



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 29, 2019

EA-16-114

David Pierce
Closure Manager
Grants Reclamation Project
Homestake Mining Company of CA
P.O. Box 98/Highway 605
Grants, NM 87020

SUBJECT: HOMESTAKE MINING COMPANY OF CALIFORNIA, U. S. NUCLEAR
REGULATORY COMMISSION AUDIT OF THE "COLLECTION FOR RE-
INJECTION MASS BALANCE/REMOVAL ANALYSIS" SUBMITTED PURSUANT
TO CONDITION 8 OF THE CONFIRMATORY ORDER EA-16-114, DOCKET
04008903, LICENSE SUA-1471

Dear Mr. Pierce:

By letter dated March 28, 2017,¹ the U.S. Nuclear Regulatory Commission (NRC) issued Confirmatory Order No. EA-16-114 (CO) to the Homestake Mining Company of California (HMC, the licensee) regarding violations that took place at the Grants Reclamation Project (Grants) site. The CO was issued as a result of Alternative Dispute Resolution mediation between HMC and the NRC.

Section V of the CO includes 16 Conditions which require licensee implementation. Condition 8 of the CO requires that the licensee, "... use the mass balance methodology described in its revised 2012 groundwater CAP [Corrective Action Plan] submittal, incorporating the issues raised in the Requests for Additional Information provided by NRC (ADAMS [Agencywide Document Access and Management System] Package No. ML13360A224), and adapting the methodology for the purpose of completing an analysis of the re-injection system's impact to the time estimate for completion of the groundwater CAP." Condition 8 additionally requires HMC to complete the analysis within 120 days of issuance of the CO, to discuss the methodology, data, and analysis with the NRC no less than 30 days prior to its finalization, and to provide all the discussion material to the NRC at least 10 days prior to the discussion.

To comply with the Condition 8 of the CO, the licensee discussed their analysis with the NRC staff on June 26-27, 2017.² Subsequently, HMC submitted their analysis in a report entitled "Collection for the Re-Injection Mass Balance/Removal Analysis" along with a cover letter dated July 26, 2017.³

¹ ADAMS Package Accession No. ML17060A752.

² ADAMS Accession No. ML17352B067.

³ ADAMS Package Accession No. ML17212A010.

Condition 8 of the CO, requires that NRC will perform an audit of the analysis, and provide in writing NRC audit results, including any recommended changes, and that HMC will incorporate NRC audit results in the actions described in Condition 5 of the CO.

The NRC completed its audit of HMC's July 26, 2017, report. The results of the NRC staff's audit are provided as an enclosure to this letter. The audit resulted in several NRC recommendations, which are listed in Section 3 of the enclosure to this letter.

This audit satisfies the NRC staff's portion of Condition 8 of the CO. HMC completion of the Order requirements will be confirmed through future submittals from HMC and onsite inspections.

The NRC staff requested comments on the NRC's audit from the Environmental Protection Agency, the New Mexico Environment Department, the New Mexico Office of the State Engineer and the U.S. Department of Energy. No substantive comments were received.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

If you have any questions regarding this matter, please contact me at 301-415-7777, or via email at ron.linton@nrc.gov.

Sincerely,

//RA//

Ron C. Linton, Project Manager
Uranium Recovery and Materials
Decommissioning Branch
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: 040-08903

License No.: SUA-1471

Enclosure:
NRC Staff Audit of the HMC
Re-Injection/Mass Balance Analysis

SUBJECT: HOMESTAKE MINING COMPANY OF CALIFORNIA, U. S. NUCLEAR
REGULATORY COMMISSION AUDIT OF THE "COLLECTION FOR RE-
JECTION MASS BALANCE/REMOVAL ANALYSIS" SUBMITTED PURSUANT
TO CONDITION 8 OF THE CONFIRMATORY ORDER EA-16-114, DOCKET
04008903, LICENSE SUA-1471. **DATE: October 29, 2019**

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ADAMS Accession No.: ML19221B533

***via e-mail**

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DATE	10/28/19	10/28/19	10/29/19

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RESULTS OF NRC STAFF AUDIT OF THE RE-INJECTION / MASS BALANCE ANALYSIS HOMESTAKE MINING COMPANY OF CALIFORNIA, GRANTS RECLAMATION PROJECT

**DOCKET NO: 040-08903
LICENSE NO: SUA-1471
ORDER NO: EA-16-114**

1.0 INTRODUCTION

By letter dated March 28, 2017,¹ the U.S. Nuclear Regulatory Commission (NRC) issued Confirmatory Order No. EA-16-114 (CO) to the Homestake Mining Company of California (HMC, the licensee) regarding violations that took place at the Grants Reclamation Project (Grants) site. The CO was issued following Alternative Dispute Resolution mediation between HMC and the NRC, which was the result of the issuance of five apparent violations documented in a letter dated October 4, 2016.²

Section V of the CO includes 16 Conditions which require licensee implementation. Condition 8 of the CO requires that the licensee use the mass balance methodology described in its revised 2012 groundwater corrective action plan (GCAP) submittal, incorporating the issues raised in the Requests for Additional Information (RAI) provided by NRC,³ and adapting the methodology for the purpose of completing an analysis of the re-injection system's impact to the time estimate for completion of the GCAP. Condition 8 additionally requires HMC to complete the analysis within 120 days of issuance of the CO, to discuss the methodology, data, and analysis with the NRC no less than 30 days prior to its finalization, and to provide all the discussion material to the NRC at least 10 days prior to the discussion. To comply with the Condition 8 of the CO, the licensee discussed their analysis with the NRC staff on June 26-27, 2017.⁴

By letter dated July 26, 2017, HMC submitted a report entitled "Collection for the Re-Injection Mass Balance/Removal Analysis."⁵ HMC submitted this report to comply with Condition 8 of the CO. The following provides NRC's audit results of HMC analysis as specified by Condition 8.

2.0 NRC AUDIT RESULTS

2.1 Use of the Mass Balance Methodology Described in the 2012 GCAP

As required by Condition 8 of the CO, HMC discussed the mass balance methodologies with the NRC staff on June 26 and 27, 2017. This discussion included the methodologies for the L area and the hydraulic control area (control area) at HMC's Grants Reclamation Project. The methodology discussed for the L area mass balance/removal analysis is essentially a spatial moments analysis using a record of water quality data for select wells to define the polygons, which account for the mass balance over a defined interval. The NRC staff found that the July 27, 2017, HMC report used this methodology in the analysis of the L area collection and associated re-injection. The NRC staff found that the description of this methodology in the HMC report to be similar to the method of spatial moments described in the revised 2012 GCAP.

¹ Agencywide Document Access and Management System (ADAMS) Package Accession No. ML17060A752.

² ADAMS Accession No. ML16251A526.

³ ADAMS Package Accession No. ML13360A224.

⁴ ADAMS Accession No. ML17352B067.

⁵ ADAMS Package Accession No. ML17212A010.

The HMC methodology for the control area is a modeling approach to determine changes in the mass of uranium over time within the reinjection. This modeling approach uses commercial surface and volume analysis software (QUICKSURF), which can utilize mapping data to determine areas, volumes, masses and other quantities. QUICKSURF analysis is not restricted to those wells selected to define the polygons and utilizes available concentration data from more wells. During the June 26 and 27, 2017, discussion, the NRC staff agreed that this modeling approach should provide the necessary detail to determine if any impacts occurred. The NRC staff found that the July 27, 2017, HMC report used this methodology in the analysis of the control area. The NRC staff found that the description of this methodology in the HMC report, which provided a more refined mass balance, to be similar to the spatial moments approach described in the revised 2012 GCAP.

2.2 Incorporation of Issues Raised in NRC's RAIs into the Mass Balance Methodology

By letter dated April 30, 2015,⁶ the NRC issued 23 RAI's as well as the NRC staff's review of the adequacy of HMC's responses to 46 previous RAIs issued on February 4, 2010.⁷ The February 4, 2010, RAI's were issued as a result of the NRC staff's review of the 2006 HMC GCAP Revision submission.⁸ As required by condition 8 of the CO, the NRC staff audited the HMC mass balance methodology in the July 27, 2017, HMC report to verify that it included issues raised in these RAIs issued on April 30, 2015, and February 4, 2010. The issues raised in the previous NRC RAI's were adequately addressed with exception of the following:

Open Issue in RAI 2 Submitted in 2010

RAI Description

The reinjection program was not described, the water quality at each of the "collection for reinjection wells" and of the reinjection area was not discussed, and the effectiveness and benefits of the reinjection of impacted water is still unclear.

Audit Result

The NRC staff found HMC's description of the re-injection program in the July 27, 2017, report to be adequate. The NRC staff found the annual water quality data for wells for the period from 1996 through 2016 (refer to Tables 4-1 and 4-2) used in HMC's mass balance analysis, and the associated discussion generally characterized the effects of the collection and reinjection of groundwater. However, the NRC staff notes that further clarity is needed concerning the effects of the clean water injection on contaminant concentrations measured for the control area and how HMC's mass balance analysis incorporates these potential dilution effects into the mass balance analysis. Additionally, the NRC staff also notes the contribution of contaminants from both the contents of the Large Tailings Pile (LTP) and the underlying partially saturated zone of alluvium to the control area is significantly qualitative. The NRC staff is unclear how this qualitative uncertainty is considered in the analysis of the mass balance in the control area.

⁶ ADAMS Package Accession No ML13360A224.

⁷ ADAMS Accession No ML100320466.

⁸ ADAMS Package Accession No ML070240350.

RAI 3 Submitted in 2015

RAI Description

The analysis should include actual saturated conditions within each of the polygons and possible division of some polygons where concentrations show significant spatial variation between nearby wells. The analysis should also take into account the additional mass being added to the system through seepage from the LTP.

Audit Result

The NRC staff found HMC's analysis adequately considered saturated conditions within the polygons and a grid system in the area of the operating wells. The NRC staff also found that HMC's analysis did take into account seepage from LTP but, as noted above in the audit result for 2010 RAI 2 (above), more clarity is needed.

RAI 5, RAI 10, RAI 12, and RAI 23 Submitted in 2015

RAI Description

The NRC staff requested that the reformulated mixing model (RMM) be rerun for the years following the calibration period. The NRC staff also requested the electronic files with all the input and output files for each of the models and any spreadsheet calculations.

Audit Result

The NRC staff found that the RMM model had been rerun with data from 2000 to 2015 and a hard copy of the RMM model input and output was provided in the attachment to HMC's July 26, 2017, report. However, the NRC staff was not provided the electronic version of the model with electronic input and output files. These electronic files are needed for the NRC staff's independent review and verification of the satisfactory use of the model and modeled estimates. This independent review is necessary and is further supported by HMC statements, such as, "RMM is an empirical model, but numerous inputs can be adjusted to develop a good representation of available measured LTP uranium concentrations and further refine model predictions."

2.3 Adapting the Methodology for the Purpose of Completing an Analysis of the Re-Injection System's Impact to the Time Estimate for Completion of the GCAP

The NRC staff found that the July 26, 2017, HMC report used the mass balance methodologies discussed in Section 2.1 of this audit report to analyze the re-injection system's impact to the time estimate for completion of the GCAP during the period from 1995 to 2015.

Regarding the L area collection and re-injection into the control area during the period from 1996 to 2015, HMC's analysis included an evaluation of impacts from two alternatives. The first alternative was no collection of impacted groundwater from the L area. The second alternative was the treatment or evaporation of impacted groundwater from the L area without re-injection. While the NRC staff agrees that the lack of collection would have resulted in an expansion of the L area plume, the "no collection" alternative is not a viable option and therefore, collection from the L area should be considered. The NRC staff found that HMC's analysis of the re-injected contaminant mass demonstrated that the volume of slightly contaminated groundwater collected from the L area and transferred to the control area, given the treatment capacity, would not require substantial additional time for groundwater treatment. Thus, the NRC staff found the impact of re-injection of groundwater collected from L area on the time estimate for the completion of groundwater remediation not to be substantial.

Regarding the control area, the NRC staff found the mass balance analysis of the re-injection system's impact on the time estimate for completion of the groundwater restoration was inconclusive and requires further clarification. The NRC staff notes that further clarity is needed concerning the effects of the clean water injection on contaminant concentrations measured for the control area and how HMC's mass balance analysis incorporates these potential dilution effects into the mass balance analysis. Additionally, the NRC staff also notes the contribution of contaminants from both the contents of the LTP and the underlying partially saturated zone of alluvium to the control area is significantly qualitative. The NRC staff is unclear how this qualitative uncertainty is considered in the analysis of the mass balance in the control area. Additionally, in order for the NRC staff to complete its independent review and verification of the satisfactory use of the model and modeled estimates, the NRC staff will need the electronic version of the model with electronic input and output files.

2.4 Condition 8 Schedule Requirements

Condition 8 requires HMC to complete the analysis within 120 days of issuance of the CO, to discuss the methodology, data, and analysis with the NRC no less than 30 days prior to its finalization, and to provide all the discussion material to the NRC at least 10 days prior to the discussion. The licensee presented and discussed their analysis with the NRC on June 26-27, 2017.⁹ Presentation slides of the methodology, data and analysis were provided to the NRC at the time of the discussion. HMC subsequently submitted their analysis by letter dated July 26, 2017.¹⁰

3.0 RECOMMENDATIONS

Recommendation 1

Further clarity is needed concerning the effects of the clean water injection on contaminant concentrations measured for the control area and how HMC's mass balance analysis incorporates these potential dilution effects into the mass balance analysis.

Recommendation 2

The contribution of contaminants from both the contents of the LTP and the underlying partially saturated zone of alluvium to the control area is highly qualitative. Further clarity is needed on how this qualitative uncertainty is considered in the analysis of the mass balance in the control area.

Recommendation 3

The RMM model had been rerun with data from 2000 to 2015 and a hard copy of the RMM model input and output was provided in the attachment to HMC's July 26, 2017, report. However, the NRC staff was not provided the electronic version of the model with electronic input and output files. These electronic files are needed for the NRC staff's independent review and verification of the satisfactory use of the model and modeled estimates.

⁹ ADAMS Accession No. ML17352B067.

¹⁰ ADAMS Package Accession No. ML17212A010.

NRC requests that HMC address these recommendations either: (1) in its GCAP, or (2) in the actions described in Condition 5 of the CO.