. 1, p. 62, Table 2-5: >0

2.2.1 SOURCE IDENTIFICATION

Name of source: Other TCE Sources from Historical Goodrich Operations Number of source: 2

Source Type: Other

Description and Location of Source:

This source includes all Goodrich operations on the 160-acre Goodrich parcel, other than the burn pit included as Source 1 that used or may have used TCE. TCE has been detected in monitoring wells on the 160-acre Goodrich parcel that are not located downgradient of Source 1 (see Section 3.1.1, Observed Release). Specifically, TCE has been detected in monitoring wells CMW-03, CMW-04, and CMW-05, which are located either upgradient or crossgradient of Source 1. (The suspected location of the former burn pit is shown on Reference 5, page 85 (Area C), on Reference 7, page 40, and on Reference 49.) TCE has never been detected in monitoring well PW-1, which is located northwest and upgradient of the 160-acre Goodrich parcel (Ref. 5, pp. 87-90, 98, 171-177; Ref. 6, pp. 85, 87, 118; Ref. 7, pp. 11-12, 25, 40, 42-43; Ref, 10, pp. 5, 7, 15; Ref. 11, pp. 6, 9, 13, 17; Ref. 15; Ref. 16, pp. 14, 52-130; Ref. 17, pp. 14, 39-57, 159-197, 215-244). Therefore, this indicates a source or sources of TCE within the 160-acre parcel in addition to Source 1. In accordance with HRS Section 2.2.2, TCE can be documented as being present at the site but the specific source(s) containing TCE cannot be documented (Ref. 1, p. 59, Section 2.2.2). Therefore, in accordance with HRS Section 2.4.2, this constitutes a separate “unallocated source” (Ref. 1, p. 61, Section 2.4.2).

In 1957, Goodrich purchased the 160-acre parcel from WCLC to relocate its Army Ordnance Research Project from Brecksville, Ohio (Ref. 5, p. 27; Ref. 6, p. 19; Ref. 28, pp. 13, 17, 35-36, 40; Ref. 37, p. 7; Ref. 39, pp. 8-9). Using the existing structures with minor modifications, Goodrich began manufacturing solid rocket propellant and production of rocket motors, while also continuing research and development for various U.S. Army and Air Force programs (Ref. 5, p. 27; Ref. 6, p. 19; Ref. 28, pp. 12, 35-36, 40; Ref. 37, pp. 7-8; Ref. 39, pp. 8-9; Ref. 53, p. 13).

Initial Goodrich projects on the 160-acre Goodrich parcel involved solid rocket propellant research and development for Edwards Air Force Base (Ref. 28, p. 36). Later work included contracts with the Naval Ordnance Test Station in China Lake, including work on the Loki and Sidewinder Missiles (Ref. 28, p. 36; Ref. 53, pp. 14, 124; Ref. 55, pp. 20, 30; Ref. 57, p. 22). These operations involved extensive use of ammonium perchlorate as an oxidizer (Ref. 28, p. 40; Ref. 53, pp. 50-51, 95; Ref. 55, p. 30; Ref. 57, pp. 19-20; Ref. 59, p. 34; Ref. 61, p. 34). Specific tasks included grinding oxidizers, mixing propellant, pouring propellant into motor casings, and static-firing solid propellant rocket motors (Ref. 28, p. 40-41; Ref. 53, pp. 50, 95, 123-124; Ref. 55, p. 12; Ref. 57, pp. 19, 27).

During Goodrich solid rocket motor manufacturing operations, solvents, including TCE, were used to clean every vessel, including the mixers, and casings (Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 117, 177; Ref. 56, pp. 60, 68, 87-88; Ref. 57, pp. 107, 123-124; Ref. 58, pp. 103, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117). TCE was delivered to Goodrich in 55-gallon drums, and stored in the warehouse (Ref. 55, p. 117). In early 1963, it was discovered that the cast propellant in the Sidewinders was cracking, and the program was discontinued (Ref. 55, pp. 133-134). The defective propellant was subsequently cleaned out of the Sidewinder casings. Removal of the propellant may have been conducted using high-pressure water, plus a solvent, possibly TCE (Ref. 55, p. 71; Ref. 56, pp. 161-163; Ref. 57, pp. 147, 150-151; Ref. 58, p. 77). Propellant was observed on the bare ground around the concrete pad on which the removal operation was conducted (Ref. 54, pp. 24-25; Ref. 57, p. 153). All waste materials from manufacturing and development operations, including excess propellant from the mixers, excess oxidizer, trimmings from the final castings, and propellant wastes from research and development activities were burned in an on-site burn pit (see Source 1) (Ref. 55, pp. 28-30, 177, 182, 192; Ref. 59, pp. 63-64; Ref. 61, p. 51). More than one burn pit or other type of on-site disposal may have been used, some at currently unknown locations within the 160-acre Goodrich parcel. Subsequent occupants of the 160-acre Goodrich parcel appear to have continued use of some of these on-site disposal locations (Ref. 7, pp. 11-12; Ref. 28, pp. 40-41; Ref. 27, p. 11; Ref. 37, p. 14; Ref. 38, pp. 5, 12; Ref. 42, pp. 2-3; Ref. 43; Ref. 44, p. 1; Ref. 47; Ref. 48; Ref. 50; Ref. 51, p.1).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

During Goodrich solid rocket motor manufacturing operations, solvents, including TCE, were used to clean every vessel, including the mixers, and casings (Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 117, 177; Ref. 56, pp. 60, 68, 87-88; Ref. 57, pp. 107, 123-124; Ref. 58, pp. 103, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117). TCE was delivered to Goodrich in 55-gallon drums, and stored in the warehouse (Ref. 55, p. 117). In early 1963, it was discovered that the cast propellant in the Sidewinders was cracking, and the program was discontinued (Ref. 55, pp. 133-134). The defective propellant was subsequently cleaned out of the Sidewinder casings. Removal of the propellant may have been conducted using high-pressure water, plus a solvent, possibly TCE (Ref. 55, p. 71; Ref. 56, pp. 161-163; Ref. 57, pp. 147, 150-151; Ref. 58, p. 77).

With the exception of the burn pit (Source 1), specific locations of TCE use and disposal during historical Goodrich operations have not been identified, and ongoing soil gas and soil sampling have not pinpointed specific TCE sources on site. Therefore, TCE use during historical Goodrich operations is assigned to the unallocated source (Ref. 1, p. 61, Section 2.4.2).

<u>List of Hazardous Substances Associated with Source</u>

TCE is associated with all sources at this site (HRS Section 2.2.2).

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Containment Description	Containment Factor Value	References
Gas release to air: Air pathway not evaluated.	Not Scored	
Particulate release to air: Air pathway not evaluated.	Not Scored	
Release to ground water: Former Goodrich employees have indicated the use and disposal of solvents, including TCE, on site. More than one burn pit or other disposal site may have been used, some at currently unknown locations within the 160-acre Goodrich parcel. TCE has been detected in monitoring wells CMW-03, CMW-04, and CMW-05, which are located either upgradient or crossgradient of Source 1. TCE has never been detected in monitoring well PW-1, which is located northwest and upgradient of the 160-acre Goodrich parcel. This indicates TCE migration from a source or sources within the 160-acre parcel other than Source 1, and not from an outside facility.	10	Ref. 5, pp. 85, 87-90, 98, 171-177; Ref. 6, pp. 85, 87, 118; Ref. 7, pp. 11-12, 25, 40, 42-43; Ref, 10, pp. 5, 7, 15; Ref. 11, pp. 6, 9, 13, 17; Ref. 15; Ref. 16, pp. 14, 52-130; Ref. 17, pp. 14, 39-57, 159-197, 215-244; Ref. 49; Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 61-63, 71, 117, 119-120, 177, 186; Ref. 56, pp. 60, 68, 70-71, 87-88, 145, 161-163; Ref. 57, pp. 107, 121, 123-124, 132, 147, 150-151; Ref. 58, pp. 77, 103-105, 111, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117
Release via overland migration and/or flood: Surface water pathway not evaluated.	Not Scored	

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1.1. Hazardous Constituent Quantity

The information available is not sufficient to adequately determine Tier A, hazardous constituent quantity; therefore it is not possible to adequately determine a hazardous constituent quantity for the Historical Goodrich Operations (Ref. 1, Section pp. 61-62, 2.4.2.1.1). Scoring proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, p. 62, Section 2.4.2.1.2).

Hazardous Constituent Quantity Assigned Value: NE

2.4.2.1.2. Hazardous Wastestream Quantity

TCE has been detected in monitoring wells CMW-03, CMW-04, and CMW-05, which are located either upgradient or crossgradient of Source 1. TCE has never been detected in monitoring well PW-1, which is located northwest and upgradient of the 160-acre Goodrich parcel. This indicates TCE migration from a source or sources within the 160-acre parcel other than Source 1, and not from an outside facility (See Sections 2.2.1, 2.2.2, and 2.2.3 of the HRS documentation record).

The information available is not sufficient to adequately determine Tier B, hazardous wastestream quantity; therefore it is not possible to adequately determine a hazardous wastestream quantity for the Historical Goodrich Operations (Ref. 1, p. 62, Section 2.4.2.1.2). Therefore, a hazardous wastestream quality of unknown but greater than zero is assigned to this unallocated source (Source 2 at this site).

Hazardous Wastestream Quantity Assigned Value: >0

2.4.2.1.3. Volume

Tier C, volume, is not applicable to the Unallocated Source (Ref. 1, pp. 61-62, Section 2.4.2.1).

Volume Assigned Value: 0

2.4.2.1.4. Area

Tier D, Area is not applicable to the Unallocated Source (Ref. 1, pp. 61-62, Section 2.4.2.1).

Area Assigned Value: 0

2.4.2.1.6. Source Hazardous Waste Quantity Value

According to the HRS, the highest of the values assigned to the source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), Volume (Tier C), and Area (Tier D) should be assigned as the source hazardous waste quantity value (Ref. 1, p. 62, Section 2.4.2.1.5).

Highest assigned value assigned from Ref. 1, p. 62, Table 2-5: >0

SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Y/N)	Containment Factor Value by Pathway				
			Ground Water (GW) (Ref. 1, Table 3-2)	Surface Water (SW)		Air	
				Overland/flood (Ref. 1, Table 4-2)	GW to SW (Ref. 1, Table 3-2)	Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	>0	N	10	NS	NS	NS	NS
2	>0	N	10	NS	NS	NS	NS

Notes:
NS: Not Scored

<u>Description of Other Possible Sources</u>:

Historical Releases of Perchlorate from Other Possible Operations: WCLC operated on the property from 1950 to 1957 manufacturing illuminating mortar shells, photo flash cartridges, pistols, and parachute flares (Ref. 28, pp. 17, 35; Ref. 29, p. 9; Ref. 37, pp. 6-7; Ref. 39, pp. 5, 8; Ref. 45, pp. 4-18). In addition, WCLC dried thousands of pounds of ammonium perchlorate to specified moisture contents for Grand Central Rocket, Co. in Redlands, California (Ref. 29, pp. 11-24; Ref. 45, pp. 4-5). Perchlorate salts were used and stored on the property as part of these operations (Ref. 45, pp. 4-18). During the plant's operating history, at least one fatality and some serious injuries occurred (Ref. 28, p. 35; Ref. 37, p. 7; Ref. 39, p. 8; Ref. 45, pp. 3-4; Ref. 55, p. 76).

Use and disposal of perchlorate and perchlorate-containing materials within the 160-acre parcel has been documented during Goodrich operations (Ref. 28, pp. 36, 40-41; Ref. 40, p. 8; Ref. 53, pp. 14, 50-51, 95, 123-124; Ref. 55, pp. 12, 20, 30; Ref. 57, pp. 19-20, 22, 27; Ref. 59, p. 34; Ref. 61, p. 34). On June 1, 1966, Goodrich sold the 160-acre parcel to Clipper Pyrotechnic Corporation (Ref. 4, pp. 32-33; Ref. 6, p. 19; Ref. 28, pp. 12-13, 18; Ref. 30, pp. 9-12; Ref. 31, pp. 23-24, 26, 30; Ref. 32, p. 19; Ref. 33, pp. 12-18; Ref. 37, pp. 5, 8-9; Ref. 38, pp. 1, 3; Ref. 40, p. 9). Fireworks containing perchlorate were manufactured on the 160-acre parcel from approximately 1966 through at least 1985 (Ref. 33, pp. 20-30; Ref. 37, p. 6; Ref. 43; Ref. 44, p. 1; Ref. 46). In December 1980, a fire occurred in a storage building of the plant, and in 1985, there was a fire in a waste pit used by the plant (Ref. 33, pp. 20-30; Ref. 37, p. 6; Ref. 43; Ref. 44, p. 1; Ref. 46). Various burn pits and disposal ponds were used for waste disposal during fireworks manufacturing (Ref. 27, pp. 37, 46-47, 50, 56; Ref. 31, pp. 40-48; Ref. 33, p. 34; Ref. 38, pp. 5, 12; Ref. 41, pp. 3-4; Ref. 42, pp. 2-3; Ref. 43; Ref. 44, p. 1; Ref. 47; Ref. 48; Ref. 50; Ref. 51, p. 1; Ref. 52, pp. 1, 6).

Perchlorate has been detected in soils and in monitoring wells on and downgradient of the 160-acre Goodrich parcel (Ref. 5, p. 18; Ref. 6, p. 87; Ref. 7, p. 8). The city of Rialto and WVWD have closed production wells downgradient of the 160-acre parcel due to the presence of perchlorate (Ref. 20, p. 3; Ref. 21, p. 5). However, this source was not scored as it would not significantly affect the listing decision.

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Ground Water Migration Pathway Description

Regional Geology/Aquifer Description: The B.F. Goodrich site is situated in the Rialto-Colton Basin, which is a sub-basin of the San Bernardino Valley Basin, located in the Peninsular Ranges Geographic Province, near the junction with the Transverse Ranges Geographic Province (Ref. 13, p. 16; Ref. 69, p. 3). The Rialto-Colton Basin is a 30-square-mile, fault-bounded basin in the upper Santa Ana River drainage area. The basin is bound to the northeast by the San Jacinto Fault, to the Southwest by the Rialto-Colton fault, the northwest by the San Gabriel Mountains, and the southeast by the Badlands geologic uplift (Ref. 69, pp. 2-4).

Hydrologic barriers include the bounding faults and geomorphic structures, as well as barriers within the structural basin. Barrier J trends in a southwest-northeast direction and lies approximately one mile upgradient of the site; ground water flows across this barrier into the Rialto Colton Basin predominantly in river channel deposits of Lytle Creek. Barrier E and an additional unnamed fault are fault structures that run parallel to the San Jacinto Fault; ground water is generally impeded by these structures, except where channel deposits of Lytle Creek cross the faults in the northern part of the basin. Barrier H is a northerly fault structure that appears to spur off of the Rialto-Colton fault and appears to pinch out near the MVSL (Ref. 69, pp. 6-7).

Water-bearing zones in the Rialto-Colton Basin are broadly divided into Upper, Middle, and Lower water-bearing units based on generalized responses in geophysical logs conducted in production wells (Ref. 70). Water-bearing units also include the Recent river channel deposits (Ref. 69, p. 5). Water-bearing units are described as unconfined to partly confined, and in hydraulic connection with each other. Deposits underlying the lower water-bearing unit are consolidated and form the base of the water-bearing system (Ref. 69, p. 5).

Of the three aquifer units (Upper, Middle and Lower) described by the U. S. Geological Survey (USGS), only the middle unit bears abundant water, based on monitoring well data from studies near the 160-acre Goodrich parcel. The middle unit is divided into three laterally continuous aquifers, based on work conducted around the MVSL. These three subzones include an upper unconfined aquifer (Subzone A), an intermediate, partially confined aquifer (Subzone B), and a deep, regional aquifer (Subzone C). Subzone C is the thickest interval and is the primary production aquifer in the basin. Subzone A is described as being approximately 15 to 35 feet thick. Subzone B is described as consisting of several thin water-bearing zones separated by thin aquitards over a 40- to 140-foot thick sequence. The aquifers are separated by low-permeability aquitards that range in thickness from only a few feet to over 30 feet (Ref. 13, pp. 17-18). Ground water beneath the 160-acre Goodrich parcel is first encountered in Subzone B. The aquitard between B and C Subzones is not present in wells south of monitoring well PW-8, which is located approximately one mile downgradient of the 160-acre Goodrich parcel; first water is encountered in the C Zone in this area (Ref. 6, pp. 53-54).

Geologic logs of soil borings conducted in support of the RI indicate a zone of interbedded gravel-sand-silt-clay lithologies from approximately 440 to 600 feet bgs. Water-bearing layers include thin sands and silty sands separated by clayey to sandy silts described as “moist” to “wet” in lithologic descriptions, and water levels in temporary wells constructed through these intervals tended to equilibrate at the same depth (Ref. 5, pp. 195-278). The authors of the RI, GeoSyntec Consultants, indicate the 440- to 540-foot interval corresponds to the previously defined Subzone B; fine-grained sediments concentrated in the interval approximately ranging from 540 to 600 feet bgs represent underlying aquitard. The authors further state that ground water deeper than 600 feet bgs likely corresponds to Subzone C as described in the MVSL studies (Ref. 5, pp. 57-58).

Ground water levels in the Rialto Colton Basin have fluctuated as much as 100 feet over the 70-year period for which data are available. Ground water flow in the basin has been consistently from the northwest to the southeast during this period of time and generally follows the same trend for all three water-bearing zones (Ref. 69, pp. 14-17). Ground water levels at the adjacent MVSL site have decreased since the late 1990s, primarily due to the drought-induced de-watering of Subzone A (Ref. 13, pp. 18-19). Ground water beneath the 160-acre Goodrich parcel is currently found in what GeoSyntec Consultants describe as Subzones B and C of the Middle Unit; borings in the site vicinity have not extended into the Lower Unit (Ref. 5, pp. 38-39, 57-59). Ground water flows from the northwest to southeast in both Subzones, with Subzone B disappearing, likely due to the pinching out of the underlying aquitard, approximately 1 to 1.5 miles south of the site (Ref. 6, pp. 53-54).

Site Geology/Aquifer Description:

- Stratum 1: The Upper Water-Bearing Zone

Description

The Upper unit (120 - 300 feet) is comprised predominantly of gravels and sands with minor clay lenses, and is completely transmissive (Ref. 70). The Upper Unit is described by GeoSyntec Consultants as being comprised of well-graded gravels and sands to a depth of approximately 100 feet bgs, and interbedded/interlensing gravels, sands, silts and clays below 100 feet (Ref. 5, p. 32). Geologic logs from the RI indicate the absence of fine-grained sediments (silt and clay) to depths of approximately 200 feet bgs (Ref. 5, pp. 194 – 278), which is broadly consistent with the USGS's approximation of thickness for this unit in the geologic cross sections presented in Report 00-4243 (Ref. 69, pp. 7-13).

Neither GeoLogic Associates (Ref. 13, pp. 18-19), nor GeoSyntec (Ref. 5, pp. 38-39, 57-59) encountered ground water in this zone in the site vicinity. Ground water levels have historically been measured in this unit in the southern end of the basin, and at least two ground water production wells (1S/4W-18B1 and 1S/4W-27M1) are screened in this interval (Ref. 69, pp. 7 – 13). The USGS indicates that this layer is in hydraulic connection with the lower units, so it is likely that surface contaminants may migrate through this layer to ground water in the lower units (Ref. 69, p. 5).

- Aquifer/Stratum 2: The Middle Water-Bearing Zone

Description

The Middle unit consists of coarse to medium sand and interbedded sand and clay. The coarse fraction (sands and gravels) fines to the southeast; the clays become thicker to the northwest (Ref. 70).

This middle unit is subdivided into three laterally continuous aquifers, Subzones A, B, and C, as described above in Section 3.0.1, based on work conducted around the MVSL (Ref. 13, pp. 17-18). The lithologies present in this Middle Zone include a series of interbedded gravel-sand-silt-clay from approximately 200 to 600 feet bgs that generally become finer toward the deeper depths of that interval. The authors of the RI, GeoSyntec Consultants, indicate the 440- to 540-foot interval corresponds to the previously defined Subzone B; fine-grained sediments concentrated in the interval approximately ranging from 540 to 600 feet bgs represent underlying aquitard. The authors further state that ground water deeper than 600 feet bgs likely corresponds to Subzone C in the MVSL studies (Ref. 5, pp. 57-58).

Monitoring wells installed within and on the perimeter of the 160-acre Goodrich parcel are generally screened within Subzone B of the Middle Water-Bearing Zone. Monitoring wells installed downgradient of the 160-acre Goodrich parcel are generally screened within Subzone C of the Middle Water-Bearing Zone. City of Rialto, City of Fontana, and WVWD production wells located within the Rialto-Colton Basin are generally screened within Subzone C of the Middle Water-Bearing Zone, with some extending into the Lower Zone in some areas (Ref. 71).

- Aquifer/Stratum 3: The Lower Water-Bearing Zone

Description

The Lower Water-Bearing Zone consists mainly of interbedded sand and clay, and ranges in thickness from 100 feet in the southeastern part of the basin to about 400 feet thick in other parts of the basin (Ref. 69, p. 6). None of the monitoring wells advanced at the 160-acre Goodrich parcel penetrate this layer; however, production wells used in the USGS regional basin studies are partially screened through this interval (Ref. 69, pp. 7-13). The USGS also indicates that all water-bearing zones are in hydraulic connection (Ref. 69, p. 5); therefore it is likely that contaminants may migrate via ground water into this Lower Water-Bearing Zone.

Aquifer Interconnection:

Hydrologic interconnection is established between all strata beneath and downgradient of the 160-acre Goodrich parcel. Stratum 1 consists of coarse-grained material and "freely allows infiltration of precipitation, stream flow, and artificially recharged imported water, which flows to the water table" (Ref. 70). Ground water in the site vicinity is first encountered in Stratum 2, Subzone B. Contaminants, including TCE and perchlorate, were detected in water samples collected at multiple depths beneath the site at three locations (PW- 2 through -4) during the field work in support of the RI. Contaminants were not detected in the upgradient ground water sampling location (PW-1) (Ref. 5, pp. 17-18). The presence of contaminants at multiple depths in ground water beneath the 160-acre Goodrich parcel indicates that contaminants have freely migrated from site sources, through Stratum 1, as well as through Stratum 2 Subzone A, and into Stratum 2, Subzones B and C (Ref. 5, p. 97).

Contaminants are detected in samples collected from multiple discrete depths ranging from 458 to 587 feet bgs in monitoring wells PW-2 and -3, and in depths ranging from 480 to 647 feet bgs in monitoring well PW-4 (Ref. 5, p. 97). Based on aquifer lithology and water chemistry, GeoSyntec Consultants indicates that water samples collected from depths greater than 600 feet bgs likely lie in Subzone C (Ref. 5, pp. 57-58; p.73). The presence of contaminants from the site in Subzone C in PW-4 indicates that the subzones within the Middle Water-Bearing Unit are in hydrologic communication beneath the 160-acre Goodrich parcel.

GeoSyntec Consultants describes the aquitard between Subzones B and C as a zone consisting predominantly of fine-grained materials. This zone lies in the depth range of approximately 540 to 600 feet bgs in borings advanced at the site (Ref. 5, pp. 58-59). Based on data from wells installed downgradient of the 160-acre Goodrich parcel, the aquitard separating Subzone B from Subzone C appears to pinch out approximately 1 to 1.5 miles southeast of the 160-acre parcel. Ground water is encountered in a 50-foot perched interval in the approximate depth range Subzone B was encountered at the site at PW-8. This ground water interval is absent from PW-5, -6, -7, and -9, which are downgradient of PW-8; ground water encountered in these wells is consistent with Subzone C. Contaminants attributable to the site are detected in Subzone C in PW-5 through -8 (Ref 6, pp. 53-54, 83, 85-86).

While none of the soil borings or monitoring wells installed at the 160-acre Goodrich parcel penetrates the Lower Zone, the USGS considers all three zones to be in hydraulic communication, based on analysis of lithology from drill cuttings and geophysical logs (Ref. 69, p. 5).

SUMMARY OF AQUIFER(S) BEING EVALUATED

Aquifer No.	Aquifer Name	Is Aquifer Interconnected with Upper Aquifer within 2 miles? (Y/N/NA)	Is Aquifer Continuous within 4-mile TDL? (Y/N)	Is Aquifer Karst? (Y/N)
2	Middle Water-Bearing Zone	Y	Y	N
3	Lower Water-Bearing Zone	Y	Y	N

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Rialto-Colton Basin Interconnected Middle Water-Bearing Zone

Chemical Analysis

Goodrich RI Ground Water Sampling

To fulfill the requirements of the EPA pursuant to its Unilateral Administrative Order 2003-11, Goodrich conducted RI activities at the 160-acre Goodrich parcel from May 2004 through January 2005. Activities included drilling of 4 wellbores to a maximum depth of 650 feet bgs at one upgradient and three downgradient / crossgradient locations, installation and sampling of 18 temporary wells, and installation of four permanent ground water monitoring wells and three piezometers to identify the potential presence of hazardous substances in ground water and to provide information on ground water conditions in the B.F. Goodrich site vicinity (Ref. 5, p. 15). The RI was conducted in accordance with the Final RI Work Plan dated April 22, 2004 (Ref. 5, p. 21).

Ground water monitoring wells installed during the RI are screened in Subzone B of the middle water-bearing unit (Ref. 5, pp. 38-39, 81, 83; Ref. 71). Background well PW-1 was installed along the southern right-of-way of West Casa Grande Drive, approximately 320 feet west of the intersection of West Casa Grande Drive and North Alder Avenue. Well PW-2 was installed approximately 1,500 feet west of the intersection of West Lowell Street and North Locust Avenue along the southern right-of-way of West Lowell Street. Well PW-3 was installed approximately 450 feet south of the intersection of West Lowell Street and North Locust Avenue along the eastern right-of-way of North Locust Avenue. Well PW-4 was installed approximately 300 feet north of the intersection of West Lowell Street and North Locust Avenue along the eastern right-of-way of North Locust Avenue (Ref. 5, p. 39). Locations of these wells are shown in Reference 6, page 80.

Additional RI activities were conducted by Goodrich in 2006. This investigation was designed to further explore the hydrogeologic conditions in the vicinity and downgradient of the 160-acre Goodrich parcel, and to evaluate the areal and vertical extent of potential constituents of concern in ground water, including perchlorate and TCE. In particular, the investigation consisted of installation of five multi-screen ground water monitoring wells (PW-5 through PW-9) extending more than 3 miles downgradient (i.e., southeast) of the 160-acre parcel (Ref. 6, pp. 10-11). Well locations are shown in Reference 6, page 81.

PW-5 was installed to a total depth of 705 feet bgs at the southeast corner of the intersection of West Ayala Drive and Easton Street on property owned by the County of San Bernardino Flood Control District. The well location was chosen to evaluate the transitional area between an “eastern plume” (i.e., from the 160-acre Goodrich parcel) and a “western plume” (i.e., from the MVSL and historical bunkers). PW-5 is also downgradient of Rialto #2, which was intended to help provide a vertical profile of contamination near that production well. PW-6 was installed to a total depth of 695 feet bgs at the west end of Leiske Drive between North Fitzgerald Avenue and West Ayala Drive. The well location was chosen to assess the centerline of the “western plume” (i.e., from the MVSL and historical bunkers) and aid in differentiating between potential “eastern” and “western” plumes and understanding the degree of commingling. PW-7 was installed to a total depth of 850 feet bgs at the northeast corner of the intersection of North Cactus Avenue and West Walnut Avenue. The well location was chosen to assess the potential downgradient edge of the “eastern plume” and to fill in a data gap in this area. PW-8 was installed to a total depth of 805 feet bgs at the northwest corner of the WVWD compound for Well #22, approximately near the southwest corner of the intersection of North Linden Avenue and Vineyard Avenue. The location of PW-8 was chosen to assess the hydrogeological conditions and perchlorate and VOC concentrations in the area between the 160-acre Goodrich parcel and WVWD Well #22 (Ref. 6, p. 33). PW-9 was installed to a total depth of 840 feet bgs within the City of Rialto’s compound for Rialto Well #6, on Etiwanda Avenue, east of Willow Avenue. It was intended to assess conditions in the vicinity of Rialto #6 and may help define the southern extent of contamination, both laterally and vertically (Ref. 6, p. 34).

Monitoring wells PW-5 through PW-9 were designed with multiple screened intervals, and were installed in Subzone C of the Middle Water-Bearing Zone on the basis of geophysical logs and ground water elevations calculated from field measurements of fluid pressures in the screened intervals of each monitoring well (Ref. 6, p. 34).

Goodrich has continued to conduct periodic sampling of ground water monitoring wells PW-1 through PW-9 (Ref. 24, p. 1). Since installation, TCE has remained below the detection limit of 0.26 µg/L in background well PW-1 (Ref. 24, p. 27). Since installation, TCE has been detected in wells PW-2 (up to 420 µg/L) (Ref. 24, p.30), PW-3 (up to 200 µg/L) (Ref. 24, p. 33), PW-4 (up to 13 µg/L) (Ref. 24, p. 36), PW-5a (up to 16 µg/L), PW-5b (up to 37 µg/L), PW-5c (up to 44 µg/L), PW-5d (up to 2.7 µg/L) (Ref. 24, p. 39), PW-7b (up to 0.88J) (Ref. 24, p. 45), PW-8a (up to 23 µg/L), PW-8b (up to 10 µg/L), PW-8c (up to 12 µg/L), PW-8d (up to 14 µg/L), PW-8e (up to 9.8 µg/L) (Ref. 24, p. 48), PW-9c (up to 7 µg/L), PW-9f (up to 2.2 µg/L), and PW-9g (up to 2.2 µg/L) (Ref. 24, p. 51). The most recent available data from the November 2007 sampling event is presented below. Only wells PW-1 through PW-4 were sampled during this event. Samples were analyzed for VOCs via EPA Method 5030B/8260B and for perchlorate via EPA Method 314.0 (Ref. 24, p. 52).

- Background Concentrations:

Well ID	Screened Interval (feet AMSL)	Sampling Date	Reference
PW-1	1224.48 to 1264.48	11/20/07	Ref. 24, pp. 7, 27

Notes:
AMSL: above mean sea level

Well ID	Hazardous Substance	Concentration (µg/L)	Method Detection Limit (µg/L)	References
PW-1	TCE	ND	0.26	Ref. 24, p. 27; Ref. 25, pp. 58-60, 83

Notes:
µg/L: micrograms TCE per liter ground water
TCE: trichloroethene
ND: not detected

PW-1 is considered to be an appropriate background location for wells PW-2, PW-3, and PW-4 because all are screened in Subzone B of the Middle Water-Bearing Zone, with similar screen lengths (Ref. 5, pp. 38-39, 81, 83; Ref. 6, p. 83; Ref. 71). In addition, based on measurements from these wells, ground water flow in Subzone B is consistently toward the southeast. Well PW-1 is located northwest of the 160-acre Goodrich parcel, and wells PW-2, PW-3, and PW-4 are located beneath and downgradient of the 160-acre parcel (Ref. 5, pp. 87-90; Ref. 6, p. 85). No other background well locations are available for these monitoring wells.

- Contaminated Samples:

Well ID	Screened Interval (feet AMSL)	Date	Reference
PW-2	1144.36 to 1184.36	11/20/07	Ref. 24, pp. 7, 30
PW-3	1115.81 to 1155.81	11/20/07	Ref. 24, pp. 7, 33
PW-4	1116.56 to 1156.56	12/1/07	Ref. 24, pp. 7, 36

Notes:
AMSL: above mean sea level

Well ID	Hazardous Substance	Concentration (µg/L)	Method Detection Limit (µg/L)	Reference
PW-2	TCE	24	0.26	Ref. 24, pp. 30, 62-71; Ref. 25, pp. 64-65, 71-81, 83
PW-3	TCE	160	0.26	Ref. 24, pp. 33, 62-71; Ref. 25, pp. 55-57, 71-81, 83
PW-4	TCE	13	0.26	Ref. 24, pp. 36, 62-71, 57-58, 73

Notes:
µg/L: micrograms TCE per liter ground water
TCE: trichloroethene

2008 EPA Ground Water Sampling

In February 2008, the EPA conducted a Ground water Characterization Sampling Event to provide data for evaluation of the nature and extent of ground water contamination associated with the 160-acre Goodrich parcel. Field activities included sampling selected ground water monitoring and production wells (Ref. 8, pp. 11-12; Ref. 9, p. 11).

In general, sampling was conducted at well locations that fell within or near the interpreted extent of contamination downgradient of the 160-acre Goodrich parcel. These locations included multiport monitoring wells PW-5 through PW-9, WVWD monitoring well No. 22 (former production well), and City of Rialto production wells Nos. 1 and 2. In addition, sampling was conducted at selected monitoring wells located on the 160-acre parcel that have exhibited the highest contaminant concentrations in the past, including PW-2, PW-3, CMW-2 (three-well cluster), and CMW-5 (three-well cluster). Monitoring well PW-1 and WVWD production well No. 24, located upgradient of the 160-acre Goodrich parcel, were sampled to provide background concentrations. VOCs were analyzed by EPA CLP Method SOM01.X (Ref. 8, p. 23).

Analytical services were provided by the EPA Region 9 Analytical Program (Ref. 8. p. 33). All of the VOC analytical results were selected for Tier 3 data validation (Ref. 8, p. 37). Well locations are shown on Reference 9, page 19.

Monitoring Well Sampling

- Background Concentrations:

Well ID (Sample ID)	Screened Interval (feet AMSL)	Date	Reference
PW-1 (Y3WA5RE)*	1224.48 to 1264.48	1/23/08	Ref. 8, p. 17; Ref. 11, p. 9; Ref. 15

Notes:
AMSL: above mean sea level
*: Sample Y3WA5 was reanalyzed due to the closing continuing calibration verification (CCV) failure. The reanalysis results are reported since the closing CCV for reanalyses met the acceptance criteria (Ref. 11, p. 3).

Well ID (Sample ID)	Hazardous Substance	Concentration (µg/L)	CRQL (µg/L)	Reference
PW-1 (Y3WA5RE)*	TCE	0.50U	0.50	Ref. 11, pp. 9, 17; Ref. 15; Ref. 17, pp. 14, 39-57

Notes:
CRQL: Contract Required Quantitation Limit
µg/L: micrograms TCE per liter ground water
TCE: trichloroethene
*: Sample Y3WA5 was reanalyzed due to the closing continuing calibration verification (CCV) failure. The reanalysis results are reported since the closing CCV for reanalyses met the acceptance criteria (Ref. 11, p. 3).

PW-1 is considered to be an appropriate background location for wells PW-2, PW-3, CMW-2 and CMW-5 because all are screened in Subzone B of the Middle Water-Bearing Zone, with similar screen lengths (Ref. 5, pp. 38-39, 81, 83; Ref. 6, p. 83; Ref. 71). In addition, based on measurements from these wells, ground water flow in Subzone B is consistently toward the southeast. Well PW-1 is located northwest of the 160-acre Goodrich parcel, and wells PW-2 and PW-3 are located beneath and downgradient of the 160-acre parcel (Ref. 5, pp. 87-90; Ref. 6, p. 85). No other background well locations are available for these monitoring wells.

Appropriate background wells for comparison to PW-5, PW-7, PW-8, and PW-9 are not available. Therefore, data from these wells are included for informational purposes, and are not being used to document the observed release.

- Contaminated Samples:

Well ID (Sample ID)	Screened Interval (feet AMSL)	Date	Reference
PW-2 (Y3WA8RE)*	1144.36 to 1184.36	1/24/08	Ref. 9, p. 33; Ref. 11, p. 9; Ref. 15
PW-3 (Y3WA7)	1115.81 to 1155.81	1/24/08	Ref. 9, p. 33; Ref. 11, p. 9; Ref. 15
PW-5A (Y3W96RE)*	948.64 to 958.64	1/21/08	Ref. 9, p. 33; Ref. 12, pp. 8, 10; Ref. 15
PW-5B (Y3W94)	903.64 to 913.64	1/21/08	Ref. 9, p. 33; Ref. 12, pp. 7, 10; Ref. 15
PW-5C (Y3W93)	858.64 to 868.64	1/21/08	Ref. 9, p. 33; Ref. 12, p. 10; Ref. 15
PW-5D (Y3W92)	798.64 to 808.64	1/21/08	Ref. 9, p. 33; Ref. 12, p. 10; Ref. 15
PW-7B (Y3W87)	896.14 to 906.14	1/18/08	Ref. 9, p. 34; Ref. 14, pp. 5, 19; Ref. 15
PW-8A (Y3WA2)	1065.42 to 1075.42	1/22/08	Ref. 9, p. 34; Ref. 12, p. 14; Ref. 15
PW-8B (Y3WA1)	960.42 to 970.42	1/22/08	Ref. 9, p. 34; Ref. 12, p. 14; Ref. 15
PW-9B (Y3W79)	884.16 to 894.16	1/17/08	Ref. 9, p. 34; Ref. 14, p. 11; Ref. 15
PW-9C (Y3W78)	814.16 to 824.16	1/17/08	Ref. 9, p. 34; Ref. 14, p. 11; Ref. 15
PW-9F (Y3W75)	579.16 to 589.16	1/17/08	Ref. 9, p. 34; Ref. 14, p. 11; Ref. 15
PW-9G (Y3W74)	489.16 to 499.16	1/17/08	Ref. 9, p. 34; Ref. 14, p. 11; Ref. 15
CMW2A (Y3WB0)	1203.68 to 1223.68	1/25/08	Ref. 9, p. 33; Ref. 11, p. 9; Ref. 15
CMW2B (Y3WB1RE)*	1164.68 to 1184.68	1/25/08	Ref. 9, p. 33; Ref. 11, p. 13; Ref. 15
CMW2C (Y3WB2)	1124.66 to 1144.68	1/25/08	Ref. 9, p. 33; Ref. 11, p. 13; Ref. 15
CMW5A (Y3WB5)	1227.9 to 1247.9	1/29/08	Ref. 9, p. 33; Ref. 10, pp. 5, 7; Ref. 15
CMW5B (Y3WB6)	1168.07 to 1188.07	1/29/08	Ref. 9, p. 33; Ref. 10, p. 7; Ref. 15
CMW5C (Y3WB7)	1128.08 to 1148.08	1/29/08	Ref. 9, p. 33; Ref. 10, p. 7; Ref. 15

Notes:
AMSL: above mean sea level
*: Samples Y3WA8, Y3WB1, and Y3W96 were reanalyzed due to deuterated monitoring compound (DMC) recovery problems. The reanalysis results are reported since all DMC recoveries were within QC limits (Ref. 11, p. 6; Ref. 12, p. 7).

Well ID (Sample ID)	Hazardous Substance	Concentration (µg/L)	CRQL (µg/L)	References
PW-2 (Y3WA8RE)*	TCE	13	0.50	Ref. 11, pp. 9, 17; Ref. 15; Ref. 17, pp. 14, 131-145
PW-3 (Y3WA7)	TCE	92	5.0	Ref. 11, pp. 6, 9, 17; Ref. 15; Ref. 17, pp. 14, 83-114
PW-5A (Y3W96RE)*	TCE	21	1.0	Ref. 12, pp. 8, 10, 22; Ref. 15; Ref. 18, pp. 12, 216-243
PW-5B (Y3W94)	TCE	10	0.50	Ref. 12, pp. 7, 10, 22; Ref. 15; Ref. 18, pp. 12, 160-173
PW-5C (Y3W93)	TCE	27	1.0	Ref. 12, pp. 8, 10, 22; Ref. 15; Ref. 18, pp. 12, 131-159
PW-5D (Y3W92)	TCE	0.86	0.50	Ref. 12, pp. 10, 22; Ref. 15; Ref. 18, pp. 12, 115-130
PW-7B (Y3W87)	TCE	0.78	0.50	Ref. 14, pp. 5, 19; Ref. 15; Ref. 19, pp. 15, 314-327
PW-8A (Y3WA2)	TCE	16	0.50	Ref. 12, pp. 14, 22; Ref. 15; Ref. 18, pp. 13, 57-72
PW-8B (Y3WA1)	TCE	1.6	0.50	Ref. 12, pp. 14, 22; Ref. 15; Ref. 18, pp. 13, 42-56
PW-9B (Y3W79)	TCE	0.63	0.50	Ref. 14, pp. 11, 19; Ref. 15; Ref. 19, pp. 15, 194-208
PW-9C (Y3W78)	TCE	8.8	0.50	Ref. 14, pp. 11, 19; Ref. 15; Ref. 19, pp. 15, 179-193
PW-9F (Y3W75)	TCE	3.6	0.50	Ref. 14, pp. 11, 19; Ref. 15; Ref. 19, pp. 14, 135-148
PW-9G (Y3W74)	TCE	3.7	0.50	Ref. 14, pp. 11, 19; Ref. 15; Ref. 19, pp. 14, 120-134
CMW2A (Y3WB0)	TCE	18	1.0	Ref. 11, pp. 6, 9, 17; Ref. 15; Ref. 17, pp. 14, 159-197
CMW2B (Y3WB1RE)*	TCE	3.3	0.50	Ref. 11, pp. 13, 17; Ref. 15; Ref. 17, pp. 14, 215-231
CMW2C (Y3WB2)	TCE	0.87	0.50	Ref. 11, pp. 13, 17; Ref. 15; Ref. 17, pp. 14, 232-244
CMW5A (Y3WB5)	TCE	170	5.0	Ref. 10, pp. 5, 7, 15; Ref. 15; Ref. 16, pp. 14, 52-82
CMW5B (Y3WB6)	TCE	87	2.5	Ref. 10, pp. 5, 7, 15; Ref. 15; Ref. 16, pp. 14, 83-114
CMW5C (Y3WB7)	TCE	11	0.50	Ref. 10, pp. 7, 15; Ref. 15; Ref. 16, pp. 14, 115-130

Notes:
CRQL: Contract Required Quantitation Limit
µg/L: micrograms per liter
TCE: trichloroethene
*: Samples Y3WA8, Y3WB1, and Y3W96 were reanalyzed due to deuterated monitoring compound (DMC) recovery problems. The reanalysis results are reported since all DMC recoveries were within QC limits (Ref. 11, p. 6; Ref. 12, p. 7).

Production Well Sampling

\- Background Concentrations:

Well ID (Sample ID)	Screened Interval (feet AMSL)	Date	References
WVWD-24 (Y3WB9)	1554.1 to 1630.1	1/30/08	Ref. 10, p. 7; Ref. 15; Ref. 20, p. 5

Notes:
AMSL: above mean sea level

Well ID (Sample ID)	Hazardous Substance	Concentration (μg/L)	CRQL (μg/L)	References
WVWD-24 (Y3WB9)	TCE	0.50U	0.50	Ref. 10, pp. 7, 15; Ref. 15; Ref. 16, pp. 14, 145-159

Notes:
CRQL: Contract Required Quantitation Limit
μg/L: micrograms TCE per liter ground water
TCE: trichloroethene

Production well WVWD-24 is considered to be an appropriate background location for wells Rialto-1, Rialto-2, and WVWD-22 because all are screened in the interconnected middle water-bearing zone (Ref. 71). Ground water flow in the middle zone is consistently toward the southeast (Ref. 69, pp. 14-17). Well WVWD-24 is located northwest and upgradient of the 160-acre Goodrich parcel, and wells Rialto-1, Rialto-2, and WVWD-22 are located southeast and downgradient of the 160-acre parcel (Ref. 5, pp. 87-90; Ref. 6, p. 85; Ref. 49). In addition, sampling dates and methodologies are comparable (Ref. 10, pp. 7, 10-11, 15; Ref. 15; Ref. 16, pp. 14, 145-207). No other background well locations are available for these production wells.

\- Contaminated Samples:

Well ID (Sample ID)	Screened Interval (feet AMSL)	Date	References
Rialto-1 (Y3WC0)	670 to 885	1/30/08	Ref. 10, p. 11; Ref. 15; Ref. 21, p. 6
Rialto-2 (Y3WC1)	450 to 862	1/30/08	Ref. 10, p. 11; Ref. 15; Ref. 21, p. 6
WVWD-22 (Y3WC2)	735.2 to 1074.2	1/30/08	Ref. 10, p. 11; Ref. 15; Ref. 20, p. 4

Notes:
AMSL: above mean sea level

Well ID (Sample ID)	Hazardous Substance	Concentration (μg/L)	CRQL (μg/L)	References
Rialto-1 (Y3WC0)	TCE	0.83	0.50	Ref. 10, pp. 11, 16; Ref. 15; Ref. 16, pp. 14, 160-178
Rialto-2 (Y3WC1)	TCE	4.2	0.50	Ref. 10, pp. 11, 16; Ref. 15; Ref. 16, pp. 14, 179-191
WVWD-22 (Y3WC2)	TCE	19	0.50	Ref. 10, pp. 11, 16; Ref. 15; Ref. 16, pp. 14, 192-207

Notes:
CRQL: Contract Required Quantitation Limit
μg/L: micrograms TCE per liter ground water
TCE: trichloroethene

Water Purveyor Production Well Sampling

The City of Rialto, City of Fontana, and the WVWD conduct routine production well sampling under the Safe Drinking Water Act. The EPA establishes and implements the Safe Drinking Water Act and its amendments through Title 40 Code of Federal Regulations (CFR) Parts 141-142, "National Primary Drinking Water Regulations" and Title 40 CFR Part 143 "National Secondary Drinking Water Regulations."

- Background Concentrations:

Well ID	Screened Interval (feet AMSL)	References
WVWD-24	1554.1 to 1630.1	Ref. 20, p. 5

Notes:
AMSL: above mean sea level

Well ID	Sampling Date	Hazardous Substance	Concentration (µg/L)	MDL (µg/L)	References
WVWD-24	11/8/1984	TCE	ND	NP	Ref. 26, pp. 6, 27; Ref. 63, pp. 6-8
	6/18/1986	TCE	ND	NP	
	1/10/1989	TCE	ND	NP	
	4/13/1989	TCE	ND	NP	
	9/22/1989	TCE	ND	NP	
	2/22/1990	TCE	ND	NP	
	2/19/1992	TCE	ND	NP	
	3/2/1993	TCE	ND	NP	
	11/3/1993	TCE	ND	NP	
	6/7/1994	TCE	ND	NP	
	7/12/1995	TCE	ND	NP	
	7/3/1996	TCE	ND	NP	
	7/9/1997	TCE	ND	NP	
	7/13/1998	TCE	ND	NP	
	7/27/1999	TCE	ND	NP	
	4/7/2000	TCE	ND	NP	
	7/6/2000	TCE	ND	NP	
	7/5/2001	TCE	ND	NP	
	7/3/2002	TCE	ND	NP	
	7/19/2005	TCE	ND	0.5	

Notes:
µg/L: micrograms TCE per liter ground water
TCE: trichloroethene
ND: not detected
MDL: Method Detection Limit
NP: not provided

Production well WVWD-24 is considered to be an appropriate background location for wells Rialto-1, Rialto-2, Rialto-6, WVWD-22, and Fontana-49A because all are screened in the interconnected middle water-bearing zone (Ref. 21, p. 6; Ref. 71). Ground water flow in the middle zone is consistently toward the southeast (Ref. 69, pp. 14-17). Well WVWD-24 is located northwest and upgradient of the 160-acre Goodrich parcel, and wells Rialto-1, Rialto-2, Rialto-6 WVWD-22, and Fontana-49A are located southeast and downgradient of the 160-acre parcel (Ref. 5, pp. 87-90; Ref. 6, p. 85; Ref. 49). In addition, sampling dates and methodologies are comparable (Ref. 10, pp. 7, 10-11, 15; Ref. 15; Ref. 16, pp. 14, 145-207). No other background well locations are available for these production wells.

- Contaminated Samples:

Well ID (Sample ID)	Screened Interval (feet AMSL)	Reference
Rialto-1 (Y3WC0)	670 to 885	Ref. 21, p. 6
Rialto-2 (Y3WC1)	450 to 862	Ref. 21, p. 6
Rialto-6	481 to 871	Ref. 21, p. 6
Fontana 49A	375 to 1115	Ref. 22, p. 5
WVWD-22 (Y3WC2)	735.2 to 1074.2	Ref. 20, p. 4

Notes:
AMSL: above mean sea level

Well ID	Sampling Date	Hazardous Substance	Concentration (µg/L)	MDL (µg/L)	References
Rialto-1	11/24/03	TCE	0.9	0.5*	Ref. 26, pp. 2, 7; Ref. 67, pp. 6-8; Ref. 84, pp. 6-13
	2/24/04	TCE	0.7	0.5*	
	3/16/04	TCE	0.7	0.5*	
	2/22/05	TCE	0.95	0.5*	
	2/21/06	TCE	1.2	0.5	
	7/20/06	TCE	1.1	0.5	
	3/7/07	TCE	0.78	NP	
Rialto-2	6/8/94	TCE	1.3	NP	Ref. 26, pp. 2, 7-8; Ref. 65, pp. 6-15; Ref. 83, pp. 4-5
	9/22/94	TCE	1.3	NP	
	12/12/95	TCE	1.7	NP	
	6/28/96	TCE	1.8	NP	
	6/2/98	TCE	6.2	0.5	
	6/17/98	TCE	6.7	0.5	
	12/7/98	TCE	4.8	0.5	
	1/12/99	TCE	4.2	NP	
	3/3/99	TCE	5.5	0.5	
	5/5/99	TCE	4.9	0.5	
	1/15/03	TCE	5.9	0.5	

Well ID	Sampling Date	Hazardous Substance	Concentration (µg/L)	MDL (µg/L)	References
	2/24/05	TCE	3.1	0.5*	
	6/5/06	TCE	5.1	0.5	
Rialto-6	12/11/01	TCE	1.0	0.5	Ref. 26, pp. 2, 7; Ref. 68, pp. 6-8; Ref. 85, pp. 3-4
	2/24/05	TCE	1.6	0.5*	
	2/21/06	TCE	2.5	0.5	
WVWD-22	1/17/89	TCE	9.7	0.5*	Ref. 26, pp. 6, 27; Ref. 64, pp. 6-9; Ref. 73, pp. 26-27, 32, 39, 45, 48, 54, 58, 61, 63, 65, 73, 75, 78, 79
	6/22/89	TCE	3.3	0.5*	
	9/22/89	TCE	4.1	0.5*	
	12/21/89	TCE	3.8	0.5*	
	2/5/90	TCE	4.7	0.5*	
	6/26/90	TCE	4.3	0.5*	
	7/5/90	TCE	4.4	0.5*	
	8/16/90	TCE	3.1	0.5*	
	9/19/90	TCE	2.7	0.5*	
	10/23/90	TCE	3.4	0.5*	
	11/13/90	TCE	3.0	0.5*	
	12/5/90	TCE	2.4	0.5*	
	11/18/93	TCE	1.4	0.5*	
	3/3/94	TCE	1.1	NP	
	3/16/94	TCE	1.3	NP	
	6/27/95	TCE	3.2	NP	
	8/21/96	TCE	4.1	NP	
	10/23/97	TCE	17.5	NP	
	10/23/97	TCE	17.3	NP	
	10/24/97	TCE	17.5	NP	
	10/24/97	TCE	18.8	NP	
	10/24/97	TCE	20.0	NP	
	4/12/99	TCE	54.7	NP	
	7/28/99	TCE	16.8	NP	
	7/28/99	TCE	31.5	NP	
	10/26/99	TCE	27.0	NP	
	10/26/99	TCE	7.0	NP	
	10/26/99	TCE	45.5	NP	
	1/26/2000	TCE	39.4	NP	
	6/15/2000	TCE	27.3	NP	
	1/10/2003	TCE	50.0	NP	
	1/10/2003	TCE	10.0	NP	

Well ID	Sampling Date	Hazardous Substance	Concentration (µg/L)	MDL (µg/L)	References
	2/24/2003	TCE	38.0	NP	
	2/24/2003	TCE	0.5	NP	
	4/21/2004	TCE	26.0	NP	
	4/21/2004	TCE	6.6	NP	
Fontana-49A	1/17/2002	TCE	1.2	NP	Ref. 26, pp. 4, 22; Ref. 66, pp. 6-10; Ref. 77, p. 3
	4/25/2002	TCE	1.8	NP	
	10/2/2002	TCE	0.6	NP	
	1/21/2004	TCE	0.55	NP	
	1/22/2004	TCE	0.65	NP	
	1/22/2004	TCE	0.66	NP	
	1/23/2004	TCE	0.58	NP	
	2/25/2004	TCE	0.64	NP	
	3/5/2004	TCE	0.52	0.5[1]	

Notes:
µg/L: micrograms TCE per liter ground water
TCE: trichloroethene
MDL: Method Detection Limit
NP: not provided
*: Detection Limit for Reporting Purposes (µg/L)
[1]: Reporting Limit (µg/L)

ATTRIBUTION

An observed release of TCE to ground water beneath the site is established, based on sampling of monitoring wells located directly upgradient, beneath, and downgradient of the 160-acre Goodrich parcel (see Section 3.1.1).

In 1957, Goodrich, purchased the 160-acre parcel from WCLC, to relocate its Army Ordnance Research Project from Brecksville, Ohio (Ref. 5, p. 27; Ref. 6, p. 19; Ref. 28, pp. 13, 17, 35-36, 40; Ref. 37, p. 7; Ref. 39, pp. 8-9). Using the existing structures with minor modifications, Goodrich began manufacturing solid rocket propellant and production of rocket motors, while also continuing research and development for various U.S. Army and Air Force programs (Ref. 5, p. 27; Ref. 6, p. 19; Ref. 28, pp. 12, 35-36, 40; Ref. 37, pp. 7-8; Ref. 39, pp. 8-9; Ref. 53, p. 13).

Initial Goodrich projects on the 160-acre Goodrich parcel included solid rocket propellant research and development for Edwards Air Force Base (Ref. 28, p. 36). Later work included contracts with the Naval Ordnance Test Station in China Lake, including work on the Loki and Sidewinder Missiles (Ref. 28, p. 36; Ref. 53, pp. 14, 124; Ref. 55, pp. 20, 30; Ref. 57, p. 22). These operations included extensive use of ammonium perchlorate as an oxidizer (Ref. 28, p. 40; Ref. 53, pp. 50-51, 95; Ref. 55, p. 30; Ref. 57, pp. 19-20; Ref. 59, p. 34; Ref. 61, p. 34). Specific tasks included grinding oxidizers, mixing propellant, pouring propellant into motor casings, and static-firing solid propellant rocket motors (Ref. 28, p. 40-41; Ref. 53, pp. 50, 95, 123-124; Ref. 55, p. 12; Ref. 57, pp. 19, 27).

During Goodrich solid rocket motor manufacturing operations, solvents, including TCE, were used to clean every vessel, including the mixers, and casings (Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 117, 177; Ref. 56, pp. 60, 68, 87-88; Ref. 57, pp. 107, 123-124; Ref. 58, pp. 103, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117). TCE was delivered to Goodrich in 55-gallon drums, and stored in the warehouse (Ref. 55, p. 117). In early 1963, it was discovered that the cast propellant in the Sidewinders was cracking, and the program was discontinued (Ref. 55, pp. 133-134). The defective propellant was subsequently cleaned out of the Sidewinder casings. Removal of the propellant may have been conducted using high-pressure water, plus a solvent, possibly TCE (Ref. 55, p. 71; Ref. 56, pp. 161-163; Ref. 57, pp. 147, 150-151; Ref. 58, p. 77). Propellant was observed on the bare ground around the concrete pad on which the removal operation was conducted (Ref. 54, pp. 24-25; Ref. 57, p. 153).

Waste materials from manufacturing and development operations, including excess propellant from the mixers, excess oxidizer, trimmings from the final castings, and propellant wastes from research and development activities were burned in an on-site burn pit (see Source 1) (Ref. 55, pp. 28-30, 177, 182, 192; Ref. 59, pp. 63-64; Ref. 61, p. 51). Former Goodrich employees have indicated the use and disposal of solvents, including TCE, in the burn pit (Ref. 53, pp. 55, 83, 119; Ref. 54, p. 35; Ref. 55, pp. 59, 61-63, 71, 117, 119-120, 177, 186; Ref. 56, pp. 60, 68, 70-71, 87-88, 145, 161-163; Ref. 57, pp. 107, 121, 123-124, 147, 150-151; Ref. 58, pp. 103-105, 129; Ref. 59, p. 46; Ref. 60, p. 36; Ref. 61, pp. 70, 71; Ref. 62, pp. 19-20, 116-117). Rags used for cleaning with solvents were disposed in the burn pit (Ref. 55, pp. 61-63, 119-120; Ref. 56, pp. 87, 145; Ref. 61, p. 71). In addition, used TCE was poured into the burn pit for disposal (Ref. 55, pp. 119-120, 186; Ref. 56, pp. 68-70, 87, 145; Ref. 57, p. 121; Ref. 58, pp. 103-105). The burn pit was not covered or lined (Ref. 57, p. 132; Ref. 58, p. 111). More than one burn pit or other type of on-site disposal may have been used, some at currently unknown locations within the 160-acre Goodrich parcel. Subsequent occupants of the 160-acre Goodrich parcel appear to have continued use of some of these on-site disposal locations (Ref. 7, pp. 11-12; Ref. 28, pp. 40-41; Ref. 27, p. 11; Ref. 37, p. 14; Ref. 38, pp. 5, 12; Ref. 42, pp. 2-3; Ref. 43; Ref. 44, p. 1; Ref. 47; Ref. 48; Ref. 50; Ref. 51, p.1).

To fulfill the requirements of the EPA pursuant to its Unilateral Administrative Order (UAO) 2003-11, Goodrich conducted RI activities on the 160-acre Goodrich parcel in May 2004 through January 2005. Activities included sampling of soil gas at 61 selected on-site locations, and sampling of soil at 8 selected on-site locations (Ref. 5, p. 15). A total of 14 borings were advanced, and 28 soil gas samples were collected, at the suspected area of the former burn pit to total depths of 12 feet bgs. Soil gas samples were collected at 6 feet bgs, and at the total depth of each boring (Ref. 5, pp. 33-34). Soil gas samples, duplicate samples, and ambient air samples were collected and directly handed, under standard chain-of-custody documentation, to an on-site mobile laboratory, Centrum Analytical of Riverside, California, for Volatile Organic Compound (VOC) analysis by EPA Method 5030/8260B (Ref. 5, p. 35). TCE was detected at 3 locations within the former burn pit at a maximum concentration of 1.7 micrograms per liter (μg/L) in sample SG-BP-13 (Ref. 5, pp. 16, 62; Ref. 7, p. 40). Soil gas sampling locations are shown on Reference 5, page 85, and Reference 7, page 40.

TCE has been detected in ground water immediately downgradient of the burn pit (Source 1), in monitoring wells CMW-01 and CMW-02 (Ref. 5, pp. 87-90, 98, 171-177; Ref. 6, pp. 26, 78, 80, 85, 87, 118; Ref. 7, pp. 11-12, 25, 42-43; Ref. 11, pp. 6, 9, 13, 17; Ref. 15; Ref. 17, pp. 14, 39-57, 159-197, 215-244). In addition, TCE has been detected in monitoring wells on the 160-acre Goodrich parcel that are not located downgradient of Source 1. Specifically, TCE has been detected in monitoring wells CMW-03, CMW-04, and CMW-05, which are located either upgradient or crossgradient of Source 1. TCE has never been detected in monitoring well PW-1, which is located northwest and upgradient of the 160-acre Goodrich parcel (Ref. 5, pp. 87-90, 98, 171-177; Ref. 6, pp. 85, 87, 118; Ref. 7, pp. 11-12, 25, 42-43; Ref, 10, pp. 5, 7, 15; Ref. 11, pp. 6, 9, 13, 17; Ref. 15; Ref. 16, pp. 14, 52-130; Ref. 17, pp. 14, 39-57, 159-197, 215-244). Therefore, this indicates a source of TCE within the burn pit, as well as a separate unallocated source within the 160-acre Goodrich parcel.

A source of TCE to ground water has been identified at the neighboring MVSL facility, located southwest of the 160-acre parcel (Ref. 6, pp. 17, 19-20, 27; Ref. 13, pp. 11-12, 39, 43-44, 109-110). However, TCE-impacted wells on and immediately downgradient of the 160-acre Goodrich parcel are not located downgradient of the MVSL (Ref. 6, pp. 85-87). Therefore, the TCE plume from the MVSL appears to be distinct from the TCE plume from the 160-acre parcel (Ref. 6, pp. 33, 85-87; Ref. 13, pp. 43-44, 109-110).

Hazardous Substances Released

TCE

Ground Water Observed Release Factor Value: **550**

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

Hazardous Substance	Source No. (and/or Observed Release)	Toxicity Factor Value	Mobility Factor Value	Does Haz. Substance Meet Observed Release by chemical analysis? (Y/N)	Toxicity/ Mobility (Ref. 1, p. 73, Table 3-9)	Reference
TCE	1, 2	10,000	1	Y	10,000	Ref. 2

Toxicity/Mobility Factor Value: **10,000**
(Ref. 1, p. 73, Table 3-9)

3.2.2 HAZARDOUS WASTE QUANTITY

Source No.	Source Type	Source Hazardous Waste Quantity
1	Other	>0
2	Other	>0

The hazardous constituent quantity is not adequately determined. Therefore, the Hazardous Waste Quantity Factor Value is assigned in accordance with Ref. 1, p. 63, Section 2.4.2.2. Because a target for the ground water pathway is subject to Level I concentrations (see Section 3.3, Targets), a value of 100 is assigned.

Hazardous Waste Quantity Factor Value: **100**

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

Toxicity/Mobility Factor Value: **10,000**
Hazardous Waste Quantity Factor Value: **100**

Toxicity/Mobility Factor Value X Hazardous Waste Quantity Factor Value: **1,000,000**

Waste Characteristics Factor Category Value: **32**
(Ref. 1, p. 63, Table 2-7)

3.3 TARGETS

The following table lists information regarding background and release drinking water wells.

Well ID	Water Purveyor	Status	Water Use	Water Elevation (feet AMSL)	Ground Water Wellhead Elevation (feet AMSL)	Well Bottom Elevation (feet AMSL)	Screened Interval (feet AMSL)	References
Background Wells								
WVWD-24	WVWD	Active	Municipal	1,781.1	1,854.1	1,554.1	1,554.1-1,630.1	Ref. 20, pp. 3, 5
Release Wells								
Rialto #2	City of Rialto	Inactive	Municipal	1,003	1,450	428	862-450	Ref. 21, pp. 3, 5-6
WVWD-22	WVWD	Inactive	Municipal	Not recorded	1,514.2	735	1,074.2-735.2	Ref, 20, pp. 3-4
Fontana 49A	City of Fontana	Active	Municipal	994	1,415	1,060	375-1,115	Ref. 22, pp. 4-5

Notes:
AMSL: above mean sea level
WVWD: West Valley Water District

Level I Concentrations

Well ID	Sample Date	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Benchmark Concentration (µg/L)	Benchmark	References
Rialto #2*	6/8/94	TCE	1.3	0.21	cancer risk screen conc.	Ref. 2; Ref. 10, pp. 10-11; Ref. 15; Ref. 16, pp. 14, 179-191; Ref. 26, pp. 2, 7-8; Ref. 65, pp. 6-15; Ref. 83, pp. 4-5
	9/22/94	TCE	1.3	0.21	cancer risk screen conc.	
	12/12/95	TCE	1.7	0.21	cancer risk screen conc.	
	6/28/96	TCE	1.8	0.21	cancer risk screen conc.	
	6/2/98	TCE	**6.2**	0.21	cancer risk screen conc.	
	6/17/98	TCE	**6.7**	0.21	cancer risk screen conc.	
	12/7/98	TCE	4.8	0.21	cancer risk screen conc.	
	1/12/99	TCE	4.2	0.21	cancer risk screen conc.	
	3/3/99	TCE	**5.5**	0.21	cancer risk screen conc.	
	5/5/99	TCE	4.9	0.21	cancer risk screen conc.	
	1/15/03	TCE	**5.9**	0.21	cancer risk screen conc.	
	2/24/05	TCE	3.1	0.21	cancer risk screen conc.	
	6/5/06	TCE	**5.1**	0.21	cancer risk screen conc.	
	1/30/08	TCE	4.2	0.21	cancer risk screen conc.	

Well ID	Sample Date	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Benchmark Concentration (µg/L)	Benchmark	References
WVWD-22*	1/17/89	TCE	**9.7**	0.21	cancer risk screen conc.	Ref. 2; Ref. 10, pp. 10-11; Ref. 15; Ref. 16, pp. 14, 192-207; Ref. 26, pp. 6, 26-27; Ref. 64, pp. 6-9; Ref. 73, pp. 27, 32, 39, 45, 48, 54, 58, 61, 63, 65, 73, 75, 78, 79
	6/22/89	TCE	3.3	0.21	cancer risk screen conc.	
	9/22/89	TCE	4.1	0.21	cancer risk screen conc.	
	12/21/89	TCE	3.8	0.21	cancer risk screen conc.	
	2/5/90	TCE	4.7	0.21	cancer risk screen conc.	
	6/26/90	TCE	4.3	0.21	cancer risk screen conc.	
	7/5/90	TCE	4.4	0.21	cancer risk screen conc.	
	8/16/90	TCE	3.1	0.21	cancer risk screen conc.	
	9/19/90	TCE	2.7	0.21	cancer risk screen conc.	
	10/23/90	TCE	3.4	0.21	cancer risk screen conc.	
	11/13/90	TCE	3.0	0.21	cancer risk screen conc.	
	12/5/90	TCE	2.4	0.21	cancer risk screen conc.	
	11/18/93	TCE	1.4	0.21	cancer risk screen conc.	
	3/3/94	TCE	1.1	0.21	cancer risk screen conc.	
	3/16/94	TCE	1.3	0.21	cancer risk screen conc.	
	6/27/95	TCE	3.2	0.21	cancer risk screen conc.	
	8/21/96	TCE	4.1	0.21	cancer risk screen conc.	
	10/23/97	TCE	**17.5**	0.21	cancer risk screen conc.	
	10/23/97	TCE	**17.3**	0.21	cancer risk screen conc.	
	10/24/97	TCE	**17.5**	0.21	cancer risk screen conc.	
	10/24/97	TCE	**18.8**	0.21	cancer risk screen conc.	
	10/24/97	TCE	**20.0**	0.21	cancer risk screen conc.	
	4/12/99	TCE	**54.7**	0.21	cancer risk screen conc.	
	7/28/99	TCE	**16.8**	0.21	cancer risk screen conc.	
	7/28/99	TCE	**31.5**	0.21	cancer risk screen conc.	
	10/26/99	TCE	**27.0**	0.21	cancer risk screen conc.	
	10/26/99	TCE	**7.0**	0.21	cancer risk screen conc.	
	10/26/99	TCE	**45.5**	0.21	cancer risk screen conc.	
	1/26/2000	TCE	**39.4**	0.21	cancer risk screen conc.	
	6/15/2000	TCE	**27.3**	0.21	cancer risk screen conc.	
	1/10/2003	TCE	**50.0**	0.21	cancer risk screen conc.	
	1/10/2003	TCE	**10.0**	0.21	cancer risk screen conc.	
	2/24/2003	TCE	**38.0**	0.21	cancer risk screen conc.	
	1/30/08	TCE	**19**	0.21	cancer risk screen conc.	
	2/24/2003	TCE	0.5	0.21	cancer risk screen conc.	

Well ID	Sample Date	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Benchmark Concentration (µg/L)	Benchmark	References
	4/21/2004	TCE	**<u>26.0</u>**	0.21	cancer risk screen conc.	
	4/21/2004	TCE	**<u>6.6</u>**	0.21	cancer risk screen conc.	
Fontana-49A	1/17/2002	TCE	1.2	0.21	cancer risk screen conc.	Ref. 2; Ref. 26, pp. 4, 22; Ref. 66, pp. 6-10; Ref. 77, p. 3
	4/25/2002	TCE	1.8	0.21	cancer risk screen conc.	
	10/2/2002	TCE	0.6	0.21	cancer risk screen conc.	
	1/21/2004	TCE	0.55	0.21	cancer risk screen conc.	
	1/22/2004	TCE	0.65	0.21	cancer risk screen conc.	
	1/22/2004	TCE	0.66	0.21	cancer risk screen conc.	
	1/23/2004	TCE	0.58	0.21	cancer risk screen conc.	
	2/25/2004	TCE	0.64	0.21	cancer risk screen conc.	
	3/5/2004	TCE	0.52	0.21	cancer risk screen conc.	

Notes:
µg/L: micrograms TCE per liter ground water
TCE: trichloroethene
*: Although this well is currently inactive, it was closed due to the presence of TCE, and is therefore considered as a target (Ref. 79; Ref. 82). Although TCE has been detected in closed wells Rialto-1 and Rialto-6, these wells were closed due to the presence of hazardous substances other than TCE, and are therefore not considered as Level I targets (Ref. 21, p. 5).
<u>Bold</u>: Bold and underlined values also exceed the Maximum Contaminant Level (MCL) of 5 µg/L.

3.3.1 NEAREST WELL

Well ID: **WVWD-22**
Level of Contamination (I, II, or potential): **I**
If potential contamination, distance from source in miles: Not applicable

Nearest Well Factor Value: **50**
(Ref. 1, p. 74, Table 3-11)

3.3.2 POPULATION

As specified in 40 Code of Federal Regulation (CFR) Part 300 of HRS, "HRS scoring will not consider the effects of responses that do not reduce waste quantities such as providing alternate drinking water supplies to populations with drinking water supplies contaminated by the site. In such cases, the EPA believes that the initial targets factor should be used to reflect the adverse impacts caused by contamination of drinking water supplies; otherwise, a contaminated aquifer could be artificially shielded from further remediation." Based on this rule, closed drinking water wells WVWD-22 and Rialto-2 are considered targets for HRS evaluation, as they were closed for the presence of TCE (Ref. 1, p. 39; Ref. 79; Ref. 82).

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

<u>Level I Population Targets</u>

Drinking water well Rialto-2, located between 1 and 2 miles southeast of Source 1, was taken out of service in November 1997 due to the presence of TCE, and other hazardous substances (Ref. 49; Ref. 75, p. 11; Ref. 82). The total production of the City of Rialto's blended drinking water system in 1997 was 12,523.95 acre-feet. Rialto #2 provided 1,156.53 acre feet in 1997 (Ref. 75, p. 11). The City of Rialto's system served 48,418 customers in 1997 (Ref. 72). Therefore:

1,156.53 / 12,523.95 = 0.09
48,418 * 0.09 = 4,358 customers served by Rialto-2 in the year it was shut down (1997).

The Fontana Water Company water system operates a blended drinking water system that consists of 34 active wells that serve approximately 153,937 people. Well Fontana-49A, located between 2 and 3 miles southeast of Source 1, is one of the active wells currently contributing to the system (Ref. 49; Ref. 22, pp. 1, 4). Currently, the Fontana Water Company obtains 81 percent of its water from ground water; approximately 19 percent is local stream flow from Lytle Creek and deliveries of State Water Project water. No one well or intake contributes greater than 40 percent to the system (Ref. 22, pp. 1-4). Therefore:

153,937 people / 35 (34 wells and 1 surface-water intake) = 4,398 people currently served by Fontana-49A.

Drinking water well WVWD-22, located between 1 and 2 miles southeast of Source 1, was taken out of service in January 1991 due to the presence of TCE (Ref. 73, pp. 2, 4; Ref. 49; Ref. 79). During the summer months of 1989 and 1990, Fontana Water Company used WVWD-22 for peaking purposes and tied it to their distribution system (Ref. 73, pp. 2, 4; Ref. 74, p. 1). The total production of Fontana Water Company's water system in 1990 was 31,707.869 acre-feet (Ref. 74, p. 4). WVWD-22 provided 543.416 acre-feet in 1990 (Ref. 73, pp. 4-5). Fontana Water Company's system served 100,261 people in 1990 (Ref. 74, p. 3). Therefore:

543.416 / 31,707.869 = 0.017
100,261 * 0.017 = 1,704 customers served by WVWD-22 in the last full year it was in service (1990).

Level I Well	Aquifer	Population	References
Rialto #2	Middle Water-Bearing Zone	4,358	Ref. 21, pp. 3, 5
F-49A	Middle Water-Bearing Zone	4,398	Ref. 22, pp. 1-2, 4
WVWD-22	Middle Water-Bearing Zone	1,704	Ref. 20, pp. 2-3

Sum of Population Served by Level I Wells: **10,460**
Sum of Population Served by Level I Wells x 10: **104,600**

Level I Concentrations Factor Value: **104,600**

3.3.2.3 Level II Concentrations

There were no wells with Level II Concentrations

3.3.2.4 Potential Contamination

Potential Population Targets

City of Rialto

The City of Rialto water system operates a blended drinking water system that consists of eight active wells that serve approximately 48,418 people (Ref. 21, p 5). There are two active wells and four inactive wells located within the Rialto-Colton Basin (Ref. 21, pp. 2-3, 5). Currently, the City of Rialto obtains approximately 68 percent of its water from ground water; 23 percent is ground water purchased from other sources, and 9 percent is from non-ground water sources obtained from WVWD. No one well contributes greater than 40 percent to the system (Ref. 21, p. 5). Well Rialto #2 has Level I concentrations of TCE and therefore is not evaluated under potential contamination, but is considered as part of the population apportionment because it is inactive due to contaminants attributable to the B.F. Goodrich site (See Section 3.3.2.2 of Document Record above) (Ref. 82).

Calculation: 48,418 people – 4,358 people served by Rialto #2 at time of closure = 44,060 people

44,060 people / 10 (8 active wells, 1 purchased ground water intake, and 1 non-ground water intake)
= 4,406 people per well

West Valley Water District

The WVWD water system operates a blended drinking water system that consists of 19 active wells that serve approximately 64,512 people. There are seven active wells and one inactive well located within the Rialto Colton Basin. Currently, the WVWD obtains approximately 66.4 percent of its water from ground water; 9.6 percent is ground water purchased from other sources, and 23.96 percent is from non-ground water sources. No one well contributes greater than 40 percent to the system (Ref. 20). Well WWVD-22 has Level I concentrations of TCE and is therefore not evaluated under potential contamination, but is considered as part of the population apportionment because it is inactive due to contaminants attributable to the B.F. Goodrich site (Ref. 79) (See Section 3.3.2.2 of Document Record above).

Calculation: 64,512 people – 1,704 people served by WVWD-22 at time of closure = 62,808 people

62,808 / 21 (19 active wells, 1 purchased ground water intake, and 1 non-ground water intake)
= 2,991 people per well

Fontana Water Company

The Fontana Water Company water system operates a blended drinking water system that consists of 34 active wells that serve approximately 153,937 people. Four of the 34 active wells are located within the Rialto-Colton Basin. Currently, the Fontana Water Company obtains 81 percent of its water from ground water; approximately 19 percent is local stream flow from Lytle Creek and deliveries of State Water Project water. No one well contributes greater than 40 percent to the system (Ref. 22, pp. 1-4). Well Fontana-49A has Level I concentrations of TCE and is therefore not evaluated under potential contamination, but is considered as part of the population apportionment (See Section 3.3.2.2 of Document Record above).

Calculation: 153,937 people / 35 (34 wells and 1 surface-water intake) = 4,398 people per well

Distance Category (miles)	Public and Private Wells	Estimated Population Served	References	Distance-Weighted Population Value (Ref. 1, p. 75, Table 3-12)
1 - 2	Total	14,778		2,939
	WVWD-23A	2,991	Ref. 20, pp. 2-3; Ref. 49	
	WVWD-24	2,991	Ref. 20, pp. 2-3; Ref. 49	
	Fontana 13A	4,398	Ref. 22, pp. 1-2, 4; Ref. 49	
	Fontana 13B	4,398	Ref. 22, pp. 1-2, 4; Ref. 49	
2 - 3	Total	14,786		2,122
	Rialto #3	4,406	Ref. 21, pp. 3, 5; Ref. 49	
	WVWD-33	2,991	Ref. 20, pp. 2-3; Ref. 49	
	WVWD-54	2,991	Ref. 20, pp. 2-3; Ref. 49	
	Fontana 15A	4,398	Ref. 22, pp. 1-2, 4; Ref. 49	
3 - 4	Total	7397		417
	Rialto #5	4,406	Ref. 21, pp. 3, 5; Ref. 49	
	WVWD-11	2991	Ref. 20, pp. 2-3; Ref. 49	
Total				5,478

Calculations:

Sum of Distance-Weighted Population Values: **5478**
Sum of Distance-Weighted Population Values/10: **547.8**

Potential Contamination Factor Value: **547.8**

3.3.3 RESOURCES

Ground water wells in the site vicinity are not known to be used for resources as defined by the HRS. In addition, this factor would not significantly impact the listing decision.

3.3.4 WELLHEAD PROTECTION AREA

It is unknown whether the B.F. Goodrich site is located in a wellhead protection area. In addition, this factor would not significantly impact the listing decision.