

February 4, 2010

Mr. Alan D. Cox, Project Manager
Grants Reclamation Project
Homestake Mining Company
P.O. Box 98/Highway 605
Grants, NM 87020

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING THE GRANTS
RECLAMATION PROJECT GROUNDWATER CORRECTIVE ACTION
PROGRAM (CAP) REVISION, LICENSE SUA-1471, DOCKET NO. 40-8903

Dear Mr. Cox:

By letter dated December 15, 2006 (ML0070240355), Homestake Mining Company (HMC) submitted the Grants Reclamation Project Corrective Action Plan (CAP) Revision, as required by License Condition 35 (B) of HMC's Source Materials License SUA-1471.

The U.S. Nuclear Regulatory Commission staff has completed its review of the revised CAP, and requests the information contained in the enclosed document. HMC should provide written responses to the enclosed requests for additional information.

If you have any questions regarding this letter or the enclosure, please contact me at (301) 415-6607, or by e-mail at john.buckley@nrc.gov.

Sincerely,

/RA/

John T. Buckley, Project Manager
Decommissioning and Uranium Recovery
Licensing Directorate
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:
Request for Additional
Information

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Request for Additional information

Grants Reclamation Project Groundwater Corrective Action Program Revision

Section 4.4 of NUREG-1620, Rev 1., "Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978," provides the criteria the staff used to review Homestake Mining Company's (HMC's) Grants Reclamation Project Groundwater Corrective Action Program (CAP) Revision, dated December 15, 2006 (ADAMS Accession No. ML070240350). As a result of our review, the staff has determined that the following additional information is needed before we can complete our review.

General Comment

The CAP should discuss each element of the CAP strategy independently to ensure that the remediation will result in conformance with the established concentration limits within a reasonable timeframe. This format will fulfill two objectives: (1) provide a consistent format for comparing the CAPs intentions, goals and minimum standards for each element to the updates provided in the Annual Monitoring Report/ Performance Update, and (2) describe each element of the groundwater remediation strategy found in the CAP by replacing the current CAP outline with the sections found in Chapter 2 of the Annual Monitoring Report/Performance Reviews. The CAP should provide technical explanations along with supporting rationale and data to establish the effectiveness of each of the elements being implemented for groundwater remediation.

Request for Additional Information (RAI)

RAI 1 Description of the Deficiency

Section 3 of the CAP provides a description of the revised groundwater remedial activities. However, the CAP does not include a description of the current ongoing groundwater remediation activities.

Basis of the Request

The original CAP was described in a September 15, 1989, submittal and modified by the reverse osmosis system described in a January 15, 1998, submittal. Since 1998 HMC has significantly revised the remedial activities at the site due to observed responses to the impacted aquifers. Therefore, current remedial actions should be described in sufficient detail for the staff to evaluate CAP revisions proposed in the December 12, 2006, submittal.

Formulation of RAI

HMC Mining Company (HMC) should briefly describe the existing groundwater remedial activities as specified in NRC License SUA-1471, License Condition 35 C. Therefore, when HMC discusses revisions in the CAP, it will be clearer what changes have occurred from the original CAP or what proposed changes are being made in the original program. As the document or report now exists, revisions in the CAP have been discussed with little or no comparison to the original CAP.

Enclosure

RAI 2 Description of the Deficiency

In reviewing the CAP, the staff is unable to find a detailed description of the re-injection program including water quality and locations of the re-injection wells.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify that the groundwater reclamation activities are achieving the desired results.

Formulation of RAI

The collection for re-injection program should have its own section to describe well locations and water quality for each extraction well. The water quality of the reinjection area should be discussed including the effectiveness the program will have on the injection area.

RAI 3 Description of the Deficiency

Section 3.15 of the CAP provides a brief general description of the irrigation system. However, the discussion does not include a technical justification for conducting the irrigation program.

Basis of the Request

Section 4.4.3(3) of NUREG-1620 states that important design features should be described sufficiently for incorporation into the modeling that supports the ground water cleanup should be included in the CAP. This information is needed so the staff can verify that the groundwater reclamation activities are achieving the desired results.

Formulation of RAI

Justification for the irrigation plan should be provided due to the contaminated water being used and the increasing level of soil contamination occurring at the irrigation fields. The contaminated water has the potential to affect the aquifers under the irrigation fields as well as speed up contaminant transport down-gradient of the site.

RAI 4 Description of the Deficiency

Section 2.3, paragraph 1, page 9: The statement that “natural water quality was generally poor” is not supported with actual data.

Basis of the Request

Section 4.4.3(1)(e) of NUREG-1620 states that data on geochemical conditions and water quality should be included in the CAP. This information is needed so the staff can verify that the groundwater cleanup standards are justifiable and reclamation activities are achieving the desired results.

Formulation of RAI

Provide water quality data from the Atomic Energy Commission's required monitoring program for groundwater protection that started in the 1950s (mentioned in paragraph 2 of this section). Also, include available water quality results from domestic wells that were installed in the 1960s and 1970s to justify your statement.

RAI 5 Description of the Deficiency

Section 2.3, paragraph 1, page 10, states "Homestake also installed a system of collection wells immediately downstream of the tailings pile that were designed to collect seepage from the tailings pile as well as to retrieve groundwater that may already have migrated from the pile." This statement does not specify what aquifer the collection wells were installed in.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify that the groundwater reclamation activities are achieving the desired results.

Formulation of RAI

Section 2.3, paragraph 1, page 10: HMC should add "into the Alluvial aquifer" after "Homestake also installed a system of collection wells" in the second-to-last sentence in this paragraph.

RAI 6 Description of the Deficiency

Section 2.3, pages 10 - 12, provides a bulleted summary of key milestones for the groundwater restoration program. However, the summary does not identify which well(s) are associated with each of the milestones.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify that the groundwater reclamation activities are achieving the desired results.

Formulation of RAI

Section 2.3, bulleted summary of key milestones in the CAP, pages 10 - 12: HMC should list the well identification numbers for all the wells discussed in these bulleted summary key milestones.

RAI 7 Description of the Deficiency

Section 2.4, last paragraph, page 13, states: "Details for the San Andres aquifer are not presented in this report because it has not been affected by seepage from the Grants site." A discussion of the San Andres aquifer should be provided in the CAP.

Basis of the Request

Water samples from at least one well indicate the presence of contaminants in the San Andres aquifer. Because the San Andres aquifer is the primary drinking water aquifer for this region and several down-gradient residents to the mill site have wells screened in this aquifer, any potential contamination of this aquifer by site-generated radionuclides and chemicals would be significant. Therefore, the CAP should include a detailed discussion of the aquifer.

Formulation of RAI

Section 2.4, last paragraph, page 13: HMC should discuss the San Andres aquifer in detail within this report. The level of discussion should be similar to that of the Alluvial and Chinle aquifers.

RAI 8 Description of the Deficiency

Section 2.4.1.1, paragraph 3, page 14, states: "A significant area of zero saturation also exists in southern Felice Acres, which extends to the west through Section 34 due to higher elevations in the base of the alluvium. The elevation to the base of the alluvium also increases on the south side of this figure with a limit of saturation in the southern portion of the map." There is no discussion of the extent of the unsaturated Alluvial aquifer in this area.

Basis of the Request

Although the CAP indicates that the area is generally unsaturated, some data indicates that the entire area is not unsaturated. New Mexico Environment Department (NMED), in a letters dated October 17, 2007, and April 25, 2008, has indicated that a least one well in this "unsaturated" area had a saturated thickness in the Alluvial aquifer of 1.5 feet in 2006.

Formulation of RAI

Section 2.4.1.1, paragraph 3, page 14: HMC should address the extent of the unsaturated Alluvial aquifer in this area.

RAI 9 Description of the Deficiency

Figure 17, HYDAULIC CONDUCTIVITY (PERMEABILITY) OF THE ALLUVIAL AQUIFER, FT/DAY, referenced in Section 2.4.1.1, page 15, does not provide the well names, locations and hydraulic conductivities as indicated on the legend.

Basis of the Request

The Legend for Figure 17 indicates that the figure includes locations of irrigation supply well, collection for reinjection wells, upgradient collection well, Reverse Osmosis (RO) collection well, fresh water injection well, RO product injection well, reinjection well, and points of compliance wells. This information is missing.

Formulation of RAI

Section 2.4.1.1, Figure 17, page 15: HMC should provide the well names, locations and hydraulic conductivities for Figure 17.

RAI 10 Description of the Deficiency

Section 2.4.1.2, paragraph 1, page 16, provides estimated groundwater flow rates for the Alluvial aquifer. However, there is no data provided in the text to substantiate these estimates.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the models supporting groundwater reclamation activities.

Formulation of RAI

Section 2.4.1.2, paragraph 1, page 16: HMC needs to provide additional data to support its estimates of the groundwater flow rates in the Alluvial aquifer. For example: hydraulic conductivity, hydraulic gradient, and effective porosity.

RAI 11 Description of the Deficiency

Section 2.4.2, paragraph 2, page 16, states: "The elevation of the top of the Upper Chinle aquifer and the base of the Alluvial aquifer define where these two aquifers are in direct communication." This statement is incorrect.

Basis of the Request

Statement is technically incorrect.

Formulation of RAI

Section 2.4.2, paragraph 2, page 16: HMC needs to modify the first sentence in this paragraph. It should read as follows: "The elevation of the top of the Upper Chinle aquifer and the base of the Alluvial aquifer **where equal** define where these two aquifers are in direct communication."

RAI 12 Description of the Deficiency

Section 2.4.2, paragraphs 5 and 6, pages 16 and 17, discusses the transmissivity values in the Upper Chinle aquifer.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the models supporting groundwater reclamation activities.

Formulation of RAI

Section 2.4.2, paragraphs 5 and 6, pages 16 and 17: HMC should provide figures of the transmissibility and hydraulic conductivity for the Alluvial aquifer, and transmissivity for the confined aquifers.

RAI 13 Description of the Deficiency

Section 2.4.3, paragraph 1, page 17, states: "Because the subcrop for the Middle Chinle is further from the source than the subcrop for the Upper Chinle aquifer, the Middle Chinle aquifer is less affected than the Alluvial aquifer or the Upper Chinle aquifer." Although this statement is technically true, it can be misleading.

Basis of the Request

The Middle Chinle subcrop has uranium levels well above the site standards as well as a northwesterly groundwater flow. Over time, the Middle Chinle aquifer will show increased contaminant concentrations that will migrate back toward the site.

Formulation of RAI

Section 2.4.3, paragraph 1, page 17: The future impacts to the Middle Chinle aquifer need to be addressed in this section.

RAI 14 Description of the Deficiency

Section 2.4.3; last paragraph, page 18 and other locations: HMC has used the outdated hydraulic term permeability for hydraulic conductivity.

Basis of the Request

The use of permeability for the hydraulic conductivity of a water-bearing unit is potentially confusing because today permeability is commonly used to discuss other properties of soils and rocks.

Formulation of RAI

Section 2.4.3; last paragraph, page 18 and other locations: HMC should replace the term permeability with hydraulic conductivity.

RAI 15 Description of the Deficiency

Section 2.4.4, paragraph 1, page 18, states: "Also, the natural water quality of the major constituents in the shaley Lower Chinle aquifer is poor so there is generally less use of this aquifer as a water source". There is no data provided in the CAP to support the claim that water quality in the shaley Lower Chinle aquifer is poor.

Basis of the Request

Section 4.4.3(1)(e) of NUREG-1620 states that data on geochemical conditions and water quality should be included in the CAP. This information is needed so the staff can verify that the groundwater cleanup standards are justifiable and reclamation activities are achieving the desired results.

Formulation of RAI

Section 2.4.4, paragraph 1, page 18: HMC needs to support the statement “natural water quality of the major constituents in the shaley Lower Chinle aquifer is poor”.

RAI 16 Description of the Deficiency

Section 2.4.5, paragraph 1, page 19, states: “Groundwater in the Upper Chinle between the two faults is flowing to the south.” This statement appears to be inconsistent with Figure 25.

Basis of the Request

The second sentence in this paragraph: “Groundwater in the Upper Chinle between the two faults is flowing to the south.” appears to be inconsistent with Figure 25 which shows that groundwater north of the Broadview Acres in the Upper Chinle is flowing northward.

Formulation of RAI

Section 2.4.5, paragraph 1, page 19: Please clarify the text or revise Figure 25.

RAI 17 Description of the Deficiency

Section 2.4.5, pages 19 and 20: Figures 25 and 26 delineate the groundwater flow directions for the Alluvial, Upper Chinle, and Middle Chinle aquifers. The usefulness of the Figures would be greatly enhanced if the groundwater levels for the Upper and Middle Chinle aquifers were also provided.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the models supporting groundwater reclamation activities.

Formulation of RAI

Section 2.4.5, pages 19 and 20: Figures 25 and 26 delineates the groundwater flow directions for the Alluvial, Upper Chinle, and Middle Chinle aquifers. Please revise the figures to include groundwater levels for the Upper and Middle Chinle aquifers.

RAI 18 Description of the Deficiency

Section 2.4.5, paragraph 2, page 20, states: "...the flow in the Middle Chinle aquifer is to the northeast between the two faults as well as east of the East Fault ..." appears to be inconsistent with Figure 26.

Basis of the Request

According to Figure 26, the groundwater flow in the Middle Chinle aquifer east of the East Fault is primarily toward the southeast.

Formulation of RAI

Section 2.4.5, paragraph 2, page 20 should be revised to make the text and Figure 26 consistent. The text should be revised to indicate that the groundwater flow in the Middle Chinle aquifer east of the East Fault is primarily toward the southeast, or Figure 26 should be revised. Also, well CW13 should be added to Figures 25 and 26.

RAI 19 Description of the Deficiency

Section 2.4.5, paragraph 2, page 20, states: "The gradient in the Middle Chinle aquifer is highly variable in this area due to variations in transmissivity." The CAP does not include data to support this statement.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the models supporting groundwater reclamation activities.

Formulation of RAI

Section 2.4.5, paragraph 2, page 20, should reference a new figure showing the transmissivity (T) of Middle Chinle aquifer. Please refer to Comment 12.

RAI 20 Description of the Deficiency

Section 2.5, paragraph 2, pages 20 and 21, states: "... that baseline water quality in the Alluvial aquifer may change in the future. Discharge of groundwater from past mine dewatering in Ambrosia lake area (north and upgradient of the site) to San Mateo Alluvial aquifer had elevated levels of the same constituents as are elevated in the Grants tailings impoundments. Travel time calculations and preliminary information from far upgradient wells indicates selenium, uranium and other constituents from mine discharges to the Alluvial aquifer could reach the Grants site in the next 20 years." The CAP does not include data to support this conclusion.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the models supporting groundwater reclamation activities.

Formulation of RAI

Section 2.5, paragraph 2, pages 20 and 21: HMC should provide data to support its conclusion "... that baseline water quality in the Alluvial aquifer may change in the future. Discharge of groundwater from past mine dewatering in Ambrosia lake area (north and upgradient of the site) to San Mateo Alluvial aquifer had elevated levels of the same constituents as are elevated in the Grants tailings impoundments. Travel time calculations and preliminary information from far upgradient wells indicates selenium, uranium and other constituents from mine discharges to the Alluvial aquifer could reach the Grants site in the next 20 years." HMC should include a comparison of current discharges from the tailing piles into the Alluvial aquifer and the up-gradient groundwater quality of the Alluvial aquifer.

Further, HMC should discuss how former up-gradient mine discharges to the Alluvial aquifer will impact efforts to remediate the effects of the tailing piles on the down-gradient groundwater in the Alluvial aquifer.

RAI 21 Description of the Deficiency

Section 2.7, page 21, references outdated groundwater monitoring reports.

Basis of the Request

The CAP should reference the most recent reports available.

Formulation of RAI

Section 2.7, page 21: Section requires updating to reference more recent reports.

RAI 22 Description of the Deficiency

Section 2.8, paragraph 1, page 21, states: "At a later date, the Milan water supply was extended out to the Valle Verde subdivision and residents immediately east of Valle Verde. Current information indicates that eleven residents in the area may still use well water for their drinking water supply." The CAP should state when the Milan water supply was extended to the Valle Verde subdivision. Further, the number of residents that still use well water for their drinking water appears to be outdated.

Basis of the Request

The CAP should present the most recent information available.

Formulation of RAI

Section 2.8, paragraph 1, page 21: Provide the date that the Milan water supply extended to the Valle Verde subdivision. Provide the current status of the residents in this subdivision that still use well water for their drinking water.

RAI 23 Description of the Deficiency

Sections 3.1 and 3.2, page 22, provide a brief general discussion about the tailings extraction and injection wells. However, there is no discussion about the objectives of the tailings injection/extraction program or how the final injection/extraction dates were determined.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the models supporting groundwater reclamation activities.

Formulation of RAI

Sections 3.1 and 3.2, page 22, should be revised to include a discussion of the objectives of the tailings injection/extraction program. The discussion should include an explanation of how the final injection/extraction dates were determined. Provide a table with past injection/extraction rates compared to model predicted rates. Describe why past rates have been sufficient or insufficient to meet remediation goals and timelines. Explain how the seepage into the Alluvial aquifer is being contained and remediated since more water is being injected than extracted.

RAI 24 Description of the Deficiency

Section 3.3, page 22, provides a brief description of the tailing toe drain and the French drain. However, the discussion is not detailed enough for the staff to evaluate the effectiveness of the reclamation activities.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the models supporting groundwater reclamation activities.

Formulation of RAI

Section 3.3, page 22: HMC needs a more thorough discussion of the tailing toe drain and the French drain. How do they differ? Are they interconnected?

RAI 25 Description of the Deficiency

Section 3.4, paragraph 1, page 23, discusses the Alluvial aquifer extraction wells. However, the discussion does not provide the quality of the water (approximately 455 gpm) that was routed to the irrigation system.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the models supporting groundwater reclamation activities.

Formulation of RAI

Section 3.4, paragraph 1, page 23, should include a discussion of the groundwater quality of the water (approximately 455 gpm) that was routed to the irrigation system.

RAI 26 Description of the Deficiency

Section 3.4, paragraph 1, page 23, discusses the Alluvial aquifer extraction wells. However, the discussion does not describe the effectiveness of extraction well P2 that pumps approximately 40 gpm of “clean groundwater” up-gradient from the Large Tailings Pile.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.4, paragraph 1, page 23: Additional clarification is required on the effectiveness of extraction well P2 that pumps approximately 40 gpm of “clean groundwater” up-gradient from the Large Tailings Pile.

RAI 27 Description of the Deficiency

Section 3.4, paragraph 1, page 23, discusses the Alluvial aquifer extraction wells. However, the discussion does not provide sufficient detail for the staff to determine if this water is directly injected into the Alluvial aquifer without being treated and if so how often are the extraction wells sampled.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.4, paragraph 1, page 23, should provide sufficient detail for the staff to determine if this water is directly injected into the Alluvial aquifer without being treated and if so how often are the extraction wells sampled.

RAI 28 Description of the Deficiency

Section 3.4, paragraph 1, page 23, states that the irrigation waters have concentrations of uranium less than 0.44 mg/L and of selenium less than 0.12 mg/L. HMC should discuss what impact the contaminated irrigation water has on the soils and subsoils in the root and vadose zones in the irrigated areas.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.4, paragraph 2, page 23: HMC states that the irrigation waters have concentrations of uranium less than 0.44 mg/L and of selenium less than 0.12 mg/L. HMC should discuss the impact of this groundwater on the soils and subsoils in the root and vadose zones in the irrigated areas.

RAI 29 Description of the Deficiency

Section 3.6, page 24 discusses the Upper Chinle extraction wells. However, the description does not provide enough detail for the staff to determine exactly where the 5 gpm is being injected and what is the concentration level of this water.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.6, paragraph 1, page 24 should describe exactly where the 5 gpm is being injected and what the contaminate concentration level of this water is.

RAI 30 Description of the Deficiency

Sections 3.5, 3.7 and 3.9, pages 23-24 discuss the injection wells in the Alluvial, Upper Chinle and Middle Chinle aquifers. These sections describe the effectiveness of the hydraulic barriers created by the injection wells and explain why their locations were chosen. However, these

sections do not include the minimum injection rate needed in each well to create an effective hydraulic barrier and how these rates are achieved, as well as how these rates were determined to be effective.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Sections 3.5, 3.7 and 3.9, pages 23-24, should provide the minimum injection rate needed in each well to create an effective hydraulic barrier and how these rates are achieved, as well as how these rates were determined to be effective.

RAI 31 Description of the Deficiency

Section 3.7, page 24, discusses the Upper Chinle Injection wells. However, the discussion does not describe which San Andres wells are being pumped to supply the injection water for the Upper Chinle aquifer.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.7, paragraph 1, page 24: Please describe which San Andres wells are being pumped to supply the injection water for the Upper Chinle aquifer.

RAI 32 Description of the Deficiency

Section 3.9, page 24, discusses the Middle Chinle Injection wells. However, the discussion does not describe which San Andres wells are being pumped to supply the injection water for the Middle Chinle aquifer.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.9, paragraph 1, page 24: Please describe which San Andres wells are being pumped to supply the injection water for the Middle Chinle aquifer.

RAI 33 Description of the Deficiency

Section 3.12, page 25, provides a brief description of the RO system. However, the description does not include sufficient detail for the staff to evaluate the effectiveness of the RO system.

Basis of the Request

Section 4.4.3(3) of NUREG-1620 states that information on important design features should be included in the CAP. This information is needed so the staff can verify the effectiveness of models supporting groundwater cleanup, including the estimate of clean-up time, and technical bases.

Formulation of RAI

Section 3.12, paragraph 1, page 25: A discussion on past and future treatment rates for the RO plant and constituent levels for pre- and post-treated water needs to be included in this section. Provide a discussion on the RO systems optimum treatment rate for successful remediation. A comparison of actual rates to projected rates should be provided and discussed to determine if HMC is staying on track with the remediation timeline. Please explain why the RO treatment plant is running at 43% efficiency and include options to increase the capacity.

RAI 34 Description of the Deficiency

Section 3.12, page 25, states: "In 2005, the RO plant received approximately 256 gpm from the tailings and Alluvial aquifer." However, HMC does not indicate what quantity was received from tailings pile and the Alluvial aquifer separately.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.12, paragraph 2, page 25: HMC should define the water rates from tailings pile and the Alluvial aquifer separately.

RAI 35 Description of the Deficiency

Section 3.13, page 25, provides a discussion of the evaporation ponds. However, this discussion does not include a discussion of Evaporation Pond 3 which was approved by NRC on August 7, 2008.

Basis of the Request

Section 4.4.3(3) of NUREG-1620 states that information on important design features should be included in the CAP.

Formulation of RAI

Section 3.13, page 25: Please update Section 3.13 to include current schedule for the third evaporation pond.

RAI 36 Description of the Deficiency

Section 3.14, page 25, states that clean groundwater is pumped from extraction wells screened in the San Andres formation (Figure 34) and in the un-impacted areas of the Alluvial aquifer and injected into the Alluvial, upper, and middle aquifers. However, the discussion does not identify where the extraction wells are located in the Alluvial aquifer, and what the contaminant concentrations are to justify the un-impacted area designation.

Basis of the Request

Section 4.4.3(1)(f) of NUREG-1620 states that information on pumping, injection and sampling wells should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.14, page 25: Please identify where the extraction wells are located in the Alluvial aquifer, and what the contaminant concentrations are to justify the un-impacted area designation.

RAI 37 Description of the Deficiency

Section 3.15, page 25, provides a description of the irrigation system. However, this section does not include a discussion about soil contamination resulting from surface irrigation, or how residual soil contamination will be addressed prior to license termination.

Basis of the Request

Section 4.4.3(1)(e) of NUREG-1620 states that information on geochemical conditions and water quality should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.15, page 25: HMC should include a discussion about soil contamination resulting from irrigation. Please describe the range in constituents of the groundwater used in the irrigation system, and how HMC will address residual soil contamination prior to license termination.

RAI 38 Description of the Deficiency

Section 3.16, paragraph 1, page 26 states: "Figures 36 through 46 show the change in the extent of contamination for uranium, selenium, and molybdenum for each of the four aquifers." Some site contaminant standards were changed within the timeframes illustrated on the figures referenced in this section. However, the text and figures do not indicate what standards were used in the development of Figures 36 - 46.

Basis of the Request

Section 4.4.3(1)(e) of NUREG-1620 states that information on geochemical conditions and water quality should be included in the CAP. This information is needed so the staff can verify the effectiveness of groundwater reclamation activities.

Formulation of RAI

Section 3.16, paragraph 1, page 26: Please indicate in both the text and on the figures what standards were used in the development of Figures 36 - 46.

RAI 39 Description of the Deficiency

Sections 3.17 and 3.18, page 26: Section 3.17 states: "The numerical model predicts that the groundwater restoration program will need to extend through 2015 to meet current site standards at the points of exposure." Section 3.18 states; "Based on the performance of the CAP and the groundwater modeling summarized in Section 3.17, it is anticipated that the CAP will be necessary in some form through 2017." The numerical model predicts that the groundwater restoration program will need to extend through 2015; however the performance of the CAP and groundwater modeling indicate that the CAP will be necessary in some form through 2017. Why do these dates not match?

Basis of the Request

Section 4.4.3(4) of NUREG-1620 states that the licensee should provide sufficient evidence that relevant site features have been considered, that the models are consistent with available data and current scientific understanding, and that the effects on cleanup time have been evaluated.

Formulation of RAI

Sections 3.17 and 3.18, page 26: The numerical model predicts that the groundwater restoration program will need to extend through 2015; however the performance of the CAP and groundwater modeling indicate that the CAP will be necessary in some form through 2017. Please provide technical justification for why these dates do not match.

RAI 40 Description of the Deficiency

Section 3.18, paragraph 1, page 27, states: “HMC understands that it is necessary to commit to minimum requirement to allow for license compliance. It has been observed that minimum

extraction rate of 200 gpm, minimum injection rate of 300 gpm and minimum irrigation rate of 400 ac-ft/yr lead to improving water quality.”

Basis of the Request

No technical justification is provided in the discussion to support HMC statements.

Formulation of RAI

Section 3.18, paragraph 1, page 27: HMC needs to explain its statements: “HMC understands that it is necessary to commit to minimum requirement to allow for license compliance. It has been observed that minimum extraction rate of 200 gpm, minimum injection rate of 300 gpm and minimum irrigation rate of 400 ac-ft/yr lead to improving water quality.”

RAI 41 Description of the Deficiency

Section 4.3, Table 4-1, page 29, provides a monitoring frequency for Point-of-Compliance and Compliance Monitoring wells. However, the table does not provide justification for the proposed monitoring frequency or for the selection of wells to be monitored.

Basis of the Request

Section 4.4.3(8) of NUREG-1620 states that the licensee should provide a description of the monitoring program which includes the number of monitor wells and their locations, and a list of constituents that are sampled and the monitoring frequency of each monitored constituent. This information is required to determine if the monitoring interval is appropriate for monitoring corrective action progress.

Formulation of RAI

Section 4.3, page 29: HMC should provide justifications for the monitoring frequency and the parameters to monitor for each well in the proposed Compliance Monitoring Program. In addition, HMC should discuss why it chose each well to monitor and why these wells are adequate to delineate progress with the CAP and/or to identify modifications to the CAP as needed.

RAI 42 Description of the Deficiency

Section 4.3, Table 4-1, page 29: The “Parameters to be Monitored” for the Chinle compliance monitoring wells are inconsistent with License Condition No. 35.B.

Basis of the Request

The CAP must be consistent with the license.

Formulation of RAI

Section 4.3, Table 4-1: Revise the table to ensure that the Chinle Wells “Parameters to be Monitored” column is consistent with License Condition No. 35.B.

RAI 43 Description of the Deficiency

Section 5.0, page 30: This Section references out of date reports.

Basis of the Request

CAP should reference most recent reports.

Formulation of RAI

Section 5.0, page 30: Section requires updating to reference most recent reports.

RAI 44 Description of the Deficiency

Section 6.0, page 31, states: “The CAP will continue to change as site conditions change and water quality improves the aquifers. Modifications will be made to optimize the removal of constituents and to bring water quality in each of the aquifers to the approved water quality standards.” This section does not include a discussion to indicate that significant changes to the CAP must be approved by NRC prior to implementation.

Basis of the Request

The CAP is an NRC-approved document which will become referenced in a license condition. HMC is not permitted to make significant changes to the CAP without prior NRC approval.

Formulation of RAI

Section 6.0, page 31: HMC should revise this section to indicate that significant changes to the CAP must be approved by NRC prior to implementation. This discussion should identify what type of changes can be made without NRC approval, and what type of changes must be requested through a license amendment.

RAI 45 Description of the Deficiency

Appendix C provides a discussion on groundwater modeling calibration (both flow and transport). This discussion includes a comparison of measured versus simulated groundwater levels in 2004, and observed versus simulated U concentrations in 2004. Lacking is a more quantitative comparison of the measured versus simulated groundwater levels and U concentrations.

With regard to transport modeling, only U concentrations are compared in the discussion. Simulated U concentrations were provided for only areas with a U concentration greater or equal to 0.15 mg/L. Simulated U values greater than 0.15 mg/L were not compared to observed

U concentrations greater than 0.15 mg/L. The discussion does not include comparisons of observed versus simulated concentrations of the other chemicals of concern at the site.

Basis of the Request

Section 4.4.3(4) of NUREG-1620 states that the licensee should provide sufficient evidence that relevant site features have been considered, that the models are consistent with available data and current scientific understanding, and that the effects on cleanup time have been evaluated. Licensees should adequately consider alternate modeling approaches where necessary to incorporate uncertainties in site parameters and ensure that they are propagated through the modeling.

Formulation of RAI

Appendix C: HMC should provide the following items for the groundwater calibration: (1) a comparison of measured versus simulated groundwater levels or U concentrations and other chemicals of concern concentrations at wells or model nodes; (2) statistical analysis like the root-mean square approach; (3) information on the acceptable calibration criteria; and (4) more details on the calibration approach (trial and error changes, apparently a manual approach was used instead of a numerical approach).

With regard to transport modeling, only U concentrations are compared in the discussion. HMC should provide comparisons of observed versus simulated concentrations of the other chemicals of concern at the site.

RAI 46 Description of the Deficiency

Appendix C provides a description of the tailings flushing program. However, the discussion does not provide sufficient detail for the staff to evaluate if the tailing flushing program has been adequately incorporated into the models supporting groundwater cleanup.

Basis of the Request

Section 4.4.3(3) of NUREG-1620 states that information on important design features should be included in the CAP. The tailing flushing program should be described in sufficient detail for the staff to evaluate if the program has been adequately incorporated into the models supporting groundwater cleanup.

Formulation of RAI

Appendix C: Describe the tailings flushing program in greater detail.