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DRC-2010-005446

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October 5, 2010

VIA HAND DELIVERY

Harold R. Roberts, P.E.
Executive Vice President, US Operations
Denison Mines (USA) Corp.
1050 17th Street, Suite 950
Denver, CO 80265

Subject: White Mesa Uranium Mill Site Nitrate Contamination Investigation Report, December 30, 2009, Per Stipulated Consent Agreement Docket No. UGW 09-03: DRC Notice of Additional Required Action

Dear Mr. Roberts,

DRC has reviewed the Denison Mines (USA) Corp. (DUSA) *Nitrate Contamination Investigation Report, White Mesa Uranium Mill Site, Blanding Utah*, dated December 30, 2009 and received by DRC on January 4, 2010. The Report was submitted to comply with the January 28, 2009 Stipulated Consent Agreement UGW09-03 (Consent Agreement). The Consent Agreement also refers specifically to the requirements of the *Utah Administration Code (UAC) R317-6-6.15(D) "Contamination Investigation and Corrective Action Plan- Requirements"* which outlines requirements for: 1. Characterization of the pollution; 2. Characterization of the facility; 3. Report of data used and data gaps; 4. Endangerment assessment, and; 5. Other information required by the Executive Secretary.

As you are aware the Consent Agreement Item 7.C. states: "If the *Executive Secretary* determines that the Contaminant Investigation Report (CIR) has omitted any information, content requirements, or failed to meet the performance standards or objectives mandated by Item 6A, the *Executive Secretary* will so advise DUSA by written notice and DUSA will remedy such omission or failure within 30 calendar days of receipt of such notice. If DUSA fails to remedy such omission or failure with such 30 day period, DUSA will pay stipulated penalties in the amount of $2,000 per calendar day for every day after such period that the CIR remains incomplete as determined by the *Executive Secretary*."

Please be advised that the *Executive Secretary* has determined that the current CIR is incomplete. Therefore, DUSA should be fully aware that the contaminant investigation has not fully satisfied

the Consent Agreement Requirements, and that the stipulations of the Consent Agreement are in full effect and enforceable. Thus all "Notices of Additional Required Action" listed below are due within 30 days unless an altemative schedule has been requested by DUSA and agreed upon by the *Executive Secretary* in conformance with Item 11 of the Consent Agreement.

Also, please be advised that if the CIR can not definitively determine the sources of the nitrate plume in the shallow ground water beneath the White Mesa Mill, then DUSA may opt to accept that multiple sources may be implicated, including sources at the White Mesa Mill, and enter into a Corrective Action Plan to actively address containment and/or remediation of the contamination. This action will require the revision of the Stipulated Consent Agreement to include terms of a Corrective Action Plan (CAP) per Item 8 of the Consent Agreement.

NOTICE OF ADDITIONAL REQUIRED ACTION:

I - Unsubstantiated Nitrate Source Determination (Frog Pond)

A. *Unsubstantiated Claims of Blanding City Wastewater Discharges to the Frog Pond*

DUSA claims in the December 30, 2009 Source Review Report (Attachment 2 of the CIR) that:

a. The effluent from the "regional sewage treatment plant" flows to Coral Canyon and that the two ponds associated with the water treatment facility are unlined, and,
b. The "waste treatment facility" experienced upsets and leakages in their post treatment sludge ponds, resulting in discharges of sewage sludge and/or sludge laden water from the plant to the Frog Pond.

These statements are unsubstantiated. Per DRC interview with Danny Fleming (Blanding City Water Superintendent), the Blanding City Treatment Lagoon (hereafter City Lagoon) has been designed as a total containment system (no effluent discharged to surface waters of the State) with a design based percolation (flux rate) from the bottom liner. Further, sludge management outside of the lagoon is not conducted (no mechanical aspects to the treatment other than a primary bar screen).

DUSA has offered no quantifiable data to support any contaminafion from the City Lagoon to the Frog Pond. Recent DRC surface water quality samples from the Frog Pond (Collected October 14, 2009), showed an ammonia and nitrate + nitrite (as N) concentration of <0.02 mg/L which is well below the domestic surface water quality numeric criteria for class IC waters of the State (see UAC R317-2-14 and Table 2.14.1).

The CIR also states in several sections that the mill used municipal sewage discharge water historically as water makeup. The CIR is largely based on this unsubstantiated claim. Information and sources to support these claims have not been documented in the CIR. Such documentation is required to be included with the CIR.

B. Unsubstantiated Demonstration of Slug Flow Behavior

Per DUSA discussion in the CIR it is stated that the nitrate contamination shows slug injection behavior, however, DRC noted that the CIR reported down-gradient concentrations of nitrate and chloride are within the same range of upgradient concentrations and that the downgradient concentrations show the same geochemical relationships as the upgradient concentrations (nitrate and chloride). The table below lists nitrate and chloride relationships from sampling data in the CIR for wells upgradient from the Mill, TWN-14, TWN-17 and TWN-19; and wells downgradient from the Mill MW-20 and MW-22.

Well Number	Sample Date	Chloride Concentration mg/L	Nitrate Concentration mg/L
Upgradient TWN-14	11/4/2009	32	3.4
Upgradient TWN-17	11/4/2009	152	6.7
Upgradient TWN-19	11/2/2009	125	7.4
Downgradient MW-20	10/28/2009	71	6.2
Downgradient MW-22	10/27/2009	67	3.8

The DUSA interpretation of where the leading edge and trailing edges of the plume are is unsubstantiated.

DRC noted that the northem nitrate plume delineation (closed contours) were based on a single sample result at wells TW-19 and TWN-17 which were both below 10 mg/L. Those results were 7.4 mg/L and 6.7 mg/L respectively. Per DRC perspective, the closed 5 mg/L concentration contour around the Frog Pond is highly subjective and is based on insubstantial data. It appears that the upgradient results at wells TWN-9, TWN-17 and TWN-19 may not be the same plume as seen in Mill Site wells TWN-2, TWN-3 and MW-30 and MW-31. The CIR does not explain why similar closed contours were not drawn downgradient from the mill based on the MW-20 and MW-22 nitrate and chloride data.

Thus no clear slug behavior is evident to the DRC, as claimed in the CIR, since Nitrate and Chloride concentrations downgradient from the Mill are within the range of upgradient concentrations. The statements by DUSA regarding slug flow behavior needs further explanation by DUSA, and need to be justified by sufficient data and analysis. Such additional work should include but is not limited to:

- Additional wells and borings around the Frog Pond
- Hydraulic evaluation including equipotential data utilizing additional testing around the Frog Pond
- Characterization of any ground water mounding potentially caused by the Frog Pond
- Geologic Information

- An evaluation of the elevation of the Brushy Basin shale upper contact in the area of Coral Canyon and an interpretation of the hydraulic conditions between the Frog Pond and the Mill Site
- Additional Nitrate + Nitrite (as N) and Chloride shallow ground water quality data for new upgradient wells installed near or around the Frog Pond area
- Additional characterization to determine the presence and location of a preferential ground water flow path that allowed a 30 year or less nitrate travel time from the Frog Pond to the Mill Site.

C. *Hydraulic Gradient and Flow Path Issues*

Per DRC review of the regional ground water hydrology in the area of the City Lagoon, it appears that the ground water flow is in a southeasterly direction (the Frog Pond is geographically southwest) and would not recharge the Frog Pond*. DUSA has not offered analysis of potential ground water hydraulic paths from the City Lagoon to the Frog Pond (e.g. has not mapped local stream tubes).

DRC also noted that the arguments in the CIR based on flow velocities from upgradient sources to the current plume locations were inconclusive and indicated that assumptions of preferential flow paths and heterogeneities would be needed to explain the observed plume location, however, the claims of preferential flow paths were not studied or supported.

The CIR Section 3.3 Contaminant Migration states, *"calculated pore zone velocities along hypothetical pathways are approximately 0.55 ft/yr to 7 ft/yr (per the attached estimated site pore velocities by HydroGeoChem) in the northeast area plume. Calculated pore velocity for the Mill area plume is 23 ft/yr. These travel times are not long enough to have transported nitrate and chloride from the upgradient to the downgradient portions of the two areas within a reasonable time frame. Assuming the 23 ft/year pore velocity and a source just upgradient of the DUSA property boundary in the vicinity of TWN-19, it would take over 300 years for nitrate and chloride to arrive at monitoring well TW4-24."*

The DUSA estimated travel time of 300 years is well beyond the 30 – 40 years the Mill has existed at White Mesa, and also predates the construction of the Frog Pond which is estimated to have been constructed in the 1920's. Also, it appears that DUSA has used the Mill Site ground water linear velocity average number of 23 ft/yr for the entire horizontal path of travel from well TWN-19 to TWN-24. Per the report it appears that the upgradient average linear velocity is actually 7 ft/yr which would apply to a large portion of the horizontal distance. Therefore, the estimated travel times could be on the order of 3-times greater, i.e. 900 years. Additionally, DRC noted that these calculations do not consider the additional travel time through the unsaturated zone which would add substantially to the travel time, nor do they consider altered flow paths from upgradient sources caused by ground water mounding which would likely add to the horizontal distance.

* Utah Department of Natural Resources, Stefan Kirby, 2008 Special Study 123, *Geologic and Hydrologic Characterization of the Dakota-Burro Canyon Aquifer Near Blanding, San Juan County, Utah*

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The DUSA CIR conclusion that the Frog Pond is a sole offsite source of nitrate (and chloride) contamination appears to be based entirely on the argument that since elevated nitrate concentrations have been found in ground water hydraulically upgradient from the mill (referring to well TWN-3), the source must be upgradient from the mill. DRC considers the conclusion that the sole source of the nitrogen contamination is from the Frog Pond to be unsubstantiated with direct and reliable evidence. Additional evidence needs to be included with the CIR as listed in the sections above.

Per DRC review of the source assessment (and independent sampling of the Frog Pond effluent) it appears that information submitted related to Blanding City Wastewater Treatment system is false. Further, the DUSA claim of on site historical usage of municipal wastewater effluent as makeup water is also unsubstantiated. Also, the conclusions in the source investigation memo and the CIR that the nitrate and chloride show slug behavior are not evident to DRC based on the current available data and geochemical relationships. Calculations of transport travel times included in the CIR are not conservative (are based on faster pore velocities than calculated for upgradient portions of the site and do not include timeframes for unsaturated flow) and conclude that contaminant travel from upgradient sources is not feasible to support the Frog Pond as a source.

--Potential Option for Additional Study/Justification for an Upgradient Source

- Stable isotopic analysis may be employed to distinguish septic tank or sewage system nitrogen from mineral or inorganic nitrogen sources in shallow ground waters. Nitrate from synthetic fertilizers receive oxygen primarily from the atmosphere which is richer in $\delta^{18}O$ than biologically formed nitrate, which receives two of the three oxygen atoms from water.[(*)] Samples showing atmospheric $\delta^{18}O$ greater than $5^0/_{00}$ would indicate an inorganic (e.g. fertilizer, industrial) source, whereas $\delta^{18}O$ less that $5^0/_{00}$ indicates organic (e.g. septic sources).

  Organic sources of nitrate will also show elevated concentrations of $\delta^{15}N$ over inorganic sources*. Concentrations greater than $10\ ^0/_{00}\ \delta^{15}N$ strongly indicates an organic source whereas inorganic sources will generally show only minor amounts of $\delta^{15}N$, generally $<5^0/_{00}$.

  In order to distinguish an upgradient source, DUSA may opt to perform isotopic analysis to provide information regarding an upgradient contaminant signature (isotopic fingerprint) to confirm that the same signature is present at multiple locations and depths both beneath the mill and at upgradient locations. Note that the study should also include an evaluation of downgradient nitrate concentrations at multiple locations and depths.

[(*)] Clark, Ian & Fritz, Peter, 1997, *Environmental Isotopes in Hydrogeology, pp 148-154, Nitrogen Cycling in Rural Watersheds*, Lewis Publishers (CRC Press)

II – Need for Additional Source (Potential Multiple Source) Investigation

In the "November 19, 2008 Preliminary Source Review Report" and "December 30 2009 Source Review Report" by Jo Ann Tischler, as many as nine nitrate sources were identified. In contrast, the CIR concluded that the City Lagoon and subsequently the Frog Pond were the only source of the pollution. The DRC does not see this claim as supported. Further, it is unclear whether the current ground water contamination is from a single source or multiple sources. Therefore, the multiple source scenario (upgradient and onsite sources) has not been eliminated or adequately studied.

The DUSA Source Review Report noted several onsite sources which should be given a high priority in the sampling plan (Tischler Source Review Report pp 13). DRC noted that the CIR provides some limited justification that certain sources could not be sole sources of the plume concentrations based on low contributions of nitrate, time of use, etc., however, it is not appropriate to negate these sources (e.g. the SAG leach field) without additional assessment (including in-situ soil and shallow ground water sampling) as recommended in the Source Review Report, in order to provide an unbiased consideration of all sources contributing to the plume. DRC has also noted that DUSA regards Lawzy Lake, Lawzy Sump and the Upper Wildlife Pond as offsite sewage sources (Tischler Source Review Report 2009, pp 23), however, since these sources were constructed by and/or under the management of DUSA during the time periods in question, it is DRC contention that these should be considered as potential onsite sources of contamination. This is reinforced by the DUSA, figure 2, land ownership map submitted with the September 1, 2009 Ground Water Permit Renewal Application.

Notice of Additional Required Action

The current CIR does not meet the agreed upon Item 6.b. in the Consent Agreement which states:

"6.b. Nitrate Source Characterization – DUSA will conduct all tests and characterization necessary to determine the physical cause(s), location(s), transfer mechanism(s) and characteristics of all the source(s) of the nitrate contamination in order to either form a basis for and facilitate later submittal of a DUSA Corrective Action Plan that meets the requirements of UAC R317-6-6.15E, or to demonstrate conclusively that DUSA did not cause or contribute to the Nitrate contamination in any manner and that, as a result, such a Corrective Action Plan is not necessary."

Per discussion above the current CIR determination that the Frog Pond is the sole source of the nitrate contamination is unsubstantiated. DUSA has additionally identified several onsite sources which have a likelihood of being contributors to the contamination and have yet to be fully examined. Provide the additional investigation as required.

III – Requirement for Contemporaneous Data to prepare the Nitrate and Chloride Isoconcentration Maps

DRC noted that the concentration contour map submitted with the CIR uses data from 3 different sampling events in September, October, and November, 2009. The Chloroform Wells were collected in September, the Tailings Cell Wells were collected in October, and the Nitrate Wells were collected in November. Additionally, samples were collected from piezometers in October, 2009. DRC noted that a single laboratory result from several non-contemporaneous (not within a 5 day time frame as required by the Consent Agreement, Item 6.A.v.) was used to draw the nitrate and chloride concentration contours on the groundwater elevation maps (aerial overlays) submitted with the December 30, 2009 report.

Notice of Additional Required Action

The CIR currently contains concentration contour maps which are not in conformance with the Consent Agreement Item 6.A.v. (they use non-contemporaneous data, i.e. not collected within a 5-day period). Additional data collection and mapping for future revised submission is required to provide maps based on contemporaneous data as defined in the Consent Agreement.

IV -- Conference Call

A conference call took place on September 15, 2010, amongst Harold Roberts (DUSA), David Frydenlund (DUSA), Jo Ann Tischler (DUSA), Dan Erskine (Intera), Angela Periico (Intera), Phil Goble (DRC) and Tom Rushing (DRC) to discuss the findings and required actions as listed in this letter. The following issues were discussed:

1. The Nitrate + Nitrite as N concentration contour map located in the 2nd Quarter 2010 Nitrate Monitoring Report (Tab I) was reviewed to insure that everyone agrees that the contamination plume is currently beneath the White Mesa Mill.
2. Current DUSA CIR conclusion of "Frog Pond" upgradient source including:
   a. Claims of discharges from the City Lagoon to the Frog Pond
   b. Claims of slug flow behavior
   c. Arguments related to ground water flow velocities
3. DRC findings related to the CIR, as stated in this letter above – Addifional needed data/study to support the CIR conclusion
4. Need for additional investigation regarding current identified potential sources, and multiple source scenarios.
5. CIR nitrate and chloride isoconcentration maps prepared with non-contemporaneous data
6. Stipulated Consent Agreement Requirements (Docket UGW09-03) -- Terms related to performance standards.
7. Potential options for DUSA to enter into a "Corrective Action Plan (CAP)" to address contamination remediation without further source assessment, or to include additional source assessment as part of the CAP.

8. Stipulated Consent Agreement Item 11, deadlines associated with the agreement listed in items 7.A. through 7.D. may be amended according to the conditions described after agreement by both parties.

It was agreed that DUSA will consider the options related to the CIR and will formulate a response based on their review of this letter. Three options for the path forward were discussed as below:

1. DUSA may submit a revised CIR to address and resolve all shortcomings identified above, within 30 days per the Consent Agreement (Item 7.C. of the Consent Agreement),
2. DUSA may request to amend the 30 day deadline for DUSA to submit a revised CIR (Item 11 of the Consent Agreement). The amendment request must be received 14 days before the deadline (no more than 16-days after receipt of this letter).
3. DUSA may request to revise the current Consent Agreement to address a performance standards and a schedule for a Corrective Action Plan (Item 8 of the Consent Agreement). Again, this request must be made within 14 days before the deadline (no more than 16-days after receipt of this letter).

If you have questions or concems regarding this letter please contact Tom Rushing at (801) 536-0080. Thank you.

Sincerely,

UTAH WATER QUALITY BOARD

Rusty Lundberg

Rusty Lundberg
Co-Executive Secretary

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