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March 22, 2021

Sandra L. Ross, Site Manager
Rio Algom Mining LLC
P.O. Box 218
Grants, NM 87020

RE: Hydrogeological Supplemental Site Assessment,
May 29, 2020 Background Groundwater Quality Report:
Rio Algom Mining LLC, Lisbon Facility, San Juan County, Utah
Radioactive Material License Number 1900481 (License)

Dear Ms. Ross:

The Division of Waste Management and Radiation Control (DWMRC) has completed a preliminary review of the Rio Algom Mining, LLC ("RAML") May 29, 2020 Background Groundwater Quality Report for the Lisbon Facility (Background Report).

The Background Report was submitted based on an April 17, 2019 DWMRC Request for Additional Information Letter (RAI) which included findings of the DWMRC review of the RAML August 30, 2018 Hydrogeological Supplemental Site Assessment Report (HSSA). Per the RAI it was agreed that monitoring wells in areas of the northern plume, areas of the southern plume, and along the Lisbon Valley Fault (LVF) zone showed distinctive constituent concentrations. In particular, that monitoring wells along the LVF are distinctive due to their interaction with the mineralized zones and common geochemical processes. It was additionally recognized that background concentrations show spatial variation due to the depositional heterogeneity of the Burro Canyon Formation which warrants the evaluation of background concentrations on an intrawell basis at the Lisbon Facility.

The DWMRC also agreed with RAML that additional evaluation of groundwater flow and constituent concentrations at the north-northwestern boundary of the long-term surveillance monitoring boundary was needed. Per recent communication between RAML and the DWMRC it appears that the southern plume arm has migrated to this boundary. Based on these findings additional findings and data are needed to define an appropriate LTSM in this area, groundwater monitoring well network expansion and groundwater data to provide a statistically sound data population at existing and new monitoring wells.

(Over)

DRC-2021-003542

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In light of these study findings, it was discussed that the duly executed stipulation and consent agreement (SCA) which was formalized on July 30, 2019 and approved a RAML June 21, 2019 work plan for the Lisbon facility requires the submission of deliverables as specified in the RAI on or before October 29, 2021. Specifically, the SCA requires the submission of, 1) a revised Site Water Balance report, 2) a Background Evaluation Report, and 3) an addendum to the HSSA Final Report.

It was discussed between DWMRC and RAML that the original intention of the SCA was that all three of these documents were envisioned to be submitted together on or before the due date. RAML provided the Background Report sooner than expected. It was discussed that the DWMRC would provide a preliminary review of the Background Report to determine if the findings and approach used appears to be appropriate, or if the DWMRC has comments or discussion items that could be used for the future update and formal ACL proposals. This letter is written to address the DWMRC preliminary review findings per discussions between DWMRC and RAML.

This initial DWMRC review finds that the Background Report adequately discusses and supports variations in background groundwater in three zones across the site, the northern Burro Canyon Aquifer (NBCA), the Southern Burro Canyon Aquifer (SBCA) and the LVF. The Background Report review regarding constituents of concern (COCs), constituents of potential concern (COPCs), and other monitoring parameters is based on tailings concentrations of constituents, groundwater mobility, and State groundwater standards; and addresses issues regarding effectiveness/reliability of current License COCs and appropriateness of a new COPC and other monitoring constituents. Reviewed portions of the Background Report proposed reasonable evidence that certain monitoring wells have not been impacted by the plumes and discusses the use of certain monitoring wells for each zone. The Background Report discusses and substantiates the use of an intrawell statistical basis for determination of background groundwater quality. Information regarding the DWMRC review is below:

Background Report 5.0 – Analysis of Background Groundwater Quality

Monitoring Wells Used for Representative Background Evaluation and Basis

Per the Background Report Sections 4.0 and 5.0 the selection of monitoring wells used to represent background groundwater concentrations were based on the hydrologic findings of the supplemental study which better characterized two separate flow zones, the northern and southern flow zones within the Burro Canyon Aquifer (NBCA and SBCA) which are hydraulically separated by unsaturated zones of the Brushy Basin Formation, and a distinct zone along the LVF which is impacted by geothermal mineralogy and geochemical processes along the fault. The Background Report discusses that groundwater flow directions are being better characterized along the Lisbon Valley fault with ongoing study at northwest portions of the site. Groundwater flow in these zones is complicated by fault blocks and associated deposition/geomorphology in those areas.

It is important to verify that background groundwater monitoring wells used at the Lisbon Facility have not been impacted by seepage from the tailings impoundments. The current License specifies two groundwater monitoring wells located hydraulically upgradient from the facility (MW-5 and MW-13). The HSSA fieldwork has included the installation of numerous groundwater monitoring wells which has increased the number for the northern and southern aquifers and has allowed for a study of background

concentrations at areas impacted by the LVF. To ensure that selected monitoring wells are located hydraulically upgradient of the tailings impoundments, the Background Report includes Figure 4 which shows water level contours per current monitoring well field data and selected monitoring wells representative of background for the three flow regimes. These proposed background wells are discussed below:

Northern Burro Canyon Aquifer

Selected background monitoring wells includes MW-5, LW-1, MW-100, RL-5, and RL-4 (Background Report Figure 4). Although monitoring wells RL-5 and RL-4 are within areas of plume migration, the Background Report Section 5.1.2 notes that COC concentrations at the selected list of wells are some of the lowest at the site except for selenium at MW-5.

Southern Burro Canyon Aquifer

Selected background monitoring wells includes MW-120, UW-1, MW-13 and MW-105 (Background Report Figure 4). The Background Report notes that monitoring well H-63 was removed from the southern aquifer background set since it was likely contaminated by mining/milling process water. The other monitoring wells listed appear to be upgradient and unaffected by tailings or process wastewater.

Lisbon Valley Fault Zone

Selected background monitoring wells includes MW-125, MW-126, MW-116, MW-128, MW-107D and MW-107S (Background Report Figure 4). Per the Background Report, the only monitoring well which is upgradient of the tailings is MW-125. The Background Report notes that although, based on groundwater elevation contours, any of the other monitoring wells recommended for background evaluation could be contaminated by tailings solution, it is unlikely based on geochemical evaluation and distinct geochemical signatures in this group of monitoring wells. DWMRC will conduct additional review of these issues with the final HSSA Report and does not have additional comments regarding the validity of the geochemical signatures at this time; however, review of the geochemical processes along the LVF were discussed in the HSSA and previous DWMRC review findings as summarized in the following:

Weathering of Sulfide Minerals along the Fault Zone

Information regarding the LVF Zone and oxidation of sulfide mineralized zones was presented in the HSSA and is additionally discussed in Section 3.4 of the Background Report. The presence of distinct zones of groundwater flow due to block faulting along the fault zone was discussed by RAML. Based on DWMRC findings of the HSSA review and cited research, the determination of a distinct background due to the mineralized zone and geochemical processes and potential isolated groundwater flow was deemed reasonable. Although existing concentrations of COCs along this zone are likely not representative of tailings plume concentrations, it is important that suitable evidence to support unaffected zones and affected zones is incorporated into the long-term monitoring of the plume(s) to ensure that the plume is not migrating beyond point of exposure monitoring wells.

Evaluation of Tailings Plumes and Proposed Background Monitoring Wells

Figures 5 through 8 of the Background Report depict the isoconcentration maps for current point-of-compliance License COCs (Uranium, Arsenic Molybdenum, Selenium). Section 5.1.2 and 6.2.1 discusses the evaluation of known contamination and spatial distribution of contamination relative to the proposed background monitoring well locations. Findings regarding the suitability for the selected proposed background wells were justified by the evaluation of groundwater elevations, plume distributions and multivariate statistical analysis to validate the presence of the three background groundwater types and to support the proposed locations.

Multivariate Analysis:

Section 5.1.3 discusses the use of multivariate statistical analysis to evaluate geochemical variables across the site. Specifically, Principal Components Analysis (PCA) was used to convert variance of multiple tested variables into scores.

Results from the October 2019 sampling events were used for analysis and are included as Appendix C of the Background Report. The PCA analysis was performed using the R software package, the analysis included the License COCs (U, As, Mo, Se); and major ions in groundwater at the Site (Ca, HCO₃, Na, SO₄). Figures 9 through 19 of the Background Report depict findings of the analysis. Per discussion in Section 5 and Section 5.1.4, summary of the analysis findings indicated that “*Background groundwater in the NBCA can be represented by wells cross-gradient of the UTI and tailing seepage flow...Background groundwater in the SBCA consists of wells upgradient of the LTI...and wells located along the LVF.*”

The justification of three background groundwater zones is reasonable and supported by HSSA and Background Report findings. The Background Report presents reasonable arguments that groups of monitoring wells are “likely” unaffected by tailings seepage but may have elevated concentrations of COCs based on geochemical processes in the Burro Canyon Aquifer and structural geology of the Lisbon Site. As noted above, additional DWMRC review will be conducted at the time of the Final HSSA Report.

Background Statistical Analysis for License COCs

The Background Report uses the 2009 Environmental Protection Agency (EPA) Unified Statistical Guidance¹ to evaluate background groundwater data. Datasets were determined for proposed wells based on well age and discussions of well data reliability. The EPA guidance was used to develop summary statistics, distribution, outlier, trend analysis and estimates of upper limits for the datasets. Appendix D of the Background Report provides electronic records of the analyses. Per a DWMRC telephone discussion with RAML, it was discussed that the applicability/suitability of the Background Report statistical approach would be reviewed, but that individual data set analysis and proposed background concentrations would not be reviewed until submission of a future final Background Report

¹ United States Environmental Protection Agency. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance. EPA-530-R-09-007.

including all relevant HSSA findings. This is appropriate since HSSA studies regarding groundwater flow and contaminant transport at northwest portions of the site is ongoing, and it appears that additional actions will be required regarding monitoring well installation and enlargement of the surveillance monitoring boundary in this area.

Overall, per DWMRC review of the statistical approach for evaluation of current License COCs including application of the EPA guidance and statistical tests, evaluation of dataset with high non-detects, data distribution, trend analysis, spatial variation of data, and statistical software packages, it appears that the statistical evaluation and data set selection is appropriate for the intended purposes. It is noted that sections in the Background Report discussing the statistics for current COCs also generally discuss the results of analysis for each of the background flow regimes. It would be helpful if the Background Report included a statistical process flowchart depicting the steps used for background well selection and statistical evaluation at the site. The DWMRC has required the development of statistical flowcharts for other facilities and could provide these as examples for RAML reference if requested.

Background Report 6.0 – Evaluation of Additional Constituents of Concern

Background Report Monitoring COC Evaluation

Section 6.0 of the Background Report discusses the evaluation of COCs, Constituents of Potential Concern (COPCs), and other groundwater monitoring constituents at the Lisbon Facility. This review was done in response to the RAI to determine if the current COCs required by the License are applicable and comprehensive to monitor the Lisbon Facility plumes or if additional monitoring constituents are appropriate. It was the DWMRC's intention to include the evaluation of current License required monitoring parameters to better understand the validity and weaknesses of the current monitoring protocols, but not to eliminate the current compliance monitoring parameters or other required monitoring parameters in the License. The DWMRC notes that evaluation of the currently required monitoring parameters (Uranium, Molybdenum, Selenium, Arsenic, Bicarbonate, Chloride, pH, Sulfate, and TDS) was conducted and is discussed in sections 6.2.1 and 6.2.2 of the Background Report. All the constituents reviewed in the Background Report are summarized on Table 7 which effectively shows the results and basis for recommendations of constituents, including current License required constituents and other constituents listed in the Utah Groundwater Rules, as COCs, COPCs or not good candidates based on the constituent group designation.

Per Table 7, the Background Report finds that nitrate is the only recommended additional COPC recommended for the northern plume and that no additional COPCs “appear to be necessary” to monitor the southern plume. The Background Report recommends that a proposed compliance limit for nitrate in the northern plume be calculated after the collection of eight data points are available across the site (second quarter of 2022).

The DWMRC agrees with the determination to include nitrate as a COPC for the NBCA based on high concentrations of nitrate in the tailings and high groundwater mobility. The timeline for data collection appears reasonable, especially since review and approval of HSSA study findings, including proposed ACLs, amendments to License Conditions, and revised LTSM plans will still be ongoing.

It was noted per Section 6.2.1 and Table 7 that some of the current License COCs (established COCs) were evaluated and ranked and found not to be good COPC candidates for the NBCA and SBCA. As discussed above, the Background Report findings are useful to gauge the reliability of constituents for plume identification and migration, however, the established COC have been reliable to this date to monitor the plumes conformance with the analyzed conditions (conceptual and numerical modeling), specifically using model generated concentration breakthrough curves. Additionally, other monitored parameters currently required by the License have been useful as a gauge of background groundwater quality. It is therefore not appropriate to remove any of the current COC or other constituents included in the License requirements.

The DWMRC did note that several other constituents identified by the Background Report as being highly concentrated in tailings are appropriate as new monitoring constituents for continued monitoring. All of the constituents which appear appropriate for monitoring objectives are listed on the following Table, and per DWMRC findings should be evaluated as required monitoring constituents:

Table of COCs and Monitored Parameters Per DWMRC Review of the Background Report

POC Wells, Trend Wells, POE Wells	Proposed COCs Northern BCA Wells Based on Review of the Background Report	Proposed COCs Southern BCA Wells Based on Review of the Background Report
Current COCs and New COPC (Italic)	Uranium Arsenic Molybdenum Selenium <i>Nitrate</i>	Uranium Arsenic Molybdenum Selenium
Other Monitored Constituents Current or to be Added (Italic)	Bicarbonate Chloride pH Sulfate TDS <i>Fluoride</i> <i>Cadmium</i> <i>Lead</i> <i>Thallium</i>	Bicarbonate Chloride pH Sulfate TDS <i>Thallium</i>

Conclusion

The DWMRC appreciates the opportunity to provide an initial review of the Lisbon Facility Background Groundwater Report. Per findings it appears that: 1) the recognition of three background zones at the Facility is appropriate, 2) the statistical evaluation of data will be conducted appropriately and per appropriate guidance, and 3) the list of monitoring constituents has been analyzed and that an evaluation to expand the License required COCs and other constituents is appropriate.

Per findings there are still some issues which will require additional review regarding the background monitoring well selection (Particularly LVF wells), and inclusion of new monitoring constituents in the License and Long-Term Surveillance Monitoring Plan. The DWMRC additionally includes a recommendation to clarify the screening process to ensure that selected background wells have not been impacted by contamination from the plume, and the process for statistical data evaluation procedures and background concentration calculation, by creating a process flow chart for inclusion in the Background Report.

The preliminary Background Report review was discussed amongst DWMRC, RAML, and INTERA during a March 18, 2021 web meeting. DWMRC appreciates RAML facilitating the meeting.

If you have questions concerning this letter, please contact Tom Rushing at (801) 536-0080.

Sincerely,



Phil Goble, Uranium Mills and Radioactive Materials Manager
Division of Waste Management and Radiation Control

PRG/TR/as

c: Mike Moulton, Interim Health Officer, San Juan County Public Health Department
Ronnie Nieves, Environmental Director, San Juan County Public Health Department
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