Comments of
The Southern California Federation of Scientists
on the
Draft Program Environmental Impact Report
and
Draft Program Management Plan
for the Santa Susana Field Laboratory
7 December 2017

Introduction[1]

SCFS was organized in the early 1950s as the Los Angeles Chapter of the Federation of American Scientists, founded by former Manhattan Project scientists concerned about the nuclear threat. SCFS is an interdisciplinary organization of scientists, engineers, technicians, and scholars dedicated to providing independent scientific and technical analyses and expertise on issues affecting science, society, and public policy. SCFS has been involved in matters related to SSFL since 1979, when it provided technical assistance related to disclosures of the partial nuclear meltdown that occurred in 1959 at SSFL. For over thirty years, SCFS has been involved in providing technical assistance to the communities near the site on matters related to cleanup of the SSFL chemical and radioactive contamination from decades of rocket and reactor testing. For approximately two decades SCFS has had a representative on the SSFL Inter-Agency Work Group overseeing the cleanup of the site and on the SSFL Advisory Panel that oversees health studies of the affected workers and neighboring communities.

SSFL is heavily contaminated from decades of reactor and rocket testing, sloppy practices, improper waste disposal, spills and releases. At least four of the nuclear reactors suffered accidents. The SNAP-8ER and SNAP-8DR reactors experienced substantial fuel damage. The AE-6 released fission gases. And in 1959, the SRE suffered a partial meltdown, with one third of its fuel experiencing melting. Radiation levels went off-scale. None of the reactors had a containment structure to prevent radiation release. In the case of the SRE partial meltdown, radioactivity was intentionally pumped out of the reactor vessel and vented into the environment for weeks.

Other accidents and releases contributed to widespread radioactive chemical contamination. There were several fires involving radioactive materials at the "Hot Lab," where high level radioactive waste—irradiated nuclear fuel—was decladded. And for many years the facility burned radioactive and chemical wastes in open burn pits, resulting in airborne release of contaminants and contamination of air, soil, groundwater and surface water.

The other operational areas of the site were no more environmentally prudent. Tens of thousands of rocket tests resulted in widespread chemical contamination involving volatile organic compounds (VOCs) such as TCE, as well as semi-volatiles, perchlorate, heavy metals, PCBs, and dioxins and furans, to name just a few. Again, contamination of soil, groundwater, surface water, and other environmental media resulted from the environmentally damaging practices.

[1] The introduction includes material adapted from our scoping comments.

This pollution has not remained solely on site. Some has been migrating to offsite areas, where it poses a risk to the neighboring communities. Failure to clean up SSFL fully, as promised in the Administrative Orders on Consent (AOCs) and the parallel DTSC promises of a comparable cleanup for the Boeing part of SSFL, would result in continuing risk to the health of neighboring communities.

Perchlorate, a component of solid rocket fuels that disrupts human development and which contaminates much of SSFL, has been found to have migrated offsite and contaminates roughly a third of wells in Simi Valley monitored for it. Half a million gallons of TCE, a carcinogen, were dumped directly onto the ground and now contaminate groundwater; TCE has also migrated offsite. Annual monitoring reports for surface water contamination show rain carrying off toxic materials offsite, at levels exceeding health-based benchmarks and other limits, hundreds of times in recent years.

A study by the UCLA School of Public Health found elevated cancer death rates among both the nuclear workers and the rocket workers from exposures to these toxic materials. Another study by UCLA found that the rocket testing had led to offsite exposures to hazardous chemicals by the neighboring population at levels exceeding EPA standards. A study performed for the federal Agency for Toxic Substances and Disease Registry found elevated cancer rates in the offsite population associated with proximity to SSFL.

In 2010, DTSC entered into legally binding AOCs with DOE and NASA, requiring cleanup to background, with very limited exceptions. No “leave in place” alternatives were allowed. At the same time, DTSC said that its normal procedures required a comparable cleanup of the Boeing portion of SSFL, because the land is zoned to allow agricultural uses, and a cleanup to those standards would be equivalent to a cleanup to background.

DTSC has now issued a draft Program Environmental Impact Report (PEIR) and associated draft Program Management Plan (PMP) for public comment. SCFS finds both grossly deficient, misleading, and scientifically flawed. Furthermore, it is deeply troubling that they involve breaching the longstanding cleanup obligations.

Discussion

1. The entire edifice of the PEIR regarding the Boeing cleanup rests on fundamentally false representations about DTSC’s own suburban residential cleanup standards. Despite the fact of DTSC official approval of those standards (the “SRAM-based suburban residential garden” Risk Based Screening Levels, found in the DTSC-approved Standardized Risk Assessment Methodology), the PEIR rejects from even consideration cleanup to those standards. It does so based on the misrepresentation that they are based on assuming 100% of one’s produce comes from one’s backyard garden. That is simply false. The standard is based on the actual amount of homegrown produce USEPA surveys identified people consume. Furthermore, the PEIR then indicates that instead a standard will be employed that it calls “EPA default” and asserts is based on 25% of one’s produce coming from a garden. Both assertions are false; the numbers are not based on 25% garden ingestion or EPA defaults, but assume only about 1% of the homegrown

ingestion that EPA defaults specify. Indeed, the PEIR values are based on the absurd assumption that one eats no more than the equivalent of a single strawberry and baby carrot per day from one's garden. By so doing, the PEIR uses a cleanup standard that is 30-60 times weaker, less protective than the true, DTSC official risk based standard, and thereby sets the maximum amount of cleanup for Boeing as a tiny portion of the contamination, posing great risks thereby. We discuss this is in detail in Attachment 1.

2. DTSC has failed to disclose the proposed project itself. DTSC clearly contemplates leaving in place vast amounts of contamination, despite its longstanding commitments to the contrary. Yet nowhere in the PEIR does DTSC disclose what the contemplated project actually is. Nowhere does it reveal how much contamination it contemplates to not clean up, what particular contaminants would not be cleaned up, and what concentrations would thus remain. Our best estimates are that as much as two thirds of the DOE and NASA contamination are being considered to be "left in place," not cleaned up, in violation of the AOCs, and similarly Boeing is being allowed to simply walk away from 91-98% of its contamination. We discuss this at some length in Attachment 2.

3. While artificially deflating the cleanup soil volumes for Boeing, the PEIR appears to significantly inflate the starting soil volumes for DOE and NASA, apparently in order to try to make the truck and similar impacts from cleanup appear onerous so as to justify breaking the AOC requirements of full cleanup. The PEIR does not disclose the basis for the estimates, barring the kind of meaningful review and comment required by CEQA. We have reviewed an earlier set of DOE estimates and include our critique as Attachment 3.

4. One of the other ways in which the PEIR appears to try to reduce cleanup obligations for the Responsible Parties is by inflating background values for contaminants. We review that matter in Attachment 4.

5. We are deeply troubled by DTSC's refusal to make available virtually any of the documents referenced in the PEIR. Many of them form the fundamental basis for claims made without support in the PEIR. One cannot meaningfully review and comment on the PEIR if DRSC has shielded from public view the material which the PEIR merely summarizes. This conduct suggests a fear of the public being able to determine that conclusions in the PEIR are contradicted by the underlying documentation. Refusal to disclose this material violates CEQA.

6. At the heart of the PEIR's deficiencies is a complete failure to disclose and analyze negative impacts from the contamination itself and from the proposals to not clean up large amounts of the contamination. This is taken to an extreme in the PEIR's claim that the No Action Alternative is the environmentally superior alternative and that it has no negative impacts. CEQA guidelines require consideration of the environmental impacts of the No Action Alternative, as well as all the other alternatives. The impacts from the radioactive and toxic chemical contamination, and from not remediating it, are large, but nowhere analyzed in the PEIR. It appears more a piece of propaganda, attacking the commitments DTSC itself made, than science. Hundreds of pages are devoted to inflated claims about impacts from the cleanup (e.g., trucks), but no analysis whatsoever about the impacts on public health and the environment from the contamination and from the proposals to breach the commitments to clean it all up. No

analysis shows how much above true public health and ecological risk based screening levels the contamination proposed to be left behind would be.

7. The claimed biological exceptions go far beyond those allowed in the AOCs, which are very narrow. We are troubled that, years late, the PEIR nonetheless does not include a Biological Opinion by US Fish and Wildlife, the sole basis for an exception. It would appear as though DTSC once again is attempting to shield from public review and comment in the PEIR process a critical document. Once the Biological Opinion comes out, the PEIR needs to be recirculated so that the public can comment on it and any impact it might have on the cleanup. Furthermore, it would appear that DTSC has failed to provide to US Fish and Wildlife (and presumably also the California Dept. of Fish and Wildlife) accurate information on which to make any recommendation. The PEIR falsely claims zero environmental impact were the contamination to not be cleaned up, and asserts harm to biological receptors if there is cleanup. However, DTSC's own Ecological RBSLs demonstrate that the contamination levels far exceed the levels deemed to harm ecological receptors, and exempting large areas that exceed No Adverse Effect Ecological RBSLs would thus doom those receptors to harm from the pollution. DTSC's failure to disclose this to federal and state Fish and Wildlife officials, and its failure to even include in the PEIR any analysis of how the pollution poses a risk to ecological features, would invalidate any conclusions that might be reached about those issues. There needs to be new, honest submissions to federal and state Fish and Wildlife officials, and an opportunity to comment in the PEIR process on any federal Biological Opinion in the context of the PEIR.

8. The PEIR and PMP hide what is proposed, deferring any such disclosure until after the closure of the comment period on the PEIR. This violates CEQA, which requires disclosure and environmental analysis and public opportunity for input in the CEQA process. One can't hide the project in the PEIR and only reveal it thereafter, which is what the PMP proposes to do. Furthermore, the PEIR claims to be a joint Program and Project EIR, but there is virtually nothing that describes and analyzes the specific projects.

9. DTSC committed to a cleanup of SSFL that met all of the land uses allowed by Ventura County General Plan and zoning designations, which includes a wide range of agricultural and residential uses. DTSC made clear that would result in a cleanup to background, equivalent to the AOCs, for all areas, including Boeing's. Yet the PEIR removes from even consideration cleanup of Boeing contamination to background, or to AOC levels, and does not even mention cleanup to agricultural levels. It is critical that these commitments be kept. Polluters do not get to get out of their cleanup obligations by declaring the land too polluted to be used for anything but open space. If that were allowed, every polluter would unilaterally do it. If the County in which the site is located were to desire that outcome, that would be one thing. But the County has made clear the site needs to be fully cleaned up, as promised, and that it doesn't want land in the County to be unable to be used for all the purposes allowed because it is too polluted. The key reason to clean it up to all the land uses allowed for it and the surrounding area is that it is the only way to assure protection of the offsite population. Onsite use is irrelevant to the people who live nearby; they are not going to be bought out and their homes turned into open space. One must clean up the source of the contamination to levels safe to live on (with gardens) and do agriculture so as to assure people who live nearby or engage in agriculture and protected. The

removal from consideration of the cleanup requirements DTSC had long promised is deeply troubling.

10. Fundamentally, the main problem with the PEIR is that it abrogates the longstanding commitments to a full cleanup, to no “leave in place” alternatives. DTSC has broken its word, and then hidden what it actually proposes to do. The result, if DTSC does not reverse course and return to its longstanding cleanup commitments, great risk to public health and the environment. We urge DTSC to redo the PEIR so that it is fully compliant with past commitments, and to remember that its job is to protect the public from polluters, not to protect polluters from the public.

Detailed comments are included in the Attachments. We have also separately transmitted, by mail, a CD containing a set of exhibits separately. We can be contacted at scalfedscientists@gmail.com.

Attachment 1

Southern California Federation of Scientists

Fundamental Misrepresentations of the Suburban Residential Garden Standard in the Draft Program Environmental Impact Report for Cleanup of the Santa Susana Field Laboratory

Abstract

Much of the Draft Program Environmental Impact Report (PEIR) rests on a fundamental misrepresentation of DTSC's own official Risk Based Screening Levels (RBSLs) for the suburban residential garden exposure scenario for the Boeing portions of the Santa Susana Field Laboratory (SSFL). The Standardized Risk Assessment Methodology Rev. 2 Update (SRAM), approved by the California Department of Toxic Substance Control, sets the official values as the SRAM-Based Suburban Residential Garden RBSLs.[1] However, DTSC's PEIR eliminates from even consideration cleanup to the official, DTSC-approved SRAM-based Suburban Residential Garden RBSL, asserting that it was based on assuming that 100% of one's overall produce comes from a backyard garden. This assertion, as we shall show below, is completely false. The SRAM-based garden RBSL was actually based on EPA's official data as to how much *homegrown* produce people actually consume in the Western United States.

Instead of using DTSC's official SRAM-based garden RBSLs, the PEIR asserts that the maximum cleanup that would be required of Boeing is what is described in the PEIR (p. 2-19) and Appendix B as the "EPA default" garden RBSLs, which the PEIR asserts are based instead on 25% of one's produce coming from the garden. These assertions are also false; these values are based neither on the assumption of 25% of one's produce being homegrown nor on EPA default values. Were the difference between the SRAM-based RBSL and the supposed 25% garden based on assuming one-fourth the homegrown consumption rate assumed in the SRAMbased RBSL, the difference between the two would be a factor of four. Instead, the values in Appendix B that the PEIR proposes to use are nearly thirty times weaker, less protective. Secondly, those values are based on a trivial amount of homegrown produce assumed consumed—the equivalent of a baby carrot and a strawberry per day for an adult and about one third that for a child. Actual EPA defaults for homegrown produce consumption are as much as 120 times higher for adults and as much as 133 times higher for children claimed by Boeing as the "EPA default" garden in Appendix B.

[1] By letters dated August 23 and September 12, 2016, DTSC informed Boeing that the suburban residential garden RBSL and the suburban residential direct soil contact RBSL should be combined into a single risk estimate for both sets of pathways. Because Appendix B of the PEIR merely reproduces the SRAM table with the two sets of RBSLs separately, and because the garden pathway for most contaminants dominates risk by orders of magnitude compared to direct soil contact, we here focus on the issues related to the suburban residential garden RBSLs.

The supposed 25% garden "EPA default" RBSLs are not in fact from DTSC but from Boeing. In the SRAM, DTSC insisted that the SRAM-based suburban residential garden RBSLs are to be used. Boeing asked if it could include "for informational purposes only" what it claimed were EPA default-based RBSLs. DTSC said Boeing could include them for that limited informational purpose, but that the values that were to be used were the official SRAM-based garden RBSLs.[2] Somehow, that has been now turned on its head, and in the PEIR, DTSC (or Boeing, if, as appears to be the case, it was allowed to write substantial portions of what was supposed to be DTSC's PEIR and have the PEIR preparer contracted to Boeing) has now thrown out the DTSC official SRAM-based values and substituted them with erroneous values prepared by Boeing and previously rejected by DTSC for use.

On its face, the assertion in the PEIR that the SRAM-based suburban garden standard was based on 100% of one's produce coming from one's garden and that a more reasonable assumption is 25% would appear reasonable. The problem is that it is false. The SRAM-based garden values were never based on assuming all one's produce came from one's garden, only that amount which EPA data show actually is consumed from a garden. And the supposed "EPA default 25% garden" is based on neither 25% of one's produce coming from one's garden nor on EPA's default ingestion rates. Instead it assumes ingestions rates that are one percent or so of those currently recommended by EPA and predicts that one eats the equivalent of a mere 2/5 of a spear of asparagus and a slice of apple on any given day from one's garden, but no more than this. On these errors and misrepresentations the entire edifice of the PEIR's consideration of cleanup of the Boeing parts of SSFL crumbles, as it assumes a miniscule fraction of the contamination would be cleaned up.

DTSC's Environmental Impact Report (EIR)

DTSC establishes the maximum soil cleanup requirement for Boeing in the PEIR as the supposed "USEPA" Default-based Suburban Residential Garden scenario included in the Standard Risk Assessment Methodology and in Appendix B of the PEIR. The PEIR claims this is based on 25% of one's produce coming from a backyard garden. There are multiple issues with this being allowed.

1. The SRAM was produced by Boeing. Allowing its cleanup standard to be one taken from a document it drafted is allowing the polluter to choose how much they want to clean up.
2. The claimed "USEPA" default based scenario does not, in fact use USEPA default ingestion rates. The values employed are substantially more lax than they should be, claiming clearly erroneous produce ingestion rates two orders of magnitude lower than USEPA defaults.
3. DTSC should be enforcing a standard in compliance with local zoning and General Plan designations, which state the land could be used for rural residential/agriculture purposes. (But even were DTSC to do so, it would have to markedly lower the rural residential

[2]The PEIR misrepresents this, asserting that the SRAM put forward three alternative suburban residential RBSLs from which to choose.

RBLSs in Appendix B, because they also employ erroneous, trivially small produce ingestion rates, a tiny fraction of EPA default values.)

SRAM-based Suburban Residential Garden

In Appendix B of the revised SRAM, there is a table that lists the exposure parameters and rationale for Suburban Residential RBSL calculations.[3] These values were used to create the RBSLs presented in the Summary of the Human Health Risk-Based Screening Levels for Chemicals in Soil at the SSFL table beginning on pdf page 1070, the same RBSLs used in the PEIR Appendix B. For the RBSLs referred to as the SRAM-based Suburban Residential Garden, the following parameters were used:

CF_p[4] = 1 IR[5]$_{fruits\text{-}adult}$ = 377.3 g/day $IR_{vegetables\text{-}adult}$ = 324.8 g/day

CF_p = 1 $IR_{fruits\text{-}child}$ = 81.45 g/day $IR_{vegetables\text{-}child}$ = 84.9 g/day

The Intake Rates were generated using values taken from **Tables 5-2 and 5-3** (attached) of the SRAM revision 2, which in turn referenced tables of data that reflect the consumption of *homegrown* produce from the USEPA Exposure Factors Handbook (EFH).[6] The value given in the EFH for an Adult's reasonable maximum exposure to homegrown fruits is 5.39 g/kg-day and homegrown vegetables as 4.64 g/kg-day as taken from **Tables 13-12 and 13-17** (attached). To estimate child intake, the adult values were multiplied by 1.008 for the fruit consumption rate, and 1.22 for the vegetable, resulting in 5.43 g/kg-day and 5.66 g/kg-day for fruits and vegetables, respectively. These values were then multiplied by the average weight of 70 kg for adults and 15 kg for children to produce the values above. The 1.008 and 1.22 multipliers are the ratio of adult consumption of fruits/vegetables to the consumption by children ages three to five.

Tables 5-2 and 5-3 show that the contaminated fraction is assumed to be 1, or 100% of homegrown produce. This means that 100% of the fruits or vegetables a person eats *from their garden* is assumed to be contaminated. The original data referenced in Tables 13-12 and 13-17 are also described as being from homegrown produce, so this assumption of 1 is accurate. The SRAM-based suburban residential garden values assume that 100% of produce taken from the garden is contaminated, not that 100% of one's produce comes from one's garden, as claimed in the PEIR.

"USEPA" Default-based Suburban Residential Garden

In section **2.2.3.5 Soil Cleanup Requirements,** the PEIR states that, "The USEPA default-based

[3] SRAM2, Appendix B: Human Health Risk-Based Screening Levels for Chemicals in Soil at the Santa Susana Field Laboratory, Ventura County, California; Attachment 1 – Table 2 (pdf P. 1129) A copy of this table is included at the end of this report.

[4] CF = Contaminated Fraction

[5] IR = Ingestion Rate

[6] USEPA Exposure Factors Handbook (1997) https://epaprgs.ornl.gov/radionuclides/EFH_Final_1997_EPA600P95002Fa.pdf

(with garden) scenario assumes that 25 percent of all produce consumed by the resident over a time frame of 30 years is contaminated.[7]" This is not true, and the values do not represent default EPA ingestion rates; far from it.

The "USEPA" Default-based Suburban Residential Garden is not truly a USEPA based cleanup standard. Rather, the information is cherry-picked from various sources across multiple decades, using old draft documents rather than the revised final ones, inappropriately mixing units, and engaging in double-counting while being described as a "USEPA" defaults based cleanup. The input values for these RBSLs are:

(Attachment 1 – Table 2)[8]

$CF_p = .25$ $IR_{fruits\text{-}adult} = 56.2$ g/day $IR_{vegetables\text{-}adult} = 28.5$ g/day

$CF_p = .25$ $IR_{fruits\text{-}child} = 14.8$ g/day $IR_{vegetables\text{-}child} = 10.4$ g/day

The Ingestion Rate (IR) values for fruits and vegetables were taken from the Risk Assessment Information System (RAIS) 2010. But RAIS used a CF_p (contamination fraction of produce) of 1, not 0.25. Boeing simply ignored that and used 0.25 instead. The source of the ingestion rates in RAIS was given as Table 13-61 of the 1997 EPA Exposure Factors Handbook and C-1-2 of a 1998 draft EPA document. Table 13-61 and the ones following it expressly give consumption rates for "*homegrown*" fruits and vegetables. They are not intake values for total intake, but the intake from a garden based on actual survey data. Thus, multiplying by a factor of .25 on the assumption the value was for total consumption is double-counting. The value already was for actual backyard garden consumption.

Like with the SRAM-based Suburban Residential Garden Ingestion rates, the RAIS values were derived using data taken from the Exposure Factors Handbook. However, these data are then run through an equation from **Table C-1-2** of the 1998 Human Health Risk Protocol for Hazardous Waste Combustion Facilities Draft (1998 Draft) (attached). This poses a problem as the C-1-2 values for ingestion are given in dry weight (DW), while the exposure factor handbook data was in wet weight values. But Boeing took the values and represented them as though they were wet weight, as required in the SRAM equations. The result are ingestion rates which pretend much smaller quantities of fruits and vegetables are being consumed than is accurate from the source data. In essence, the SRAM-based garden values are, as they should be, in wet weight units; the Boeing supposed EPA default numbers are vastly lower because they both double-counted the 25% and they took ingestion rates based on dry weight (e.g., the apple with all water removed) and counted them as though they were actual, wet weight values. This results in backyard garden intake rates that are 26-29 times smaller than values based on true EPA defaults for actual garden intakes.

The EPA Soil Screening Guidance: Technical Background Document (SSG, 1996) lists the average conversion factor from fresh to dry weight for vegetables to be 0.085, and for fruits to be

[7] Page 2-19, pdf page 115

[8] SRAM2, Appendix B: Human Health Risk-Based Screening Levels for Chemicals in Soil at the Santa Susana Field Laboratory, Ventura County, California; Attachment 1 – Table 2 (pdf P. 1129)

0.15. These values are consistent with the what we see provided in the SRAM table. The "EPA" value for adult fruit ingestion rate is roughly 15% ($.15 * .3773 = .0566$) of the SRAM value, while the EPA value for vegetable ingestion rate is roughly 8.5% ($.085 * .3248 = .028$) of the SRAM value.

The values for the child ingestion rates do not match up as closely as those for adults when converted from dry to wet weight, however it seems this can most likely be explained by how the child rates were calculated. For the SRAM, we know the intake rates were produced by scaling up the values they used for adults by the ratio of adult to 3-to5-year-old consumption. For the "EPA", the method was not so simply disclosed. In table C-1-2, we are given the EPA recommended default ingestion rates for exposed aboveground produce, protected aboveground produce, and belowground produce for children and adults, but we are not told how they got to these values, only that they were derived from **Tables 13-61 and 13-65** of USEPA EFA (1997). Whatever the conversion was may account for why the child value is not as clean an 8.5-15% conversion as the adult values.

Furthermore, there was an assumption made in the calculation of these ingestion rates that a certain amount of produce is lost in cooking and preparation. Table C-1-2 states that "the average preparation and cooking loss used for exposed vegetables was 15.8 percent." However, "no preparation and cooking loss occurs with exposed fruits because it is further assumed the fruit is eaten in the raw form." Accounting for cooking loss is reasonable, but reduces the assumed IR, which can lead to understating the amount of contamination one ingests. Additionally, in Chapter 9 of the Exposure Factors Handbook, it is discussed how cooking can actually increase the concentration of chemicals:

> "Similarly, cooking can increase the mass of contaminant in food (due to formation reactions, or absorption from cooking oils or water) or decrease the mass of contaminant in food (due to vaporization, fat loss, or leaching). The combined effects of changes in weight and changes in contaminant mass can result in either an increase or decrease in contaminant concentration in cooked food. Therefore, if the as-consumed ingestion rate and the uncooked concentration are used in the dose equation, dose may be underestimated or over-estimated," (EFH, 2011).

Of course, as if those ingestion rate assumptions were not already too low, the "USEPA default values" scenario uses a contaminated fraction of 0.25 taken from the USEPA 2009 PRG calculator for Radionuclides. This factor implies that, of the amount of vegetables or fruits consumed, only 25% is contaminated. The SRAM falsely claims that this factor is to account for the fact that only a fraction of the fruits or vegetables we consume are homegrown, and the reasoning is drawn from the from the 1998 *draft* of the Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRA). Section 6.2.2.3 on page 6-6 of the 1998 draft states:

> The percentage of home grown food consumed by the individual will affect exposure, because not all of an individual's dietary intake may be contaminated. Receptors, located in a rural or suburban area, who can raise animals and grow food in gardens will have a larger percentage of their food produced locally than people living in the city.

> US EPA OSW, in accordance with existing U.S. EPA guidance (1990e), recommends the following assumptions regarding the percentage of contaminated food:
>
> - With regard to aboveground and belowground produce, it is assumed that the subsistence farmer and the subsistence farmer child consumes 100 percent contaminated produce; it is assumed that 25% of the produce consumed by receptors for the remaining recommended exposure scenarios (adult resident, child resident, and subsistence fisher, and subsistence fisher child) is contaminated. (see Appendix C, Table C-1-2).

However, the draft was incorrect in its assumptions. the data that the draft HHRA references are already in terms of homegrown produce, making the assumption of 25% completely incorrect. Realizing the mistake, the 2005 Final HHRA was changed to reflect the new, correct assumptions. Section 6.2.2.3 now reads:

> "The percentage of food consumed by an individual which is home-grown will affect exposure, because the HHRAP assumes that only the portion of an individual's dietary intake which is home-grown is impacted by facility emissions.
>
> We recommend assuming the **all food produced at the exposure location** – i.e. the farm for the farming scenarios, and the home garden for the residential and fishing scenarios – is impacted by facility emissions. Only that portion of the diet produced at home (and therefore exposed to facility emissions) is of consequence in the risk assessment. As detailed in section 6.2.2.2, the consumption rates we recommend **represent only the home-produced portion of the diet**. Therefore, by using consumption rates specific to home produced foods, we consider it reasonable to assume that **100% of those homeproduced foods are contaminated**," [emphasis added].

The "USEPA" value assumed in the SRAM is using a contaminated fraction a quarter of what it should be, and by continuing to use the 25% consumption factor, the final RBSLs presented for this scenario are far greater (that is to say, less protective) than they should be.

Regardless of how the ingestion rates were produced for the "USEPA default based" scenario, the IRs being used are completely unreasonable. Assuming an adult consumes 14 grams of fruit a day (IR of 56.2*0.25=14) is to assume the adult eats *no more than 0.5 ounces of fruit a day*. To put this in context, a small apple is 3.7 oz. An average banana after the peel is removed is 4.2 oz. Consuming 12.5 *grams* of fruit is the equivalent of eating a single a strawberry. Below are a handful more examples of how little fruit the "USEPA" SRAM proposal assumes an adult would eat.

Average Mass of Fruits Compared to Boeing's Adult Consumption Assumption

	Mass (grams)[9]	**How much would you eat before reaching the "USEPA" assumed limit?**
Small Apple	100	0.14 of an apple
Seedless Grape	1.4	10 grapes
Medium Strawberry	12.5	**1.12 strawberries**
Medium Peach	100	0.14 of a peach
Medium Pear	165.5	0.08 of a pear
Medium Banana	118	0.12 of a banana
Blueberry	0.94	15 blueberries
Raspberry	1.9	7.5 raspberries
Cherry	6.3	**2.23 cherries**

As for vegetables, after accounting for the 25% factor, and adult is assumed to consume 7.05 grams of vegetables. That's the equivalent of eating a little less than a single baby carrot.[10] Under this assumption, the adult eats no more vegetables than 3/5 of a baby carrot on any given day. In fact, out of the 9 vegetables we looked at, under these faulty "EPA" assumptions, an adult would not be able to finish a single vegetable without consuming more contamination than the scenario accounted for.

Average Mass of Vegetables Compared to Boeing's Consumption Assumption

	Mass (grams)[11]	**How much would you eat before reaching the "USEPA" assumed limit?**
A spear of Asparagus	18.6	2/5 of a spear of asparagus
Baby Carrot	11.4	3/5 of a baby carrot
Broccoli	148	1/20 of a head of broccoli
Medium Bell Pepper	148	1/20 of a medium bell pepper
Medium Stalk of Celery	55	3/20 of a stalk of celery
Medium Cucumber	300	1/50 of a medium cucumber
1 Cup of shredded Lettuce	56.7	3/20 of a cup of lettuce
Medium Onion	148	1/20 of a medium onion
Medium Potato	148	1/20 of a medium potato

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[9] Data on the mass of fruits from https://www.fatsecret.com/Default.aspx?pa=toc&s=1

[10] Mass of a baby carrot was taken from https://www.fatsecret.com/calories-nutrition/usda/baby-carrots

[11] Data for the mass of vegetables was retrieved from the US Food and Drug administration Raw Vegetables poster: https://www.fda.gov/Food/IngredientsPackagingLabeling/LabelingNutrition/ucm114222.htm

Using these outrageously low ingestion rates is dangerous as it leads to RBSLs being produced with exceedingly lax standards. How can we properly asses the "safe" level of contamination one might consume if we are assuming they are eating practically no fruits or vegetables? It is frankly put, ludicrous to imagine a person limiting their produce consumption to just a single baby carrot, a slice of an apple, a bite of a banana, or a single strawberry in one day. People do not eat that little, and to create cleanup standards catering to this falsehood is to poison every member of the community that may be eating a fruit or vegetable from their garden.

It is hard to understand how DTSC could look at these ridiculously low ingestion rates claimed by Boeing and not catch the fact that they were, in fact, ridiculously low. If 25% of one's produce comes from one's garden, it can't be the equivalent of a baby carrot and a slice of apple a day. The fact that DTSC signed off on this raises serious questions about the technical competence or honesty of its review, or both. In either case, now that these huge errors have been identified, it undermines any confidence that DTSC will fix them without once again trying to employ a cherry-picked, revised input to compensate for the errors made, all to lead to the same result of allowing vast amounts of contamination to not be cleaned up.

40-year Rural Residential Soil RBSL

Under normal DTSC and USEPA procedures, cleanup of a site should be sufficient to protect human health and the environment for all possible future land uses as permitted by County zoning and General Plan designations. In 2010 DTSC stated:

> "The local government General Plan land designations and local zoning designations are the most reliable expressions of prospective land use…DTSC and USEPA defer to local governments' land use plans and zoning decisions, and base their cleanup level calculations on the assumption that the land will be used as the land use requirements would allow, irrespective of its current use."[12]

County zoning laws for SSFL designate the land for possible agricultural or rural residential use. Despite this, DTSC and Boeing are now proposing a cleanup for soil that is far weaker than should be allowed. They argue that they have no intention of allowing the land to be used for anything but open space, and therefore it does not need to be cleaned to *the legal requirement*, but regardless of how the responsible parties claim the land will be used, the 2010 decision still holds.

Furthermore, to clean up the site with respect only to its potential future use is to ignore the community that currently surrounds the field lab. The dangerous chemicals and toxins that have been shown to migrate off the site are known to be linked to certain forms of rare cancer, many of which are found in extremely high numbers in children living near SSFL. These community members are not limited to visiting the area on occasion for recreational purposes—they live in the surrounding area for years, eating food grown in their gardens and playing in their yards. Boeing and DTSC's proposed cleanup, is not protective of these communities.

[12] Page 12; http://www.dtsc-ssfl.com/files/lib_correspond/agreements/64765_AIP_Response_to_Comments_Volume_I.pdf

Unfortunately, even if DTSC and Boeing were to use the SRAM 40-year Rural residential scenario, the RBSLs presented in the SRAM are once again far less protective than they should be.

Attachment 1 – Table 2[13]

$CF_p = 1$	$IR_{fruits\text{-}adult} = 56.2$ g/day	$IR_{vegetables\text{-}adult} = 28.5$ g/day
$CF_p = 1$	$IR_{fruits\text{-}child} = 14.8$ g/day	$IR_{vegetables\text{-}child} = 10.4$ g/day

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The 40-year Rural Residential Soil RBSL uses the same IRs as the "USEPA" Default based scenario. As explained in the previous section, these ingestion rates are outrageously low, even more so when considering the 40-year rural residential is an agricultural scenario. The intake rates should be much higher.

The SRAM also includes a 30-year Rural Residential scenario for "comparison purposes." EPA's standard assumption for rural residential estimates is 40-years. A 30-year scenario should not be considered even for the purposes of comparison. Again, DTSC insisted on the 40-year assessment, the standard time period, and Boeing asked to include "for informational purposes only" the 30-year. This is the same reasoning that was given for the inclusion of the supposed "USEPA" default-based RBSLs in the SRAM for "informational purposes only,' and now that scenario is being seriously considered for the cleanup of the site.

DTSC should be pushing for the use of the 40-year Rural Residential Standard, but not the one outlined in the SRAM. They should be applying the true EPA default based on current standards for Santa Susana Field Laboratory.

Current USEPA Ingestion Rates

In November 2016, USEPA updated its remediation goal standards for risk assessment modeling.[13] The new guide considers four factors: whether the produce is a fruit or vegetable, whether the consumer is an adult or child, whether the consumer is a resident or farmer, and whether the produce was consumed fresh or prepared. The data are expressly for the amount of *homegrown* produce consumed, not the total amount of produce ingested. The original chart (attached at end of report) shows the amount of each of the various produce items that went into the total, however for our purposes we only need to compare the total consumed by residents to those proposed in the SRAM.

Current USEPA Default Values

	IR Resident Child (Fresh Weight)	IR Resident Adult (Fresh Weight)	IR Resident Child (Prepared/cooked)	IR Resident Adult (Prepared/cooked)
Total Fruits	493.5	626.7	255.8	324.9
Total Vegetables	313.4	852.3	214.1	582.4

[13] Biota Modeling in EPA's Preliminary Remediation Goal and Dose Compliance Concentration Calculators for Use in EPA Superfund Risk Assessment, 2016.

We compared both the current EPA fresh weight and prepared/cooked weight default homegrown produce ingestion rates to Boeing's purported "USEPA" default with 25% garden ingestion rates, and found that the actual EPA default rates range from **23 to 120 times higher than Boeing's**. That is to say, that what Boeing claims are the "USEPA" default ingestion rate assumption are in fact only a tiny fraction of the amount of homegrown produce that EPA truly estimates is consumed, based on data EPA has assembled for actual homegrown produce consumption. Based on these massive errors, Boeing thus proposes, and DTSC accepts in the PEIR, cleanup standards that are orders of magnitude weaker and less protective than required. On that basis, the PEIR proposes to leave in place vast amounts of Boeing contamination that far exceed the true risk based levels (SRAM-based garden) for public health.

Conclusion

DTSCs PEIR is extremely lacking. It reverses longstanding DTSC commitments to a full cleanup; misrepresents DTSC's own official SRAM-based suburban residential garden standard and on the basis of that misrepresentation, rejects it from consideration and proposes as a maximum cleanup one based on a standard greatly weaker than is protective of human health or the environment. The alleged "USEPA" default scenario with 25% garden, Boeing's current choice for the cleanup, uses faulty inputs that are not EPA default at all. In fact, compared to the current USEPA suggested inputs, the supposed 25% garden proposed scenario is off by factors of 23 to 130. Boeing and DTSC should be following the Ventura county zoning plan by cleaning up to a 40-year rural residential standard with proper inputs. If the suburban residential standard is to be employed, it must be DTSC's approved SRAM-based suburban residential garden standard identified in Appendix B of the SRAM Revision 2.

The errors and misrepresentations in the PEIR raise serious questions about the quality and integrity of the PEIR and DTSC's review of the central issues. DTSC's proposals to abrogate the longstanding cleanup commitments pose a substantial health and environmental risk.

Attachments

Attachment 1 - Table 2

Exposure Parameters and Rationale for Suburban Residential and Recreational Risk-Based Screening Level Calculations

		Suburban Resident				SRAM-based Suburban Residential Garden				USEPA Default-based Suburban Residential Garden				Recreator			
Parameter	Units	Adult Resident	Child Resident	Age-Adjusted Composite Resident	Rationale	Adult Resident	Child Resident	Age-Adjusted Composite Resident	Rationale	Adult Resident	Child Resident	Age-Adjusted Composite Resident	Rationale	Adult Recreator	Child Recreator	Age-Adjusted Composite Recreator	Rationale
General																	
BW = body weight	kg	70	15	NA	(a)	70	15	NA	(a)	70	15	NA	(c)	70	15	NA	(a)
ED = exposure duration	years	24	6	30	(a)	24	6	30	(a)	24	6	30	(c)	24	6	30	(a)
EF = exposure frequency	days/year	350	350	350	(a)	350	350	350	(a)	350	350	350	(c)	75	75	75	(c)
ET = exposure time	hours/day	24	24	24	(a)	24	24	24	(a)	24	24	24	(c)	8	8	8	(a)
ATc = averaging time for carcinogens	year x 365 days/year	27,375	27,375	27,375	(a), (b)	27,375	27,375	27,375	(a), (b)	25,550	25,550	25,550	(b), (c)	27,375	27,375	27,375	(a), (b)
ATn = averaging time for non-carcinogens	year x 365 days/year	8,760	2,190	NA	(a), (d)	8,760	2,190	10,950	(a), (d)	8,760	2,190	10,950	(c), (d)	8760	2190	10,950	(a), (d)
Ingestion of Soil																	
IR_{so} = soil ingestion rate	mg/day	100	200	NA	(a)	NA	NA	NA	NA	NA	NA	NA	NA	100	200	NA	(a)
IF_{so_res} = age-adjusted soil ingestion factor	mg-year/kg-day	NA	NA	114	(a)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	114	(a)
Dermal Contact with Soil																	
SA_{so} = skin surface area for dermal exposure	cm^2/day	5,700	2,800	NA	(a)	NA	NA	NA	NA	NA	NA	NA	NA	5,700	2,800	NA	(a)
AF_{so} = soil adherence factor	mg/cm^2	0.07	0.2	NA	(a)	NA	NA	NA	NA	NA	NA	NA	NA	0.6	0.2	NA	(f)
DF_{su_res} = age-adjusted dermal factor	mg-year/kg-day	NA	NA	361	(c)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,397	(c)
Inhalation of Dust																	
PEF = particulate emission factor	m^3/kg	1.36E+09	1.36E+09	1.36E+09	(e)	NA	NA	NA	NA	NA	NA	NA	NA	1.36E+09	1.36E+09	1.36E+09	(e)
Ingestion of Fruits and Vegetables																	
CF_p = fraction of produce consumed that is contaminated	unitless	NA	NA	NA	NA	1	1	1	(a)	0.25	0.25	0.25	(e)	NA	NA	NA	NA
IR_f = fruit ingestion rate	kg/day	NA	NA	NA	NA	0.3773	0.08145	NA	(a)	0.0562	0.0148	NA	(c)	NA	NA	NA	NA
IR_v = vegetable ingestion rate	kg/day	NA	NA	NA	NA	0.3248	0.0849	NA	(a)	0.0285	0.0104	NA	(c)	NA	NA	NA	NA
IF_{f_res} =age-adjusted fruit ingestion factor	kg-year/kg-day	NA	NA	NA	NA	NA	NA	0.1619	(c)	NA	NA	0.0252	(c)	NA	NA	NA	NA
IF_{v_res} = age-adjusted vegetable ingestion factor	kg-year/kg-day	NA	NA	NA	NA	NA	NA	0.1453	(c)	NA	NA	0.0139	(c)	NA	NA	NA	NA
MLF = plant mass-loading factor	unitless	NA	NA	NA	NA	0.26	0.26	0.26	(c)	0.26	0.26	0.26	(c)	NA	NA	NA	NA

Notes:
kg = kilogram(s)
L = liter(s)
mg = milligram(s)
m = meter(s)
NA = not applicable
RME = reasonable maximum exposure

(a) SRAM 2005 - Site-specific values provided in SRAM Tables 5-2 to 5-5 (MWH, 2005). Adult and child SRAM-based suburban residential garden fruit and vegetable ingestion rates were adjusted to units of kg/day using the adult and child body weights of 70 and 15 kg, respectively.
(b) Cancer averaging time (AT) (year x 365 days/year) = Cancer averaging time (AT) years * 365 days/year. SRAM-based AT is for 75 years; USEPA default-based AT is 70 years.
(c) RAIS 2010 - Online RAIS (http://rais.ornl.gov/tools/rais_chemical_prg_guide.html) default parameter from RAIS Preliminary Remediation Goals (PRGs) for Chemicals User's Guide, accessed in May 2010. Age-adjusted intake factors calculated using RAIS-based rationale: (Child Ingestion Rate x EDc/BWc) + (Adult Ingestion Rate x EDa_RME/Bwa).
(d) Noncancer AT = ED (year) * 365 days/yr.
(e) USEPA 2009a - EPA PRG calculator for radionuclides (http://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search) default parameter. Ingestion rates were converted to kg/day using a conversion factor of 1 year/365 days.
(f) USEPA 2004a - RME soil adherence factors for adult and child recreators are geometric mean values for adult pipe layers in wet soil and children playing in wet soil from Exhibit 3-3, respectively.

Table 5-2 (4 of 4)

Exposure Assessment Parameters for a Residential Adult

Parameter	Central Tendency Exposure (CTE)	Exposure Distribution	Reasonable Maximum Exposure (RME)
Ingestion of Homegrown Food/Fish:			
Ingestion Rate, Fruit	Value: 1.20 g/kg-day Rationale: 50th percentile value of homegrown fruit consumption in the western U.S., USEPA 1997	Lognormal mean: 4.2 g/kg-day standard deviation: 0.84 g/kg-day Source: Distribution for consumption of fruits and vegetables combined, CalTOX 1994[1]	Value: 5.39 g/kg-day Rationale: 90th percentile value of homegrown fruit consumption in the western U.S., USEPA 1997
Ingestion Rate, Vegetables	Value: 0.9 g/kg-day Rationale: 50th percentile value of homegrown vegetable consumption in the western U.S., USEPA 1997		Value: 4.64 g/kg/day Rationale: 90th percentile value of homegrown vegetable consumption in the western U.S., USEPA 1997
Fractions of fruit and vegetable local	Value: 1 Rationale: Deterministic value is for homegrown produce	Lognormal mean: 0.24 standard deviation: 0.17 Source: CalTOX 1994[1]	Value: 1 Rationale: Deterministic value is for homegrown produce

[1] CalTOX computer model version 1994.
Crystal Ball (Decisioneering, Inc., Denver, CO)

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Table 5-3 (4 of 4)

Exposure Assessment Parameters for a Residential Child

Parameter	Central Tendency Exposure (CTE)	Exposure Distribution	Reasonable Maximum Exposure (RME)
Ingestion of Homegrown Food/Fish:			
Ingestion Rate, Fruit	Value: 2.15g/kg-day Rationale: 50th percentile value for adult times 1.79 (ratio of adult to 3- to 5-year-old consumption for all U.S. regions combined), USEPA 1997	Lognormal mean: 7.5 g/kg-day standard deviation: 1.5 g/kg-day Source: Distribution for consumption of fruits and vegetables combined, by children, CalTOX 1994[1]	Value: 5.43 g/kg-day Rationale: 90th percentile value for adult, times 1.008 (ratio of adult to 3- to 5-year-old consumption for all U.S. regions combined), USEPA 1997
Ingestion Rate, Vegetables	Value: 1.01 g/kg-day Rationale: 50th percentile value for adult times 1.13 (ratio of adult to 3- to 5-year-old consumption for all U.S. regions combined), USEPA 1997		Value: 5.66 g/kg-day Rationale: 90th percentile value for adult times 1.22 (ratio of adult to 3- to 5-year-old consumption for all U.S. regions combined), USEPA 1997
Fractions of fruit and vegetable local	Value: 1 Rationale: Deterministic value is for homegrown produce	Lognormal mean: 0.24 standard deviation: 0.17 Source: CalTOX 1994[1]	Value: 1 Rationale: Deterministic value is for homegrown produce

[1] CalTOX computer model version 1994.
Crystal Ball (Decisioneering, Inc., Denver, CO)

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Exposure Factors Handbook (1997), Volume 2 Page 13-14 (pdf page 464)

Table 13-12. Consumer Only Intake of Homegrown Fruits (g/kg-day) - West

Population Group	Nc wgtd	Nc unwgtd	% Consuming	Mean	SE	P1	P5	P10	P25	P50	P75	P90	P95	P99	P100
Total	4574000	233	12.68	2.62E+00	3.07E-01	1.50E-01	2.75E-01	3.33E-01	6.17E-01	1.20E+00	2.42E+00	5.39E+00	1.09E+01	2.49E+01	4.83E+01
Season															
Fall	843000	28	7.88	1.47E+00	2.49E-01	2.91E-01	2.91E-01	2.95E-01	4.83E-01	1.04E+00	2.15E+00	2.99E+00	4.65E+00	5.39E+00	5.39E+00
Spring	837000	78	10.26	1.37E+00	1.59E-01	1.73E-01	1.96E-01	2.51E-01	5.10E-01	9.81E-01	1.61E+00	2.95E+00	5.29E+00	6.68E+00	7.02E+00
Summer	1398000	44	17.51	2.47E+00	4.72E-01	1.86E-01	2.75E-01	4.04E-01	6.17E-01	1.28E+00	3.14E+00	7.26E+00	1.09E+01	1.30E+01	1.30E+01
Winter	1496000	83	16.22	4.10E+00	7.91E-01	7.14E-02	2.96E-01	3.33E-01	7.74E-01	1.51E+00	3.74E+00	1.11E+01	1.85E+01	4.83E+01	4.83E+01
Urbanization															
Central City	1494000	59	12.41	1.99E+00	4.24E-01	7.14E-02	2.35E-01	3.42E-01	5.26E-01	8.63E-01	2.04E+00	4.63E+00	9.52E+00	1.93E+01	1.93E+01
Nonmetropolitan	474000	32	7.76	2.24E+00	5.25E-01	1.84E-01	2.76E-01	4.24E-01	6.25E-01	7.68E-01	2.64E+00	4.25E+00	1.09E+01	1.09E+01	1.09E+01
Suburban	2606000	142	14.54	3.04E+00	4.63E-01	1.83E-01	2.75E-01	3.14E-01	7.10E-01	1.39E+00	3.14E+00	5.81E+00	1.03E+01	3.22E+01	4.83E+01
Response to Questionnaire															
Households who garden	4170000	207	32.77	2.76E+00	3.39E-01	1.00E-01	2.75E-01	3.14E-01	6.29E-01	1.20E+00	2.54E+00	5.81E+00	1.09E+01	2.49E+01	4.83E+01
Households who farm	795000	35	50.13	1.85E+00	2.59E-01	2.75E-01	2.76E-01	5.98E-01	7.10E-01	1.26E+00	2.50E+00	4.63E+00	5.00E+00	6.81E+00	6.81E+00

NOTE: SE = standard error
P = percentile of the distribution
Nc wgtd = weighted number of consumers; Nc unwgtd = unweighted number of consumers in survey.
Source: Based on EPA's analyses of the 1987-88 NFCS

Exposure Factors Handbook (1997), Volume 2 Page 13-17 (pdf page 468)

Table 13-17. Consumer Only Intake of Homegrown Vegetables (g/kg-day) - West

Population Group	Nc wgtd	Nc unwgtd	% Consuming	Mean	SE	P1	P5	P10	P25	P50	P75	P90	P95	P99	P100
Total	6035000	300	16.73	1.81E+00	1.38E-01	7.35E-03	9.85E-02	1.66E-01	3.79E-01	9.01E-01	2.21E+00	4.64E+00	6.21E+00	1.14E+01	1.55E+01
Seasons															
Fall	1841000	72	17.21	2.01E+00	2.93E-01	9.83E-02	1.50E-01	2.04E-01	4.81E-01	1.21E+00	2.21E+00	4.85E+00	7.72E+00	1.25E+01	1.25E+01
Spring	1192000	99	14.61	1.06E+00	1.74E-01	3.31E-03	7.35E-03	4.66E-02	1.95E-01	3.56E-01	9.08E-01	3.37E+00	5.54E+00	8.60E+00	8.60E+00
Summer	1885000	59	23.60	2.39E+00	3.71E-01	6.93E-02	1.04E-01	2.46E-01	5.45E-01	1.37E+00	3.23E+00	4.67E+00	8.36E+00	1.55E+01	1.55E+01
Winter	1117000	70	12.11	1.28E+00	1.72E-01	1.29E-02	1.52E-01	1.99E-01	4.83E-01	7.65E-01	1.43E+00	2.81E+00	5.12E+00	7.57E+00	7.98E+00
Urbanizations															
Central City	1482000	56	12.31	1.80E+00	2.76E-01	2.58E-02	7.39E-02	1.57E-01	4.81E-01	1.10E+00	2.95E+00	4.64E+00	4.85E+00	1.14E+01	1.14E+01
Nonmetropolitan	1112000	65	18.21	1.52E+00	2.24E-01	3.42E-03	9.80E-03	2.04E-01	2.69E-01	6.75E-01	2.13E+00	4.13E+00	5.12E+00	8.16E+00	8.16E+00
Suburban	3441000	179	19.20	1.90E+00	1.98E-01	1.29E-02	1.04E-01	1.52E-01	3.94E-01	9.32E-01	2.20E+00	4.63E+00	7.98E+00	1.25E+01	1.55E+01
Response to Questionnaire															
Households who garden	5402000	276	42.45	1.91E+00	1.04E-03	8.53E-03	1.04E-01	1.66E-01	4.33E-01	1.07E+00	2.37E+00	4.67E+00	6.21E+00	1.25E+01	1.55E+01
Households who farm	957000	48	60.34	2.73E+00	3.32E-03	1.17E-01	4.14E-01	4.69E-01	7.65E-01	1.42E+00	3.27E+00	6.94E+00	1.09E+01	1.55E+01	1.55E+01

NOTE: SE = standard error
P = percentile of the distribution
Nc wgtd = weighted number of consumers; Nc unwgtd = unweighted number of consumers in survey.
Source: Based on EPA's analyses of the 1987-88 NFCS

TABLE C-1-2

COPC INTAKE FROM PRODUCE

Description
This equation calculates the daily intake of COPC from ingestion of exposed aboveground, protected aboveground, and belowground produce. The consumption rate varies for children and adults, and for the type of produce. The concentration in exposed aboveground, protected aboveground, and belowground produce will also vary with each scenario location. Consumption rates were derived from the *Exposure Factors Handbook* (U.S. EPA 1997). U.S. EPA (1997) presents consumption rates based on body weight; therefore, body weight is not included as a variable in the calculation of I_{ag}. Uncertainties associated with this equation include the following: (1) The amount of produce intake is assumed to be constant and representative of the exposed population. This assumption may under- or overestimate I_{ag}. (2) The standard assumptions regarding period exposed may not be representative of any actual exposure situation. This assumption may under- or overestimate I_{ag}.
Equation
$$I_{ag} = [((Pd + Pv + Pr) \cdot CR_{ag}) + (Pr \cdot CR_{pp}) + (Pr_{bg} \cdot CR_{bg})] \cdot F_{ag}$$

Variable	Description	Units	Value
I_{ag}	Daily intake of COPC from produce	mg/kg-day DW	
Pd	Aboveground exposed produce concentration due to direct (wet and dry) deposition onto plant surfaces	mg/kg	**Varies** This variable is COPC- and site-specific, and is calculated by using the equation in Table B-2-7. Uncertainties associated with this variable include the following: (1) The calculation of *kp* values does not consider chemical degradation processes. Inclusion of chemical degradation processes would decrease the amount of time that a chemical remains on plant surfaces (half-time) and thereby may increase *kp* values. *Pd* decreases with increased *kp* values. Reduction of half-time from the assumed 14 days to 2.8 days, for example, would decrease *Pd* about five-fold. (2) The calculation of other parameter values (for example, *Fw* and *Rp*) is based directly or indirectly on studies of vegetation other than aboveground produce (primarily grasses). Uncertainty is introduced to the extent that the calculated parameter values do not accurately represent aboveground produce-specific values.

Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume Three Appendix C (pdf page 350).

TABLE C-1-2

COPC INTAKE FROM PRODUCE

Variable	Description	Units	Value
CR_{ag}; CR_{pp}; CR_{bg}	Consumption rate of aboveground, protected aboveground, and belowground produce, respectively	kg/kg-day DW	This variable is site-specific. The recommended default values represent the total of the following produce-specific ingestion rates: Plant Type / Receptor / Ingestion Rate (kg/kg-day DW) Exposed Aboveground Produce (Cr_{ag}) / Adult / 0.0003 Child / 0.00042 Protected Aboveground Produce (Cr_{pp}) / Adult / 0.00057 Child / 0.00077 Belowground Produce (Cr_{bg}) / Adult / 0.00014 Child / 0.00022 Ingestion rates were derived from U.S. EPA (1997), Tables 13-61 and 13-65. The ingestion rates listed in U.S. EPA (1997) are derived from the 1987-1988 USDA National Food Consumption Survey and may be used to assess exposure to contaminants in foods grown, raised, or caught at a specific site. The ingestion rates were adjusted for cooking and preparation loss as recommended by U.S. EPA (1997). The average preparation and cooking loss used for exposed vegetables was 15.8 percent (U.S. EPA 1997). However, it is assumed that no preparation and cooking loss occurs with exposed fruits because it is further assumed the fruit is eaten in the raw form. In addition, ingestion rates for the child receptor represent a time-weighted mean from the respective tables. Uncertainty associated with this variable include the following: The recommended ingestion rates are based on national average home produced consumption rates. Site-specific ingestion rates may be higher or lower than those recommended. Therefore, use of the recommended ingestion rates may under- or overestimate I_{ag}.

Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume Three Appendix C (pdf page 352).

Table 13-61. Consumer Only Intake of Homegrown Exposed Fruit (g/kg-day)

Population Group	Nc wgtd	Nc unwgtd	% Consuming	Mean	SE	P1	P5	P10	P25	P50	P75	P90	P95	P99	P100
Total	11770000	679	6.26	1.49E+00	8.13E-02	4.41E-02	1.37E-01	2.55E-01	4.46E-01	8.33E-01	1.70E+00	3.16E+00	4.78E+00	1.20E+01	3.25E+01
Age															
01-02	306000	19	5.37	*	*	*	*	*	*	*	*	*	*	*	*
03-05	470000	30	5.80	2.60E+00	7.78E-01	0.00E+00	0.00E+00	3.73E-01	1.00E+00	1.82E+00	2.64E+00	5.41E+00	6.07E+00	3.25E+01	3.25E+01
06-11	915000	68	5.48	2.52E+00	4.24E-01	0.00E+00	1.71E-01	3.73E-01	6.19E-01	1.11E+00	2.91E+00	6.98E+00	1.17E+01	1.57E+01	1.59E+01
12-19	896000	50	4.37	1.33E+00	2.06E-01	8.46E-02	1.23E-01	2.58E-01	4.04E-01	6.09E-01	2.27E+00	3.41E+00	4.78E+00	5.90E+00	5.90E+00
20-39	2521000	139	4.09	1.09E+00	1.44E-01	7.93E-02	1.30E-01	1.67E-01	3.04E-01	6.15E-01	1.07E+00	2.00E+00	3.58E+00	1.29E+01	1.29E+01
40-69	4272000	247	7.53	1.25E+00	1.10E-01	6.46E-02	1.64E-01	2.54E-01	4.39E-01	7.19E-01	1.40E+00	2.61E+00	3.25E+00	1.30E+01	1.30E+01
70 +	2285000	118	14.39	1.39E+00	1.17E-01	4.41E-02	2.07E-01	2.82E-01	5.71E-01	9.57E-01	1.66E+00	3.73E+00	4.42E+00	5.39E+00	7.13E+00
Season															
Fall	2877000	100	6.04	1.37E+00	1.16E-01	2.59E-01	2.91E-01	3.42E-01	5.43E-01	1.03E+00	1.88E+00	2.88E+00	4.25E+00	5.41E+00	5.41E+00
Spring	2466000	265	5.34	1.49E+00	1.51E-01	8.91E-02	1.98E-01	2.54E-01	4.32E-01	8.56E-01	1.65E+00	2.91E+00	4.67E+00	8.27E+00	3.25E+01
Summer	3588000	122	7.89	1.75E+00	2.50E-01	0.00E+00	8.66E-02	1.30E-01	3.89E-01	6.41E-01	1.76E+00	4.29E+00	6.12E+00	1.30E+01	1.57E+01
Winter	2839000	192	5.83	1.27E+00	1.06E-01	4.15E-02	1.04E-01	2.31E-01	4.59E-01	8.29E-01	1.55E+00	2.61E+00	4.66E+00	8.16E+00	1.13E+01
Urbanization															
Central City	2552000	99	4.53	1.34E+00	1.98E-01	4.41E-02	1.01E-01	2.59E-01	4.46E-01	8.63E-01	1.60E+00	2.37E+00	2.88E+00	1.30E+01	1.30E+01
Nonmetropolitan	3891000	269	8.64	1.78E+00	1.67E-01	6.46E-02	1.04E-01	1.67E-01	4.15E-01	9.42E-01	1.94E+00	4.07E+00	5.98E+00	1.57E+01	3.25E+01
Suburban	5267000	309	6.08	1.36E+00	9.00E-02	9.18E-02	2.07E-01	2.93E-01	4.69E-01	7.73E-01	1.65E+00	3.16E+00	4.67E+00	7.29E+00	1.29E+01
Race															
Black	250000	12	1.15	*	*	*	*	*	*	*	*	*	*	*	*
White	11411000	663	7.24	1.51E+00	8.33E-02	6.49E-02	1.55E-01	2.59E-01	4.49E-01	8.56E-01	1.72E+00	3.31E+00	4.78E+00	1.20E+01	3.25E+01
Region															
Midwest	4429000	293	9.55	1.60E+00	1.42E-01	4.41E-02	1.25E-01	2.23E-01	4.23E-01	8.78E-01	1.88E+00	3.58E+00	4.78E+00	1.20E+01	3.25E+01
Northeast	1219000	69	2.96	7.55E-01	1.18E-01	8.08E-02	8.66E-02	1.65E-01	3.00E-01	4.74E-01	7.84E-01	1.39E+00	2.86E+00	5.21E+00	7.13E+00
South	2532000	141	3.94	1.51E+00	1.84E-01	7.93E-02	2.32E-01	3.01E-01	5.08E-01	9.16E-01	1.63E+00	2.63E+00	5.98E+00	1.57E+01	1.57E+01
West	3530000	174	9.79	1.60E+00	1.43E-01	1.00E-01	2.40E-01	3.17E-01	5.69E-01	9.57E-01	1.97E+00	3.72E+00	5.00E+00	1.30E+01	1.30E+01
Response to Questionnaire															
Households who garden	10197000	596	14.96	1.55E+00	9.12E-02	4.15E-02	1.58E-01	2.58E-01	4.49E-01	8.78E-01	1.73E+00	3.41E+00	5.00E+00	1.29E+01	3.25E+01
Households who farm	1917000	112	26.16	2.32E+00	2.50E-01	7.21E-02	2.76E-01	3.71E-01	6.81E-01	1.30E+00	3.14E+00	5.00E+00	6.12E+00	1.57E+01	1.57E+01

* Intake data not provided for subpopulations for which there were less than 20 observations

NOTE: SE = standard error
P = percentile of the distribution
Nc wgtd = weighted number of consumers; Nc unwgtd = unweighted number of consumers in survey.

Source: Based on EPA's analyses of the 1987-88 NFCS

Table 13-65. Consumer Only Intake of Homegrown Root Vegetables (g/kg-day)

Population Group	Nc wgtd	Nc unwgtd	% Consuming	Mean	SE	P1	P5	P10	P25	P50	P75	P90	P95	P99	P100
Total	13750000	743	7.31	1.16E+00	5.84E-02	4.72E-03	3.64E-02	1.12E-01	2.51E-01	6.66E-01	1.47E+00	2.81E+00	3.71E+00	9.52E+00	1.28E+01
Age															
01-02	371000	22	6.51	2.52E+00	6.10E-01	1.66E-01	1.66E-01	2.19E-01	3.59E-01	9.20E-01	3.67E+00	7.25E+00	1.04E+01	1.04E+01	1.04E+01
03-05	390000	23	4.81	1.28E+00	3.24E-01	0.00E+00	0.00E+00	1.17E-01	2.25E-01	4.62E-01	1.68E+00	4.26E+00	4.73E+00	4.73E+00	4.73E+00
06-11	1106000	67	6.62	1.32E+00	2.14E-01	0.00E+00	1.39E-02	3.64E-02	2.32E-01	5.23E-01	1.63E+00	3.83E+00	5.59E+00	7.47E+00	7.47E+00
12-19	1465000	76	7.15	9.37E-01	1.19E-01	7.59E-03	8.00E-03	6.84E-02	2.69E-01	5.65E-01	1.37E+00	2.26E+00	3.32E+00	5.13E+00	5.13E+00
20-39	3252000	164	5.28	8.74E-01	7.39E-02	1.21E-02	5.35E-02	9.93E-02	2.00E-01	5.64E-01	1.24E+00	2.11E+00	3.08E+00	4.64E+00	6.03E+00
40-69	4903000	276	8.64	1.13E+00	9.86E-02	3.34E-03	3.29E-02	1.17E-01	2.51E-01	6.75E-01	1.27E+00	2.74E+00	3.56E+00	9.52E+00	1.28E+01
70 +	2096000	107	13.20	1.22E+00	1.02E-01	1.73E-02	2.90E-02	1.69E-01	3.76E-01	8.51E-01	1.71E+00	2.86E+00	3.21E+00	4.01E+00	4.77E+00
Season															
Fall	4026000	153	8.45	1.42E+00	1.53E-01	5.15E-02	1.38E-01	1.72E-01	3.09E-01	9.20E-01	1.67E+00	3.26E+00	3.85E+00	1.23E+01	1.28E+01
Spring	2552000	260	5.53	6.87E-01	6.08E-02	3.34E-03	1.73E-02	3.00E-02	1.44E-01	3.65E-01	7.69E-01	1.69E+00	2.80E+00	4.24E+00	7.69E+00
Summer	5011000	169	11.02	1.19E+00	1.20E-01	0.00E+00	4.76E-02	1.32E-01	2.77E-01	7.26E-01	1.51E+00	2.74E+00	3.64E+00	1.04E+01	1.19E+01
Winter	2161000	161	4.44	1.17E+00	1.19E-01	3.23E-03	8.57E-03	4.34E-02	2.38E-01	5.57E-01	1.56E+00	3.08E+00	4.14E+00	6.21E+00	1.13E+01
Urbanization															
Central City	2385000	96	4.23	7.49E-01	8.40E-02	2.68E-02	3.90E-02	1.43E-01	2.23E-01	4.26E-01	9.16E-01	1.91E+00	2.70E+00	3.56E+00	3.93E+00
Nonmetropolitan	6094000	366	13.54	1.43E+00	9.81E-02	8.57E-03	6.87E-02	1.29E-01	2.78E-01	7.58E-01	1.85E+00	3.32E+00	4.24E+00	1.13E+01	1.28E+01
Suburban	5211000	279	6.02	1.06E+00	8.62E-02	3.73E-03	1.21E-02	7.17E-02	2.32E-01	7.34E-01	1.19E+00	2.34E+00	3.26E+00	6.29E+00	1.19E+01
Race															
Black	521000	31	2.40	8.83E-01	3.93E-01	4.72E-03	9.28E-03	3.64E-02	8.82E-02	5.42E-01	7.65E-01	1.06E+00	1.25E+00	1.23E+01	1.23E+01
White	12861000	697	8.16	1.18E+00	5.97E-02	7.79E-03	4.58E-02	1.29E-01	2.61E-01	6.80E-01	1.50E+00	2.82E+00	3.72E+00	9.52E+00	1.28E+01
Region															
Midwest	5572000	314	12.01	1.31E+00	9.54E-02	3.37E-02	7.48E-02	1.66E-01	2.69E-01	7.39E-01	1.67E+00	3.23E+00	4.26E+00	1.04E+01	1.19E+01
Northeast	1721000	92	4.18	8.38E-01	1.03E-01	3.23E-03	7.79E-03	8.69E-03	1.43E-01	4.81E-01	1.18E+00	2.05E+00	2.77E+00	4.78E+00	6.03E+00
South	3842000	205	5.97	1.38E+00	1.38E-01	1.10E-02	5.35E-02	1.32E-01	2.77E-01	6.90E-01	1.70E+00	3.32E+00	3.83E+00	1.23E+01	1.28E+01
West	2555000	130	7.08	7.68E-01	6.43E-02	4.72E-03	2.24E-02	1.14E-01	2.38E-01	5.70E-01	9.77E-01	1.69E+00	2.45E+00	3.72E+00	3.72E+00
Response to Questionnaire															
Households who garden	12578000	682	18.46	1.15E+00	5.72E-02	4.79E-03	3.64E-02	1.17E-01	2.58E-01	6.74E-01	1.50E+00	2.81E+00	3.64E+00	7.47E+00	1.28E+01
Households who farm	2367000	136	32.30	1.39E+00	1.26E-01	1.11E-01	1.58E-01	1.84E-01	3.65E-01	8.83E-01	1.85E+00	3.11E+00	4.58E+00	7.47E+00	7.69E+00

NOTE: SE = standard error
P = percentile of the distribution
Nc wgtd = weighted number of consumers; Nc unwgtd = unweighted number of consumers in survey.
Source: Based on EPA's analyses of the 1987-88 NFCS

TABLE A-1. DEFAULT PROPOSED INTAKE RATE

	IR Farmer Child (FW)	IR Farmer Adult (FW)	IR Resident Child (FW)	IR Resident Adult (FW)	IR Farmer Child (CPW)	IR Farmer Adult (CPW)	IR Resident Child (CPW)	IR Resident Adult (CPW)
Apples[3]	82.9	84.7	72.2	73.7	43.0	43.9	37.4	38.2
Citrus Fruits[3]	194.4	309.4	194.1	309.4	100.6	160.4	100.6	160.4
Berries[3]	23.9	35.4	23.9	35.4	12.4	18.3	12.4	18.3
Peaches	99.3	103.1	111.4	115.7	51.5	53.5	57.7	60.0
Pears	76.9	59.9	66.7	51.9	39.9	31.1	34.6	26.9
Strawberry	25.3	40.5	25.3	40.5	13.1	21.0	13.1	21.0
Total Fruit	502.3	633.1	493.5	626.7	260.5	328.2	255.8	324.9
Asparagus	12.0	39.3	12.0	39.3	8.2	26.8	8.2	26.8
Beets	3.9	33.9	3.9	33.9	2.7	23.2	2.7	23.2
Broccoli	14.4	35.3	13.1	32.0	9.9	24.1	8.9	21.9
Cabbage[3]	11.5	85.7	12.3	92.1	7.8	58.6	8.4	62.9
Carrots	13.3	24.4	14.9	27.3	9.1	16.6	10.2	18.7
Corn	32.7	82.0	23.8	59.8	22.3	56.0	16.3	40.9
Cucumbers	16.9	54.9	25.4	82.4	11.5	37.5	17.3	56.3
Lettuce[3]	4.2	37.5	4.2	37.5	2.9	25.6	2.9	25.6
Lima Beans[2]	6.5	33.8	6.5	33.8	4.5	23.1	4.5	23.1
Okra[2]	5.3	30.2	5.3	30.2	3.6	20.7	3.6	20.7
Onions	7.2	27.2	5.8	21.8	4.9	18.6	4.0	14.9
Peas	28.7	31.7	32.1	35.4	19.6	21.7	21.9	24.2
Pumpkins[2]	45.2	64.8	45.2	64.8	30.9	44.2	30.9	44.2
Snap Beans[2]	27.5	54.2	27.3	53.9	18.8	37.0	18.7	36.8
Tomatoes	34.9	94.2	29.7	80.3	23.8	64.4	20.3	54.8
White Potatoes[3]	57.3	141.8	51.7	127.8	39.1	96.9	35.3	87.3
Total Vegetables	321.7	870.9	313.4	852.3	249.6	595.1	214.1	582.4
Dairy	994.7	676.4	n/a	n/a	n/a	n/a	n/a	n/a
Beef	62.8	165.3	n/a	n/a	31.1	81.7	n/a	n/a
Swine	33.7	92.5	n/a	n/a	16.6	45.7	n/a	n/a
Poultry	46.9	107.4	n/a	n/a	23.2	53.1	n/a	n/a
Egg	31.7	59.6	n/a	n/a	n/a	n/a	n/a	n/a
Fish	57.4	831.8	n/a	n/a	35.2	509.9	n/a	n/a
Total Meat and Dairy	1227.2	1933.0			106.0	690.4		

1. All intake rates are given in g/day.
2. Data taken from EFH 1997 because it was not available in EFH 2011.
3. **Apples:** with/without peel & crabapples. **Citrus:** all **Berries**: blackberry, blueberry, boysenberry, cranberry, elderberry, loganberry, mulberry, & raspberry (other than strawberry). **Cabbage:** brussel sprout, red, savoy, & Chinese celery (bok choy). **Lettuce:** whole, iceberg, & romaine. **White Potatoes:** peeled/whole.

Biota Modeling in EPA's Preliminary Remediation Goal and Dose Compliance Concentration Calculators for Use in EPA Superfund Risk Assessment, 2016 Appendix A page A-8 (pdf page 29).

IRW_c	Drinking Water Ingestion Rate - Child (L/day)	1	U.S. EPA 1989 (Exhibit 6-11)
IRW_a	Drinking Water Ingestion Rate - Adult (L/day)	2	U.S. EPA 1989 (Exhibit 6-11)
IFW_{adj}	Drinking Water Ingestion Rate - Age-adjusted (L-year/kg-day)	1.086	Calculated using the age-adjusted intake factors equation
$IFWM_{adj}$	Mutagenic Drinking Water Ingestion Rate - Age-adjusted (L-year/kg-day)	3.39	Calculated using the age-adjusted intake factors equation
IFW_{rec}	Recreation Water Ingestion Rate (L/hr)	0.05	U.S. EPA Region 4
IRF_a	Fish Ingestion Rate (g/day)	54	U.S. EPA 1991a (pg. 15)
IR_{ow}	Soil Ingestion Rate - outdoor worker (mg/day)	100	U.S. EPA 2001 (pg. 4-3)
IR_{iw}	Soil Ingestion Rate - indoor worker (mg/day)	50	U.S. EPA 1991a (pg. 15)
IR_{ew}	Soil Ingestion Rate - excavation/construction worker (mg/day)	330	U.S. EPA 2002
IRP_{fr-c}	Produce Ingestion Rate - Fruit - Child (mg/day)	14.8×10^3	U.S. EPA 1997a (Table 13-61). U.S. EPA 1998 (Table C-1-2)
IRP_{fr-a}	Produce Ingestion Rate - Fruit - Adult (mg/day)	56.2×10^3	U.S. EPA 1997a (Table 13-61). U.S. EPA 1998 (Table C-1-2)
IRP_{fr-adj}	Produce Ingestion Rate - Fruit - Age-adjusted (mg-year/kg-day)	25.2×10^3	Calculated using the aged adjusted intake factors equation
IRP_{vg-c}	Produce Ingestion Rate - Vegetables - Child (mg/day)	10.4×10^3	U.S. EPA 1997a (Table 13-61). U.S. EPA 1998 (Table C-1-2)
IRP_{vg-a}	Produce Ingestion Rate - Vegetables - Adult (mg/day)	28.5×10^3	U.S. EPA 1997a (Table 13-61). U.S. EPA 1998 (Table C-1-2)
IRP_{vg-adj}	Produce Ingestion Rate - Vegetables - Age-adjusted (mg-year/kg-day)	13.9×10^3	Calculated using the aged adjusted intake factors equation
IRM_c	Milk Ingestion Rate - Child (mg/day)	265×10^3	U.S. EPA 1997a (Table 13-28). U.S. EPA 1998 (Table C-1-3)
IRM_a	Milk Ingestion Rate - Adult (mg/day)	615×10^3	U.S. EPA 1997a (Table 13-28). U.S. EPA 1998 (Table C-1-3)
IRM_{adj}	Milk Ingestion Rate - Age-adjusted (mg-year/kg-day)	317×10^3	Calculated using the aged adjusted intake factors equation
IRB_c	Beef Ingestion Rate - Child (mg/day)	12.9×10^3	U.S. EPA 1997a (Table 13-28). U.S. EPA 1998 (Table C-1-3)
IRB_a	Beef Ingestion Rate - Adult (mg/day)	138×10^3	U.S. EPA 1997a (Table 13-28). U.S. EPA 1998 (Table C-1-3)
IRB_{adj}	Beef Ingestion Rate - Age-adjusted (mg-year/kg-day)	52.5×10^3	Calculated using the aged adjusted intake factors equation
Irr_{rup}	root uptake from irrigation multiplier (L/kg)	contaminant-specific	Calculated
Irr_{res}	resuspension from irrigation multiplier (L/kg)	contaminant-specific	Calculated
Irr_{dep}	aerial deposition from irrigation multiplier (L/kg)	contaminant-specific	Calculated
R_{upp}	dry root uptake for pasture multiplier (unitless)	$=BV_{dry}$	
R_{upv}	wet root uptake for vegetables multiplier (unitless)	$=BV_{wet}$	
Q_{p-b}	Beef Fodder Intake Rate (kg/day)	11.77	U.S. EPA 1999a (pg 10-23). U.S. EPA 1997b.
Q_{p-m}	Dairy Fodder Intake Rate (kg/day)	16.9	U.S. EPA 1999a (pg 10-23). U.S. EPA 1997b.
$Q_{w-dairy}$	Dairy Water Intake Rate (kg/day)	92	U.S. EPA 1999a (pg 10-23).
Q_{w-beef}	Beef Water Intake Rate (kg/day)	53	U.S. EPA 1999a (pg 10-23).
Q_{s-m}	Dairy Soil Intake Rate (kg/day)	0.41	U.S. EPA 1999a (pg 10-23). U.S. EPA 1997b.
Q_{s-b}	Beef Soil Intake Rate (kg/day)	0.39	U.S. EPA 1999a (pg 10-23). U.S. EPA 1997b.
f_{p-b}	fraction of year animal is on site (unitless)	1	
f_{p-m}	fraction of year animal is on site (unitless)	1	
f_{s-b}	fraction of animal's food is from site (unitless)	1	
f_{s-m}	fraction of animal's food is from site (unitless)	1	
F_m	Milk Transfer Factor (day/kg)	Contaminant-specific	ANL. 1993. NCRP 1996.
F_b	Beef Transfer Factor (day/kg)	Contaminant-specific	ANL. 1993. NCRP 1996.
BCF	Fish Bioconcentration Factor (L/kg)	Contaminant-specific	
CF_p	Fraction of Produce Consumed that is Contaminated	1	U.S. EPA 1998
CF_m	Fraction of Milk Consumed that is Contaminated	1	U.S. EPA 1998
CF_b	Fraction of Beef Consumed that is Contaminated	1	U.S. EPA 1998
I_r	Irrigation rate (L/m^2-day)	3.62	Personnal communication
F	irrigation period (unitless)	0.25 (based on 3 months per year)	Personnal communication
λ_B	effective rate for removal (1/day)	$\lambda_i + \lambda_{HL}$	NCRP 1989
λ_E	decay for removal on produce (1/day)	$\lambda_i + (0.693/t_w)$	NCRP 1989
λ_{HL}	soil leaching rate (1/day)	0.000027	NCRP 1989
λ_i	decay (1/day)	$0.693/T_R$ - radionuclides, 0 - non-radionuclides	NCRP 1989

Attachment 2

Southern California Federation of Scientists

FAILURE TO DISCLOSE HOW MUCH CONTAMINATED SOIL WON'T BE CLEANED UP UNDER THE PEIR PROPOSALS AND THE ENVIRONMENTAL EFFECTS THERFROM

Abstract

Under the California Environmental Quality Act (CEQA), an Environmental Impact Report is supposed to clearly describe the proposed project and alternatives and thoroughly examine environmental impacts associated with them. Unfortunately, the authors of the draft Program Environmental Impact Report (PEIR) for the cleanup of the Santa Susana Field Laboratory (SSFL) appear to have taken pain to do precisely the opposite, failing to disclose what is proposed to be cleaned up and what, in violation of past promises and longstanding requirements, is proposed to not be cleaned up.

In the face of this extraordinary failure of disclosing that which is central to the proposed project—how much contamination would not get cleaned up and the environmental impacts that would arise from that pollution—we here have tried to provide a rough approximation. It would appear that DTSC is contemplating leaving in place as much as two-thirds of the DOE and NASA contamination, despite the prohibition on "leave in place" alternatives in the Administrative Orders on Consent. Even were the amount less than that, say 25%, it would still involve walking away from cleaning up hundreds of thousands of cubic yards of contaminated soil. As to Boeing, the PEIR fails to disclose even how much contamination there is in Boeing's areas, let alone what percentage of it is proposed to be not cleaned up. Our best estimates from available information are that between 91% and 98% would not be cleaned up.

The PEIR not only fails to disclose how much contamination is proposed to not be cleaned up, it doesn't disclose what particular contaminants at what concentrations. There is thus no analysis to show how far above risk based levels of pollutants these exempted areas would be, either in terms of protecting human health or ecological receptors. It is clear, however, that what DTSC contemplates is leaving very large amounts of contamination at levels far above levels that pose unacceptable risks to health and to biological receptors. Ironically, DTSC is claiming protection of ecological features as one of its bases for violating its cleanup promises and allowing contamination to stay in place at levels far above levels deemed to harm those very biological receptors.

The failure to disclose how much contamination is proposed to not be cleaned up, or analyze the environmental impacts from, is a fundamental flaw.

How Much DOE and NASA Contamination Won't Get Cleaned Up

For the DOE and NASA portions of SSFL, the draft PEIR fails to disclose how much contaminated soil is proposed to not be cleaned up pursuant to purported biological exceptions, cultural exceptions, and the use of monitored natural attenuation. (The first two appear to far exceed those allowed under the Administrative Orders on Consent, and, as DTSC itself said in its comments on DOE's draft Environmental Impact Statement, monitored natural attenuation would violate the AOCs' prohibition on "leave in place" alternatives.)

What specific contaminants exist in the locations that would not get cleaned up, what their concentrations are, and how those concentrations compare to the relevant risk based screening levels (e.g., the SRAM[1]-based suburban garden, an accurate rural residential standard,[2] and Ecological RBSLs based on levels that cause no harm to biological receptors) is also not disclosed. Furthermore, there is no analysis whatsoever of the adverse public health or environmental effects from choosing to not remediate the radioactive or toxic chemical contamination in those locations. Critically, the PEIR spends many pages asserting potential harm to biological features from the cleanup, and therefore proposing to exempt large amounts of land from cleanup, but there is no evaluation whatsoever comparing the levels of contaminants that would be left behind to the RBSLs that are to represent levels that cause no harm to those same biological receptors. Were such a comparison made, it would be clear that the proposals to leave in place contamination would harm those ecological receptors.

One is thus left with only the very rough ability to estimate how much contaminated soil would not get cleaned up in the DOE and NASA areas were the approach in the PEIR taken (one which, as indicated above, violates the AOCs.) PEIR Figure 1-4 shows the proposed remediation areas. Area IV is the DOE Area, Area II and the small portion of Area I at the northern boundary are NASA areas.

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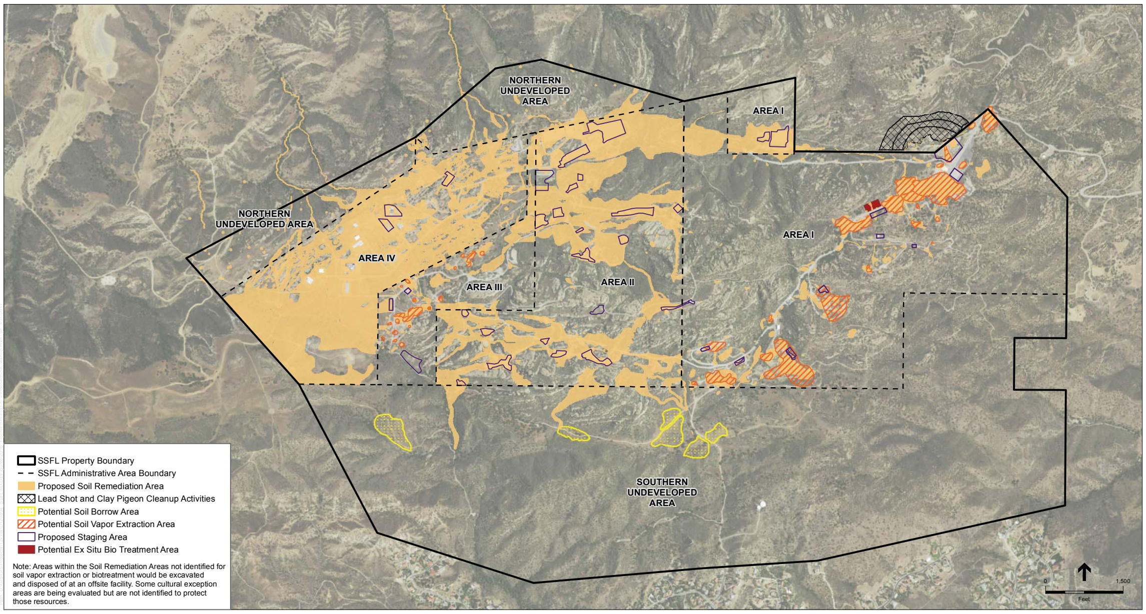
[1] Standardized Risk Assessment Methodology Rev. 2 Update

[2] The PEIR Appendix B Rural Residential RBSLs are far too high (nonprotective) because of the use of erroneous and extremely small assumed homegrown produce ingestion rates.



SOURCE: ESA 2016; Boeing 2016; DOE 2012; NASA 2016

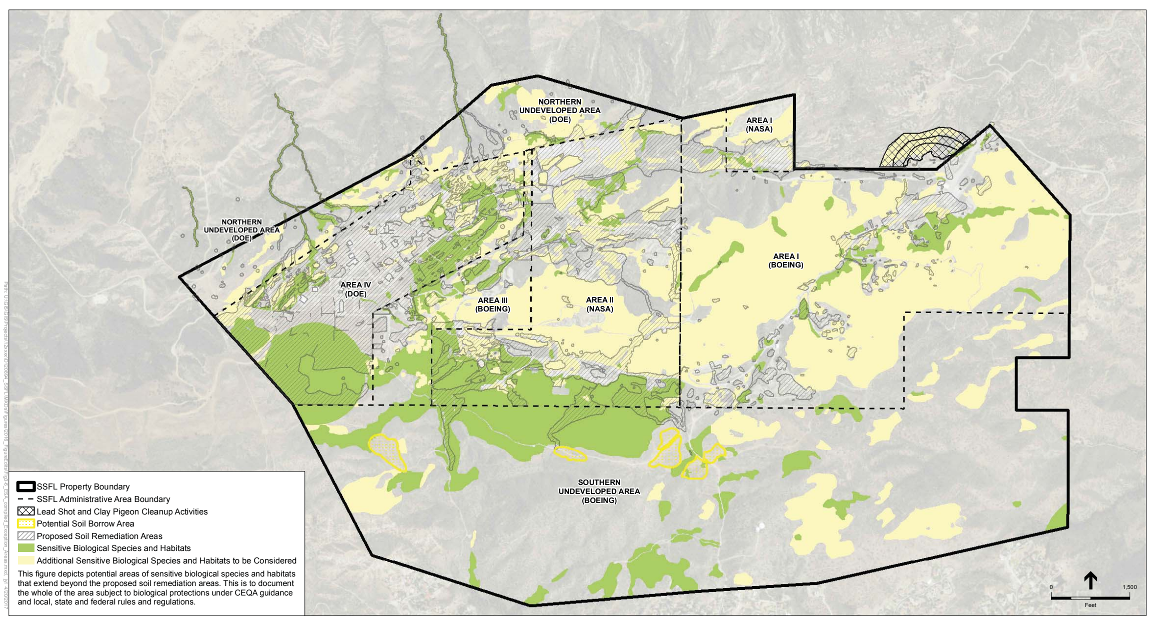
Santa Susana Field Laboratory.120894
Figure 1-4
Proposed Soil Cleanup Areas

Figure 1-5, reproduced below, identifies possible biological exception areas. No basis is given for the claims, no detail provided, and the source documents cited have not been made available (let alone even given full titles) so there is no ability to independently check the claims or no quantifiable amounts are disclosed. No justification is provided as to why these proposed exceptions do not go far beyond the narrow one allowed in the AOCs. Additionally, no explanation is provided about the distinction, if any, between the green and yellow areas marked for possible biological exceptions.

However, it would appear that roughly half of the NASA and DOE areas requiring remediation are being considered for biological exemptions that go far beyond those specified in the AOCs. That does not consider additional unspecified amounts of contaminated land that the PEIR indicates are being proposed for indeterminate cultural exemptions or for monitored natural attenuation. Taken together, significantly more than half of the contamination might be left in place, in violation of the AOCs. The amount of soil that wouldn't get cleaned up from just claimed monitored natural attenuation is not disclosed in the PEIR. A "placeholder" estimate for DOE alone is given at 150,000 cubic yards. Assuming a similar exception for NASA, that would represent an additional ~15% of the total contamination being left in place, in violation of the AOCs. And the claimed cultural exemptions also aren't disclosed or even estimated. Thus the biological, cultural, and monitored natural attenuation proposed exemptions could readily result in two-thirds or more of the contaminated soil not getting cleaned up and just left in place, contrary to the AOCs.

Even if the percentage were smaller, there is so much contaminated soil that very large amounts of contamination are obviously being contemplated to not be cleaned up, contrary to the AOCs.

(If the amount not to be cleaned up were, say, 25%, that would still be half a million cubic yards of contaminated soil that would not be cleaned up. The PEIR does not disclose what is proposed at all, hiding the amounts of soil proposed to not be cleaned up and the specific contaminants and their concentrations that would thus remain. It also completely fails to perform any analysis of the impacts of thus breaching the AOCs and leaving the contamination not cleaned up—e.g., how far above the SRAM-based suburban residential garden or the lowest EcoRBSLs the contamination that remains would be. It should be noted that none of the exemptions contemplated is based on the degree of contamination, so very high levels of contamination could end up eliminated from cleanup. Claiming the need to protect biological features from cleanup rather than from plutonium-238 and -239, strontium-90, cesium-137, perchlorate, VOCs, PCBs, heavy metals, dioxins, etc., risks which aren't even analyzed, is a complete failure of CEQA obligations and of a scientifically defensible environmental review. Exempting from cleanup radioactive and toxic chemical contamination required by the AOCs to be cleaned up and failing to disclose how much or what levels or how they exceed public health risk levels similarly violates both CEQA and scientific norms.



SOURCE: DOE 2012; Boeing/MWH 2016; USFWS 2016; ESA 2016

Santa Susana Field Laboratory.120894
Figure 1-5
Potential AOC Exceptions Areas

<u>How Much Boeing Contamination Won't Get Cleaned Up</u>

In Appendix K of the PEIR, one finds estimates of cleanup acreage and soil volumes based upon three scenarios. The weakest scenario, Residential without Garden, estimates that of the 791 SSFL acres of which Boeing is responsible, excluding the Southern Undeveloped area, only 37.5

acres would be remediated.[3] The second scenario, what is claimed is residential with a home garden that supposedly provides 25% of the residents' produce (but actually isn't, as SCFS demonstrates in a separate paper included in its PEIR comments), is estimated to result in 56 acres that would be remediated. According to footnote D on table 1-2, this is the most protective cleanup that DTSC is willing to consider.[4] As discussed in the separate SCFS paper, the PEIR grossly misrepresents the suburban residential Risk Based Screening Levels (RBSLs), using standards dozens of times less protective than the true suburban residential RBSL with backyard garden.

DTSC had committed in 2010 that even were there no Administrative Orders on Consent (as there are for DOE and NASA), and even were there no SB990 (a state law specific to SSFL that was struck down), DTSC's normal requirements require use of the strictest standard, the agricultural, because that use is allowed by Ventura County General Plan and zoning. DTSC said the agricultural standard would result in a cleanup to background, equivalent to the AOC requirements. But the PEIR in general and Appendix K in particular break those commitments and do not evaluate cleanup to background, to the agricultural standard, or to the AOC levels.

A key failure of the PEIR is that it fails to provide data as to how much soil is chemically and radioactively contaminated, nor what fraction of the contaminated soil would not get cleaned up under its proposed maximum cleanup. One cannot evaluate the environmental impacts of not cleaning up large amounts of contamination if one doesn't disclose how much contamination one is proposing to not clean up.

We here attempt to estimate these critical missing numbers. In Table 1-2 of the PEIR, it is estimated that 219 out of a total of 290 acres of Area IV are contaminated and in need of remediation—i.e., 75% of Area IV is contaminated. Considering that while Area IV was primarily used for nuclear work, but radioactive contamination is a small percentage of the overall contamination in Area IV, and Boeing's areas were engaged in heavy rocket testing work and significant contamination from decades of open-air burning of toxic chemicals in the Area I burnpit, with subsequent fallout of the airborne contamination, there is no reason to assume that the percentage of Boeing's areas that are contaminated is any less than that for DOE's.

Assuming that the DOE estimate is correct[5] and also that the percentage of Boeing's operational areas that is contaminated is similar to DOE's, the data suggest that ~593 acres out of the total of 791 acres of Boeing land in Areas I and III are contaminated. However, the PEIR proposes that a maximum of only 56 of the 593 contaminated acres would receive remediation. This would mean only 9% of contaminated soil would be removed, at best. leaving 91% to continue to place at risk the ecosystem and surrounding communities.

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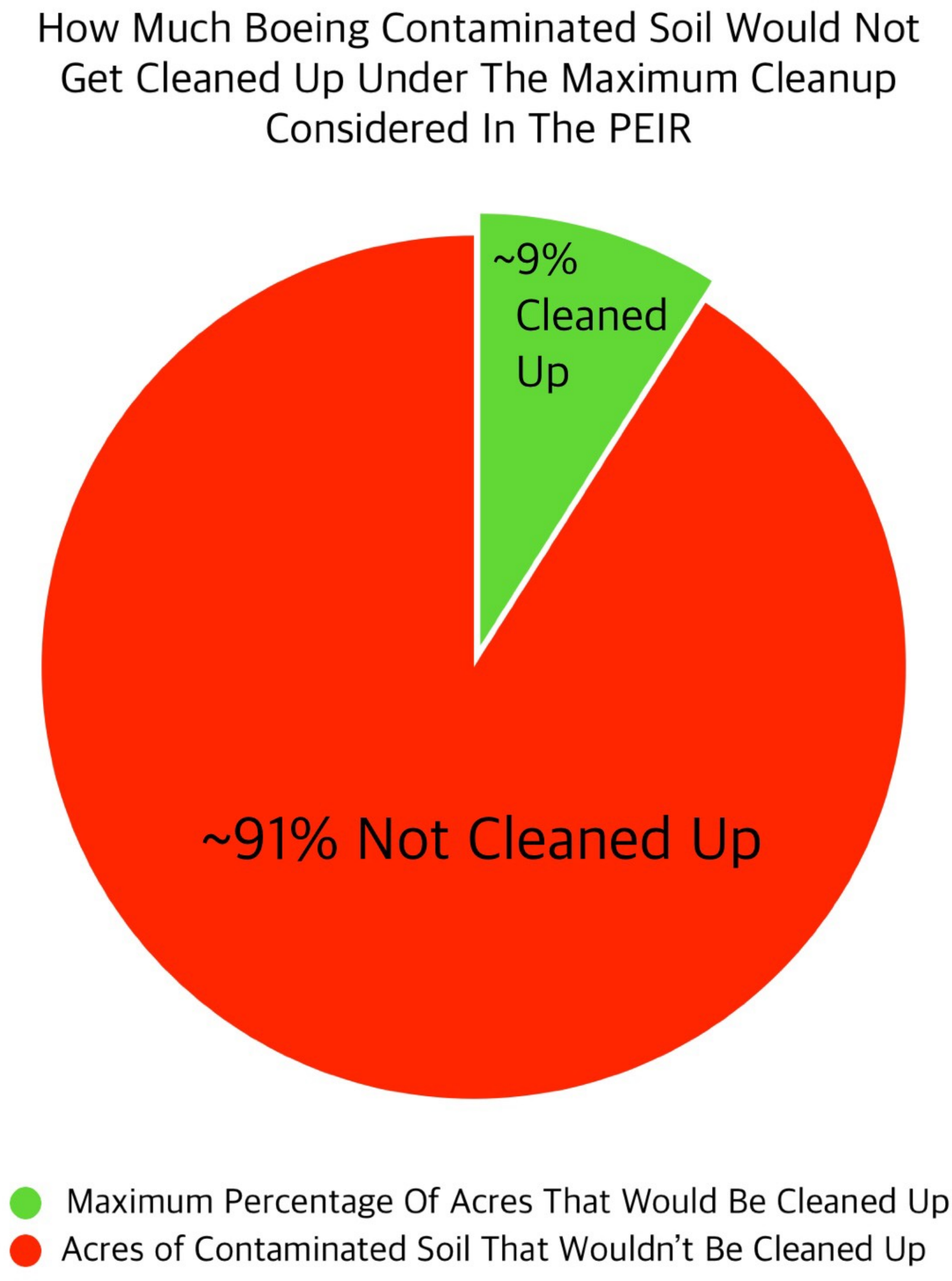
[3] See Table 1-2 of the PEIR for the acreage of Boeing's Area I and III land; see Appendix K p. iii for acreage proposed to be cleaned up. The Appendix K values include 8.5 acres of non-Boeing land, outside of SSFL, that may need to be cleaned up; that acreage is excluded from these calculations as they are based on how much of Boeing SSFL land would be cleaned up.

[4] A third alternative, supposedly assuming 100% of one's produce comes from a backyard garden, was included for comparison purposes.

[5] We have separately criticized some of the assumptions used by DOE for its soil volume estimates. But since the PEIR has adopted them, for the purposes of this analysis, we use the PEIR values here.



Regarding the soil volume estimates, a similar pattern emerges. Boeing, which is responsible for 2.7 times more acreage than the DOE, is estimating to at maximum remove three times less contaminated soil than DOE. The DOE plans to remediate 1,260,000 cubic yards, whereas

Boeing plans to, at maximum, excavate and dispose of 330,000-375,000 from its SSFL operational areas.[6] Assuming similar contamination in the DOE and Boeing operational areas, and considering the amount of cubic yards Boeing is responsible for, Boeing should really be remediating ~3,440,000 cubic yards. Indeed, Boeing is again only planning to remediate a fraction of the contaminated cubic soil compared to the other responsible parties. Using the contamination estimates from DOE applied to Boeing areas, the estimated percentage of cubic yards of soil to be remediated is only 9.6-11% of the overall amount of contaminated soil in Boeing's SSFL operational areas -- similar to the calculations for Boeing's estimated acreage remediation.

These cleanup goals are extremely weak when compared to the goals of the other Responsible Parties. For example, DOE and NASA are supposed to remediate 100% of the contamination in their areas, under the AOCs, prior to application of any (very limited) biological or cultural exceptions. Considering the DOE and NASA areas are directly adjacent to the areas for which Boeing is responsible, there should not be such a stark discrepancy in soil remediation estimates.

This is made painfully clear when reviewing PEIR Figure 1-4, reproduced earlier in this analysis. Whereas much of the DOE and NASA areas are identified as contaminated and requiring remediation, virtually none of the Boeing areas are. It is not that the land that Boeing is responsible for is somehow less contaminated than its counterparts, rather, Boeing is proposing to walk away from the vast majority of the contamination for which it is responsible.

One can understand now why DTSC has refused to reveal in the PEIR how much contaminated soil there is in the Boeing areas and how much it is proposing to allowing Boeing to avoid cleaning up. The numbers are scandalous and would produce a public outcry if revealed. But an EIR cannot be CEQA-compliant if critical information of this sort, absolutely essential to an environmental review and public disclosure, is kept hidden.

Additionally, it is important to note that the cultural and biological exceptions will further decrease the percentage of soil remediation. Again, the PEIR hides what is actually proposed. No acreage or soil volume estimates are given for purported biological and cultural exceptions; no detail as to how contaminated are the areas that would be cleaned up, how far they exceed SRAM-based suburban residential standards or Low TRV EcoRBSLs, for example, so the impact on people or ecological receptors cannot be examined. Despite there being no numerical values given regarding the estimated acreage being exempt for biological and cultural features, based on figure 1-5 in the PEIR, it is clear that a significant amount of soil is planned to be exempt solely for biological features. One can see in figure 1-5, reproduced earlier in this analysis, the alarmingly massive amount of acreage being charted for biological exemptions

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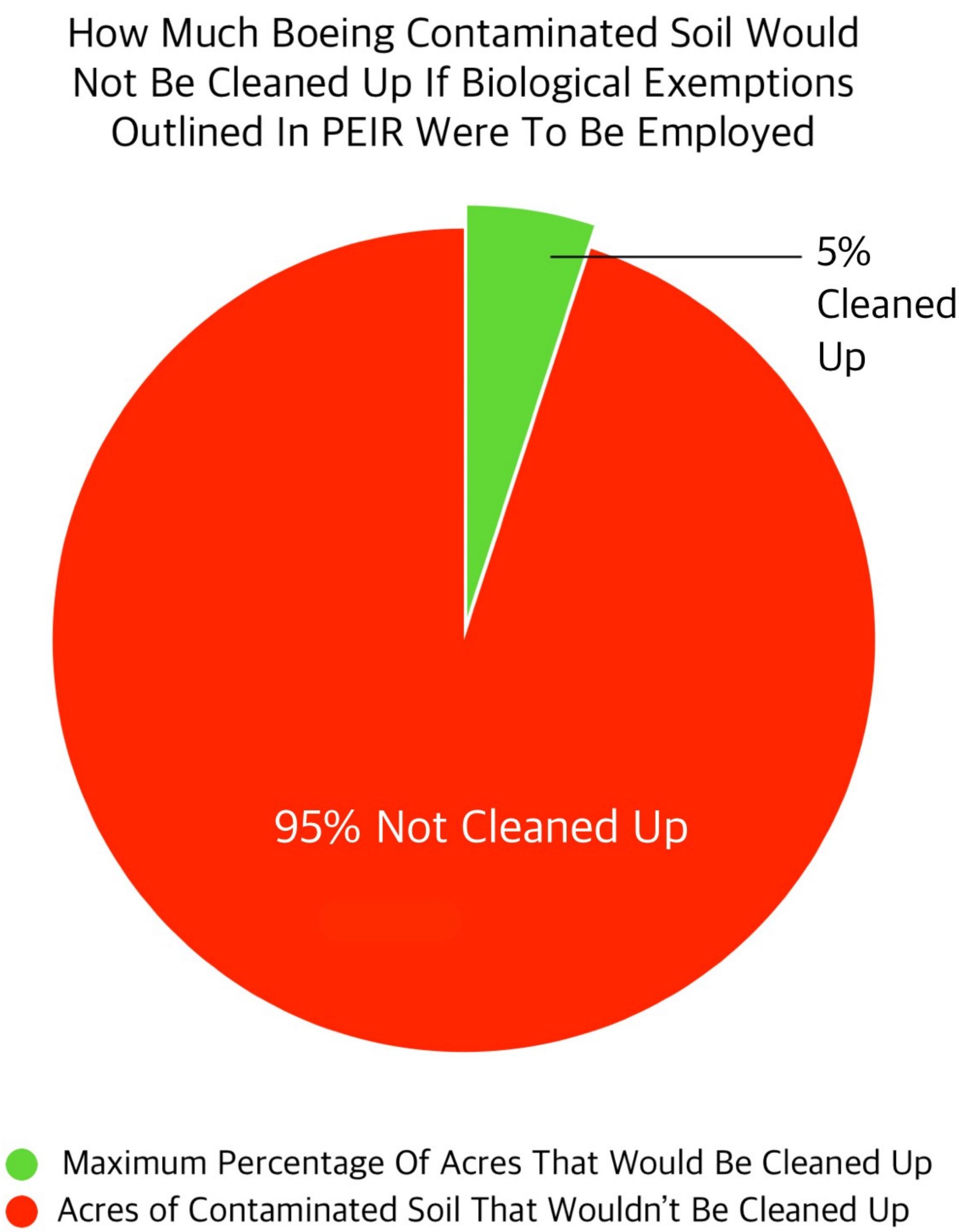
[6] Appendix K gives two soil volume estimates, one presuming they would only excavate 1 foot below the last contamination measurement, the second 1.5. Note that Boeing identifies 14,000 cubic yards of contaminated soil from non-SSFL areas that might need to be cleaned up; for consistency purposes, as we are comparing cleanup percentages of SSFL operational areas, and as we did for acreage, that is not included here. Including it, however, would make essentially no difference in the conclusions. We did not include the estimated *in situ* and *ex situ* treatment, as there are no comparable estimates for DOE and NASA. Additionally, the Boeing estimates for soil vapor extraction (not included in the PEIR for DOE and NASA) are not relevant here, as they involve merely sucking soil vapor from soil, leaving the contaminated soil and with its non-vapor contaminants still in place.

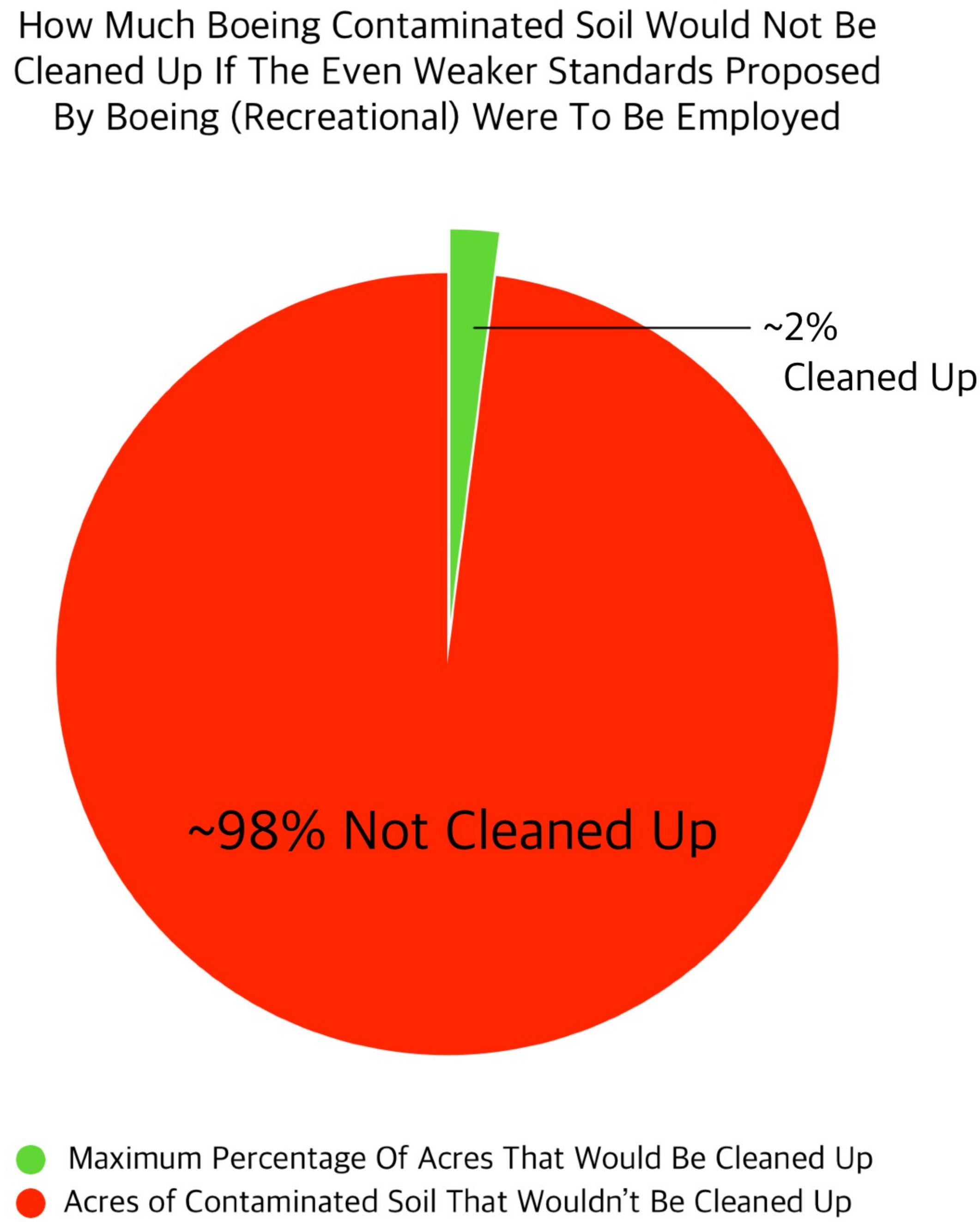
alone (which far exceed the exception allowed in the AOCs). No figures, images, or numerical data was provided regarding acreage of soil to be exempted for cultural features. Furthermore, no figures whatsoever are provided for estimates of how much Boeing contamination would be allowed to not be cleaned up based on monitored natural attenuation.

From Figure 1-5, for biological exceptions alone, it would be appear that as much as half of the Boeing contamination is being considered for such exceptions. That would result in ~95% of the contamination not being cleaned up. It is not that the land that Boeing is responsible for is somehow less contaminated than its counterparts, rather, Boeing is proposing to walk away from the vast majority of the contamination for which it is responsible.



With undisclosed cultural exemptions (which also appear to go far beyond what is allowed in the AOCs and described in the PEIR as AOC-exceptions for Boeing land) and natural attenuation—no figures for which are provided in the PEIR at all—96 or 97% of the contaminated soil in the Boeing operational areas might not be cleaned up.

Finally, the PEIR makes clear that the supposed 25% residential garden standard is, despite past DTSC commitments to the contrary, the *maximum* cleanup standard that will be considered, and that the actual cleanup standard to be adopted will likely be considerably less protective than even that woefully non-protective standard. For example, were DTSC to allow Boeing use a recreational standard, as it is pushing to do, far weaker than the already terribly weak standard in Appendix K, even more contamination would be left behind. So, in the absence of disclosure by DTSC in the PEIR as to how much contamination there is and how much it is proposing to not clean up, the best estimate that can be made is that at the end of the day, as much as 98 or 99% of the contamination would not get cleaned up, if DTSC proceeds as it seems to be intending, to break its long-standing cleanup commitments.


How Much Boeing Contaminated Soil Would Not Be Cleaned Up If The Even Weaker Standards Proposed By Boeing (Recreational) Were To Be Employed
~2% Cleaned Up
~98% Not Cleaned Up
Maximum Percentage Of Acres That Would Be Cleaned Up
Acres of Contaminated Soil That Wouldn't Be Cleaned Up

Conclusion

At the heart of CEQA is a requirement to fully disclose what is proposed and to analyze the environmental impacts associated with what is proposed. DTSC had committed to a full cleanup of all of SSFL. In the Draft PEIR, it abrogates those commitments. The AOCs bar "leave in place alternatives," yet the PEIR proposes to leave large but unspecified amounts of contamination in place, not cleaned up. Associated commitments and longstanding policies of DTSC required a comparable cleanup for the Boeing portions of SSFL, but again, the PEIR proposes to allow Boeing to walk away from huge but unspecified amounts of its contamination.

Rather than disclose what it proposes, DTSC hides from public view how much of the DOE and NASA contamination would not get cleaned up. As for Boeing, DTSC does not even reveal how much of the Boeing property is contaminated, let alone how much of that would remain not cleaned up under what DTSC contemplates.

An accurate project description and of alternatives is essential to CEQA. One can understand why DTSC would wish to hide what it is proposing—the outcry about the breach of commitments would be immense. But fear of public dismay for breaking of promises is no grounds under CEQA to hide from public review what the agency is proposing to do.

Furthermore, CEQA requires a thorough review of the environmental impacts of what is proposed. Not only does DTSC fail to disclose what it is proposing, it fails to perform any environmental review of the negative impacts on public health and the environment of choosing to break cleanup obligations and instead allow the contamination to avoid cleanup. It is clear, however, that soil in areas proposed to be exempt from cleanup requirements would in many cases far exceed contaminant concentrations above risk based levels for human health or ecological receptors.

We have made the best estimates we can from the limited information available. It suggests 91-98% of Boeing's contamination would not get cleaned up, and perhaps as much as two-thirds of the DOE and NASA contamination. Even were the percentages considerably lower, they would represent massive amounts of contamination that would be available to harm the environment and the public. DTSC's failure to disclose critical information about what it proposes and the impacts therefrom violates central requirements of CEQA and of scientific analysis. We urge DTSC to live up to the commitments it made for a full cleanup, and start over with a thoroughly revised PEIR fixing its overwhelming deficiencies, and then recirculated for public comment.

Attachment 3

Southern California Federation of Scientists

PROBLEMS WITH SOIL VOLUME ESTIMATES FOR DEPARTMENT OF ENERGY

Note: The PEIR gives soil volume estimates for DOE and NASA that are far larger than prior estimates, but DTSC has refused to provide public access to the documents on which those estimates are based. (DTSC has in fact refused access to essentially all the referenced documents in the PEIR on which the conclusory claims contained therein are based.) SCFS is thus unable to critique estimates for which no basis is provided.

We did, however, review an earlier set of estimates for DOE and presented our critique in our scoping comments on the DOE draft EIS. That critique is included here.

Statement of
The Southern California Federation of Scientists
at DOE Scoping Hearing for the
Draft Environmental Impact Statement
for the Santa Susana Field Laboratory
March 1, 2014

The Southern California Federation of Scientists focuses our comments today on a deeply questionable document released by DOE as part of this scoping process that raises troubling questions about the scientific integrity of the process, and which creates further appearance of an effort to try to get out of the obligation to clean up the contamination at SSFL. We refer here to the document "Rough Order of Magnitude Estimates for AOC Soil Cleanup Volumes in Area IV, and Associated Truck Transport Estimates based on DTSC Look-up Table Values." It is an extraordinary document.

A note of background: The Boeing Company in particular, and other Responsible Parties as well, have been trying to wriggle out of their cleanup responsibilities by, to be candid, hyping, exaggerating, and otherwise propagandizing about how many trucks they claim it would take to do the cleanup. One would think that that argument would only further reinforce the public understanding of the magnitude of the environmental harm the Responsible Parties have done at the site, that they have contaminated so much soil. Of course, leaving massive amounts of contamination not cleaned up would be a vastly greater problem than the inconvenience of some trucks, but it remains the PR game plan.

DOE has now issued the afore-mentioned soil volume and truck estimates. But in fact DOE did not prepare them. Dixie Hambrick and two colleagues from MWH did. MWH is Boeing's prime contractor at

SSFL to provide support for Boeing's arguments it should be relieved of most of its cleanup obligations, and Ms. Hambrick has been key to that work. Indeed, the Hambrick et al. memorandum is cc'd to the Boeing official for whom they work and to whom they report, Dave Dassler. In short, this is not a scientific review by DOE or by an independent scientific group, but appears to be a piece of advocacy paralleling Boeing's efforts to avoid cleanup.

It is therefore not surprising that the report asserts that the amount of contaminated soil needing remediation in Area IV of SSFL could be many three to five times higher than previous estimates. If any reporters are present here today, this should be headline news: DOE ANNOUNCES IT CONTAMINATED UP TO FIVE TIMES AS MUCH SOIL AT SSFL WITH TOXIC WASTE AS PREVIOUSLY DISCLOSED. Thus, if the estimates were valid, they would show an even greater necessity to clean up the polluted site.

But, of course, the estimates are not accurate, but highly inflated in a fashion that meets the interests of Boeing and apparently those within DOE trying to break out of cleanup obligations. So how did they go about so severely inflating the figures? Here are some examples:

- They added 30% to all soil volumes by assuming it would fluff up when dug up. 20% increase in volume can result, not 30%; and indeed, NASA stated at the Work Group meeting that they had considered using 20% but in fact chose not to include any fluff factor at all in their EIS. But whether it is 20 or 30% in the end is irrelevant, because one would re-compact the soil anyway as it is placed in the truck or train car so as to keep the number of shipments and transport and disposal costs down. This 30% fudge factor used by MWH to inflate the volumes is thus fictional.
- Where there was a surface drainage or channel that had more than one soil sample that was contaminated, they assumed most or all of the entire drainage or channel would have to be dug up even if there was no evidence those other areas were

contaminated. This is nonsensical, but aimed solely at skewing the result dramatically upward.

- They assumed one would remove all soil down to bedrock in those drainages or channels, even if there was no evidence the contamination went nearly that far.
- If a pond or large surface water area had several samples in one location showing contamination, they assumed all of the soil in the entire pond or area would be removed, even if the rest of the area had no evidence of contamination.
- They assumed the entire soil area would be removed out to bedrock outcrops, even if there were no evidence of contamination anywhere near there.
- In areas where there was more than one soil sample that showed contamination at particular locations in those areas, they assumed the entire large footprint where historical activity occurred would be dug up, even if there was no evidence in significant portions of that large area that there was contamination.
- And they assumed one would remove throughout those areas all soil down to where the deepest single instance of contamination was found, even when all the other measurements in other parts of the area showed far more shallow contamination.
- They assumed one would dig up soil that had been found to have no contamination but which had geophysical indications that non-contaminated items might possibly be underground.
- They assumed there would be no soil excluded from remediation for any of the exceptions built into the AOC—endangered or threatened species, Native American artifacts, or unexpected problems. All of these would reduce the soil volumes.
- And they assumed there would be no *in-situ* treatment of contaminated soils, which eliminates the need to remove them. NASA, for example, assumes up to a third of

contaminated soils could be so treated.

Then, to top it all off, MWH went ahead and inflated matters further, to come up with a second, even more "upper range case." For this, it assumed that vast areas where no contamination had been found would be dug up anyway. (Showing the bias further, we note that there is no "lower range case" provided.)

This is not science; this is not disinterested technical analysis; this is mangling data for a predetermined outcome. The report should be withdrawn and DOE commit itself to honest science for its EIS and living up to its AOC cleanup commitments, not working to get out of them.

We should make one other critical point. Whatever the true amount of contaminated soil, it needs to be fully cleaned up. If indeed DOE contaminated much more soil than it has previously admitted to, then that soil needs to be cleaned up, to background, as required by the AOC. If, on the other hand, the MWH estimates are inflated, so as to help push for abandonment of the cleanup obligations, then honest estimates are needed, but in ANY case the cleanup commitments solemnly entered into by DOE in the AOC should be fully honored and carried out. DOE caused substantial radioactive and chemical contamination by its decades of inadequate environmental controls, resulting in a partial meltdown and numerous other accidents. It entered into a binding agreement to remediate all contamination that could be detected. It must live up to its commitments.

Attachment 4

Southern California Federation of Scientists

Inflation of Background Threshold Values is Scientifically Suspect
and Threatens Public Health and the Environment

Abstract

Throughout the Draft Program Environmental Impact Report (PEIR) for cleanup of the Santa Susana Field Laboratory (SSFL), one questionable measure after another is taken, each of which would result in weakened cleanup, allowing the Responsible Parties (RPs) to walk away from ever larger amounts of contamination without cleaning it up, posing larger and larger risks to public health and the environment.

One such endeavor, not disclosed or analyzed in the PEIR, is the inflation of values proposed for background levels of radioactivity and toxic chemicals. Since the RPs are not required to clean up below background, it is very much in their interest if DTSC will accept as background values that are as high as possible. The higher the claimed background value, the less cleanup must occur, saving the RPs money. On the other hand, if background is inflated, contamination that should be cleaned up won't be, posing threats to humans and other biological receptors who might be exposed, on site or offsite from migration.

There are two primary types of statistical error that one wishes to avoid in such a setting, Type I and Type II errors, those involving false positives and false negatives. Under ideal circumstances, one would want data that have vanishingly small chances of missing contamination if it is there while also having very small probabilities of cleaning up something that doesn't need to be cleaned up. Ideal circumstances rarely exist, however, and so one needs to choose which type of error one most wishes to avoid. Erring on the side of public health, i.e., avoiding Type II errors, should of course be a no-brainer in a situation involving toxic and radioactive materials.

However, polluters are often politically powerful and regulators often under great pressure from the polluters' lobbyists. DTSC in particular has been widely criticized by legislators, communities, and the news media as being a significantly captured regulatory agency. One of the clearest ways of testing whether that is true is by examining which type of error DTSC has made its priority to avoid – requiring a RP to clean up some soil that didn't need it (and therefore costs it some money) or not requiring a RP to clean up some contaminated soil that needed remediation (and therefore increasing risks to human heath or ecological receptors.)

Which bias DTSC has chosen is clear through its choice of inflated background values for SSFL. For DOE and NASA, it has employed a statistical test used virtually nowhere else, the Upper Simultaneous Limit (USL), which produces higher background values than any other method.

For Boeing, it supposedly is using the 95-95 UTL approach, which still provides very inflated background figures. (We note, however, that in Appendix K of the PEIR, and despite the formal determination by DTSC that the extremely high USL values were inappropriate for the Boeing cleanup, the USL was nonetheless used.)

The significance of using elevated background values, i.e., higher than a true background, and thus not cleaning up contamination that should be cleaned up, can be seen by examining one case study: arsenic. As DTSC staff have written:[1]

> Background metals in soil can prove problematic for risk assessment purposes because metals detected at a site may be comprised of naturally occurring metals, regional anthropogenic contributions or a site-specific release. *Arsenic is especially problematic since the risk-based soil concentration is 100-times below typical ambient concentrations.*

That generalization is even truer for SSFL, where the suburban residential direct soil contact Risk Based Screening Level (RBSL) is 0.0658 mg/kg, the SRAM-based suburban residential garden RBSL is 0.0000992 mg/kg, and even the Low-TRV Ecological RBSL is 2 mg/kg. (See PEIR Appendix B.) By contrast, the background value employed in the PEIR for Boeing is 24.2 mg/kg, and for DOE and NASA, an astonishing 46 mg/kg. At those values, one wouldn't have to do any cleanup until the arsenic concentration exceeded 368 times the risk based level for just coming in direct contact with the contaminated soil on the Boeing land and nearly 700 times that risk standard for the DOE and NASA land. As to the SRAM-based suburban garden standard, the background level for Boeing is so inflated that the risk before one would even start cleaning up would be 244,000 times the risk based standard (meaning a risk of every fourth person exposed getting a cancer from the contamination). For DOE and NASA, no cleanup would occur even if the contamination levels were 464,000 times the risk standard, meaning a risk of every other person exposed getting a cancer from the exposure. For ecological receptors, these inflated values mean no cleanup until the levels exceed 10-20 times the levels shown to cause harm to them.

The background value for arsenic appears to be substantially inflated.

Discussion

Historically, background comparison levels for arsenic have been determined to be far lower than the values now put forward. The 2005 Soil Background Study set an upper limit for background at 15 mg/kg, with the great majority of measurements being just a few mg/kg (MWH 2005). This was compared to similar values from a statewide study. A survey by DTSC staff of arsenic background values in Southern California recommended an upper bound value for "ambient levels" as 12 mg/kg (DTSC 2008), suggesting that only about 1.5 mg/kg of that was due to naturally occurring arsenic and the rest was anthropogenic in origin.

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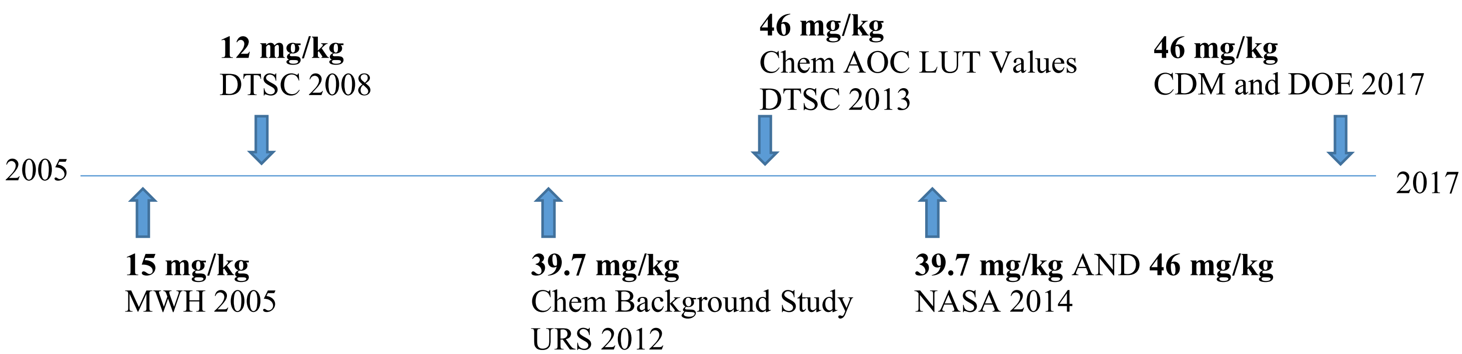
[1] *Determination of a Southern California Regional Background Arsenic Concentration in Soil,* by G. Chernoff, W. Bosan, and D. Oudiz, California Dept. of Toxic Substances Control

In 2010 DOE signed an Administrative Order on Consent (AOC) with the state regulatory agency, the Department of Toxic Substance Control (DTSC), which legally committed them to cleaning up the contamination they were responsible for to background levels of contamination (i.e. the amount of chemicals found onsite before contamination occurred).

In 2012, when developing chemical look-up table (LUT) values for the polluters to use as cleanup standards that would be compliant with the 2010 AOC, the DTSC established background threshold values (BTV) as 39.7 mg/kg, and somehow marked that up even further to an AOC LUT value of 46 mg/kg.

Timeline (Arsenic Background Concentrations at SSFL)



Document Details
(Chronological Order)

Soil Background Report, Santa Susana Field Laboratory, Ventura County CA
September 2005, MWH for Boeing, DOE, NASA

- Soil Background Comparison Level value for arsenic is set at 15 mg/kg (PDF pg 58)

Determination of a Southern California Regional Background Arsenic Concentration in Soil
March 2008, DTSC

- Background concentration of arsenic in soil in Southern California is determined to be 12 mg/kg
  - "A probability plot and statistical analysis of a large data set from school sites in Los Angeles County gave an upper-bound background arsenic concentration of 12 mg/kg. A probability plot for school sites from 5 counties in Southern California also gave an upper-bound background arsenic concentration of 12 mg/kg." (PDF pg 5)

- DTSC themselves recommend 12 mg/kg as screening value for Arsenic:
  - "This finding suggests that in Southern California, 12 mg/kg maybe a useful screening number for evaluating arsenic as a chemical of potential concern." (PDF pg 5)

Conclusion

Because of the extraordinary toxicity of contaminants such as arsenic to both human health and other ecological receptors, setting an accurate background value below which there will not be clean up is essential. In erring, one needs to err on the side of public health and the environment as opposed to the Responsible Parties financial interests. It appears that inflated background values have been set, however, erring heavily on the side of protecting the RPs rather than public health and biological receptors.

Links

Chemical Data Summary Report, Santa Susana Field Laboratory, Ventura County CA
January 2017, CDM for DOE
http://www.etec.energy.gov/Library/Cleanup_and_Characterization/chemical_data/Draft%20Chemical%20Data%20Summary%20Report/CSDR%20January%202017%20Draft_Clean.pdf

Chemical Look-Up Table Technical Memorandum
June 2013, DTSC
http://www.dtsc-ssfl.com/files/lib_look-uptables/chemical/66073_06112013lutand_cover.pdf

Chemical Soil Background Study for the Santa Susana Field Laboratory
July 2012, URS for DTSC
http://www.dtsc-ssfl.com/files/lib_cbs/results_report/tables/65394_SSFL_Chemical_Background_Study_Table_5_Chemical_Analytes_-_Summary_of_Statistical_Evaluation_Results.pdf

Powerpoint Presentation:
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