September 5, 2013

Mr. Sai Appaji
Superfund Division
EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

SUBJECT: COMMENTS ON DRAFT HUMAN HEALTH RISK ASSESSMENT, HOMESTAKE MINING CO. SUPERFUND SITE, CIBOLA COUNTY, NEW MEXICO

Dear Mr. Appaji:

On June 18, 2013, the U.S. Environmental Protection Agency released its draft Homestake Human Health Risk Assessment, Homestake Mining Co. Superfund Site, Cibola County, for comment. Enclosed are the U.S. Nuclear Regulatory Commission comments on this report.

If you have comments or questions regarding this letter, please contact me at 301-415-6607.

Sincerely,

/RA/
John T. Buckley, Senior Project Manager
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No.: 40-8903
License No.: SUA-1471

Enclosure: As Stated

cc: Homestake Service List

Mr. Sai Appaji
Superfund Division
EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

SUBJECT: COMMENTS ON DRAFT HUMAN HEALTH RISK ASSESSMENT, HOMESTAKE MINING CO. SUPERFUND SITE, CIBOLA COUNTY, NEW MEXICO

Dear Mr. Appaji:

On June 18, 2013, the U.S. Environmental Protection Agency released its draft Homestake Human Health Risk Assessment, Homestake Mining Co. Superfund Site, Cibola County, for comment. Enclosed are the U.S. Nuclear Regulatory Commission comments on this report.

If you have comments or questions regarding this letter, please contact me at 301-415-6607.

Sincerely,

/RA/
John T. Buckley, Senior Project Manager
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No.: 40-8903
License No.: SUA-1471

Enclosure: As Stated

cc: Homestake Service List

Distribution:
FSME r/f BSpitzberg, R IV LGersey, R IV JWhitten, R IV

ML13247A540

OFFICE:	DWMEP	DWMEP	DWMEP	DWMEP
NAME:	JBuckley	CHolston	APersinko for BWatson	JBuckley
DATE:	9/4 /13	9/4 /13	9/ 5/13	9/ 5 /13
OFFICE:				
NAME:				
DATE:				

OFFICIAL RECORD COPY

Homestake Distribution List

cc:

Sai Appaji
USEPA Region 6
1445 Ross Ave, Ste 1200
Mail Code: 6SF-LT
Dallas, TX 75202-2733

Jerry Schoeppner
Mining Environmental Compliance Section
Ground Water Quality Bureau
Harold Runnels Building Room N2250
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Phyllis Bustamante
New Mexico Environment Department
Harold Runnels Building Room N2300
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Angelo Ortelli
Superfund Oversight Section
Ground Water Quality Bureau
Harold Runnels Building Room N2250
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Water Quality Specialist
Pueblo of Acoma
Office of the Governor
P.O. Box 309
Acoma, NM 87034

Bluewater Valley Downstream Alliance
P.O. Box 2038
Milan, NM 87021

Multicultural Alliance for a Safe
Environmental (MASE)
P.O. Box 4254
Albuquerque, NM 87196

NRC Comments on EPA's draft Human Health Risk Assessment,
Homestake Mining Co. Superfund Site, Cibola County, New Mexico

General Comment

1. The Human Health Risk Assessment (HHRA) does not meet the purpose and objectives of conducting the study.

The HHRA scope of work (SOW) states that the purpose is to address concerns raised by the public living adjacent to the Homestake Mining Company of California (HMC) site. The SOW, and Section 2.2 of the HHRA, state that the public is concerned that they are exposed to unacceptable levels of contaminants transported from the HMC site by:

- Spray mist from the evaporation ponds associated with remediation activities;
- Emissions from the large tailings pile (LTP);
- Emissions from the land application of contaminated water;
- Public use of contaminated ground water for cooking showering, washing, etc.;
- Consumption of produce irrigated with contaminated water;
- Consumption of livestock exposed to groundwater in the area; and
- Transport of contaminated soil from the HMC property during flooding.

The SOW also states that the objectives of the HHRA are to characterize and quantify where appropriate, the current and potential human health risks that would prevail if no further action is taken. Section 2.3 of the HHRA further states the environmental question to be addressed is:

> What is the increase in lifetime cancer risk to the residents living near the Homestake Mining Site that is attributable to ongoing remediation at the site and can this risk be lowered by using alternate remediation methods or modifying existing remediation methods?

The HHRA does not meet the stated objectives because it does not:

- Estimate the increase in lifetime cancer risk to the residents living near the HMC site that is attributable to ongoing remediation at the site;
- Describe how the lifetime cancer risk can be lowered by using alternate remediation methods or modifying existing remediation methods at the site;
- Estimate the increase in lifetime cancer risk from spray mist from the evaporation ponds;
- Estimate the increase in lifetime cancer risk from radon emissions from the LTP;
- Estimate the increase in lifetime cancer risk from land application of contaminated water;
- Provide a conclusion regarding the transport of contaminated soil from the HMC property during flooding.

As currently written, the report does not provide analyses or conclusions which are informative to the general public, the regulators, or the licensee. To be an informative report for the public, analyses should be performed to: (1) estimate the risk to the public from background conditions; and (2) estimate the risk to the public from all sources (background plus HMC). The risk estimates should be presented as a range and should provide the results from realistic analyses addressing each of the objectives identified in the SOW.

Enclosure

Specific Comments

The staff does not believe the U.S Environmental Protection Agency (EPA) collected sufficient data, nor performed the analyses required, to successfully achieve the stated purpose and objectives of the HHRA. The staff believes that comments on the details of the HHRA are of limited value because even if EPA addresses all of the detailed comments, the HHRA will not achieve the stated purpose and objectives. Nevertheless, the staff feels obligated to provide detailed comments on the HHRA, as written. Below are the staff's detailed comments.

2. The Executive Summary states that EPA considers 10-4 to 10-6 as an acceptable risk range by which it regulates carcinogens, but does not explain or define what the values in an acceptable risk range mean.

3. The Executive Summary does not explain the significance of the calculated cancer risk values or how the calculated increased incidence of cancer risk compares to the national average or to the EPA's calculated cancer risks from the natural background in the vicinity of the HMC site.

4. The Executive Summary should provide conclusions based on data and analysis for each of the HHRA objectives and public concerns identified in the SOW and Section 2.2 of the HHRA.

5. Section 2.1.3 – states that produce samples were collected from vegetable gardens to evaluate risk to homeowners consuming vegetables grown in "contaminated" soil. The HHRA does not specify whether the soil and vegetation samples were co-located. Further, the HHRA does not indicate whether the vegetation was washed or unwashed. It is important to know the analyte concentrations in the soil and plants to determine if the analyte is present from root uptake or surface deposition (e.g., wind erosion, water spray). The HHRA has not demonstrated whether the soil is "contaminated" from HMC activities or just contains natural U.

6. Section 2.1.3 – states that private well waters were sampled to evaluate additional risk to a future resident who may dig a well and use the water for domestic purposes. Evaluating risk from the use of well water is not justified because; (1) all residents have been hooked up to city water; (2) the HHRA is supposed to be limited to evaluating the risk to residents during remediation of the HMC site; and (3) any evaluation of risk to future residents should be based on water quality which will be present at the time of license termination.

7. Section 2.3 – The HHRA does not address the "environmental question being asked." Section 2.3 states that the "environmental question being asked" is, "What is the increase in lifetime cancer risk to the residents living near the Homestake Mining Site that is attributable to ongoing remediation activities at the site and can this risk be lowered by using alternate remediation methods or modifying existing remediation methods?" The report does not: (1) provide an estimate of lifetime cancer risk associated with exposures prior to initiating the current remediation activities; (2) estimate the increase in lifetime cancer risk to the residents living near the HMC Site that is attributable to ongoing remediation activities at the site; or (3) provide any conclusions

about how the risk can be lowered by using alternate remediation methods or modifying existing remediation methods.

8. Section 2.4 states that "[t]he purpose of this Project was to provide gamma count rates to help characterize the HMC site to help determine the extent of contamination and identify areas for further investigation." However, EPA provides no historical data for the site prior to HMC activities that supports a conclusion that the contamination has changed over time.

9. Section 2.4 – The conclusions are not consistent with the purpose for performing the ERGs survey. One of the stated purposes of the HHRA is to determine if the residences of the five subdivisions are exposed to unacceptable levels of contaminants transported from the HMC site by spray mist from the evaporation ponds associated with remediation activities.

On page 2-4 it says, "The study did not show a trend that would be consistent with the spraying of contaminated water into the air or mill tailings being carried down gradient or with an overtopping event of the retention/evaporation ponds." This conclusion statement is unclear.

The data did not support the author's assumption that the spraying of contaminated water or the overtopping of the retention/evaporation ponds would result in radioactive contamination is building up near the evaporation ponds. Nonetheless, the author concluded that the increased count rates are attributable to past milling activities even though the count rates were below 2x background. The background locations shown on the figure indicate that a large portion of the background area is above the 9800cpm designated as background.

Based on the scanning results, there is no evidence to suggest that evaporative spraying or surface water runoff has contaminated the neighborhoods down-wind and down-gradient of the HMC site.

There is no basis provided for selection of the soil background area discussed in this section. Further, it appears from the data that the background area selected has count rates up to 1.5-2 times background. The background area should not be 1.5-2 times background.

10. Section 2.5 – As stated in Section 2.4, the main purpose of gamma scanning was to determine if contamination from the HMC site was found off-site on residential property. As noted in Comment 10, scanning did not demonstrate that material from the HMC site was transported into the surrounding neighborhoods and therefore, there is no basis provided for calculating a Derived Concentration Guideline Level (DCGL) for each residence.

Further, there is no mention of whether these DCGLs are based on the total uranium concentrations collected at the individual residences, or if background uranium concentrations were subtracted from the samples. This designation is needed to understand whether the HHRA is evaluating the uranium concentrations at the sites in general, or evaluating the increased concentrations associated with ongoing remediation activities at the HMC site.

11. Section 2.5 - states that analytical results from each of the 191 soil samples collected and analyzed for total uranium (chemical toxicity) were less than the EPA Regional Screening Levels (RSLs) action level of 230 milligrams per kilogram (mg/kg). Any DCGL calculated should be based only on any HMC material transported to the soil around the house, not naturally occurring material in the soil.

Section 2.5 provides no demonstration that contaminated material was transported from the HMC site. It says 86 residential properties were sampled, and 48 of these properties had outdoor levels above the DCGL. As stated above, there is no basis for calculating a DCGL for each residence. However, the RA does not show where these properties are located, nor does it say what background was used to determine 15 mrem/yr, above background.

12. Section 2.6.1 – The discussion does not state that radon may also enter residences from the outside air. Outdoor concentrations of radon provide a baseline for indoor concentrations of radon. According to UNSCEAR 2006, outdoor concentrations are affected by the magnitude of the release rate from the soil and atmospheric mixing. Turbulent air mixing will transport radon upwards and away from the ground, whereas atmospheric inversion will trap radon close to the ground. Ref: UNSCEAR, 2009. Effects of ionizing radiation, Volume II. Report to the general assembly with scientific annexe E. UNSCEAR 2006 Report. Vienna: United Nations Office.

13. Section 2.7.1 – states that the radon background area was selected based on the following criteria; (1) aerial reconnaissance, (2) geological features, (3) soil type, (4) site reconnaissance, (5) historical research, and (6) radiological scanning. Based on these criteria, EPA selected the Bluewater Community as the radon background area. If EPA's selection of the Bluewater Community is technically valid, then there is no technical basis for selecting a separate soil background area, especially since indoor and outdoor radon concentrations are based on geological features, soil type and atmospheric mixing conditions. Furthermore, this section should include the criteria detailed in the referenced draft memorandum evaluation report for the reader.

14. Section 2.7.2 – Thoron was only monitored for 2 quarters instead of 4 quarters as required by the sampling plan.

In addition, no basis is provided for separating the radon data by subdivision. Unless each subdivision represents a separate sample population, the combined results for all subdivisions should be compared against the background data.

15. Section 2.7.2 – The text in this section discusses the sampling of indoor radon in the residences of the five subdivisions as well as the background location. Samples were collected to look at both short-term (2 – 6 days) and long-term (1 year) radon concentrations. The HHRA references the descriptive results provided in Tables 2.1 through 2.3. It also states, "although short term radon levels give a good screening estimate of the level of radon in air, … annual average air radon levels is a better estimate to represent long term exposure due to the inherent variability expected in air radon measurements." The data provided in Tables 2.1 through 2.3 do not differentiate

between short-term and long-term data or designate that the data is associated with only one type of sample.

16. Section 2.7.2 – When discussing the descriptive statistics for the indoor radon analyses (Table 2-1) the HHRA compares the median indoor air radon data from the subdivisions (1.34 pCi/l) with the generic mean for indoor radon data in the background area (1.25 pCi/l). There is no basis provided for comparing two different statistics.

17. Section 2.7.3 – states that 122 radon samples were taken at the HMC fence line. Samplers were located on 12 posts with 2 samplers on each post. The report should specify how 12 post locations with 2 samplers on each post can produce 122 radon samples. Similarly, the report states that 120 samples were collected up- and down-gradient of the HMC site. Samplers were located on 9 posts with 3 samplers per post. The report should specify how 9 post locations with 3 samplers on each post can produce 120 radon samples.

18. Section 2.7.3 - The data in Tables 2-5, 2-6, and 2-7, do not match the number of outdoor samples taken. It appears that the indoor data was copied to these tables.

19. Section 2.7.3 – The number of samples reported in Table 2-8 does is not consistent with the text. The table shows 56 samples collected on top of posts and 52 samples collected on bottom of posts. The text says 122 samples were collected at the fence line on 12 posts.

20. Section 2.7.3 – The last paragraph of this section discusses the outdoor data collected from various sites within the HMC property area. No statistical summary tables or conclusions associated with this data are provided as was done for the other outdoor radon sampling data.

21. Section 2.7.4 – It says that 14 groundwater samples were taken from residences who use groundwater for irrigation. Figure 2-4 only provides results for 11 residences.

    The conclusion that the alluvial groundwater is contaminated with radon and therefore has the potential to contribute to indoor air radon levels is unjustified. First, the samples collected were from residences that use the GW for irrigation not for domestic use. Second, no information is provided regarding the location of wells sampled – were samples taken in a contaminated area or in a reclaimed area? Third, all residences have been connected to the municipal water supply and thus no residences are using contaminated groundwater for domestic purposes. Therefore, this source of potential dose should be removed from the study.

22. Section 2.7.5 – This section provides a breakdown of housing types in the five subdivisions. A total of 75 houses were characterized. The number of houses characterized is inconsistent with the number of houses used to collect indoor radon samples (79 houses). The report should be consistent.

23. Section 2.8 – There is no basis for the selection of the soil background area. EPA selected Bluewater Village as the radon background area. Since soil type was one of

the six criteria used for the selection of Bluewater Village as the radon background why was Bluewater Village not considered valid for soil background?

24. Section 2.8.1 – The purpose of collecting vegetables from private gardens is to determine if the public is being exposed to unacceptable levels of contaminants transported from the HMC site. Given that the ERGs scan data (reported in Section 2.5) indicates that contamination from the HMC site has not been transported to the adjacent neighborhoods, what is the basis for collecting vegetables from home gardens without first determining whether soil in the garden is contaminated with material from the HMC site or whether the crops were irrigated with contaminated well water?

    Section 2.8.1 – states, "Potassium 40 is the radionuclide of interest that did show up in the vegetable samples. Potassium 40 was found also in the soil samples and found in the background soil at the same concentrations." Given that Potassium 40 is not a contaminant from HMC activities (neither in the soil or private well water), then including Potassium 40 as a radionuclide of concern is not consistent with the stated scope and objectives of the HHRA.

25. Section 2.8.2 – states, "About 26 water samples were collected from private wells in the residential area, evaporation pond and collection pond." "About 26" is really not precise enough for a scientific study. Further, Tables 2-19 through 2-21 do not provide data for 26 water samples or even "about 26" water samples.

26. Section 2.8.3 – states, "Some hazardous chemicals or radionuclides which are known to be associated with the history of operations at the site were not eliminated from the list of potential concern and were included in the risk assessment." There is no valid technical basis for identifying a chemical or radionuclide as a potential concern unless it meets the criteria. If a chemical or radionuclide is present, but at levels lower than in the background area, the chemical or radionuclide should not be included in the risk assessment because the purpose of the study is to determine the risk due to HMC reclamation activities.

27. Section 2.8.3 – states, "The maximum detected value for each of the chemicals or radionuclides were compared with the cancer or noncancer screening value. The screening value is based on the media concentration associated with a one in a million cancer risk or a hazard quotient of 1. If the maximum value is below the screening level, the risk associated with this chemical or radionuclide was considered negligible. However, if the maximum level was higher than the screening level, then each detected chemical or radionuclide was statistically compared to the same compound in the background or reference area." Given the criteria for consideration as a potential concern, why has EPA not determined background values for all chemicals and radionuclides in Tables 2.1.1, 2.1.2 and 2.1.3 of Appendix A?

28. Section 3.1.1 – states, "In 1990, the mill closed and was decommissioned and demolished. During 1993–1995, the Nuclear Regulatory Commission (NRC) supervised surface reclamation activities at the site." This is incorrect. The mill ceased operations in 1990. The mill operating facilities were decommissioned and demolished between 1993 and 1995.

The NRC did not "supervise" surface reclamation activities at the site. In 1993 the NRC and EPA signed a Memorandum of Understanding (MOU) designating NRC as the lead regulatory agency for site reclamation and closure activities. HMC decommissioned the mill operating facilities in accordance with NRC License SUA-1471.

29. Section 3.1.8 – states, "An area south of the five residential subdivisions was selected as a soil background area to the residential communities. The area is close enough to have same geological and surface soil make up as the five subdivisions but far enough to be impacted by the HMC site related contaminants." There appears to be a typo in the second sentence. The sentence should likely read, "The area is close enough to have same geological and surface soil make up as the five subdivisions but far enough not to be impacted by the HMC site related contaminants."

    There is no technical basis for the selection of a soil background area which is different from the radon background area. EPA selected Bluewater Village as the radon background area based on a number of factors including geological features, soil type, and radiological scanning. The report should provide the technical basis for not using Bluewater Village as the soil background area.

30. Section 3.1.9 – states, "The sources of contamination to the surrounding communities are the Tailing Piles, Reverse Osmosis Unit, evaporation pond, irrigation fields, and mechanical spraying of contaminated water at the central pivot area. "This statement is not entirely correct. The tailing piles, Reverse Osmosis unit, evaporation ponds, and irrigation fields are potential sources of chemical and radiological constituents of concern from the HMC site. However, based on the sample data provided in the report, there is no basis to conclude that the RO unit, evaporation ponds or irrigation fields have provided contaminants to the surrounding communities. As stated in the Objectives of the HHRA, chemicals and radionuclides present in concentrations at or below background levels are not "contaminants" transported from the HMC site and should not be included in the risk assessment.

31. Section 3.2 – states, "As shown in the tables above in section 2, elevated levels of contaminants were found in yard soil, indoor air, produce private well waters and ambient air." This statement is incorrect. The tables in Section 2 show that chemicals and radionuclides are present in the air, soil and water in concentrations exceeding EPA's screening toxicity values. However, as noted in Comments 19 and 20 above, EPA has not demonstrated that all of the chemical and radionuclides of concern are present in concentrations exceeding background values. For example, in Section 2 it states that indoor air and produce had chemical and radionuclide concentration levels consistent with background and are thus not "contaminants" from the HMC site.

32. Section 3.2 – states, "Also almost all houses are connected to the Milan municipal water. However, in this risk assessment we evaluate a future resident who might install a private well and use it for domestic purposes. Thus inhalation of volatiles and dermal contact with water is evaluated too." This position is not justified since all residences have been connected to the municipal water supply, so there is no risk from consumption of well water or through inhalation or dermal contact with well water. The

HHRA should not consider a future resident scenario because the scope of the HHRA is to evaluate the risk during remediation activities.

33. Section 3.2.1 – states, "Current and potential future residential exposure conditions in the five subdivision areas are expected to be essentially the same. All of the potential exposures considered in this risk assessment may occur at existing residences and could continue to occur at residences in the future; therefore, no fundamental changes in the types of exposure that may occur are expected." This assumption is incorrect and results in an unrealistic dose to the public in the future. When groundwater reclamation is complete (currently scheduled for completion in 2022), the final cleanup standards will reduce radon emissions from the tailings piles due to the installation of the final radon barrier and cover, and the reduce groundwater contaminant levels in the alluvial and Chinle aquifers to the levels provided in License Condition 35 of NRC License SUA-1471.

    In addition, EPA's determination of future risk is inconsistent with the objective of the HHRA which is to evaluate the risk to public health during remediation activities at the HMC site. Based on the current reclamation schedule for the HMC site, the exposure durations assumed for a resident (30 years) and for a farmer (40 years) have no technical basis.

34. Section 3.2.2.1 – states, "Because the exposure point concentrations calculated for some of the COPC and ROPCs for the Five subdivisions area were close to or below the exposure point concentration for the reference background area, the exposures and risks were calculated for residents of both the five subdivisions and for a hypothetical reference area located further south of the five subdivisions for comparisons. EPA guidance RAGS-HHEM (EPA 1989) recommends that the 95% upper confidence limit (UCL) of the arithmetic mean concentration be used as a conservative estimate of the average concentration in an exposure area for the purpose of estimating reasonable maximum exposures and risks." Did EPA use 95% upper confidence limit (UCL) of the arithmetic mean concentration to calculate the hypothetical risks to members of the reference area for comparison with the five subdivisions? If not, please provide the technical justification for not following the guidance in RAGS-HHEM (EPA 1989).

35. Section 3.2.2.1 – states, "Evaluation of risk was calculated for a future resident who moves into the community and decides to dig a well and use its water for domestic purposes." EPA's evaluation of future risk is outside the scope of the RA. Further, any evaluation of the risk to public health after remediation is complete should be based on lower emissions from the tailings piles and reduced concentrations of contaminants in the groundwater.

36. Section 3.2.2.2 – states, "The reasonable maximum exposure duration for a resident is assumed to be 30 years which is the 90th percentile length of time people live in the same residence and for agricultural scenario the RME exposure duration is assumed to be 40 years. For the age-integrated receptor, 6 of those years are assumed to be as a young child, 1 to 6 years of age, the remaining 24 years are assumed to be as an adult in a residential scenario or 34 years in an agricultural scenario." EPA's determination of future risk is inconsistent with the objective of the HHRA which is to evaluate the risk to

public health during remediation activities at the HMC site. Based on the current reclamation schedule for the HMC site, the exposure durations assumed for a resident (30 years) and for a farmer (40 years) have no technical basis.

37. Section 3.2.3 – indicates that the equations for ROPCs are from the Preliminary Remediation Goal (PRG) for Radionuclides calculator at http://epa-prgs.ornl.gov/radionuclides/. The HHRA should note that the equations associated with the PRG for Radionuclides are not exactly the same as the formulas used in the HHRA and that modifications to the equations are needed in order to perform the necessary calculations.

38. Section 3.3 - From the perspective of the general public, it is difficult to understand how the "Intake/Exposure Concentration" values are calculated for each of the radionuclides and each of the pathways. A list of radionuclide-specific decay constants (identified as λ [lambda]) and area concentration factors (ACF) are not provided. In order to aid the public in understanding how the cancer risk is calculated, the HHRA should include both the radionuclide decay constants and the ACFs used as well as provide an example of how the formulas are used to calculate the cancer risk. It should also be noted that the values listed for "Intake/Exposure Concentration" for most pathways have the units pCi and are technically not concentrations.

39. Section 3.4 – The link provided for the Radionuclide ARAR Dose Compliance Concentrations (DCCs) for Superfund calculator (http://epa-dccs.ornl.gov/radionuclides/) does not work. Access was obtained by using the link: http://epa-dccs.ornl.gov/cgi-bin/dose. This broken link was also included in Section 5.1.6 of the HHRA.

40. Section 5.1.2 – states, "Government agencies typically regard cancer risks less than 1 x 10-6 as de minimis and consider risks between 1 x 10-6 and 1 x 10-4 to be within a generally acceptable range. These regulatory risk levels have been adopted by the EPA Superfund program." Please define which government agencies EPA is referring to. These are not the accepted levels of risk to NRC.

41. Section 5.1.3 – The table showing risk summary for residents living in the subdivisions includes exposure from private well water. All residents are connected to municipal water supply so there is no exposure from private well water use. Further, if EPA must include exposure from well water use, exposure from background well water use should also be evaluated and subtracted from the risk to the public living near the HMC site.

42. Section 5.1.4.1 – states, "The risk was primarily due to external exposure to radium - 226+D (Ra-226 plus its daughters) which posed a risk by itself of 1.9 x 10-4 (Table 5-1)." Progeny is not included. In the background area, RA-226 plus daughters plus progeny is used. No technical basis is provided for including progeny in the background area.

43. Section 5.1.4.1 – states that "… the purpose of this risk assessment which also evaluates potential future risk …" as a justification for considering exposures associated with groundwater from private wells. This HHRA, however, was developed to consider risks associated with current activities, as mentioned in Sections 2.2 and 2.3. It should also be noted that, aside from dose calculations provided with the RESRAD results, no

other data or conclusions related to future risks associated with other potential exposure pathways (e.g., inhalation, ingestion, consumption of food products, etc.) are discussed in the HHRA.

44. Section 5.1.4.1 – With regards to exposures associated with groundwater from private wells, the HHRA should have addressed the decreased contaminant concentrations that will exist in the future as a result of current remediation activities on the site.

45. Section 5.1.5 - Further clarification is needed regarding the role Potassium-40 (K-40) plays on the dose received and the cancer risk to the public in the five subdivisions. As noted in Table 2-22, K-40 is identified as a radionuclide of potential concern (ROPC), but it was not included in the RESRAD analyses performed by the EPA. Section 5.1.5 discusses the use of the EPA Radionuclide PRG calculator to estimate the risk from ingestion of home grown produce. Results show that the total cancer risk from ingestion of home grown produce in the five subdivisions was 4.7 X 10-5 with K-40 posing the highest risk (3.4 X 10-5). However, the results from evaluating the background site show that the risk from ingestion of home grown produce is 5.1 X 10-5 with K-40 posing a risk of 3.8 X 10-5. A comparison of these results show that the cancer risk attributed to K-40 is higher at the background location as is the overall cancer risk from all ROPCs. Based on these results further justification for including K-40 in the HHRA is needed or it should be removed from consideration as a ROPC.

46. Section 5.2 – states "… the average radon at the fenceline and at the communities monitors were slightly higher than the upgradient monitors, the statistical tests were unable to pick up the difference at the 95% confidence interval … This shows that the impact of the thoron gas coming from the site towards the residential communities is very slight." If there is no statistical difference, what is the basis for concluding that there are any impacts from thoron gas?

47. Appendix A - There are two tables labeled Table 6.4 (see pages A-40 and A-41).

48. Appendix A - The last column in Table 2.1, "Rationale for Selection or Deletion (S)" only provides a basis for excluding a chemical of potential concern; no basis is provided for including the chemicals identified as being of potential concern.

<u>Comments Specific to the RESRAD Analyses</u>

49. The RESRAD (onsite) analyses include modifications to default parameter values for the radionuclide dose conversion factors for ingestion and inhalation as well as the precipitation and irrigation rates. No basis for these modifications is provided.

50. A review of the RESRAD (onsite) results provided in the HHRA show that analysis of the five subdivisions resulted in peak doses of 1.78E+02 mrem/yr when including radon and background radionuclide concentrations, 4.03E+01 mrem/yr when excluding the radon exposure pathway, and 4.79E+01 mrem/yr when excluding background radionuclide concentrations. No data or RESRAD analyses were provided to show that these values

are different from what an individual would have received prior to initiating the current remediation activities.

51. Doses calculated using RESRAD (onsite) are based on contaminant concentrations and specific parameter values at a specific point in time. Increases or decreases in contaminant concentrations, changes in parameter values associated with various processes that may impact exposure (e.g., contaminant deposition, erosion rate, food consumption rates, etc.), and future activities associated with a specific site are not considered in an individual RESRAD analysis. Taking this into consideration, a review of the RESRAD (onsite) results provided in the HHRA show that analysis of the five subdivisions without including the background concentrations or without including the radon pathway result in peak doses that are calculated to occur at approximately 72 and 23 years, respectively. These time periods are beyond the anticipated 2022 closure date for the site (in 9 years). RESRAD (onsite) doses calculated after 9 years were less than the peak doses discussed above. To more accurately assess the doses to residents of the five subdivisions beyond 9 years, additional samples should be collected and the appropriate RESRAD parameters adjusted. However, this is beyond the scope of this HHRA.

52. In Section 5.1.6.1 EPA estimates the dose (with and without the radon pathway) to the residents of the five subdivisions by subtracting the RESRAD-calculated dose for the background location from the RESRAD-calculated dose for the five subdivisions. This calculation is inaccurate. It does not consider the difference in the radionuclide concentrations and daughter products being used in the RESRAD calculations as well as the fact that these two peak doses occur at different times. For the scenario in which the radon pathway was suppressed, which is used in the HHRA, the peak dose for the five subdivisions occurred after approximately 73 years while the peak dose for the background area occurred after approximately 2 years. A more accurate way of performing this calculation would be to run the RESRAD analysis subtracting the background radionuclide concentrations from the radionuclide concentrations measured in the five subdivisions and using the difference as the RESRAD input value.