MEMORANDUM

TO: [redacted]

FROM: JOEL I. CEHN

SUBJECT: 2015 TESTING RESULTS

DATE: DECEMBER 21, 2015

CC: [redacted]

BACKGROUND

Environmental testing of the Brandeis Bardin Campus (BBC) occurs periodically. This year's testing included sediments near the property line that may have been washed down from Boeing's Santa Susana Field Lab (SSFL), and groundwater near the southwest and southeast property lines. Groundwater on Boeing's side of the property line has a history of tritium contamination, but that has been decreasing over time. Testing occurred the week of December 1st.

SUMMARY OF TESTING RESULTS

Sediments

There are a limited number of ravines that carry surface water runoff towards BBC. These have been visited and tested over the years to ensure that contaminants aren't being carried onto BBC property. I collect fine sediments from the bottom of the ravines, since most contaminants attach to these sediments. This campaign I visited four ravines: drainage from the old "sodium burn pit" (Boeing Runoff 2a), from the old reactor area & waste facility (Boeing Runoff 2b), from the Sodium Reactor area (Boeing SRE Runoff), and from the western most part of SSFL Area IV (Boeing Runoff 1). Locations are listed in Table 1 and shown in Figure 1. I tested the sediments for metals (mercury, etc.), PCBs, and hydrocarbons. I also placed sediment traps in two ravines that will catch any sediment runoff occurring this winter. These will be emptied and tested next spring. I should note that since about 2012, Boeing has stopped discharging rainwater runoff from Area IV into the Northern Buffer Zone.

Metals in Sediments

Sediments were tested for the following metals: Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver. Some of these have been found to contaminate soils at Boeing, particularly mercury and arsenic. The testing results for key metals (mercury, arsenic and lead) are shown in Figure 2. Some previous testing results for

BBC soils are also shown. All results are within the range of natural occurrence for these metals. Several mercury results stand out in Figure 2, but are similar to a background level found in Balboa Park in 2006.

PCBs in Sediments

Polychlorinated biphenyls (PCBs) were detected in two sediment samples. The two, from Boeing Runoff 2a and from further downstream, measured 14 and 18 parts per billion (ppb). This is likely residue from the former "sodium burn pit" at Rocketdyne. In the 1990's, I measured levels as high as 920 ppb in what is now Boeing's Northern Buffer Zone. This month's results are well below EPA's soil action level of 240 ppb.

Hydrocarbons in Sediments

In 1995, I detected these hydrocarbons in what is now the Northern Buffer Zone, at up to 505 ppm. These findings were attributed to runoff from asphalt parking lots, roads, and possibly a Rocketdyne landfill. This month's testing looked for two types: light petroleum organics and heavier petroleum organics. Three samples near the property line (Boeing Runoffs 2b and SRE) showed heavier organics at 140 to 190 parts per million (ppm). All other results were between less than 1 and 67 ppm.

Although a small residue was detected this month, levels are minor and safe, and don't extend far into BBC property. Hydrocarbons due to petroleum products are quite common in developed areas.

Tritium in Groundwater

Tritium is the most mobile of the radioactive elements found at Boeing. It has been found in groundwater and vegetation near the property line. Testing is done to gauge its movement in groundwater, which is toward BBC. Water was collected from five flowing springs. It was also collected from plant foliage, close to the property line. This method collects water from plant transpiration, and has been an efficient way to collect groundwater, without the need for a drilled well. Locations are listed in Table 2.

Results show very low levels of tritium (up to 26 pCi/L) in the springs at the southwest corner of the property. No tritium was detected more distant from the property line, at OS-9. In 2007, I measured higher levels (up to 140 pCi/L) in the southwest area but slightly lower levels last year (up to 10 pCi/L). In 1995, levels were as high as 520 picocuries per liter of water (pCi/L) in Boeing's Northern Buffer Zone. The drop over time is partly due to radioactive decay—half of the tritium transmutes to helium every 12 years. It is also due to dispersion and dilution. Figure 3 displays the results and includes a rainwater sample tested in 2006, containing natural tritium at 29 pCi/L. Natural tritium is created by cosmic rays in the upper atmosphere.

CONCLUSIONS AND RECOMMENDATIONS

The observed levels of tritium in groundwater show a decline based on previous testing. They also compare with levels naturally found in the environment. Tritium was released by Rocketdyne decades ago and levels are expected to continue decreasing.

The observed levels of hydrocarbons are due to runoff from paved surfaces and are not unexpected. Trace levels of PCBs were found in two sediment samples and doesn't represent a health risk. I will continue to monitor PCB levels in sediments near the southwest property line. Finally, metals in sediments continue to be well within natural ranges.

I am enclosing copies of the lab reports. Contact me if you have any questions.

Table 1. Ravine Sediments Tested

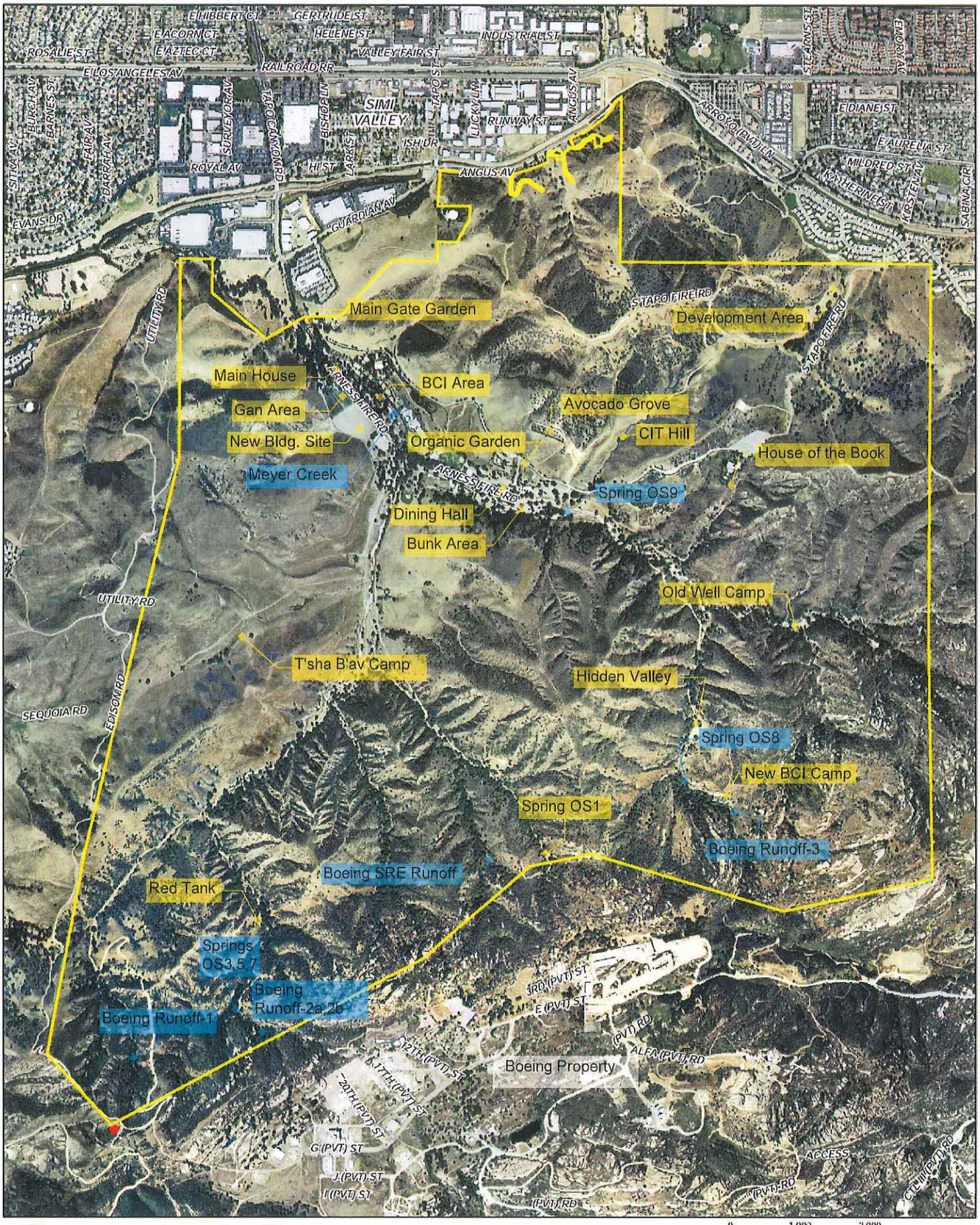
Locations	Sample Code	Comments
Boeing Runoff 1 – drains from west end of Area IV	(DG-518)	Well into BBC property
Boeing Runoff 2a – drains from old sodium burn pit area	(BB-18)	Just below the SW property line
Boeing Runoff 2b – drains from old RMDF and reactor areas	(BB-17)	Very near the SW property line
Boeing Runoff 3 – drains from east end of Area IV and Outfall 9	(OS-8)	Well into BBC property, south of Hidden Valley
Boeing SRE Runoff – drains from old sodium reactor area	(BB-19)	Well into BBC property
Below the Confluence of Runoffs 2a and 2b	(BB-20)	Inside BBC property
Meyer Creek at Bunk Area Bridge (Creek Rd.)	(MC-CR)	About two miles from the property line

Note: Locations shown on Figure 1.

Table 2. Water Tested for Tritium

Location	Comments
Spring OS-3	Southwest corner of property
Spring OS-5	Southwest corner of property
Spring OS-7	Southwest corner of property
Spring OS-8	Southeast corner of property
Spring OS-9	1,000 ft. southeast of dining hall
BB-17 (Boeing Runoff 2b)	Ground water collected from plant transpiration (see text for explanation)

Note: Locations shown on Figure 1.

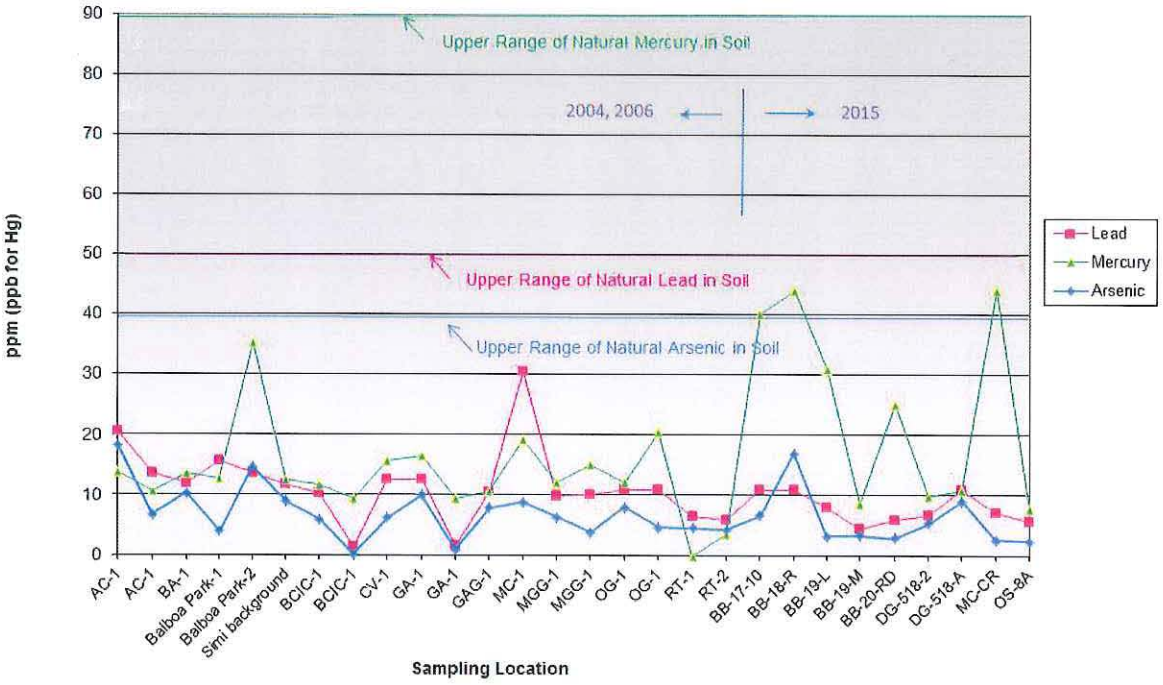


Key: Garden
Testing Locations for soil, water, and/or vegetation. Blue indicates testing this campaign

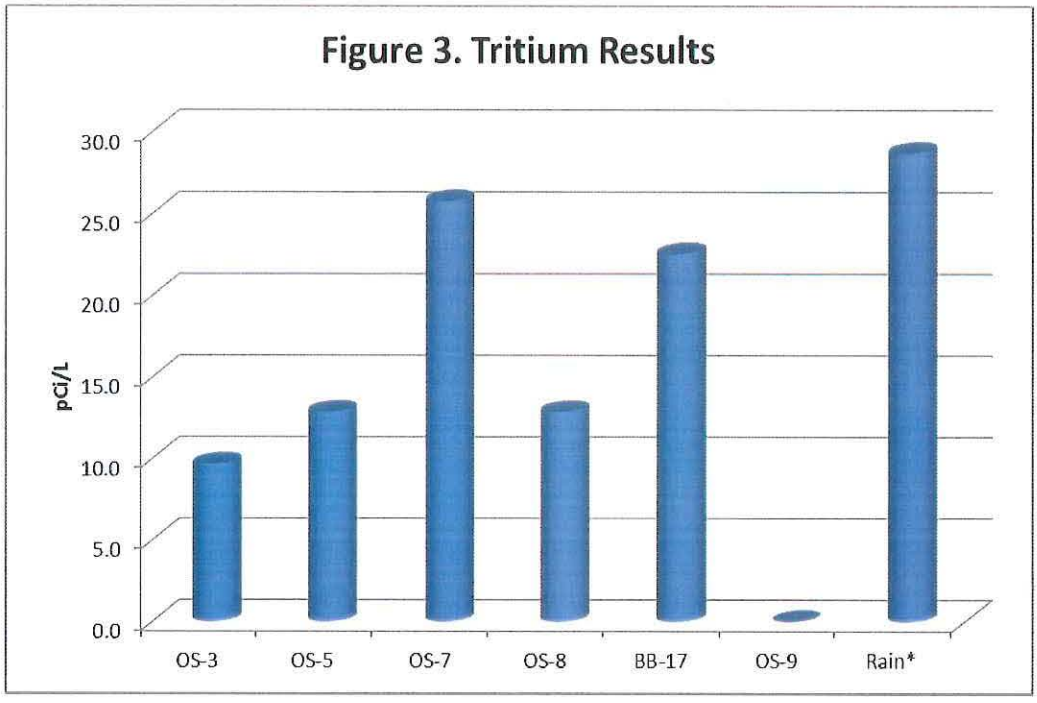
THE BRANDEIS-BARDIN INSTITUTE PROPERTIES

FIGURE 1

Figure 2. Metals in Soil



Note: Older Sampling Locations Identified in Testing Memo Dated May 15, 2006



*** datum from April 2006**

Note: EPA's Limit for Tritium in Drinking Water is 20,000 pCi/L