

# Tank 5 Quarterly Release Response Report Red Hill Bulk Fuel Storage Facility JBPHH, Oahu, Hawaii

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## ***Executive Summary***

Commander Navy Region Hawaii (CNRH) prepared this Quarterly Release Response Report in accordance with the State of Hawaii Department of Health (DOH) Underground Storage Tank (UST) Technical Guidance Manual (DOH, 2000) and in response to the DOH release response letters dated February 12, 2014 and February 26, 2014 for the Red Hill Bulk Fuel Storage Facility. The objective of this report is to describe the actions taken by the Navy between October and December 2015 in response to the fuel reportedly released from Tank 5 in January 2014.

Soil vapor and groundwater samples continue to be collected from locations adjacent to Tank 5. Groundwater samples are also collected from locations outside the Red Hill tunnel system. Laboratory analytical results continue to indicate the concentrations of petroleum constituents in the groundwater directly beneath the tanks are within historical ranges.

The Navy continues to perform work to ensure the drinking water around the Facility remains safe. Future release response actions include determining the feasibility of alternatives for investigating and remediating releases from the Facility and continuing efforts to monitor and characterize the flow of groundwater around the Facility.

## **1.0 Introduction**

As required by Hawaii Administrative Rules 11-281-80.1, Release Response Reporting, this Quarterly Release Response Report presents the following information:

- 1) All release response actions taken pursuant to subchapter 7 after the last reported date;
- 2) A plan for future release response actions to be taken; and
- 3) Information required pursuant to section 11-281-78.1.

This report presents a summary of the release response activities performed from October 10, through December 31, 2015 at the Red Hill Bulk Fuel Storage Facility (hereinafter referred to as “the Facility”) located at Joint Base Pearl Harbor-Hickam (JBPHH), Oahu, Hawaii.

### **1.1 Statement of Purpose**

Release response actions were performed to address a fuel release observed in Tank 5.

### **1.2 Previous Reports**

The following documents were previously submitted to DOH:

- Release confirmation information for Tank 5 as Commander Navy Region Hawaii (CNRH) letter 5090 Ser N45/044 dated January 23, 2014
- Initial Release Response Report, enclosed with CNRH letter 5090 Ser N45/320 dated April 24, 2014
- Quarterly Release Response Report enclosed with CNRH letter 5090 Ser N45/563 dated July 22, 2014
- Quarterly Release Response Report enclosed with CNRH letter 5090 Ser N45/929 dated November 10, 2014
- Quarterly Release Response Report enclosed with CNRH letter 5090 Ser N45/121 dated January 21, 2015
- Quarterly Release Response Report enclosed with CNRH letter 5090 Ser N45/322 dated April 20, 2015
- Quarterly Release Response Report enclosed with CNRH letter 5090 Ser N45/573 dated July 17, 2015
- Quarterly Release Response Report enclosed with CNRH letter 5090 Ser N45/812 dated October 16, 2015

Weekly progress reports were provided to DOH and U.S. Environmental Protection Agency (EPA) every Tuesday by e-mail, followed by hard copy, from March 4, 2014 through October 6, 2015.

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## **2.0 Background**

The following sections provide a description of the site and information on the Facility.

### **2.1 Site Description**

The Facility is located on federal government land (zoned F1- Military and Federal), located in Halawa Heights, approximately 2.5 miles northeast of Pearl Harbor. It is located on a low ridge on the western edge of the Koolau Mountain Range that divides Halawa Valley from Moanalua Valley. The Facility occupies 144 acres of land and the majority of the site is at an elevation of approximately 200 to 500 feet above mean sea level (msl) (Environmental Science International, Inc., 2014).

The Facility is bordered on the west by the United States (U.S.) Coast Guard reservation, on the south by residential neighborhoods, and on the east by Moanalua Valley. The Facility is bordered on the north by Halawa Correctional Facility and Halawa Industrial Park, which includes private businesses and a former bus facility. A quarry is located less than a quarter mile away to the northwest.

### **2.2 Facility Information**

The Facility contains 18 active and 2 inactive bulk fuel field-constructed underground storage tanks (USTs), which are operated by Naval Supply Systems Command (NAVSUP) Fleet Logistics Center (FLC) Pearl Harbor (formerly Fleet and Industrial Supply Center). The Facility was constructed by the U.S. Government in the early 1940s. Twenty USTs and a series of tunnels were constructed to supply fuel to the Navy. Each UST has a capacity of approximately 12.5 million gallons. The Facility is located approximately 100 feet above the basal aquifer. The USTs contain jet fuel propellant-5 (JP-5), JP-8, and marine diesel fuel (F-76). Tank 5 is used to store JP-8.

Four groundwater monitoring wells (wells RHMW01, RHMW02, RHMW03, and RHMW05) are located within the lower access tunnel, and one sampling point (RHMW2254-01) is located at Red Hill Shaft. Sampling point RHMW2254-01 is located inside the infiltration gallery of the Department of the Navy (Navy) Well 2254-01. Navy Well 2254-01 is located down-gradient of the USTs and provides potable water to the JBPHH Water System, which serves approximately 65,200 military customers. Naval Facilities Engineering Command (NAVFAC) Public Works Department operates the infiltration gallery and Navy Well 2254-01.

Five groundwater monitoring wells (RHMW04, RHMW06, RHMW07, HDMW2253-03, and OWDFMW01) are located outside of the Facility tunnel system. Monitoring well RHMW04 is located by the Navy firing range. Well HDMW2253-03 is located at the Halawa Correctional Facility (outside the Facility) and well OWDFMW01 is located at the former Oily Waste Disposal Facility, near Adit 3.

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### **3.0 Groundwater and Soil Vapor Monitoring**

The following sections describe activities that were performed to monitor the groundwater and soil vapor beneath Tank 5 from October 10 through December 31, 2015.

#### **3.1 Oil/Water Interface Measurements**

The water level at each well was gauged and measured for the presence of light non-aqueous phase liquids (LNAPLs) using an interface meter. The interface meter was lowered into the wells and sampling point to determine the depth of water to the nearest 0.01 foot, and the existence of any immiscible layers (LNAPL).

Oil/water interface measurements were taken at monitoring wells RHMW01, RHMW02, RHMW03, and RHMW05 in October, November, and December 2015. No LNAPL was detected.

#### **3.2 Soil Vapor Monitoring**

Soil vapor samples were collected and analyzed in the field for volatile organic compound (VOC) concentrations using a photo-ionization detector (PID). Soil vapor monitoring points (SVMPs) were given a SV prefix, followed by the associated tank number, and then the location under the tank: “S” for shallow or front of the UST, “M” for mid depth or middle of the UST, and “D” for deep or outer edge of the UST.

A conservative approach to assess the integrity of the associated tank system is to measure if VOC concentrations exceed 280,000 parts per billion by volume (ppbv) in soil vapor monitoring probes beneath tanks containing JP-5 or JP-8, or 14,000 ppbv in soil vapor monitoring probes beneath tanks containing marine diesel fuel (TEC, 2010). These values are 50 percent of the calculated vapor concentration from fuel-saturated water.

Soil vapor monitoring was performed at all active and accessible tanks in October, November, and December 2015. Soil vapor VOC concentrations at Tank 5 were above the action level of 280,000 ppbv during the December 2015 monitoring event. Soil vapor VOC concentrations at all other active and accessible tanks were about 10 to 800 times below the action levels, with no consistent trending.

Soil vapor sampling results from March 2008 through December 2015 are presented in Appendix A.

#### **3.3 Groundwater Sampling and Analysis**

Groundwater samples were collected from sampling point RHMW2254-01 and monitoring wells located inside and outside the Red Hill lower access tunnel in October 2015. All groundwater samples were analyzed for petroleum constituents. Groundwater samples collected from sampling point RHMW2254-01 were also analyzed for total lead.



Analytical results were compared to site specific risk based levels (SSRBLs) for total petroleum hydrocarbons as diesel fuel (TPH-d) and benzene (TEC, 2008). Analytical results were also compared to DOH Environmental Action Levels (EALs) for sites where groundwater is a current or potential drinking water source (DOH, 2011).

### ***3.3.1 Inside Tunnel Wells***

Groundwater samples were collected from four groundwater monitoring wells (wells RHMW01, RHMW02, RHMW03, and RHMW05) located within the lower access tunnel, and one sampling point (RHMW2254-01) located at Red Hill Shaft. A summary of sampling activities and laboratory analytical results will be provided in a separate groundwater monitoring report.

### ***3.3.2 Outside Tunnel Wells***

Groundwater samples were collected from five groundwater monitoring wells (RHMW04, RHMW06, RHMW07, HDMW2253-03, and OWDFMW01) located outside of the Facility tunnel system. A summary of sampling activities and laboratory analytical results will be provided in a separate groundwater monitoring report.

## ***3.4 Drinking Water Sampling***

Drinking water samples were collected from the Red Hill Shaft post-treatment regulatory compliance sampling point (360-011, Tap Outside Cl<sub>2</sub> Building) on September 15 and December 15, 2015 and analyzed for Lead, JP-8, and contaminants listed in the Transition Plan. A drinking water sample was also collected from the Red Hill Shaft pre-treatment regulatory compliance sampling point (360-001, Red Hill Shaft Pumphead) on December 16 and analyzed for TPH-o and contaminants listed in the Transition Plan.

EPA Methods 524.2 (VOCs), 525.2 (SVOCs), 8015B (JP-8), and 200.8 (Lead) were used and all analyses were conducted by labs certified by the DOH State Laboratories Division.

Sample test results for the September 2015 event were below detectable levels and acceptable for distribution. Sample test results for the December 2015 will be available in January 2016.

A summary of the drinking water sampling is provided in Table 1.

## ***4.0 Continued Groundwater and Soil Vapor Monitoring***

Based on discussions with DOH, continued monitoring of the groundwater and soil vapor will be conducted as follows:

- Oil/water interface measurements – quarterly
- Soil vapor sampling – monthly
- Groundwater sampling and analysis – quarterly

Monitoring results will be submitted to DOH for each sampling event.

**RED HILL DRINKING WATER SHAFT SAMPLING  
TRANSITION PLAN FOR TANK 5 RED HILL RELEASE FROM EMERGENCY RESPONSE TO REMEDIATION  
AS AMENDED ON FEBRUARY 13, 2014**

Sample Date	360-011, Tap Outside CL2 Bldg			Pumphead, 360-001			Detections and Comments
	524.2; 525.2	8015B	200.8	524.2; 525.2	8015B	200.8	
1/14/2014	ND	ND	-	-	-	-	8015B analysis originally conducted with high MRL (10 mg/l), follow up with lower MRL outside of 14-day hold time
1/16/2014	Bromoform	ND	-	ND	ND	-	8015B analysis originally conducted with high MRL (10 mg/l), follow up with lower MRL outside of 14-day hold time. Bromoform detected in the 524.2 analysis for the 360-011 sample.
1/21/2014	Bromoform, Dibromochloromethane	ND	-	-	-	-	Bromoform, Dibromochloromethane detected
1/28/2014	Bromoform, Bromodichloromethane, Dibromochloromethane	ND	-	-	-	-	Bromoform, Bromodichloromethane, Dibromochloromethane were detected.
2/11/2014	Bromoform, Dibromochloromethane	ND	5.2 ppb	-	-	3.7 ppb	Bromoform, Dibromochloromethane, and Lead were detected. Result for lead at old post-chlorination sampling point was ND.
2/28/2014	N/A	-	ND	-	-	ND	Not required by UC Monitoring plan, not submitted to DOH. Result for lead at old post-chlorination sampling point was 10 ppb.
3/11/2014	Bromoform	ND	ND	-	-	ND	Bromoform was detected. Result for lead at old post-chlorination sampling point was ND.
4/8/2014	ND	ND	ND	-	-	ND	No contaminants detected.
5/13/2014	-	-	ND	-	-	-	Sampled for lead at 360-011 only. Lead not detected.
6/10/2014	-	-	ND	-	-	-	Sampled for Lead at 360-011 only. Lead not detected
7/8/2014	ND	ND	ND	-	-	-	Sampled for 524.2, 525.2, 8015B, Lead at 360-011. No contaminants detected.
10/7/2014*	ND	ND	ND	-	-	-	Sampled for 524.2, 525.2, 8015B, Lead at 360-011. No contaminants detected.
1/21/2015	Bromoform, Dibromochloromethane	ND	ND	-	-	-	Sampled for 524.2, 525.2, 8015B, Lead at 360-011. Detected bromoform, dibromochloromethane.
4/7/2015	ND	ND	ND	-	-	-	Sampled for 524.2, 525.2, 8015B, Lead at 360-011. No contaminants detected.
6/16/2015	ND	ND	ND	-	-	-	Sampled for 524.2, 525.2, 8015B, Lead at 360-011. No contaminants detected.
9/15/2015	ND	ND	ND	-	-	-	Sampled for 524.2, 525.2, 8015B, Lead at 360-011. No contaminants detected.
12/15/2015							

EPA Method 524.2 for volatile organic compounds (VOCs)  
EPA Method 525.2 for semi-volatile organic compounds  
EPA Method 8015 for JP8 (C8-C18) gas chromatograph  
EPA Method 200.8 for lead

\* Received DOH approval to change sample date from 10/14/14 to 10/7/14

**VOCs tested (EPA Method 524.2)**

Benzene	trans-1,2-Dichloroethylene	1,2,4-Trichlorobenzene
Carbon tetrachloride	Dichloromethane	1,1,1-Trichloroethane
Chlorobenzene	1,2-Dichloropropane	1,1,2-Trichloroethane
1,2-Dichlorobenzene	Ethylbenzene	Trichloroethylene
1,4-Dichlorobenzene	Naphthalene (unregulated)	Vinyl chloride
1,2-Dichloroethane	Styrene	Xylenes, Total
1,1-Dichloroethylene	Tetrachloroethylene	
cis-1,2-Dichloroethylene	Toluene	

**SVOCs tested (EPA Method 525.2)**

Benzo(a)pyrene
Di(2-ethylhexyl)adipate
Di(2-ethylhexyl)phthalate
Acenaphthene (unregulated)
Acenaphthylene (unregulated)
Anthracene (unregulated)
Phenanthrene (unregulated)
Fluoranthene (unregulated)
Pyrene (unregulated)

**HISTORICAL DRINKING WATER RESULTS AT RED HILL SHAFT:**

- Lead, VOCs and SVOCs regulated by HAR 11-20 and are monitored every 3 years. All petroleum-related contaminants were ND since 2000 (monitoring data not available prior to 2000).  
- UEM conducted additional monitoring for benzene, toluene, and xylene quarterly and benzo(a)pyrene twice a year from mid 1990's - 2013. Results not available prior to 2002. All results from 2002 were ND.  
- UEM also conducted additional quarterly monitoring for lead from mid 2012 - 2013. Lead was detected on:

8/17/12	6 ppb
11/27/12	1 ppb
8/22/13	1.9 ppb
11/19/13	1.8 ppb

## **5.0 Continued Drinking Water Sampling**

In accordance with the approved Transition Plan, drinking water sampling will continue on a quarterly schedule at the entry point to the distribution system (360-011 Tap Outside Cl<sub>2</sub> Building). Samples will be analyzed using the following analytical methods:

- VOCs – EPA 524.2
- SVOCs – EPA 525.2
- Gas Chromatography for JP-8 – EPA 8015
- Lead – EPA 200.8

## **6.0 Planned Future Release Response Actions**

The Navy and DLA negotiated with the EPA and DOH release response actions that will be pursued. Future release response actions include determining the feasibility of alternatives for investigating and remediating releases from the Facility and continuing efforts to monitor and characterize the flow of groundwater around the Facility.

## **7.0 Public Notifications**

The Navy provided notifications to the public through the following document:

- Red Hill Update Stakeholder Letter of November 13, 2015

A copy of this document is included as Appendix B.

## **8.0 Conclusions and Recommendations**

Results of oil/water interface measurements, groundwater sampling and analysis, and drinking water sampling and analysis indicate the release of JP-8 from Tank 5 has not impacted the Red Hill Shaft.

Additional release response actions have been negotiated with the EPA and DOH to protect the drinking water sources located down-gradient of the Facility.

The next quarterly release response report will be submitted in April 2016 and will cover the release response actions completed between January and March 2016.

## **9.0 References**

DOH, 2000, Technical Guidance Manual for Underground Storage Tank Closure and Release Response, Environmental Management Division, Solid and Hazardous Waste Branch, Underground Storage Tank Section, March 2000.

DOH, 2011, Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater, Environmental Management Division, Fall 2011, revised January 2012.

DOH, 2013, Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan, Office of Hazard Evaluation and Emergency Response, Interim Final, March 2013.

Environmental Science International, Inc., 2014, Final Third Quarter 2014 – Quarterly Groundwater Monitoring Report, Inside Tunnel Wells, Red Hill Bulk Fuel Storage Facility, Prepared for Department of the Navy, Naval Facilities Engineering Command, Hawaii, JBPHH, Hawaii, September 2014.

Hawaii Administrative Rules, Title 11, Chapter 281, Underground Storage Tanks, August 2013.

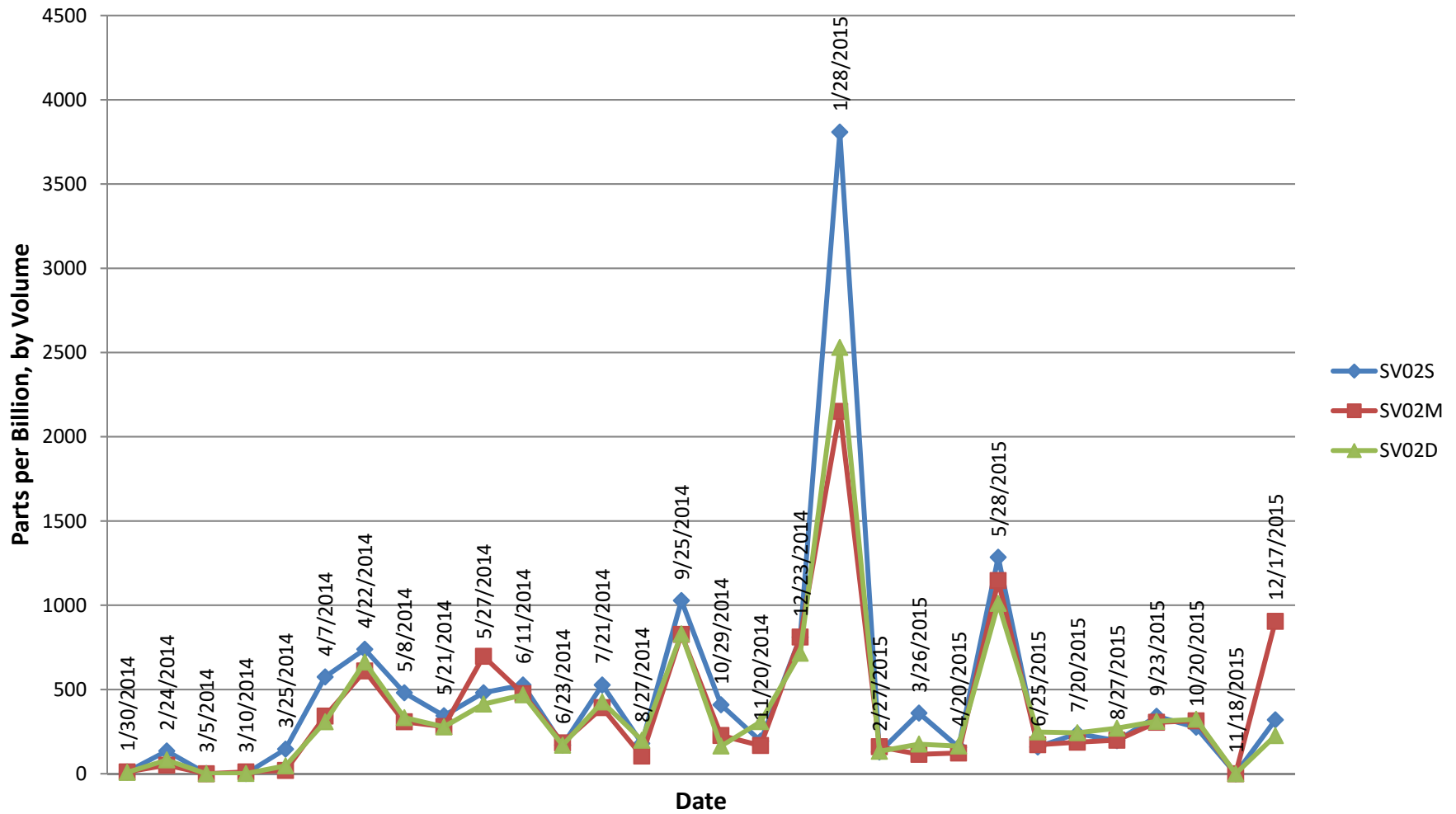
TEC, 2007, Final Technical Report, Red Hill Bulk Fuel Storage Facility, Prepared for Department of the Navy, Commander Naval Facilities Engineering Command, Pacific, Pearl Harbor, Hawaii, August 2007.

TEC, 2008, Final Groundwater Protection Plan, Red Hill Fuel Storage Facility, Prepared for Navy Region Hawaii, Pearl Harbor, Hawaii, January 2008, revised December 2009 and August 2014.

TEC, 2010, Final Soil Vapor Sampling Monitoring Analysis Letter Report, February 1, 2010.

***Appendix A***  
***Soil Vapor Sampling Results through December 2015***

**Figure 1**  
**Soil Vapor Measurements**  
**SV02**

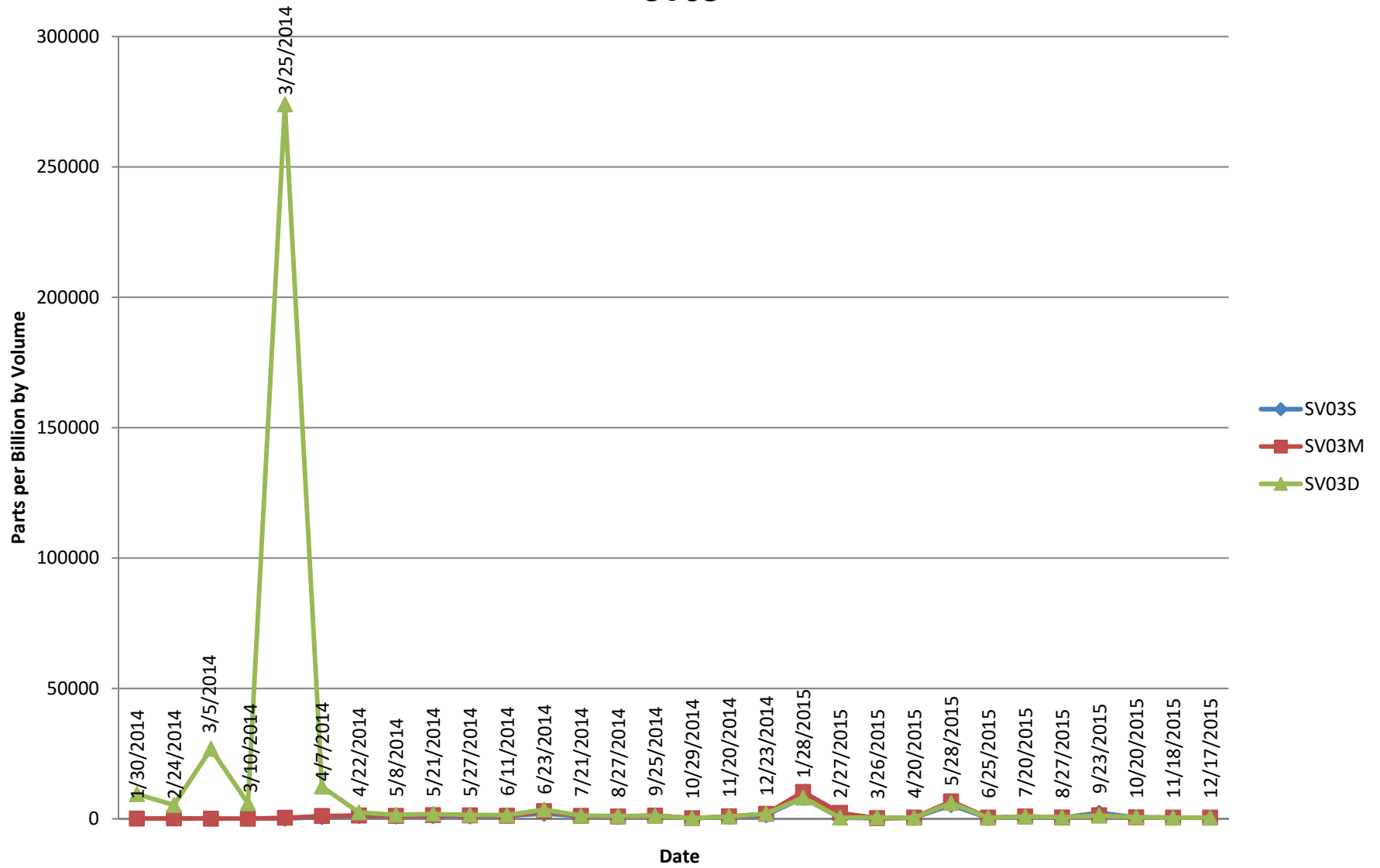


**Table1**  
**Soil Vapor Results for SV02 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV02S	SV02M	SV02D
1/30/2014	11	11	8
2/24/2014	135	51	82
3/5/2014	1	0	0
3/10/2014	1	11	1
3/25/2014	146	19	47
4/7/2014	575	342	308
4/22/2014	739	610	662
5/8/2014	481	308	333
5/21/2014	344	280	278
5/27/2014	481	697	413
6/11/2014	527	475	468
6/23/2014	170	183	169
7/21/2014	527	392	426
8/27/2014	180	105	199
9/25/2014	1028	827	830
10/29/2014	409	227	164
11/20/2014	194	167	309
12/23/2014	810	811	715
1/28/2015	3808	2150	2530
2/27/2015	129	160	133
3/26/2015	360	115	176
4/20/2015	157	123	164
5/28/2015	1285	1146	1011
6/25/2015	159	172	248
7/20/2015	238	187	243
8/27/2015	196	199	270
9/23/2015	341	305	311
10/20/2015	276	314	323
11/18/2015	NC <sub>1</sub>	NC <sub>1</sub>	NC <sub>1</sub>
12/17/2015	320	904	226

ppbv: parts per billion by volume  
NC: Not collected due to maintenance work

**Figure 2**  
**Soil Vapor Measurements**  
**SV03**



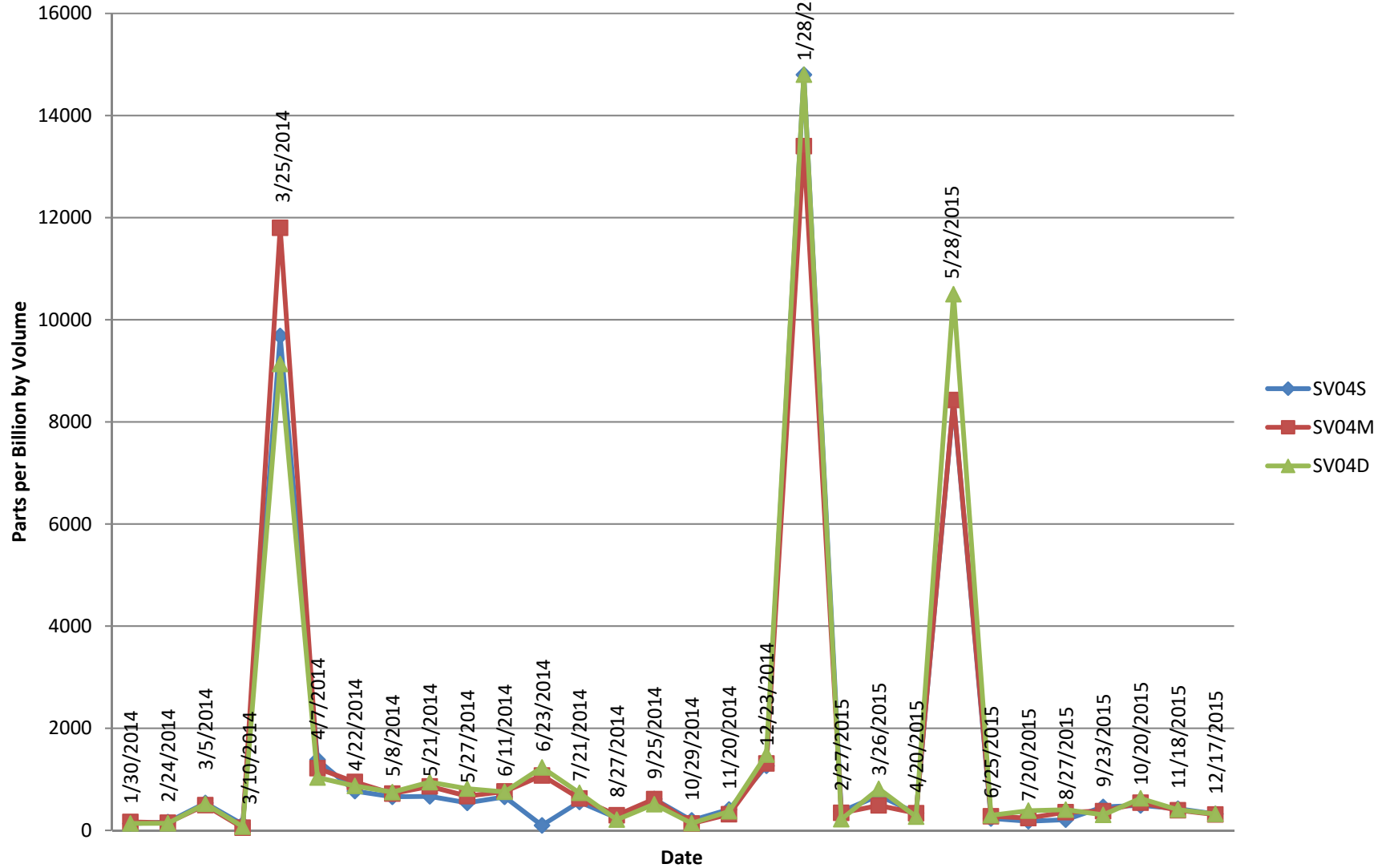


**Table 2**  
**Soil Vapor Results for SV03 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV03S	SV03M	SV03D
1/30/2014	41	46	9444
2/24/2014	70	162	5290
3/5/2014	20	17	26800
3/10/2014	8	27	5922
3/25/2014	87	385	274000
4/7/2014	676	1054	12300
4/22/2014	1056	1266	2442
5/8/2014	877	1096	1525
5/21/2014	1085	1378	1864
5/27/2014	915	1278	1536
6/11/2014	1148	1138	1424
6/23/2014	1970	2931	3530
7/21/2014	1021	1133	1215
8/27/2014	749	885	1050
9/25/2014	1298	1214	1187
10/29/2014	199	222	254
11/20/2014	731	919	856
12/23/2014	1403	1860	2004
1/28/2015	8037	10300	8075
2/27/2015	422	2231	435
3/26/2015	210	236	554
4/20/2015	363	422	436
5/28/2015	5289	6657	6075
6/25/2015	287	435	386
7/20/2015	849	880	880
8/27/2015	381	496	576
9/23/2015	2316	1334	1223
10/20/2015	488	552	619
11/18/2015	469	451	435
12/17/2015	418	434	506

ppbv: parts per billion by volume  
 NC: Not collected due to maintenance work

**Figure 3**  
**Soil Vapor Measurements**  
**SV04**

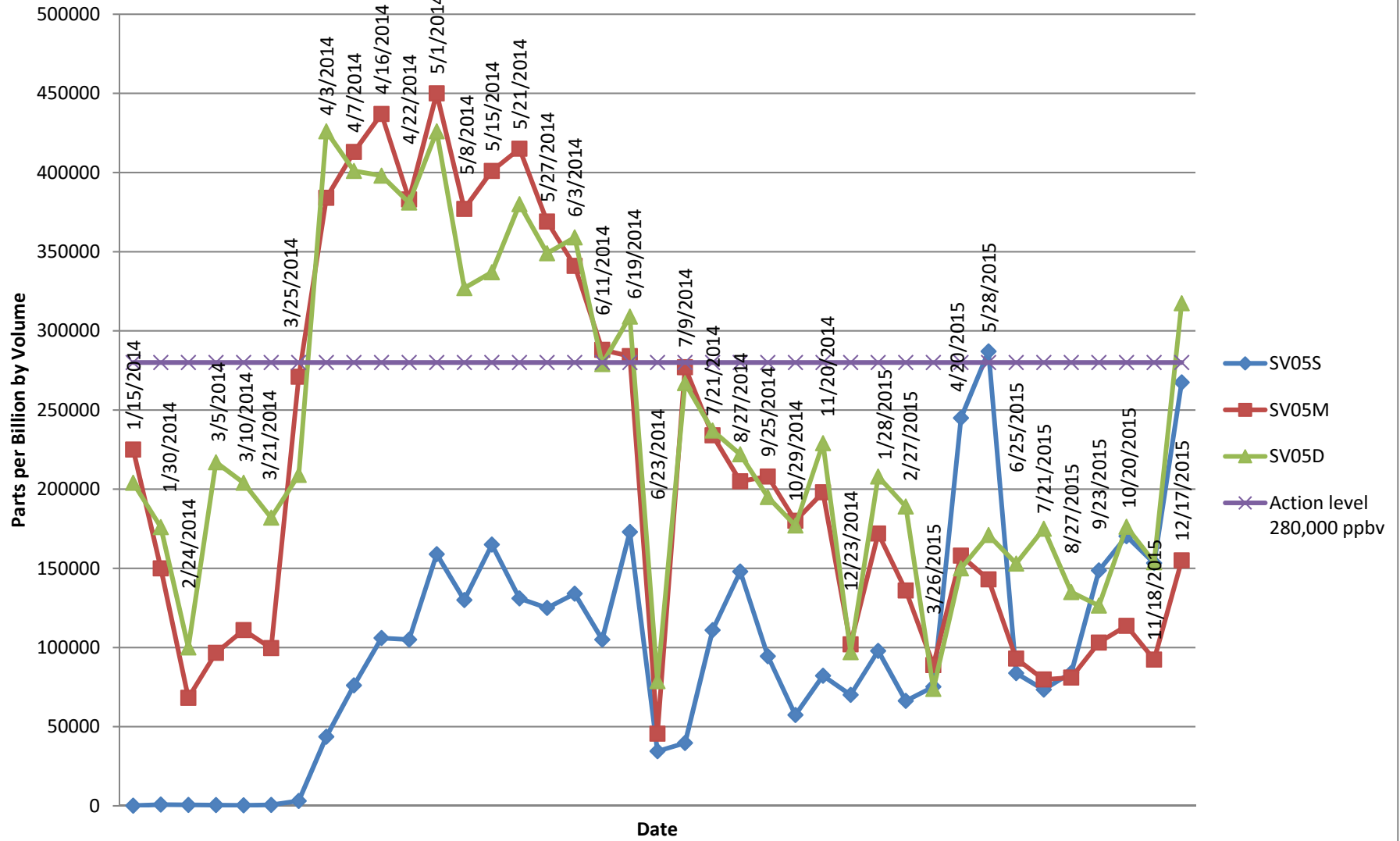


**Table 3**  
**Soil Vapor Results for SV04 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV04S	SV04M	SV04D
1/30/2014	132	165	135
2/24/2014	163	149	138
3/5/2014	536	493	520
3/10/2014	116	51	72
3/25/2014	9682	11800	9134
4/7/2014	1382	1217	1035
4/22/2014	769	948	870
5/8/2014	658	721	748
5/21/2014	666	861	944
5/27/2014	540	670	817
6/11/2014	657	762	754
6/23/2014	98	1075	1233
7/21/2014	557	625	735
8/27/2014	245	296	210
9/25/2014	614	612	512
10/29/2014	194	136	139
11/20/2014	409	315	373
12/23/2014	1265	1311	1483
1/28/2015	14800	13400	14800
2/27/2015	370	343	217
3/26/2015	682	488	814
4/20/2015	339	336	268
5/28/2015	8401	8427	10500
6/25/2015	233	276	295
7/20/2015	179	241	385
8/27/2015	209	357	406
9/23/2015	460	376	304
10/20/2015	489	541	627
11/18/2015	425	395	405
12/17/2015	323	310	320

ppbv: parts per billion by volume  
 NC: Not collected due to maintenance work

**Figure 4**  
**Soil Vapor Measurements**  
**SV05**

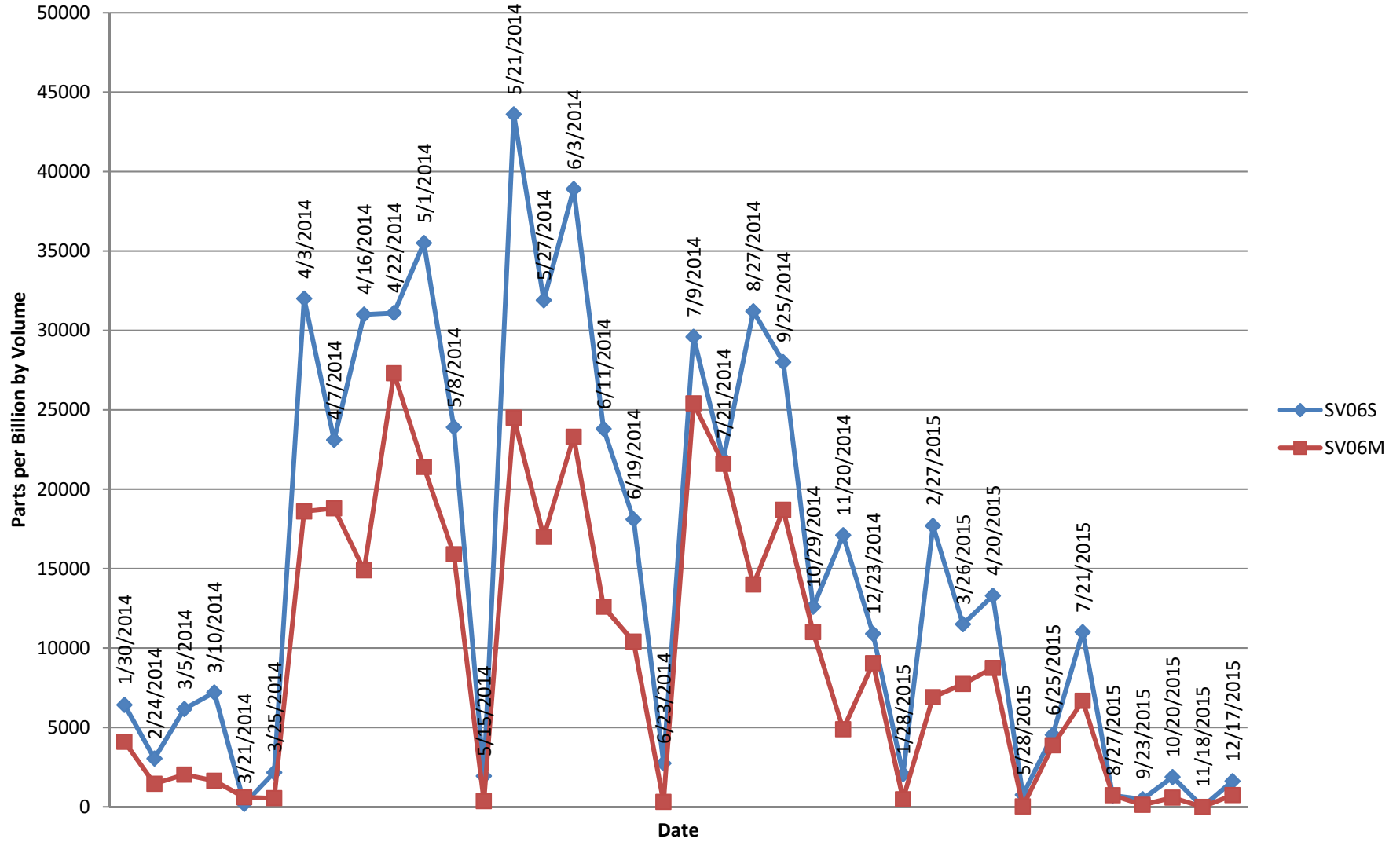


**Table 4**  
**Soil Vapor Results for SV05 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV05S	SV05M	SV05D
1/15/2014	96	225000	204000
1/30/2014	818	150000	176000
2/24/2014	597	68200	100000
3/5/2014	492	96600	217000
3/10/2014	308	111000	204000
3/21/2014	593	99600	182000
3/25/2014	3144	271000	209000
4/3/2014	43700	384000	426000
4/7/2014	76100	413000	401000
4/16/2014	106000	437000	398000
4/22/2014	105000	383000	381000
5/1/2014	159000	450000	426000
5/8/2014	130000	377000	327000
5/15/2014	165000	401000	337000
5/21/2014	131000	415000	380000
5/27/2014	125000	369000	349000
6/3/2014	134000	341000	359000
6/11/2014	105000	288000	279000
6/19/2014	173000	284000	309000
6/23/2014	34500	45600	78700
7/9/2014	39700	277000	267000
7/21/2014	111000	234000	237000
8/27/2014	148000	205000	222000
9/25/2014	94500	208000	195000
10/29/2014	57400	180000	177000
11/20/2014	82200	198000	229000
12/23/2014	70100	102000	97000
1/28/2015	97900	172000	208000
2/27/2015	66300	136000	189000
3/26/2015	75200	88900	73800
4/20/2015	245000	158000	150000
5/28/2015	287000	143000	171000
6/25/2015	83800	93000	153000
7/21/2015	73400	79800	175000
8/27/2015	84000	81000	135000
9/23/2015	148667	103123	126433
10/20/2015	170300	113700	176267
11/18/2015	153333	92350	153867
12/17/2015	267467	155000	317400

ppbv: parts per billion by volume  
Action Level (ppbv) = 280,000

**Figure 5**  
**Soil Vapor Measurements**  
**SV06**

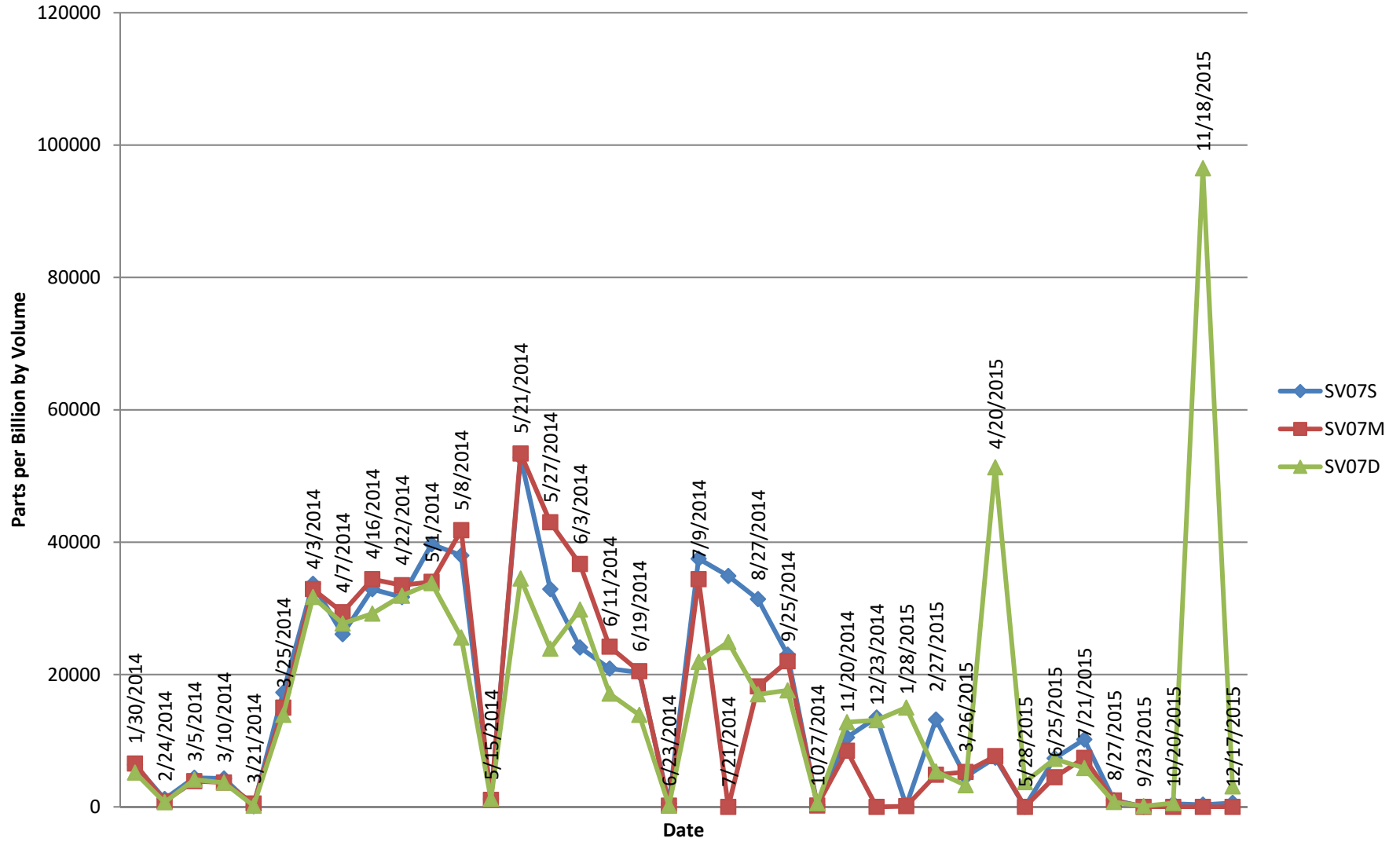


**Table 5**  
**Soil Vapor Results for SV06 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV06S	SV06M
1/30/2014	6424	4097
2/24/2014	3046	1457
3/5/2014	6165	2033
3/10/2014	7204	1644
3/21/2014	195	605
3/25/2014	2169	551
4/3/2014	32000	18600
4/7/2014	23100	18800
4/16/2014	31000	14900
4/22/2014	31100	27300
5/1/2014	35500	21400
5/8/2014	23900	15900
5/15/2014	1948	365
5/21/2014	43600	24500
5/27/2014	31900	17000
6/3/2014	38900	23300
6/11/2014	23800	12600
6/19/2014	18100	10400
6/23/2014	2747	314
7/9/2014	29600	25400
7/21/2014	21900	21600
8/27/2014	31200	14000
9/25/2014	28000	18700
10/29/2014	12600	11000
11/20/2014	17100	4886
12/23/2014	10900	9042
1/28/2015	2051	482
2/27/2015	17700	6909
3/26/2015	11500	7734
4/20/2015	13300	8747
5/28/2015	763	33
6/25/2015	4536	3873
7/21/2015	11000	6679
8/27/2015	718	731
9/23/2015	486	130
10/20/2015	1881	586
11/18/2015	NC <sub>1</sub>	NC <sub>1</sub>
12/17/2015	1620	739

ppbv: parts per billion by volume  
NC: Not collected due to maintenance work

**Figure 6**  
**Soil Vapor Measurements**  
**SV07**



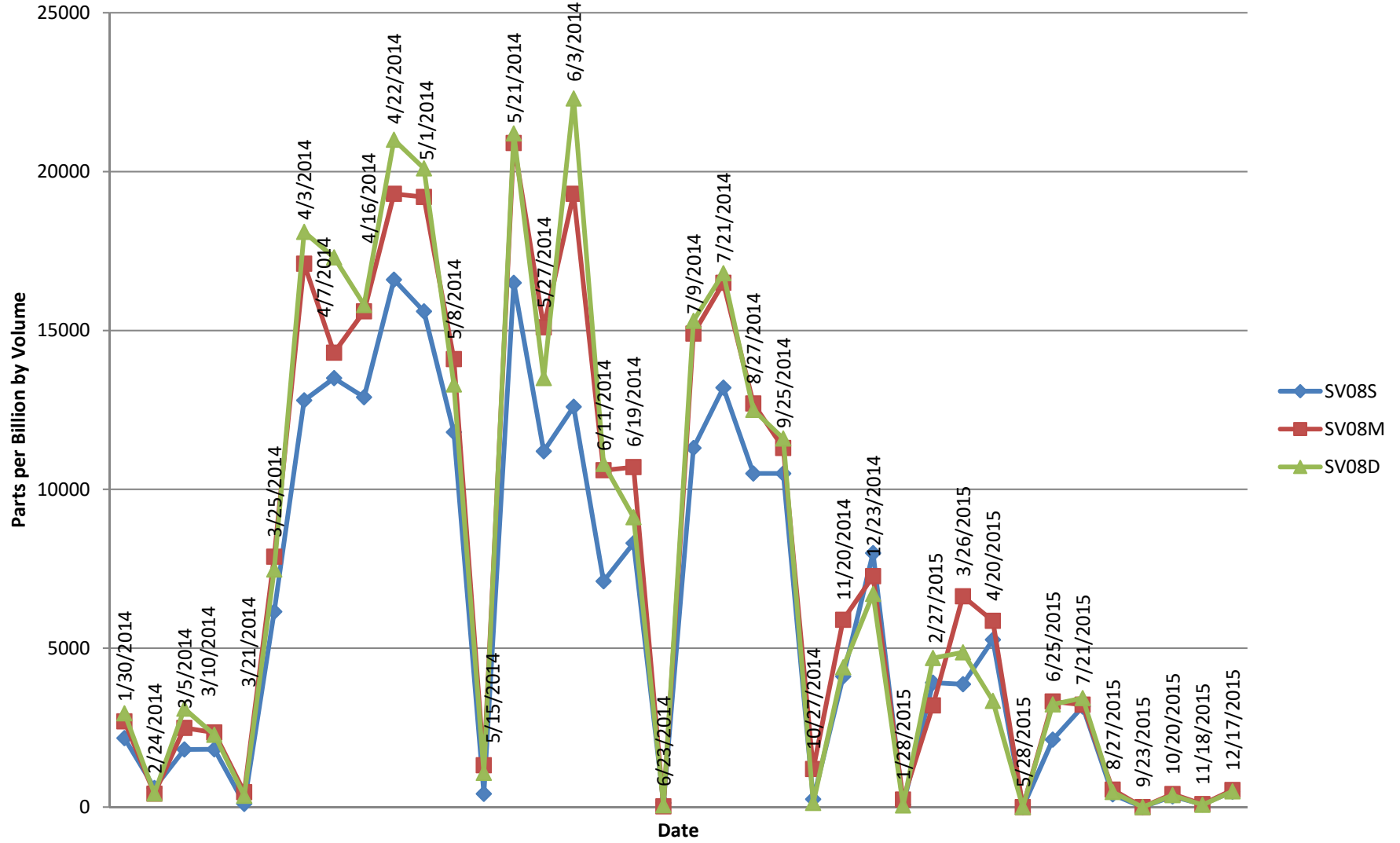


**Table 6**  
**Soil Vapor Results for SV07 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV07S	SV07M	SV07D
1/30/2014	6350	6539	5180
2/24/2014	1187	849	690
3/5/2014	4406	3890	4119
3/10/2014	4287	3687	3654
3/21/2014	102	512	170
3/25/2014	17300	15000	13900
4/3/2014	33700	32900	31700
4/7/2014	26100	29400	27700
4/16/2014	32900	34400	29200
4/22/2014	31700	33500	31900
5/1/2014	39700	34000	33800
5/8/2014	38000	41800	25600
5/15/2014	1209	1063	1188
5/21/2014	52800	53400	34500
5/27/2014	32900	43000	23900
6/3/2014	24100	36700	29800
6/11/2014	20900	24200	17100
6/19/2014	20300	20500	13900
6/23/2014	495	193	198
7/9/2014	37500	34400	21900
7/21/2014	34900	NC <sub>2</sub>	24900
8/27/2014	31400	18200	17000
9/25/2014	23000	22000	17600
10/27/2014	310	209	540
11/20/2014	10500	8478	12800
12/23/2014	13500	NC <sub>2</sub>	13100
1/28/2015	208	108	15000
2/27/2015	13200	4855	5347
3/26/2015	4567	5280	3260
4/20/2015	7434	7660	51300
5/28/2015	8	0	3740
6/25/2015	7341	4485	7246
7/21/2015	10200	7399	5863
8/27/2015	1025	957	726
9/23/2015	0	0	113
10/20/2015	474	NC	569
11/18/2015	328	NC	96503
12/17/2015	596	NC	3086

ppbv: parts per billion by volume  
 NC: Not collected due to an obstruction in the vapor line

**Figure 7**  
**Soil Vapor Measurements**  
**SV08**

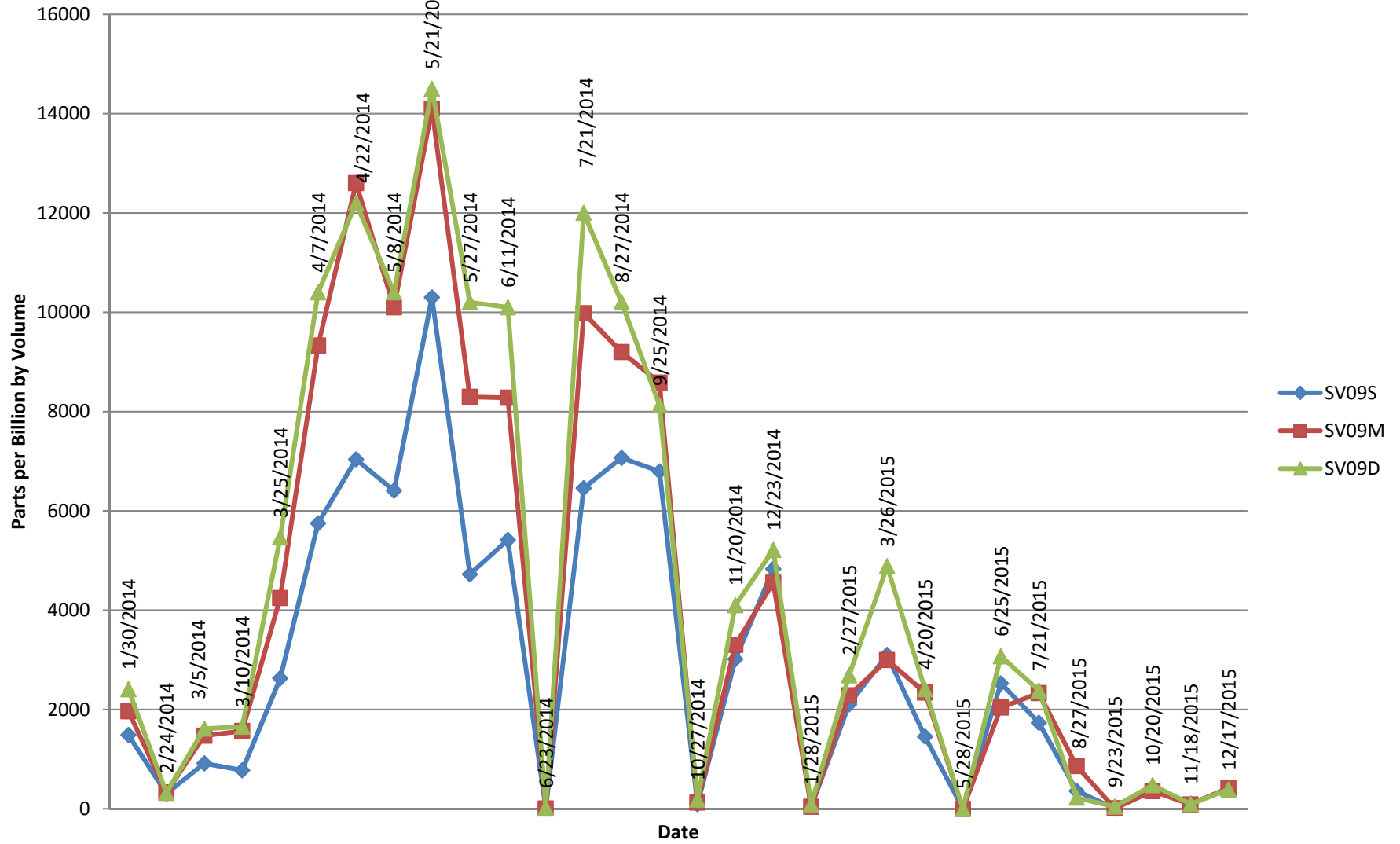


**Table 7**  
**Soil Vapor Results for SV08 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV08S	SV08M	SV08D
1/30/2014	2170	2698	2952
2/24/2014	601	423	428
3/5/2014	1814	2492	3097
3/10/2014	1819	2348	2274
3/21/2014	102	469	354
3/25/2014	6152	7880	7474
4/3/2014	12800	17100	18100
4/7/2014	13500	14300	17300
4/16/2014	12900	15600	15800
4/22/2014	16600	19300	21000
5/1/2014	15600	19200	20100
5/8/2014	11800	14100	13300
5/15/2014	419	1315	1073
5/21/2014	16500	20900	21200
5/27/2014	11200	15100	13500
6/3/2014	12600	19300	22300
6/11/2014	7109	10600	10800
6/19/2014	8307	10700	9120
6/23/2014	133	22	54
7/9/2014	11300	14900	15300
7/21/2014	13200	16500	16800
8/27/2014	10500	12700	12500
9/25/2014	10500	11300	11600
10/27/2014	248	1196	129
11/20/2014	4113	5894	4398
12/23/2014	7996	7265	6710
1/28/2015	74	237	50
2/27/2015	3916	3201	4689
3/26/2015	3867	6634	4870
4/20/2015	5268	5860	3343
5/28/2015	0	0	0
6/25/2015	2124	3323	3232
7/21/2015	3163	3223	3430
8/27/2015	401	549	475
9/23/2015	0	0	0
10/20/2015	339	412	373
11/18/2015	87	93	69
12/17/2015	486	538	494

ppbv: parts per billion by volume

**Figure 8**  
**Soil Vapor Measurements**  
**SV09**

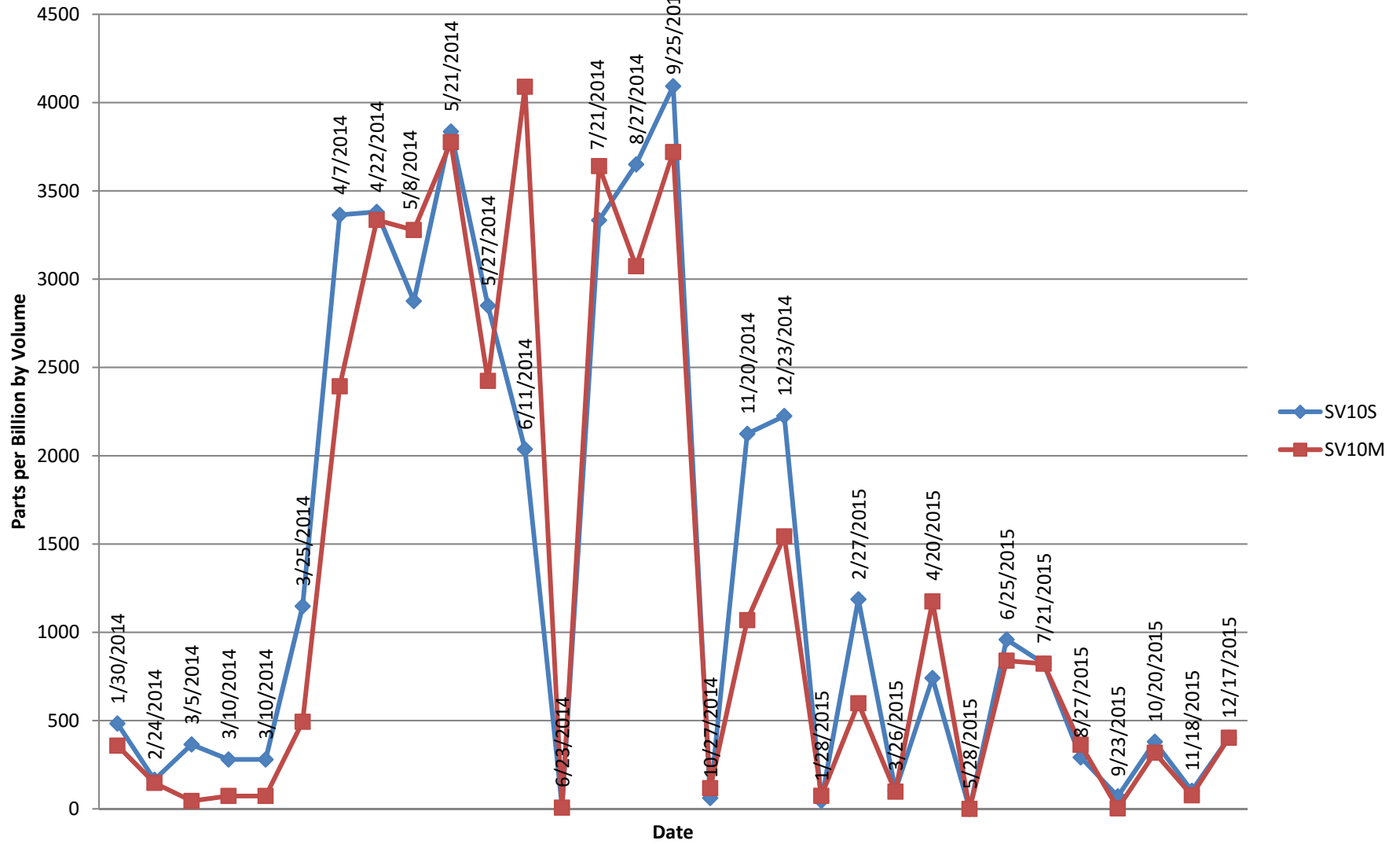


**Table 8**  
**Soil Vapor Results for SV09 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV09S	SV09M	SV09D
1/30/2014	1488	1963	2408
2/24/2014	307	330	319
3/5/2014	915	1474	1614
3/10/2014	777	1569	1656
3/25/2014	2629	4246	5465
4/7/2014	5750	9329	10400
4/22/2014	7038	12600	12200
5/8/2014	6407	10100	10400
5/21/2014	10300	14100	14500
5/27/2014	4725	8296	10200
6/11/2014	5415	8278	10100
6/23/2014	10	7	22
7/21/2014	6459	9981	12000
8/27/2014	7069	9198	10200
9/25/2014	6795	8583	8125
10/27/2014	95	127	185
11/20/2014	3016	3303	4102
12/23/2014	4832	4555	5213
1/28/2015	41	43	87
2/27/2015	2106	2286	2689
3/26/2015	3101	2997	4885
4/20/2015	1456	2342	2410
5/28/2015	0	0	2
6/25/2015	2527	2039	3074
7/21/2015	1734	2331	2383
8/27/2015	360	859	224
9/23/2015	5	11	44
10/20/2015	388	357	476
11/18/2015	103	89	97
12/17/2015	399	420	390

ppbv: parts per billion by volume

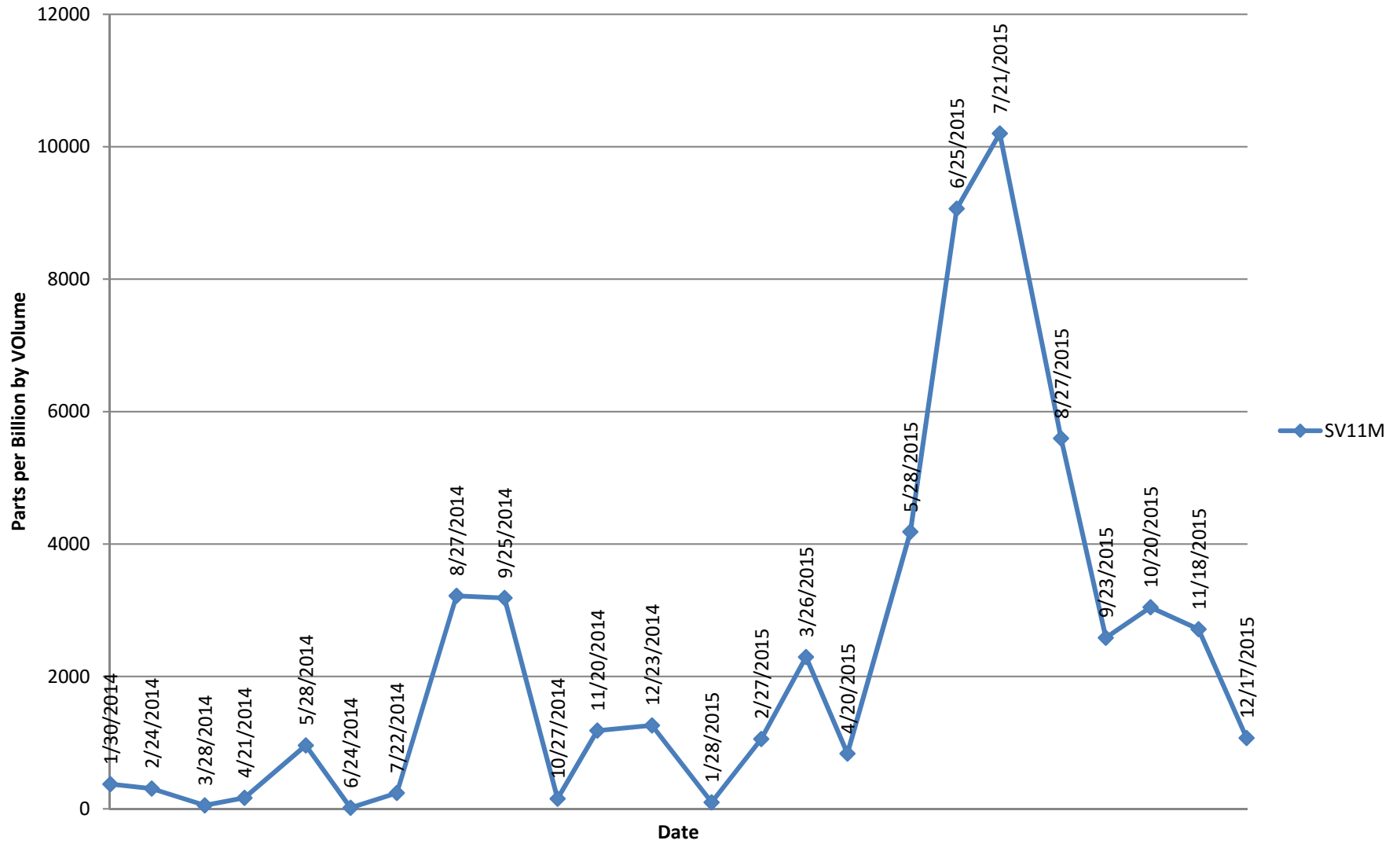
**Figure 9**  
**Soil Vapor Measurements**  
**SV10**



**Table 9**  
**Soil Vapor Results for SV10 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

<b>Date</b>	<b>SV10S</b>	<b>SV10M</b>
1/30/2014	483	358
2/24/2014	165	147
3/5/2014	365	45
3/10/2014	280	73
3/10/2014	280	73
3/25/2014	1148	493
4/7/2014	3364	2393
4/22/2014	3381	3335
5/8/2014	2876	3278
5/21/2014	3836	3776
5/27/2014	2850	2424
6/11/2014	2037	4089
6/23/2014	10	7
7/21/2014	3334	3640
8/27/2014	3650	3073
9/25/2014	4093	3720
10/27/2014	62	117
11/20/2014	2124	1069
12/23/2014	2225	1543
1/28/2015	46	74
2/27/2015	1187	598
3/26/2015	104	97
4/20/2015	741	1175
5/28/2015	0	0
6/25/2015	959	839
7/21/2015	823	822
8/27/2015	292	363
9/23/2015	71	3
10/20/2015	380	318
11/18/2015	103	77
12/17/2015	403	403

**Figure 10**  
**Soil Vapor Measurements**  
**SV11**





**Table 10**  
**Soil Vapor Results for SV11 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

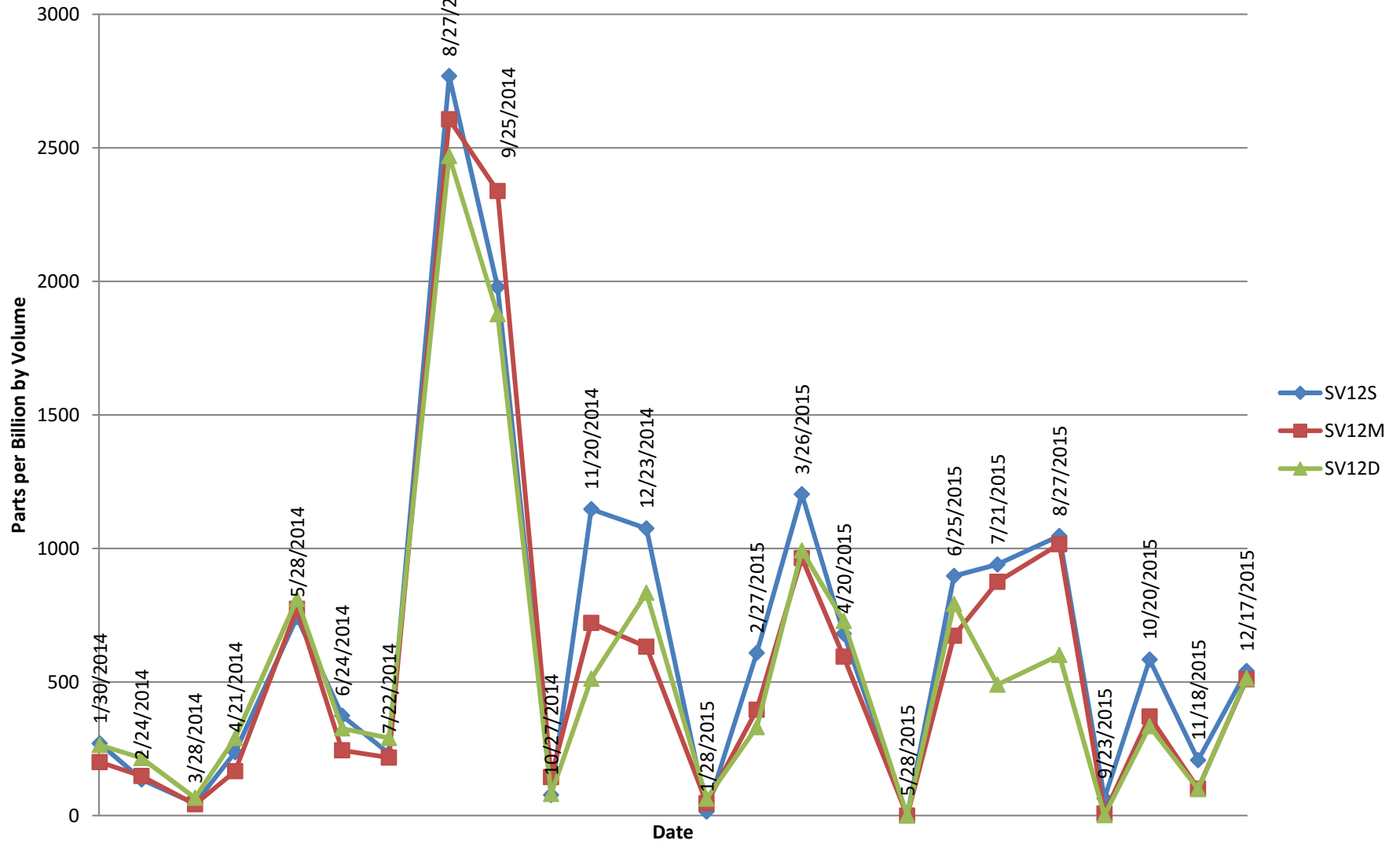
Date	SV11M	SV11D
1/30/2014	374	NC <sub>2</sub>
2/24/2014	307	NC <sub>2</sub>
3/28/2014	53	NC <sub>2</sub>
4/21/2014	167	NC <sub>2</sub>
5/28/2014	959	NC <sub>2</sub>
6/24/2014	17	NC <sub>2</sub>
7/22/2014	240	NC <sub>2</sub>
8/27/2014	3218	NC <sub>2</sub>
9/25/2014	3185	NC <sub>2</sub>
10/27/2014	154	NC <sub>2</sub>
11/20/2014	1182	NC <sub>2</sub>
12/23/2014	1261	NC <sub>2</sub>
1/28/2015	99	NC <sub>2</sub>
2/27/2015	1056	NC <sub>2</sub>
3/26/2015	2294	NC <sub>2</sub>
4/20/2015	835	NC <sub>2</sub>
5/28/2015	4184	NC <sub>2</sub>
6/25/2015	9065	NC <sub>2</sub>
7/21/2015	10200	NC <sub>2</sub>
8/27/2015	5595	NC <sub>2</sub>
9/23/2015	2584	NC <sub>2</sub>
10/20/2015	3045	NC <sub>2</sub>
11/18/2015	2714	NC <sub>2</sub>
12/17/2015	1071	NC <sub>2</sub>

ppbv: parts per billion by volume

NC<sub>2</sub>: Not collected due to an obstruction  
in the vapor line

ppbv: parts per billion by volume  
NC<sub>2</sub>: Not collected due to an obstruction in the vapor line

**Figure 11**  
**Soil Vapor Measurements**  
**SV12**

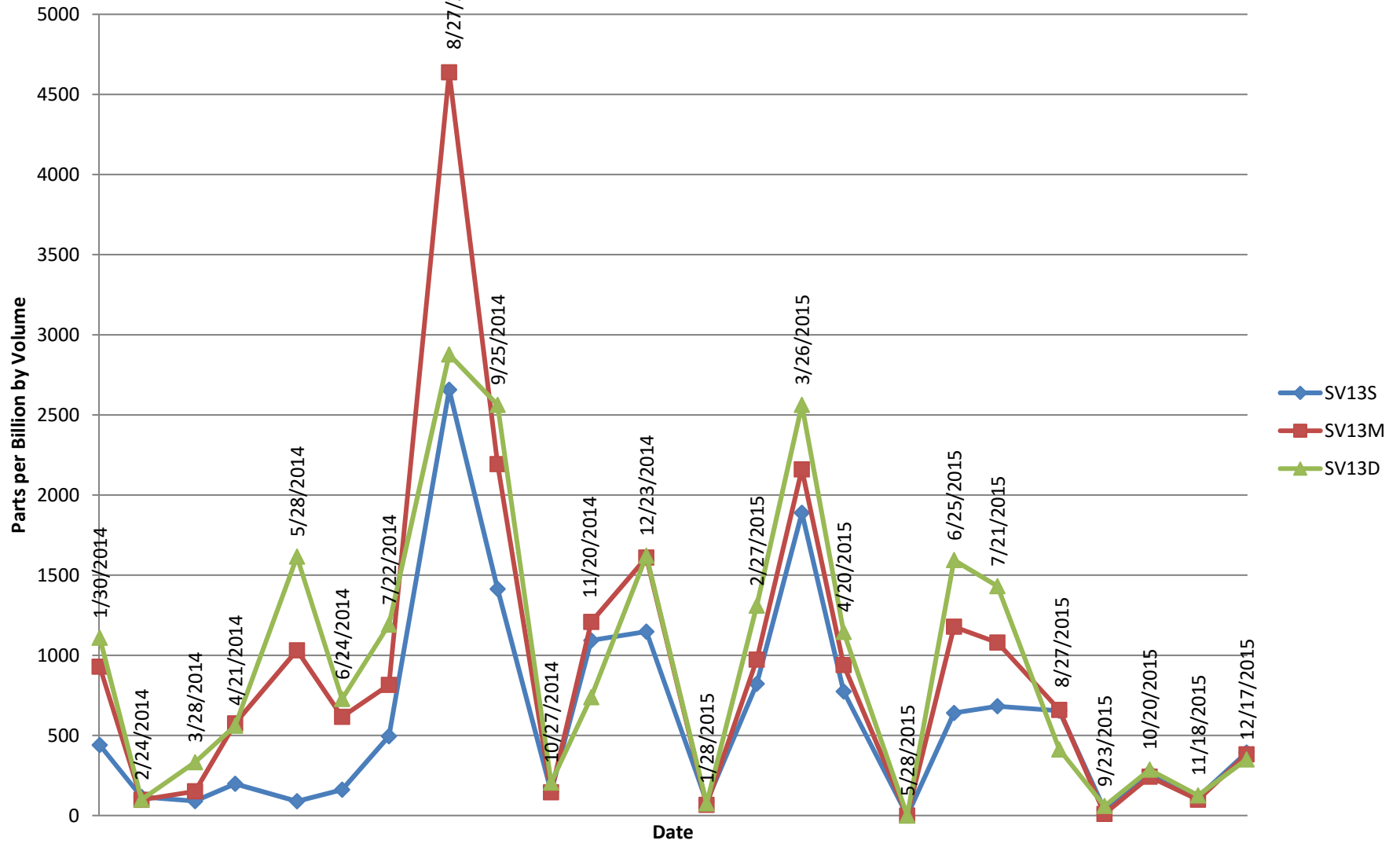


**Table 11**  
**Soil Vapor Results for SV12 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV12S	SV12M	SV12D
1/30/2014	270	200	264
2/24/2014	135	148	215
3/28/2014	45	42	66
4/21/2014	237	166	290
5/28/2014	743	774	810
6/24/2014	374	244	326
7/22/2014	232	217	290
8/27/2014	2769	2607	2469
9/25/2014	1979	2338	1877
10/27/2014	77	144	81
11/20/2014	1147	721	512
12/23/2014	1075	632	834
1/28/2015	15	46	63
2/27/2015	609	396	331
3/26/2015	1203	964	992
4/20/2015	681	595	728
5/28/2015	0	0	0
6/25/2015	897	673	792
7/21/2015	940	875	490
8/27/2015	1047	1016	601
9/23/2015	64	8	1
10/20/2015	584	371	334
11/18/2015	207	101	99
12/17/2015	541	510	514

ppbv: parts per billion by volume

**Figure 12**  
**Soil Vapor Measurements**  
**SV13**

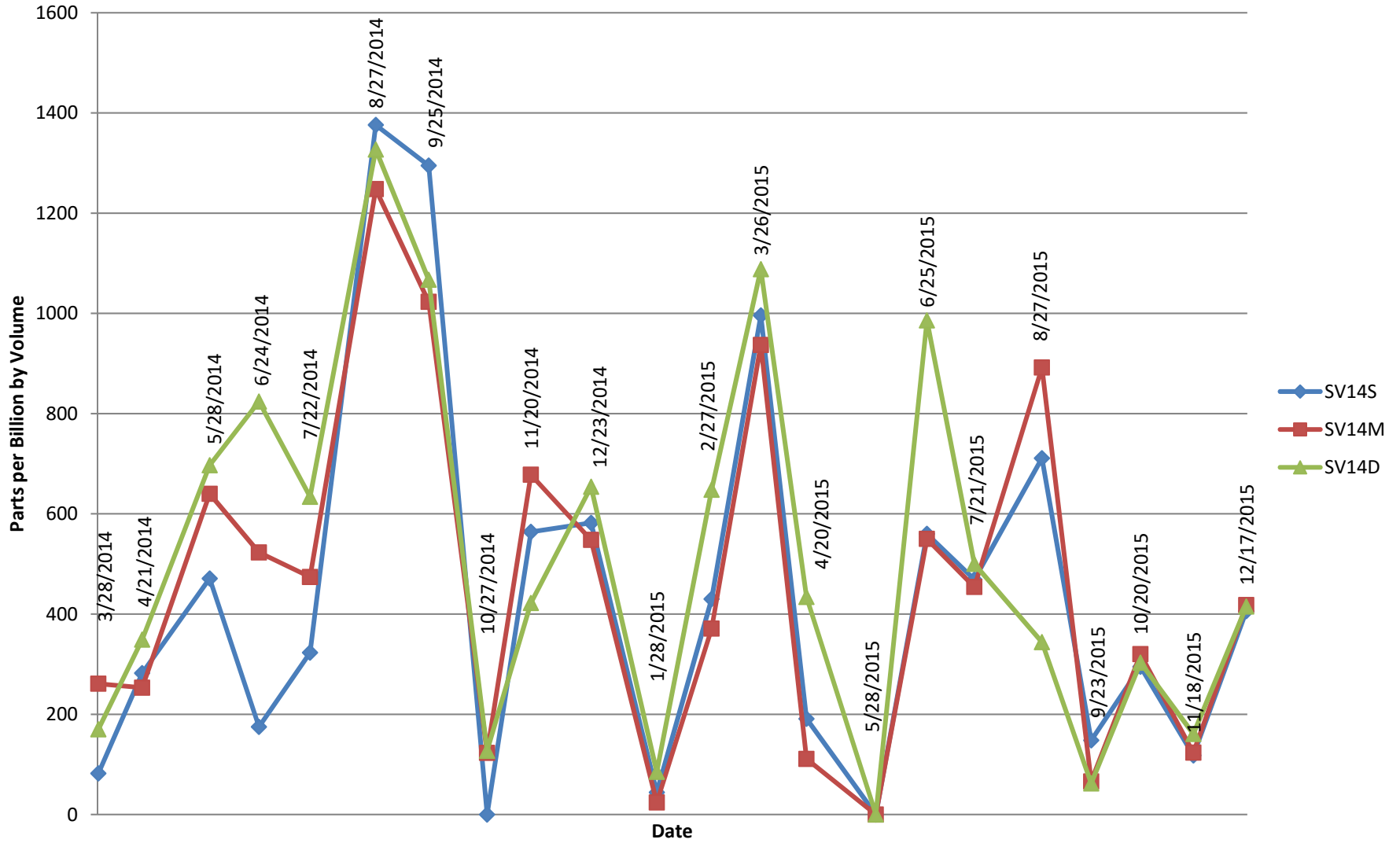


**Table 12**  
**Soil Vapor Results for SV13 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV13S	SV13M	SV13D
1/30/2014	440	929	1109
2/24/2014	116	98	99
3/28/2014	90	151	332
4/21/2014	198	575	560
5/28/2014	89	1031	1615
6/24/2014	161	616	727
7/22/2014	495	815	1191
8/27/2014	2657	4638	2877
9/25/2014	1414	2193	2562
10/27/2014	149	145	205
11/20/2014	1093	1208	738
12/23/2014	1148	1610	1621
1/28/2015	85	66	75
2/27/2015	822	973	1309
3/26/2015	1889	2160	2562
4/20/2015	774	939	1145
5/28/2015	0	0	0
6/25/2015	640	1178	1594
7/21/2015	682	1079	1431
8/27/2015	654	659	412
9/23/2015	37	10	59
10/20/2015	270	242	286
11/18/2015	115	98	125
12/17/2015	393	382	350

ppbv: parts per billion by volume

**Figure 13**  
**Soil Vapor Measurements**  
**SV14**

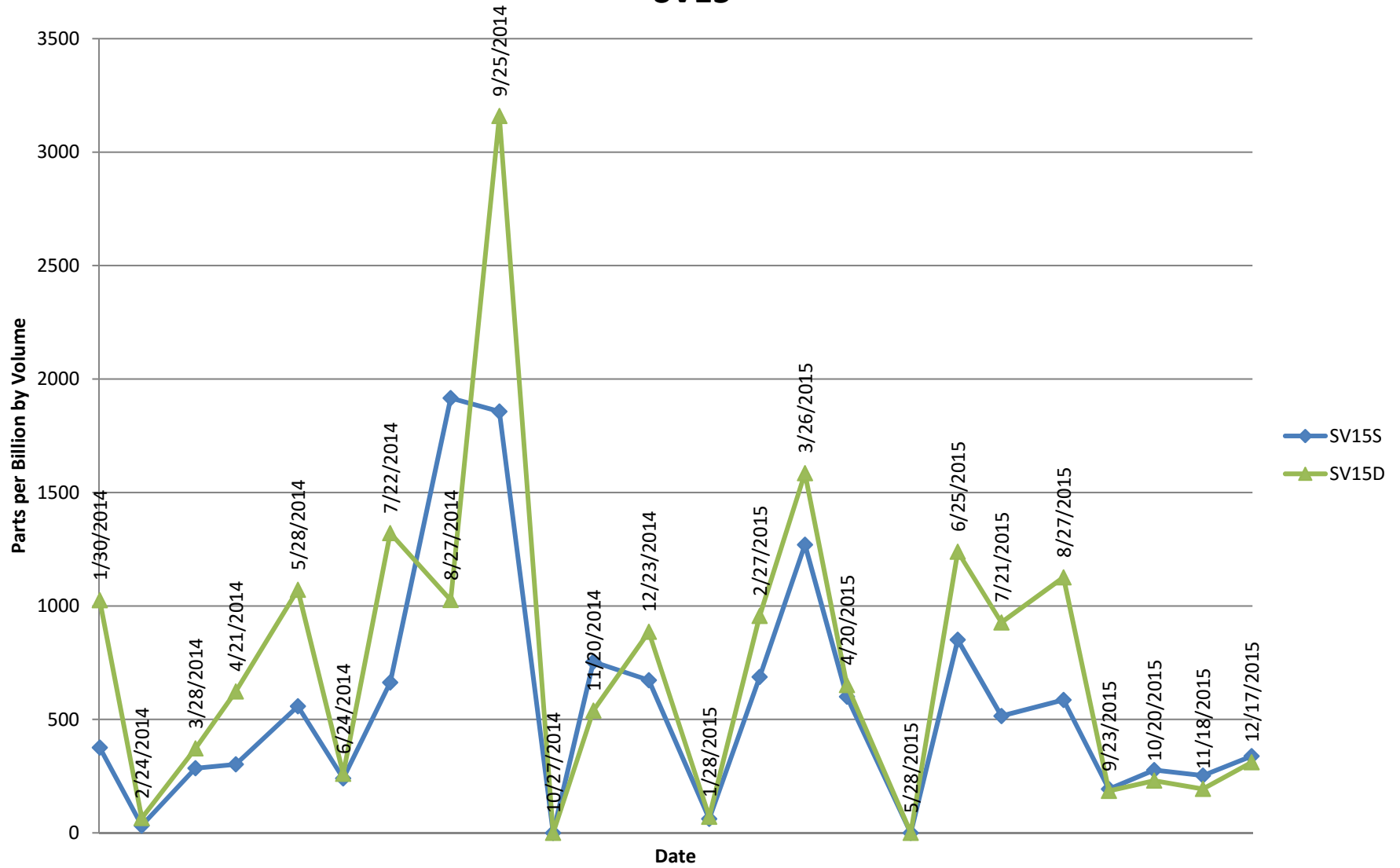


**Table 13**  
**Soil Vapor Results for SV14 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV14S	SV14M	SV14D
3/28/2014	82	261	170
4/21/2014	282	253	349
5/28/2014	471	640	697
6/24/2014	175	523	824
7/22/2014	323	474	634
8/27/2014	1376	1248	1327
9/25/2014	1295	1023	1067
10/27/2014	0	123	127
11/20/2014	564	678	422
12/23/2014	582	548	654
1/28/2015	44	24	85
2/27/2015	430	371	648
3/26/2015	996	937	1088
4/20/2015	191	111	434
5/28/2015	0	0	0
6/25/2015	560	550	986
7/21/2015	469	454	500
8/27/2015	711	892	344
9/23/2015	148	66	62
10/20/2015	295	320	303
11/18/2015	118	123	161
12/17/2015	406	418	415

ppbv: parts per billion by volume  
 NC: Not collected due to maintenance work

**Figure 14**  
**Soil Vapor Measurements**  
**SV15**



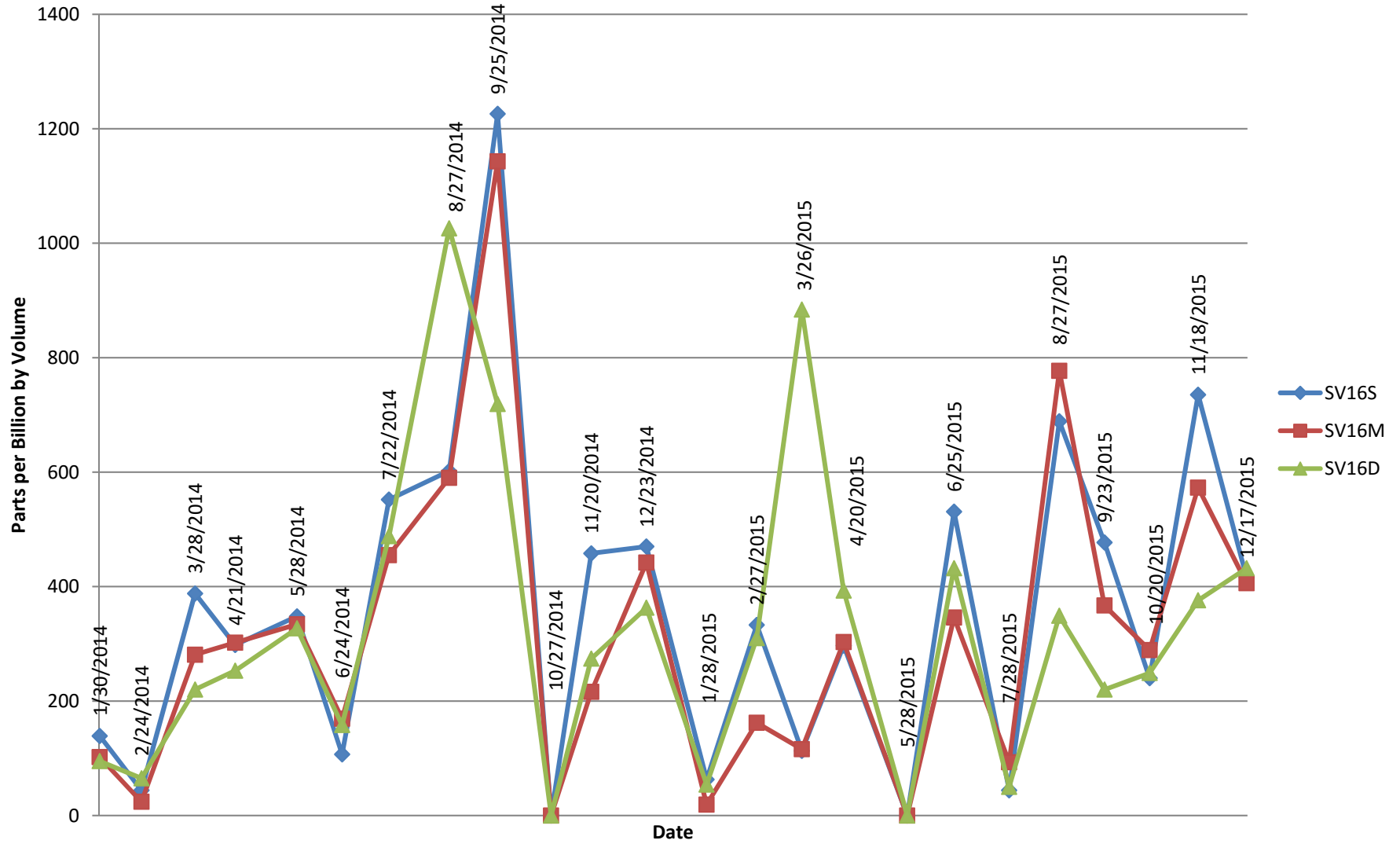


**Table 14**  
**Soil Vapor Results for SV15 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV15S	SV15M	SV15D
1/30/2014	376	NC <sub>2</sub>	1025
2/24/2014	32	NC <sub>2</sub>	65
3/28/2014	285	NC <sub>2</sub>	372
4/21/2014	302	NC <sub>2</sub>	623
5/28/2014	558	NC <sub>2</sub>	1071
6/24/2014	240	NC <sub>2</sub>	260
7/22/2014	663	NC <sub>2</sub>	1321
8/27/2014	1916	NC <sub>2</sub>	1026
9/25/2014	1857	NC <sub>2</sub>	3159
10/27/2014	0	NC <sub>2</sub>	0
11/20/2014	754	NC <sub>2</sub>	539
12/23/2014	673	NC <sub>2</sub>	886
1/28/2015	62	NC <sub>2</sub>	71
2/27/2015	687	NC <sub>2</sub>	956
3/26/2015	1270	NC <sub>2</sub>	1585
4/20/2015	600	NC <sub>2</sub>	651
5/28/2015	0	NC <sub>2</sub>	0
6/25/2015	851	NC <sub>2</sub>	1239
7/21/2015	515	NC <sub>2</sub>	927
8/27/2015	586	NC <sub>2</sub>	1126
9/23/2015	193	NC <sub>2</sub>	185
10/20/2015	277	NC <sub>2</sub>	230
11/18/2015	253	NC <sub>2</sub>	194
12/17/2015	338	NC <sub>2</sub>	311

ppbv: parts per billion by volume  
 NC<sub>2</sub>: Not collected due to an obstruction in the vapor line

**Figure 15**  
**Soil Vapor Measurements**  
**SV16**

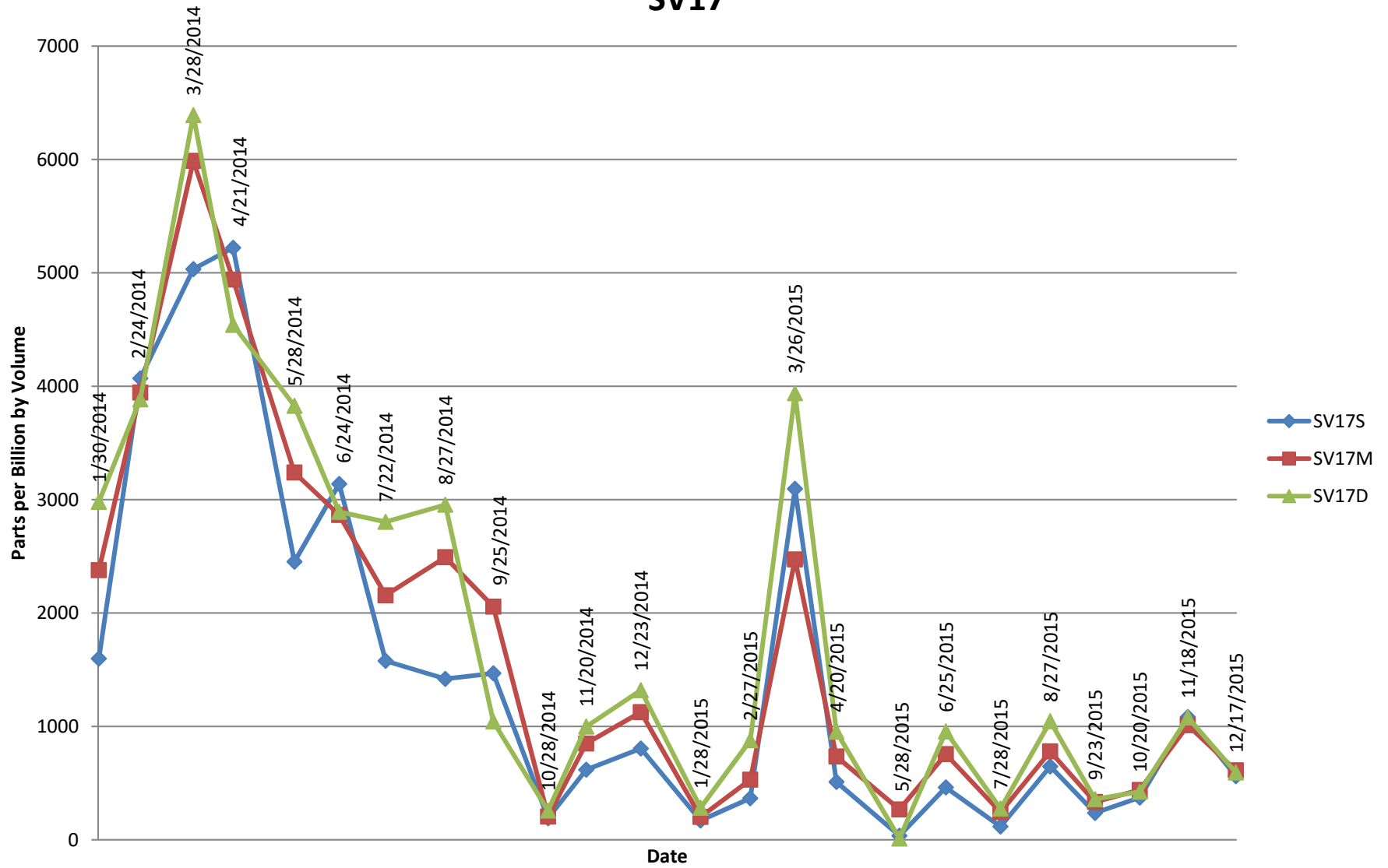


**Table 15**  
**Soil Vapor Results for SV16 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV16S	SV16M	SV16D
1/30/2014	139	102	95
2/24/2014	44	24	65
3/28/2014	388	281	220
4/21/2014	298	302	253
5/28/2014	348	334	327
6/24/2014	107	169	158
7/22/2014	552	455	488
8/27/2014	602	590	1026
9/25/2014	1226	1143	719
10/27/2014	0	0	0
11/20/2014	458	216	274
12/23/2014	470	442	363
1/28/2015	63	19	54
2/27/2015	333	162	310
3/26/2015	113	116	884
4/20/2015	297	303	393
5/28/2015	0	0	0
6/25/2015	531	346	432
7/28/2015	44	93	50
8/27/2015	689	777	349
9/23/2015	477	367	220
10/20/2015	240	289	249
11/18/2015	735	573	376
12/17/2015	416	406	432

ppbv: parts per billion by volume

**Figure 16**  
**Soil Vapor Measurements**  
**SV17**

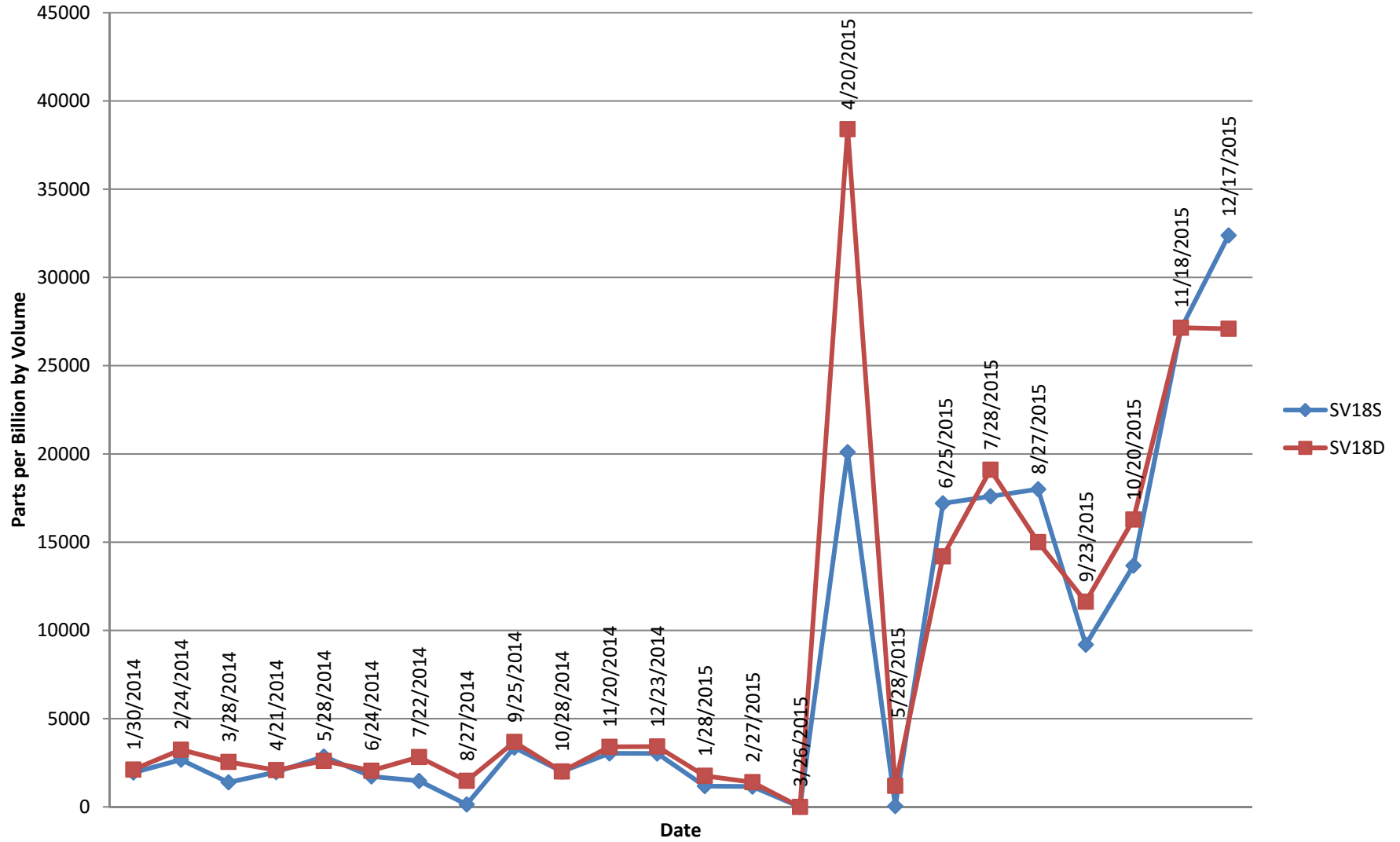


**Table 16**  
**Soil Vapor Results for SV17 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV17S	SV17M	SV17D
1/30/2014	1598	2378	2980
2/24/2014	4069	3944	3884
3/28/2014	5033	5987	6391
4/21/2014	5221	4941	4541
5/28/2014	2452	3239	3827
6/24/2014	3138	2865	2892
7/22/2014	1578	2156	2804
8/27/2014	1419	2492	2954
9/25/2014	1468	2056	1043
10/28/2014	190	205	257
11/20/2014	618	849	998
12/23/2014	805	1126	1319
1/28/2015	170	202	282
2/27/2015	366	530	877
3/26/2015	3095	2472	3938
4/20/2015	510	734	952
5/28/2015	36	268	11
6/25/2015	462	755	955
7/28/2015	117	243	275
8/27/2015	647	779	1045
9/23/2015	237	334	358
10/20/2015	372	439	424
11/18/2015	1082	1010	1078
12/17/2015	561	612	593

ppbv: parts per billion by volume

**Figure 17**  
**Soil Vapor Measurements**  
**SV18**

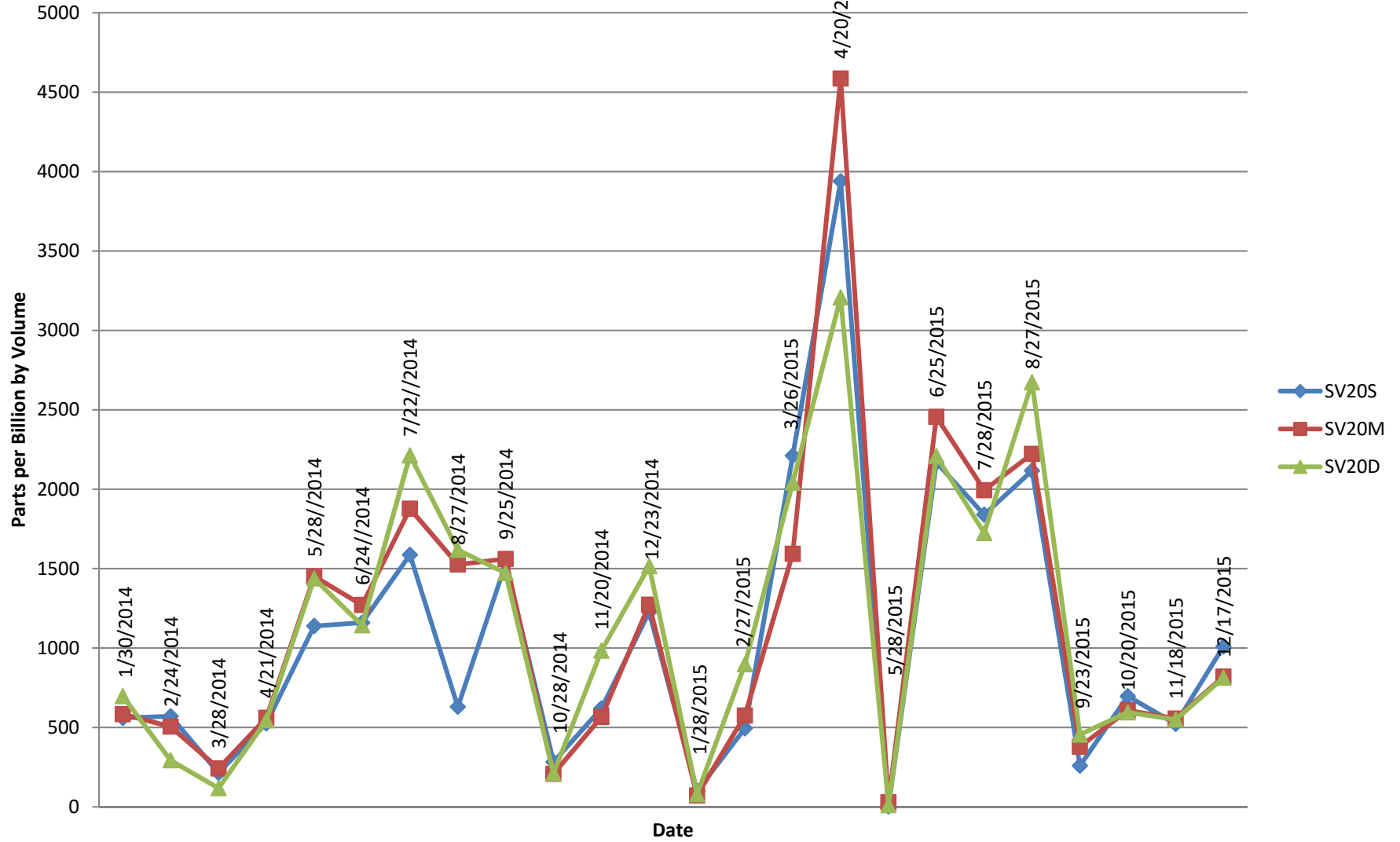


**Table 17**  
**Soil Vapor Results for SV18 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

<b>Date</b>	<b>SV18S</b>	<b>SV18D</b>
1/30/2014	1949	2116
2/24/2014	2674	3241
3/28/2014	1392	2545
4/21/2014	1973	2082
5/28/2014	2856	2607
6/24/2014	1727	2050
7/22/2014	1474	2823
8/27/2014	137	1478
9/25/2014	3361	3679
10/28/2014	2001	2008
11/20/2014	3033	3404
12/23/2014	3026	3421
1/28/2015	1179	1762
2/27/2015	1154	1398
3/26/2015	NC <sub>1</sub>	NC <sub>1</sub>
4/20/2015	20100	38400
5/28/2015	47	1191
6/25/2015	17200	14200
7/28/2015	17600	19100
8/27/2015	18000	15000
9/23/2015	9188	11625
10/20/2015	13670	16280
11/18/2015	27097	27153
12/17/2015	32387	27093

ppbv: parts per billion by volume  
 NC<sub>1</sub>: Not collected due to maintenance work  
 NC<sub>2</sub>: Not collected due to an obstruction in the vapor line

**Figure 18**  
**Soil Vapor Measurements**  
**SV20**





**Table 18**  
**Soil Vapor Results for SV20 (ppbv)**  
**Historical Soil Vapor Monitoring Results - January 2014 Through Present Event**  
**Red Hill Bulk Fuel Storage Facility**

Date	SV20S	SV20M	SV20D
1/30/2014	560	584	697
2/24/2014	571	505	293
3/28/2014	214	242	118
4/21/2014	526	561	545
5/28/2014	1139	1451	1438
6/24/2014	1160	1271	1143
7/22/2014	1587	1877	2213
8/27/2014	630	1526	1618
9/25/2014	1531	1561	1472
10/28/2014	283	208	211
11/20/2014	620	566	983
12/23/2014	1227	1273	1516
1/28/2015	101	72	80
2/27/2015	495	575	898
3/26/2015	2211	1593	2041
4/20/2015	3939	4586	3207
5/28/2015	3	29	11
6/25/2015	2169	2456	2209
7/28/2015	1840	1994	1724
8/27/2015	2117	2222	2673
9/23/2015	259	379	455
10/20/2015	697	608	595
11/18/2015	523	556	549
12/17/2015	1010	820	813

ppbv: parts per billion by volume

*Appendix B*  
*Public Notifications*



## DEPARTMENT OF THE NAVY

COMMANDER  
NAVY REGION HAWAII  
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13 November 2015

Dear Stakeholder,

Thank you for your continued support to our Navy team in Hawaii. As you know, the Navy, Defense Logistics Agency (DLA), United States Environmental Protection Agency (EPA), and Hawaii's State Department of Health (DoH) signed a landmark agreement on September 28<sup>th</sup> covering future actions at the Red Hill Bulk Fuel Storage Facility. The Administrative Order on Consent (AOC) provides a path ahead for future inspections and modernization upgrades that will further protect drinking water and minimize the risk of future releases from the facility. This agreement also confirms that these parties will work together into the future to fulfill our collective responsibility to protect Oahu's drinking water while acknowledging the facility's strategic importance to our nation.

The AOC lays out specific requirements, along with deadlines and milestones for completing each task. These tasks include: tank inspections; repairs and maintenance; upgrade alternatives and release detection processes; tank tightness testing; corrosion and metal fatigue studies; and ground water protection and evaluation. EPA and DoH may assess monetary penalties against the Navy and DLA if deadlines are missed.

My staff met with Hawaii's DoH and the EPA at the end of October to address the first set of deadline requirements. These requirements included an exchange of information on tank inspections, fuel release response procedures, surveillance monitoring, ground water modeling and tank corrosion dynamics. As part of the continuing facility modernization efforts that began before the AOC negotiation, we recently awarded over \$43 million in contracts to upgrade the facility's fire suppression, ventilation, and oil-tight door systems.

Since the fuel loss from Tank 5 in January 2014, we increased our vigilance and response capabilities. We continuously monitor fuel levels and conduct tank inspections. When fuel is transferred in Red Hill, we follow and then exceed industry standard operating practices with an added level of measured scrutiny and precaution. We employ state-of-the-art automated alarms and regularly test our response capabilities. Taken together, I am confident we have minimized the possibility of future releases at the Red Hill facility.

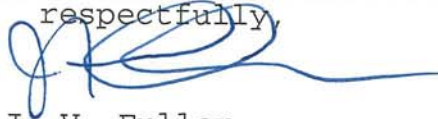
Due to the complexity of the surrounding geology, the EPA, DoH and Navy will be consulting with experts to determine what actions should be taken to address the fuel that was lost in January 2014. We will be gathering additional information as to how quickly fuel breaks down in basalt as part of natural biological and chemical processes. To date, all available evidence indicates that no free product fuel released from the Red Hill facility has reached the aquifer. The AOC requires that before any precipitous actions are taken, additional studies must be conducted to add to our collective knowledge as to the nature, fate and transport of fuel constituents in this particular location. Meanwhile, my environmental professionals continue their long-term effort to monitor ground water and drinking water sources and to provide the results to the regulatory agencies for evaluation and assessment. The results indicate that the drinking water remains safe for all users.

As you know, the Navy's Red Hill drinking water shaft is the drinking water source closest to the Red Hill facility. Over the years, we have detected trace amounts of fuel constituents (parts of fuel) at this location in levels so low that they often cannot be quantified by the EPA-certified labs we are required to use. The sampling results to date indicate that, when detected, these constituents have always been well below Environmental Action Levels (EALs). EALs are established by the regulators as standards protective of human health. We provide the sampling results to the DoH for evaluation. Let me assure you that we remain committed to continued compliance with the DoH-approved Groundwater Protection Plan and the updates to that plan which will be prepared pursuant to the AOC. With DoH and EPA oversight, the Navy and DLA will be responsible for implementing any remedy that would be needed to continue to keep the drinking water safe. We will not walk away from our responsibilities.

I am dedicated to making this a transparent and inclusive effort and will continue to communicate frequently with you about our progress. As you receive this, I'm proud to report that have conducted our 75<sup>th</sup> familiarization visit to the facility in the past 18 months, showing it to more than 500 stakeholders. They learned about the Facility's operations and our environmental protection efforts. Our guests also had the opportunity to comprehend the size of the facility and appreciate why it may take more than 20 years to complete the agreed upgrades throughout the entire facility.

Your continued support is invaluable. Please do not hesitate to contact me at any time regarding the AOC's progress or Red Hill operations. I encourage you to learn more about Red Hill by reviewing the Navy's website ([www.cnmc.navy.mil/redhill](http://www.cnmc.navy.mil/redhill)) or suggest that you subscribe to the EPA's website ([www3.epa.gov/region9/waste/ust/redhill/index.html](http://www3.epa.gov/region9/waste/ust/redhill/index.html)). Thank you again for your time, interest, and extraordinary support to our Navy.

Best regards and Very  
respectfully,



J. V. Fuller  
Rear Admiral, U.S. Navy