ML040560079

WESTERN NUCLEAR, INC.

2801 YOUNGFIELD, SUITE 340, GOLDEN, COLORADO 80401
TELEPHONE (303) 274-1767 FAX (303) 274-1762

February 16, 2004

United States Nuclear Regulatory Commission
Attn: Mr. Robert Nelson
Mail Stop T8-A33
Washington, D.C. 20555-0001

SUBJECT: Response to November 18, 2003, Nuclear Regulatory Commission Staff Letter Regarding Western Nuclear, Inc.'s Split Rock Uranium Mill Site Final Site Closure Proposal, SUA-56

Dear Sir or Madam:

On February 4 and 5, 2003, Nuclear Regulatory Commission (NRC) Staff met with representatives of the United States Department of Energy (DOE) regarding Western Nuclear, Inc.'s (WNI's) proposed plan for final closure and long-term surveillance and monitoring of the Split Rock uranium mill site in Jeffrey City, Wyoming. WNI's proposed plan involves the use of institutional controls to maintain the integrity of the Split Rock site, to monitor, and, if necessary, take action to mitigate the potential impacts of any off-site migration of 11e.(2) byproduct material in a groundwater plume which has been identified by WNI's technical support team, for the NRC mandatory closure period of a minimum of 200 years and, to the extent reasonably achievable, 1,000 years.

After these meetings, in June of 2003, NRC Staff met with representatives of WNI in Denver, CO, to discuss WNI's proposed plan and the responses of DOE and the Wyoming Department of Environmental Quality (WDEQ) to this plan. Then, on November 18, 2003, NRC Staff issued a Request for Additional Information (RAI) in which NRC Staff requested further clarification of WNI's proposed plan and an update of decommissioning activities prior to that date. Finally, on December 8, 2003, NRC Staff met with representatives of WNI at NRC Headquarters at Rockville, MD, to discuss further developments in the decommissioning process and to update future activities.

NRC Staff's November 18, 2003, RAI requested, among other things, a status report on the Commission's directive that, prior to the approval of its proposed plan, WNI make a "good faith effort" to purchase private properties located in a subdivision adjacent to the

WNI site known as Red Mule. If it cannot successfully purchase these private properties or purchase relevant deed restrictions from their current owners limiting future access to groundwater for domestic uses and the above-mentioned groundwater plume reaches such properties, WNI's plan proposes the use of an alternate water supply operated by the long-term custodian to provide any of these owners who remain on their properties with an option to avoid exposure to contaminated groundwater.

With respect to the proposed alternate water supply, NRC Staff's RAI detailed DOE's insistence that "it will not install or maintain an alternate water supply system for the Red Mule community...." NRC Staff RAI at 1, ¶ 2. In addition, NRC Staff requested information regarding the use of site groundwater for particular purposes and additional responses regarding the proposed long-term groundwater and surface-water monitoring plan. NRC Staff RAI at 1, ¶¶ 3 & 4.

In response to NRC Staff's RAI and the discussions at the various meetings described above, WNI hereby submits this response.

1. **NRC Staff RAI ¶ 1:** In its November 18, 2003, RAI, NRC Staff requested an update on WNI's attempts, to date, to purchase "all properties that have been impacted, or are projected to be impacted, by groundwater contamination as a result of mill operations." NRC Staff RAI at 1, ¶ 1.

Prior to the issuance of its RAI, NRC Staff had instructed WNI representatives that the Commission required WNI to make a "good faith effort" to purchase fee title to all properties potentially affected by migration of 11e.(2) byproduct material contaminants in groundwater.

WNI's "good faith effort" to purchase properties that, potentially may be within the proposed long-term care boundary commenced almost nine years ago. Beginning in 1995, after WNI's groundwater technical support team identified a groundwater plume migrating from the tailings disposal area, WNI representatives contacted the representatives of parcels of land more immediately adjacent to the reclaimed mill site and tailings pile which the plume potentially could impact so that such lands could be purchased and, eventually, transferred to the long-term custodian after the Commission terminates WNI's license. Meetings with four respective landowners began with offers to purchase the entirety of their properties in fee. In one instance, the negotiations resulted in the successful sale of the properties to WNI. However, the other three landowners were unwilling to sell their properties in fee, but they were willing to sell, and WNI purchased legally enforceable subsurface rights and/or groundwater use (deed) restrictions preventing the use of groundwater for domestic purposes within the properties' boundaries. Like fee title, these restrictive covenants and/or deed restrictions are legally enforceable, durable property instruments that may be readily enforced by the long-term custodian at any time during the appropriate closure period in an appropriate judicial venue.

WNI also attempted to acquire tracts of land in fee within the proposed long-term care boundary from the State of Wyoming and the Bureau of Land Management (BLM). Attempts at purchasing State of Wyoming lands were successful,[1] while attempts to purchase BLM lands were unsuccessful because the BLM administrator in Wyoming at the time was unwilling to engage in the administrative process necessary to sell such lands.[2]

Additionally, WNI has attempted to purchase properties in the so-called Red Mule sub-division in fee or, where purchasing fee title is not possible, to purchase similar durable, legally enforceable restrictive covenants and/or deed restrictions to those purchased from the owners of the properties noted above. WNI also has considered offering current landowners life estates that will allow such landowners to use their properties until the life estate terminates at the end of their natural lives and prior to when any contaminated groundwater potentially may reach their lands.

Currently, WNI has accelerated its efforts to purchase the remaining Red Mule properties in fee or to purchase durable, legally enforceable restrictive covenants and/or deed restrictions in such properties so that potential exposure to contaminated groundwater from the Split Rock site is minimized or eliminated. WNI has received corporate approval to budget the purchase of the remaining properties within the proposed long-term care boundary. WNI is hopeful that these efforts will result in the purchase of such properties or property interests which restrict residential access to groundwater for domestic use or which will provide current landowners with a life estate which will terminate their ownership interest in the land upon the end of their natural lives, a period of time which is well before any contaminated groundwater would reach their land. However, should WNI be unable to purchase the remaining Red Mule properties or interest in such properties as described above, the "good faith effort" made by WNI in accordance with its proposed groundwater monitoring plan to purchase such properties or restrictive property interests will constitute an as low as *reasonably* achievable (ALARA) effort to satisfy UMTRCA ownership criteria, as well as NRC criteria and guidance.

Generally, it is clear from the plain language of the AEA, as amended, that the ability to transfer fee ownership to the long-term custodian with respect to land used for the disposal of 11e.(2) byproduct material *is not* a prerequisite to license termination. Section 83 of the AEA provides that, upon termination of the license for a uranium mill tailings facility, title to the tailings and to the land used for disposal of such tailings must be transferred to the long-term custodian, *unless* NRC determines that such transfer is not required to protect public health and safety or the environment.[3] Specifically, the AEA states as follows:

---

[1] Even though WNI was successful in purchasing the State of Wyoming lands, the State retained mineral rights under such lands, despite WNI's best efforts.
[2] *See* Attached Affidavit of John H. Licht.
[3] 42 U.S.C. § 2113(a) & (b) (emphasis added).

> "The Commission shall require by rule, regulation, or order that prior to the termination of any license which is issued after the effective date of this section [November 8, 1981], title to the land, including any interests therein (other than land owned by the United States or by a State) which is used for the disposal of any byproduct material, as defined in section 11e.(2), pursuant to such license shall be transferred to—
>
> (i) the United States, or—
>
> (ii) the State in which such land is located, at the option of such State,
>
> *unless the Commission determines prior to such termination that transfer of title to such land and such byproduct material is not necessary or desirable to protect the public health, safety, or welfare or to minimize or eliminate danger to life or property.*"[4]

While this provision may not be directly applicable to WNI (because WNI's license was not issued after November 8, 1981), the general principle it establishes is important: transfer of title to land used for the disposal of 11e.(2) byproduct material will not be required if NRC determines that such transfer is not necessary to protect public health, safety and the environment.

Moreover, with respect to sites licensed prior to 1981, such as WNI's site, the AEA provides NRC with even greater flexibility in determining whether to require transfer of title to land used for the disposal of byproduct material. Specifically, the statute provides that:

> "In the case of any such license under section 62, which was in effect on the effective date of this section [November 8, 1981], the Commission may require, before the termination of such license, such transfer of land and interests therein (as described in paragraph (1) of this subsection) to the United States or a State in which such land is located, at the option of such State, as may be necessary to protect the public health, welfare, and the environment from any effects associated with such byproduct material. *In exercising the authority of this paragraph, the Commission shall take into consideration the status of the ownership of such land and interests therein and the ability of the licensee to transfer title and custody thereof to the United State or a State.*"[5]

This provision is directly applicable to WNI's site.

---

[4] 42 U.S.C. § 2113(b).
[5] 42 U.S.C. § 2113(b)(4) (emphasis added).

Thus, the AEA, as amended, presumes that, in general, title to a uranium mill tailings at licensed facilities, and title to the land used for disposal of such tailings and other 11e.(2) byproduct material wastes, will be transferred to the United States or the resident State upon license termination, *unless* the Commission determines that such transfer is unnecessary to protect public health, safety or the environment. In addition, in the case of the Split Rock site, the Commission is directed to take into account the status of land ownership and the ability of the licensee (WNI) to transfer title when deciding whether to transfer title to the government. Consequently, if fee title of land used for the disposal of 11e.(2) byproduct material is not necessary to protect public health and safety and the environment or, in the case of sites such as Split Rock that were licensed prior to November 8, 1981, if fee title of such land cannot, as a practical matter, be transferred to the long-term custodian, then transfer of ownership of land used for 11e.(2) byproduct material disposal is not required.

With this in mind, according to 10 CFR Part 40, Appendix A, Criterion 6, a licensee must close the tailings disposal area in a manner which is "effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years." This level of protection is consistent with the generally applicable standard promulgated by EPA in 40 CFR § 192.02 which states that control of residual radioactive materials shall be "effective for up to one thousand years, *to the extent reasonably achievable*, and, in any case, for at least 200 years." (emphasis added) WNI's updated groundwater model demonstrates that Red Mule residents, if any remain, will not be impacted by contaminated groundwater from mill operations for at least 500 years, which is well above the minimum closure period outlined by NRC and EPA regulations. If WNI makes a "good faith effort" to obtain fee title to the Red Mule properties and such properties cannot be obtained, then, based on the existing groundwater model and "good faith effort," WNI has proposed a closure plan which is ALARA and, as such, should be acceptable to NRC Staff and the Commission. Further, if WNI is unable to obtain fee title to the aforementioned Red Mule properties and demonstrates that acquisition of such properties is not "reasonably achievable," it is questionable whether WNI should be required to obtain other property interests in Red Mule properties or provide an alternate water supply since the groundwater model illustrates that the contaminated plume will not reach Red Mule for at least 500 years, which is well within NRC's site closure standard.

In support of the foregoing statements, WNI hereby attaches and incorporates by reference an internal memorandum dated January 23, 2004, that documents the "good faith effort" which WNI has undertaken and that demonstrates that WNI is continuing to pursue the acquisition of fee title to the Red Mule properties. [Attachment 1]

2. **NRC Staff RAI ¶ 2:** As stated above, NRC Staff requested that WNI propose an "alternate solution to provide protection to the Red Mule groundwater users," because DOE has stated that it will not assume responsibility for installing and maintaining an alternate water supply for Red Mule residents. NRC Staff RAI at 1, ¶ 2.

It is WNI's position that, should the Commission determine that the use of an alternate water supply is an appropriate component of the long-term surveillance and monitoring package for the Split Rock site, DOE *must* become the operator of the alternate water supply if it becomes the site's long-term custodian. As a general proposition, the Atomic Energy Act of 1954 (AEA), as amended by the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) requires that [i]f transfer to the United States of title to such byproduct material and such land is required...the Secretary of Energy...shall...assume title and custody of such byproduct material and land transferred....Such Secretary...*shall maintain such material and land in such a manner as will protect the public health and safety and the environment...*" (emphasis added).

Under Section 83 (b)(1)(B)(5) of the AEA, as amended by UMTRCA, "[t]he Commission may...require the Secretary [of Energy] or other Federal Agency or State having custody of such property and materials to undertake *such monitoring, maintenance, and emergency measures as are necessary to protect the public health and safety and such other actions as the Commission deems necessary* to comply with the standard promulgated pursuant to section 84 of this Act." (emphasis added) Based on the AEA, as amended by UMTRCA, *the Commission, and not the long-term custodian,* determines the manner in which 11e.(2) byproduct material shall be managed.

In addition, NRC's implementing regulations at 10 CFR § 40.28(a) that: A general license is issued for the custody of and long-term care including monitoring, *maintenance and emergency measures* necessary to protect public health and safety..."The purpose of this general license is to ensure that uranium and thorium mill tailings disposal sites *will be cared for* in such a manner as to protect public health, safety and the environment after closure." (emphasis added). Subsection (b) states, *the long-term Surveillance Plan (LTSP),* which must be approved by *the Commission,* will set forth the requirements for management of the site by the long-term custodian which could include requirements for measures to be taken such as the installation and operation of an alternate water supply system.

When proposing a long-term surveillance and monitoring plan to the Commission for review, Section 84 of the AEA, as amended, allows licensees to "propose alternatives to the specific requirements set forth in Appendix A and, after reviewing the proposed alternative(s), *the Commission* will decide whether such an alternative(s) is feasible and is adequately protective of public health and safety." (emphasis added). Since institutional controls (i.e., deed restrictions on Red Mule properties) and the use of an alternate water supply are *alternatives* proposed by WNI, *the Commission* now must determine whether such alternatives are reasonably feasible and adequately protective of public health and safety. Should *the Commission* determine that these alternatives are acceptable, it is the responsibility of the long-term custodian (DOE) to engage in "emergency actions" or "such other actions" necessary for protecting public health and safety, including the operation of an alternate water supply. Therefore, the Commission is empowered to mandate that the long-term custodian (DOE) install and operate an

alternate water supply at the Split Rock site should the Commission determine that such an alternative is reasonably feasible and enhances protection of public health and safety in a manner consistent with EPA *generally applicable standards* and NRC regulations.

Related to this issue is DOE's comment that, if an alternate water supply system is to be installed for the Red Mule sub-division, operation of any such system should be transferred to Jeffrey City or some other operating organization, *before* the NRC terminates WNI's license.

Since potential ground water contamination containing site generated (i.e., 11e.(2)) constituents may never reach the potentially affected properties and, if it does so, is projected to do so in 500-1,000 years it makes no sense to set up such an alternate water system now. Since DOE's license will never be terminated (10 CFR Part 40.28(b)), should such a water system be necessary in 500 years DOE as the long-term custodian is the appropriate entity to operate the pre funded system.

Additionally, WNI has provided enough financial assurance to support the implementation and continued operation of an alternate water supply should the need arise. As DOE is well aware, financial assurance for uranium recovery licensees must be approved by the Commission prior to license termination and must be in accordance with Appendix A, Criterion 10. Thus, adequate financial assurance will be available for DOE's use should the use of an alternate water supply become necessary.

3. **NRC Staff RAI ¶ 3:** NRC requested an analysis to show that water within the long-term care boundary could be used for agricultural purposes. That evaluation is enclosed as Attachment 2.

The evaluation shows that water with the maximum expected concentrations of hazardous constituents in areas where the water could be accessed, would not pose an unacceptable risk were it to be used for agricultural purposes. It should be noted that with the exception of the land included in the McIntosh restrictive covenants, and the Red Mule Area, WNI (and DOE after transfer) has complete control over all uses of the groundwater. The modeling indicates that very little, if any, contaminants are expected to reach either the McIntosh or Red Mule areas.

4. **NRC Staff RAI ¶ 4:** WNI proposes a new groundwater and surface water monitoring program in response to the NRC request. That program is outlined in the enclosed memorandum in Attachment 3.

It is proposed that this monitoring program replace the existing groundwater and surface water monitoring programs currently required by license. This will allow some monitoring to occur before the site is transferred to the DOE.

WNI is committed to the timely completion of the remaining tasks that need to be accomplished to allow license termination and site transfer. Should you need additional information, please contact us at your earliest convenience.

Sincerely,

Lawrence J. Corte for
President

LJC:kmh

ATTACHMENT 1

MEMORANDUM

To: Lawrence J. Corte
From: Harley Shaver and Brad DeWaard

Re: Status of Red Mule Property Acquisitions
Date: January 23, 2004

The Red Mule Acres Subdivision consists of eight lots, one of which has been divided into two separate parcels (Lot 8). Thus there are nine parcels within the subdivision. Adjacent to the subdivision to the east are five additional parcels, and the one immediately adjacent to Red Mule is within the proposed long-term care area. Thus there are ten individually owned parcels within the proposed boundary of the long-term care area.

WNI obtained an appraisal on these properties dated October, 2001, from Keith Kasselder, a Wyoming certified appraiser from Hudson, Wyoming. At the time of the appraisal WNI had acquired parcel 027 from Cline and it is presently used as the staff house. In the past two years, WNI has acquired three parcels in the Red Mule subdivision and one additional adjacent parcel. Lot 3 (Caproni), Lot 5 (Roberts), Lot 6 (Bauer) and Parcel 012 (Tyra) have been purchased. I attach a copy of the subdivision plat together with a list of owners.

On May 8, 2000, a letter was written to Earl Lockhard to attempt to acquire Lot 7. No response was forthcoming so Harley Shaver stopped in to see Mr. Lockhard in Absarokee, Montana to inquire about purchasing the Lot. Mr. Lockhard told Mr. Shaver he was not interested in selling. Mr. Lockhard has not been contacted since that time, but will be this spring.

All of the other Lot or Parcel owners, except for Lot 4 (Tuttle), were contacted during October 2003. Brad DeWaard and Harley Shaver personally contacted all resident owners and Brad DeWaard phoned, wrote and e-mailed all non-resident owners.

On October 14, 2003, Harley Shaver met with Richard Gist, Esq., an attorney in Lander, Wyoming to retain him on behalf of WNI to open an estate for Mary Tuttle who is institutionalized with Alzheimer's disease.

On October 14, 2003, Brad and Harley met with Van Alstines and offered to trade them parcel 012 (Tyra) for their parcel 028. Even though the Van Alstine property is not within the proposed long-term care area, it is immediately adjacent to it and would provide an additional buffer zone. It presently appears that the trade should take place this spring.

Brad and Harley also met with the Kelleys (Parcel 032) at their home on October 14, 2003. The Kelleys were informed that WNI would like to acquire their property and would pay in excess of the appraised value or trade them for other property. Mr. Kelley was not much interested in a sale but might think about a trade.

On October 15, 2003, Brad reached the Raynors (½ Lot 8) via phone in Nevada. On October 16, 2003, email contact was established between Brad and the Raynors. Several emails were exchanged from then until November 5, 2003. On November 18, 2003, Brad e-mailed the Raynors an offer in the amount of the appraised value to purchase their portion of Lot 8. There has been no response to date.

On October 16, 2003, Brad and Harley met with the Redlands over the noon hour at their home (Lot 2). The Redlands were told that WNI would purchase their property at 125% of the appraised value, trade land or purchase the property at some price and give them a term of years to remain on the property. The Redlands did not appear much interested in selling and said they would think about what had been discussed.

On the evening of October 16, 2003, Brad and Harley met with Earl and Wallace Jamerman. Mr. Jamerman was hostile. The Jamermans were told that WNI was making a good faith effort to acquire all of the Red Mule parcels as part of its site closure plan, but that WNI did not have the power of condemnation. The Jamermans were told that WNI would buy them out, trade property or pay for the property and give them a life estate, if the NRC would approve. The Jamermans had no interest in selling or moving but I sensed there might be some appeal if WNI bought their property and gave them a life estate. They need to be convinced that they could not be evicted, which was a concern Mr. Jamerman voiced. Mrs. Jamerman is the Post Mistress in Jeffrey City and Mr. Jamerman is in the cattle business.

On October 16, 2003, Brad wrote a letter to the Peters (½ Lot 8) in Ohio setting forth that WNI was interested in acquiring their parcel. On October 21, 2003, Brad had a conversation with Mr. Peters regarding their parcel of Lot 8 and the interest of WNI in acquiring that parcel if they were willing to sell. Mr. Peters continually expressed his family's hopes and dreams for this property in the future. Brad emailed the Peters the $3250 appraisal value of the parcel. On November 18, 2003, Brad contacted Dan Peters and discussed the property again. Mr. Peters contended they had $7000 invested in the property and would sell immediately if an offer of $20,000 were made. That would be approximately $8,000/acre for land that does not have a working well, no house, etc., and would be a terrible precedent for other acquisitions. An offer of $5500 was made for specific reasons, however that offer promptly was turned down. There have been no further discussions with the Peters.

In a conversation recently between Lou Miller and Bill von Till, the NRC Project Manager for the site, Lou Miller was informed that the NRC had accepted the ground water model and the proposed long-term care boundary. That means that WNI can proceed to offer trades to the Red Mule residents for property outside the long-term care boundary and can also offer Red Mule residents a life estate, or term of years. Brad DeWaard will commence visiting with the Kelleys and the Redlands about other sites in which they may have an interest. WNI would move them at no cost, drill new wells at the new locations and give them a larger acreage position than they now own. WNI would also pay them some additional consideration for an agreement to move.

The ability to offer a trade, a life estate (or term of years) combined with the new authorization to be able to spend, in some instances, up to twice the appraised value, should accelerate the acquisition process of the Red Mule parcels.

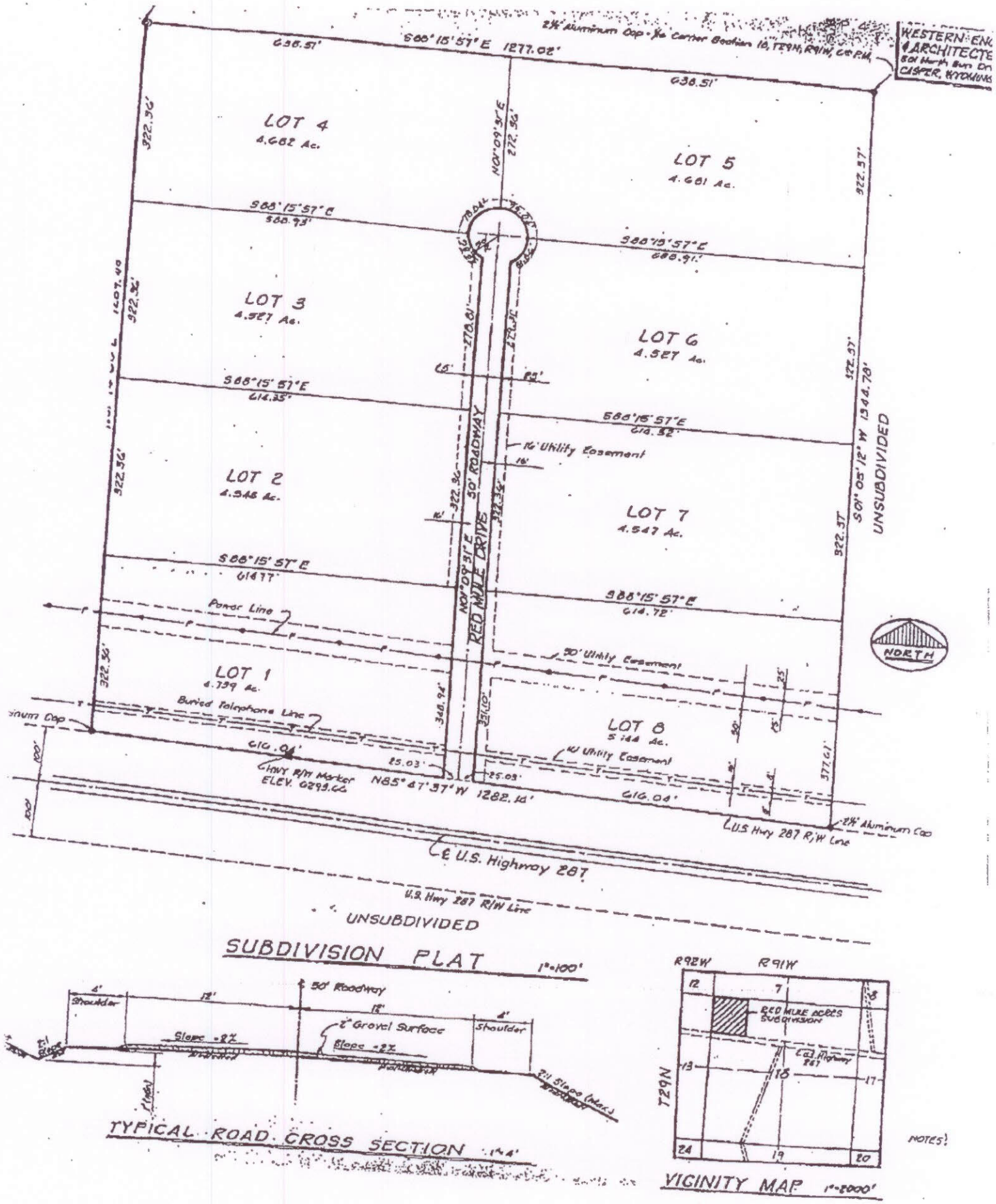
RED MULE ACRES SUBDIVISION OWNERSHIP
Section 18, T29N, R91W

Lot #	Name	Address
1	Earl A. & Wallace R. Jamerman	P. O. 368 Jeffrey City, WY 82310
2	Thomas H. & Laurie A. Redland	P. O. Box 911 Jeffrey City, WY 82310
3	John A. Caproni	P. O. Box 85, Pavillion, WY 82523
4	Mary E. Tuttle	P. O. Box 401, Jeffrey City, WY 82310
5	Charlie D. & Mary E. Roberts	P. O. Box 164, Jeffrey City, WY 82310 or 1015 E. Fremont Ave., Riverton, WY 82501
6	Gary L. & Nancy H. Bauer	17 Dalley Rd. Riverton, WY 82501
7	Earl F. Lockard	P. O. Box 828, Absarokee, MT 59001
8 (part)	Daniel E. & Theresa K. Peters	P. O. Box 346 Mt. Vernon, OH 43050
8 (part)	David A. D. & Jay Dee Raynor	c/o Lorraine Raynor 237 North Fork Road Lander, WY 82520

OWNERSHIP OF PARCELS EAST OF RED MULE ACRES

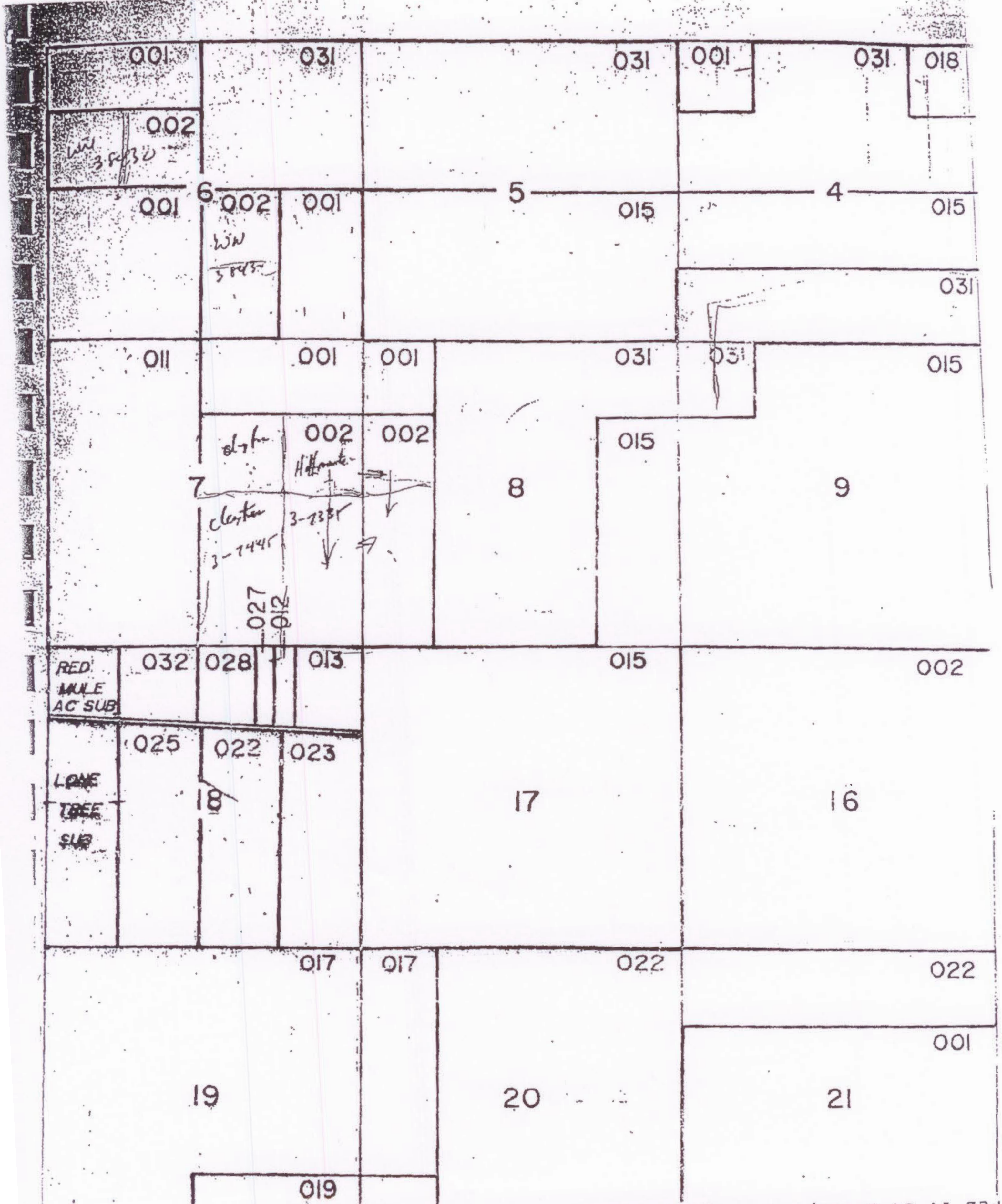
Parcel #	Name	Address
032	Michael J. & Ronda L. Kelley	c/o Shannon & Derek Kelley P. O. Box 338 Jeffrey City, WY 82310, or P. O. Box 341, Sutton, AK 99674
028	Jo & Betty Van Alstine	3317 Whiting Ave. Stevens Point, WI 54481
027	Western Nuclear, Inc.	
012	James Tyra	4159 State Hwy. 789, Lander, WY 82528
013	James Tyra	4159 State Hwy. 789, Lander, WY 82528

Feb 17 04 02:04p Harley Shaver 3037577500 p.1



SUBDIVISION PLAT 1"=100'

NOTES:



Feb 17 04 01:18p Harley Shaver 3037577500 p.3

ATTACHMENT 2

consulting
scientists and
engineers

MEMORANDUM

MFG PROJECT: 180888

TO: Larry Corte, WNI

FROM: Jan Johnson

DATE: February 12, 2004

SUBJECT: Response to NRC Letter – Item 3

---

3. *WNI must address contaminated water used for agriculture, gardening, stock water, and other ranching purposes since WNI has not proposed to restrict contaminated water use for these purposes.*

The maximum estimated future concentrations of the constituents of concern in groundwater that may be used for agricultural purposes are as follows:

Nitrate – 10 to 50 mg/l
Sulfate – 250 mg/l
Manganese – 0.5 mg/l
Uranium – 0.5 mg/l

The potential long-term adverse impacts of these constituents on agricultural use of the groundwater with these concentrations has been evaluated and it has been determined that these levels do not represent a significant human health hazard or adverse impact to livestock. The chemical constituents: sulfate, nitrate, and manganese were compared to existing guidelines and standards. The potential adverse impact of uranium in groundwater was considered from a radiological and chemical toxicity perspective.

Chemical Constituents (excluding uranium)

Selected regulatory and risk-based values for the chemical constituents for livestock watering and irrigation are given in Table 1. While the USEPA has provided general guidance for agricultural use of water in the Blue Book (1972), Red Book (1976), and Gold Book (1986), there are no specific U. S. standards for stock agricultural use of water for livestock watering and irrigation. Because the USEPA guidance is generally dated, more recent criteria from Canada, South Africa, Australia/New Zealand and the U. N. Food and Agriculture Organization (FAO) was reviewed and included as Table 1.

MFG, Inc.
3801 Automation Way, Suite 100
Fort Collins, CO 80525
Phone: 970-223-9600 Fax: 970-223-7171

Table 1 Regulatory and Risk-Based Values for Livestock Watering

Constituent	Livestock Watering (mg/l)				Irrigation (mg/l)		
	ANZECC [1]	CCME [2]	DWAF [3]	FAO [4]	ANZECC [1]	DWAF [3]	FAO [4]
Nitrate	400	100	100	100	25-125	5-30	
Sulfate	2000	1000	1000				450-2000
Manganese			10	0.05 [5]	0.2 – 10	0.02 – 10	0.2

[1] Australia and New Zealand Guidelines for irrigation (ANZECC 2000)
[2] Canadian Council of Ministers of the Environment (CCME 2002 update); livestock water
[3] South African Water Quality Guidelines for Livestock Watering (DWAF 1996)
[4] Food and Agriculture Organization of the United Nations (Ayres and Westcott 1985); livestock water
[5] FAO value based on pipe scaling issues

As noted in this table, livestock are insensitive to nitrate, with reported criteria of 100-400 mg/L. Irrigation water can safely contain up to 125 mg/L, based on the ANZECC values. Livestock criteria for sulfate range from 1000-2000 mg/L, while the UN lists 450-2000 mg/L as acceptable for irrigation. Generally, concentrations up to 10 mg/L manganese are reported as acceptable for livestock and irrigation. The values at the low end of the criteria range are generally associated with scaling of equipment rather than toxicity. The DWAF (1996) report that at 0.1 to 1.5 mg/l, moderate problems may be encountered with clogging of drip irrigation systems.

Uranium

Uranium is the constituent of greatest concern because it has both chemical toxicity and is also radioactive. The chemical toxicity was considered for cattle and for grasses, the most likely crop to be grown on land in the vicinity of the Split Rock site.

The daily intake of uranium by cattle was calculated using screening factors from the National Council on Radiation Protection and Measurements (NCRP) Report 123I, Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground (NCRP, 1996). Two routes of intake were considered, forage and direct ingestion of groundwater. The intake from forage was calculated assuming the animal consumed grasses and hay grown on ground irrigated with groundwater.

Calculated Uranium Concentration in Soil

The soil concentration at equilibrium was calculated assuming a constant irrigation rate of 5 liters per day per square meter ($l\ m^{-2}\ d^{-1}$) for 150 days per year and a rate constant (λ) for removal of uranium from soil by harvesting and leaching of 2.7×10^{-5} per day (d^{-1}). That is, approximately 0.003 percent of the uranium is removed from soil per day. The uranium concentration in irrigation water was assumed to be 0.5 mg/l. The uranium was assumed to be distributed to a depth of 15 cm, the average plow depth, and the soil density 1500 kg/m^{-3}. All parameter values used in this assessment came from NCRP Report 123I (NCRP 1996).

The equilibrium soil concentration was calculated as follows:

$$\text{Concentration} = I\ (\lambda m)^{-1}$$

Where: I = mass of uranium added to the soil per year = $5\ l\ d^{-1} \times 150\ d\ y^{-1} \times 0.5\ mg\ U\ l^{-1}$
$= 375\ mg\ U\ y^{-1}$
λ = rate constant = $2.7 \times 10^{-5}\ d^{-1} \times 365\ d\ y^{-1} = 9.9 \times 10^{-3}\ y^{-1}$

$$m = \text{mass of soil} = [10{,}000\ cm^2\ m^2 \times 1\ cm][15\ cm \times 1.5\ g\ cm^{-3}] = 2.25 \times 10^5\ g$$

$$\text{Concentration} = [375\ mg\ U\ y^{-1}]/[9.9 \times 10^{-3}\ y^{-1} \times 2.25 \times 10^5\ g] = 0.17\ mg\ U\ g^{-1}$$

$$\text{Activity concentration of U-238} = [0.17\ mg\ U\ g\text{-}1][330\ pCi\ mg^{-1}][0.037\ Bq\ pCi^{-1}] = 2.1\ Bq\ g^{-1}$$

Calculated Uranium concentration in Forage

The equilibrium concentration in forage was calculated using the concentration in soil and the transfer coefficient for dry forage from NCRP Report 123I (NCRP 1996).

$$\text{Concentration in forage} = [0.1][0.17\ mg\ U\ g^{-1}][1000\ g\ kg^{-1}] = 17\ mg\ U\ kg^{-1}$$

Estimated Daily Intake of Uranium by Beef Cattle

The estimated daily intake of uranium by beef cattle includes intake from forage and direct intake from stock water. The daily intake from forage was calculated assuming a dry forage intake for beef cattle of 12 kg d^{-1} (NCRP 1996).

$$\text{Intake (forage)} = [17\ mg\ kg^{-1}][12\ kg\ d^{-1}] = 204\ mg\ d^{-1}$$

The direct intake in stock water was calculated assuming a daily water intake of 50 liters for beef cattle (NCRP 1996).

$$\text{Intake (water)} = [50\ l\ d^{-1}][0.5\ mg\ l^{-1}] = 25\ mg\ U\ d^{-1}$$

Total estimated daily intake at equilibrium = 230 mg U

The chemical toxicity of uranium has been extensively studied in laboratory animals but there is little information on toxicity in livestock. One study in cattle found that administration of 4 g of uranium per day in water resulted in some initial deterioration in general health for two weeks with a gradual return to an apparently normal state even with continued ingestion of uranium at same rate (NAS 1980). Feeding experiments with dogs showed histological kidney changes at levels as low as 20 mg per kg per day uranyl nitrate hexahydrate (NAS 1980). The estimated daily intake for cattle due to irrigation of forage with groundwater is less than 6 percent of the daily dose found to cause some health effects in the cattle study. The intake is less than 1 percent of the lowest daily intake found to cause histological changes in the kidney in dogs. Therefore, the chemical toxicity of uranium is not likely to affect the health of livestock ingesting water and forage irrigated with water at a concentration of 0.5 mg per liter.

Estimated Annual Intake of Uranium and Dose from Ingestion of Beef for Members of the Public

The estimated annual intake of uranium from eating beef raised using groundwater for stock watering and irrigation was calculated assuming an adult ingests 100 kg of beef per year and the transfer coefficient from intake to beef is 0.0008 d kg^{-1} (NCRP 1996):

$$\text{Uranium concentration in meat} = [230\ mg\ d^{-1}][0.0008\ d\ kg^{-1}] = 0.184\ mg\ U\ kg^{-1}$$

$$\text{Estimated annual intake} = [0.184\ mg\ U\ kg^{-1}][100\ kg\ y^{-1}] = 18.4\ mg\ U\ y^{-1}$$

The estimated annual dose from intake of uranium in beef was calculated using the dose coefficients for U-238, U-235, and U-234 from the International Commission on Radiological Protection (ICRP) Database of Dose Coefficients: Workers and Members of the Public 2001.

U-238 ingestion dose coefficient = 4.5 E-8 Sv Bq^{-1}
U-235 ingestion dose coefficient = 4.7 E-8 Sv Bq^{-1}
U-234 ingestion dose coefficient = 4.9 E-8 Sv Bq^{-1}

The average dose coefficient is 4.7 E-8 Sv Bq-1
The specific activity of natural uranium = 680 pCi mg^{-1} = 25 Bq mg^{-1}

The estimated annual dose from ingestion of beef is as follows:

Dose = [18.4 mg U y^{-1}][25 Bq mg^{-1}][4.7 E-8 Sv Bq^{-1}] = 2.2 E-5 Sv y^{-1}

Estimated Annual Intake of Uranium and Dose from Ingestion of Garden Vegetables

The transfer coefficient from soil to fresh vegetables for uranium is 0.002 (NCRP 1996). Therefore, the uranium concentration in vegetables grown on soil irrigated with ground water would be as follows:

Soil concentration = 0.17 mg g-1

Concentration in fresh vegetables = [0.17 mg g^{-1}][0.002][1000 g kg^{-1}] = 0.34 mg kg^{-1}

The estimated annual intake of vegetables, fruits, and grains is 200 kg (NCRP 1996). Assuming an individual gets half of his/her annual intake from home grown vegetables, the annual uranium intake would be as follows:

Annual intake = [200 kg y^{-1}][0.5][0.34 mg kg^{-1}] = 34 mg U y^{-1}

The estimated annual dose from ingestion of homegrown vegetables is as follows:

Dose = [34 mg U y^{-1}][680 pCi mg-1][0.037 Bq pCi^{-1}][4.7 E-8 Sv Bq-1] = 4.0 E-5 Sv y^{-1}

The total estimated dose to a human receptor from ingestion of irrigated garden vegetables and beef is 6.6 E-5 Sv per year or 6.6 mrem per year.

Therefore, the estimated annual dose to an individual ingesting homegrown vegetables from an irrigated garden and ingesting beef from animals raised on forage irrigated with the same water at 0.5 mg uranium per liter would be less than 25 mrem, the maximum allowable dose rate to a member of the public to meet the criteria for license termination.

Uranium Chemical Toxicity to Plants

A study of the chemical toxicity of uranium to plants was performed using three native grasses. The grasses were grown in soils with a range of uranium concentrations from 0 to 25,000 mg per kg under low, medium, and high stress. Adverse impacts on the grasses were observed only at the highest level and were independent of stress (Meyer, 1997). The estimated equilibrium uranium concentration in soil due to irrigation with groundwater at a concentration of 0.5 mg/l was 0.17 mg U per g (170 mg per kg).

No adverse effects on plant health were found at a concentration of 5000 mg per kg, a factor of 30 greater than the estimated equilibrium soil concentration.

Conclusions

Agricultural use of groundwater with chemical constituent concentrations at the maximum potential levels predicted for the area outside of the reclaimed Split Rock mill site does not pose a hazard to humans, animals, or the type of crops that could be produced in that area. The manganese concentrations could cause some problems with clogging drip irrigation systems. The estimated potential radiation dose to humans from consuming agricultural products raised using the water is approximately 7 mrem per year even using very conservative consumption parameter values in the calculation.

References

ANZECC (Austrailian and New Zealand Environmental and Conservation Council), 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. October.

CCME (Canadian Council of Ministers of the Environment). 2002. Canadian Environmental Guidelines. Winnipeg, ONT. Originally published in 1999, updated December 2002.

DWAF (Department of Water Affairs and Forestry, South Africa). 1996.South African Water Quality Guidelines, 2nd Edition. May.

ICRP (International Commission on Radiological Protection). 2001. Database of Dose Coefficients: Workers and Members of the Public 2001 (Available on CD).

Meyer, M. C. and T. McLendon. 1997. Phytotoxicity of Depleted Uranium on Three Grasses Characteristic of Different Successional Stages. J. Environ. Qual. 26:748-752 (1997).

NAS (National Academy of Sciences). 1980. Mineral Tolerance of Domestic Animals. (Boiard on Agriculture). National Academy Press. Washington DC.

NCRP (National Council on Radiation Protection and Measurements). 1996. Screening Models for Released of Radionuclides to Atmosphere, Surface Water, and Ground. NCRP Report No. 123I. NCRP. Bethesda, MD.

ATTACHMENT 3

consulting
scientists and
engineers

MEMORANDUM

MFG PROJECT: 180888

TO: Larry Corte, WNI

FROM: Lou Miller, P.E.

DATE: February 12, 2004

SUBJECT: Response to NRC Letter – Item 4

---

4. *In NRC's RAI, dated September 6, 2001, item number 2 requested that WNI address the deficiency of a long-term groundwater and surface water monitoring program. WNI's response of May 28, 2002, on this item is not adequate. William von Till discussed this issue in detail with Lou Miller in a phone conversation on November 4, 2003. This is also covered in the NRC Guidance document NUREG-1620, Section 4.3.3.4.*

A new groundwater and surface water monitoring program is proposed. This system is designed to better monitor evolution of the groundwater plume and to provide more detail for the surface water monitoring program. The location of the existing monitoring locations and the new proposed locations are shown on Figure 1.

The wells that are part of the existing monitoring requirements are generally close to the tailings impoundment and are not useful in defining the continued evolution of the contaminant plume. The new proposed wells will be able to monitor the plume as it matures. Data from the proposed wells could be used to evaluation the plume development with the modeled results.

Point of compliance (POC) wells, proposed in the October 1999 groundwater report (SMI, 1999), are Well 5 and Well WN-21. The proposal for these wells to be the POC wells remains the same.

Two new points have been added to the surface water sampling system. These points are labeled Surface water B and C. They supplement the existing sample location A to better monitor water in the Sweetwater River that might be impacted from the contaminate plume.

The point of compliance wells will be monitored for the complete list of hazardous constituents. The hazardous constituents as determined in the October 1999 Groundwater Report (SMI, 1999) are presented in Table 1. The other wells and the surface water samples will be analyzed for the most mobile constituents, uranium and sulfate. It has been demonstrated that these two constituents are the most conservative indicator parameters for the contaminate plume and they would be the best parameters to use to define the contaminant plume as it evolves.

The existing monitoring is performed on a quarterly basis. These results have been submitted on a semi-annual basis. The results of the historic sampling clearly indicate that groundwater quality changes occur very slowly. As an example of this, Figures 2 and 3 show historical water quality data from wells WN-25 and WN-18. These wells are in the contaminate plume and are in the same general areas the propped monitoring wells. Results from these wells clearly show that annual monitoring would be sufficient to adequately monitor the changing conditions within the contaminate plume. Some seasonal variability is evident in the Northwest valley wells completed in the Sweetwater River floodplain. This is due to the effects of irrigation and flooding and not due to changes in groundwater flow.

It has been suggested by NRC that groundwater monitoring north of the Sweetwater River should be considered. Groundwater monitoring north of the river is not proposed. This issue was raised previously and was addressed in correspondence to you (SMI, 2001). A copy of that response is attached.

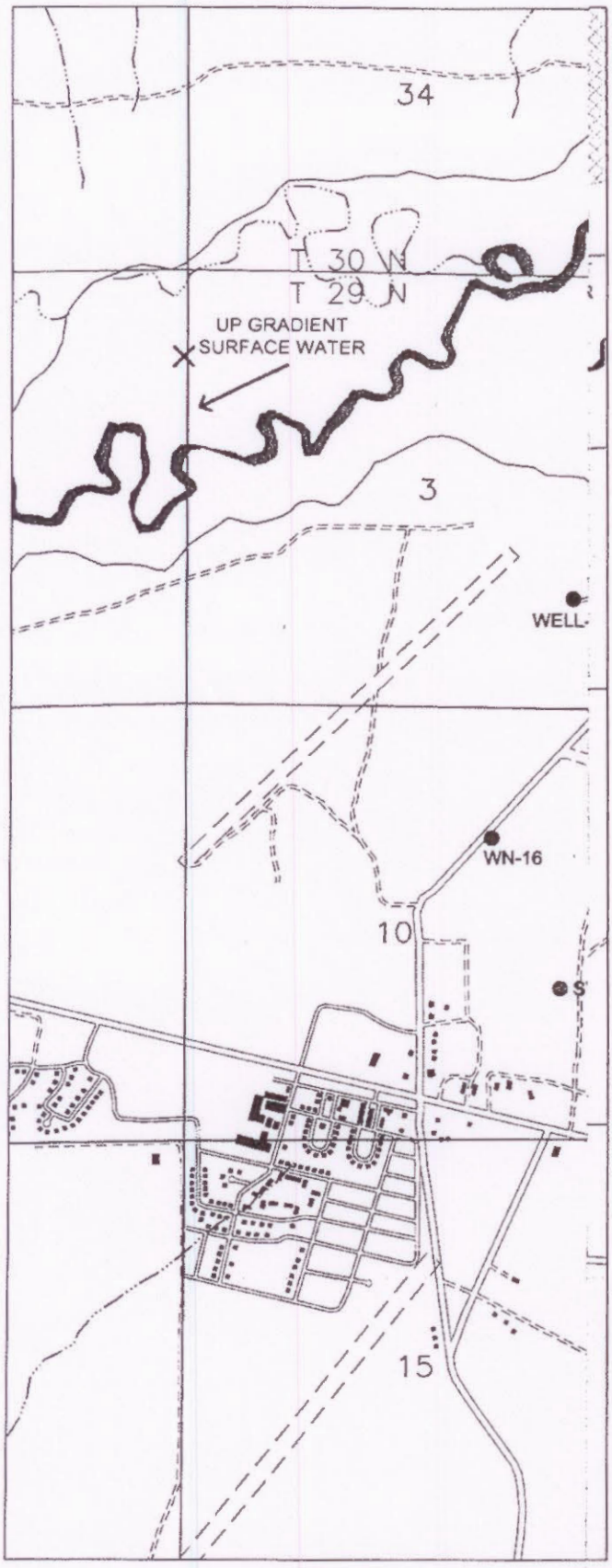
Table 1 Hazardous Constituents Analyzed in POC Wells 5 and WN-21

Al	Mo	Sb
As	Ni	Se
Be	NH_3	Th-230
Cd	NO_3	Tl
F	Pb	U
Mn	Ra-226 and Ra-228	

References:

Shepherd Miller, 2001. "WNI Response to NRC Request of 9/6/01 for Additional Information on Site Closure Plan for the Split Rock, Wyoming Site." November.

Shepherd Miller, Inc. (SMI), 1999. "Site Closure Plan." Consultant's Report. October



LEGEND

- EXISTING MONITORING WELLS
- PROPOSED MONITORING WELLS
- PROPOSED POC WELLS

NORTH

SCALE IN FEET

0 2000

FIGURE 1
EXISTING AND PROPOSED MONITORING WELLS

consulting scientists and engineers

Date:	FEBRUARY 2004
Project:	003347\2003
File:	WELLS-PREX-3.DWG

Filename: E:\03-347\2003\WELLS-PREX-3.dwg
Date: 02/12/2004
Time: 14:49:47.39

are appropriate (Anderson and Woessner, 1991). WNI maintains that this relationship is met in the model. Evidence of this relationship was observed during a site inspection of the granite outcrops near Claytor ranch. If significant granite conductivity existed, seeps would be present in that location. Although dry streambeds in this location indicate surface water is present during high precipitation events, no moisture was indicated at base flow conditions. To further characterize the presence or absence of contaminated groundwater flow through bedrock in this vicinity, a soil boring installation is planned as described in the attached approach for supplemental data collection.

Question 3: *To support the assumption that all discharge in the Sweetwater River floodplain is in the river, WNI needs to provide information to show that the USGS findings for the regional ground water applies specifically to ground water in the vicinity of the WNI mill site.*

Large bodies of water, such as the Sweetwater River, are typically assumed to be groundwater divides. The river performs either as a sink (i.e. collects groundwater) or as a source (i.e. discharges to the aquifer). Certainly, in the area of the Narrows, groundwater flow is constricted. Sedimentary bedrock groundwater flow is forced to surficial deposits as the granite bedrock rises to the surface. This hypothesis is supported by dense riparian vegetation in this area. The presence of "salt lakes" is also an indication of groundwater discharge. North of the Sweetwater River, salt lakes form on the north side of granite outcrops. These outcrops act as local dams and force groundwater to the surface on the upgradient side.

River sampling data (Appendix F, Section 8.0 of SMI, 1999) indicates that mass loading to the river is occurring from groundwater discharge from the south side of the river. As illustrated in Figures F-8-3 through F-8-13, concentrations of site-derived constituents show a consistent increase from the sampling location upstream (S-7) and across from the site (S-6) to the down stream sampling location (S-5). The loading indicated by these data demonstrate that the river acts as a sink for the flow from the south side of the river. In addition, data from the ENSR Baseline Risk Assessment (Appendix I of SMI, 1999) indicate similar data trends. Though none of the measured concentrations exceed values

protective of public health safety and the environment, these data clearly indicate the river is acting as a sink for groundwater from the south side of the river over the reach adjacent to the site.

Water level data from wells and minipiezometers on the north side of the river, when compared to projected stream stage elevations support the modeled configuration of the river as a regional sink. As shown on Tables 1 through 3 and in Figure 1, potentiometric potentials decrease toward the river from both sides of the river.

The movement of contaminants in groundwater north of the Site will be limited if the potentiometric surface of groundwater north of the Sweetwater River is at a higher elevation than the surface elevation of the river. The estimated river stage was compared to the water levels in nearby, alluvial minipiezometers to determine the difference between the potentiometric surface and the water level of the river. Minipiezometers and a river location from two areas were used in the comparison. Location A is near the Grieve Ranch directly to the north from the Site and includes MP-57 (north of river), along with MP-2 (south of the river). Location B is located near the haul road bridge over the river and includes MP-58 (north of the river) and MP-3 (south of the river). The locations of the minipiezometers are given in Figure 1.

Surface water levels were estimated for the River A and River B locations. River stage data (Table D-5-2, Appendix D of SMI, 1999) from surface water sampling locations (Figure 1) upstream and downstream of each location was used to estimate the water surface gradient at both locations A and B (Table 1). The gradient was then used with the stage data from the adjacent upstream sampling location to interpolate a river stage at both the River A and River B locations. The estimated river stage was then compared to potentiometric surface data from the nearby minipiezometers both north and south of the river. Groundwater levels for each minipiezometer can be found in Table A-15-2, Appendix A of the Site Closure Plan (SMI, 1999).

The difference between the surface elevation of the river and the associated minipiezometers is given in Table 3. In both areas, the groundwater level north of river is

at a higher elevation than the elevation of the surface of the river (0.35 feet higher at MP-57 and 1.03 feet higher at MP-58). This information suggests that between the SG-6 and SG-8 locations (Figure 1) the Sweetwater River effectively acts as a hydrologic boundary to the northward migration of groundwater.

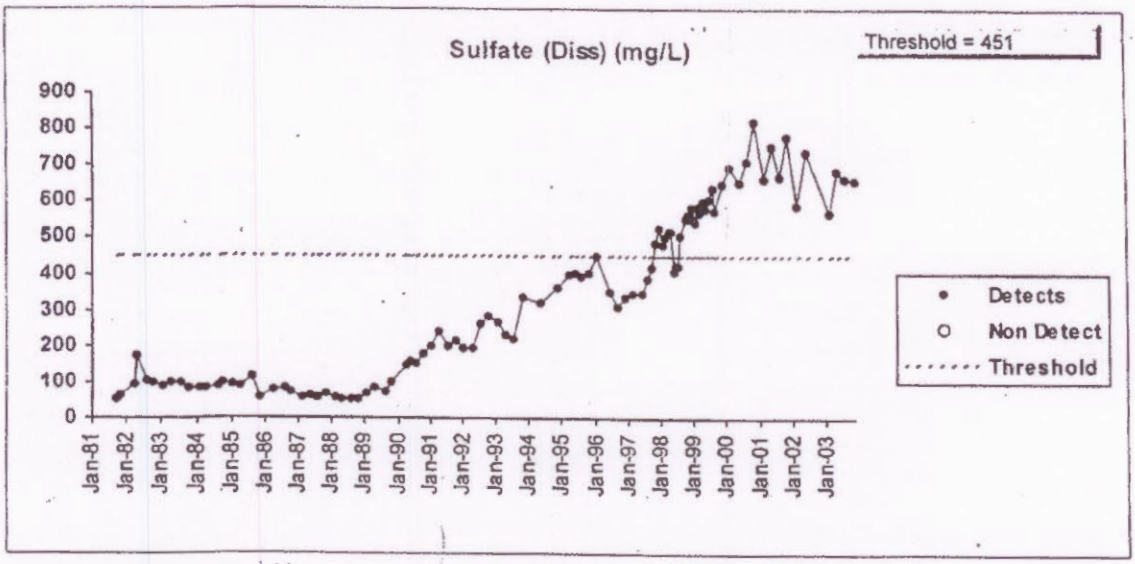
In addition, vertical gradients between the Lower Split Rock Formation, the Upper Split Rock Formation and the Floodplain Alluvium (see Table 4) support the position that the Sweetwater River is a local and regional sink. The river acts as a boundary for flow and transport for the lower formations or hydrostratigraphic units along the northern boundary of the site.

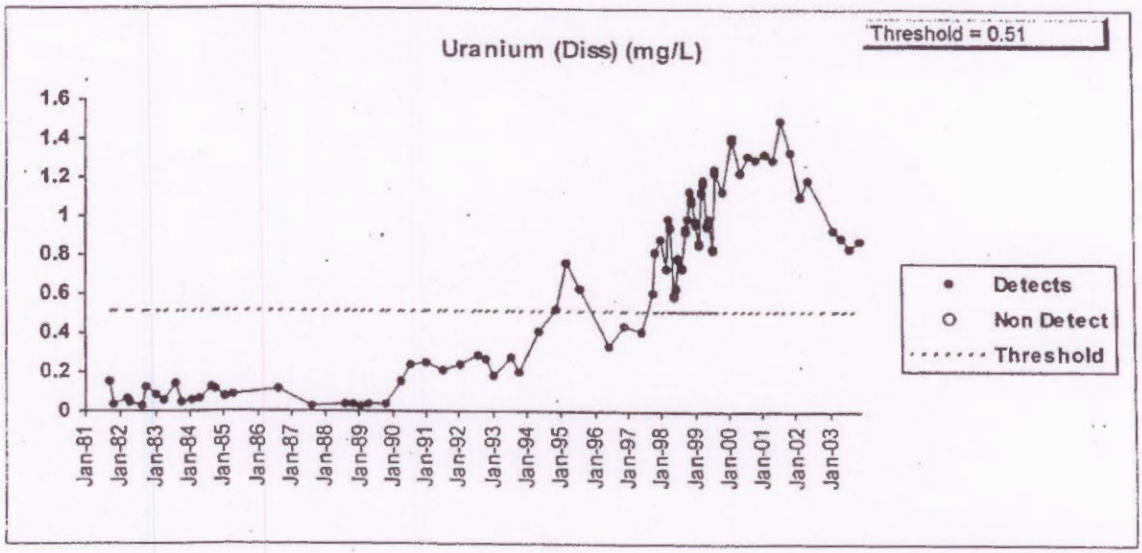
Further, inspection of the topographic contours and aerial photographs of the area support the interpretation that the area to the north of the river behave hydraulically the same as the area south of the river, that is the river is a sink for the reach adjacent to the site. The slope of the topography from the Beaver Rim, north of the site, toward the Sweetwater River and the flow of surface drainages in this same direction and the occurrence of soda lakes north of the river, where groundwater flow is impeded by small local granite outcrops, also supports the interpretation that the river is a sink for the reach adjacent to the site.

Question 4: *It is not clear whether the 1986 and 1996 calibrations were done subsequently or concurrently. If it was done subsequently, it would be useful to know what adjustments were made to the parameters from one calibration to the next and when the comparison with the observed data was done?*

The flow model calibration was an iterative process. Parameters for the 1986 model were adjusted to reasonably match the targets for that time period. After calibration of the 1986 model was achieved, the 1996 stresses, developed from review of operational data, were applied and the predicted heads and fluxes compared to the target values for the 1996 period. Again, adjustments in model parameters were made to better fit the 1996 model and the new parameters were then re-applied to the 1986 model. These iterative adjustments were continued until no adjustments were required to attain reasonable calibration in either the 1986 or the 1996 models. The model was then verified by

Jeffrey City WN-18





Jeffrey City WN-25