Appendix C. Public Comments

ATSDR received comments on the Evaluation of Potential Exposures to Contaminated Off-Site Groundwater from the ORR Public Health Assessment, Public Comment Release (August 19, 2005), from peer reviewers, individuals, organizations, and agencies. We have also received additional comments at various public meetings. We thank all of those who took the time to comment. This appendix includes a listing of the public, peer review, and agency comments and our responses to them. Some grammatical and editing comments, such as typos and undefined acronyms, have been corrected in this document but not included in this appendix.

1. Reliability of data used in this PHA

Reviewer Comments:

"The nature and extent of contamination are described by something that I would compare to liar's poker – the reader needs to have faith that the data are correctly and fully reported. These data may be included in many of the numerous documents cited, but this report itself concentrates on the maximum concentration reported in respect to the Comparison Values (CVs) sometimes as much as a decade ago. What are missing are any reports of data quality, variability of measurements (site, background and reference) over time and the date of the last measurement"

"When added, discussions of the historical monitoring data should also address the consistency and adequacy of the data sets for PHA purposes."

ATSDR Response:

In preparing this PHA, ATSDR reviewed and evaluated environmental data provided to ATSDR scientists directly from the Department of Energy or in various reports prepared by the Environmental Protection Agency Region IV, the Tennessee Department of Environment and Conservation (TDEC) DOE Oversight Division, or their contractors. ATSDRs evaluation included the identification of inconsistencies and data gaps. The validity of analyses and conclusions drawn in this PHA are based on the reliability of the information referenced in reports related to the Oak Ridge Reservation (ORR). In our assessment, the quality of environmental data available in these documents is sufficient for public health decisions. A statement similar to this one has been added to the 'Evaluation of Environmental Contamination and Potential Exposure Pathways' section of this document.

2. Narrow focus of this PHA on groundwater

Reviewer Comments:

"[T]he document concentrates single-mindedly on groundwater itself and no pathways other than residential drinking water."

"I am firmly convinced that isolated health assessments of the type attempted here (ignoring all other pathways and media) do a disservice to the public and do not assist ATSDR in its mission."

"You only talk about off-site groundwater."

ATSDR Response:

It may be unclear to the reviewer that there are 8 other PHAs being conducted for ORR. These PHAs address all other contaminants of concern and related pathways of exposure. This document was intended to be specific and narrowly focused on contaminated groundwater and associated off-site exposure pathways.

3. Adequacy and completeness of off-site groundwater sampling

Reviewer Comments:

"In some instances contaminated sources are not re-sampled!"

"The nature and frequency of the off-site sampling program is not well-described in the report and may be inadequate. Monitoring programs based on snapshots in time every few years or even on an annual basis often lead to false conclusions concerning public health safety and the effectiveness of remediation programs."

"Based on my reading of the report, the off-site monitoring program appears to be random and infrequent, particularly as it relates to residential wells."

ATSDR Response:

ATSDR used all available data in this assessment. We recognized the sporadic and inconsistent nature of the off-site residential sampling data and have noted this as a data gap in the document (p. 7). However, this sampling was conducted by TDEC and was never intended to be comprehensive or to fully characterize off-site contamination from ORR. TDEC does not have the resources or funding to complete a comprehensive sampling program. A recommendation has been added to this document that a regular monitoring of off-site residential wells should be included in DOE's groundwater monitoring program.

4. Health outcome data

Reviewer Comments:

"Based on their assumptions and views of the data, the authors reach conclusions for which their explanations are appropriate, and therefore they communicate the proposition that there are no adverse health effects expected, and if there are any in the area (not checked or evaluated) they

are unrelated to site-based exposure via groundwater because of the absence of complete pathways."

"Sites such as the subject area often have the attention of activists and others creating a counter-balance to any tendency to whitewash a potentially dangerous situation. Frequently they seize upon some statistical aberration or local cancer cluster as their cause celebre, thereby inflaming public and agency reaction (and over-reaction). Although I know there have been issues in the area, especially regarding mercury, apparently they have not motivated anyone to get very excited about potential threats. Hence, I was surprised that the authors did not present some population-based statistics to validate their assertions that there was no threat. Even census tract data on longevity or disease incidence from the cancer registry would add confirming support for the conclusions which, to me, seemed stretched."

ATSDR Response:

ATSDR scientists generally consider health outcome data to evaluate the possible health effects in a population known to have been exposed to enough environmental contamination to experience health effects. In this pubic health assessment on off-site groundwater at ORR, ATSDR scientists determined that people were not and are not using private groundwater wells and were not exposed to ORR related contaminants from groundwater exposure. For these reasons, health outcome data were not evaluated in this public health assessment.

5. Include more maps

Reviewer Comments:

"The significant ETTP monitoring points should be clearly shown on a map. *This same comment applies to data locations for the other sites/watersheds.*"

"Potentiometric maps and geologic cross-sections are appropriate and needed to adequately evaluate potential hazards to public health."

"The report does not include maps of the contaminant plumes emanating from the Y-12 complex. Such maps are also appropriate and needed to adequately evaluate potential hazards to public health."

"In the discussion of contamination in Bethel Valley and Melton Valley, creeks are mentioned by name, such as White Oak Creek, Raccoon Creek, First Creek, and the Northwest Tributary, but there is no figure to show the reader the locations and the configurations of these creeks. This problem is actually generic to the whole report. There are figures in the draft PHA for releases to White Oak Creek, especially Figure 10, that show these creeks, although sometimes not too distinctly. A good figure showing the surface water drainage pattern for the ORR is considered a necessity for this report, because the message of this report is as much or more graphical and qualitative than it is quantitative."

"Figure B-1 does not include the Maynardville Formation, which is described in Table B-1 as a significant aquifer and is also mentioned several times in the text."

"Figure B-1 is an incomplete representation of the geologic and hydrogeologic relationships that exist on and around the ORR. Vertical profiles or cross-sections are needed to show the interrelationships of the various formations, aquifers, and flow paths. Depictions of flow gradient and conductivity calculations or models would also be helpful."

ATSDR Response:

Several maps and figures have been added to the document to address the issues raised by the reviewers. Figure 2 shows the monitoring locations near ETTP. Geologic cross-sections are provided in several maps including Figures 3, 6, 9, 11, and 12. The contaminant plume emanating from Y-12 and extending off-site into Union Valley is depicted in Figure 13 and Figure B-1. White Oak Creek, Raccoon Creek, First Creek, and the Northwest Tributary are represented in Figure 5.

The Maynardville Formation is a sub-group of the Conasauga Group. This is indicated in the text of the document as well as in Table B-1. Figure B-1 is intended to show the major geologic formations of the ORR

6. Vapor intrusion

Reviewer Comments:

"Absent are any consideration of vapor intrusion for VOCs and semi-VOCs, including some forms of mercury…"

"One potential pathway of human exposure that is not addressed in the report is the volatilization of contaminants from the groundwater system to the soil system and subsequent inhalation by residents in underground structures (i.e., basements or houses partially located below grade) or in buildings with cracked foundations."

ATSDR Response:

A thorough discussion of vapor intrusion as it relates to the EEVOC plume extending off-site from the Y-12 Complex has been added to the 'Evaluation of Environmental Contamination and Potential Exposure Pathways' section of the document.

7. Adequacy of institutional controls and pump-and-treat technology in Union Valley

Reviewer Comments:

"The document should detail which institutional controls are in place in Union Valley. It is our understanding that these include deed restrictions on groundwater use."

"The idea of institutional controls being adequate to exclude [hunting and fishing], of course, runs counter to the local culture."

"The administrative controls are not adequately described. Technical details of the plume, remediation system, and performance metrics are also lacking. The general tone of the section (*ATSDR's Conclusion for Bear Creek Valley and UEFPC Watersheds*) suggests that the pump-and-treat will be sufficient when it is well-known that this remediation technology is rarely effective in reaching site-specific remedial action objectives."

"The recommendation to solely rely on institutional controls set forth in the Interim Record of Decision is flawed given that the pump-and-treat remediation technology is ineffective in reducing contamination to safe levels."

"Most of the pathways seem to be well-defined. However, the Union Springs pathway seems ambiguous. It is unclear why an area zoned as industrial can be assumed to have unlikely human contacts. What about humans that exercise in this area during break periods at facilities? Also, workers involved in infrastructure maintenance may contact these seeps."

ATSDR Response:

The institutional controls are outlined under *'UEFPC Watershed'* in the 'Contamination at Bear Creek Valley and UEFPC Watersheds' section.

The issues of hunting and fishing are addressed in other PHAs for the ORR, including: White Oak Creek, Current Chemical Exposures and Mercury PHAs.

The efficacy of pump and treat technologies is certainly a debatable point; however, the purpose of this health assessment is not to recommend treatment technologies which would reduce contamination, nor is it our objective to evaluate whether the selected remediation tactics can reach site-specific remedial action objectives. It is our goal to evaluate whether exposure to contaminated groundwater is occurring, has occurred in the past, or will likely occur in the future. If a completed exposure route has been identified, we would then evaluate the health impacts, if any, from that level of exposure. The institutional controls that are in place were not intended to reduce the EEVOC plume's toxicity, mobility of volume of contamination. They were merely intended to 1) ensure that the public's health is protected by mitigating exposure, 2) to prohibit future activities that could lead to exposure, and 3) prohibit activities that can make the plume migrate faster or increase in extent.

The exposure scenario that is mentioned here is the possibility of someone coming in contact with contaminated groundwater in this area. Because of the zoning for this area as industrial, we do not anticipate any contact by people with groundwater. While it is entirely possible that maintenance workers could somehow come in contact with springs or seeps in the area, we feel that an exposure (especially one of any health consequence) of this nature is an unlikely scenario.

8. Description of contaminant sources and provision of additional data

Reviewer Comments:

"Deficiencies in the report with respect to the description of groundwater contamination include: (a) description of contaminant sources in the aquifer; (b) disconnect between the description and discussion of contaminants found in off-site monitoring points and the activities of the various facilities; (c) incomplete presentation of the positioning of off-site monitoring and residential wells (i.e., depths and hydrogeologic units) in relation to groundwater flow paths; (d) inadequate description of biogeochemistry of the groundwater system."

"The contamination discussion is too brief. Only selected contaminants are discussed without giving any sense of the data sets that were available to the PHA preparers. Were radionuclides and non-VOCs not a potential groundwater issue at ETTP? Summary tables of pertinent data sets should be provided so the reader can clearly see why, for example, only VOCs are discussed for ETTP groundwater. Otherwise it's left open to question whether or not data exists or was examined for other possible contaminants. *This same comment applies to the discussion of selected analytes/contaminants for the other sites, watersheds, or media.*"

"The PHA fails to give the reader the general perspective of what the potential groundwater contamination sources and constituents are, how much data is available, and why only certain contaminants are discussed. Consequently, the PHA discussions of only a few contaminants come across as selective and incomplete."

"The source data on area hydrogeology and groundwater monitoring are included only as reference citations. Sufficient portions of that data need to be presented in the PHA text and as tables and figures to support and justify ATSDR's conclusions. Without the supporting information, the lay reader does not get the sense that the historical data have been reviewed critically and that any potential data gaps have been looked for."

ATSDR Response:

We believe that the document contains adequate descriptions of relevant contaminant sources in each watershed. Each respective section has a subsection devoted to the contaminant sources as well as a section discussing relevant data from monitoring wells, residential wells, and seep/spring data. *(Monitoring well depth and biogeochemistry issues are discussed below)*

The primary contaminants of concern in groundwater at ETTP are VOCs. The primary contaminants in sediments at ETTP are inorganic elements, radionuclides, and polychlorinated biphenyls (PCBs). In soils, the contaminants of concern include inorganic elements, radionuclides, semi-volatile organic compounds (SVOCs), polyaromatic hydrocarbons (PAHs), and VOCs. As is the case with other watersheds discussed in the PHA, the contaminants that are discussed are the primary contaminants of concern in groundwater. A statement similar to this one has been added to the 'Contamination at ETTP' section for clarity.

The vastness of the data sets that exist concerning the hydrogeology of the ORR precludes their inclusion, even as summary tables, in this document. We feel that summarizing these studies in text is sufficient to convey the concepts of the hydrology of the area. These concepts are well-supported and are not of a generally contentious nature. Relevant data from off-site groundwater monitoring and from residential well sampling are included in summary form in the relevant sections. If the reader would like to review the raw data, we will be happy to provide them.

9. Well (monitoring and residential) depths and sampling depths

Reviewer Comments:

"…there is no information provided in the report that explains whether off-site wells are sampling groundwater from the shallow aquifer system or deeper formations."

"[Appendix B] indicates fractures and solution cavities occurring from 100' to 300' deep in bedrock, which seems to contradict the earlier statement … that they occur mostly from 0 – 100' deep. How deep is the Clinch River bottom on average? How deep is the hyporheic zone beneath the Clinch? How deep are typical groundwater drinking wells in the area?"

ATSDR Response:

Specific well depths were not available with the data received by ATSDR. However, from all reports reviewed by ATSDR, it appears that many of the samples were taken using multi-port sampling devices from wells that extend deep into bedrock (>500 feet). The Clinch River varies in depth but is typically around 100 feet deep.

Residential well depths were not reported along with the data. However, the depth of residential wells can vary greatly. Variables that affect well depth include: type of well, location of well with respect to surface water, composition of bedrock and location of the water table. Because of the cost of drilling and the likelihood of finding usable amounts of groundwater at depth, most private wells in this area are less than 200 feet deep.

The text mentioned in Appendix B contained a typo – an apparent remnant from earlier edits. This sentence has been corrected to read that fractures and solution cavities occur predominantly in the shallow zone (0' – 100' deep) and decrease significantly at depth.

10. Geochemistry of groundwater around ORR

Reviewer Comments:

"Deficiencies in the report include… inadequate description of biogeochemistry of the groundwater system."

ATSDR Response:

A general discussion about the geochemistry for the relevant formations underlying the ORR has been included in Appendix B.

11. More in-depth discussion of Karst

Reviewer Comments:

"Karst zones do not appear in Figs. B-2, -3, or –4, or in the text of Appendix B, although an exposition on this subject would be a useful addition to this Appendix."

"Also discussed in ORNL-5870 is the fact that the more calcareous formations underlying Bear Creek Valley often contain large solution-weathered cavities that are conduits for groundwater. This fact probably needs some additional explicit discussion in the PHA because the existence of this type of condition tends to fuel speculation by concerned citizens."

"Portions of the geology discussion are incorrect. Many of the streams on the Oak Ridge Reservation are now known to gain or lose water through their beds. This is especially true of Bear Creek. Acknowledgement of the presence of karst and the understanding of it's effects on groundwater flow and contaminant migration has changed substantially since the 1980s. Karst features are important conduits for groundwater in the Upper East Fork Poplar Creek watershed, Union Valley, Bear Creek Valley, at East Tennessee Technology Park and in Bethel Valley. It was the primary reason that X-10 waste disposal activities were moved from Bethel Valley to Melton Valley, which is underlain by shale bedrock. Additionally, groundwater flow in the industrial areas is strongly influenced by the presence of pipes, building formations, buried utilities, and backfill."

ATSDR Response:

A more thorough discussion of the karst geology beneath the ORR has been added to Appendix B. Also, a discussion of the presence of karst geology as well as buried pipelines and other structures below ground and their impact on groundwater flow, has been added to the '*UEFPC Watershed*' section of the document.

Appendix B addresses the fact that Bear Creek has both gaining and losing reaches. The presence of karst systems and their effect on groundwater movement in the Oak Ridge area is addressed repeatedly in the document; however, because of the variability and unpredictability that the presence of karst conduits introduce to a groundwater system, the topic has been expounded upon further in Appendix B.

12. Explanation of "incised meander"

Reviewer Comment:

"The important term "incised meander", occurring on page B-7, should be explained."

ATSDR Response:

The term "incised meander" has been defined in Appendix A and explained further in Appendix B.

13. Historical groundwater use and over-pumping of wells

Reviewer Comments:

"The PHA lacks any meaningful discussion on historical groundwater usage in the area. Other than the figures depicting offsite well locations near the ORR boundaries, there is no inventory or discussion of well usage in the area and how pumping may or may not have influenced localized flow of groundwater emanating from the ORR."

"There is a need in the conclusions section of the report to add a statement about the potential (or lack of potential) for induced infiltration of water through well pumping as an off-site groundwater exposure pathway (i.e., the potential that part of the discharge from a well near contaminated surface water could be water drawn from the contaminated surface water)."

ATSDR Response:

The figures depicting off-site well locations include residential wells from which we have sampling data. While it is true that most residences near the ORR receive their drinking water from municipal sources, we are aware that there are many more residential wells than are depicted on these maps. For the areas near ETTP and ORNL, there are a significant number of monitoring wells near the ORR border. We have evaluated these data and have concluded that contamination from the ORR has not migrated beyond the ORR boundaries in groundwater. This conclusion is based upon the limited data currently available. Should any new data become available that could change our assessment, the issue will be reevaluated.

It is true that heavy well pumping can create a negative hydraulic gradient and cause groundwater to flow toward the well in all directions. Also, the theoretical potential exists for contaminated water to be drawn from surface water sources. Based on available data, we do not believe this is occurring in residential wells surrounding the reservation. This discussion appears in the 'Conclusion' section of the PHA as a consideration.

14. Melton Valley contamination

Reviewer Comment:

"Page 21, lines 5 – 14 seem to discuss only strontium 90. What happened to the tritium and cesium 137 mentioned in the preceding paragraph? What about other contaminants (rad and chemical) that have been detected in wells throughout Melton Valley?"

ATSDR Response:

The contaminants mentioned are indeed contaminants of concern in Melton Valley; however, because of the close interaction between groundwater in the aquitard formations of Melton Valley and surface water, these contaminants migrate via surface water. Consequently, most of the monitoring that is performed in Melton Valley concerns surface water with emphasis on the WOD. Surface water contamination in this area is addressed in the White Oak Creek Public Health Assessment. Contaminant data from off-site wells near Melton Valley are discussed in the relevant section of this document.

15. Significance of "integration points"

Reviewer Comment:

Please explain the meaning and significance of an "integration point."

ATSDR Response:

Integration points are important in defining and integrating conditions at the watershed level and are key sites for assessing long-term water quality improvement as various remedial actions in the watershed are completed (SAIC 2005).

16. Significance of Comparison Values

Reviewer Comment:

"Although hazard identification as such is adequate, toxicological data themselves are not really brought into play, since the authors have determined that there are no completed pathways and therefore no subject population at risk to evaluate toxicologically. The significance (or lack thereof) of CVs as toxicologic benchmarks is not discussed."

ATSDR Response:

Comparison Values (CVs) are used to assess voluminous data sets in an efficient and consistent manner during the screening analysis. They enable you to identify substances that are not expected to result in adverse heath effects (i.e., substances detected below comparison values) and substances requiring further evaluation (i.e., substances detected above comparison values).

Comparison Values are not thresholds of toxicity. Comparison values should not be used to predict adverse health effects. These values serve only as guidelines to provide an initial screen of human exposure to substances. Although concentrations at or below the relevant comparison value may reasonably be considered safe, it does not automatically follow that any environmental concentration that exceeds a comparison value would be expected to produce adverse health effects.

A text box on page 12 reflects the above information and directs readers to Appendix A where there is a more thorough explanation of comparison values.

17. Presence of other springs in the area

Reviewer Comment:

"Bacon Springs where Oliver Springs get all there water from. Key Springs is one more. And right where the Oak Ridge outdoor swimming pool there is a spring that is where they get the water to fill the swimming pool up. All along the Black Oak Ridge there is springs and water coming out from that ridge line. All too much water to come from one mountain chain."

ATSDR Response:

Because of the karst nature of the geology in the Oak Ridge area there are many springs and seeps. ATSDR has reviewed all available data from seeps and springs that have been identified in the vicinity of the Oak Ridge Reservation. A summary and discussion of these data is provided in respective sections for each watershed.

18. Contamination in the Lower EFPC floodplain

Reviewer Comment:

"On page 23, under the heading Monitoring Wells, the sentence beginning 'As previously mentioned…' needs to be followed by a sentence that states how the contamination in the EFPC floodplain ground water arrived at the off-site monitoring locations, in not through '…a direct result of groundwater contamination emanating from the Y-12 complex.'"

ATSDR Response:

The groundwater contamination in the EFPC Floodplain results from contaminated surface water (EFPC) infiltrating into the groundwater. In 1993, ATSDR conducted a Health Consultation for this area and concluded that there is a possible health threat to people consuming groundwater in this area; however, based on available data, all residences in the area were using water from the municipal water system. This statement has been added in the document.

19. Contamination leaving the ORR via surface water

Reviewer Comment:

"The document needs to reiterate that while only one site has off-site migration of groundwater (i.e., EEVOC – not defined in the acronym list), the short groundwater pathway for subsurface contamination to surface creeks and streams does not imply that surface waters leaving the site are safe. There is a significant amount of groundwater contamination being diluted within the surface creeks and streams."

ATSDR Response:

Indeed, groundwater contamination is contributing to surface water contamination. This point is mentioned in the document and has been reiterated in the appropriate sections. However, this document is solely focused on human exposure to off-site groundwater. Exposure to contamination in surface water and other media is addressed in other ATSDR public health assessments including: Current & Future Chemical Exposure Evaluation (1990-2003), White Oak Creek Radionuclide Releases, and Y-12 Mercury Releases PHA's.

20. Figures are too general in Appendix B

Reviewer Comment:

"Pages B-5 and B-7. The discussion and two figures are very general and conceptual in nature. Need to provide specific local data to support what's depicted in the figures."

ATSDR Response:

Figures B-2, -3, and -4 are intended to be demonstrative of general surface water/groundwater interactions and not necessarily specific to the geology of the ORR area. Information presented in Appendix B is supported by cited sources throughout the text. These sources contain site-specific data to confirm concepts expressed in Appendix B. These concepts are well-supported and are not of a generally contentious nature. We feel that it is unnecessary and beyond the scope of this document to include these data.

21. Inadequacy of ATSDR response to Community Concern #4 (p. 51)

Reviewer Comment:

"Page 40, comment # 4. ATSDR's response is inadequate. The overall summary level discussion in the PHA does not reflect "a thorough investigation of the underlying geology." Previous geologic reports are cited in the PHA, but salient data from these reports are not presented to support or justify ATSDR's conclusions. Also, the response refers the reader to

Appendix B for "specific information regarding the geology and hydrogeology of the ORR." However, the information in Appendix B seems to be highly general, presenting textbook concepts without the support of localized, site-specific data."

ATSDR Response:

We believe that the comment itself is of such a general nature that it expresses the sentiment that drives the preparation of this PHA. This citizen is concerned that contaminated groundwater may be reaching private residents through karst conduits or other pathways. The entire PHA is designed to address this issue. In our response to this comment, we are expressing our recognition of these concerns and the fact that they are addressed throughout this PHA. We also hope that additions made to this PHA as a result of some of the excellent comments received through the public comment process has increased the thoroughness and specificity of the document.