
**REPORT ON REVIEW OF
GROUNDWATER TESTING DATA
&
RUNOFF WATER RISK ASSESSMENT**

**BRANDEIS-BARDIN CAMPUS
SIMI VALLEY, CALIFORNIA**

for

AMERICAN JEWISH UNIVERSITY

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ABBREVIATIONS AND ACRONYMS

AJU	American Jewish University
BBC	Brandeis-Bardin Campus
DOE	U.S. Dept. of Energy
DTSC	California Dept. of Toxic Substance Control
EIS	environmental impact statement
Na-22	sodium-22, radioactive element
NASA	U.S. National Aeronautics and Space Administration
MCL	Maximum Contaminant Level, set by DTSC
OS	offsite spring
pCi/L	picocuries per liter; a measure of radioactivity in water
RD	monitoring well designation
SP	spring or seep designation
SSFL	Santa Susana Field Laboratory
TCE	trichloroethene

Review of Groundwater Testing Data

1.0 INTRODUCTION

Groundwater and storm water data, collected by SSFL organizations, are reviewed in this report to assess the potential environmental impact on BBC due to historic activity at SSFL. It should be noted that groundwater and storm water are not drinking water sources for BBC. Drinking water has been supplied by the Calleguas Municipal Water District since the early 1960's.

The AJU environmental testing program includes testing of some springs and seeps on the BBC property. Groundwater monitoring wells at BBC have been installed by organizations associated with SSFL. AJU is not able to access these wells for groundwater testing, they can only be accessed by SSFL contractors and are tested annually by Boeing and others. The purpose of this report is to summarize the test data from these wells and recommend any follow-up actions. The data also include test results from springs located near the wells. The goal is to assess groundwater quality under BBC, last reviewed in 2014 (Cehn, 2014). An additional goal is to review the recently published risk assessment relating to storm water runoff from SSFL on to BBC (GeoSyntec Consultants, 2017).

Since the last report, the responsibilities for testing the BBC wells has changed. DOE has oversight for the wells near SSFL Area IV, and NASA has oversight for the wells near SSFL Area II. Boeing has oversight for the wells/springs in the BBC interior and near the southern boundary between BBC and the Northern Buffer Zone (NBZ). This is summarized in Table 1.

Table 1. Responsible Organizations for BBC Test Wells

Organization	Contractor	Wells/Springs	Comments
DOE	CDM, then Northwind	RD-59, SP-19*, SP-900*	* Annual sampling not required (by DTSC)
Boeing	MWH/Stantec	OS-2, -3, -4, -5, -9R, SP-424	
NASA	Haley & Aldrich	RD-68, SP-29, SP-30, SP-25*	* Annual sampling not required (by DTSC)
None	n/a	OS-8, OS-10	Sampled by BBC/AJU

Groundwater flow from the north side of SSFL is generally northward, towards BBC. Accordingly, monitoring wells have been placed in the Northern Buffer Zone and near the southern border of BBC. Springs, which are groundwater fed, are found near the BBC southern border. Additional springs are found further north. Locations are shown in Figure 1.

1.1 REPORTS INCLUDED

As noted above, multiple agencies are involved with groundwater testing at SSFL. The following annual reports were obtained and included in this review:

- NASA Quarterly Monitoring Reports (BBC wells are tested in the first quarter only)
- DOE Annual Monitoring Reports

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- DOE Annual Environmental Reports (groundwater test data are summarized)
- Boeing Quarterly Progress Reports (BBC wells are tested in the first quarter only)

In addition, several special reports were included in this review. Beginning in 2016, DOE has conducted an annual testing campaign of springs in and near Area IV. In 2017, Boeing conducted a risk assessment of potential human exposure to surface runoff water. While this is not a groundwater study, it is included here at the request of AJU.

2.0 RUNOFF WATER RISK ASSESSMENT

This risk assessment (GeoSyntec Consultants, 2017) was requested by the Los Angeles Regional Water Quality Control Board. The review focused on the part of this analysis dealing with rainwater runoff from SSFL Outfall 9, which enters BBC property toward the eastern end of the property line. This is one of the largest outfalls from SSFL (by area served; 530 acres). It receives runoff from SSFL Areas I and II. Area IV outfalls near the property line are diverted to a treatment plant at SSFL and are not normally released to BBC property.

Trace amounts of metals and chemicals (many naturally occurring) have been detected in Outfall 9 water. The only two that contribute to risk, per the GeoSyntec assessment, are chromium and pentachlorophenol. They are each responsible for half of the calculated total cancer risk of 0.4 in 1 million. This is below the “target” cancer risk of 1 in a million (per lifetime). Regulatory agencies generally consider a 1 in a million risk to be *de minimis* (e.g., Federal guidance in 40CFR300).

Overly conservative assumptions about exposure to this runoff water are made by GeoSyntec. They assume that there is frequent recreational contact with the water. Their analysis also assumes that small quantities of creek water are ingested. While heavy rain runoff creates creeks on BBC property (e.g., Meyer Creek), these do not exist during summer months when campers and hikers are generally present at BBC. Thus, the hypothetical, calculated cancer risk to BBC occupants is an absolute worst case finding. Even as such, it is below the level considered significant (*de minimis*).

3.0 NASA REPORTS

In 2016, NASA took responsibility for wells in and near Area II. This included wells on BBC, namely, RD-68, SP-25, SP-29 and SP-30. However, SP-25 is not part of the DTSC-approved testing program and is not routinely sampled. Groundwater collected from the wells is tested for various solvents, chemicals, metals and radionuclides. Their monitoring reports for the last two years were reviewed (NASA, 2016, and NASA, 2017).

BBC wells’ results were nearly all non-detect for solvents, chemicals, metals and radionuclides. One exception was the detection of TCE in well SP-30 (see Figure 1) in 2016. The level (0.5

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ppb) is tenfold lower than the DTSC's action level of 5 ppb. The well was sampled again the following year, and TCE was not detected. Test results in the 2018 campaign should be reviewed to determine if this is a false positive, or a significant finding.

The only other notable result at BBC was fluoride detected in RD-68 and SP-29. At 1 to 5 ppm, this is in the range of global background levels. Note that fluoride is added to some drinking water systems at about 1 ppm.

In the Northern Buffer Zone close to Area II, TCE was detected about 1,000 feet south of the BBC property line. It was not detected in the closest well on BBC, RD-68 (see TCE discussion in Section 5.0). Also, dioxane, an organic compound sometimes associated with TCE, was detected in wells about 1,300 feet south of the BBC property line. Also detected was isopropyl alcohol, a common laboratory chemical which sometimes affects samples being handled at the laboratory.

4.0 BOEING REPORTS

Boeing issues quarterly reports on their test program. BBC monitoring wells are tested in the first quarter of each year. Reports for 2016 and 2017 were reviewed (MWH, 2016; MWH, 2017). Boeing tests the "OS" springs and a well cluster (SP-424) near the property line and others in the NBZ. The springs only showed background levels of fluoride and some dissolved natural metals, but no contaminants.

Water from well SP-424 showed background levels of fluoride and dissolved metals. In 2016 only, a very low level of perchlorate was detected (0.013 ppb versus an MCL of 6 ppb). The perchlorate is very likely natural background. No solvents (e.g. TCE) were detected in any samples.

5.0 DOE REPORTS

DOE is responsible for BBC well RD-59 and springs SP-19 and SP-900. However, only RD-59 is required (by DTSC) to be sampled routinely. The springs were included in a separate testing program (see Section 5.1). Well RD-59 was tested by CDM Smith in 2014 and 2015 (CDM, 2014; CDM, 2015). North Wind, Inc. took over sampling in 2016 (North Wind, 2016; North Wind, 2017). The latest data show RD-59 clear of TCE and tritium. However, the report shows that radioactive cobalt-60 and sodium-22 were detected in shallow well RD-59A. Their presence seems highly unlikely due to the short radioactive half-lives of these isotopes. The Rocketdyne reactors were shut down decades ago and the half-lives of these isotopes are 5.3 years and 2.6 years, respectively. Sodium-22 has been through about ten half-lives, leaving only 0.1% of the original amount. If this test result were sound, sodium-22 would have been detected in large quantities, years ago. The fact that it was not suggests the recent sampling results are false positives.

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In addition, the reports show TCE and tritium contamination in Area IV and the Northern Buffer Zone. Figure 2 shows the extent of the groundwater plumes. The decrease in tritium levels over time has been discussed in earlier reports (Cehn, 2014). It turns out TCE levels have also been decreasing. Figure 3 shows TCE levels in a Northern Buffer Zone monitoring well, about 650 feet south of the BBC property line. TCE concentrations have dropped from a high of 50 ppb in 1989, to below 5 ppb (the action level) today.

DOE also publishes annual environmental reports (North Wind, 2016a; North Wind, 2017a). These were reviewed and they only summarize the information found in the annual and quarterly groundwater reports. The data are limited to Area IV and the Northern Buffer Zone.

5.1 SPECIAL STUDIES

In 2016, DOE began a study of springs north of Area IV (CDM, 2016). BBC springs near the property line: SP-19, SP-900, and SP-424 were included. However, the “OS” springs in that area were not included in this special study. Unfortunately, SP-900 was dry at the time and could not be sampled. Also tested was a monitoring well cluster in the Northern Buffer Zone, SP-T02.

TCE was not detected in these springs, not even in the Northern Buffer Zone. SP-19 was not tested for TCE, but did test negative for dioxane. Tritium was found in the Northern Buffer Zone springs at up to 1,272 pCi/L. (The drinking water limit for tritium is 20,000 pCi/L.) At BBC, tritium was not detected in any tested wells. Other results showed high mineral content, including sodium and calcium, in SP-19. Tested wells were negative for perchlorate, mercury, and other potential contaminants.

The testing was performed again in 2017, with similar results (not yet published). Unpublished data were reviewed and well SP-19B showed a gross alpha radioactivity level of 28 pCi/L. The prior year’s result was 8 pCi/L, typical of natural background. Adjacent well SP-19A measured 9 pCi/L. Isotopic analysis of SP-19B showed natural levels of radium and uranium, which contribute to gross alpha. However, other background minerals (e.g. thorium), which could be responsible for the higher gross alpha result, were not included in the lab analysis. A recommendation is given in Section 6.0.

5.2 DOE EIS

DOE’s Environmental Impact Statement for the remediation of Area IV (DOE, 2017) presents groundwater study data that were reported elsewhere (e.g., quarterly reports). It makes the point that the sources of contamination have been removed and thus levels of tritium, TCE, and strontium-90 are in decline. It calls for “monitored natural attenuation” for tritium, and additional treatment options for TCE and strontium-90.

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6.0 SUMMARY AND RECOMMENDATIONS

Groundwater testing at SSFL involves hundreds of test wells and thousands of analyses each year. Several monitoring wells and numerous springs are located on BBC property.

Groundwater from those wells and springs were non-detect for the main SSFL pollutant, TCE, with one exception. One sample (from SP-30 in 2016) showed TCE at one-tenth the DTSC limit. Re-sampling in 2017 found the well to be clean. This likely means that the 2016 result was a false positive. Future test results should be reviewed to confirm that assumption. Also, well SP-25 should be tested for TCE since that well sits between SP-30 and SSFL.

Monitoring wells in the Northern Buffer Zone showed the presence of dioxane. Since this chemical is slow to degrade in the environment over time, data from monitoring wells closer to BBC should be reviewed periodically.

Tritium was not detected in BBC groundwater, but was detected under the Northern Buffer Zone. AJU's testing program, which uses a more sensitive analysis for tritium, has detected tritium just above background levels near the property line. As discussed elsewhere, tritium levels have decreased significantly since the nuclear reactors were removed many years ago (Cehn, 2014). Since these decreases are due to natural processes, they can be expected to continue.

DOE reported the presence of several radionuclides in BBC well RD-59. These appear to be false positives. DOE should ask their contractor, North Wind, to re-examine those results. Finally, DOE's special groundwater study reported a slightly higher than normal gross alpha result in well SP-19B. Further testing and analysis should be done going forward, to determine if this result is due to naturally radioactive minerals.

7.0 REFERENCES

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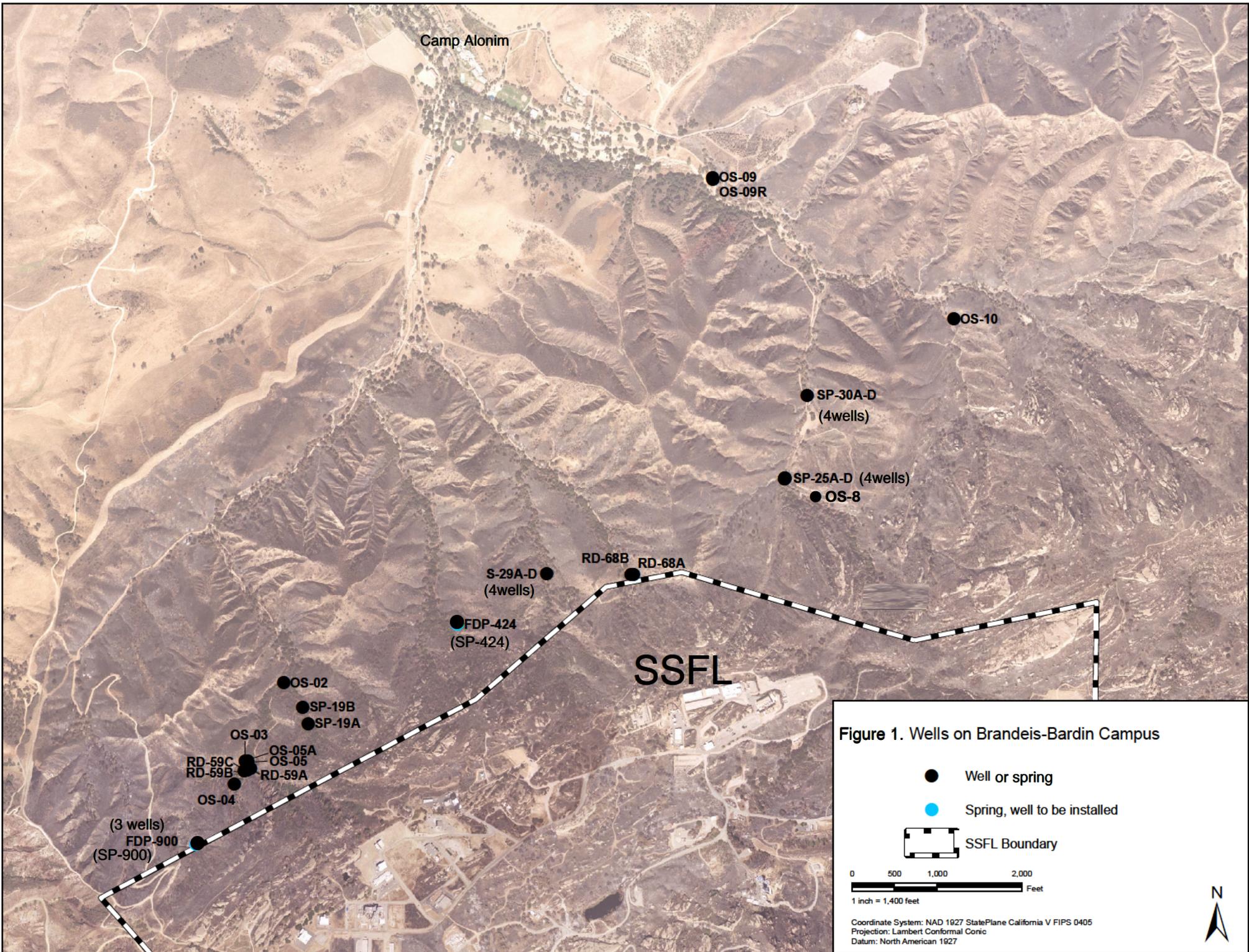
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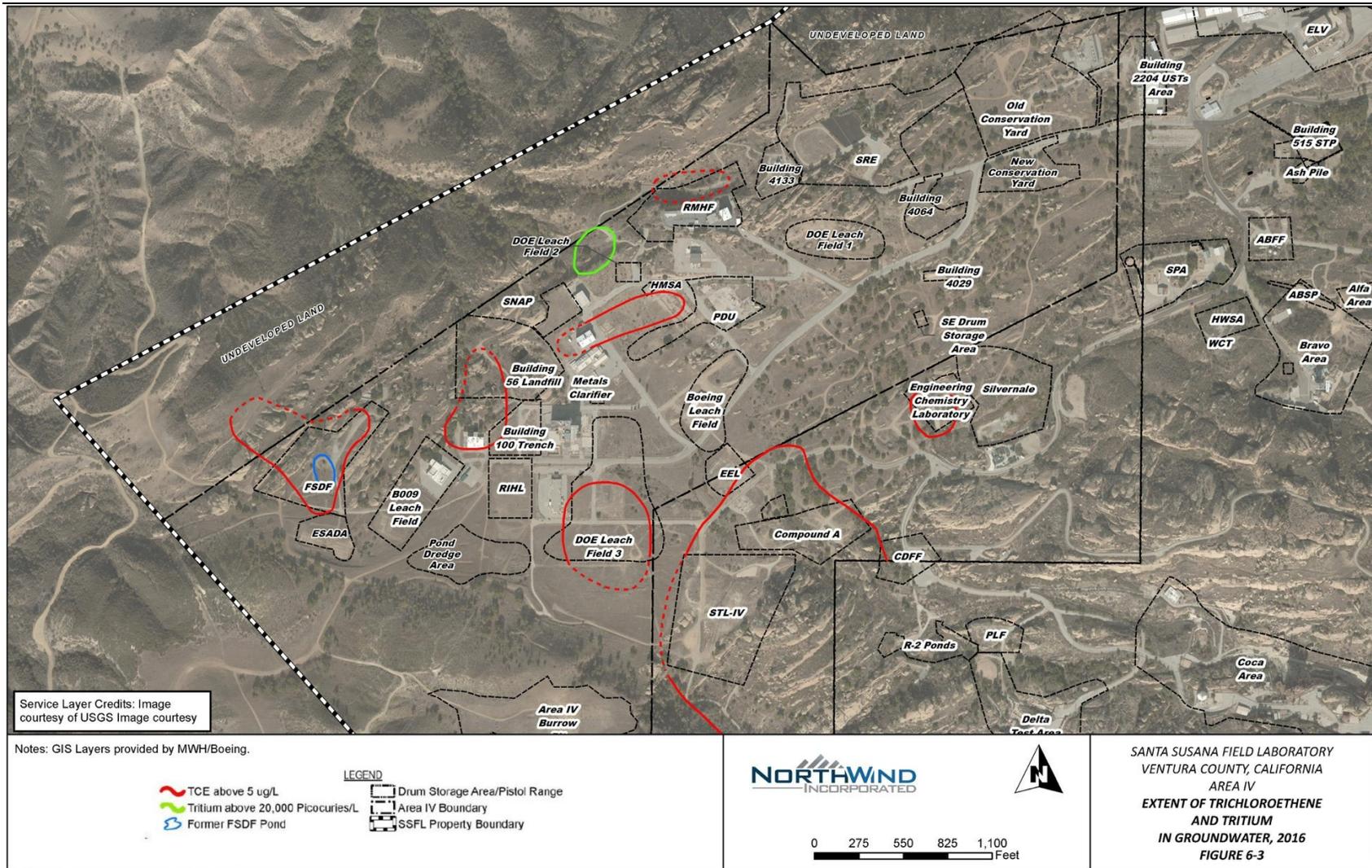
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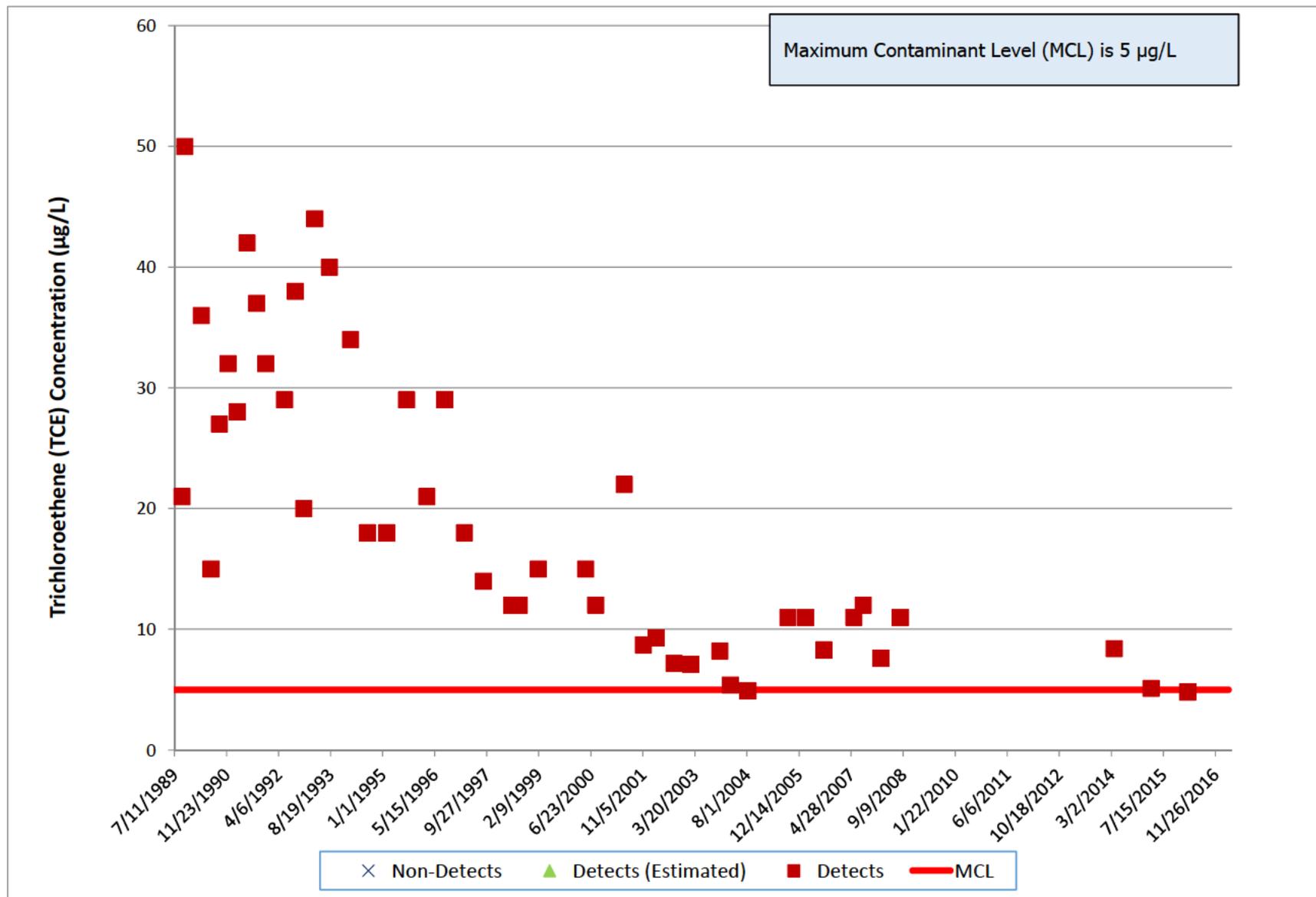




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Figure 2. Tritium/TCE Occurrences in Groundwater at SSFL, Area IV

Figure 3. RD-30, RMHF
Trichloroethene



Reference: NorthWind, 2016