DEQ
Montana Department
of Environmental Quality

February 10, 2020

Mr. Gordon Criswell
Talen Montana
PO Box 38
Colstrip, Montana

RE: DEQ Comments on *Units 3&4 EHP Revised Remedy Evaluation Report, August 2019*

Gordon:

DEQ and its contractor, Weston Solutions, have reviewed the *Units 3&4 EHP Revised Remedy Evaluation Report*. DEQ agrees that the technologies and methods proposed in Alternative 4 provide the most effective cleanup relative to the other Alternatives. However, DEQ believes additional sampling and treatability studies are needed to finalize the remedy. As such, DEQ is providing conditional approval of the Report, with the stipulation that the attached comments are addressed, and the following contingencies are completed:

1) Talen must run a pumping test on the underdrain as soon as possible to determine whether the underdrain will be able to fully dewater the ponds. The results of the test must be provided to DEQ in a report. If the underdrain does not have the capacity to achieve this, DEQ will require additional measures, such as targeted dewatering, to be implemented that completely dewater the ponds.
2) Talen must demonstrate that adequate space will be available to run the underdrain in 2021. If this cannot be achieved, DEQ will require that additional water storage be constructed to accommodate the water pumped from the underdrain.
3) Talen must complete a study on the utilization of Monitored Natural Attenuation at the site. The findings must be provided to DEQ in a report. If MNA is not demonstrated to be effective, DEQ will not approve the use of MNA, and will instead require other measures to implemented to ensure plume stability, which may include long-term pumping.
4) A feasibility study must be conducted for the use of a Permeable Reactive Barrier (PRB). DEQ will not approve the use of a PRB until the study demonstrates this technology will be effective.
5) Additional figures and data on the groundwater elevation relative to the bottom of the ponds must be provided. These figures should include aerial diagrams for each of the aquifers through time, including present-day, during active capture/injection, and after the capture/injection system is shut down.
6) Samples of the soils beneath the ponds must be collected to assess secondary sources that may be present in the aquifer.

7) The model must be updated to include new findings as a result of the additional sampling and treatability studies. The geochemical data from the underdrain sampling should also be included in the model update.
8) The Water Resources Monitoring Plan must be updated to include monitoring for all COCs identified in the Cleanup Criteria and Risk Assessment Report, please also include monitoring requested in DEQ Comments on Units 3&4 CCRA dated September 13, 2019.
9) The capture/injection system must be evaluated annually, based on remedy progress demonstrated by sampling. DEQ can require additional wells be installed, and/or additional measures be implemented based on the progress.
10) A timeline for implementing these contingencies must be provided to DEQ.

Conditional approval of the Report triggers Talen's submission of financial assurance in accordance with the Administrative Order on Consent, Article VIII. Talen has estimated the cost to be $107,362,681 using the agreed-upon discount rate of 3%. DEQ requests that Talen submit a table that provides a more detailed breakdown of the financial assurance that includes specific costs for items such as labor, well installation, capping costs, etc. The financial assurance should be submitted within 60 days of receipt of this conditional approval, in the form of surety bonds. Please note that the financial assurance will be re-evaluated and potentially updated on an annual basis, to reflect any changes or additions to the remedy, especially those that may result from completion of the contingencies listed above.

Please feel free to contact DEQ with any questions at sedinberg@mt.gov or (406) 444-6797.

Sincerely,

Sara Edinberg

cc: Terri Mavencamp, DEQ (electronic copy)
Jenny Chambers, DEQ (electronic copy)
Ed Hayes, DEQ (electronic copy)
Al Hilty, Hydrometrics (electronic copy)
Bob Glazier, Geosyntec (electronic copy)
Cam Stringer, NewFields (electronic copy)
Marietta Canty, Neptune Inc. (electronic copy)

DEQ Comments on Revised Units 3&4 Remedy Evaluation Report

General Comments:

1) Please include a reference to the Units 3&4 CCRA Response Letter to DEQ dated December 5, 2019, which describes the actions that will be taken for the man-made surface water structures in the 3&4 area.
2) The sample results and leaching tests conducted in the SOEP indicated some mass was trapped in the underlying sediment/soil and can act as weak secondary sources of groundwater contamination for both boron and sulfate. Due to similar operational history, the underlying soil at the Units 3&4 ponds must be sampled and tested to verify the conditions under the ponds. The Fate and Transport model should then be updated based on the sample results.
3) Based on groundwater flow presented in the Site report, the direction of groundwater flow in Sub-McKay underneath the EHP is to north and east, so are the plumes. However, it is unclear why both sulfate and boron plumes are modeled to expand to the south in Layer 5 under Alternatives 2-4, especially when considering that Alternative 4 has increased capture in the north. Additional capture wells should be considered for installation in Alternative 4, in the Layer 5 at the southern boundary of EHP. Please evaluate and clarify.
4) Please provide model simulations for predicted groundwater elevation changes vs time for Alternative 4, similar to the boron and sulfate concentrations. Also see General Comment #16.
5) For clarification, please change the Alternative 4 name to Source Control and In Situ Flushing with Increased Capture.
6) Formations in Colstrip are highly heterogeneous and/or there is great uncertainty of the K values used in the model as indicated by the recent pilot tests conducted in the Plant Site. The groundwater model should only be used as a general guidance tool to evaluate how groundwater and COI concentrations might react at the site-scale and over longer timeframes. The final decision of site closure should be based on the site groundwater data only.
7) The seepage estimates from many Cells (i.e., A, B, D/E, F, and H) do not take into account continuous seepage from the saturated aged ash stored in these Cells. In addition, Talen should collect field data to verify or confirm the model calculations (e.g., from the Underdrain system beneath the C Cell, and the liquid underdrain collection systems beneath geomembranes in various Cells).
8) Please provide cross-sections for each Cell to show the elevations of cell bottom and/or liner, water levels (free water or residual water head in the aged ash), and the thickness of deposited ash demonstrating separation between the ash and groundwater. Also see General Comment #16.
9) Under Alternative 4, the configuration of the boron plume in 2119 in Layers 2-4 (as shown in Figures 6.29-6.31) are very similar to those of Alternative 2 and 3, despite increased capture (vertical and horizontal wells) and in situ flushing activities. Please explain why this is the case.

10) As shown in the model figures, both sulfate and boron plumes at EHP appear to have not migrated into and impacted the sub-McKay at the southern boundary of the EHP despite over 30 years operations, since 1983. However, the plumes will start expanding toward the south in the next few years under all alternatives based on the model simulation. Please discuss what causes the southern expansion and why this has not occurred to date.
11) The F&T model simulation is based on the groundwater model that assumed porous media flow for the site. However, as pointed out in the previous comments to the Site Characterization Report by MDEQ, there are likely fractured-controlled flow pathways at EHP Site based on the Seep distribution around the EHP. Talen should continue to collect the information during implementation of the remedial work, and update the model accordingly.
12) Inconsistency in input parameters of the F&T model throughout the report offer little confidence in the model outputs. For instance, the pumping of the Underdrain system appears to be not included in Alternative 2 (Table 6-10) as indicated in the report; and the Underdrain pumping rate is set at 0 gpm in Alternative 4 for all model periods (Appendix D, Table 6-12); The underdrain is in operation in Alternative 3 for just 5 years until 2025 (Appendix D, Table 6-11). In addition, it is unclear why the mass recovery is zero when capture wells with COI exceedance are pumping (e.g., Well 645D, 646D, Tables 6-10-6-12 vs Table 7-3). Please clarify and edit and/or revise the report as appropriate.
13) The sensitivity analysis results indicate the tested F & T model are not sensitive, or slightly sensitive to the following inputs: source concentrations, pond seepage rates, hydraulic conductivities, retardation, and effective porosity which appear to be the most sensitive parameters observed through the modeling process. Although the sensitivity analysis process is acceptable, it is noted that increases in hydraulic conductivity, source concentrations, and seepage rates did not alter the 4 mg/l boron isoconcentration significantly. The anticipated outcome is that the boron plume would have been larger, which leads to the conclusion that the model should remain solely as a guide for the remedial efforts, with actual field data as the final driver.
14) None of the Alternatives proposed at the EHP will achieve PCC at the POC by 2050. Please revise the statement wherever appropriate to avoid confusion.
15) The Federal Coal Combustion Residual (CCR) Rule can currently be interpreted as corrective measures including groundwater cleanup should be completed within 15 years. However, a proposal to allow a facility to continue corrective action during the post closure care period (until the corrective action is completed) is under review by EPA and will be added to the CCR Rule soon. The 15-year limitation should not be a consideration for a removal scenario; please remove these statements from the report.
16) Data in the report indicates that the boron plume in Layer 5 may not be stable at the end of the capture/injection period (2050) or at the end of the modeling timeframe (2119). It is unclear from the report why this is occurring. The cross section provided in the report demonstrates that groundwater will not be in contact with the bottom of the ponds after capture ceases. However, cross sections should be provided in multiple areas, all aquifers and in areas outside the ponds to confirm that groundwater will not be in contact with any of the ponds throughout the EHP area. Aerial potentiometric surface maps that show

changes in groundwater elevation during the modeling period (2018 – 2119) may also support this information, and will provide a better representation of any changes in groundwater flow direction due to cessation of pond seepage and groundwater capture. DEQ does not believe that contact with the bottom of the ponds is causing the lack of stability in the plume; however, soluble salts containing COCs are known to be present in the aquifer matrix, especially in areas that are currently unsaturated due to ongoing capture. The injection system appears to be an effective way to prevent re-contamination in most layers when the water table recovers post-pumping, but it appears that additional, targeted injection and capture may need to be placed in areas where the plume increases after the capture system is shut down.

17) In accordance with General Comment #16, model data indicates that the mass and volume of the plume in layer 5 will increase after the capture system shuts down. Additional studies must be conducted to determine the cause of this, and a study on the use of Monitored Natural Attenuation (MNA) must be performed to support the use of this technique after shutdown of the capture/injection system. DEQ understands that inorganic contaminants behave differently than organic contaminants, and are subjected to different attenuation processes; therefore, inorganic contaminants may experience a slight increase in concentration at the leading edge of the plume for a period of time. However, the mass of the plume should decrease to support the use of MNA; the model currently suggests that the mass of boron may increase, likely as a result of the presence of soluble salts that remain in the aquifer material and act as secondary sources. DEQ requests that a thorough study on the use of MNA be conducted, including the use of site-specific data, and the results be provided to DEQ in a report. If the use of MNA is not supported by the study, DEQ will require other measures be taken to ensure the stability of the plume.
18) The operational capacity and ability of the underdrain to completely dewater the ponds needs to be quantified. This information is crucial in determining the pumping rate of not only the underdrain, but of the capture wells proposed to be installed in clinker within the slurry wall. According to discussions with Talen, the theoretical pumping rate of the underdrain is very low, as a result of more than 100 gpm being pumped by these capture wells. If this is the case, Talen should provide information on the overall water budget for pond and capture water management. The calculations provided by Talen indicating that enough space will be available to run the underdrain in 2021 do not include the additional capacity that would be needed to deal with the additional water generated by the new vertical and horizontal capture wells. Since the pumping rate of the underdrain is expected to be much smaller than that of the capture wells, the fate of all captured water (wells and underdrain) needs to be clarified.
19) The Report notes that "vermin control would be conducted as part of normal custodial care of a closed cell." (The Units 1&2 Remedy Evaluation Report cites the ITRC guidance, *Technical and Regulatory Guidance for Design, Installation, and Monitoring of Alternative Final Landfill Covers* (ITRC, 2003).) Vermin control will be required beyond the CCR Rule's 30-year post-closure care period; Talen should provide financial assurance to cover costs of vermin control after the post-closure care period.

20) Please provide a thorough description of the intent and use of Institutional Controls (ICs), which indicates the duration or milestone that would trigger the cessation of the use of ICs.

Specific Comments

1) Page xiv, *Preferred Remedial Alternative*, 1st paragraph, 2nd to last sentence: The text states "Some areas around the EHP would contain boron and low mobility …, but plume expansion is controlled". This is not consistent with the modeling results which boron plume continues to expand in 2119. Also see General Comment #16.
2) Page xv, *Implementation of the Preferred Remedial Alternative*, 1st paragraph, 1st sentence: The statement of "As shown in Table 7-2, B Cell and G-Cell are planned to be closed in 2019" is inaccurate. According to Table 7-2, B Cell is planned to be closed in 2022, and G Cell is 2024. Please revise.
3) Page 5, Section 2.1.1, 3rd paragraph: Please include language that specifically states that water is only present in Cow Creek in direct response to precipitation (ephemeral) to be consistent with the 3&4 CCRA.
4) Page 10, Section 2.2.2, 2nd paragraph, 1st sentence: Please remove the statement that "radium and thallium concentrations...appear to be consistent with background". No background concentrations (BSLs) were calculated for radium or thallium (as stated in the next sentence), therefore no background is available for comparison.
5) Page 13, 3rd bullet: The Closure Plans indicate that D/E cells are filled and no longer receive CCR. Please clarify; if the use of D/E cells has changed, this should be updated in the Closure Plans.
6) Page 25, Section 2.5.3, 1st paragraph, 4th sentence: Please check if "...cobalt, lithium and manganese" should be "...cobalt, lithium, and selenium"; manganese is not a CCR Rule Appendix IV constituent.
7) Page 25, Section 2.5.3, 1st paragraph, last sentence: Please add text indicating that the Water Resources Monitoring Plan will be revised in spring 2020 to include the new COIs that were identified under the CCRA from the CCR Rule monitoring.
8) Page 25, Section 2.5.3, last paragraph, last sentence: The data used to construct the plume maps is provided in Appendix C, not Appendix F of Appendix D6. Please revise.
9) Page 28, Section 2.6.1, 1st paragraph and bullets: Please indicate which of the cells listed in the bullets are still believed to be contributing seepage.
10) Page 32, Section 2.6.3, bullet #3: This interpretation is not supported by the direction of the groundwater flow in this area unless there is an identified fracture zone which acts as a preferential flow pathway. Has a fractured zone been identified in this area? Please provide additional information to support this interpretation.
11) Page 39, Section 4.1, 2nd paragraph: Although potential rebounding of the water table was not considered in the matrix diffusion scenario, it is an important aspect of assessing the effectiveness and permanence of the proposed remedies. Please see General Comment #16.
12) Page 39, Section 4.1, last paragraph: The sample results and leaching tests conducted in the SOEP indicated contaminant mass was trapped in the underlying sediment/soil and can be

a weak secondary source of both boron and sulfate to groundwater. Due to similar operational histories, the underlying soil at the Units 3&4 EHP also warrants sampling to confirm COI concentrations. The model has also predicted the water table will rebound in some areas after the capture system shutdown (Figure 6-46 of Appendix D). Although the water table does not rebound to reach the ash, that water table may rebound to re-dissolve COIs that are trapped in the once-unsaturated matrix beneath the EHP Cells. Both factors should be evaluated and incorporated in the model.

13) Page 40, Section 4.2, 2nd sentence: The further MNA evaluation should include an evaluation of clays, aluminum (hydr)oxides, and natural organic matter which can be beneficial for the adsorption process.
14) Page 41, Section 4.2, Mineral Precipitation Beneath 3 & 4, EHP, 2nd paragraph, last sentence: If the statement is limited to the cell samples, revise "multiple" to "all". Based on the data provided in Appendix F, 7 of the 56 mixed cell and mixed samples modeled had ionic strengths less than 0.1 molal, which were limited to the most dilute sub-McKay mixtures. Therefore, if the statement is intended to include the both the cell and mixed samples revise "multiple" to "most".
15) Page 41, Section 4.2, Mineral Precipitation Beneath 3 & 4 EHP, 3rd paragraph: Specify that average coal-related background and sub-McKay background groundwater values were used to simulate dilution effects beneath the cells and refer to Table 2 and Table 3 of Appendix F for an easy review.
16) Page 41, Section 4.2, Mineral Precipitation Beneath 3 & 4, EHP, last paragraph, 2nd sentence: Consistent with Appendix F, Tables 2 and 3, the list of minerals predicted to be saturated below the source area should also include aragonite and magnesite.
17) Page 42, Section 4.2, Sorption, 1st paragraph, last sentence: Specify and provide rationale for the use of Eh = 0.1175 eV in all speciation models (Appendix K). Furthermore, because Eh values are used in the speciation models, please provide additional information and reference(s) to support the sulfate interference with the oxidation reduction potential measurements. Also see General Comment #2.
18) Page 42, Section 4.2, Sorption, 2nd paragraph, 6th sentence: Please confirm that this sentence refers to magnesium, not manganese (magnesium is not a COC). If magnesium is correct, please discuss why magnesium is excluded from further MNA evaluation, and provide references, if any.
19) Page 42, Section 4.2, Sorption, 2nd paragraph: As part of the further MNA evaluation it is expected that adsorbents beyond manganese oxide and ferric oxide will be included. Therefore, as part of the further MNA evaluation reporting please provide a summary table of ZPC values for all materials that will be used for this project.
20) Page 44, Section 4.3, 5th bullet: Please delete this bullet; it is a duplicate of the previous bullet.
21) Page 54, Section 6.3, 2nd paragraph: Please add that C-1 and G-1 cells will store dry CCR material.
22) Page 55, Section 6.3, 2nd paragraph, 1st sentence: Please add sulfate to this list, as Alternative 2 does not address all of the sulfate beyond the POC.
23) Page 55, Section 6.3, last paragraph, last sentence: Please clarify whether this would be for new wells installed in distal areas after 2050, or for existing wells that may be at risk due to continued plume migration under this Alternative.

24) Page 56, Section 6.4, 1st paragraph, 2nd Sentence: The pumping of the underdrain system is part of Alternative 2. Please revise.
25) Page 64, Section 7.1.2.1, 1st bullet: Please discuss what drives the majority of particles starting in the southern part of Model Layer 2 to migrate south, and ultimately to reach the shallow Sub-McKay (Model Layer 5). Also, please discuss why the COI plume has not reached the Sub-McKay in the last 30 years.
26) Page 71, Section 7.2.1.4, 2nd paragraph, last sentence: This statement is inconsistent with section 6.3 (page 53, 2nd paragraph), which indicates that D/E cells will cease receiving bottom ash in 2021, and the Closure Plan, which indicates the D/E cells will be closed in 2022. Please clarify.
27) Page 80, Section 7.3.1.4, 3rd paragraph, last sentence: Please see Specific Comment #26.
28) Page 80, Section 7.3.2.1, 1st paragraph, 3rd sentence: Please clarify whether this sentence refers to current pond seepage. The paragraph indicates that Alternative 3 does not perform adequately due to cell seepage and subsequent migration; however, the source control measures should be designed to eliminate seepage. Additionally, the same source control methods are used in the preferred Alternative 4, indicating that cell seepage would still contribute to plume migration.
29) Page 81, Section 7.3.1.1, 3rd paragraph, 5th sentence: Please explain why the EHP underdrain system is only in operation for about 5 years.
30) Page 81, Section 7.3.2.1, last paragraph, last sentence: Please check this sentence; it appears it should say, "The reduction in volume of groundwater exceeding sulfate PCC is expected to be greater than that of boron..." Note that the example capture well provided in this sentence (1039A), does not have either boron or sulfate exceeding the PCC in 2017. As this well does not appear to have exceedances, please indicate if this well was intended to be the example well provided and revise the text as necessary.
31) Page 84, Section 7.3.2.4, last paragraph, last sentence: Please see Specific Comment #23.
32) Page 86, Section 7.3.2.8, 2nd paragraph, last sentence: Please edit this sentence to say, "Talen Montana will also continue to implement future Annual Plans and 5-Year Plans..." since the remedy will continue beyond 2019.
33) Page 86, Section 7.4.1.1, 2nd paragraph: Please indicate whether a potential source for these naturally elevated concentrations have been identified, what stratigraphic unit(s) the wells are in, and indicate where these wells are relative to the plume. Please provide groundwater data for the two wells.
34) Page 87, Section 7.4.1.1, 1st paragraph: Please include a statement indicating that pumping rates will be increased at existing capture wells where possible.
35) Page 89, Section 7.4.1.2, 2nd and 3rd paragraphs: Please see General Comment #16.
36) Page 90, Section 7.4.1.3: Please refer to the cross sections that show the amount of separation between groundwater and the ponds. Also see General Comment #16.
37) Page 91, Section 7.4.1.4, first paragraph, last sentence: Please see Specific Comment #26.
38) Page 91, Section 7.4.2.1, 1st paragraph, 1st sentence: The text states Alternative 4 would achieve the PCC in most areas within the CSES property by 2050 with the exception of two small areas at the southern and east edges of the EHP which reach the PCC by 2070. It is unclear which two small areas referred to here. Please clarify.

39) Page 91, Section 7.4.2.1, 1st paragraph, 2nd sentence: According to the model animations, it appears that the boron plume continues to migrate toward the southwest boundary of the property after the capture/injection system shuts down, and reaches (but does not cross) the boundary in 2119. This suggests that the boron plume will migrate off of Talen property after 2119. Also see General Comment #16.
40) Page 91, Section 7.4.2.1, 1st paragraph, last sentence: Talen should provide figures to show the simulation of extending operation of the system to 2070 to support the conclusion.
41) Pages 91-92, Section 7.4.2.1, last bullet: Transects F-F' through K-K' are not discussed in this section. Is mass flux through these transects greater than theoretical? If so, by how much?
42) Page 92, Section 7.4.2.1, 1st bullet: Please see General Comment #16.
43) Page 92, Section 7.4.2.1, 3rd bullet: There are a total of thirteen transects, not eleven. Please revise.
44) Page 98, Section 7.4.2.8, 1st paragraph, 1st sentence: Both boron and sulfate appear to be spread vertically and migrate south in Layer 5 under all alternatives; therefore, although the simulations do not show migration in Layer 5 outside of Talen property, the potential exists that boron and sulfate could migrate off of Talen property. Please revise the text to indicate that institutional controls may be required across off-site areas.
45) Page 98, Section 7.4.2.8, 2nd paragraph, last sentence: This statement is not entirely true. According to Table 6-12 in Appendix D, the total injection rate will be greater (up to 53 gpm) than the total pumping rate from year 2030 to 2049. Please reconcile the inconsistency and revise as necessary.
46) Page 98, Section 7.4.2.8, last paragraph, last sentence: Please see Specific Comment #32.
47) Page 101, Section 7.5.1.2, last paragraph: Please see General Comment #15.
48) Page 101, Section 7.5.1.3, 1st paragraph, 2nd sentence: Alternative 5 would not have more constituent mass introduced in the aquifer than Alternative 1 (no further action); please edit this sentence for consistency.
49) Page 102, Section 7.5.1.4, 1st paragraph: Please add D/E cells to this discussion.
50) Page 102, Section 7.5.1.4, 1st paragraph: Please indicate if these systems (pipelines, paste plant, etc.) would need to be re-constructed, and if those costs are accounted for in the estimate.
51) Page 107, Section 7.5.2.5, 1st bullet: For the purposes of financial assurance under the AOC, facility Closure Plans should be updated every five years, or when a major change occurs at the facility.
52) Page 107, Section 7.5.2.6: Please see Specific Comment #50.
53) Page 110, Section 8.1, 2nd paragraph, second sentence: Please delete this sentence that begins with "In contrast…"
54) Page 111, Section 8.1, 1st sentence: Please see General Comment #15.
55) Page 111, Section 8.2, 1st paragraph, 2nd sentence: As stated in Section 7.5.1.3, Alternative 5 provides the greatest levels of source control. Please revise this sentence for consistency.
56) Page 111, Section 8.2, 1st paragraph, last sentence: Please see General Comment #15 (CCR Rule).
57) Page 113, Section 8.3, 4th paragraph, 1st sentence: Please add that aquifer solids below the ponds will be collected as part of this effort. Also see General Comment #16.

58) Page 114, Section 8.4, 1st paragraph, 1st sentence: Please cite the report where the surge pond data is located.
59) Table 2-1: Please add a column to include the thickness of deposited ash in each Cell.

Appendix D Comments

1) General Comment: There are many duplicate numbers throughout this report; please check dates, etc. for typos.
2) Page 20, Section 6.2.2: Please clarify which of the ponds will be used for storage of water pumped from the underdrain system.
3) Page 26, Section 6.6: Well 1116D shows a distinct increase after capture system shutdown. Concentration decreases are consistent in shallower wells (layers 2-4), but deeper wells appear to have more variety in concentration trends, calling plume stabilization into question in layer 5. Also see General Comment #16.
4) Page 32, Section 8: Please see General Comment #13.
5) Page 35, Section 9.0, 5th paragraph, 2nd sentence: Although mass discharge would be expected to decrease over time as seepage rates decrease, this may not be the case for concentration. As the amount of seepage decreases, concentrations of the seepage could remain the same or even increase.
6) Page 37, Section 10, 7th bullet: The increase in the mass of boron between 2050 (capture system shutdown) and 2119 indicates that the boron plume is not stable, and the amount of mass may continue to increase. Also see General Comments #16 and #17.
7) Table 6-2: Projected seepage rate for many Cells (e.g., A, B, D/E, F, and H) do not consider the residual water in the aged ash. Also see General Comment #7.
8) Table 6-3: The years of liner installation for C and G Cells is not consistent with the scheduled year (2024) as presented in Table 7-2 of the main report. Please revise.
9) Table 6-3: The first three notes are not applicable for this table. Please remove and revise.
10) Table 6-8: The B Cell Closure year (2019) is not consistent with the scheduled year (2022) as presented in Table 7-2 of the main report. Please revise.
11) Table 6-8: The initial pumping year for capture wells W80 through W82 is indicated to be 2020. Table 6-12 indicates these wells start pumping during stress period 11, which begins with 2028. This implies that the model is not representing pumping from these wells for eight years. Please revise the table(s) accordingly and indicate if changes to the model are necessitated.
12) Tables 6-10 through 6-12: The underdrain system pumping rate is not consistent with what is proposed for Alternative 2-4. Also see General Comment #12.
13) Table 7-3: It is unclear why the mass recovery is zero when capture wells with COI exceedances are pumping (e.g., 645D, 646D). Please provide an explanation.
14) Table 7-3. Baseline is labeled as 2018 in this table. Please revise to 2017.
15) Table 7-3: This table is missing several footnotes. Please revise.
16) Tables 7-4 &7-5: The predicted volume and mass of groundwater exceeding boron and sulfate PCC levels in 2120 are greater than those in 2050. This indicates groundwater

rebounds and re-dissolves COIs that are trapped in the once-unsaturated matrix beneath the EHP Cells. Re-evaluation should be conducted prior to shut down of the capture system. Also see General Comments #16 and #17.

17) Figure 8-1; The Layer 5 base concentration of boron is different than the concentration presented on Figures 8-2 through 8-5. Please correct Figure 8-1, layer 5.
18) Appendix D (Selection of Fate and Transport Constituents), Page D-16, 1st paragraph, 1st sentence: Please change Table 9 to Table 10.
19) Appendix E, Figures E-2, E-4, E-7 and E-9: Please define the units with white shade (below the Clinker) depicted on the cross-sections B-B', E-E' and F-F'.

Appendix J-1 Specific Comments:

1. Appendix J, General Comment: Through discussions with Talen, Talen has indicated that the primary objective of the HELP model is to predict seepage rates after the cells are closed and capped, and after injection/capture begins. This implies that the seepage rates predicted by the HELP model will not be accurate until the cells are closed, which could be as late as 2040.
2. Appendix J, General Comment: Talen has indicated that the initial seepage rates used to set up initial conditions for the HELP model were calculated in the site report using the available site data. Please clarify how the site data was used to calculate initial seepage for the individual cells.
3. Appendix J-1, Table 2: Please add thickness of deposited ash in each Cell.
4. Appendix J-1, Table 8: Please see General Comment #7.

Appendices F and K General Comments:

1. The current preliminary MNA evaluation for Units 3&4 EHP adequately supports the conclusion that MNA is a promising technology for addressing constituents beyond the POC after the capture system is shut down, and that further MNA evaluation is appropriate.
2. The text should include a discussion of the input parameters used for the saturation index calculations and speciation modeling. Summary tables should be included which identify the source/provides justification for all input parameters. Ultimately, ensure the input parameters are representative of site-specific conditions.
3. Please plot the modeled well sample on all Eh-pH diagrams.
4. The further MNA evaluation should include an evaluation of clays, aluminum (hydr)oxides, and natural organic matter which can be beneficial for the adsorption process.

Appendix F Specific Comments

1. Page 1, Sample Input Parameters and SI Calculations, 1st paragraph, 2nd to last sentence: The text states *"[w]here temperature was not provided, a default value of 15 Celsius (C) was*

assigned for both cell and groundwater samples." However, the known values range used in the model suggest a lower value could be appropriate. Provide the rationale for issuing 15 Celsius as a default value. Alternatively, in the absence of site-specific data, a sensitivity analysis for temperature could be included. See General Comment 2.

2. Page 1, Sample Input Parameters and SI Calculations, 2nd paragraph, 2nd to last sentence: The data used to generate the averaged concentrations used for the model groundwater should be included as a separate table in Appendix F. See General Comment 2.
3. Page 2, Sample Input Parameters and SI Calculations, 2nd and 3rd paragraphs: It is unclear whether the Pitzer equations have been applied to all calculations including the low ionic strength, or just those greater than 0.1 molal. Please clarify.
4. Page 2, Sample Input Parameters and SI Calculations, 3rd paragraph, 4th sentence: If the statement is limited to the cell samples, revise "multiple" to "all". Based on the data provided in Appendix F, 7 of the 56 mixed cell and mixed samples modeled had ionic strengths less than 0.1 molal, which were limited to the most dilute sub-McKay mixtures. Therefore, if the statement is intended to include the both the cell and mixed samples revise "multiple" to "most".
5. Page 3, Preliminary Calculations, 2nd paragraph, 1st sentence: Consider including Piper diagrams depicting the cell samples and the model groundwater samples. Also see Specific Comment 4.
6. Page 3, Preliminary Calculations, 3rd paragraph, 1st sentence: It should be noted that the sub-McKay groundwater, unlike the cell samples and the McKay model groundwater sample, is not high ionic strength.
7. Page 3, Preliminary Calculations, 3rd paragraph, 2nd sentence: Consider including Piper diagrams depicting the cell samples and the model groundwater samples.
8. Page 4, Mixing Analysis, 1st paragraph, 2nd sentence: The text states anhydrite is predicted at the 1:1 cell water: model groundwater ratio for A Cell and D/E Cell. This is not consistent with the data provided in Table 2. Reconcile the inconsistency and revise as necessary.
9. Page 4, Mixing Analysis, 1st paragraph, 3rd sentence: The text states carbonate precipitation is only predicted at A Cell and D/E Cell at a 1:1 cell model groundwater ratio. This is not consistent with the data provided in Table 2. Reconcile the inconsistency and revise as necessary.
10. Page 4, Mixing Analysis, 1st paragraph, last sentence: It should be noted that G Cell shows decreasing carbonate saturation indices as the fraction of cell water decreases.
11. Page 4, Mixing Analysis, 2nd paragraph, 2nd sentence: Please revise *"at ratios below 1:10"* to "*at or below 1:10 ratios*".
12. Page 4, Mixing Analysis, 2nd paragraph, last sentence: Based on how Specific Comments 8 through 11 are resolved, revise the last sentence as appropriate.
13. Page 4, Conclusions, 3rd sentence: The text states that carbonate minerals are undersaturated and sulfate minerals are more likely to precipitate in mixtures with a higher ratio of cell water. However, A Cell and G Cell show increasing dolomite saturation with a higher ratio of cell water. Please revise as appropriate.
14. Page 4, Conclusions, 2nd to last sentence: The text states *"[a]s the relative groundwater ratio increases, carbonate minerals are more likely to precipitate for all cells except G Cell."* However, unlike the McKay (Table 2), the dolomite saturation index in the Sub-McKay (Table 3) decreases in A Cell as the groundwater ratio increases. Please clarify the text.

Appendix K Specific Comments

1. Page 1, Background and Objectives, 1st paragraph: Although the MODFLOW results indicate that by 2049 sulfate will achieve the cleanup criteria, it should be included in the further MNA evaluation so that MNA could be available as a potential contingency in the event that actual site sampling results are contrary to the MODFLOW results.
2. Page 3, 1st complete paragraph, 1st sentence: Please specify the inferred groundwater flow direction.
3. Page 3, 1st complete paragraph, last sentence: A description of the input parameters used and how they are representative of actual site conditions should be provided.
4. Page 7, 2nd paragraph, last sentence: Consistent with the speciation model output files provided for downgradient well 602S in Attachment 2, please revise *"92 percent"* to *"91 percent"*.
5. Figures 1 through 14, Eh-pH Diagrams: See Appendix F General Comment #3.
6. Figure 8 & Figure 10. Please clean up overlapping diagram labels on the Figures.
7. Attachment 1, Plume Maps: All concentration maps should include arrows indicating the primary groundwater flow direction(s) to support the evaluation provided in the text.
8. Attachment 2, Geochemist's Workbench Speciation Output Files: All speciation models are run using 25 ° C, pH = 7.2, and Eh = 0.0075 V. See Appendix F General Comment #2.