

ENCLOSURE 2

TDCC RESPONSE TO NRC RAI'S DATED DECEMBER 26, 2002, ON THE SUPPLEMENT TO THE DECOMMISSIONING PLAN

1. Section 1.1.3, Current Site Condition, page 5 - Geology, soil and groundwater conditions are described starting from the first full paragraph up to fifth full paragraph. Please provide data to support depth to groundwater (between 3 and 5 feet), groundwater gradient (0.004 ft/ft) and related information. Geologic cross-sections, water table elevations, flow directions, well locations and related data need to be provided to support this information.

The sixth paragraph notes two permits currently held by TDCC to allow excavating and regrading of areas during decommissioning activities. Please provide a list of all Federal, State, and local permits and licenses held by TDCC pertaining to the site. Identify additional permits that will be needed to complete remediation and decommissioning.

TDCC Response: A detailed hydrological assessment report for the Bay City site is provided in Attachment 1 (Hydrogeological Assessment, Dow Thorium Site, Bay City, MI", April 2001 by URS Corporation).

The two permits listed in Section 1.1.3 are the only permits held by TDCC for the Bay City site. The DEQ permit is due for extension on December 31, 2003. No additional permits are required to complete the decommissioning.

2. Section 1.1.5, Future Land Use, pages 7 to 8 - TDCC has proposed a future unrestricted land use scenario where the critical group will most likely consist of either recreational users or individuals that consume drinking water from a well that draws water from the site. Under this scenario, TDCC notes that the saturated zone contamination is not expected to contribute a significant dose to the critical group. Also, in the supplemental decommissioning plan (SDP), Section 3.1, page 9, TDCC states "As described previously in Section 1.1.5, there is very low probability that the material in the saturated zone would be excavated and is not considered a plausible scenario." In contrast, NRC staff conversations with the Michigan Department of Environmental Quality, Land and Water Management Division in the Bay City District, indicated that there are other plausible land use scenarios that could involve the excavation or dredging of the saturated zone, such as development for a marina or condominium complex. TDCC needs to justify why recreational use should be considered as the bounding land use scenario.

TDCC Response: TDCC provided a detailed response to this RAI in letter dated March 17, 2003. The response was reproduced verbatim in Section 2 of the Revised Supplement.

3. Section 3.1, Unrestricted Use Criteria for Soil in the Saturated Zone, Page 9 - TDCC states in the fourth paragraph, "In summary, consistent with the SDMP Action Plan, TDCC proposes that the unrestricted use criteria for the contaminated material in the

saturated zone be based on compliance with the 10 $\mu\text{R/hr}$ SDMP exposure rate criteria and the EPA Safe Drinking Water Regulations.” TDCC needs to indicate in the SDP that all of the EPA MCLs will be complied with at license termination.

TDCC Response: TDCC will comply with all MCL's.

4. Section 3.2, Demonstrating Compliance with Exposure Rate Criterion, page 10 - TDCC has proposed to use as backfill, the unsaturated soil which was removed from those areas where the saturated zone was remediated. Describe the method for assessing the level of thorium contamination in the unsaturated soil before it is used as backfill. If no assessment is to be done, explain this rationale.

TDCC Response: The thorium concentration in the excavated unsaturated zone overburden will be assessed by collecting a grab sample from each excavator bucket load and compositing the grab samples. Each composite sample will represent a volume of approximately 25 m^3 or less.

5. Section 3.3.1, Method for Determining Drinking Water Criterion, page 13 - TDCC has proposed to use the EPA's National Primary Drinking Water Standards (10 CFR Part 141) at time of license termination and 5 pCi/L Ra-226/228 after 1000 years ingrowth as unrestricted use criteria for the contamination in the saturated zone. Thus, TDCC intends to cleanup the Th-230/232 in the saturated zone to a soil concentration which results in 5 pCi/L Ra-226/228 in groundwater after 1000 years ingrowth. Using this approach and site-specific information, TDCC performed a calculation to determine the permissible amounts of each radium isotope at 1000 years, for which the total radium groundwater concentration is approximately 5 pCi/L. Limiting values of 2.5 and 2.4 pCi/L of Ra-226/228 at 1000 years were derived and correspond to Th-230/232 soil concentrations at license termination of 72 and 24 pCi/g, respectively. Based on this approach, NRC staff concludes that TDCC will not succeed in meeting the Ra-228 in groundwater criterion at 1000 years if the groundwater is cleaned up to the 5 pCi/L MCL at license termination. Therefore, NRC staff finds the proposed approach to be unacceptable. In order to succeed with the proposed criterion based on a 1000 year time frame, TDCC could commit to meeting a Ra-228 groundwater concentration of 2.4 pCi/L at license termination or could propose an alternative method to show that the criterion at 1000 years will be met.

TDCC Response: This comment is not applicable to the Revised Supplement. The MCL-based method was deleted and is no longer being proposed by TDCC.

6. Section 4, Final Status Survey, page 14 -

1. The first sentence at the top of this page states “The FSS (final status survey) methods are consistent with NUREG/CR-5849 guidance and apply to surface soil, subsurface unsaturated soil, and subsurface saturated soil.” However, TDCC then proposed FSS methods which contradict the guidance recommended in NUREG/CR- 5849 (NRC 1992b). TDCC should revise the final status survey methods to strictly adhere to the NUREG/CR-5849 guidance or delete this reference and justify TDCC proposing its own guidance.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

2. The second paragraph notes “Future final surveys of surface soil will not include consideration of integrated count rate since no soil compositing is proposed.” TDCC needs to clarify this statement. Specifically, revise the SDP to explain what is meant by “will not include consideration of integrated count rate” and “no soil compositing is proposed.”

TDCC Response: The “integrated count rate” requirement is a part of the current FSS methods that were approved in Amendment No. 7 to the site license (License No. TB-527). All previously approved FSS methods are superseded by the Revised Supplement for the remaining 9.1 acres requiring remediation and FSS. The currently approved methods will continue to apply to all areas where FSS has been completed, as documented in the TDCC Verification Reports I-VI.

7. Section 4.1, Final Survey of Saturated Zone Soil, pages 14 to 15 - Provide the following technical information in order to facilitate the review and adequacy of the FSS design which is used to demonstrate regulatory compliance:

1. The introductory paragraph indicates that the Th-232 concentration in the soil will be sampled and measured directly using the on-site gamma spectroscopy laboratory. Confirm how the concentrations of Th-228/232 will each be determined. Previously, the final status survey data analysis for Verification Areas I to VI appeared to involve the separate determination of each thorium isotope when demonstrating regulatory compliance. In contrast, it appears that for the characterization data submitted for the area covered by the SDP, the Th-232 concentration was directly measured and the Th-228/230 concentrations inferred. If TDCC intends to use the latter method to demonstrate compliance, this needs to be specified and rationale given why this is acceptable to demonstrate compliance.

TDCC Response: The FSS results reported in Verification reports I-III were counted at an offsite TDCC laboratory (Freeport, TX) using gamma and alpha spectroscopy that allowed for the reporting of separate results for Th-232, Th-228 and Th-230. The FSS results for Verification Reports III-VI were counted at the onsite Bay City laboratory using NAI detectors that reported results for Pb-212 and used equilibrium and ratio assumptions to calculate the thorium concentrations. The ratio of Th-232/Th-228 is assumed to be 1.0 (i.e., in equilibrium) and the ratio of Th-

230/Th-232 is assumed to be 3/1 as discussed in the March 1996 TDCC response to NRC comments. At least 5% of all FSS samples were sent to the Freeport, TX laboratory for QA/QC. All future FSS and remediation support samples will be analyzed in the onsite laboratory using the ratio assumptions described above. The 5% QA/QC criteria will continue to apply. The onsite laboratory has undergone several successful NRC inspections.

2. The first bullet states "Compliance will be based on the mean concentration of Th-232 in saturated zone." Verify that the mean concentration to be complied with is the saturated zone unrestricted use criterion of 24 pCi/g for Th-232 stated in Section 3.3.1, Equation 11 on Page 13, of the SDP.

TDCC Response: This comment is not applicable to the Revised Supplement. The MCL-based method was deleted and is no longer being proposed by TDCC. The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

3. The second bullet notes that the mean Th-232 concentration will be demonstrated at the 95% confidence level using Equation 8-13 in NUREG/CR-5849. Equation 8-13 is based on calculating the average level of all measurements in a survey unit and comparing that level with the guideline. This evaluation is inappropriate because staff has determined that in order to demonstrate groundwater compliance, the MCL needs to be met at every borehole location; therefore the Th-232 concentration for each bore hole sample cannot exceed the mean concentration.

TDCC Response: This comment is not applicable to the Revised Supplement. The MCL-based method was deleted and is no longer being proposed by TDCC. The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

4. Regarding the third bullet, TDCC states "A hot-spot criterion of three times the mean concentration limit will be applied, i.e., an individual sample may be between 1 and 3 times the criteria if the mean meets the criteria at the 95% confidence interval." This evaluation is inappropriate because staff has determined that in order to demonstrate groundwater compliance, the MCL needs to be met at every borehole location; therefore the Th-232 concentration for each bore hole sample cannot exceed the mean concentration.

TDCC Response: This comment is not applicable to the Revised

Supplement. The MCL-based method was deleted and is no longer being proposed by TDCC. The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

5. In the fourth bullet, TDCC provides justification for the acceptability of the number of borehole samples to be taken in the saturated zone. The method of calculation in this section appears to be correct. However, TDCC needs to explain the basis for assuming a standard deviation of 5.8, and what level of assurance there is, that it is not greater than 5.8, since this affects the shape of the curve. If, for example, the standard deviation is greater than 5.8, the curve would be flatter and, therefore, the chance of not detecting an average concentration greater than 24 pCi/g is going to be higher than 5 percent.

TDCC Response: This comment is not applicable to the Revised Supplement. The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated, including sample size. Please see Section 4 of the Revised Supplement for FSS methods.

6. Since your analysis under the fourth bullet showed that 25 samples would be justified using the Data Quality Objectives process, explain the rationale for the proposed sample size of 330. Also, provide an explanation of the method to be used for locating the boreholes in the 100 m² areas.

TDCC Response: This comment is not applicable to the Revised Supplement. The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones, including sample size. Please see Section 4 of the Revised Supplement for FSS methods.

7. Describe how the surface and subsurface unsaturated zone soil portion of the borehole samples will be used in the FSS design.

TDCC Response: The survey design in the revised Supplement includes borehole samples at the frequency recommended in the NUREG/CR-5849 and exposure rate measurements. This is a significantly more expensive sampling method than surface grab samples but the results are more closely linked to the risk from the random, volumetric contamination present at the site. To ensure that the risk from direct radiation is acceptable (i.e., less than 10 uR/hr average over each 100 m² subgrid), 4 times as many exposure rate measurements are proposed than recommended in NUREG/CR-5849. Sixteen exposure rate measurements will be collected in each 100 m² subgrid versus the recommended four

measurements.

8. The seventh bullet states “Any saturated zone areas found to contain Th-232 exceeding the unrestricted use criteria during the final survey will be remediated.” As regulatory compliance in the saturated zone is based on groundwater MCLs and exposure rate at the surface, clarify that the intent is to remediate using the mean concentration of Th-232 in the saturated zone. As explained in RAI 7c above, in order to demonstrate groundwater compliance, the MCL needs to be met at every borehole location; therefore, the Th-232 concentration for each bore hole sample cannot exceed the mean concentration.

TDCC Response: This comment is not applicable to the Revised Supplement. The MCL-based method was deleted and is no longer being proposed by TDCC. The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

9. TDCC has previously provided borehole characterization data for the saturated zone. A number of these samples exceeded the mean concentration of Th-232. TDCC should confirm that these areas will be cleaned up to comply with the mean thorium concentration criterion.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

8. Section 4.2, Final Survey of Surface Soil and Subsurface Unsaturated Zone Soil, page 15-16

General Comment - TDCC has not requested to change the exposure rate nor thorium concentration criteria for this region, both of which were previously approved under License Amendment No. 7 (NRC 1997a). However, TDCC has proposed a final survey plan to demonstrate regulatory compliance which is different from that approved under License Amendment No. 7. Since there are no changes to the release criteria, it is unclear why TDCC would propose to modify the final status survey plan. TDCC should provide the rationale for deviating from the previously approved final status survey plan and justify the adequacy of the proposed plan.

TDCC Response: The FSS methods currently approved resulted in the unnecessary excavation of significant volumes of clean material. The methods described in the revised Supplement are intended to supercede the methods described in Amendment No. 7.

9. Section 4.2, Final Survey of Surface Soil and Subsurface Unsaturated Zone Soil, pages 15 to 16

Specific Comments - Provide the following technical information in order to facilitate the review and adequacy of the FSS design which is used to demonstrate regulatory compliance:

1. The first bullet states “Scan ground surface using NaI detector.” TDCC needs to indicate the scan coverage for each survey unit. Additionally, TDCC needs to provide appropriate MDCs (minimum detectable concentrations) and corresponding sensitivities.

TDCC Response: The scan survey coverage will be 100% and the MDC’s are assumed to be at the levels listed in MARSSIM Table 6.7.

2. Regarding the second bullet, given that more than one elevated scan location could be present in the 25 m² subgrid quadrant, justify the method to further assess only the location with the highest NaI surface scan result.

TDCC Response: In many cases, there is little correlation between the scan result and the borehole result because the contamination is random and volumetric down to the clay layer. This results in the borehole being essentially another random sample. Trying to correlate the scan results to the volumetric concentration and risk has been one of the major problems with the currently approved plan as discussed in the cover letter to this submittal. Assuming that the 16 exposure rate measurements are below the limit, additional borehole samples at locations other than the highest scan location are not necessary.

3. The third bullet states “If exposure rate measurement and surface soil sample meet unrestricted use criteria no further sampling required.” Given the heterogeneity of the thorium contamination and that no additional samples are obtained in the 25 m² subgrid quadrant, TDCC needs to explain how it will demonstrate that the subsurface unsaturated zone soil in this area complies with the concentration criterion. Please describe what concentration will be detected by your instrumentation in the subsurface unsaturated zone soil. Also, please show all calculations.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

4. In the section, Additional Clarifications to Supplement (Page 9), under

Attachment 1 to the SDP (TDCC 2002b), TDCC revised the FSS protocol for the fourth and fifth bullets of Section 4.2. Regarding this revision, please justify the number of additional exposure rate measurements taken and explain how these locations are predetermined, since you are applying a multiple sampling technique. Also, explain what actions will be taken when any one location meets or exceeds two times the criterion.

TDCC Response: The 16 exposure rate measurements will be equally spaced in each 100 m² subgrid. This results in 1 measurement every 2.5m. Reducing the measurement grid from 5m to 2.5m significantly increases the probability of detecting a small elevated area located equidistant from the measurement locations. As described in Section 4 of the Revised Supplement any exposure rate measurement that exceeds two times the criterion will be investigated and remediation conducted as necessary.

The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

5. Regarding the revision to the fourth and fifth bullets, the SDP needs to discuss the procedure to be followed if the average of the resulting five exposure rate measurements is greater than two times the criterion or the average over the entire 100 m² is greater than the criterion.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

6. In the section, Additional Clarifications to Supplement (Page 9), under Attachment 1 to the SDP (TDCC 2002b), TDCC revised the FSS protocol for the sixth and seventh bullets of Section 4.2. Regarding this revision, please justify the number of additional soil samples taken and explain how these locations are predetermined, since you are applying a multiple sampling technique. Also, explain what actions will be taken when any one location meets or exceeds three times the criterion.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

7. Regarding the revision to the sixth and seventh bullets, the SDP needs to discuss the procedure to be followed if the average of the resulting four samples is greater than two times the criterion or the average over the entire 100 m² is greater than

the criterion.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

8. The revision to the sixth and seventh bullets also states “The same averaging criteria will be applied to the unsaturated zone borehole sample results.” Averaging of multiple borehole samples for the same 100 m² is acceptable provided that the entire sample from each borehole is profiled to assess for hot spots exceeding three times the concentration criterion and that an action guideline has been met per borehole sample that is some fraction of the concentration criterion. TDCC needs to commit to using such a protocol and revise the SDP accordingly. Also, please clarify the situations that would justify taking samples from multiple boreholes in the unsaturated zone for a 25 m² subgrid quadrant. For example, explain whether collecting three additional surface soil samples for the purpose of averaging would also involve boreholes of the unsaturated zone soil.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

9. The eighth bullet states “If the soil meets the criteria but the exposure rate exceeds criteria, collect a composite sample of the unsaturated zone soil (1-3 feet).” Regarding this statement, clarify whether the term “soil” means “surface soil.” Please confirm that composite samples of the subsurface unsaturated zone soil will be collected at one meter depth intervals, starting at the surface soil boundary (i.e., 6” from the ground surface) and continuing to the saturated zone boundary. TDCC needs to discuss how boreholes and resulting samples will be assessed to identify the presence and distribution of subsurface activity to guide remediation and how the hot-spot criterion of three times the soil concentration limit will be applied.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

10. The eighth bullet also states that the proposed method for subsurface soil compositing is consistent with NRC guidance related to the AAR Corporation (NRC 1997a). TDCC needs to clarify whether portions of this guidance, other than the soil compositing interval, are also intended to be part of the FSS design.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

11. The ninth bullet indicates that the elevated exposure rate is assumed to result from saturated zone soil if the composite sample of the unsaturated zone soil column meets the soil criteria. Explain what borehole and sample profiling will be done to verify that the elevated exposure rate was not due to the unsaturated soil zone. Also, assuming that the unsaturated zone meets the criteria, please specify what concentration will be detected by your instrumentation at the unsaturated/saturated zone boundary. Please show all calculations.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

12. TDCC has previously provided borehole characterization data for the surface soil and subsurface unsaturated zone soil. Many of these samples were between one and three times the soil concentration criterion, as well as three times the criterion. Please explain how cleanup of the surface soil and subsurface unsaturated zone soil will be done prior to the conduct of the FSS. Also, the SDP needs to explain whether these results will be used to supplement the FSS data.

TDCC Response: The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

ATTACHMENT 1(dated July 19, 2002) TO THE SDP (TDCC 2002b)

10. NRC Request #3: Statistical Analysis of Saturated Zone Sampling Results, pages 5 to 6 - The second paragraph states that the F-Test and the Wilcoxon Rank Sum (WRS) tests were used to determine differences between the means at the 95% confidence level. It should be noted that the F-Test is typically used to determine the equality of two variances as opposed to means; therefore, the F-Test may not be the appropriate statistical test. A more appropriate test to compare means would be a Z-test or a T-test. However, when reviewing the two data sets for the 24 pCi/g truncate, the two means are noticeably different (1.83 versus 1.37) based on the large sample size (295 and 406), contrary to TDCC's conclusion. Consequently, NRC staff has determined that the conclusion is incorrect and that TDCC should explain the following: 1) the decision to truncate at 24 pCi/g and delete at 10 pCi/g since data should not be manipulated prior to any statistical assessment, 2) the difference between "truncate" and "delete," 3) what value was assigned to non-detects, 4) whether the whole set (untruncated) was analyzed and what was found,

5) what was tested with the F test, 6) why the WRS test was run, 7) what was tested with the WRS test, 8) whether a test for “normality” was done, 9) explain why the results of the WRS test were not used.

TDCC Response: The statistical tests are not applicable to the Revised Supplement and were deleted.

11. NRC Request #5: Remediation Action Level for Exposure Rate in Excavated Saturated Zone Areas, page 8 - Although not stated, it is assumed that the ratio developed in Table 4 is based on Th-232 being at naturally occurring concentrations in the backfill material. Please confirm that this is correct and, if not, revise the ratio. In addition, staff cannot reconcile the factors provided in the second and third sentences of the second paragraph.

TDCC Response: The Revised Supplement, Section 4, contains a complete revision to the FSS methods for the saturated and unsaturated zones. The remediation action level discussed in the original Supplement was for informational purposes only and intended for TDCC’s use during remediation support work, and not compliance with NRC criteria. The information was deleted from the Revised Supplement.

ADDITIONAL CLARIFICATIONS TO ATTACHMENT 1 THE SDP (TDCC 2002b)

12. Sampling Method for Excavating Sidewalls, pages 9 to 10 - This section regarding the sampling method for subsurface sidewalls states that sidewall samples will be collected by compositing over 1-meter depth intervals. Given that historically, compliance is achieved by composite sampling over 15 cm rather than 1-meter intervals, explain why TDCC has chosen to depart from historical precedence and guidance. Please clarify whether this sampling method applies to both the subsurface unsaturated zone soil and the saturated zone soil. Also, describe the depth beyond which the region of sidewall activity will be assessed in order to confirm regulatory compliance.

TDCC Response: The NRC approved AAR method was used as guidance for developing the borehole sampling plan in the Revised Supplement. This method includes 1m composite samples. As described in the cover letter to this submittal, typical grab samples are not representative, or risk-informed, when the contamination is random and volumetric as is the case for the Bay City site. The excavation sidewall samples will be collected directly from the sidewall or from a location immediately adjacent to the sidewall using borehole sampling equipment. The sample location will be as close as possible to the sidewall given safety and sidewall strength limitations (~1-2 feet).

13. Post-Excavation Sampling of Saturated Zone if Excavation Required Based on Elevated Exposure Rate, page 10 - Given that TDCC has committed to sample after excavation to

ensure that remediation has been successful, clarify the sampling procedure and explain how the proposed concentration criterion of 24 pCi/g for Th-232 will be applied.

TDCC Response: This comment is not applicable to the Revised Supplement. The MCL-based method was deleted and is no longer being proposed by TDCC. The Revised Supplement contains a complete revision to the FSS methods for the saturated and unsaturated zones. Please see Section 4 of the Revised Supplement for FSS methods.

14. Section 1.1.1, Site History - TDCC states that a metallic magnesium alloy was produced at the Bay City and Midland sites, resulting in a magnesium-thorium slag as a by-product. TDCC needs to provide a more detailed description of the smelting process and primary feed material used in the alloy production process. In addition, information should be provided on the chemical composition of the types of slag contained at the site. This should include a percent weight breakdown of the key chemicals within the slag (e.g., metal oxides - MnO, TiO₂, MgO, CaO, P₂O₅, Al₂O₃).

TDCC Response: This comment is not applicable to the Revised Supplement. It is our understanding that this information was requested to support the leaching calculations in the original Supplement. The leaching calculation was part of the MCL-based method which is no longer being proposed by TDCC.

15. Section 3.3.1, Method for Determining Drinking Water Criterion - In determining an acceptable concentration of thorium in slag that can remain in the saturated zone, in compliance with the long-term ground-water radium concentration; TDCC assumes a ground water to soil ratio of 10% (i.e., a distribution coefficient {K_d} of 10,000 L/Kg). TDCC needs to justify the use of this value for making long-term (i.e., a 1000-year time frame) predictions on the behavior of the slag.

TDCC Response: This comment is not applicable to the Revised Supplement. The leaching issue was a part of the MCL-based method which is no longer being proposed by TDCC.

16. Section 3, Saturated Zone Soil Unrestricted Use Criteria - TDCC needs to provide the following information to support NRC's dose analyses of residual radioactivity remaining at the site:

1. The average concentration of radionuclides expected at the site at termination. This should include concentrations for all key radionuclides (e.g., Th-232, Th-230, Th-228, Ra-226, and Ra-228) and a basis for the derived concentrations. Further, this information should address expected radioactivity within the unsaturated and saturated zones.

TDCC Response: Based on the 1500 boreholes collected to date and the results in the six FSS reports submitted to NRC, the concentration of Th-232 and Th-228 is expected to be between 0.3 pCi/g and 2.1 pCi/g. The average concentration of Th-230 is at most 3 times the Th-232 concentration. The maximum 2.1 pCi/g value assumes the remediation of the highest 30 locations identified out of the 1500 locations sampled. Using the methods described in the Revised Supplement TDCC expects that significantly more than 30 locations will be remediated, leading to lower residual concentrations.

2. A schematic of the expected configuration of radioactive slag at termination. This schematic should show the thickness of the slag in relationship to the water table (i.e., the thickness of the slag in the unsaturated and saturated zones) considering average fluctuations in the water table.

TDCC Response: The water table is at the ground surface elevation over the entire site at certain times of the year. TDCC will provide electronic copies of graphics showing the location and depth distribution of the contamination. The detailed hydrogeology report submitted in response to RAI #1 should provide the requested information regarding fluctuations of the water table.

3. A general schematic of the surface hydrogeology (uppermost groundwater system) at the site. This schematic should show the general thicknesses of the unsaturated and saturated zones at the site.

TDCC Response: The detailed hydrogeology report submitted in response to RAI #1 provides the requested information.

4. The size of the watershed for the Bay City site.

TDCC Response: The detailed hydrogeology report submitted in response to RAI #1 provides the requested information.

5. General information on ground-water use in the area. Specifically, information should be provided on the number of wells in the area, average annual withdrawal rates, general uses of ground-water, hydrogeologic zones from which water is withdrawn, and common well construction characteristics.

TDCC Response: The detailed hydrogeology report submitted in response to RAI #1 provides the requested information. Additional information is provided in Section 2.1 of the Revised Supplement.

17. Section 3.3, Demonstrating Compliance with Drinking Water Criterion

1. The supplement to the decommissioning plan states that TDCC intends to use water samples from at least 5 wells to evaluate compliance with the 5 pCi/L concentration limit for radium. TDCC needs to clearly identify the number of wells and number of rounds of samples that will be used to evaluate compliance, and provide a basis (e.g., Data Quality Objective - DQO) supporting the number of each that will be used. If TDCC intends to determine compliance using a single sampling round, they need to clearly demonstrate that concentrations in the ground water have stabilized over the short-term leading up to site release (and possibly the intermediate time period following site release). Further, TDCC needs to describe the protocol that will be followed for collecting and analyzing water samples as part of the compliance demonstration. The sampling plan should clearly describe the proposed design for monitor wells and their proposed location on the site (especially with respect to the known radioactivity sources and elevated ground-water concentrations). In addition, the sampling plan should clearly describe how samples will be collected, preserved, and analyzed. At a minimum, the sampling plan should include information on: the sampling objective, sample collection approach, any planned in-situ field analysis, planned sample preservation, and field and laboratory QA/QC plans.

TDCC Response: TDCC provided a response to this RAI in letters dated March 17, 2003 and June 3, 2003. NRC approved the RAI response in a letter dated June 6, 2003.

2. TDCC needs to provide a plan showing how ground water measured above the 5 pCi/L total radium limit will be remediated. This plan should identify the remediation technology that will be used, its anticipated effectiveness, and the time period over which it will be used.

TDCC Response: TDCC does not anticipate the need for any groundwater remediation at the site and therefore does not believe that a remediation plan is necessary.