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November 1, 2018

Lindsey Mahrt
The Boeing Company
Supply Chain & Operations; Environment, Health & Safety
Remediation Group
PO Box 3707 MC 1P-310
Seattle, WA 98124

Re: **Boeing Kent Space Center**
Remedial Investigation Report
Facility ID#: 2099
Site ID#: 12671

Dear Lindsey Mahrt:

On January 2, 2018, the Washington State Department of Ecology (Ecology) received the Boeing Company's draft *Remedial Investigation Report* (RI Report) for the Boeing Kent Space Center facility. Later (on February 22 and September 12 of this year), Ecology also received two Addenda to the Report. The draft RI Report is a required deliverable of Agreed Order DE 12820. Thank you for submitting the three documents.

Ecology's comments on the draft RI Report and its Addenda are enclosed. In accordance with the schedule established in the approved RI Work Plan, please submit a revised RI Report that satisfactorily addresses our enclosed comments within sixty (60) days. If you have any questions concerning this letter, or would like to schedule a meeting to discuss our comments, please contact me at (425) 649-4449 or ejon461@ecy.wa.gov.

Sincerely,

EJones

Ed Jones
Environmental Engineer
Hazardous Waste and Toxics Reduction Program

Sent by Certified Mail: 9171 9690 0935 0203 0796 57

cc: Carl Bach, Boeing
Kathryn Moxley, Boeing
Laura Castrilli, EPA
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ecc: John Level, AAG
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Enclosure

ENCLOSURE

Boeing Kent Space Center
Draft Remedial Investigation Report (and Addendum)
Ecology comments

GENERAL COMMENTS

1. RI Screening Levels (SLs). Specific SL-related comments are included below for Section 6 of the RI Report, as well as Tables 10 through 15, 17, and 18, and the two RI Report Addenda. In the revised Report the SL values in these tables should be modified, as needed, to reflect current MTCA Method B (or C, as applicable) risk-based cleanup concentrations and ARAR levels. It has been almost two years since the Final RI Work Plan was submitted; CLARC's risk-based cleanup concentrations and/or applicable ARAR levels, per medium, are now different for particular substances.[1]

   In addition, RI soil SLs protective of groundwater quality must be low enough to protect all current and future "uses" of that groundwater. For groundwater contamination that reaches, or may eventually reach, surface water, soil SLs must be chosen that will not potentially cause exceedances of groundwater SLs as low as surface water cleanup/ screening levels (per WAC 173-340-720(4)(b)(ii)).

2. Since the 2017 draft RI Report was submitted additional site data have become available. A number of Specific Comments below mention this and request that the data be included in, and integrated into, the revised Report.

3. During the site visit last August, Boeing described plans for future actions on the property, such as demolishing Building 18-67 and modifying the stormwater management system. The Specific Comments below, however, are focused on the draft RI Report and its two Addenda. They do not include Ecology responses to the anticipated property redevelopment.

SPECIFIC COMMENTS

1. Executive Summary (2 pages). Ecology agrees that groundwater at the site is not currently a source of drinking water. This is an important consideration, but the statement in the fourth paragraph should be appropriately qualified. Unless Boeing believes site groundwater is not potable, as potability is defined in WAC 173-340-720(2), the RI should assume that its future beneficial uses include use as drinking water. Please also see Comment #20 below.

   In addition:

[1] CLARC stands for Cleanup Levels and Risk Calculation (https://fortress.wa.gov/ecy/clarc/).

- As the Report notes, Mill Creek is close to the eastern boundary of the site. Other "surface water bodies" are also on or near the site. These aquatic ecological habitats should also be mentioned in the ES.[2]
- The "several historic studies" noted in the fourth paragraph of the first page should be cited, and included in the revised Report's Section 9.0.
- Water quality in Mill Creek, as the Report states, may not be ideal for aquatic life. But for the purposes of the RI, and the identification of ecological receptors who may potentially be impacted by site releases, the more germane consideration relates to the types of ecological receptors currently present in the Creek (and other surface water bodies) and their susceptibility to site contaminant exposures. Please see Comments #22.g and h, and #24.c, below.

2. Executive Summary. Point of clarification: while Ecology agrees with the statement in the fifth paragraph that "no new sources of contamination were found," we also believe the "sources" of certain contaminants detected during the RI remain unclear. Please see, in particular, our comments below regarding groundwater arsenic levels, soil gas VOC detections, and substances found in the facility's stormwater sewer system.

3. Executive Summary. Since the 2017 draft RI Report was submitted additional site data have become available. The seventh paragraph should therefore be revisited and updated during Report revision. In addition:

   - Ecology agrees that concentrations of vinyl chloride below 0.2 µg/l in shallow groundwater rarely pose a potential vapor intrusion threat. However, it is unclear why Boeing refers here (in the seventh paragraph) to a groundwater SL of 0.025 µg/l. The migration/exposure pathway associated with this SL concentration is not vapor intrusion. In the revised Report the groundwater SLs protective of indoor air via vapor intrusion should be referenced (0.35 µg/l for residential buildings and 3.5 µg/l for buildings used industrially).
   - Elevated levels of copper, lead, zinc, and arsenic were detected in a groundwater sample from MW-1. This is the sample Boeing is apparently referring to in the seventh paragraph. Although the revised RI Report may provide context for these detections (such as the mention of previous and other sampling results, Ecology's past risk determinations, etc.), as part of this context it should also note that MW-1's copper concentration, 39.8 µg/l (j-qualified), is more than an order of magnitude higher than the groundwater SL and any copper concentration detected in MWs 2 through 7.
   - At the close of the seventh paragraph the RI Report asserts that arsenic concentrations as high as 266 µg/l "appear to reflect area-wide groundwater conditions, not due to a site-specific source." In the revised RI Report Boeing

[2] There is an east-perimeter ditch running parallel to and just west of 68th, the north detention pond, and wetland areas proximal to the northwest corner of the site. While ditching and detention ponds may be engineered portions of the facility's stormwater management system, they may also serve as ecological habitat.

should either delete this phrase or replace it with wording consistent with the resolution of Comments #37 and 47 (including Attachment A) below.

4. Executive Summary. In the eighth paragraph (1st paragraph on the 2nd page of the ES) the draft Report discusses sampling of the facility's stormwater sewer system. In the revised Report this part of the document should: a) be updated to include information contained in the RI Report's first Addendum, and b) address SWMU 86-related comments below.

   In addition,

   - the Report states that "[s]ediment traps yielded low sediment accumulation over the course of a full year, suggesting that the site has low sediment loading that would potentially contribute to contamination in downstream surface water bodies." Ecology agrees that solids accumulations at a number of manhole sampling locations were minimal, even over a very long sampler deployment period. This is consistent with the observation that the culverts, at least until they approach the eastern side of Boeing's property, infrequently have significant water in them. But the difficulty obtaining enough material in manhole sediment traps, by itself, does not verify that solids loading to surface water discharge locations is "low." Sediment traps were not deployed to estimate "sediment loading," but to measure contaminant of potential concern (COPC) concentrations in any solids that accumulated at the manhole locations. The minimal accumulations, as we have discussed, may be in part due to the type of collection device used and the manner in which the devices were deployed. Please see our discussion of conveyance system solids collection in Attachment A;
   - the next sentence in the paragraph refers to monitoring benchmarks in the facility's Industrial Stormwater General Permit (ISGP). It states that these benchmarks are being met. However, according to Ecology's PARIS database the benchmarks for copper and zinc were not met in July 2017. Nor was the zinc benchmark met in April 2018. The revised Report should contain: a) a summary of the permit's Stormwater Pollution Prevention Plan's monitoring program (including the monitoring analytes/parameters), and b) an accurate record of current and historic benchmark exceedances (by location, date, analyte, and – for measurable substances – measured concentration); and,
   - the revised Report Boeing should clarify the statement: "PCBs were detected in a solid sample collected from an onsite stormwater pond; the concentration was in the range of detections previously detected prior to cleaning of the stormwater conveyance system in 2002." Should this sentence be interpreted to mean that PCBs have been discharged to the North Detention Pond since the 2002 cleaning, and, therefore, PCB sources "upstream" of the Pond continue to be present?

5. Executive Summary. The last paragraph of the Summary briefly describes Boeing's RI/FS conclusions. Ecology does not concur that all critical RI data gaps have been filled; nor have we concluded that "cleanup of soil or groundwater" may not be required.

In the revised RI Report this paragraph should be revisited and modified, as needed, to be consistent with resolution of Ecology's comments below.

6. Page 1, Section 1.0. The facility's ISGP is referenced here. As discussed in Comment #4 above, the revised Report should include a summary of the stormwater monitoring Boeing performs pursuant to the permit. A table should be included that identifies the stormwater benchmark for each contaminant/parameter, where stormwater samples are collected, and how often stormwater at these locations is inspected/sampled/analyzed.

7. Page 4, Section 2.4.1. Although Ecology does not expect the revised RI Report to contain, per area of investigation, the same information provided in the RI Work Plan, critical information must be included.[3] For SWMUs 88 and 89 the Report should:
    a) identify the particular hazardous substances known – or expected – to be present in the "microfiche process waste," their likely concentrations, and the pH of the waste material;
    b) state whether the tanks (KS-25 and -26) were known, or suspected, to have released; and,
    c) if releases occurred at one of both tanks, estimate when this would have occurred and how much waste material may have been released. The subsurface depths that would have likely been impacted should also be identified.

8. Page 4, Section 2.4.2. Critical information about AOCs 1 and 3 should be included in the revised Report. The Report should:
    a) identify the particular hazardous substances known – or expected – to have released. E.g., is diesel fuel (product) the only "fuel oil" of concern?
    b) if releases occurred at one of both tanks (KS-5 and -6) before 1986, estimate how much fuel may have been released;
    c) note the subsurface depths that would likely have been impacted and briefly describe the expected groundwater flow direction(s) in the investigation area;
    d) briefly explain why the RI's three boring samples were collected at their specific one foot intervals (8.5-9.5', 8-9', and 11-12' bgs); and,
    e) compare the sampling locations to the current locations of any diesel-containing USTs in this area (in 2016 there were apparently two diesel-containing USTs [30K and 6K gals] located nearby).

9. Page 4, Section 2.4.3. Critical information about AOC-2 should be included in the revised Report. A good historical summary is provided here, but the Report should also:

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[3] Ecology realizes that Tables 3 and 4 in the draft RI Report have regulatory and historical investigation information about the site and the RI's focus areas. In this comment and the seven that follow we are requesting that critical (to the RI) information be included in the Report's text. This information – some of which is presently included in the tables – may be briefly summarized in the Report, with citations referring to the respective information sources. If Boeing is unable to provide the information because it is unknown, this can simply be stated.

a) identify the particular hazardous substances known – or expected – to have released. E.g., what was the older tank's "fuel oil" likely to have been?

b) estimate how much fuel may have been released (releases apparently occurred at one or both tanks before 1986);

c) note the subsurface depths that would have likely been impacted by releases from one or both pre-1986 tanks;

d) explain why the soil and groundwater investigation in this area did not include tetrachloroethene (PCE) or PCBs as analytes. Trichloroethene (TCE), dichloroethenes (DCEs), and vinyl chloride were analytes, but PCE was not. PCBs were also not analtyes, though a transformer yard was located nearby this AOC (near Building 18-35). According to the June 2002 Clearwater investigation Figure 2 (appended to the RI WP), 0.994 mg/kg of PCBs were detected in soil at location 18-24-1; and,

e) briefly:
- describe the expected groundwater flow direction(s) in the investigation area, and
- explain why the RI's samples were collected at the SB-6, SB-7, and SB-8 locations (and were limited to: (1) only groundwater samples, and (2) groundwater depths no deeper than 15' bgs).

10. Pages 4 and 5, Section 2.4.4. As noted in the comments above, critical information should be included in the revised RI Report for each area investigated. For the milling machine building the Report should identify – in addition to mineral oil – all hazardous substances known or suspected to be present in the "cooling oil" (a product called "4000 Strong" in the RI Work Plan) released, their likely concentrations, and the pH of the released material.

    In addition, the Report should:

    a) note the subsurface depths that would likely have been impacted by Building 18-62 releases;

    b) identify the SB sample collected inside Building 18-62 that was located in the vicinity of SWMU-23's waste-containing tank; and,

    c) briefly:
    - describe the expected groundwater flow direction(s) in the investigation area, and
    - explain why the particular locations for samples SB-9, SB-10, SB-11, and SB-12 were chosen (and were limited to: (1) only groundwater samples, and (2) groundwater depths no deeper than 15' bgs).

11. Page 5, Section 2.4.5. Critical information for the former jet fuel UST area should include:

    a) the particular hazardous substances expected in any release (including those substances suspected to be stored in the "waste fuel" tank);

b) an estimate, if releases occurred, of the volume of fuel that may have been released;

c) identification of the subsurface depths that would have been likely impacted by releases;

d) a description of the expected groundwater flow directions in the tank farm area, and a hypothesis for why these directions are temporally variable;

e) a brief explanation for why the RI's single groundwater sample (SB-13) was collected immediately east of Building 18-62 (between this building and Building 18-67) and was limited to a screened interval of 8-12' bgs; and,

f) reference to any oil/water separators historically or currently located near the seven tanks or sampling locations.

12. Page 5, Section 2.4.6. Critical information for the investigation area where UST KS-1 was formerly located should include:

a) identification of the subsurface depths that would have been likely impacted by UST releases;

b) a description of the expected groundwater flow direction(s) in the investigation area;

c) a brief explanation for the RI's three groundwater samples (SB-14, -15, and -16) locations, their screened intervals, and why they were not supplemented with soil samples; and,

d) reference to the locations of other tanks, fueling stations, and/or oil/water separators historically or currently located near UST KS-1's former location or the three RI sampling locations.

13. Page 5, Section 2.4.7. Critical information for the investigation area where UST KS-3 was formerly located should include:

a) identification of the subsurface depths that would have likely been impacted by UST releases;

b) a description of the expected groundwater flow direction(s) in the investigation area;

c) a brief explanation for the RI's four groundwater samples (SB-17 through -20) locations, their screened intervals, and why they were not supplemented with soil samples; and,

d) reference to the locations of other tanks historically or currently located near UST KS-1's former location or the four RI sampling locations.

14. Page 6, Section 2.4.9. The draft Report is correct: stormwater monitoring under the ISGP does not include measurements for all site COPCs. In fact, it appears that this monitoring only includes routine sampling and analysis for two COPCs: copper and zinc. This should be noted in the revised Report. The revision should also:

a) define, for the purposes of the RI, what the "conveyance system" is (and is not) compromised of. This definition should include a brief description of each "unit" within the system, from catch basins (or other inlets where stormwater is designed to enter the conveyance system) to outfalls; and,

b) broaden the statement (in the second paragraph) describing the objective of the conveyance system's investigation. As alluded to in Section 5, one of the primary goals of the RI is to determine if contaminants released from the Boeing property have migrated, or are migrating to, surface water or surface water body sediments. If this migration is occurring, or has occurred, the RI must assess the related risks to receptors. One potential migration mechanism for transporting contaminants to surface water is, of course, groundwater. But stormwater conveyance piping, collection ponds, and ditching can also serve as migration mechanisms. Piping and ditching can transport contaminants directly to surface water and sediments; all three mechanisms have the potential to transfer any contaminants they contain to groundwater, where the contamination can then be transported to surface water at groundwater discharge locations.[4]

   Section 2.4.9 itself should either include this "broadened" description of the objective of the conveyance system's investigation, or refer to another part of the revised Report where the description is located.

15. Pages 7 through 9, Section 3. Following submittal of the draft RI Report and its first addendum, additional site sampling was performed (and/or became available). Some of this sampling was not conducted in accordance with the approved RI Work Plan or any sampling and analysis plan (SAP) reviewed or approved by Ecology. Boeing performed this sampling for non-RI, *due diligence* (real estate-related) purposes. Nevertheless, the sampling and analysis effort included the collection of soil, groundwater, and/or soil gas samples that were analyzed for a wide range of hazardous substances – many of which have been identified as RI COPCs. Moreover, a number of locations where samples were collected correspond to, or are nearby, areas the RI has focused on. In Section 3 of the revised Report Boeing should therefore summarize the sampling efforts which produced environmental data not included in the draft RI Report or its first addendum. It should then reference an attachment or appendix to the Report that contains:

    a) the SAPs (and QAPPs) prepared preliminary to the sampling efforts,

    b) the information contained in RI Report Addendum #2,

    c) the environmental data and other information associated with the *due diligence* sampling effort that were not included in Addendum #2,

    d) the environmental data associated with the sampling efforts that were initiated following the preparation of Addendum #2, and

    e) the full data quality assessment and validation results related to the sampling data not included in the draft RI Report.

[4] And vice versa (i.e., the potential for contaminated groundwater to transfer any contaminants to the conveyance system, where the contamination can then be transported to surface water).

16. Page 9, Section 3.4. The draft Report's DQA section concludes by stating that all data should be considered "usable" with only minor qualifications. This may be a fair statement in terms of general data quality and what was known at the time the Report was prepared. In the revised document, however, the discussion regarding data usability should:
    a) include acknowledgment of the difficulties experienced attempting to obtain sufficient stormwater-solids sample mass within a timely collection period;
    b) include an evaluation of the analytical reporting limits achieved per medium and analyte, by comparing the achieved limits to the – updated – RI SLs for those media; and,
    c) incorporate an evaluation of data usability for those additional data, referred to in Comment #15, which are relevant to the conclusions reached in Sections 5, 7, and 8.

17. Pages 11 and 12, Section 4.3. For those site areas the RI focuses on, the hydrogeology discussion in the draft Report is limited to briefly describing "near surface" conditions. The Report does not appear to contain any discussions related to deeper on-site groundwater. Nor, for any depth, does the text describe groundwater geochemistry. The revised RI Report should:
    - supplement the discussion in Section 4 with a fuller description of vadose zone and shallow groundwater (less than 15' bgs) lithology within, near, and "downgradient" of the RI's major focus-areas;[5]
    - provide a description of shallow groundwater geochemistry, and discuss the fate and transport ramifications, per area, of shallow groundwater lithology and geochemistry;[6] and,
    - acknowledge the lithologic and geochemical uncertainty, per area, for both shallow and deeper groundwater depths. Where uncertainty is significant and/or data gaps apparent, the Report should then propose area-specific data collection activities to cost-effectively improve confidence in the hydrogeologic conceptual model.[7]

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[5] As well as those areas where sampling results submitted after preparation of the draft Report indicate significant soil, groundwater, and/or soil gas contamination.

[6] Table 16 includes one-time measurements of pH, conductivity, and turbidity for the seven RI monitoring wells and SB-1 through -20. For the monitoring wells it also includes one-time measurements of ORP, DO, Fe^{+2}, NO_3, and SO_4. The "description" of geochemistry requested in the comment may refer to these measurements, but should additionally attempt to *characterize* – or at least bound – the site's geochemical conditions.

[7] In this comment, and in Comment #19, the determination of whether uncertainty results in critical data gaps should, of course, factor-in the types and degree of contamination known to – or assumed to possibly – be in the focus area. But the types and degree of groundwater contamination found to date via sampling in the focus areas may be time- and location-dependent. The uncertainty analysis requested in these comments should consider how well the existing RI groundwater sampling data represent contaminant types and concentrations present in the focus area at times other than the sampling dates, and at locations besides those assumed to be downgradient of a release.

18. Page 11, Section 4.3. The draft Report states that wet-season water level elevations measured at the seven new monitoring wells in 2017 were "1.4 - 4.7 feet higher than during the dry season." Table 6 indicates that the differential levels at three of the wells (MW-1, -6, and -7) were greater than 4'; level fluctuation at the other four was less than 3'. The revised Report should not only report *how much* the measured levels fluctuated, it should provide a hypothesis for *why* a seasonal fluctuation of four feet or more is observed only in the western (and more northern) part of the site.

19. Page 11, Section 4.3, and Figures 9 and 10. As the draft Report notes, site groundwater flow directions estimated from May 2017 measurements were significantly different than those estimated from data obtained four and a half months later. The significance of these findings, and from site flow direction estimates generated in the past, should be further discussed in this section. The revised RI Report should:

    - supplement the discussion in Section 4.3 with a fuller description of flow direction variability at, near, and "downgradient" of the RI's five major focus-areas.[8]
    - present hypotheses for *why* flow direction is variable in these areas;
    - discuss the fate and transport ramifications, per area, of flow direction variability (including how this may affect the receptor points of most concern); and,
    - acknowledge flow direction uncertainty. Where uncertainty is significant, the Report should then propose – per area – data collection activities to cost-effectively improve confidence in the hydrogeologic fate-and-transport conceptual model. If, e.g., Boeing believes flow directions are influenced by any on-site groundwater pumping, or localized mounding, or if directions appear to be affected by water levels in perimeter surface water bodies, additional data collection activities may be needed to better understand the cause-and-effect relationships.

    Please also see Comment #47 below, and Attachment A.

20. Page 14, Section 5.3. Unless Boeing believes site groundwater is not "potable," as defined in WAC 173-340-720(2), the RI should assume its future beneficial uses include use as drinking water and this should be explicitly stated in Section 5.3.

    In addition, the second bullet in the fourth paragraph of 5.3 should be clarified. Is this statement included in the RI Report to assert that: (1) CPOCs associated with the Boeing site have not migrated in groundwater to City of Kent sentry wells? or, (2) Boeing releases are the sole contributors of organic and inorganic CPOCs found in site groundwater during the RI? Or both?

21. Page 15, Section 5.4. At the top of the page the Report includes general statements about the depth to site groundwater and stormwater runoff. In the revised document these

[8] As well as those areas where sampling results submitted after preparation of the draft Report indicate significant soil, groundwater, and/or soil gas contamination.

topics should be discussed per RI focus area, and with greater specificity. For example, the Report should note the water table elevations that were measured/inferred within and near each focus area during RI sampling and monitoring events. Later this information can be used to better qualify soil and groundwater COPC sampling data.[9]

22. Page 15, Section 5.4, and Figure 11. The Report identifies "pathways of potential concern" and "potential receptors." The former include:

    - transport of soil contamination to shallow groundwater (via leaching)
    - discharge of contaminated shallow groundwater to surface water and sediments
    - transport of volatile soil and shallow groundwater contamination to soil gas and then indoor air (via vapor intrusion)
    - transport of contaminated water and solids in the stormwater conveyance system to surface water and sediments

    The latter (potential receptors) include:

    - site workers, including "construction" workers;
    - site terrestrial wildlife exposed to soil contamination; and,
    - ecological organisms in Mill Creek surface water and sediments.

    Ecology agrees that the four identified migration pathways are a potential concern, and we also agree that the three categories of receptors could be potentially exposed to site contamination. But the revised Report's text should additionally acknowledge and describe current and future exposure pathways of potential concern.[10] These would include the following:

    a) current, aboveground human receptors (workers or site visitors) directly contacting contaminated surficial soils in areas where the ground surface is not paved or otherwise covered;

    b) future, aboveground human receptors directly contacting contaminated surficial soils. These receptors could include workers, site visitors, or residents. Future scenarios should not be limited to only those that are foreseeable or "anticipated." Nor should the Report assume that areas of soil contamination which are currently covered will remain covered in the future;[11]

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[9] I.e., the Report can then identify which soil samples were collected: in the vadose zone; within the capillary fringe; or, below the local water table height. It can also distinguish between those groundwater samples which were collected within a screened interval that spanned the water table, and those that were not.

[10] Exposure pathways should not only be graphically displayed, as in Figure 11 (which includes many "exposure routes"). They should also be identified and discussed in the text. These same pathways can then be brought into the assessment of potential receptor risks, which should follow the description of: a) the current nature and extent of site contamination, and b) the expected fate and transport of that contamination.

[11] Ecology realizes that Boeing believes future uses of the site area will not include residential uses. However, during the RI it is valuable to know whether or not soil contaminant levels exceed Method B direct contact cleanup/screening levels protective of unrestricted use (such as a residential receptor or a non-industrial worker). There are likely to be a number of areas at the Kent site where soil contaminant concentrations are lower than such

c) current and future, aboveground human receptors inhaling contaminated soil particulates. As noted above, it should not be assumed in the RI that areas of surficial soil contamination will be covered in the future;

d) current and future human receptors working belowground who directly contact contaminated vadose zone soils or shallow groundwater, or inhale contaminated soil particulates or gas;

e) future human receptors directly contacting contaminated potable groundwater;[12]

f) current and future, indoor receptors inhaling contaminated indoor air caused by vapor intrusion. Current receptors could include workers and site visitors. Future receptors could also include workers and visitors, as well as residents. For future scenarios it should be assumed that: (1) buildings could be constructed at any contaminated site location, and (2) where buildings are presently located, these buildings may be replaced with different structures;

g) current and future ecological receptors who directly contact contaminated surface water or sediments;

h) current and future ecological receptors who feed on those organisms directly contacting contaminated surface water or sediments; and,

i) current and future human receptors who harvest fish that have been contaminated by direct contact with contaminated surface water or sediments, or by preying on species directly contacting the contamination.

Providing this degree of specificity in Section 5.4 allows the Report to then directly and unambiguously link the media screening levels it uses (in Section 6) to the receptors, exposure/migration pathways, media, and contaminants of potential concern at the site.

23. Page 16, Section 6.0. In the revised Report the second paragraph should additionally discuss future (and any current) land uses that would not be "industrial," but would also not be residential. In particular, it should note that non-industrial "commercial" uses of Boeing property, or parts of that property, are possible in the future.

24. Page 16, Section 6.0. The third paragraph of this section summarizes the pathways that RI screening levels (SLs) must be protective of. This is a good summary and identifies most of the current and future exposure pathways Ecology described in Comment #22. During revision of the Report Boeing should add the following "pathways" to the paragraph's 10 bullets:

- Groundwater – direct contact by future human receptors using groundwater as a primary drinking water source
- Soil – direct contact by current and future human receptors

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screening levels, and – for these areas – there would be no need for the site remedy to mandate surface cover, or land-use controls, to protect future receptors.

[12] During the RI it is important to know whether or not groundwater contaminant concentrations exceed direct contact (ingestion) screening levels, even if groundwater at the site is not currently used as a drinking water source and is unlikely to be used as such in the future.

In addition,

a) the 3rd and 6th bullets should differentiate between ambient and indoor air, and between workers – and other receptors – inhaling VOCs now, versus in the future;

b) the text should clarify how a "construction worker" differs from a "utility line worker" in terms of how such a person could become exposed to belowground contamination; and,

c) the last two bullets discuss solids and water transported by the stormwater conveyance system to Mill Creek, and properly note the general ecological receptors that could be directly exposed to discharged contamination, or indirectly exposed via prey behavior. The first bullet also identifies surface water that could become contaminated by discharges of contaminated groundwater.

What appears to be missing, however, is inclusion of: (1) current and future human receptors who may harvest site-contaminated fish from Mill Greek or other impacted surface water bodies; and, (2) ecological receptors who become directly, or indirectly, exposed to site contamination that reaches aquatic habitat other than Mill Creek. This includes habitat integral to the current stormwater conveyance system (like the detention ponds and perimeter ditches) as well as wetland areas (such as the area west and northwest of the north detention pond) that potentially have received, or may receive, contamination via the migration and discharge of contaminated groundwater – or as a result of more direct discharges.

25. Page 17, Section 6.0. At the top of the page the Report identifies the four categories of COPCs for the site. During document revision this list should be updated to acknowledge site data which have become available since the draft Report was submitted. For example, the results of the *due diligence* sampling effort indicate that SVOCs are present in certain site areas. In addition, while the reference to SWMU 86's expanded analyte list (compared to other SWMUs) in the 4th bullet is reasonable, it should then also be noted that the conveyance system itself is not considered the initial/generating "source" of PCBs and PAHs (or most other COPCs). Nor are the belowground portions of the system considered potential ecological receptor points.

26. Page 17, Section 6.1. A minor point, but the first paragraph should explain that although the direct contact Method B and C soil cleanup levels (CULs) are different, the "driving" soil SLs/CULs for both Methods is protection of groundwater, and these concentrations are the same.

27. Page 17, Section 6.1. Four bullets summarize the soil SLs/CULs reviewed and updated in the draft RI Report. As discussed in Comment #22.b (and its footnote), the Report should also compare site soil concentrations to standard Method B direct contact soil CULs.

In addition,

a) if the authors believe the soil SLs/CULs associated with 6.1's four bullets also protect receptors exposed to soil contamination via inhalation (i.e., via the pathways identified in the 5th and 6th bullets on page 16), this should be stated and the rationale provided; and,

b) please see Comment #53 below on Table 10.

28. Pages 17 and 18, Section 6.2. This section summarizes the groundwater SLs/CULs reviewed and updated in the draft RI Report. A minor point, but the first bullet's reference to Method B drinking water-based CULs should note that the CUL is established by the ARAR (MCL) concentration unless this level is insufficiently protective.

    In addition,

    a) with respect to vapor intrusion, the revised Report should: (1) note that these groundwater SLs only apply to VOCs and shallow groundwater, and (2) state that both the Method B and C groundwater VI SLs were used to evaluate volatile groundwater COPC detections (the former – Method B – providing a comparison to concentrations protective of an unrestricted building use);

    b) the last bullet's reference to Method B surface water CULs should note that the human health CUL is established by the ARAR concentration unless this level is insufficiently protective; and,

    c) please see Comment #53 below on Table 11.

29. Pages 18 and 19, Section 6.3. This section summarizes the SLs applied to COPC concentrations detected in conveyance system stormwater and solids. In the revised Report the text should explain how COPC concentrations in solids were assessed for those contaminants that do not have an SCO or SCL. It should also describe the specific COPCs that are monitored in accordance with the December 2016 – or most current – Stormwater Pollution Prevention Plan (SWPPP), as well as their benchmark values.

    Please see Ecology's additional comments on conveyance system stormwater/solids screening below (Comments #39, 41, 42, 44, and 54 through 56).

30. Page 19, Section 6.3. Although Section 6 refers to surface water CULs/SLs in its discussion of groundwater CULs/SLs (in Section 6.2), and to sediment CULs/SLs in its discussion of SLs for conveyance system solids (in Section 6.3), it does not contain a sub-section devoted to surface water/sediments alone. Such a sub-section should be included in the revised Report. It should be clear how water and sediment quality in surface water bodies potentially receiving site contaminants was assessed in the RI.

31. Pages 20 through 27, Section 7. The approved RI Work Plan was structured with respect to nine "focus areas" that the investigation targeted. Section 2.4 of the draft Report is similarly structured. Yet Section 7 of the Report is organized by media (soil and groundwater sub-sections) and only SWMU 86 has a sub-section devoted to its associated "nature and extent of contamination." There are, of course, different ways to organize

the results of the RI, but Ecology would much prefer that the revised Report use Section 2.4's structure.

As we have discussed, the *due diligence* sampling results (which did not become available until August 2018) identify contaminated, or potentially contaminated, areas in addition to the nine RI focus areas. These areas should also be discussed in Section 7, preferably under their own sub-section headings.

In addition, prior to reaching conclusions regarding COPC concentrations detected (and not detected) in the various media sampled,

a) RI SLs should be revisited. Please see our comments below on Tables 10 through 13; and,

b) RI analyte lists and achieved Reporting Limits (RLs) should be evaluated. Are both sufficient, per focus area, to conservatively characterize the current nature and extent of media contamination?

32. Page 20, Section 7.1. Soil contamination should be discussed for each RI focus area, as well as those contaminated, or potentially contaminated, areas identified during the recent *due diligence* sampling effort.[13] The discussion for these areas should summarize the results of previous investigations and provide the company's suppositions regarding the current nature and extent of soil contamination.

    With the exception of the "area-wide arsenic" focus area, Section 7.1's discussion per area should not be limited to only arsenic. Nor should it be limited to only those COPCs where recent sampling results suggest that current soil concentrations in that area are clearly above RI SLs.

    In addition, elevated levels of VOCs were measured in *due diligence* soil gas samples. It is unclear if the subsurface sources of these detections are contaminated soils, groundwater, or both (though, in several cases, the VOCs were not detected in nearby groundwater samples). Please see Comment #45 below.

33. Page 20, Section 7.1. The three paragraphs of Section 7.1 are devoted to a discussion of arsenic. The Report should note how many site soil samples have been analyzed for arsenic, and include a figure (or figures) depicting the sample locations. It should also:

    a) discuss the implications for the depths that these samples were collected at. At SB locations -1, -2, and -3, soil samples analyzed for arsenic were obtained at depth (as deep as 12' bgs at SB-1 and -2). The Report says the samples were collected "near the water table," but should they be considered representative of saturated (or capillary fringe) or vadose zone subsurface conditions?

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[13] At AOC-2, the former milling-machine area at Building 18-62, the former jet fuel UST area, and the former UST KS-1 and KS-3 areas, no RI soil sampling was performed. Although RI soil sampling was not performed at AOC-2, *due diligence* soil samples were collected in the vicinity of this area. *Due diligence* soil samples were also collected just south of the former jet fuel UST area.

b) update the discussion to include soil sampling results for arsenic obtained following the January and April 2017 RI sampling events. According to Addendum #2's Table 3, elevated arsenic levels – higher than those detected at SB-1 and -2, and higher than 2011 detections at KSP-DP-32 and -33 – were found at LAI34, -19, -3, and -4 in 2017/2018. The sampling depth at LAI-19 was relatively shallow (1-5-3' bgs); and,

c) acknowledge that the two SWMU-88/89 USTs were used to store microfiche process waste, that these wastes presumably contained arsenic, that groundwater arsenic concentrations at SB-1 and -2 are relatively high, and that arsenic concentrations in soils at SB-1, SB-2, and LAI4 are also relatively high.

34. Page 20, Section 7.2. As with soil contamination, site groundwater contamination should be discussed for each RI focus area, as well as those contaminated, or potentially contaminated, areas identified during the recent *due diligence* sampling effort. The discussion should not be limited to only those COPCs where recent sampling results suggest that current groundwater concentrations in that area are clearly above RI SLs.

    In addition, as noted in Comment #32, in these and/or other areas elevated levels of VOCs were measured in *due diligence* soil gas samples. It is unclear if the subsurface sources of these detections are contaminated soils, groundwater, or both. Please see Comment #45 below.

35. Pages 20 and 21, Section 7.2. In the sub-section concerning VOCs the draft Report notes that vinyl chloride was detected at SB-6 and -8, two of the three RI samples analyzed for this compound. According to Addendum #2's Table 6, vinyl chloride has also been detected previously in groundwater: in 2001 at locations 18-21 and 18-23; in 2003 at 18-21 and 18-35; in 2010 at KSC-DP-2 and -3; and, at KSC-DP-16 through -19 in 2011. More recently it was analyzed in selected samples collected during the *due diligence* effort. The concentration found in sample LAI31 was similar to the levels found at SB-6 and -8. However, the concentrations measured in samples LAI14 and -32 were more than an order of magnitude higher. The revised Report should discuss all these results, posit a hypothesis for the presence of vinyl chloride at the SB-6, SB-8, LAI31, LAI14 (where elevated levels of 1,1-DCE were also detected), and LAI-32 sampling locations, and identify data gaps that should be filled to improve the characterization of vinyl chloride's nature and extent, as well as the evaluation of its fate and transport. The three bullets at the top of page 21, limited in the draft Report to a discussion of SB-6 and -8 results, should also be revisited, and revised as needed.

36. Page 21, Section 7.2. In the first three paragraphs of the sub-section regarding metals the draft Report discusses detections of copper, lead, and zinc at MW-1. Ecology agrees that the measured concentrations of these three elements exceed RI SLs. We also agree that lead and zinc levels as high, or higher, than the concentrations detected at MW-1 have been detected elsewhere in the past. However,

    a) the only RI focus-area groundwater samples analyzed for copper, lead, and zinc were SB-1 and -2 (SWMU-88/89);

b) lead was analyzed in 14 *due diligence* groundwater samples. It was not detected in 13 of those samples. In the one sample where it was detected the concentration was about six times lower than the level found at MW-1;

c) copper, nickel, and zinc were not analytes for the 14 *due diligence* groundwater samples;

d) the MW-1 copper concentration is more than an order of magnitude higher than the RI SL and any of the other 2017 measurements of copper (at six monitoring wells and SB-1 and -2). MW-1 is located at the northwest corner of the site, and also located downgradient from SWMUs 88 and 89. This area was not part of the Clearwater Property, and no NFA was issued for it; and,

e) the fact that site groundwater is not currently a source of drinking water may have been an important factor in Ecology's issuance of NFA letters several years ago. However, the site is now under an Agreed Order and Boeing is seeking both a final cleanup decision and withdrawal from RCRA interim status. The RI's focus should therefore be as much on the potential future uses of groundwater as its current use.

Ecology therefore disagrees that the 2017 sampling results for copper, nickel, and zinc do not "warrant further investigation." The concluding paragraph (following the three bullets) in this part of the draft Report should be revised or removed. Please also see Comment #47 below, and Attachment A.

37. Pages 21 and 22, Section 7.2. Following the discussion of copper, lead, and zinc in the sub-section concerning metals, the draft Report focuses on groundwater arsenic levels. In the revised Report:

a) the first full sentence on page 22 should be clarified/modified. Arsenic concentrations measured during the RI and during the *due diligence* sampling apparently exceeded 100 µg/l at eight locations. Seven of these locations are in the more northwestern part of the site, in the general vicinity of Buildings 18-43, -42, and -59. One location is below Building 18-62 in the more southern portion of the site. Characterizing these elevated measurements as "isolated" does not accurately capture the evident grouping of seven of the highest eight detections.

It is also unclear what Boeing means by stating that elevated detections are not "associated with known or potential sources of arsenic." What are the "known" sources of arsenic at the site that these measurements are not associated with? What are the "potential" sources? If this statement is referring to measured levels of arsenic in site soils, which have not been significantly elevated, the reference should be made explicitly;

b) the first full paragraph on page 22 should also be clarified/modified. If Boeing's hypothesis for explaining the variable levels of arsenic found in groundwater at the site is that localized reducing conditions favor the solubility/mobilization of naturally occurring arsenic in the aquifer matrix, the supporting evidence should be presented in a convincing manner or data gaps should be identified that, when filled, can provide this support. The draft RI Report's description of shallow

groundwater at the site (in the following sub-section) does not suggest that, in general, it is geochemically favorable to producing significant reducing conditions; and,

c) the last paragraph of the arsenic discussion on page 22 should be modified. As noted in Comment #36, the RI's focus should be as much on the potability and potential future uses of groundwater as its current use. In addition, while Ecology agrees that:

- arsenic groundwater concentrations "area-wide" are variable, as we note above: the very highest levels found on site appear to be clustered in one or two areas, and
- to date we have not located a current vadose zone "source" for the elevated arsenic concentrations detected at several shallow groundwater sampling points, this acknowledgement does not imply the absence of a historic, or even current, "site-specific source."

38. Pages 23 through 27, Section 7.3. This section of the draft Report, which discusses the site's stormwater conveyance system, was prepared before samples of manhole solids were collected and analyzed. Later Boeing prepared and submitted an RI Report Addendum (the first Report Addendum; February 2018) which provides the manhole sampling results. More recently, a second Addendum was submitted (September 2018) that includes the results of analyzing two samples collected in the east-perimeter ditch. In the revised Report, the information provided in the Addenda should be used to revise/update Section 7.3.

39. Page 23, Section 7.3.1. In the first paragraph of this sub-section the Report identifies potential sources of conveyance system contaminants. It states that "building materials, landscaping, and vehicular traffic onsite" may contribute to stormwater system "PCBs, metals, oils," etc. Ecology agrees, but in the revised Report Boeing should additionally consider the depths below ground surface:

a) that portions of the conveyance system piping are located at in relation to the seasonal high water table. Are there no locations where piping (or system ditching) extends to depths below the water table?[14]

b) that portions of the North Detention Pond are located at in relation to the seasonal high water table nearby. Since the pond appears to be fairly deep (below grade) and have water in it in late summer, Ecology assumes that groundwater discharges to it. There is the potential, therefore, for: (1) groundwater contaminants to enter the pond, (2) contaminants in the pond to enter

[14] If there are locations where piping/ditching is at depths below the water table, there is at least the potential for (any) contaminants in groundwater to enter the stormwater system – and vice versa. If the stormwater system's "base flow" (volume or volumetric flowrate) has already been determined, this information should be included in the revised RI Report. For several reasons it would be helpful (to the RI) to have an estimate of how much water travels through the conveyance system that is not actual "stormwater," and how much this amount (or flowrate) varies seasonally or due to other factors.

groundwater, and (3) pond water levels to affect local groundwater flow directions. And,

c) that conveyance system ditching is located in relation to the nearby seasonal high water table.

40. Page 23, Section 7.3.1. During revision of the Report the second paragraph of 7.3.1 should be revised to include:
    - a discussion of those buildings discussed during the August 22 site visit that Boeing believes may be constructed of PCB-containing materials, and
    - a fuller description of previous – as well as more recent – sub-station investigations. PCB sampling locations and the resulting concentration levels should be described. The Report should also explain how PCB-containing soils at this or other site locations could be potential sources of PCB contamination in the stormwater conveyance system. Is the migration pathway at this site, for example, limited to only those uncovered areas where soil contamination is present at very shallow depths?

41. Page 24, Section 7.3.2. This section of the Report discusses surface water and sediment quality in Mill Creek. Based on information obtained from "historical evaluations," Boeing concludes that conditions in the Creek are not ideal for aquatic life. However, as noted in Specific Comment #1, while this is a pertinent conclusion the more germane consideration relates to the types of ecological receptors currently present in the Creek (and other surface water bodies) and their susceptibility to COPC exposures. The identification of ecological receptors who may potentially be impacted by site releases is an important objective of the RI, and Sections 5 and 7.3 in the revised Report should include this information.

42. Page 25, Section 7.3.2. At the top of the page, under "Site Specific Testing," the draft Report provides information regarding catch basin cleaning/sampling and the North Detention Pond. In the revised Report these three paragraphs should also:

    a) describe what has been, and is currently, included as part of conveyance system "routine maintenance." According to the 2016 SWPPP, oils, sludges, and debris are regularly cleaned from catch basins, settling/detention basins, oil/water separators, boomed areas, and other "conveyance systems." Catch basins are apparently cleaned when sediment levels reach 60% of height from the bottom of the basin to the invert of lowest pipe into/out of the basin. Grate inlet filters are located in four of these catch basins to treat the water/solids for metals (e.g., Zn, Cu, and Pb), phosphorus, TSS, and oils and grease. Basin and downstream stormwater system cleaning is additionally performed, though the frequency this has been, and is currently, performed should be confirmed. In the discussion of conveyance system maintenance the revised Report should describe how the materials collected during cleaning operations are disposed of, and how it is determined whether the materials are or are not dangerous/hazardous wastes. Are there sampling records for the collected materials that could better inform our

understanding of what COPCs may potentially be transported through the stormwater system?[15]

b) describe any maintenance efforts related to the east perimeter ditch. For example, are sediments ever dredged from ditch locations? If so, who (Boeing? City of Kent?) performs these maintenance activities?

c) incorporate into the first paragraph, if available, the results of more recent (than 2002) catch basin sampling efforts;

d) incorporate into the second paragraph the frequency that the 54" culverts are cleaned, how they are cleaned, and any sampling results resulting from the cleaning operation or associated waste disposal; and,

e) incorporate into the third paragraph a discussion of all pre-2017 sampling results associated with North Detention Pond sediment and water sampling. According to Table 17, referenced in this paragraph, "solids" from the North Detention Pond were only sampled once (2011), and analyzed for a limited number of site COPCs (petroleum, metals, and VOCs). Has this been the only pre-RI sampling of the Pond's sediments? Have sediments been removed in the past (as part of maintenance activities or detention re-configurations) and sampled for waste characterization purposes?

43. Pages 25 and 26, Section 7.3.3. On page 25 the Report states that solids were sampled at "Outfall 20/20B, Outfall 16, and the North Detention Pond." Later, on page 26, it states that stormwater was sampled at "Outfall 20/20B, Outfall 16, and Outfall 15." With respect to solids and stormwater samples collected at the North Detention Pond, the solids sample ID in Table 17 is "OF-DP-0.3"; in Table 18 the (stormwater) ID is "OF-NDP-W". Figure 14 shows the Pond's sampling location (though not in detail) but an "OF" designation is not included.

Ecology assumes that neither stormwater nor solids were sampled near Outfall 15,[16] that the North Detention Pond solids and stormwater samples were collected proximate to one another, and that Figure 14 correctly depicts the general location of these samples. In the revised Report a figure should be added that depicts these two sampling locations in relation to:

- all current stormwater discharge points into the present configuration of the North Detention Pond;
- all current discharge points out of the present configuration of the North Detention Pond;
- all historic discharge points into and out of the North Detention Pond;

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[15] The SWPPP states that storm system waste waters "may be decanted" (treated and discharged) to Boeing's sanitary sewer. It also refers to solidifying certain sludges, and implies that the PCB levels in sludges are measured to inform disposal decisions ("depending on the PCB concentrations, PCB-contaminated sludge is solidified and sent to…Subtitle C landfill" (or incinerator)).

[16] That is, until the follow-up RI sampling performed in July 2018. Sediment samples BD-1 and BD-2 were collected about 75' north and 250' south, respectively, of OF-15.

- all current and historic stormwater discharge points into and out of areas north of the North Detention Pond; and,
- ditching or other potential routes of surface water communication between the North Detention Pond and wetland areas to the immediate north, northwest, and west.

The revised Report should additionally include a corresponding description of how the North Detention Pond has been constructed (including any lining), its depths in relation to ground surface and the water table, and any significant changes that were made to the Pond in the past. As-built design documents for the stormwater conveyance system's piping, catch basins, detention ponds, and outfall locations would be a valuable addition to the Report.

44. Pages 26 and 27, Section 7.3.4. As noted in Comment #38, Section 7.3 should be updated and revised to include results of conveyance system sampling that were not available at the time the draft RI Report was submitted. This includes a revision of sub-section 7.3.4, where Boeing presents "Stormwater Conveyance System Conclusions." During revision the Report:
    a) may refer to "similar industrial" sites and what is "typical" of industrial stormwater, but should primarily focus on the site's conveyance system, what COPCs are likely to be present in solids and stormwater transported by that system, which surface water bodies – including on-site, water-filled surface "units" considered part of the system – are likely to receive these solids and stormwater, what potential risks the measured levels of COPCs in the system potentially pose to receptors at these surface water bodies, and whether there are data gaps associated with adequately estimating/characterizing these potential risks;
    b) should qualify the linkage between low solids accumulations in manhole sediment traps and surface water body "sediment loading" (as noted in Comment #4); and,
    c) should only refer to historic ISGP benchmark attainment if such statements are accompanied by: (1) referencing the particular substances those benchmarks apply to, and (2) acknowledging instances when the benchmark values have been exceeded.

45. Page 27, Section 7. As noted in Comment #34, elevated levels of VOCs were measured in *due diligence* soil gas samples. VOCs were detected at significant concentrations in RI focus areas as well as other areas of the site. In the revised Report soil gas contamination should be discussed for each RI focus area, as well as those other contaminated, or potentially contaminated, areas identified during the recent *due diligence* sampling effort. This may be presented in a separate sub-section of Section 7, or within the soil or groundwater sub-sections (if it is clear that one or the other subsurface medium is responsible for particular soil gas detections).

    Please also see our Addendum 2 comments below (#4, 5, and 11) regarding soil gas VOC detections.

46. Pages 28 through 30, Section 8.0. This section should be updated and revised to include results of the *due diligence* and other site sampling activities that were unavailable when the draft RI Report was submitted. In addition,
    a) unless shallow groundwater is not potable (as potability is defined in WAC 173-340-720(2)), the statement in the fourth bullet on this page should only refer to groundwater's current beneficial uses;
    b) the fifth bullet's description of Mill Creek is not, in Ecology's opinion, a "result of the RI." In the revised RI Report this "conclusion" should be modified to be consistent with other portions of the document, revised to address Ecology's Specific Comments #1 and #41 above; and,
    c) the bullets corresponding to soil, groundwater, and stormwater system results should be revised to: (1) incorporate more recently obtained sampling data, (2) reflect the comparison of all sampling data (used for RI purposes) to up-to-date and properly conservative screening levels, and (3) be consistent with other portions of the document, corrected or otherwise altered to address Ecology comments above and below.

47. Page 30, Section 8.0. The concluding statements in the first two sentences of the last paragraph of this section may reflect Boeing's current opinions, but Ecology does not concur that the draft Report should be approved. Nor do we believe that the current – and likely future – nature and extent of site contamination and potential risks to receptors are understood well enough to end the RI. From our perspective certain RI data gaps, critical to improving our understanding of current and future site conditions, should be filled before revising the RI Report and determining the need for an FS.

    Since the draft RI Report and its first Addendum were submitted, Boeing has conducted additional sampling to fill important data gaps that became apparent upon review of the 2017 sampling data. The sampling results associated with this follow-up work were reported in RI Report Addendum #2. The company also performed additional groundwater sampling in early October, to better understand the nature and extent of contamination in two areas where previous RI and due diligence sampling results indicate the presence of contaminants. Ecology appreciates these efforts. In Attachment A of this enclosure we describe potential RI data gaps identified during our review of the three RI Report submittals. Following Boeing's receipt of our comment letter the parties should discuss these apparent data gaps and decide how best to fill them before, or during, revision of the RI Report.

48. Table 2. The table's first parcel number is missing a digit. It should be 6600070090.

49. Table 3. In the revised Report the table should:
    a) clarify the entry related to the 1997 RCRA closure of a Building 18-67 storage tank. If this is the same tank referred to in Table 4 (5th row of dates), Table 3

should note that the tank was a UST and state whether it was located inside or exterior to Building 18-67; and,

b) include additional details about the eight "regulated units" that received clean closure certification (last row on Table 3's first page). The table – or a section in the Report's text – should identify all hazardous/dangerous waste units that were regulated under interim status regulations and referenced in Part A/B applications. For each of these units the types of clean closure should be differentiated between:

- full clean closure, which includes the clean closure of all environmental media contaminated, or potentially contaminated, by the unit; and,
- "surface" clean closure, which typically *defers* the closure of environmental media contaminated, or potentially contaminated, by the unit to a later date (and/or to the RCRA corrective action process).

In addition, Boeing should consider combining the good historical information provided in Tables 3 and 4 into a single table. It appears that Table 4, which is titled "Historical Investigations," is primarily a list of site-related documents, several of which concern "regulatory" actions on the part of Boeing or Ecology. Supplementing Table 3's summaries with the pertinent document titles would provide a valuable resource for readers.

50. Table 5. The table should be updated to include results of the *due diligence* and other site sampling activities that were unavailable when the draft RI Report was submitted. In addition,

a) if other monitoring wells installed at the site are still serviceable (as sampling locations and/or to measure water levels), these should be included in the table;

b) the screened interval for all wells should be clearly noted. For the direct push samples included on the table, Ecology assumes that "Sample Depth" corresponds to screened interval; and,

c) for those site areas where data obtained prior to 2017 contribute significantly to our current understanding of the current nature and extent of any contamination in the area, the table should additionally refer to this pre-RI "sampling information."

51. RI Report SL Tables. The draft RI Report states that RI SLs for the site were established in the final RI Work Plan and then later revised, as needed, to be consistent with Ecology's CLARC database. Ecology assumes the CLARC tables that Boeing used for these purposes were those in the August 2015 version of CLARC. Since that version is now over three years old, COPC SLs should be re-checked against the most recent update of CLARC. If, at the time of Report revision, the August 2015 update remains the most current version of CLARC, Ecology suggests that Boeing refer to the latest EPA Regional Screening Level tables to ensure that site SLs embody the most recent toxicity values (i.e., RfDs and CPFs)

In addition, the draft Report does not include a table of indoor air or VI-based soil gas SLs. During the *due diligence* sampling events, however, a number of soil gas samples were collected throughout the site and VOCs were often detected.[17] The revised Report should therefore contain a soil gas SL table. Ecology suggests that the table include:

- Method B VI soil gas SLs (available in CLARC);
- Method C VI soil gas SLs (available in CLARC); and,
- soil gas SLs protective of a non-industrial worker.

For subsurface areas beneath and nearby current and future buildings, Method C VI soil gas SLs are appropriate for cases where all practicable methods of treatment will be used during the cleanup, institutional controls are implemented, and the buildings are being – or will be – used "industrially." Soil gas SLs protective of a non-industrial worker, on the other hand, would be applicable to those scenarios where current and future buildings are, or will be, used commercially (not "industrially"), and the potential RME receptor is an indoor worker.

Because there are likely to be a number of areas on the site where soil gas VOC concentrations are below all three SL categories bulleted above, it is advantageous to compare site data to standard Method B VI soil gas SLs – even if the probability of future residential land use is very low. For these areas institutional controls protective of indoor air quality would generally not be needed.

52. Table 10. In the revised Report the soil SL values in this table should be modified, as needed, to reflect current risk-based cleanup concentrations and applicable ARAR levels. In addition,
    a) soil SLs protective of groundwater quality must be low enough to protect all current and future "uses" of that groundwater. For groundwater contamination that reaches, or may eventually reach, surface water, soil SLs must be chosen that will not potentially cause exceedances of groundwater SLs as low as surface water cleanup/ screening levels. It does not appear that this has been consistently done in Table 10;[18]
    b) soil SLs protective of groundwater quality may be calculated assuming a subsurface temperature of 13° C;
    c) the table should be expanded to include soil SLs for all: (1) COPCs detected in soils during the 2017 RI or during recent follow-up or *due diligence* sampling; and, (2) COPCs detected in soil gas or groundwater during the 2017 RI or during recent follow-up or *due diligence* sampling. It should also include soil SLs for:

[17] Significant detections were measured at LAI locations 37, 40, 38, 20, 19, 32, 14, 31, 30, 35, 6, 8, 12, 18, 23, and 27.

[18] CLARC provides soil CULs protective of groundwater quality that have been calculated using the "fixed parameter three-phase partitioning model" (described in WAC 173-340-747(4) and based on MTCA Equation 747-1). The target groundwater concentrations input to the calculations are values protective of drinking water uses, and are not always as low as surface water CULs.

- soil COPCs identified in the RI Work Plan that have not been detected in 2017/2018 soil sampling, and
- contaminants that were not specifically identified as COPCs in the RI Work Plan, but were detected during 2017/2018 soil, soil gas, or groundwater sampling;

d) column headings referring to Method B and C soil CULs should also note that these are levels protective of "direct contact" (only); and,

e) soil SLs protective of indoor air (vapor intrusion pathway) should be added to the table, or a note should be added stating that the table's soil SLs protective of groundwater quality are assumed to also be protective of indoor air quality.

53. Table 11. Similar to Table 10, groundwater SL values in Table 11 should be modified, as needed, to reflect current risk-based cleanup concentrations and applicable ARAR levels. Furthermore,

a) this table should also be expanded to include groundwater SLs for all: (1) COPCs detected in groundwater during the 2017 RI or during recent follow-up or *due diligence* sampling; and, (2) COPCs detected in soil gas or soils during the 2017 RI or during recent follow-up or *due diligence* sampling. It should also include groundwater SLs for:

- groundwater COPCs identified in the RI Work Plan that have not been detected in 2017/2018 soil sampling, and
- contaminants that were not specifically identified as COPCs in the RI Work Plan, but were detected during 2017/2018 soil, soil gas, or groundwater sampling; and,

b) a note should added to the table's TPH Vapor Intrusion columns referring to Ecology's TCP Implementation Memoranda 14 and 18. These Memoranda do not provide the same kind of groundwater VI SLs found in the CLARC tables, but describe an assessment process for determining whether petroleum-contaminated groundwater constitutes a potential VI source.

54. Table 12. This table includes RI SLs for stormwater system solids. When contaminated stormwater-related solids are present in belowground, on-site conveyance system piping, it seems reasonable to assume that the only receptors potentially exposed to these solids would be workers occasionally accessing the piping for maintenance/repairs. Direct contact with the solids would presumably be the exposure pathway of concern, though the duration of exposure assumed in the Method B and C CUL equations would be far greater than the length of time such a worker would potentially be exposed.

Conversely, when stormwater-related solids are present in on-site conveyance system ditching or ponds, other receptors – including ecological receptors – may become

exposed to contaminants in these solids. In addition, some of the solids present in upstream piping will eventually be discharged to surface water bodies.[19]

The SLs for the conveyance system's solids should therefore consider where the solids samples are collected, as well as which receptors could be exposed to the solids' contaminants. Boeing has attempted to do this in Table 12 by including Method B soil CULs, protective of humans who could directly contact the solids, as well as SMS freshwater sediment SCOs and CSLs, protective of receptors within the aquatic environment (where the solids could come to be located),. Ecology agrees with the use of these sets of SL values. However, there are no SCOs and CSLs for individual SVOCs (PAHs), and it is not clear:

- why, when an individual PAH has a Method B or C soil cleanup level, instead of listing this value the table states "see CPAH TEQ" (i.e., why does the table not provide both values – the individual compound's soil cleanup level and the acceptable CPAH TEQ number?);
- what purpose is served by listing the Method B soil CULs in the column second to the right, if the "screening level: solids and sediment" column farthest right never appears to consider them; and,
- why freshwater sediment SLs for individual SVOCs/PAHs were not obtained from another (i.e., non-SMS) source. The "total PAH" SMS SCO concentration is very high (17 mg/kg), and some freshwater sediment screening levels/ benchmarks for individual PAHs are much lower.[20]

In the revised Report Ecology suggests that Boeing:

a) remove the Method B direct-contact soil CULs from Table 12. The document already has a soil SL table (Table 10), and the PAHs and other COPCs now included in Table 12, but not 10, can be added to the latter; and,

b) add freshwater sediment SLs for individual SVOCs/PAHs to Table 12.

55. Table 13. This table is titled "Stormwater Screening Levels," and the title was likely chosen to make it clear that water samples collected as part of the SWMU 86 investigation would be compared to these SL values. However, with the exception of the column farthest to the right, the concentrations included in the table are surface water cleanup/ARAR levels and it is more appropriate that the title reflect this. In addition, in the revised Report:

a) the surface water SL values should be modified, as needed, to reflect current risk-based cleanup concentrations and applicable ARAR levels. For example, Washington State's Water Quality Standards were updated in 2016, leading to

[19] The more mobile particulates (e.g., smaller particle sizes) are likelier to reach surface water, and the likelihood of their transport to surface water increases as their locations in the system nears discharge points.

[20] As an example, EPA Region 3's 2006 "BTAG" freshwater sediment screening benchmark for 2-methylnaphthalene is 0.02 mg/kg. The Region 3 values are only one of the sources available for obtaining/ calculating risk-based sediment concentrations per compound.

significant reductions in human-health criteria concentrations for a number of organic compounds.[21] This update is not reflected in the Table 13 SLs;

b) freshwater aquatic ecological SLs should be added to the surface water table for those compounds that do not have CLARC ARAR values (i.e., the hazardous substances of potential concern at the site which do not have either corresponding Washington State freshwater aquatic life criteria or national recommended freshwater water quality criteria for aquatic life);[22]

c) a DRO SL concentration of 150 µg/l should be added to the table, as a value "predicted to be protective of freshwater aquatic receptors;"[23] and,

d) a distinction should be made between those "WA Industrial Stormwater Benchmarks" that specifically apply to Boeing's Kent facility permit and are monitored for compliance, and those benchmark values that only apply to specific industries (and not the Kent facility).

56. Tables 14, 15, 17, and 18. These tables should be updated to include results of the *due diligence* and other site sampling activities that were unavailable when the draft RI Report was submitted. In addition, in the revised Report:

    a) a table of soil gas sampling results should also be added;

    b) Table 14 should indicate whether soil samples were collected in the unsaturated or saturated zones;

    c) Table 15 should indicate whether groundwater samples were collected from screened intervals that (at the time of sampling) intersected the water table, or were fully below the water table; and,

    d) the RI SLs in these tables should be revisited and changed, where necessary, if modifications are needed to address Comments #51 through #55 above;

57. Table 17. A note should be added to the table, explaining how the three cPAH TEQ values were calculated for the "off-site" samples collected in February 2014.

58. Figure 4. The Clearwater Property inside the current property boundary was not removed from the RCRA "footprint." This should be noted on the figure.

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[21] See "Water Quality Standards for Surface Waters of the State of Washington," adopted August 2016, and revised October 2017

[22] There are very few ecological surface water SLs for VOCs and SVOCs in Table 13. Yet there are a number of volatile and semi-volatile site COPCs. Having SLs for these compounds is valuable during the RI. In their absence it is difficult to determine whether a comparison of site concentration data to only the surface water CULs/SLs -- for substances which have such CULs/SLs (such as the metals and PCBs in Table 13) -- is a conservative assessment of WAC 173-340-730's "environmental effects." WAC -730(3)(b)(ii) requires comparison of site surface water concentrations to levels that are "estimated to result in no adverse effects on the protection and propagation of wildlife, fish, and other aquatic life." In the absence of such comparisons whole effluent toxicity testing is commonly needed to verify the protection of fish and other aquatic life.

[23] From Ecology's Toxics Cleanup Program Implementation Memorandum #23, "Gasoline and Diesel Surface Water Concentrations Predicted to be Protective of Aquatic Receptors," October 2018 draft.

59. Figure 6. The property boundary shown here is incorrect. As depicted in Figure 4, the western portion of the site area shown in Figure 6 is no longer owned by Boeing.

60. Figure 8. This figure depicts two cross-sections across the site, near the locations of buildings 18-61, -62, -54, and -41. In the revised Report:
    a) Cross-sectional and plan-view blow-up figures should be included for each of the RI focus areas, as well as those additional areas where the results of recent additional sampling (such as the *due diligence* sampling and follow-up sampling efforts) indicate the presence of site-related contamination in soils, groundwater, and/or soil gas. These figures should not only include each of the sampling locations targeted during the RI (i.e., the locations where samples were collected and analyzed per the 2016 RI Work Plan).[24] They should also include those previous locations sampled prior to, or concurrently with, the RI where the information obtained is instrumental to characterizing the current nature and extent of contamination, per area.
    b) The cross-sectional figures (discussed in a) above) should indicate the depths at which soil and soil gas samples were collected, and the water table depth.

61. Figure 9. A minor comment, but is not clear why the groundwater flow direction arrow, pointing to the NNW, is located in the more central portion of the site. Perhaps several arrows should be added, showing where directions appear to significantly change from upgradient flow paths.

62. Figure 11. The figure's CSM diagram is a good addition to the RI Report and Ecology agrees with much of its depiction of the various source-to-receptor pathways. However, in the revised Report it should be clear why the diagram indicates that:
    - direct contact with contaminated soils is an incomplete pathway for <u>future</u> residents, office workers, visitors, and ecological receptors. These would seem to be potentially complete pathways unless assumptions are made about continued ground-surface cover or imposed land use controls;
    - the inhalation of contaminated soil particles, and indoor air contaminated by vapor intrusion due to soil volatilization, are incomplete pathways for <u>future</u> residents;
    - the inhalation of contaminated outdoor air, which is due to the volatilization of contaminated soil, is an incomplete pathway for <u>future</u> residents and <u>current and future</u> office workers. This is shown as a potentially complete pathway for industrial workers;
    - dermal contact with contaminated groundwater is an incomplete pathway for <u>future</u> residents and office workers. It is also unclear why the diagram believes future industrial workers and/or visitors could not directly contact contaminated groundwater; and,

[24] Figure 8 does not depict SB locations 1, 2, 5, 10, or 14 through 18. Nor does it show MWs 1, 3, or 5.

- ecological receptors are not currently exposed to contaminated surface water. This pathway appears to be at least potentially complete. Nor is it clear why the diagram believes site visitors could not be exposed to contaminated surface water.

In addition, the CSM diagram in the revised Report should:

a) indicate that shallow groundwater can be a source of VOC contamination for indoor air (via vapor intrusion), and

b) distinguish surface water from surface water sediment receptor points.

RI Report Addendum #1, February 2018 (SWMU 86 sampling results)

1. The first RI Report Addendum was submitted primarily to communicate the results of manhole sampling that were unavailable at the time the draft Report was prepared. Ecology expects the information in this Addendum to be integrated into the revised RI Report. At that time our comments on the draft Report concerning stormwater and solids SLs should be addressed when presenting and discussing the Addendum's sampling results.

2. Pages 1 and 2, Section 3.0. The Addendum states that water levels at manhole locations 20.237 and 20.235 were consistent with Mill Creek levels. These manholes appear to be about 1000' west of the Creek/east-perimeter ditch. In the revised RI Report Boeing should discuss:

   a) whether, at the time water levels were measured, water quality in the conveyance system as far west as the two manholes better represented site stormwater, surface water, or groundwater, and

   b) to what degree water and solids sampling results from these manholes, as well as the results from MH 16.12 and 15.10, represent COPC concentrations solely attributable to stormwater collected at upstream catch basins and other inlets to the conveyance system.

3. Page 3, Section 5.1. The Addendum states that RI sampling results for SWMU 86 are "consistent and in some cases lower than those anticipated by earlier studies..." If a similar statement is contained in the revised Report it should be coupled with specific reference to the earlier studies this conclusion refers to.

   In addition, according to Table 1, sampling of conveyance system solids in 2002 and 2011 did not include analysis for PAHs (and it is not clear why the three off-site samples collected in 2014 and included in Table 1 only have cPAH TEQ values). The table does not include any pre-RI PCB data from catch basins or the north detention pond that were collected more recently than 2002; nor does it indicate that there are pre-RI data for silver, selenium, or nickel. Conclusions regarding recent sampling results and their *consistency* with older data sets should therefore be appropriately qualified.

4. Page 3, Section 5.1. In the discussion of diesel detections in manhole solids samples the revised Report may state (as the Addendum does here) that concentrations were below RI SLs at outfall sampling stations. But it should also note that in 2017 there was no corresponding outfall sampling location for the relatively high levels of diesel found at MH 15.10.[25]

5. Page 4, Section 5.2. The Addendum's conclusions include statements regarding how "consistent" the sampling results are with "regional and historical data," how they are much like the concentrations likely be found at other industrial facilities, and how they suggest low "sediment loading" to offsite surface water bodies. Similar statements were made in the draft RI Report; please see Comment #44 above.

6. Table 1, and associated lab data. It appears that the RL for PCB Aroclor 1248 was slightly elevated for the stormwater solids sample collected at MH 15.10. For the sample collected at MH 20.235 the RLs for all Aroclors were significantly elevated (≥ 150 µg/kg), with an Aroclor 1248 RL of 376 µg/kg. This information should be included in the discussion and assessment of SWMU 86 sampling results in the revised RI Report.

7. Table 2. The Aroclor RL for analyses of stormwater samples was apparently 0.01 µg/l. This may have been the targeted RL for these samples, but in the revised RI Report's discussion of SWMU 86 it should be acknowledged that this RL is orders of magnitude higher than the PCB surface water ARAR concentration (7E-6 µg/l).

Addendum #2 (*due diligence* sampling results and follow-up proposals)

1. The second RI Report Addendum was prepared to communicate the results of sampling activities that were either performed after the draft Report was submitted or for *due diligence purposes*.[26] Ecology expects the information in this Addendum to be integrated into the revised RI Report. At that time our comments on the draft Report concerning RI SLs should be addressed when presenting and discussing the Addendum's sampling results.

2. Page 2, Section 2.2. The Addendum's conclusions section includes statements regarding how "consistent" the sampling results are with "regional and historical data," and how they are much like the concentrations likely be found at other industrial sites. Similar statements were made in the draft RI Report and Ecology has provided responses to these assertions in our comments above.

   In addition, it is not clear what the last sentence is attempting to convey. It states that contamination found in the stormwater conveyance system is "likely from an anthropogenic source typical of the urban environment." Ecology agrees that many of the substances detected in stormwater and stormwater-system solids originate from an

[25] Ditch sediment samples near OF-15 (BD-1 and BD-2) were collected in July 2018.
[26] Addendum #2 also included proposals for follow-up RI work. Ecology responded to these proposals via email on September 21.

"anthropogenic source," but in the revised Report the phrase referring to sources typical of the urban environment should either be removed or the sources should be identified/specified.

3. Page 3, Section 3.1. In the first paragraph of this section the Addendum refers to SWMU 23 as a potential source of arsenic in groundwater. According to the RFA, SWMU 23 was an aboveground chrome-reduction tank located within Building 18-62. The revised Report should briefly note whether releases from the tank occurred, and how releases reaching soils and groundwater could increase local dissolved-phase arsenic – but not other metal – concentrations (e.g., is this because liquids stored in the tank contained relatively high levels of arsenic? had a high pH? etc.).

   In addition, though a minor comment, the last sentence in the second to last paragraph on this page should be clarified (if included in the revised Report). When the Addendum asserts that elevated arsenic levels in groundwater are "not associated with known releases of arsenic," it should be clear to the reader whether Boeing means: (1) there have been releases of arsenic, but high levels in groundwater are not associated with them; or, (2) there are no known/identified releases of arsenic.

4. Page 4, Section 3.2.1. In the discussion regarding sampling near the location of former Building 18-24 the Addendum states that the *due diligence* sampling results "did not change the conclusions about this area made in the RI..." Ecology is not sure what conclusions this sentence is referring to, but from our perspective a number of the VOCs detected in soil gas, and several of the SVOCs in soil and groundwater, were either not expected to be found or not expected to be detected at such high levels near Building 18-24. It, therefore, follows that our understanding of the nature and extent of contamination has changed.

5. Page 5, Section 4. The Addendum properly refers here to Ecology's 2009 draft VI guidance document. However, although the Addendum acknowledges that VOC concentrations in a number of soil gas samples exceeds the Method C VI soil gas SLs, there are no proposals for follow-up VI investigation and assessment. The revised RI Report should evaluate the soil gas data and determine if there are existing site buildings – e.g., Buildings 18-43, -42, -62, and/or -25 – where indoor air quality may be potentially impacted by vapor intrusion.

6. Tables 1, 2, 5, 6, 9, 10, and 14. Please see General Comment #1 (on the RI Report) and Specific Comment #51 concerning RI SLs.

7. Table 1. The table's RI SL for PCBs in soils (0.11 mg/kg) appears to be a Sediment Management Standard SCO value. In the revised Report the SLs used for comparison to soil data should be soil concentrations protective of direct contact and indoor air and groundwater quality (with the assumption that the groundwater is used for drinking water and/or discharges to surface water).

In addition, a minor point but the table refers to manhole 20.236M. Ecology assumes this is a typo, and the data included in this row apply to manhole 20.235M.

8. Table 2. Any similar table included in the revised RI Report should:
   a) note that the PCB RLs (0.010 µg/l) were much higher than the groundwater/ surface water SLs, and
   b) make any needed changes to the SB-25 row (RL values increase per cell by 0.001 from left to right)

9. Tables 5 and 9. The RI SLs in these tables appear to be Method C direct contact soil cleanup levels (CULs). Soil SLs protective of groundwater quality are much lower. Please see Comment #52 on the RI Report's Table 10.

10. Table 13. The table's RI SLs for soils appear to be Sediment Management Standard values. As discussed above in the comment on Table 1, in the revised Report the SLs used for comparison to soil data (such as the TD and TE locations) should be soil concentrations protective of direct contact and indoor air and groundwater quality (with the assumption that the groundwater is used for drinking water and/or discharges to surface water).

11. Table 14. The soil gas RI SLs in the table appear to be CLARC's VI Method C soil gas SLs. These are appropriate, but as noted in Comment #51, Ecology recommends that such tables also include Method B VI soil gas SLs (available in CLARC) and soil gas SLs protective of a non-industrial worker.

ENCLOSURE
ATTACHMENT A

POTENTIAL RI DATA GAPS

1. A number of Ecology comments refer to the draft RI Report's media screening levels (SLs). Once agreement has been reached on the revised set of RI SLs, contaminant concentrations measured in site soil, soil gas, groundwater, stormwater, stormwater solids, surface water, and surface water sediments should be re-evaluated. Based on the re-evaluation, some: a) media concentrations, thought to be greater than SLs, may now appear to be of less concern; b) media concentrations, thought to be below SLs, may now appear to be of greater concern; and, c) non-detected contaminants may have had reporting limits (RLs) significantly higher than their risk-based SLs. For those contaminants in the last two categories, corresponding RI data gaps may potentially need to be identified.

2. In certain site areas where RI (or due diligence) sampling was performed, the analyte lists appear – based on the analytical results obtained and/or potential sources of releases nearby – to be insufficiently comprehensive. In these cases RI data gaps may potentially need to be identified. Examples include: a lack of total-TPH, or TPH-fraction, data for those soil gas samples where significant levels of petroleum-related VOCs were detected; an absence of copper, zinc, and nickel concentration data for certain soil and groundwater samples collected during the *due diligence* fieldwork; and, a lack of SVOC concentration data for soil and groundwater samples collected at several locations.

3. Several Ecology comments (e.g., #17, #19, etc.) refer to the minimal description of site hydrogeology in the draft Report, and the absence of a well-informed conceptual model of local groundwater conditions – as those conditions relate to the fate and transport of groundwater contaminants. Developing such an understanding is key to completing the RI. It appears that the present uncertainty associated with just the shallowest groundwater gradients and flow directions in certain parts of the site constitutes a need for additional RI data. The goal should be to reduce this uncertainty by better understanding: (1) when and why horizontal/vertical gradients and flow directions change in portions of the site; (2) what effect surface water bodies have on these gradients and directions; (3) what effect season/precipitation has on these gradients and directions;, and (4) what effect, if any, sewer conveyance system units have on these gradients and directions. Once this site "model" has been developed, the likely fate and transport of subsurface contamination can be more confidently predicted.

4. SWMU 88/89. Soils were sampled below Building 18-43 at a depth of 11.5-12.5' bgs at two locations (SB-1 and SB-2). Arsenic concentrations were close to the natural background-based soil SL, but relatively high levels of copper were detected. Groundwater samples were collected from the same locations and arsenic levels were

elevated (especially at location SB-1). The arsenic concentration in a *due diligence* soil sample located between Buildings 18-43 and 18-42 was as high as 9.5 mg/kg.

Potential RI data gaps for the Building 18-43 area include:

a) groundwater metals concentrations, other than arsenic, that may be associated with releases of "microfiche process waste," and

b) monitored groundwater arsenic and copper (and perhaps other metals) concentrations in areas of the site east of MW-1, between LAI5 and LAI34.

5. AOC-2, and vicinity. A number of samples were collected near the sites of former Buildings 18-35 and 18-24. MW-7 is located at the far northwest end of this area; MW-6 is at the far southeast end. Contaminant concentrations measured in samples from MW-7 and -6 have been low. However, vinyl chloride has been detected in groundwater at SB-6, -8, and -26 (and older samples); petroleum hydrocarbons and 1-methylnaphthalene were detected in the LAI19 groundwater sample; a number of VOCs were measured at elevated levels in *due diligence* soil gas samples (e.g., TCE, benzene, CFC-11, chloroform, and 1,2,4-trimethylbenzene); and, while soil contaminant concentrations were generally low (with the exception of location LAI19), a wide range of substances was detected. According to the June 2002 Clearwater investigation report's Figure 2, PCBs were apparently found in soils at location 18-24-1 (near an historic transformer yard).[27]

   RI groundwater samples SB-6, -7, and -8 were not analyzed for PCE (or most VOCs) or PCBs. *Due diligence* samples LAI37, -38, -39, -40, and -19 samples were not analyzed for PCBs, copper, zinc, or nickel, and only the LAI19 soil and groundwater samples were analyzed for SVOCs.

   It is not clear which areas near former Buildings 18-35 and 18-24 are upgradient of MW-7 or during which times of the year they are so (or under what site conditions). Nor is it clear what the sources of the different contaminants detected in this area are, or which contaminants are environmental breakdown products of "parent compounds" initially released.

   Prior to revision of the RI Report Boeing should gather building and land use information available for this portion of the site (which the company has already proposed to do). Based on the recent sampling results and unknowns/uncertainty described above, RI data gaps should be identified for this area (i.e., data gaps in addition to those that direct-push groundwater samples SB-26, -27, and -28 were collected to fill).

6. Building 18-62. Four RI groundwater samples were collected and analyzed from within the building (SB-9 through -12). The arsenic concentration obtained from the sampling location farthest south, SB-12, was one of the highest levels measured onsite (266 µg/l). Two *due diligence* samples collected immediately south of the building were not

[27] The Clearwater investigation Figure 2 (appended to the RI WP) indicates that 0.994 mg/kg of PCBs were detected in soil at location 18-24-1. A transformer yard was located nearby Building 18-35.

analyzed for arsenic, though a concentration less than 100 µg/l was measured in a sample positioned southeast of the building's southeast corner (LAI13). Monitoring wells (MW-5 and -4) are currently located SSW and SSE of Building 18-62, presumably in a generally upgradient direction.

Vinyl chloride was detected in one of the southerly *due diligence* groundwater samples (LAI31), and elevated levels of benzene, chloroform, and 1,3-butadiene were found in soil gas.

No monitoring wells are currently located north, east, or west of Building 18-62 (and SB-12). It is not clear what the sources of the contaminants detected in groundwater in this area are, though it is possible that contamination migrating from the south may be contributing to the organic compound concentrations measured last year. Based on the recent soil gas sampling results and the absence of monitoring wells downgradient of the SB-12 area, RI data gaps may potentially need to be identified.

7. Former UST KS-1 and Building 18-42. Groundwater was sampled at SB-14, -15, and -16 on the west side of Building 18-42. Diesel was detected and the arsenic concentration at SB-14 was relatively elevated. *Due diligence* samples were also collected: from beneath the north end of the building, and about 100' farther north (north of MW-1). North of the building (at LAI3) arsenic was relatively elevated in soils. Benzene was present at significant concentrations in soil gas and 1,4-dichlorobenzene levels were elevated beneath the building (at LAI23).

   No monitoring wells are currently located west, northwest, or east of Building 18-42 (and SB-14). Based on the recent soil gas sampling results and the absence of monitoring wells northwest of the SB-14 area, RI data gaps may potentially need to be identified.

8. Groundwater and soil arsenic levels. Among the RI focus areas "area-wide arsenic" has been identified as one of the investigation targets of the RI. Potential data gaps related to characterizing the nature and extent of arsenic contamination have not been "grouped" in this Attachment, but are discussed in several of the numbered potential data gaps above and below.

9. SWMU 86, stormwater conveyance system solids. During the RI it has been difficult to collect enough solids mass at most manhole sampling stations to perform all of the analyses required by the RI Work Plan. The sediment traps Boeing has utilized are, as of today, still in place and if sufficient solids accumulate, samples will be collected and analyzed. During revision of the RI Report and the identification of data gaps the company should consider:

   - Characterizing the typical grain-size composition of stormwater sewer solids (and especially at locations nearing discharge points). If, as Ecology assumes, stormwater carries an abundance of finer-grained sediments/particles, deploying several of the "rounded-dome bowl-type" styles of trap may be a good supplement to the solids-collection effort. These traps have been designed to preferentially collect finer-grained sediments.

- Collecting a number of stormwater solids "grab" samples, at locations where this is possible and there is enough material to perform the desired analyses. Catch basins are the more obvious locations for such collections, but samples could also be collected within conveyance piping (at/near manholes, or otherwise) at any locations where solid material appears to preferentially accumulate.
- Compositing collected solids from multiple locations. At some sampling locations it may be possible to deploy more than one trap and then composite the collections from these traps. Compositing is an acceptable approach if the sampling objective is to determine which non-volatile site COPCs may be discharging to surface water and surface water body sediments.
- Selecting different (and accessible) sampling points in the same line where greater solids accumulations are expected to occur.

In addition, Boeing apparently intends to demolish certain buildings and modify the sewer system in the near future. Conveyance system samples (grabs or trapped solids) should be collected before and immediately after these activities/changes.

10. SWMU 86, North Detention Pond and vicinity. In Comments #39 and #43 above Ecology has requested that the revised RI Report contain additional information about this Pond, including its connections to shallow groundwater, nearby ditching, and wetland areas to the west, northwest, and north. The current North Detention Pond is of interest for several reasons:
    a) it is part of the site's stormwater conveyance system and, as such, may be contributing to stormwater contaminants being discharged to surface water from that system;
    b) it may serve as a discharge location for contaminated groundwater upgradient of the Pond;
    c) it may, depending on the water levels present at any given time within it, influence groundwater gradients and flow directions in the area;
    d) it's water and sediments may serve as a source of contamination for groundwater beneath and downgradient of it;
    e) it may be "connected" to wetland areas to the west and northwest, and if so, may be a source of contamination for these areas; and,
    f) it provides a surface water habitat for water fowl and perhaps other ecological receptors, who may then be exposed to contaminated water and/or sediments in the Pond.

    To better evaluate a) through f) above, Pond-related information has been requested in Comments #39 and #43. Additional information should be provided to answer the following questions:

    - Besides the sampling that was recently performed at the North Detention Pond outfall, and the sediment sampling conducted in 2011 (as part of the Striker property investigation), has any other Pond stormwater or sediment sampling

been conducted since the unit was installed in 1979? During the 2013 re-configuration, perhaps, or as part of sludge/sediment waste characterization? Did any of this sampling include analyses for SVOCs, PCBs, and metals (including nickel and selenium)?

- Have the stormwater and/or solids upstream of the Pond been sampled? According to the SWPPP, a stormwater vault below/near Building 18-51 is upstream of the Pond. Has the water or solids in this vault been sampled? Has the Building 18-59 bio-filtration swale – which according to the SWPPP treats stormwater run-off before discharge to the North Detention Pond – been sampled?
- Have any monitoring wells been installed (in the past) upgradient, downgradient, or in the vicinity of the Pond? If so, is there associated groundwater sampling information and/or water level measurement data available?
- Have any direct-push groundwater samples been collected immediately upgradient, downgradient, or – other than locations SB-26, SB-21, and LAI22 – in the vicinity of the Pond? If so, are the associated sampling data available?
- Has any soil, surface water, or sediment sampling been conducted in areas due north, northwest, or west of the Pond's present location and configuration? Are the associated sampling data available?

Based on the amount of information currently available, and its ability to answer the questions and address the RI evaluation-needs noted above, data gaps should be identified for this area of the site.

11. Building 18-59 area. A high arsenic concentration (269 µg/l) was detected in *due diligence* groundwater sample LAI21, located just north of Building 18-59 and about 300' southwest of MW-1. Arsenic concentrations above 100 µg/l were also measured in samples collected from LAI2, northwest of the building, and LAI22, west of the building. PCBs were detected in soils west of the building (at SB-21), and in groundwater immediately south (at SB-22). Building 18-59 is located close to the North Detention Pond, and no groundwater monitoring wells have been installed to northwest or west of the building.

    Prior to revision of the RI Report Boeing should gather building and land use information available for this portion of the site. Based on the recent sampling results and the absence of monitoring wells in this area, RI data gaps may potentially need to be identified.

12. Former Building 18-63. Nine *due diligence* samples were collected at and nearby the former location of Building 18-63, south of Building 18-62. Although this was not one of the RI Work Plan's focus areas, a number of contaminants were detected in these samples:

    - vinyl chloride was detected at a level of 12.6 µg/l at location LAI32 and at 7.9 µg/l at LAI14; and,

- a variety of other petroleum-related, and non-petroleum-related, VOCs were detected in groundwater and soil gas. In soil gas, the levels of benzene, chloroform, and 1,3-butadiene exceeded Method B VI SLs.

Soils were sampled for VOCs at five locations and for TPH at four locations. However, metals were only analyzed at location LAI13, north of the Building 18-63 footprint, and at this location copper, zinc, and nickel were not analytes. Likewise, SVOCs were only analyzed in soil samples from LAI13. Groundwater was sampled for VOCs and TPH at six and five locations, respectively. SVOCs and metals, however, were only analytes for two sampling locations. Copper, zinc, and nickel concentrations were not measured at any location.

In early October, Boeing sampled groundwater in three additional locations within the 18-63 area. Preliminary results from shallow sampling depths indicated that arsenic levels were elevated at one location (229 µg/l at SB-29), and significant concentrations of diesel and oil range hydrocarbons were present. Vinyl chloride was detected, but at a low level (0.042 µg/l) and at only one depth interval at one location.

Shallow groundwater monitoring wells MW-4 and -5 were installed during the RI east and west of the former Building 18-63 area. Samples collected to date from the two wells have been relatively clean, but neither is located up- or downgradient of the contamination detected during the due diligence sampling effort. New groundwater samples SB-31 and -29 were collected in generally up- and downgradient locations, but were obtained via direct-push methods.

According to the SWPPP, in November 1993 a stormwater treatment/detention facility was built southeast of former Building 18-63. It included a combination detention/wet pond (South Detention Pond) and a bio-filtration swale. The purpose of the facility was to treat run-off from the 18-63 area, and parking lots west and south of this area. Outflow from the pond and swale was routed to a drainage ditch which connected to Mill Creek. Since the building was removed, the footprint area has been covered with gravel. But apparently the former building's perimeter storm drain system is still in place. The draft RI Report does not include the results of any stormwater-related sampling that has been performed at the pond, swale, or ditch.

Prior to revision of the RI Report Boeing should gather building and land use information available for this southern portion of the site (as the company has already proposed), including the stormwater management system described in the paragraph above. Groundwater, soil, and stormwater-related RI data gaps for the area should then be identified.