

# HRI, Inc.

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Mr. Daniel Gillen, Assistant Chief  
Uranium Recovery Branch  
Division of Waste Management  
NMSS (T-7-J9)  
Nuclear Regulatory Commission  
11545 Rockville Pike  
Rockville, MD 20850

Dear Mr. Gillen:

In reviewing the most recent questions from the NRC which incorporate language that we understand likely will be placed in the Final Environmental Impact Statement (FEIS), HRI is concerned that certain statements, conclusions and the potential implications thereof are not consistent with the reality of ISL uranium production which historically has produced no significant adverse environmental impacts.

In response to the open issues (comments) from the NRC, we present our responses in two categories:

- a.) Responses wherein we suggest clarification of language in the draft or correction of inaccuracies to contribute to a more accurate and effective document; and,
- b.) Responses wherein we propose specific changes in language in the draft to address NRC's concerns (attached.)

## Section A:

**A1, Page 1:** "However the risk of applying these criteria in close proximity to a public water supply located in the zone of mining is significantly different."

NRC has made no showing that applying these criteria is "significantly" different - "different" to be sure, but what is the basis for the use of the word "significantly?"

NRC may have some additional concerns or perhaps heightened regulatory sensitivity, but the basic process is the same. The use of "significantly" may be viewed as implying that controls and safeguards proposed by the company and NRC's ability to assess them are less than adequate.

**Suggestion:** Suggest the word **significantly** be deleted.

**A2, Page 2:** "The NRC staff observes that the town of Crownpoint water supply wells are completed in the same uranium ore body proposed for mining."

**Response:** The low concentrations of uranium and radium - 226 in the water plus the historical exploration drilling in the vicinity of the water wells show that the Crownpoint water supply wells are not in a "uranium ore body." This statement incorrectly implies that the water chemistry in the town wells is the same as that associated with the water quality in the uranium ore body - which it is not.

**Suggestion:** Delete this sentence in its entirety.

**A3, Page 2:** "This situation is very analogous to a factory (or another town) using and returning water to a surface water body immediately upstream of a community which is using the same surface water as a source of drinking water."

**Response:** This is not a good analogy since the implication that groundwater moves like a stream is incorrect and may be subject to misinterpretation. Whether "upstream" groundwater will ever impact "downstream" groundwater must be based on many site specific conditions (such as porosity, pH, ground conditions, etc.) that are not relevant (or at least relevant in different ways) to the surface water analogy. Also, the implication that groundwater moves quickly, as a stream would, is totally misleading.

**Suggestion:** Remove this sentence.

**A4, Page 3:** "If these well field baseline concentrations are greater than baseline concentrations at the town water supply wells, then the previous assumption that acceptable restoration of the well field equals acceptable water quality impacts at the town wells cannot be made."

**Response:** First, this statement implies that even without ISL mining, the groundwater conditions at the town wells will be adversely impacted - certainly HRI should not be held responsible for such a situation. This also implies that there are instances where

restoring exactly to baseline or better than baseline is not acceptable. Again, this statement is subject to potential misinterpretation.

**Suggestion:** Delete the sentence.

**A5, Page 5:** "However, these time periods are also long enough that the pollution impact of the mining operation would occur long after solution mining restoration activities had finished, making corrective action by the applicant impossible."

**Response:** This statement implies that after successful restoration and sign-off by NRC, the aquifer will remain polluted and unacceptable for previous use. This is potentially highly inflammatory and subject to misinterpretation. It is also unnecessary as it amounts to nothing more than unsupported, careless speculation.

**A6, Page 6:** "From an analysis of the flow lines, it can be seen that contamination from both the Crownpoint and Unit 1 sites would flow into wells NTUA-1 and BIA-6."

**Response:** At a minimum, the "would" should be "could." The statement implies that contamination from operations will affect public water supplies, which is not accurate. Considering the proposed defense-in-depth which includes the hydrology circumstances, the operational controls, monitoring wells, post-mining restoration and commitment to move the town wells, there is only a minuscule hypothetical possibility that operations could affect public water supplies.

**A7, Page 9:** "When wells are located within the ore body, it is possible that some well fields may have average uranium baseline values that exceed 0.44mg/l. This raises the concern that uranium could migrate to the Town of Crownpoint wells."

**Response:** If naturally elevated levels of radionuclides are a concern, they should be a concern now and not because of proposed ISL operations. The point of ISL operations is to remove as much uranium as possible and continue to remove uranium as a byproduct of restoration activities. Without some adequate explanation, the spectre of possible uranium migration should not be raised.

**Suggestion:** Delete or qualify by a statement that any such concerns are theoretical.

**A8, Page 10:** "The NRC has yet to approve successful restoration of a production scale well field at any of its licensed sites."

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**Response:** This statement standing alone, could be misinterpreted. It implies that ISL technology is not adequately understood by NRC. Restoration of production and near commercial scale operations has occurred at the Bill Smith ISL facility. NRC has Agreement State oversight responsibility for Texas operations where numerous commercial well fields have been satisfactorily restored and in fact, numerous production scale restoration demonstrations have been completed in the past to NRC requirements. Because of the favorable results of these demonstrations, it has been determined by the NRC (Smith 1987) that pre-operational restoration demonstrations are not necessary. We are unaware of any circumstances associated with ISL projects since that time which would cause the NRC to change that conclusion. There has not been any significant adverse impact associated with modern ISL facilities. NRC should not risk creating the misimpression regarding the state of the ISL art that this statement implies.

**Suggestion:** Delete or modify this sentence to reflect the broader reality of site restoration.

**A9, Page 10:** "The demonstration should be conducted at a large enough scale that production-scale ground water restoration is demonstrated."

**Response:** In the first 18 months of operations, inclusive of any stability period, HRI agrees that restoration demonstrations at Churchrock will be completed. The purpose of the restoration demonstration at Churchrock is to size the number of pore volumes for bonding purposes. Completing final restoration of commercial size well fields that may be in production for years prior to beginning production in Unit 1 is unnecessary and could cause Unit 1 production to be deferred years into the future. There is no evidence that operating at Unit 1 will have **any** negative effect on public water supplies. However, for the purpose of defense-in-depth, HRI will present the data for bond sizing to the NRC prior to injection at Unit 1.

**Suggestion:** Delete or modify this comment.

**A10, Page 16:** "As a result, the risk of horizontal excursions is increased over hydrologic conditions commonly encountered by uranium solution mining operations."

**Response:** The risk mentioned is **not significant**.

**Suggestion:** Delete or qualify (i.e., "although any such risk is not considered significant and can be adequately controlled.")

**A11, Page 16:** "This action would greatly reduce the influence of the town wells on the Crownpoint site well field and, therefore, reduce the potential for excursions to occur."

**Response:** There is very little risk, therefore, it cannot be **greatly** reduced.

**Suggestion:** Delete "greatly."

**A12, Page 16:** "It would also have the effect of increasing the distance between the town wells and the well field which would allow more time for excursion definition and correction."

**Response:** The allowance of more time implies a quick escape of fluids that cannot occur. The regular monitor well protection with the proposed "over protection" from five additional wells provides more than ample time to address any excursions whether the town wells are moved or not.

**Suggestion:** Here the concept of defense-in-depth is the only appropriate reason for the movement of wells.

**A13, Page 17:** "However, the NRC staff also observes that guard wells cannot be correctly located to assure an excursion will not migrate to the public water supply before the time consuming process of identifying the extent and location of the excursion is finished."

**Response:** This statement is inflammatory because it implies that neither the company or NRC have expertise in locating guard or monitor wells to protect water supplies. It is also technically inaccurate because the time for contaminated water to travel to the public water supply wells is greater by far than the time necessary to identify the extent and the location of the excursion.

**Suggestion:** Delete this sentence.

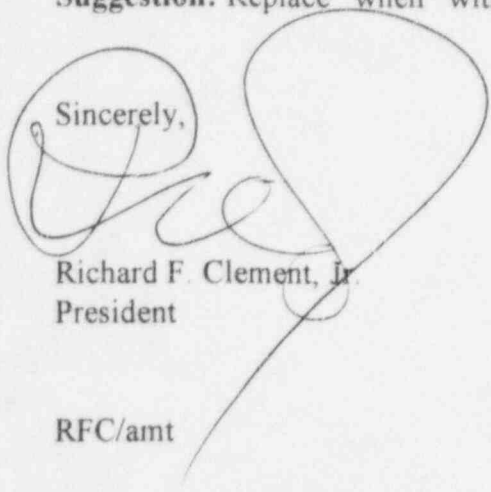
**A14, Page 24:** " The applicant will monitor for vertical excursions and correct them when they occur."

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**Response:** HRI does not at all concur that vertical excursions will occur. However, if they do occur, HRI will correct them.

**Suggestion:** Replace "when" with "if."

Sincerely,



Richard F. Clement, Jr.  
President

RFC/amt

cc: Mark Pelizza - HRI  
Craig Bartels - HRI  
Joseph Holonich - NRC  
Tony Thompson - Shaw, Pittman, Potts & Trowbridge



Q4/50. COMMENT: Degradation of Crownpoint Water Supply Wells by Restored Solution Mine Ground Water

NRC ACTION NEEDED: Agree to the recommendations in Comment 50 or propose another acceptable alternative.

#### HRI RESPONSE

The NRC technical staff has recommended that *"prior to the injection of lixiviant (i.e. prior to the extraction of uranium) at either the Unit 1 and Crownpoint sites, a restoration demonstration should be conducted at the Church Rock property."* HRI has agreed to a limited restoration demonstration and continues to support this position of the NRC with the caveats expressed in comment A9 of the 11/20/96 cover letter.

The NRC also recommended that *"prior to the injection of lixiviant at the Unit 1 site: that bonding be provided to cover the cost of town well replacement."* Since bonding is a common way to assure that monies will be available to perform and complete some important future task, HRI is not opposed to the concept of bonding itself. However, HRI is extremely concerned that such bonding might imply even the remotest, reasonable possibility that a lixiviant excursion from HRI's ISL operations at Unit 1 might reach the Town of Crownpoint water wells, a water travel-time distance away of 1000-2000 years.

Bonding will be in place as per regulatory requirement to assure that restoration actually takes place at Unit 1. During operations, production zone monitor wells, completely surrounding the ISL wellfields, will be sampled twice monthly and will detect any lixiviant excursions, which will be remediated if they occur. To finalize this "defense in depth" scenario, HRI proposes that three to five monitor wells in the overlying Dakota aquifer be placed between the wellfield and Town water wells. This will be in addition to the overlying monitor wells spaced at one well per four acres. These 3 - 5 additional wells would be "twinned" to the production zone monitor wells and would provide the same protection to the overlying zone.

HRI believes that it has shown through its numerous submittals that contamination will not occur in the Town of Crownpoint water wells due to ISL operations at the Crownpoint site. However, per HRI's earlier offer, HRI accepts the NRC's recommendation that the Town water wells be replaced (except for NTUA Littlewater) and pipelines constructed prior to operations beginning at the Crownpoint site. Water, of equal quantity and quality, will be supplied to the existing distribution system. This is with the understanding that location of the new water wells is reasonable and that agreement on such is not unduly or unreasonably withheld by the regulatory authorities.

Since the two water systems mentioned in the NRC recommendation are operated by separate regulatory entities (the BIA and NTUA), HRI has no control over the

cooperation or agreements between them. However, if acceptable to both, HRI will connect the two water systems.

Certain wording and analogies in the discussion to this question might inadvertently imply that lexiviant movement to the Town water wells is a likely possibility, e.g., "... *water which has gone through the solution mining and restoration process will eventually reach the Town of Crownpoint water supply system. This situation is very analogous to a factory (or another town) using and returning water [to] a surface water body immediately upstream of a community which is using the same surface water body as a source of drinking water.*" A common misconception of non-groundwater professionals is that water moves underground as "rivers" through the rock. However, this is just not the case. Surface waters can move in a matter of MINUTES over the same distance which would take groundwater moving through rock HUNDREDS OR THOUSANDS OF YEARS. Water movement and velocities in rivers are just not indicative of water movement through rock. Estimates of the time for groundwater to move from the license boundary of the Unit 1 ISL project to the NEAREST Town water well (NTUA #1) was 1,657 years as reported in HRI's response to Q1/50.

In summary, while HRI is not opposed in principle to bonding for the relocation of the Town water wells, the concepts presented in the above question imply (we believe incorrectly) that the water supply of the Crownpoint residents will be deteriorated by ISL activities in the area. The company adamantly objects to this implication, and believes that defense in depth for Unit 1 includes:

a) the distance involved (over two miles), which means that an ISL project will have negligible likelihood of pressure changes that will cause a migration of solution that would ever approach the water supply for Town of Crownpoint,

b) perimeter monitor wells will detect and allow control of any potential excursion, no matter how unlikely,

c) shallow monitor wells, twinned in the overlying sandstone with the production zone monitor wells and lie between the wellfields and the Town water wells, so that no vertical excursion will be undetected, and if detected, can and will be controlled and cannot affect drinking water supplies.



Q4/74. COMMENT: Westwater Canyon Horizontal Excursion Control - Crownpoint Property

ACTION NEEDED per NRC: Respond to the recommendations in the NRC evaluation of Comment 50 or propose another acceptable alternative.

# HRI RESPONSE

In HRI's response to Q4/50, HRI agreed to replace the Crownpoint Town water wells prior to beginning ISL operations at the Crownpoint site (please see that response) and we would like to re-iterate that commitment here.

HRI takes strong exception to the implication that excursions are likely because of the uncontrollable affects of the Town water wells: *"[moving the Town water wells] would greatly reduce the influence of the town wells on the Crownpoint site well field and, therefore, reduce the potential for excursions to occur. It would also have the effect of increasing the distance between the town wells and the well field which would allow more time for excursion definition and correction."* This characterization makes it appear that the Town water wells will affect groundwater velocities in the vicinity of the ISL wellfields and surrounding monitor wells on the order of hundreds of feet per year, and therefore, if an excursion were to occur, the contamination of the Town water wells would be imminent. This is not so. The impact on groundwater velocities at the ISL wellfields and on the surrounding monitor wells by the Town wells is VERY SMALL. HRI believes that it has shown this through its hydrologic modeling and explanatory submittals, and that credible engineering studies or data have not been provided indicating otherwise, which would allow alternate operational plans and safeguards to be developed if necessary.

The general effect of flowrates from the Town water wells on groundwater velocities in the vicinity of the Crownpoint project monitor wells can be also demonstrated through the use of professionally accepted and generally available groundwater models. Whether using particle tracking, pathlines, or graphical procedures with potentiometric surface maps, pressures changes and groundwater velocities at various distances from producing water wells can be determined. This was done below, incorporating the various reservoir characteristics in the Crownpoint area:

2,550	gpd/ft	transmissivity
8.6e-5		storage coefficient
0.251		porosity
201	feet	thickness.

A single well was used to gauge the affect of widely varying flowrates. Figure 8 (attached as Attachment 1) of Geraghty & Miller's "Analysis of Hydrodynamic Control, HRI, Inc., Crownpoint and Churchrock New Mexico Uranium Mines" (10/7/93) shows

that NTUA #1 is the nearest Town water well to the proposed ISL operations to the west at about 1,700 feet. Geraghty & Miller found that the well had a flowrate of 27.7 gpm during the summer period of higher water usage. More distant wells would have even less affect, but could easily be included. Distances of 1700, 1600 and 1500 feet from the producing well were used in the model. This is equivalent to an excursion at the monitor well (1700 feet) shown in Figure 8, and 100 feet beyond the monitor well toward the Town water well (1600 feet), and 200 feet beyond the monitor well (1500 feet). Two flowrates were used, 25 gpm and 100 gpm, at different times but from the same producing well, to show the affects of a **huge** increase/decrease in flowrate. Drawdowns were calculated using unsteady state flow, while velocities were determined at steady state to **maximize** their values. Table 1 shows the results for a well at 25 gpm and Table 2 for a well at 100 gpm.

Table 1						
Groundwater Velocities and Drawdowns Caused by Producing Well at 25 gpm						
Distance from Producing Well (feet)	Distance from MONITOR Well (feet)	Velocity (ft/day) Toward Producing Well [Steady State]	Velocity (ft/year) Toward Producing Well [Steady State]	Drawdown (feet) After ONE Day [Unsteady State]	Drawdown (feet) After FIVE Days [Unsteady State]	Drawdown (feet) After TEN Days [Unsteady State]
1,700	At Mon. Well	8.93e-3	3.26	1.5	3.1	3.9
1,600	100' beyond	9.488e-3	3.46	1.6	3.2	4.0
1,500	200' beyond	1.012e-2	3.7	1.7	3.4	4.1

Table 2						
Groundwater Velocities and Drawdowns Caused by Producing Well at 100 gpm						
Distance from Producing Well (feet)	Distance from MONITOR Well (feet)	Velocity (ft/day) Toward Producing Well [Steady State]	Velocity (ft/year) Toward Producing Well [Steady State]	Drawdown (feet) After ONE Day [Unsteady State]	Drawdown (feet) After FIVE Days [Unsteady State]	Drawdown (feet) After TEN Days [Unsteady State]
1,700	At Mon. Well	3.572e-2	13.0	5.8	12.4	15.5
1,600	100' beyond	3.795e-2	13.9	6.3	13.0	16.0
1,500	200' beyond	4.048e-2	14.8	6.8	13.5	16.6

Comparison of the Tables shows a 10-15 feet change in water levels, yet an insignificant change in fluid velocity. Insignificant in that, if an excursion were to occur, it could be readily controlled without imminent contamination of the Town water wells. This demonstrates that estimated groundwater travel times from the Crownpoint project to the Town water wells of 90.4 YEARS (~33,000 days) shown on the pathline plot from Q1/50 (Attachment 50-2, and here attached as Attachment 2) is reasonable, and well beyond the time (60 days) in which corrective action will be required by the NRC for an excursion. The up and down changes in water level at a specific point does NOT equate to a change in velocity, which is caused by the pressure differential BETWEEN points. Thus,

flowrate changes in Town water wells will NOT cause severe groundwater flow problems at the proposed ISL site.

The impact of the Town water wells on groundwater velocities in the area of the proposed Crownpoint ISL operations was also addressed in HRI's response to Q2/76. The monitor wells in Figure 2 of Attachment A of Q2/76 show as extending to the vicinity of the Town water well, NTUA #1, and indicate that NTUA #1 would be plugged and abandoned (P & A). Since September, 1992 (the date of the letter referenced in Q2/76) the proposed license boundary of the Crownpoint ISL project has been moved approximately 1,700 feet to the west of NTUA #1. However, the results of the modeling shown in Q1/76 are still instructive, in that the velocity of the groundwater in the area of the monitor wells, caused by a **different** water production **scenario** from the Town water wells than shown in Attachment 4 here, ranges from 12.3 to 20.3 feet/year. Again, these are very low water velocities which are easily controllable by ISL wellfield operations if an excursion were to occur, and would NOT cause imminent contamination of the Town water wells.

This does NOT mean that HRI does not take excursions very seriously. We design and operate wellfields with this constantly in mind, as our operating history shows. Therefore, we disagree with the apparent discounting of the hydrodynamic models and results, which were run by HRI and its consultants, to verify the initial wellfield designs and operations at the Churchrock and Crownpoint sites: *"Due to the lack of data and model design, the model was not able to take into account variations in aquifer properties, variations in water levels over time, and actual well field design and operation."* This is not at all the case. Over five thousand geophysical and lithologic logs at Churchrock, Unit 1 and Crownpoint and surrounding areas were interpreted and correlated, and the breadth and extent of multiple ore fronts identified. Preliminary wellfields were then designed for these ore fronts, **well by well**: about 860 wells for Churchrock, 640 wells for Unit 1 and 770 wells for Crownpoint. These wellfields were balanced for flowrates **well by well** (including flowrate bleed) just as done in normal HRI/URI operations, modeled, analyzed for areas of possible excursions, the design and bleed rates were revised, and models re-run. Multiple schedules of production and restoration were developed and revised for each project (an example, originally part of Q2/78, is attached here as Attachment 3). The wellfield schedule, along with start and stop times for production **and** restoration for **each** of the wells, and the flowrates, which **varied** well to well and again from production to restoration, were then used in the hydrodynamic models by Geraghty & Miller. In addition, pre-existing pressure gradients **were** included in the models, and the Town water wells were included in the Crownpoint model at the higher summer flowrates as determined by Geraghty & Miller. The wellfields were NOT generalized by a few injection/extraction wells and flowrates for of the wells. **Each** of the flowrates for each well for production **and** restoration were included. The effort was intense and provides a realistic view of the wellfield production and restoration operations at Churchrock and Crownpoint. Thus, the wellfield design and variable flowrates and operation WERE included in the model. Since the change in

flowrates causes the variations in water levels, water level fluctuations **were** incorporated into the model.

Of course, for each scenario developed and modeled, many more can be envisioned and the smallest of variations made. **However, this should not mean that a single groundwater velocity generalized over the whole of the area, from HRI's proposed Crownpoint ISL project site to the Town water wells, provides a valid or reasonable representation of fluid velocities, as compared to detailed and in depth hydrodynamic studies.** HRI believes that the iterative models used in characterizing the potential for contamination in the public water supply wells proves conclusively that the potential for contamination is not only unlikely, but of minuscule probability. However, HRI would welcome the opportunity to review and discuss **any** credible hydrologic study or data indicating otherwise, so that proper safeguards can be determined and implemented prior to any ISL operation.

Attachment Q4/74 - 1