RAS 9916

DOCKETED
USNRC

April 27, 2005 (3:45pm)

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
E. Roy Hawkins, Presiding Officer
Dr. Richard F. Cole, Special Assistant
Dr. Robin Brett, Special Assistant

In the Matter of:)
)
) Docket No.: 40-8968-ML
Hydro Resources, Inc.)
P.O. Box 777) Date: April 21, 2005
Crownpoint, NM 87313)
)

HYDRO RESOURCES, INC.'S RESPONSE IN OPPOSITION TO INTERVENORS' WRITTEN PRESENTATION REGARDING GROUNDWATER, GROUNDWATER RESTORATION AND FINANCIAL ASSURANCE

I. INTRODUCTION

Hydro Resources, Inc. (HRI), by its undersigned counsel of record, hereby submits this Response in Opposition to Intervenors' Written Presentation Regarding Groundwater, Groundwater Restoration, and Financial Assurance with respect to HRI's Nuclear Regulatory Commission (NRC) source material license to operate an *in situ leach* (ISL) uranium recovery facility at Church Rock and Crownpoint, New Mexico. For the reasons discussed below, HRI respectfully requests that the Presiding Officer reject each of Intervenors' arguments regarding groundwater, groundwater restoration, and financial assurance.

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II. BACKGROUND AND PROCEDURAL HISTORY

HRI applied for an NRC source material license to operate an ISL uranium mining facility at the Crownpoint Uranium Project (CUP) consisting of the Church Rock Sections 8 and 17, Unit One, and Crownpoint uranium recovery sites. On November 14, 1994, NRC Staff prepared a draft environmental impact statement (DEIS) and published a notice in the Federal Register detailing its availability. *See* 59 Fed. Reg. 56,557 (November 14, 1994). This Federal Register notice provided potentially affected parties with an opportunity to request a hearing in accordance with 10 CFR § 2.1205. Several parties filed hearing requests with NRC and a Presiding Officer was designated by the Atomic Safety and Licensing Board on December 21, 1994. *See* 59 Fed. Reg. 66,979 (January 8, 1995). However, the Presiding Officer held all aspects of the proceeding, including final determinations of standing for a hearing, in abeyance until NRC Staff completed its review of HRI's license application and issued its final environmental impact statement (FEIS). On February 29, 1997, NRC Staff issued its FEIS and, on January 5, 1998, NRC Staff approved HRI's license application and granted HRI License No. SUA-1508.

On May 13, 1998, the Presiding Officer permitted several parties, including the Eastern Navajo Dine Against Uranium Mining (ENDAUM), the Southwest Research Information Center (SRIC), and Grace and Marilyn Sam (hereinafter the "Intervenors"), to intervene to challenge HRI's license under NRC's 10 CFR Part 2, Subpart L provisions for "informal hearings." *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), LBP-98-9, 47 NRC 261 (May 13, 1998). Additionally, in September of 1997, NRC Staff requested leave to participate as a party in the hearing process in accordance with 10 CFR §§ 2.1213 & 2.1237. During the hearing, the Presiding Officer bifurcated the proceeding to address HRI's four proposed uranium mining sites under its NRC license separately: (1) Church Rock Section 8; (2) Church Rock Section 17; (3) Unit One; and (4) Crownpoint.

A. Groundwater Area of Concern

As part of the Subpart L hearing process, Intervenors were required to submit a list of contentions to the Presiding Officer to determine which areas of concern, if any, were germane to this proceeding. The Presiding Officer admitted the following areas of concern regarding groundwater as germane: (1) degradation of the Crownpoint and Church Rock water supplies, threatening public health in violation of the Safe Drinking Water Act (SDWA); (2) inadequate monitoring for excursions; (3) improper guidance defining excursions, resulting in inadequate protection of drinking water; (4) inadequate groundwater restoration standards; and (5) failure to demonstrate that adequate restoration can be achieved. *See id.* at 268, fn 46-50.

With respect to groundwater and groundwater restoration issues, on January 11, 1999, Intervenors filed their initial written presentation and argued, *inter alia,* that HRI's NRC license should be suspended or revoked based on alleged deficiencies in HRI's license application and NRC Staff's review of such application. *See* Intervenors' Written Presentation in Opposition to Hydro Resources, Inc.'s Application for a Materials License with Respect to Groundwater Protection, (January 11, 1999) (ACN ML9901200072). On January 18, 1999, Intervenors filed an amended written presentation which included additional information and argument. *See* Intervenors' Amended Written Presentation in Opposition to Hydro Resources, Inc.'s Application for a Materials License with Respect to Groundwater Protection, (January 18, 1999) (ACN 9901210089). On February 19, 1999, HRI submitted its response to Intervenors' written presentation arguing that its license application satisfied relevant NRC regulatory requirements for ISL uranium recovery operations. *See HRI's Response to Intervenors' Brief with Respect to Groundwater Issues*, (February 19, 1999) (ACN ML9903010016).

On August 20, 1999, the Presiding Officer determined that Intervenors' arguments with respect to groundwater and groundwater restoration issues were without merit and that HRI's license application satisfied NRC regulations for groundwater protection and restoration during licensed ISL uranium recovery operations. *See In the Matter of Hydro Resources, Inc.*, 50 NRC 77, LBP-99-30 (August 20, 1999). More specifically, the Presiding Officer determined that Intervenors' characterization of the geologic features of the proposed Section 8 site was incorrect and that HRI's license application provided for ample protection of public health and safety with respect to groundwater issues. *See generally id.*

After the Presiding Officer issued his decision in LBP-99-30, Intervenors appealed the decision to the Commission. On July 10, 2000, the Commission declined review of Intervenors' appeal stating that, where Licensing Board decisions are dependent on fact-specific submission and the Presiding Officer's interpretation of such submissions, "'[b]ecause the Presiding Officer has reviewed the extensive record in detail, with the assistance of a technical advisor, the Commission is generally disinclined to upset his findings and conclusions, particularly on matters involving fact-specific issues or where the affidavits or submissions of experts must be weighed."' *In the Matter of Hydro Resources, Inc.*, CLI-00-12, 52 NRC 1, *3 (July 10, 2000) *quoting In the Matter* *of Hydro Resources, Inc.*, CLI-99-22, 50 NRC 3 (1999). Thus, with respect to groundwater issues, HRI's license application to conduct ISL uranium recovery activities at Section 8 has been upheld.

B. Groundwater Restoration & Financial Assurance Area of Concern

On March 9, 1999, the Licensing Board issued LBP-99-13 in which the Presiding Officer opined that the provisions of 10 CFR § 40.36 do not apply to HRI's license application, that the portions of 10 CFR Part 40, Appendix A regarding permanent isolation of tailings and the long-term surveillance of such tailings and other milling wastes are not applicable to HRI's license application, and that HRI's license specifically mandates financial assurance cost estimates using nine (9) pore volumes for groundwater restoration with the requirement that the pore volume estimate be adjusted after a mandatory wellfield restoration demonstration should the pore volume estimate be deemed insufficient.

Intervenors appealed the decision in LBP-99-13 to the Commission. In CLI-99-22, the Commission determined that further briefing was required on the issue of (1) whether HRI submitted sufficient financial assurance information for groundwater restoration and decommissioning and (2) whether the submission of a financial assurance plan is a prerequisite to receiving an NRC license for ISL uranium mining. *See In the Matter of Hydro Resources, Inc.*, CLI-99-22, 50 NRC 3, *42 (July 23, 1999).

After reviewing the parties briefs, on May 25, 2000, the Commission determined that 10 CFR Part 40, Appendix A, Criterion 9 requires that HRI submit restoration action plans (RAPs) detailing financial assurance cost estimates for groundwater restoration in order to be granted a license. *See generally In the Matter of Hydro Resources, Inc.*

(Crownpoint Uranium Project), CLI-00-08, 51 NRC 227 (May 25, 2000). Declining to revoke the license, the Commission ordered HRI to submit RAPs for each of its four (4) proposed ISL uranium recovery sites for NRC Staff review and approval.

In accordance with the Commission's Order in CLI-00-08, HRI submitted RAPs for each of its proposed CUP ISL uranium recovery sites. Subsequently, over the course of 2001 & 2002, NRC Staff approved HRI's RAPs and determined that its accompanying financial assurance cost estimates were sufficient to effectuate groundwater restoration and decommissioning at each site.

In the interim, this proceeding was held in abeyance pending settlement discussions between Intervenors and HRI. The Licensing Board appointed a Settlement Judge to oversee the negotiations. After nearly two years of unsuccessful negotiations, the Presiding Officer reconvened this proceeding and reviewed each of the parties' submissions regarding the Church Rock Section 8 RAP and accompanying financial assurance costs estimates.

On February 27, 2004, the Presiding Officer issued LBP-04-03 stating that HRI's Church Rock Section 8 RAP required three (3) specific revisions prior to conducting any ISL uranium recovery operations at the site: (1) the RAP's financial assurance cost estimates could not assume the availability of major site equipment at the time of restoration; (2) the RAP's financial assurance cost estimates could not assume that site employees would perform multiple, unrelated tasks (i.e., wearing "multiple hats"); and (3) the RAP must be revised to reflect the "tremie line" method of well-plugging.

HRI appealed the Presiding Officer's ruling in LBP-04-03 to the Commission arguing that LBP-04-03's conclusion that a RAP financial assurance cost estimate could not assume the availability of major site equipment or the performance of multiple, unrelated tasks by site employees was incorrect and was inconsistent with NRC regulations and standard ISL uranium recovery industry practices. In CLI-04-14, the Commission granted review of HRI's appeal and ordered substantive briefs to be submitted.

On December 8, 2004, the Commission issued CLI-04-33 finding that the Presiding Officer's conclusions in LBP-04-03 regarding HRI's appealed issues (1) and (2) above were incorrect and, as such, reversed the Presiding Officer's findings. Thus, the Commission's decision in CLI-04-33 signaled the end of the proceedings regarding the Section 8 site.

On November 5, 2004, the Presiding Officer issued a scheduling order requiring HRI and Intervenors to proceed with litigation of all germane areas of concern regarding the three remaining CUP sites in the CUP: (1) Churchrock Section 17; (2) Unit One; and (3) Crownpoint. On January 19, 2005, the Presiding Officer approved a joint motion filed by Intervenors and HRI to amend the briefing schedule as set forth in the Presiding Officer's November 5, 2004 Order. After approving the parties' requested amendments to the briefing schedule, on February 3, 2005, the Presiding Officer issued a new scheduling order reflecting such amendments. More specifically, as agreed by the parties, the new scheduling order eliminated three germane areas of concern from the litigation (i.e., environmental justice, financial and technical qualifications, and liquid waste disposal and surface water protection) and limited one additional area of concern (i.e., air emissions) to the Church Rock Section 17 site.

In response to the Presiding Officer's November 5, 2004, scheduling order, as revised by his February 3, 2005, order and Intervenors' March 7, 2005, written presentation, HRI hereby submits this written presentation and respectfully requests that the Presiding Officer reject each of Intervenors' arguments with respect to groundwater, groundwater restoration, and financial assurance.

III. STANDARD OF REVIEW

A. Scope of Licensing Board Review

Normally, the Licensing Board is charged with compiling a factual record in a proceeding, analyzing the record, and making a determination based upon the record. The Licensing Board performs the important task of judging factual and legal disputes between parties and has the responsibility for appraising *ab initio* the record developed before it and for formulating the agency's initial decision based on that appraisal. *See Wisconsin Electric Power Co.* (Point Beach Nuclear Plant, Unit 2), ALAB-78, 5 AEC 319, 322 (1972). A Licensing Board is not required to do independent research or conduct *de novo* review of an application in a contested proceeding, but may rely upon uncontradicted Staff and applicant evidence. *See Consumers Power Co.* (Midland Plant, Units 1 & 2), ALAB-123, 6 AEC 331, 334-35 (1973).

With respect to the jurisdiction of the Licensing Board, a Licensing Board has only the jurisdiction and power which the Commission delegates to it. *See e.g., Public Service Co. of Indiana* (Marble Hill Nuclear Generating Station, Units 1 & 2), ALAB-316, 3 NRC 167 (1976). While the Licensing Board possesses the power to provide initial reviews of license applications in contested proceedings, it does not possess the power to overrule Commission holdings. Where a matter has been considered by the

Commission, it may not be reconsidered by a Board. *Virginia Electric & Power Co.* (North Anna Nuclear Power Station, Units 1 & 2), ALAB-584, 11 NRC 451, 463-65 (1980). A Licensing Board for an operating license proceeding is also limited to resolving matters that are raised therein as *legitimate* contentions by the parties or by the Board *sua sponte*. *See e.g., Dairyland Power Cooperative* (LaCrosse Boiling Water Reactor), LBP-88-15, 27 NRC 576, 579 (1988) (emphasis added).

B. Collateral Estoppel

Principles of *collateral estoppel*, like those of *res judicata*, may be applied in administrative adjudicatory proceedings. *U.S. v. Utah Construction and Mining Co.*, 384 U.S. 394, 421-422 (1966). Collateral estoppel precludes re-litigation of issues of law or fact which have been finally adjudicated by a tribunal of competent jurisdiction. *Toledo Edison Co.* (Davis-Besse Nuclear Power Station, Units 1, 2, and 3), ALAB-378, 5 NRC 557 (1977). The application of collateral estoppel does not hinge on the correctness of the decision or interlocutory ruling of the first tribunal. *Id.* It is enough that the tribunal had jurisdiction to render the decision, that the prior judgment was rendered on the merits, that the cause of action was the same, and that the party against whom the doctrine is asserted was a party to the earlier litigation or in privity with such a party. *Id.* Collateral estoppel requires the presence of at least four elements in order to be given effect: (1) the issue sought to be precluded must be the same as that involved in the prior action, (2) the issue must have been actually litigated, (3) the issue must have been determined by a valid and final judgment, and (4) the determination must have been essential to the prior judgment. *See e.g., Houston Lighting & Power Co.* (South Texas Project, Units 1 & 2), LBP-79-27, 10 NRC 563, 566 (1979).

C. Statutory and Regulatory Pre-Conditions for ISL Uranium Recovery Pursuant to an NRC License

1. EPA's Safe Drinking Water Act Underground Injection Control Program

To assure safe and effective underground injection throughout the United States, in 1974, the United States Congress enacted the SDWA, which, in part, authorized establishment of the Underground Injection Control (UIC) program so that injection wells would not endanger current and future underground sources of drinking water (USDWs). The SDWA empowered the United States Environmental Protection Agency (EPA) with the primary authority to regulate underground injection to protect current and future sources of drinking water. EPA also was authorized to provide States with the opportunity to assume primary authority over UIC programs in accordance with final regulations promulgated by EPA in 1980, which set minimum standards for State programs to meet to be delegated primary enforcement responsibility (primacy) over such programs.[1] UIC regulations establish specific performance criteria for each well class (ISL uranium mining wells for the CUP are Class III wells) to assure that drinking water sources, actual and potential, are not rendered unfit for such use by underground injection of the fluids common to that particular category of wells.

Between 1981 and 1996, EPA granted primacy to 34 States for all injection wells (except those on Tribal lands). EPA implements the UIC program directly in 10 States and shares responsibility in six (6) other States. The State of New Mexico has primacy for the UIC program, but EPA directly implements UIC programs for all Native

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[1] *See* 42 U.S.C. § 300h(1) (2005).

American lands. Unless authorized by rule or by permit, any underground injection is unlawful and is in violation of the SDWA and UIC regulations.

Before NRC-licensed ISL uranium recovery operations can commence at any CUP site, HRI must have obtained two authorizations: (1) an aquifer exemption for the aquifer or portion of the aquifer wherein ISL mining operations will occur and (2) a UIC permit. Underground injection is broadly defined as the technology of placing fluids underground in porous formations of rocks through wells or other similar conveyance systems. Thus, all ISL uranium recovery injection well activities require these relevant authorizations.

2. Aquifer Exemptions

As noted above, the UIC program was created to protect current or future USDWs. A USDW is defined as an aquifer, or portion thereof, which serves as a source of drinking water for human consumption, or contains a sufficient quantity of water to supply a public water system, and contains fewer than 10,000 mg/liter of total dissolved solids (TDS). The broad definition of a USDW was mandated by Congress in Section 1421(d)(2)[2] of the SDWA to ensure that future USDWs would be protected, even where those aquifers were not currently being utilized as a drinking water source or could not be used without some form of water treatment.

Within this regulatory framework, however, some aquifers or portions of aquifers, which can meet the broad regulatory definition of a USDW, may not reasonably be expected to serve as a current or future source of drinking water. As a result, the UIC program regulations allow EPA to *exempt* portions of an aquifer from delineation as a

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[2] *See* 42 U.S.C. § 300h(b)(1) (2005).

USDW and allow for injection into such aquifers or portions thereof. EPA regulations at 40 CFR § 144.8 specifically state:

> "An aquifer or a portion thereof which meets the criteria for an 'underground source of drinking water' in § 146.3 may be determined under 40 CFR § 144.8 to be an *'exempted aquifer'* if it meets the following criteria:
>
> a. It does not currently serve as a source of drinking water; and
> b. It cannot now and will not in the future serve as a source of drinking water...or
> c. The total dissolved solids content of the ground water are more than
>
> 3,000 and less than 10,000 mg/L and it is not reasonably expected to supply a public water system."[3]

According to EPA, aquifers meeting these criteria are generally associated with *in situ* mineral recovery and enhanced oil recovery. If an operator, licensee or permittee wishes to inject into a USDW for the purpose of recovering minerals (e.g., uranium), a demonstration must be made that the proposed aquifer meets at least one of the exemption criteria. EPA has issued guidance on the standards that must be satisfied to qualify for an aquifer exemption. To the best of HRI's knowledge, there is no provision in the SDWA authorizing revocation of an aquifer exemption granted pursuant to 40 CFR § 144.8 nor has EPA promulgated regulations establishing criteria for revocation of an aquifer exemption nor has it ever actually revoked such an exemption.

In addition, EPA does not prescribe specific groundwater restoration standards for exempted aquifers, because such exempted aquifers will not be used as drinking source at any point after ISL operations are complete. However, as described in 40 CFR § 146.7, EPA does require corrective action/remediation for any contamination of adjacent, non-

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[3] *See* 40 CFR § 144.8 (2005) (emphasis added).

exempt aquifers in accordance with the purpose of the SDWA and the UIC program to protect USDWs.[4]

3. Underground Injection Control Permits

To obtain a permit for a new Class III well, the owner/operator or licensee must file an application with the UIC Director for the relevant jurisdiction containing specific information listed in 40 CFR Part 146 or in applicable State requirements. Once a UIC permit application has been reviewed, the applicant will be notified of the items needed to complete the application, if any. After a complete application is received, an initial decision to grant or deny the permit is issued. UIC regulations also provide opportunities for public participation and comment.

A UIC permit for each site is a necessary prerequisite for the operation of an ISL uranium recovery project such as the CUP. Such a permit necessarily assumes that the aquifer or portion thereof to be used for underground injection *cannot now or in the future be used as a USDW.* Without this fundamental assumption, a UIC permit for ISL uranium mining will not be issued.

Pursuant to its NRC license, HRI will be required to restore mining zone groundwater (exempted aquifer groundwater) consistent with *pre-mining water quality* or *secondary* standards (e.g., maximum contaminant levels (MCLs)) prescribed for given constituents under the SDWA. Additionally, if neither restoration goal referenced above can be satisfied, a licensee is permitted to request an exemption for a constituent upon a

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[4] For further discussion on this issue, *please see* HRI Exhibit A at ¶¶ 12-18.

showing that there will be no adverse impacts on public health and safety.[5] This requirement is permissible, because the aquifer exemption concept assumes that the exempted aquifer or portions thereof *will not serve as a drinking water source at any time.*

Thus, EPA's UIC program recognizes that many aquifers or portions thereof cannot now or ever in the future serve as viable USDWs. In many cases, the contamination in such water sources is created by the presence of high concentrations of minerals (e.g., uranium) that may be recovered using underground injection methods. As such, the UIC program provides for aquifer exemptions, *which must be obtained prior to the commencement of underground injection* for the purposes of ISL uranium recovery.

IV. ARGUMENT: GROUNDWATER: CHURCH ROCK SECTION 17, UNIT ONE, & CROWNPOINT

To promote better organization, HRI has prepared Sections IV, V, and VI of this written presentation to encompass all three remaining HRI uranium recovery sites. Should any argument require HRI to differentiate between uranium recovery sites, HRI will provide separate subheadings in accordance with the Presiding Officer's Order of November 5, 2004. As many of Intervenors' site-specific arguments are addressed in HRI's expert affidavits, specific references to such affidavits will be provided where relevant.

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[5] This procedure is similar to that provided for conventional uranium milling licensees in 10 CFR Part 40, Appendix A, Criterion 5 which allows groundwater remediation to background or MCLs, whichever is higher, or to constituent-specific *alternate concentration limits* (ACLs) upon a demonstration that the latter will not result in any adverse impacts on public health, safety, and the environment.

A. HRI Concedes that the Secondary Groundwater Standard May Be Set At 0.03 mg/L for All CUP Sites

Initially, Intervenors argue that the secondary groundwater restoration standard of 0.44 mg/L for uranium at each of the three (3) remaining CUP mining sites (i.e., Church Rock Section 17, Unit One, and Crownpoint) should be revised to reflect the new SDWA maximum contaminant level of 0.03 mg/L (MCL) for uranium in *drinking water sources.* More specifically, Intervenors allege that implementation of the 0.44 mg/L will result in various harmful effects to groundwater in the mining zone portion of the aquifer and to nearby *non-exempt* aquifers that potentially may serve as a USDW under EPA regulations.

Intervenors allege that each of the aquifers, or portions thereof, at Church Rock Section 17, Unit One and Crownpoint where uranium recovery will occur currently serve as drinking water sources and that ISL uranium recovery in such aquifers will result in permanent contamination of a USDW. *See* Intervenors' March 7, 2005, Written Presentation at 22, 31, & 33. This allegation includes assertions that the current secondary groundwater restoration standard is not intended to protect USDWs and that HRI should be required to restore groundwater in the mining zone to the SDWA MCL for uranium. *See id.* at 59-60. In support of these arguments, Intervenors offer the testimony of John Fogarty, Donald Molony, and Richard Abitz, as well as citations from and discussions on numerous treatises and studies. *See id.* at 22-39 & Intervenors' Exhibits N, Q, & R.

Intervenors arguments are without merit for several reasons. Initially, Intervenors assumption that the aquifers or portions thereof in the Church Rock Section 17, Unit One, and Crownpoint uranium recovery zones can be classified as USDWs under the SDWA[6] ignores the fact that HRI is not permitted to conduct ISL uranium mining operations in *any* aquifer without an aquifer exemption. As stated above, EPA's UIC program requires the issuance of aquifer exemptions prior to the commencement of injection into aquifers where minerals may be recovered (e.g., uranium). EPA does not issue aquifer exemptions for aquifers that potentially may serve as a drinking water source presently or in the future. As a result, HRI cannot conduct ISL mining activities in the aquifers at the three remaining sites unless EPA determines that the water in the recovery zone *cannot* serve as a potential source of drinking water. The issue of whether these particular aquifers can serve as drinking water sources will be decided when HRI applies for aquifer exemption. Presumably, these aquifer exemptions will be based on the high concentrations of uranium (and uranium progeny; radium, and radon) that make the water in these aquifers or portions thereof unfit to be a USDW.[7] Therefore, Intervenors' contentions are not a matter for this Licensing Board to adjudicate and need not be addressed.

Further, even if the Licensing Board determines that Intervenors' arguments should be addressed, HRI does not contest Intervenors' request to amend the secondary groundwater restoration standard to reflect the 0.03 mg/L SDWA MCL for uranium.

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[6] Intervenors also allege that the Cow Springs aquifer will serve as an USDW for the proposed Springstead Estates Project near the Church Rock Section 17 mining site. Intervenors' March 7, 2005, Written Presentation at 23. Prior to the submission of their written presentation, Intervenors requested that the Licensing Board, and later the Commission, direct NRC Staff to supplement the FEIS to account for the potential construction and occupancy of the SEP. In both cases, Intervenors' request was rejected, because the SEP is merely in a conceptual stage and should not be part of the NRC's evaluation of the CUP. *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), 2004 NRC LEXIS 203 (October 22, 2004).

[7] For addition discussion on this issue, *please see* HRI Exhibit A at ¶¶ 35-39 & Attachment A.

When HRI submitted its license application (1988) and NRC Staff drafted and issued the DEIS (1994) and the FEIS (1997), EPA had not yet promulgated an MCL for uranium for drinking water sources. As a result, NRC Staff and HRI reviewed the various potential secondary standards for groundwater from different regulatory authorities. After this review was complete, NRC Staff and HRI agreed to select the 0.44 mg/L standard for uranium for the CUP's secondary groundwater restoration standard. By selecting this standard, HRI and NRC Staff sought to ensure that groundwater in the relevant mining zone aquifers would either be restored consistent with pre-mining water quality or be compliant with a relevant regulatory standard.

In the time period between the issuance of the FEIS and the present, EPA promulgated its final rule for uranium in drinking water and set the MCL for uranium at 0.03 mg/L. Since the promulgation of this standard occurred after the submission of HRI's license application and the creation and issuance of the DEIS and FEIS for the CUP, such standard was not among the potential options considered by NRC Staff and HRI when determining the proper secondary groundwater restoration standard. As a result, HRI agrees that now it is proper to set the CUP's secondary groundwater restoration standard at 0.03 mg/L.

In summary, Intervenors' arguments relating to the potential impacts to public health and safety and the environment[8] as a result of setting the CUP's secondary groundwater restoration standard need not be evaluated by the Licensing Board because the aquifers or portions thereof where mining operations will occur require EPA aquifer

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[8] Although HRI does not dispute the application of the new SDWA MCL for uranium to the CUP, HRI does not necessarily agree with Intervenors' interpretation of the potential health and safety impacts of uranium in drinking water.

exemptions and UIC permits. These exemptions and permits require, by regulation, a determination by EPA or other relevant regulatory authorities that such aquifers cannot now nor in the future be considered a USDW. Further, even if such arguments are evaluated by this Licensing Board, HRI does not object to setting the CUP's secondary groundwater restoration standard at 0.03 mg/L. Therefore, based on the requirements of EPA's SDWA UIC program and HRI's concession to Intervenors' request to revise the secondary groundwater restoration standard discussed above, Intervenors arguments regarding the potential adverse impacts of the 0.44 mg/L standard are moot.

B. Intervenors Have Failed to Demonstrate that HRI's Proposed ISL Uranium Recovery Operations Will Result in Migration of Contaminants to Adjacent, Non-Exempt Aquifers

Next, Intervenors offer several arguments alleging that HRI's proposed ISL uranium recovery operations at the Church Rock Section 17, Unit One, and Crownpoint sites will result in the migration of contaminants from each respective uranium recovery zone to adjacent non-exempt aquifers and the contamination of a USDW; particularly the existing Crownpoint municipal wells. Specifically, Intervenors allege: (1) that HRI's groundwater flow model is improperly calibrated for the calculation of potential migration times, (2) that HRI has improperly characterized the Westwater Formation as "homogeneous," (3) that the study of outcrops at the Westwater provides more relevant geological data than tests used by HRI, (4) that HRI's pump test data demonstrates that the aquifer is "heterogeneous at each mining site, and (5) that HRI has misinterpreted is own pump test data and geophysical logs. Intervenors' March 7, 2005, Written Presentation at 73-74, 78-81, & 85-86. Intervenors also allege that the Westwater Formation in the uranium recovery zones is not vertically confined and that the

"Recapture Shale" does not exist at the Church Rock Section 17 site. *Id.* at 77, 83-84, & 87-89. In support of these allegations, Intervenors offer the testimony of Spencer Lucas (Lucas), Richard Abitz (Abitz), and Michael Wallace (Wallace) to demonstrate that migration of contaminants will occur outside the mining zone.[9]

1. Intervenors' Expert Testimony Regarding Its Groundwater Model and the Presence of "Channels" Should Be Rejected

Intervenors' main focus is on the alleged existence of "channels" in the Westwater Formation that will promote the rapid, uncontrolled migration of groundwater contaminants and mining solutions from the exempted aquifer in the uranium recovery zone to adjacent, non-exempt USDWs. Intervenors' expert, Wallace, alleges that the groundwater model used by HRI to demonstrate that the migration of mining solutions will not endanger non-exempt USDWs is flawed. In response to HRI's model, Wallace offers testimony involving a new groundwater model that allegedly is "better calibrated" than HRI's model. Using this model, Intervenors' allege that groundwater contaminants will migrate more quickly from each of the proposed mining sites to non-exempt USDWs than originally estimated by HRI and NRC Staff in the FEIS. *Id.* Further, Intervenors offer additional testimony to refute HRI's statements that these alleged "channels" do not exist.

As will be discussed below, Intervenors' "channel" concept is without merit and is not supported by any of the data or other information currently in the record. Indeed, in LBP-99-30, Judge Bloch determined that Intervenors' "channel" theory was not applicable to the CUP. *See generally* LBP-99-30. More specifically, Judge Bloch stated:

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[9] It is worth noting at the outset that none of Intervenors' "experts" has had any recent "hands-on" experience with ISL uranium recovery pre-mining characterization, production or groundwater restoration.

> "For the Intervenors' concerns about channelways to be relevant to this proceeding, there must be narrow channelways that transport water must faster than surrounding rock, possibly causing water to bypass monitoring wells and to create rapid excursions, much as if there were underground pipes that somehow manage to avoid all the monitoring wells....I conclude, based on a review of the entire record, that the Westwater does not contain channelways."

LBP-99-03 at *14.

Since Intervenors' rest many, if not all, of their allegations regarding groundwater contamination in adjacent USDW's from HRI operations on this "channel" concept, if Judge Bloch's decision as affirmed by the Commission and HRI's written presentation and expert testimony effectively demonstrate that Intervenors' channel theory is without merit, then their entire case fails and must be rejected.

a. Wallace Testimony Regarding Model Calibration and the Existence of "Channels" in the Westwater

Contrary to Intervenors' assertions, "channels" promoting groundwater excursions do not exist at the CUP. Intervenors allege that HRI's groundwater model for demonstrating retarded groundwater migration is improperly calibrated and that Wallace's new groundwater model is "better calibrated"[10] and more accurately depicts the potential for groundwater excursions and travel times to adjacent, non-exempt USDWs.

Initially, HRI's expert, Mr. Bartels, analyzes the model presented by Wallace with respect to the Westwater and determines that they lack proper foundation:

> "[l]acking the specific data input for those models, the assumptions of the basic models themselves can be neither verified nor validated. Rather than specifics of the models, <u>cell by cell</u> (layers and thickness, size in 3-D, boundary conditions, K, storage, porosity, well locations, open intervals, flowrates, etc.), Wallace provides

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[10] HRI Exhibit B at ¶¶ 130-139 also provides detailed analyses of Wallace's "animation" and "predictive" models.

> only generalized information (Wallace Figures 5, 6, and 23 from Exhibit B, and Table 1 at ¶ 32)."

HRI Exhibit B at ¶¶ 135-136.

Without this information, Mr. Bartels concludes that Wallace's model can only be evaluated "generally" and not with any specificity. Given that "each of the cells and stem parameters are important in assessing their claims," Wallace's model lacks the proper foundation to be considered viable. *See id.* at ¶ 136.

Wallace also assumes that his model is "more closely calibrated to HRI's pump test data than HRI's model." However, Mr. Bartels strongly disputes this conclusion when he states, "[t]here is no justification for suggesting that detail is know about the Crownpoint site to the extent shown in his [Wallace] Exhibit B at Figures 5 and 17 [attached here as Exhibit N]...." HRI Exhibit B at ¶ 134. With respect to the data and input actually provided by Wallace for his SEP model, Mr. Bartels states, "[a] close examination of that data, in trying to validate his model, shows some values to be hugely exaggerated (despite his claims that the model was 'conservative')." *Id.* at ¶ 130. Mr. Bartels also asserts that Wallace failed to use the correct data in several instances, such as with respect to the proposed SEP:

> "his calculated drawdown is too low by 60 (10 X 6) times; instead of 200 feet drawdown calculated by Wallace, it should be 12,000 feet of drawdown....Wallace...simply ignores scientific evidence that is inconvenient for his argument...."

Id. at 88.

Wallace's failure to use the correct data is compounded by his reliance on assumptions with no evidence:

> "His scenario...requires these unproven assumptions...(1) that the SEP will ever be constructed, or even started before HRI has finished mining at Church Rock Section 8 and 17, (2) that there is sufficient transmissivity in Cow Springs to pump 417 gpm, (3) that there is sufficient water in the area to pump 417 gpm, (4) that a '*set of blocks is postulated to form an effectively continuous 'field' from Section 17 to an anticipated municipal well field at the north end of the proposed Springstead community, approximately 18,000 feet away*' leaking from above but not to the sides, (5) that monitor wells do not exist at Church Rock, or are ignored by NRC or other regulatory agencies for 150 years, [and] (6) that his model is credible."

Id. at ¶ 88.

By relying primarily on assumptions without supporting evidence, Wallace's testimony does not convey any credibility.

Then, Mr. Bartels analyzed the general premise underlying Wallace's testimony which he determined to be that "Wallace is attempting to recast his original *single pipeline theory*...into a heterogeneous system model shown as his Figure 5 (see Attachment N)." HRI Exhibit B at ¶ 92 (emphasis in original). As a general proposition, Mr. Bartels states that, "his [Wallace] 'pipelines' were shown to be nonsensical" by Judge Bloch in 1999. *See id.* More specifically, Mr. Bartels notes that, "Wallace...discussed the 'pipeline' fault as if it existed without noting the evidence to the contrary [Bartels (2004) at ¶ 25]." *Id.* at ¶ 78. When evaluating Wallace's SEP testimony from 2004 using available evidence, Mr. Bartels determined that:

> "[w]e are expected to defend ourselves against the imaginary concept that buried sedimentary blocks formed and bounded an 18,000 foot 'pipeline' that...goes exactly where Wallace wants it, from [Church Rock] Section 17 to Springstead municipal wells, even though no such wells exist, and no one knows if SEP will ever be constructed, or <u>if</u>, or <u>where</u> municipal well will ever be drilled."

Id. at ¶ 83.

According to Mr. Bartels, the same inconclusive, convenient conclusions without supporting evidence reached by Wallace with respect to the SEP can be projected over his analysis of the CUP at Unit One and Crownpoint:

> "[j]ust as he does now for the SEP, Wallace (1999) proposed single 'pipeline' channels containing all of the flow from the Crownpoint municipal wells....[However], the barriers or boundaries of the channel that Wallace...proposes would be evident from the pump tests of the area, and have never been observed, not at Church Rock, Unit 1, or Crownpoint."

Id. at ¶¶ 84 & 92.

Based on this lack of practical evidence, Wallace's "channel" concept should be rejected.

Moreover, according to Mr. Bartels, Wallace's (and Abitz's) testimony focuses generally on discussions of *heterogeneous, fluvial* systems versus homogeneous systems. However, based on their fundamental misunderstanding of the critical differences between the two systems, they fail to recognize that "the fluvial and heterogeneous nature of the sands in New Mexico have been repeatedly and extensively discussed, and the sands in New Mexico are no different from most other ISL settings,"—that is, they behave *hydrologically* as a homogeneous unit. *Id.* at ¶ 94. Based on a comprehensive review of multiple ISL uranium recovery facilities in the United States, Mr. Bartels agrees with Judge Bloch's decision from 1999:

> "The conclusion was reached in 1999:
>
> > "Bloch (1999) at p. 15: "I agree with HRI expert Bartels that if lengthy channelways exist at Church Rock, they should occur in other ISL uranium sites which have a very similar fluvial environment. (Bartels Affidavit at 10-14.). Channelways have not been reported elsewhere, so far as I am not aware, nor do the Intervenors provide evidence of them."

LBP-99-30 at *19.

Therefore, based on the discussion above, Wallace's testimony regarding the presence of "channels" in the Westwater should be rejected.

b. Lucas Testimony Regarding the Existence of "Channels" at the Westwater

Next, Lucas cites Cowan in an attempt to demonstrate that the Westwater Member is *heterogeneous* and that such "channels" exist. However, Mr. Lichnovsky refutes Lucas as follows:

> "Cowan's paper specifically demonstrates that at the small scale that the Westwater Canyon Member *is not lithologically heterogeneous* and does <u>not</u> consist [sic] of numerous, interlaced ribbon-like sandstone bodies and lenses of conglomerate and mudstone *but does consist [sic] of amalgamated and coalesced sandstone sheets*."

HRI Exhibit C at ¶ 73 (emphasis added).

According to Mr. Lichnovsky, Cowan's writing "certainly excludes ribbon-like permeability channels being present at any of the HRI sites....The small-scale ribbon-like channels that Lucas and Wallace envision simply are not present." *Id.* at ¶¶ 74 & 77.

Further:

> "[t]he ore deposits occur at the edge of a large body of oxidized sandstone, not in long ribbon-like sandstone pointing away from the outcrop....The small lithofacies (sand depositional features) Lucas sees on the outcrop do not act *hydrologically* independent from the enclosing sandstones. As can be seen by Cowan's references to aquifer conduits...."

Id. at 77 (emphasis in original).

Mr. Lichnovsky's conclusions are also verified by the natural groundwater flow pattern at the CUP uranium recovery sites. As stated by Mr. Lichnovsky:

> "[t]he groundwater flow pattern that helped create the deposits [at the CUP sites] is the one that is still active today...The deposits occur at the interface between oxidized sandstone and reduced sandstone....As the groundwater moves down gradient through the coalesced and amalgamated sandstone sheets the uranium is

> continuously deposited at the oxidation/reduction interface. Thus, the one controlling factor in the location of the ore body is geochemistry."

Id. at ¶ 91.

The ore body or "roll front" is labeled based on its relationship to the others that are present. In the case of the Westwater, "[t]he roll fronts trends are *perpendicular* to the regional groundwater gradient. It also trends perpendicular to the original direction of sand deposition." HRI Exhibit C at ¶ 91 (emphasis added). Contrary to Intervenors' assertions that "channels" exist, Mr. Lichnovsky concludes, "the ore does not occur in small ribbon-like channels that would be perpendicular to the cross section." *Id.* at ¶ 89. Thus, Intervenors allegation that "channels" exist to promote groundwater excursions from the mining zone to non-exempt USDWs should be rejected.

Further, in order to bolster their "channel" theory, in view of HRI's expert, Mr. Dan W. McCarn, Intervenors have gone to great length to mischaracterize his expert testimony on this issue. In HRI's February 19, 1999, written presentation, Mr. McCarn presented expert testimony and several analytical figures describing the geological conditions at the CUP. After reviewing technical documents, including geophysical well logs prepared by HRI and the natural depositional conditions in the Westwater Formation, Mr. McCarn presented expert testimony stating[11] that he was unable to find evidence of discrete channeling, and the development of the specific sand units appeared to be continuous over considerable distances. HRI Exhibit D at ¶¶ 39-76

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[11] As will be discussed below, Mr. McCarn's findings are consistent with HRI's characterization of the Westwater at the CUP as acting *hydrologically* like *a homogeneous fluvial system.*

Mr. McCarn also notes that Abitz mischaracterizes each of his findings with respect to the existence of "channels" in the Westwater at the CUP. For example, as stated by Mr. McCarn:

> "Abitz quotes McCarn as an important source to his and Wallace's affidavits. He does so, however, *disregarding the most important regional ore control which is the extensive development of a regional redox front which extends continuously for 10s of kilometers in the Westwater Canyon Member and has been well-documented by such sources as Saucier* (1980)."

Id. at __.

Intervenors' mischaracterization of Mr. McCarn's testimony also extends to Intervenors' claim that his testimony supports the potential for groundwater excursions and that HRI's proposed groundwater monitoring program is insufficient to detect such excursion. In response to Abitz's statement that Mr. McCarn's testimony supports this statement, Mr. McCarn states, "I categorically refute this statement, and I have categorically refuted this simplification of my paper since 1999...McCarn (1999) refuted this interpretation of Figure 8 and presented to the court the original paper, which has since been published by the IAEA [International Atomic Energy Agency] (2001)." Further, as stated by Mr. McCarn, "[i]f groundwater flow was being channeled through narrow, discontinuous channels as suggested by Abitz and Wallace, continuous mineralization could not occur in the vicinity of Crownpoint and Church Rock."[12]

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[12] Mr. Lichnovsky's expert testimony also supports Mr. McCarn's findings. As stated by Mr. Lichnovsky when discussing the creation of uranium ore deposits that may be mined using ISL uranium recovery techniques:

> "This type of deposition requires that the sandstone aquifer is continuous and expansive because oxidized water must pass through large volumes of rock that contains small amounts of uranium and then travel uninterrupted to the redox contact where accumulation or deposition can ultimately occur."

HRI Exhibit C at __.

Based on his analysis of Intervenors' experts and their improper use of his expert testimony, Mr. McCarn concludes:

> "[s]ince the NRC hearing in 1999, SRIC has continued to use my publication as if the 1999 hearing never occurred, namely, to continue to use the reference to McCarn (1997) as support in their campaign to convince, the public, and the Navajo population that their health and water quality were at stake and under attack by HRI."

HRI Exhibit D at 49.

Thus, any attempts by Intervenors' experts to use Mr. McCarn's testimony to demonstrate the existence of "channels" in the Westwater at the CUP should be rejected.

2. The Westwater Acts Hydrologically as a Homogeneous Fluvial System

As stated above, Intervenors' initially challenge HRI's statements that the Westwater acts as a "homogeneous" fluvial system and that their expert testimony demonstrates that channels exist that will allow contaminants to migrate rapidly from exempt aquifers to non-exempt USDWs. Further, Intervenors contend that the "Recapture Shale" of the Morrison Formation does not serve as a confining layer to prevent the migration of contaminants from the uranium recovery zone aquifer at each CUP site to adjacent USDWs and that HRI's experts misinterpreted the geophysical well logs used to determine the presence of the Recapture Shale. Intervenors' claim that the potential for migration of contaminants to non-exempt aquifers demonstrates that HRI's license should be revoked.

a. HRI's Alleged Characterization of Westwater as "Homogeneous"

First, Intervenors completely mischaracterize HRI's description of the Westwater Formation's geological features. Intervenors allege that HRI has characterized the

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Based on this information, Mr. Lichnovsky concludes, "[c]hannels would not provide the necessary source rock." *Id.*

Westwater Formation as a "homogeneous pile of sand." At no point has HRI referred to the Westwater Formation in this manner. In fact, as stated by Mr. Pelizza, "HRI has characterized the Westwater Formation as a fluvial system." *See* HRI Exhibit A at ¶ 134-147. For example, HRI's Crownpoint Technical Report of 1993, §§ 2.2.1.1 & 2.6.2 and the Church Rock Revised Environmental Report of 1993, § 2.6.2 both characterize the Westwater Formation as a "fluvial system" and demonstrate that HRI has not characterized the Westwater Formation as *physically* homogeneous. *See id.* On the contrary, HRI has consistently stated that, *hydrologically*, the Westwater Formation acts as a homogeneous, fluvial system for the purposes of HRI's ISL uranium recovery operations. *See id.*

Further, as stated by Mr. Lichnovsky, the Westwater has been characterized as a homogeneous, fluvial system by multiple experts:

> "the Westwater Canyon was deposited as a broad alluvial fan sequence with a preponderance of thick arkosic sandstone on the west side of the San Juan Basin, shaling out to the east and northeast of the fan system (Galloway 1980 p. 60)."

HRI Exhibit C at ¶ 72.

Based on these findings and the statements of other experts, Mr. Lichnovsky concludes, "[t]he Westwater Canyon was deposited as sheet sandstones, with each sheet overlying and scouring into another sheet. These sandstone sheets are coalesced and amalgamated into thick sandstone bodies [sic] that *function hydrologically as one unit.*" *Id.* (emphasis added).[13]

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[13] It is worth noting that the sandstone sheets to which Mr. Lichnovsky refers are present throughout the entire San Juan Basin, and the CUP uranium recovery sites are part of the San Juan Basin. *See generally* HRI Exhibit C.

In addition, the issue of whether the Westwater acts, hydrologically, as a homogeneous unit already has been addressed by this Licensing Board. In LBP-99-30, Judge Bloch reviewed Intervenors' allegations that HRI mischaracterized the Westwater as "homogeneous" and HRI's assertions that its characterization of the Westwater was that it acted hydrologically as a "homogenous" unit. Judge Bloch determined that the "most reasonable characterization" was that the Westwater acted *hydrologically* as a homogeneous unit. *See* LBP-99-30 at *21-22. Based on this finding, Intervenors effectively are collaterally estopped from arguing this issue for the remaining uranium recovery sites without some concrete evidence that circumstances are *significantly* different (which each of HRI's experts demonstrate does not exist), Judge Bloch's opinion should apply to the portions of the CUP outside of Church Rock Section 8, and, therefore, Intervenors' arguments regarding this issue should be rejected.

b. The Presence of the Recapture Shale, Geophysical Well Log Interpretations, and Pump Tests

Second, Intervenors' allegation that the "Recapture Shale" of the Morrison Formation is not present as a confining layer composed of shale and does not assist in the prevention of groundwater migration is incorrect. As stated by Mr. Lichnovsky, "HRI had designated the underlying interval of mudstone and siltstone (of the Recapture Member) as the Recapture Shale." HRI Exhibit C at ¶ 25. With respect to Lucas' analysis, Mr. Lichnovsky states:

> "[t]he references...that Lucas...cites, plus all published descriptions of the Recapture Member, state that the Recapture member consists of sandstone, claystone, mudstone, and siltstone. *A continuous layer of mudstone, claystone or clayey siltstone that overlies or underlies the production zones is an aquatard*

> *(confining layer) and will prevent mining solutions from contaminating overlying or underlying water bearing zones.*"

See id. at 24 (emphasis added).

Using this information, HRI uncovered the existence of "a confining layer of mudstone and siltstone below the ore bearing section of the Westwater Canyon at all four HRI sites." *See id.* at ¶ 25. Whether or not it is fully composed of "a true shale," the Recapture Shale still functions as a confining aquitard. As stated by Mr. Lichnovsky, there are varying degrees of permeability in materials that function as aquitards and the Recapture Shale unquestionably will serve as an aquitard for the five to seven years of ISL uranium recovery. *Id.* at ¶¶ 17, 24-25. This conclusion was supported in 1999 by Judge Bloch when he stated, "many drill holes penetrated the Recapture Shale to varying degrees and in every case its characteristics are those of an aquatard." *See* LBP-99-30 at *23.

Further, Intervenors' allegation that HRI's expert misinterpreted the geophysical well logs used to determine the presence of the Recapture Shale is also incorrect. Intervenors assert that an analysis of the geophysical logs provided by HRI demonstrates that the Recapture Shale does not occur at the proposed mining sites and that, based on these logs, the potential for groundwater migration is increased. With respect to the geophysical logs, Mr. Lichnovsky states, "[a]t all of the sites there are many exploration drill holes, each with its own geophysical log. These geophysical drill hole logs record the lithology of subsurface rocks." *Id.* at ¶ 25. After reviewing Intervenors' testimony, Mr. Lichnovsky states that their interpretations of these geophysical logs are fundamentally flawed. For example, Mr. Lichnovsky states:

> "Comparing Cretaceous Shale to a Jurassic mudstone and siltstone sequence

> and expecting them to match exactly is foolish....Lucas in saying the SP values in drill hole 53/41 in the Recapture correspond to SP values in the Westwater Canyon is unbelievable...Geophysical logging is no 'black box' science, these geophysical logs have been used by the petroleum industry since the 1930s. "

HRI Exhibit C at ¶ 30.

Based on his analysis of the technical aspects (i.e., geophysical log curves), Mr. Lichnovsky concludes that the Recapture Shale is indeed present and that "to interpret the Recapture Member as not being present below the Westwater Canyon in Section 17, Church Rock, Crownpoint, or Unit One sites or *as* 'almost wholly sandstone' questions the credibility Lucas' testimony."[14] *Id.* at ¶ 34 (emphasis in original). This conclusion is supported by several authors who have produced publications describing the Recapture Shale:

> "[m]ost authors show the Westwater Canyon is underlain by the Recapture Member across the entire Grants Uranium Region (Galloway 1980...Wentworth 1980...Ristorcelli 1980...Place 1980...Kirk and Condon 1986...and so on)....*The important fact is that an aquitard of claystone and siltstone is present below the production zone at Section 17 and Church Rock.*"

Id. at ¶ 36 (emphasis added).

With respect to a "thinning" of the Recapture Shale at the outcrop near the Cow Springs Aquifer, Mr. Lichnovsky states, "one can not assume this is the case 4 or 15 miles down dip from the outcrop,...." *Id.* at ¶ 22. Using standard industry practices of analyzing geophysical well logs, Mr. Lichnovsky confirms that "geophysical logs at the sites indicate the presence of an overlying and underlying aquitard at the Section 17,

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[14] *See also* HRI Exhibit F for further discussion on this point.

Church Rock [sic], Unit One and Crownpoint sites."[15] *Id.* Further, additional safeguards are in place to detect and prevent migration of contaminants as "monitor wells will be placed in overlying and underlying aquifers to insure these zones are not being affected [sic] during mining and restoration." *Id.* at ¶ 17. Therefore, based on these factors, Intervenors' allegations regarding the presence of the Recapture Shale and the analysis of geophysical well logs should be rejected.

Finally, with respect to Wallace's characterization and critique of HRI's pump tests and models, Mr. Bartels states generally:

> "Wallace does not appear to have ever designed, conducted, or performed the original analysis of a pump test on the scale of ISL 'site characterization,' and most obviously on the scale of an ISL wellfield....Wallace appears to have no actual experience in either drilling or re-completion of wells, deep or shallow, so lacking such experience, he has no basis to characterize a well re-completion as either 'typical' or otherwise."

HRI Exhibit B at ¶ 142 & 148.

However, with respect to the pump tests, despite Wallace's statements to the contrary, Mr. Bartels states, "the test design is sound, resulting in reasonable distances between pumping and monitoring wells at each phase of the program..." *Id.* at ¶ 152.

In addition, with respect to Wallace critique of HRI's "well re-completion," based on his experience in oil drilling and as a drilling engineer, Mr. Bartels states, "I tried to convey the difficulty and riskiness of re-completing wells on page 5 of the original pump test report...(Attachment J)...I have found that it is generally easier, more straightforward, and less prone to complications to drill and complete a new well, than it is to re-complete a well...." *Id.* at ¶ 148. Further, Wallace has offered no direct evidence

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[15] In addition, Mr. Lichnovsky notes that, "[i]n log 02.8/17.7 some of the local limestone beds are present in the Brushy Basin section. The SP indicates no mud invasion (*no permeability*) and the resistivity indicates resistance to electrical current flow."

that HRI's procedures and results regarding pump tests or well recompletion indicate that potential adverse impacts to public health and safety exist. Thus, Intervenors allegations regarding this issue should be rejected.

c. Previous ISL Uranium Mining Geological Case Studies

Indeed, nowhere in the massive record of this proceeding or in the technical literature is there any evidence of adverse impacts on USDWs from ISL uranium recovery operations over the past 40 years in the United States. *See generally* LBP-99-30. HRI has reviewed and presents *data* from several different ISL uranium mining facilities across the United States with nearly identical fluvial geology to that of the CUP ore bodies and has determined that no impediments to environmentally protective uranium recovery exist. For example, Mr. Pelizza states:

> "all of URI South Texas operations are within fluvial type deposits with multiple stacked ore sands...Both the Kingsville Dome and Rosita ISL Project are in the fluvial Goliad Formation that is stratigraphically similar to the CUP ore zones. Detailed pump testing has confirmed that the formation is functionally a single hydrological unit. Successful operations have [followed]."

See HRI Exhibit A at ¶ 124.

In addition, several ISL uranium projects in the States of Wyoming and Nebraska have been installed and operated without the migration of contaminants from exempt aquifers to non-exempt aquifers occurring. *Id.* at ¶¶ 125-126, Attachments N & O). Intervenors have presented no evidence demonstrating that their theory on "channel-like" conduits have ever occurred in production scale ISL uranium recovery operations in the United States. Thus, uranium geology combined with the horizontal results of past and present standard ISL uranium recovery industry practices designed to control migration of contaminants from uranium recovery zones to adjacent USDWs (including well-field design, well-field balancing, groundwater monitoring wells, and "bleed" during operations)[16] demonstrate that Intervenors allegations regarding potential migration of contaminants are not accurate.

3. Intervenors' Expert Analysis Regarding the Use of Outcrops to Analyze Geology is Flawed

Intervenors submit the testimony of Lucas to support their allegation that studies of rocks at outcrops in geological structures provide a more detailed and accurate assessment of geological features than bore hole data and geophysical well logs. Intervenors contend that Lucas' analysis demonstrates that the Westwater Formation is "heterogeneous" at Church Rock Section 17 and that there is no vertical confinement at Unit One and Crownpoint. *See* Intervenors' March 7, 2005, Written Presentation at 75-76, 83-84, & 87-89.

As a general proposition, Lucas' analysis regarding outcrops and their usefulness in studying geology is incorrect. Initially, Mr. Lichnovsky states that Lucas' statement that "'geologists have long known that <u>much more</u> can be learned from the study of rocks at outcrops than can be learned from subsurface data from bore holes and geophysical well logs'" is incorrect." HRI Exhibit C at ¶ 19 (emphasis in original). The inability of this methodology to properly account for the geologic structure of a proposed uranium recovery area and its failure to address how fluvial systems work make this methodology less attractive for use as standard industry practice.

Instead, using standard industry geophysical well logs, ISL uranium recovery licensees can better determine the geologic conditions in a proposed uranium recovery area. As stated by Mr. Lichnovsky, "[t]he geophysical logs from all of HRI sites consists

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[16] *See* HRI Exhibit A at ¶ 44 & 115.

of three curves, the natural gamma, the SP, and the resistivity." *Id.* at ¶ 30. When interpreting geophysical well log data, "[t]he natural gamma records the amount of uranium in each drill hole. When the SP curve is compared to the resistivity curve, *relatively* permeable beds (sandstone) can be differentiated from *relative* impermeable beds (claystone, shale, and mudstone)." *Id.* By correlating standard industry geophysical log data, drill cuttings, and drilling rates "one can easily determined the types of rocks encountered." *Id.* at ¶ 30.

Based on this, Mr. Lichnovsky's critique of Lucas' theory is focused on the fundamental presumption that "[a]n outcrop [in a formation] provides weathered and therefore altered information of the sediments present....A description of the outcrop isn't able to tell the lateral extent of the sediments of whether they pinch-out or thicken in the subsurface downdip of the outcrop, or the hydrological characteristics of the sediments downdip." *Id.* at ¶ 21. This conclusion leads Mr. Lichnovsky to conclude that the use of outcrop mapping is unreliable in the context of ISL uranium recovery.

In addition, Intervenors claim that the Brushy Basin Member of the Morrison Formation is not present at Church Rock, that it is actually the Dakota Formation, and that it is a combination of sandstone and shale. However, several experts writing on the presence of the Brushy Basin Member at Church Rock have described that Member as "mostly mudstone with moderately high gamma-ray, moderately spontaneous potential (SP) and low resistivity log values" and as "60 feet thick at Church Rock and Section 17 and 140 feet thick at Crownpoint and Unit One." HRI Exhibit C at ¶ 44.

Further, Lucas' concern that the Brushy Basin is non-existent at the outcrop and is 60 feet thick at Church Rock is addressed by Mr. Lichnovsky when he states: "the Dakota

Formation (Cretaceous) lies with angular unconformity on the Morrison rocks in the Church Rock area." *Id.* at ¶ 49. Based on this, Mr. Lichnovsky concludes, "[t]his relationship represents simple eroisional planation of Mesozic strata that was tilted north prior to deposition of the Dakota." *Id.* Even though this analysis demonstrates that groundwater excursions are highly unlikely, "[a]t Church Rock and Section 17, URI [HRI] has committed to placing monitor wells in the sandstone unit of the Brushy Basin and in the overlying Dakota sandstone to monitor for unlikely leakage from the mining zone." *Id* at ¶ 51. Based on this, Intervenors' allegations regarding the use of outcrops should be rejected.

4. HRI Has Properly Demonstrated that Natural Attenuation Will Assist in Preventing Contamination of Non-Exempt Aquifers

Intervenors argue that HRI's assertion that natural attenuation of contaminants will assist in groundwater restoration has not been adequately demonstrated. This argument includes allegations that the natural geochemistry in the Westwater Formation prevents reduction of high uranium concentrations and will not lead to precipitation of uranium out of pregnant lixiviant. *Id.* at 58.

First, as stated by Mr. Pelizza:

> "[t]he area that is subject to mineral recovery is extremely small as compared to the size of the regional aquifer....These [CUP] wellfields will be completed in a small fraction of the regional Westwater aquifer, will be restored so that uranium and other radionuclides are consistent with premining values *to minimize or eliminate the potential for post mining migration to adjacent USDWs.*"

HRI Exhibit A at ¶ 117. (Emphasis added)

As a result of the small relative size of the CUP's proposed uranium recovery operations when compared with the size of the regional aquifer, Mr. Pelizza concludes that Abitz's contentions on natural attenuation are "not logical." *Id.*

Further, Mr. Pelizza states, "[t]he aquifer has shown the regional capacity to reduce and precipitate uranium over a frontal length that extends from west of the Church Rock area, through Crownpoint, over to the Ambrosia Lake area, 60 or more miles, a much larger area than is planned at the CUP sites." *Id.* In conjunction with this factor, "natural mineralization in water is present in uranium ore zones that is indigenous to groundwater locally and has been present in the aquifer locally for millions of years, which is strong evidence that these minerals in groundwater stay in proximity to the source." *Id.* at ¶ 116.

Moreover, Mr. Bartels' review of Abitz testimony regarding geochemical conditions at the CUP sites lends further support to Mr. Pelizza's testimony. In reviewing Abitz's testimony, Mr. Bartels states that not only does Abitz fail to cite an example of an uncontrolled "*toxic groundwater plume,*" but he also does not cite "a single instance of contamination of water wells near ISL projects," which are closer than adjacent, non-exempt USDWs. HRI Exhibit B at ¶ 30.

Further, with specific reference to Abitz's contentions on natural attenuation, Mr. Bartels states that Abitz's analyses cannot be considered plausible because they are based on "his conclusions on his generic geochemistry discussion, his flawed analyses of (¶ 65-68), and his assertion that the rock is completely oxidized at the end of leaching." *Id.* at ¶ 33. Based on the natural processes involving "reducers" in creating an ore body which are generally accepted industry premises, Mr. Bartels concludes, "[i]f there were not enough reducers in the rock to re-precipitate that ore body , the uranium would stay in solution, and there would be no 'ore body....Otherwise, at some point, the ore body would cease to exist as the uranium stayed in solution.'" *Id.* at ¶ 33. Thus, according to Mr. Bartels, "Abitz is wrong about natural attenuation." *Id.* Based on this, Intervenors' allegations regarding natural attenuation should be rejected.

C. HRI Written Presentations and Testimony Regarding Church Rock Section 8 Groundwater Issues

To date, HRI has submitted the following written presentation(s) and testimony regarding Church Rock Section 8 groundwater issues.

1. HRI's Response to Intervenors' Brief in Opposition to HRI's Application for a Materials License With Respect to Groundwater Issues, (February 19, 1999) (ACN ML9903010016)

HRI's written presentation with respect to groundwater issues is composed of the legal brief and a series of five (5) expert affidavits addressing multiple technical issues. Initially, HRI's legal brief summarized each of the arguments presented in opposition to Intervenors' written presentation regarding groundwater issues, including arguments refuting the written testimony offered by Intervenors.

2. Affidavit of Mark S. Pelizza Pertaining to Water Quality Issues, (February 19, 1999) (ACN ML9903010024)

The Affidavit of Mark S. Pelizza addressed several of Intervenors' arguments, including the testimony of Richard J. Abitz, Michael G. Wallace, William P. Staub. Mr. Pelizza's expert testimony started with a discussion of the development and use of "pore volumes" in the ISL uranium recovery industry and an explanation of the parameters used by HRI to create the nine pore volume estimate for groundwater restoration. Mr. Pelizza then presented an argument that Intervenors' characterization of water quality data for the Church Rock Section 8 site was internally inconsistent. This discussion involved a refutation of Abitz's claim that HRI has not properly established baseline water quality standards for the site by stating that HRI has never claimed that the wells and preliminary analysis done at Church Rock Section 8 was intended to establish baseline for operations or restoration. Based on HRI's performance-based license, baseline water quality does not need to be established until just prior to the commencement of ISL uranium recovery operations.

Mr. Pelizza also compared the water quality characteristics of the CUP with those of other ISL uranium recovery sites in the United States. This comparison included a discussion refuting Intervenors' claim that uranium mineralization occurs outside the ore zone at the CUP. Further, Mr. Pelizza directly refuted Abitz's assertion that HRI should restore groundwater in the ore zone to water quality levels outside the ore zone. Mr. Pelizza stated that forcing an ISL uranium recovery licensee to restore groundwater to water quality levels more stringent than baseline or pre-mining quality would be to "defy natural conditions."

Mr. Pelizza also discussed the issue of EPA aquifer exemptions for ISL uranium recovery licensees and the fact that ISL uranium recovery occurs within the confines of exempted aquifers. Mr. Pelizza cited several examples of ISL uranium recovery facilities operated by HRI's parent company, Uranium Resources, Inc. (URI), as well as those operated by several other licensees.

Then, Mr. Pelizza stated that the Westwater is a *hydrologically homogeneous* fluvial system and that HRI has never represented that the Westwater was physically *completely homogeneous*. The fluvial nature of the Westwater also would not affect

HRI's groundwater monitoring protocol and that, based on the geological features of the Westwater and the nature of the uranium deposits therein, the posited existence of "channels' that promote the rapid, uncontrolled flow of fluids was incorrect.

Mr. Pelizza also provides detailed discussions of the following issues: (1) statistical analysis methods (¶ 14.4), (2) Church Rock Sections 8 and 17 simultaneous operations (¶ 16.2), (3) excursions at existing mines (¶ 17), (4) the presence of mineshafts at the Church Rock Section 17 site (¶ 18), and (5) and an analysis of the development of groundwater restoration standards and surety (¶ 20-27).

3. Affidavit of Dan W. McCarn Regarding Michael Wallace Testimony, (February 19, 1999) (ACN ML9903010035)

The Affidavit of Dan W. McCarn was focused on the limited issue of Intervenors' use of a figure produced by Mr. McCarn regarding uranium deposits at the CUP. Mr. McCarn stated that Wallace's depiction of this figure as supporting Intervenors' theory that "channels" exist to promote the rapid, uncontrolled flow of fluids in the Westwater to adjacent, non-exempt aquifers was incorrect. Mr. McCarn's affidavit included an attachment showing the above-mentioned figure.

4. Affidavit of Maryann Wasiolek and Michael P. Spinks, P.E. Regarding Hydrology and Geology, (February 19, 1999) (ACN ML9903010039)

The Affidavit of Maryann Wasiolek and Michael P. Spinks focused on the limited issue of Intervenors' contention that "channels" exist that will promote the rapid, uncontrolled flow of fluids in the Westwater to adjacent, non-exempt aquifers. The affiants stated that typical descriptions of the Westwater demonstrate that it is characterized as acting *hydrologically* like a homogeneous unit rather than containing "channels" pursuant to Intervenors' contentions. The affiants further state that they were unaware of any literature characterizing the Westwater as represented by Wallace.

5. Affidavit of Frank Lee Lichnovsky Regarding Hydrology and Geology, (February 19, 1999) (ACN ML9903010033)[17]

The Affidavit of Frank Lee Lichnovsky focused on Intervenors' characterization of the geologic conditions of the Westwater. Initially, Mr. Lichnovsky reviews and critiques Intervenors' characterization by comparing their assertions with published literature on the Westwater. For example, Mr. Lichnovsky uses the writing of several geologists and other professionals to demonstrate that Intervenors' "channel" theory is incorrect and inconsistent with published literature on the Westwater. These writings include an analysis of the geologic conditions of the San Juan Basin, including the proposed CUP portions of the Westwater, which is universally composed of stacked sandstone beds and not "channels."

Mr. Lichnovsky also states that Intervenors mischaracterized HRI's data regarding well-field control of subsurface solutions. Mr. Lichnovsky concluded that Intervenors failed to understand the ISL uranium recovery process and that their assertion that ISL mineral recovery can only occur in stream channels is incorrect. Further, in support of this conclusion, Mr. Lichnovsky offered a discussion of the origins of "roll-front" uranium deposits and how the presence of such deposits do not support the existence "channels" at the CUP. Additionally, Mr. Lichnovsky opined that the use of standard industry geophysical logs and data is the most accurate way to collect subsurface data and to analyze the potential subsurface effects of ISL uranium recovery operations. Mr. Lichnovsky includes a detailed description of the types of data provided

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[17] A revision to this affidavit was filed by HRI on February 26, 1999 (ACN ML03040091).

by geophysical logs and how such data is analyzed to determine the geologic features of a given area.

Mr. Lichnovsky also includes a detailed discussion of the HRI groundwater monitoring protocol and why such protocol in effective for the Westwater. This discussion addresses the presence of the Recapture Shale and the fact that it is not "shale," but it is a serious of *discontinuous* sandstone lenses that act as an aquitard to prevent rapid, uncontrolled migration of fluids from the exempt portion of the Westwater to adjacent, non-exempt aquifers. This discussion led Mr. Lichnovsky to conclude that the potential for rapid, uncontrolled migration of groundwater fluids was negligible, even without taking into account HRI's proposed groundwater monitoring protocol. Mr. Lichnovsky supported his conclusion by comparing the CUP to the sandstone deposits of other geologic structure in States of New Mexico, Texas, Wyoming, and Nebraska.

6. Affidavit of Craig S. Bartels Regarding Hydrology and Geology, (February 19, 1999) (ACN ML9903010029)[18]

The Affidavit of Craig S. Bartels began with statements that a considerable Portion of Intervenors' testimony was not directly applicable to Church Rock Section 8. Mr. Bartels states that, as a general proposition, Intervenors' contention that groundwater migration from ISL uranium recovery operations in fluvial systems cannot be controlled is incorrect. Mr. Bartels specifically notes that Intervenors' testimony did not account for the industry evidence provided by other ISL uranium recovery operations.

Mr. Bartels begins his analysis of Intervenors' testimony by stating that a conceptual geologic model, similar to that offered by Intervenors', does not reflect the actual geologic and hydrological features of the Westwater and does not serve as an

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[18] A revision to this affidavit was filed by HRI on February 26, 1999 (ACN ML03040091).

accurate indicator of subsurface conditions. Mr. Bartels' expert testimony also includes reference to the use of regional pump tests prior to licensing and site-specific pump tests prior to production as the NRC-approved industry standard for ISL uranium recovery operations, each of which has been proposed by HRI and approved by NRC Staff.

Then, Mr. Bartels supports the assertions by HRI's other experts that the Westwater is a fluvial system and that most uranium ore in the United States in contained in fluvial systems. Based on this assertion, Mr. Bartels concludes that Intervenors' "channel" theory is incorrect and is not supported by the fact that uranium deposits in the Westwater and the entire San Juan Basin are "roll-front" deposits. These "roll-front" deposits, by their very nature, defy Intervenors' "channel" theory based on natural geochemical conditions in such deposits. Mr. Bartels also provides additional discussion on other factors leading him to conclude that Intervenors' "channel" theory is incorrect.

Mr. Bartels also offers discussion on how the Westwater is a "confined" aquifer (i.e., is overlaid and underlaid by aquitards) and that Intervenors' conclusions for Church Rock pump tests are inappropriate. Specifically, Mr. Bartels questioned Intervenors' understanding of how pump tests contribute to the analysis of geologic conditions at a proposed ISL uranium recovery site.

Finally, Mr. Bartels offers a discussion of the re-injection of "bleed" at the Church Rock Section 8 site. The "bleed" at each ISL uranium recovery site is designed to create a "cone of depression" in ISL well-fields to contain ISL lixiviant and prevent groundwater excursions. The design of the well-field to account for the proper re-injection of "bleed," which minimizes the loss of water resources, is not available until the uranium deposit is fully understood and the proposed uranium recovery site is fully developed.

7. Affidavit of V. Steve Reed (February 19, 1999) (ACN ML9903010042)

The Affidavit of V. Steve Reed is focused primarily on Wallace's critique of his report regarding the feasibility of maintaining hydrodynamic control during production and restoration of the Church Rock and Crownpoint sites. Mr. Reed refutes Wallace's attacks on the validity of his modeling for the CUP sites. He specifically notes that Wallace's contentions fail to account for the successful history of the ISL uranium recovery industry, the rigorous agency review process, and does not offer any substantive rebuttal of his modeling.

Mr. Reed provides an explanation of the fundamental bases for the conclusions in his report and offers additional explanation regarding the types of models used in reaching such conclusions.

D. Licensing Board and Commission Decisions on Groundwater for Church Rock Section 8

1. LBP-99-13: 49 NRC 233 (March 9, 1999)

With respect to Section 8 groundwater issues, both the Licensing Board and the Commission have issued decisions supporting HRI's technical assessment of groundwater and geology at the Section 8 site. In LBP-99-13, the Presiding Officer addressed issued related to groundwater restoration and financial assurance. In addition to ruling on the applicable regulations and requirements for HRI's financial assurance offering, the Presiding Officer determined that the nine pore volume estimate would be a satisfactory initial estimate to project restoration costs for groundwater at the Church Rock Section 8 site.

2. LBP-99-30: 50 NRC 77 (August 20, 1999)

In LBP-99-30, the Presiding Officer addressed groundwater issues for the Church Rock Section 8 site and the technical analyses offered by HRI, Intervenors, and NRC Staff. Initially, the Presiding Officer determined that the Westwater Formation at the Section 8 mining site operates *hydrologically* like a homogeneous aquifer and does not contain channels through which contaminants may migrate to adjacent, non-exempt aquifers. In addition, the Presiding officer found that Intervenors' groundwater expert, Mr. Wallace questions regarding the assumption of the Westwater's hydrologic homogeneity were unfounded and that "homogeneity appears to be the most reasonable characterization."

Further, the Presiding Officer determined that HRI did not misrepresent groundwater pathways and divides as lixiviant barriers or aquitards. Specifically, the Presiding Officer noted that "[a]ll arguments are presented for Crownpoint and are, therefore, not directly relevant for this [Church Rock] phase of the hearing…." However, the Presiding Officer noted that "the method employed by HRI is a commonly used method for evaluating *in situ* mines…and do not misrepresent groundwater pathways." The Presiding Officer also noted that HRI does not misrepresent the Westwater's baseline water quality as such water quality will be "set according to the protocol in COP Rev. 2.0, § 8.6."

Finally, the Presiding Officer determined that proper data and pump testing was conducting to determine that vertical excursions will not occur between the exempted uranium recovery zone portion of the Westwater and other non-exempt aquifers. HRI's and NRC Staff agreed upon monitor well configuration was deemed sufficient to monitor for any such excursions should they occur.

3. CLI-00-08: 51 NRC 227 (May 25, 2000)

In CLI-00-08, the Commission received briefs regarding the application of specific regulations to HRI's financial assurance offering. The Commission determined that 10 CFR Part 40, Appendix A, Criterion 9 applied to HRI's license and that HRI would be required to submit RAPs for each of its mining sites prior to engaging in ISL uranium recovery operations.

4. CLI-00-12: 52 NRC 1 (July 10, 2000)

Intervenors appealed the Presiding Officer's decision in LBP-99-30 to the Commission. The Commission declined Intervenors' appeal and stated that it was unwilling to disturb the Presiding Officer's findings, "particularly on matters involving fact-specific issues or where affidavits or submissions of experts must be weighed." The Commission's decision also declined to grant review on Intervenors' motion to re-open the record to offer additional evidence on HRI's secondary groundwater restoration standard because it is unlikely that the secondary standard would ever be applied.

5. LBP-04-03: 59 NRC 84 (February 27, 2004)

After the Commission remanded the issue of the submission of RAPs for each uranium recovery site to the Licensing Board, the Presiding Officer reviewed HRI's NRC-approved Church Rock Section 8 RAP and determined that it was acceptable with three specific exceptions. As they apply directly to groundwater restoration and financial assurance, these exceptions are addressed in greater detail in Section V of this brief.

6. CLI-04-33: 2004 NRC LEXIS 254 (December 8, 2004)

Both HRI and Intervenors appealed specific portions of LBP-04-03 to the Commission. The Commission reversed the Presiding Officer's findings with respect to HRI's two appealed issues and affirmed such findings with respect to Intervenors' appealed issues. The Commission's decision is reviewed in greater detail in Section V of this brief.

V. ARGUMENT: GROUNDWATER RESTORATION AND FINANCIAL ASSURANCE: CHURCH ROCK SECTION 17, UNIT ONE, & CROWNPOINT

A. Intervenors Have Failed to Demonstrate that HRI's RAPs and Proposed Financial Assurance Cost Estimates for Groundwater Restoration Are Inadequate

Intervenors also have presented several arguments alleging that HRI's NRC-approved RAPs for the Church Rock Section 17, Unit One, and Crownpoint mining sites and their accompanying financial assurance cost estimates are inadequate to effectuate groundwater restoration at each site. Each of Intervenors' arguments is without merit and will be addressed individually in the sections below.

1. HRI's Nine Pore Volume Estimate is Adequate for Groundwater Restoration

First, Intervenors allege that HRI's nine (9) pore volume estimate for groundwater restoration and for calculation of financial assurance for the Church Rock Section 17, Unit One, and Crownpoint RAPs is insufficient. More specifically, Intervenors allege that the use of nine pore volumes is unsupported by HRI's and NRC Staff's technical analyses. *See* Intervenors' March 7, 2005, Written Presentation at 51-55. Intervenors also incorporate this argument by reference for the Unit One and Crownpoint sites. *See id.* at 64-65. Further, Intervenors' challenge the actual RAP financial assurance cost estimate for each uranium recovery site with respect to the use of nine pore volumes. *Id.*

As a general proposition, Intervenors' challenges to the use of nine pore volumes for groundwater restoration at and the calculation of financial assurance cost estimates for the Church Rock Section 17, Unit One, and Crownpoint sites ignore Judge Bloch's and the Commission's findings that nine pore volumes is adequate. This estimate was found to be adequate, because groundwater restoration demonstration will further refine the estimate up or down, and annual surety updates will provide for any necessary adjustments to financial assurance at these sites.

Moreover, prior to commencing ISL uranium recovery activities at the CUP, HRI must submit water quality and other data to NRC Staff for the purpose of creating an initial estimate of the volume of water that must be circulated in the uranium recovery zone to restore groundwater consistent with pre-mining quality and, thereby, to determine the actual value of the financial assurance mechanism that must be in place in accordance with 10 CFR Part 40, Appendix A Criteria and pursuant to the Commission's directive in CLI-00-08. Thus, absent some evidence of compelling differences between Church Rock Section 8 and the other CUP uranium recovery sites, Intervenors' assertions regarding the nine pore volume estimate should be rejected.

With respect to groundwater restoration, as stated by Mr. Pelizza in his affidavit of February 19, 1999, "plots of total dissolved solids, and specific conductivity values (an indirect measure of TDS) show little improvement with continued pumping after eight to ten pore volumes." Affidavit of Mark S. Pelizza, February 19, 1999 at 77 (ACN ML9903010024). Further, Mr. Pelizza states regarding the Mobil demonstration project, which is the largest restoration demonstration in the local area to date, "[d]uring groundwater restoration activities, after 6.9 and 9.7 pore volumes, TDS concentrations were close to the TDS secondary restoration goal of 500 mg/L." *Id.* Based on this and other accompanying data submitted by HRI in its license application, NRC Staff and HRI determined that "practical production scale ground water restoration activities will require no more than a nine pore volume restoration effort." *Id.* Using each of the relevant parameters for calculating pore volumes (i.e., porosity, flare factors, etc.) and all available data for the Church Rock site, NRC Staff and HRI selected nine pore volumes as an *initial* estimate.

As noted above, the selection of nine pore volumes for groundwater restoration and financial assurance calculations is merely the first step in a larger, iterative process. ISL uranium mining, by its nature, is a performance-based form of mineral recovery. That is, ISL uranium recovery operations cannot finalize performance criteria for a given uranium recovery site until a well-field is installed and all well-field-specific data is gathered. Without such well-field-specific data, licensees cannot develop appropriate restoration goals and criteria and calculate necessary financial assurance cost estimates.

As a result, NRC Staff and HRI have created an iterative, performance-based process, which is consistent with standard ISL uranium recovery industry practice, through which groundwater restoration will be effectuated using accurate pore volume estimates and allowing for calculation of proper financial assurance cost estimates in compliance with applicable NRC regulations. Both NRC Staff and HRI realize that "absolute proof [of the pore volumes required for groundwater restoration] can only come from a field level test of commercial scale." *Id.* In the FEIS, NRC Staff specifically states that, prior to mining outside of the Church Rock sites, "more site-specific information would be necessary to actually demonstrate that restoration standards could in fact be achieved at the HRI sites on a large or "production-scale level." *See* CLI-04-33 at *6, *quoting* FEIS at 4-62 & 4-113. To this end, as stated by Mr. Pelizza in his February 19, 1999 affidavit, HRI's NRC license and the Crownpoint Operations Plan (COP) Revision 2.0, § 10.4.4 does not permit the commencement of ISL uranium recovery operations, much less groundwater restoration, at the Unit One or Crownpoint sites until a commercial-scale, bonding level restoration demonstration project[19] is completed.[20] More specifically, Mr. Pelizza states that the COP requires that:

> "Prior to the injection of lixiviant at either the Unit 1, or Crownpoint site the licensee shall submit NRC-approved results of a groundwater restoration demonstration conducted at the Church Rock site. The demonstration shall be conducted at a large enough scale, acceptable to the NRC to determine the number of pore volumes that will be required to restore a production-scale wellfield."[21]

However, prior to engaging in this demonstration project, NRC Staff and HRI were required to select a pore volume estimate for groundwater restoration based on available data so that an initial financial assurance cost estimate could be calculated for their RAPs. Thus, the nine pore volume estimate currently is used by HRI to calculate its financial assurance cost estimates for each mining site based on the directive from the Commission to submit RAPs for each mining site prior to engaging in any mining operations. *See generally In the Matter of Hydro Resources, Inc.*, CLI-00-08, 51 NRC 27 (May 25, 2000). Again, while the nine pore volume estimate serves as a *preliminary* estimate for each RAP, the actual pore volume estimate and, therefore, the financial assurance cost estimate for each CUP site will be adjusted to reflect site-specific

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[19] Please see Mr. Pelizza's February 19, 1999 Affidavit at 78 for an explanation of the parameters for the demonstration project.

[20] *See* HRI NRC License No. SUA-1508, License Condition 10.28.

[21] *See* Crownpoint Uranium Project, Consolidated Operations Plan Revision 2.0, § 10.4.4 (attached as "HRI Exhibit A, Attachment C").

conditions at each site. Thus, Intervenors have no basis to challenge the use of nine pore volumes for the Church Rock Section 17, Unit One or Crownpoint mining sites, because the pore volume estimate can be adjusted based on data to be compiled after the completion of the Church Rock Section 8 demonstration project and other site testing.

Further, in order to prevent an underestimate of financial assurance for groundwater restoration, HRI's license requires that the financial assurance cost estimates for groundwater restoration be adjusted to reflect *any* change in the number of pore volumes to be used after the Church Rock Section 8 demonstration project and prior to commencing uranium recovery operations at any specific CUP site. *See* HRI License No. SUA-1508, License Condition 9.5. NRC regulations at 10 CFR Part 40, Appendix A, Criterion 9 also require *mandatory* annual surety updates to reflect any adjustment in costs at an NRC-licensed facility, including maintenance and/or repair or replacement of site equipment and changes in the parameters for site decommissioning and groundwater restoration, such as pore volume estimates. These safeguards ensure that HRI will be required to post adequate financial assurance for each CUP site prior to uranium recovery operations and post-mining groundwater restoration. The combination of these factors discussed above results in an iterative, performance-based process using the best available water data to adequately protect public health and safety and the environment.

2. HRI's RAPs Properly Account for the Availability and Costs of Radiological Technicians

Intervenors assert that HRI has failed to properly account for specific cost items in their RAPs for the Church Rock Section 17, Unit One, and Crownpoint sites. First, Intervenors allege that HRI underestimates the availability and cost of radiological technicians for site decommissioning and that HRI does not include the costs for such technicians in its RAPs. Intervenors' March 7, 2005, Written Presentation at 61 & 63-64. Specifically, Intervenors state that, "should HRI not be the operator at the time of site closure, there needs to be an estimate of the costs to acquire trained individuals to conduct contamination surveys. *Id.* at 61 & Exhibit DD at ¶ 23. Additionally, Intervenors state that HRI must include the rates and lodging expenses for trained professionals to conduct contamination surveys. *Id.*

Konwinski ignores the inclusion of salary for the Environmental Manager in the Crownpoint RAP, in addition to the $45,000 budgeted for the RSO. Currently, HRI has budgeted an additional $104,000 for an Environmental Manager for the CUP in its Crownpoint RAP. HRI Exhibit A at ¶ 254. As stated by Mr. Pelizza, the Environmental Manager for the CUP will perform a wide range of duties including having "responsibility over radiological surveys and technician level responsibilities described for the RSO [radiation safety officer]. In addition, the Environmental Manager shall share in the responsibility of conducting surveys and other RSO functions as part of the HRI plan to share responsibilities among staff." *Id.* This factor demonstrates that the cost requirement for conducting radiological surveys has been addressed by HRI with the budgeting of a substantial salary for the Environmental Manager.

3. HRI's RAPs Properly Account for the Costs Associated With the Disposal of 11e.(2) Byproduct Material Wastes

a. Disposal Fees

Next, Konwinski asserts that HRI's RAPs have failed to properly account for the disposal of 11e.(2) byproduct material wastes from the Church Rock Section 17, Unit One, and Crownpoint sites at a licensed NRC facility. Konwinski evaluated three potential disposal locations and determined that HRI's most likely disposal location would be the International Uranium (USA) Corporation's White Mesa Mill in Blanding, Utah and that HRI's estimated costs for disposal at this site are well below actual disposal costs. *See* Intervenors March 7, 2005, Written Presentation at 61, 63-64.

HRI's License Condition 9.6 and COP Revision 2.0, § 1.5 require HRI to "develop and maintain an agreement for the disposal of 11e.(2) byproduct material with a facility licensed by the NRC or an Agreement State to accept such material." *See* COP Revision 2.0, § 1.5. This agreement is to be developed and executed *prior to the commencement of mining operations* at the CUP and must be replaced if it expires or is terminated within 90 days or mining operations must cease. Since mining operations have not commenced at any of the CUP's mining sites, the contract does not need to be in place at this time.

Additionally, Konwinski's testimony is flawed in several respects. First, Konwinski evaluated only *three* potential disposal locations for HRI's 11e.(2) byproduct material; (1) Envirocare, Inc.'s disposal facility in Tooele County, Utah, (2) COGEMA Mining's Shirley Basin Mill Tailings facility, and (3) International Uranium (USA) Corporation's White Mesa Mill facility in Blanding, Utah. *See* Intervenors' Exhibit DD at ¶ 12. However, as noted by Mr. Pelizza, Mr. Konwinski fails to account for the availability of two alternate disposal locations at the Cotter Corporation Canon City, Colorado facility and the Waste Control Specialists' Texas facility. *See* HRI Exhibit A at ¶ 247. These facilities also can be consulted by HRI to secure a contract for the disposal of 11e.(2) byproduct material. Thus, Mr. Konwinski's conclusion that the White Mesa Mill is the likely disposal location for HRI's 11e.(2) byproduct material is based on incomplete information and analysis.

Second, Mr. Konwinski states that the disposal fee for HRI's 11e.(2) byproduct material at the White Mesa Mill is approximately $100-125 per cubic yard and, as a result, HRI's disposal cost estimates are too low. However, Mr. Pelizza states that, "Cotter [Corporation] has quoted URI, Inc. in writing a fee of $50 per cubic yard." *Id.* at ¶ 248. Thus, Mr. Pelizza concludes that, "Konwinski's subsequent recalculation of costs [for HRI's RAPs] is overstated." *Id.* Therefore, Mr. Konwinski's statement that HRI's disposal costs must be increased to reflect White Mesa Mill disposal fees is incorrect.

Third, assuming that the White Mesa Mill is the disposal location selected by HRI, Mr. Konwinski states that this facility is limited to 500 cubic yards of solid material *per year* and that the site would not be big enough to accept solid materials if HRI cannot decontaminate all of its buildings and concrete. *See* Intervenors' Exhibit DD at ¶ 15. The White Mesa Mill's limit is 5,000 *cubic yards from a single source* (i.e., HRI's CUP) and not 500 cubic yards as stated by Mr. Konwinski. *See* HRI Exhibit A at ¶ 250. In any event, there are other disposal options but, if necessary, facilities such as the White Mesa Mill are permitted to pursue license amendments from NRC or the relevant Agreement State to accept additional 11e.(2) byproduct material wastes in excess of existing license conditions. Thus, Mr. Konwinski's assessment of this limitation is misguided.

b. Transportation, Packaging, Surveying and Other Costs Associated with Disposal of 11e.(2) Byproduct Material

Konwinski alleges that HRI either underestimates or does not include relevant costs associated with transportation and packaging of 11e.(2) byproduct material wastes to the disposal site and unloading of such wastes and decontamination of transport vehicles and containers at the disposal site. *See* Intervenors' March 7, 2005, Written

Presentation at 63-65, Exhibit DD at ¶ 22. Intervenors' allegation is expressed or incorporated by reference for each of the three remaining mining sites. *Id.*

With respect to the containerization (packaging) of the 11e.(2) byproduct material wastes, Mr. Pelizza has personally supervised the decommissioning of several ISL uranium recovery projects and has not encountered any instance where 11e.(2) byproduct materials required containerization prior to transport. *See* HRI Exhibit A at ¶ 255. As stated by Mr. Pelizza, "URI has always shipped in bulk because it is more efficient" as it is desirable to limit the weight of truck shipments to decrease potential risk from accidents. *Id.* Further, if 11e.(2) byproduct material is stored on-site prior to shipment, HRI will empty the storage containers into a bulk shipment and flatten the drums to effectuate disposal of all contaminated materials. *Id.* This disposal procedure is common to URI's licensed ISL uranium recovery operations and Intervenors have offered no evidence as to why such procedures are not applicable to HRI's ISL uranium recovery operations.

Konwinski also expresses a concern that HRI did not account for the cost of disposing of wellhead casing, reverse osmosis (RO) reject, and brine concentrator solids. Mr. Pelizza asserts that his experience in ISL uranium project decommissioning has not demonstrated that "wellhead contamination" is a decontamination issue. *Id.* at 256. The removal of surface contamination from a wellhead usually is completed using an acid/pressure wash process common to the uranium recovery industry. HRI Exhibit A at ¶ 252. Further, with respect to RO reject, "all RO reject is processed through the brine concentrator so there will only be solids from the brine concentrator." HRI Exhibit A at ¶ 252; *see also* Crownpoint RAP at § 2.3. With respect to brine concentrator solids, "HRI budgeted $ 8,291 per month for brine concentration disposal ($99, 492 per year or $696, 444 over the 7 year restoration period)." HRI Exhibit A at ¶ 252; *see also* Crownpoint RAP, Attachment E-2-1, line 88. Thus, Intervenors' allegations regarding the costs associated with disposal of a wellhead casing, RO reject, and brine concentrator solids should be rejected.

Further, Konwinski claims that HRI has not accounted for the amount of concrete and other building waste materials that will be generated during decommissioning. This allegation is based on HRI's alleged inability to fully decontaminate concrete and building structures for release and that HRI would be forced to dispose of such materials at an NRC-licensed facility. As stated by Mr. Pelizza:

> "[i]n 2004, URI, Inc. reconstructed buildings at its Kingsville Dome process facility including the contaminated dryer enclosure. The dryer enclosure is arguably the most contaminated structure at the facility. Even so, *all scrap was routinely decontaminated and decommissioned and released for unrestricted use. Similarly, HRI plans that all buildings will be decontaminated at the CUP.*"

HRI Exhibit A at ¶ 257; *see also* HRI Exhibit F.

Intervenors have provided no evidence that decontamination of the concrete and building structures after completion of uranium recovery operations cannot be effectuated in this manner. Further, HRI is required to update its surety to reflect any changes in decontamination plans, such as disposal of concrete and/or building structures at licensed facilities. Thus, Konwinski's allegation regarding HRI's estimate of waste to be generated at the CUP after decommissioning should be rejected.

Moreover, similar to many of Intervenors' allegations in their brief, Mr. Konwinski ignores the iterative nature of HRI's financial assurance assessment. As stated by Mr. Pelizza, Mr. Konwinski fails to account for HRI's requirement to refine financial assurance cost estimates immediately prior to the commencement of uranium recovery operations and the 10 CFR Part 40, Appendix A, Criterion 9 requirement to update such estimates annually. Based on these factors, HRI has properly accounted for the costs associated with the disposal of 11e.(2) byproduct material and, as such, Intervenors allegations regarding HRI's cost estimates should be rejected.

B. HRI Written Presentations for Church Rock Section 8 Regarding Groundwater Restoration and Financial Assurance

To date, HRI has submitted the following written presentations and exhibits regarding groundwater restoration and financial assurance:

1. Response of Hydro Resources, Inc. to Commission's Questions in CLI-00-12 (August 9, 2000) (ACN ML003740334)

In response to a list of specific questions issued by the Commission regarding the submission of financial assurance for ISL uranium recovery operations, HRI submitted a response to such questions. Paraphrased, the Commission asked four (4) specific questions: (1) did the Presiding Officer rely on an EPA aquifer exemption or UIC permit when making technical groundwater findings; (2) if so, would any of these findings be undermined if Church Rock Section 8 were deemed to fall under the "Indian Country" classification; (3) was it necessary for the Presiding officer to address whether HRI complied with the SDWA; and (4) what practical effects does the Tenth Circuit's decision on jurisdiction have on ISL uranium recovery operations at the Church Rock Section 8 site?

First, HRI stated that, after evaluating the testimony of multiple experts, the Presiding Officer recognized that the portion of the aquifer at the Church Rock Section 8 site was *already exempted* while finding, separately, that HRI's license should not be invalidated on a technical basis. As a result, HRI argued that the Presiding Officer did not rely on any aquifer exemptions or UIC permits when making technical groundwater findings.

Second, HRI argued that the effects of the jurisdictional dispute over Church Rock Section 8 is limited to determining which is the proper regulatory entity from which a UIC permit must be granted. Thus, HRI asserted that the jurisdictional dispute over this proposed site would not be greatly affected if the site was classified as "Indian Country."

Third, HRI argued that NRC was not required to determine whether HRI's proposed ISL uranium recovery operations complied with the SDWA. Since ISL uranium recovery licensees cannot inject liziviant into an underground ore body without the relevant EPA SDWA aquifers exemption(s) and UIC permit, HRI asserted that NRC should not decide this issue. Further, HRI noted that its NRC license (License Condition 9.14) specifically notes that it must obtain all relevant permits and licenses from appropriate regulatory entities prior to injection any lixiviant at any of its proposed uranium recovery sites.

2. Response of HRI to Commission's Order in CLI-00-08 Requiring Submittal of a Financial Assurance Plan (November 21, 2000) (ACN ML003772549)

This filing served as the cover statement for the submission of HRI's Church Rock Section 8 RAP. HRI stated that its RAP was compliant with applicable NRC regulations and with NRC-approved license conditions.

3. Hydro Resources, Inc., Church Rock Section 8/Crownpoint Process Plant Restoration Action Plan, License No. SUA-1508 (November 17, 2000) (ACN ML003772549);

HRI's RAP for the Church Rock section 8 uranium recovery site was submitted in response to the Commission's directive in CLI-00-08. HRI's Church Rock Section 8 RAP includes all financial assurance cost estimates prior to the construction and development of the Church Rock Section 8 uranium recovery site. Included in these cost estimates are the estimated costs for groundwater restoration based on a nine pore volume estimate, for payment of labor costs during such restoration, and for the maintenance, repair, and/or replacement of major site equipment. After the completion of litigation before the Licensing Board and the Commission, HRI's Church Rock Section 8 RAP was approved with one specific exception.

4. **Reply of Hydro Resources, Inc. to Intervenors' Response to Hydro Resources, Inc.'s Cost Estimates for Decommissioning and Restoration Action Plan (January 22, 2001) (ACN ML010250426);**

HRI filed its written presentation supporting its Church Rock Section 8 RAP and argued several points. First, HRI argued that its Church Rock Section 8 RAP adequately satisfied the Commission directive in CLI-00-08 and NRC regulations applicable to ISL uranium recovery licensees. In support of this argument, HRI provided expert affidavits stating that Intervenors' testimony was based on mere speculation and did not involve any practical, "real-world" experience at ISL uranium recovery facilities. On the contray, HRI argued that its expert testimony was based on experience at URI-operated and/or restored ISL uranium recovery facilities and that all licensed operations will occur pursuant to NRC-approved license conditions, protocols, and commitments. These operations also require revisions when and if necessary, including annual surety updates pursuant to NRC regulations.

5. . **Affidavit of Mark S. Pelizza Responding to Affidavits of Steven Ingle and Richard Abitz (January 22, 2001) (ACN ML010250426);**

The Affidavit of Mark S. Pelizza was submitted to directly refute the testimony of Ingle and Abitz. Mr. Pelizza reiterated his testimony from February 19, 1999, when he described the development of the "pore volume" concept and the process in which HRI arrived at it nine pore volume estimate. Mr. Pelizza reaffirmed that the pore volume estimate would be adjusted, pursuant to license condition, to reflect any necessary increase or permissible decrease in water levels to be re-circulated during groundwater restoration. In addition, Mr. Pelizza notes that HRI's nine pore volume estimate is conservative because it includes the *entire* ore zone and not just the well patterns. Thus, it is possible that the required number of pore volumes may be reduced if the well-field is constructed to reduce dispersion further than originally anticipated.

Mr. Pelizza specifically refutes Abitz's and Ingle's testimony regarding the adequacy of HRI's financial assurance cost estimates. In his testimony, Ingle did not assess the *conservative* number of pore volumes required of HRI by NRC Staff as compared to the number used by other ISL uranium recovery licensees. Mr. Pelizza also discusses brine concentrator efficiency and states that the figures used in the RAP are adequate to address use of the brine concentrator during restoration.

Mr. Pelizza also addresses the capital costs of reverse osmosis and the use of a brine concentrator, the method for well-plugging, and the procedures to be used during restoration such as operating twenty-four hours per day and seven days per week. Each point raised by Mr. Pelizza was supplemented with an analysis of the relevant financial assurance cost estimate from the Church Rock Section 8 RAP.

6. Affidavit of Richard A. Van Horn Responding to the Affidavits of Steven Ingle and Richard Abitz (January 22, 2001) (ACN ML010250426)

The Affidavit of Richard A. Van Horn presented industry knowledge and data regarding URI's current ISL uranium recovery operations in South Texas. Mr. Van Horn's affidavit provided a description of the procedures applicable to URI groundwater restoration operations, the required manpower for such operations, and operating costs necessary to continue such operations. Mr. Van Horn specifically noted that Abitz's analysis regarding the costs at the Fernald site cannot be compared to those at URI South Texas sites and that HRI's estimated costs are feasible.

C. Licensing Board and Commission Decisions on HRI's Pore Volume Estimate, Groundwater Restoration, and Financial Assurance

1. LBP-99-13: 49 NRC 233 (March 9, 1999)

The selection of nine pore volumes as the preliminary groundwater restoration estimate for the CUP and the viability of HRI's process for determining financial assurance have been addressed by this Licensing Board and the Commission in the context of Church Rock Section 8. First, in LBP-99-13,[22] the Licensing Board took its first look at the adequacy of the nine pore volume estimate and the applicability of specific NRC regulations to HRI's license. Intervenors raised a number of arguments including: (1) that 10 CFR § 40.36's requirements for financial assurance apply to HRI's license and (2) that 10 CFR Part 40, Appendix A requirements apply to HRI's license. *See* 49 NRC at *4-6. The Presiding Officer determined that 10 CFR § 40.36 does not apply to HRI's license because "pregnant lixiviant" (i.e., source material) exempts HRI

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[22] *See In the Matter of Hydro Resources, Inc.*, (Crownpoint Uranium Project), LBP-99-13, 49 NRC 233 (March 9, 1999).

from the regulation. *Id.* However, 10 CFR Part 40, Appendix A, Criterion 9's requirements for financial assurance do apply to HRI's license and, as a result, HRI would be required to post adequate financial assurance prior to beginning licensed operations in accordance with License Condition 9.5. *Id.* The Presiding Officer also determined that the use of nine pore volumes was adequate based on NRC Staff's "professional judgment." *Id.* at *6.

2. CLI-99-22: 50 NRC 3 (July 23, 1999)

Intervenors' appealed LBP-99-13 and, in CLI-99-22,[23] the Commission granted review on the limited issues of whether a financial assurance plan is a prerequisite to the issuance of a license and whether the financial assurance information submitted by HRI was sufficient to meet licensing requirements. After submission of briefs from all parties, in CLI-00-08,[24] the Commission, while recognizing that a financial assurance mechanism does not have to be in place until uranium recovery operations begin, reversed the Presiding officer's finding that HRI was not required to submit a RAP for its mining sites prior to licensing. Declining to revoke HRI's license, the Commission required that HRI submit RAPs for each of its four CUP sites. As discussed in Section II, HRI submitted the required RAPs in 2001.

3. CLI-00-08: 51 NRC 227 (May 25, 2000)

As discussed above, the Commission issued CLI-00-08 in response to Intervenors' appeal of LBP-99-13. In CLI-00-08, the Commission received briefs regarding the application of specific regulations to HRI's financial assurance offering.

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[23] *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-99-22, 50 NRC 3 (July 23, 1999).

[24] *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-00-08, 51 NRC 227 (May 25, 2000).

The Commission determined that 10 CFR Part 40, Appendix A, Criterion 9 applied to HRI's license and that HRI would be required to submit RAPs for each of its mining sites prior to engaging in ISL uranium recovery operations.

However, the Commission also determined that financial assurance must be established by the licensee prior to the commencement of operations. As a result, the Commission imposed an additional condition on HRI's license requiring that RAPs be submitted outlining the proposed financial assurance cost estimates for restoration and decommissioning of each of HRI's proposed mining sites. The Commission specifically stated that HRI could not commence ISL uranium recovery operations until such RAPs were submitted and approved.

4. LBP-04-03: 59 NRC 84 (February 27, 2004)

After submission and NRC Staff approval of the Section 8 RAP, in LBP-04-03,[25] the Presiding Officer determined that the RAP was sufficient with three (3) specific exceptions: (1) the RAP could not account for the availability of major site equipment during decommissioning by an independent contractor, (2) the RAP's labor cost estimates could not account for site employees performing multiple, unrelated tasks at the site, and (3) HRI's well-plugging method should be revised to reflect the "tremie line" method.

5. CLI-04-14: 59 NRC 250 (May 20, 2004) & CLI-04-33: 2004 NRC LEXIS 254 (December 8, 2004)

HRI appealed LBP-04-03 to the Commission and challenged two of the Presiding Officer's three findings; (1) that HRI's Section 8 RAP properly accounts for the availability of major site equipment and (2) that HRI's Section 8 RAP can rely on site

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[25] *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), LBP-04-03, 59 NRC 84 (February 27, 2004).

employees performing multiple, unrelated tasks at the site. The Commission granted review on HRI's appealed issues, and issues appealed by Intervenors, in CLI-04-14[26] and, in CLI-04-33,[27] the Commission reversed the Presiding Officer's findings regarding HRI's Section 8 RAP with respect to the availability of major site equipment and proposed labor cost estimates. Further, the Commission specifically noted that:

> "[t]he reasonableness of 9 pore volumes as an estimate was challenged in earlier portions of this proceeding. The Presiding Officer's initial decisions on these issues went against the intervenors. The decisions nonetheless noted that 'the requirement does not end at 9 pore volumes,' if in fact it is shown that more than 9 pore volumes are needed and likewise that the 'surety amount may be increased if 'at any time' it is determined that wellfield restoration requires greater pore volumes or a higher surety."

CLI-04-33 at *6-7.

Thus, the Commission's decision in CLI-04-33 specifically recognizes the iterative nature of HRI's continuing duty to revise pore volume estimates and to update, if necessary, its financial assurance cost estimates for groundwater restoration under its license. As such, HRI's Section 8 RAP was approved pending revision of its proposed well-plugging method to reflect the Presiding Officer's decision in LBP-04-03.

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[26] *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-04-14, 2004 NRC LEXIS 99 (May 20, 2004).

[27] *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), CLI-04-33, 2004 NRC LEXIS 254 (December 8, 2004).

VI. ARGUMENT: MISCELLANEOUS PROCEDURAL ISSUES: CHURCH ROCK SECTION 17, UNIT ONE, & CROWNPOINT

A. Intervenors Hearing Rights Have Not Been Violated By Permitting HRI to Determine Baseline Water Quality Standards After the Close of the Hearing

1. Intervenors Misinterpret NRC's In Situ Leach Uranium Recovery Standard Review Plan

Intervenors allege that NRC Staff has violated their hearing rights by granting HRI two specific license conditions, License No. SUA-1508, License Conditions 10.21 and 10.22, and that NRC Staff has imposed two additional license conditions, License Conditions 10.23 and 10.31, which allow HRI to determine "whether the Westwater Canyon aquifer is vertically confined and free of fractures." Intervenors' March 7, 2005, Written Presentation at 39-40. Intervenors' also allege that NUREG-1569, NRC's Standard Review Plan for In Situ Extraction License Applications ("ISL SRP"), classifies the establishment of baseline water quality standards for groundwater restoration as a "material" part of HRI's license. *Id.* at 41-42. Further, Intervenors claim that establishment of such standards does not qualify as "preoperational testing" for the purposes of licensed activities and that they should be permitted to challenge HRI's determination of "interaquifer communication" and "fracturing." *Id.* at 42-45. Intervenors conclude that each of these factors demonstrate that their hearing rights have been violated.

Based on standard NRC and industry practice, Intervenors' interpretation of the ISL SRP is misguided. Intervenors argue at great length that the establishment of baseline water quality standards is "material" to licensing. However, as a general proposition, the establishment of baseline water quality standards is a part of the "phased-in" approach to the licensing of ISL uranium recovery facilities explicitly recognized in the ISL SRP. For purposes of this discussion, the two relevant portions of the ISL SRP are Section 2 entitled *Site Characterization* and Section 5 entitled *Operations*. As discussed by Mr. Pelizza in his affidavit:

> "With respect to groundwater, the Site Characterization section recommends 'reasonably comprehensive chemical and radiological analysis obtained within and at locations away from the mineralized zone. The Operations section recommend much more detail 'for each new wellfield'"

HRI Exhibit A at ¶ 196.

Given this recommendation, Mr. Pelizza states:

> "SRP § 5 is based on standard industry practice when the wellfield is to be installed and the test wells will be available. Any change in this approach would require a complete re-engineering of the methods upon which the ISL industry has operated since its inception."

Id. at ¶ 201 (emphasis added).

Given the differences between the *Site Characterization* and *Operations* Sections of the ISL SRP, as stated by Mr. Pelizza, "[i]t is inappropriate [of Intervenors] to treat the purposes of these two provisions as being the same." *Id.*at ¶ 197. With respect to the *pre-licensing Site Characterization* portion of ISL uranium recovery operations, Section 2 of the ISL SRP "provides guidance for 'reasonably comprehensive' analysis to determine baseline conditions" (i.e., *Site Characterization*). *Id.* This assessment includes evaluation of general baseline water quality conditions using the best available data but *without* the installation of well-fields necessary to determine detailed baseline values for restoration goals and other parameters. Moreover, HRI is not permitted to engage in the construction of well-fields and sampling operations at such well-fields during the *Site Characterization* phase or the licensee risks having its licensed denied or revoked. *See*

HRI Exhibit B at ¶ 39. If the licensing phase is not complete, HRI cannot engage in *Operations* activities.

With respect to the Section 5 *Operations* phase of the CUP, HRI must install well-fields at each of the proposed mining sites to determine or conduct "restoration goals, excursion upper control limits, and pump testing for vertical and horizontal confinement." *Id.* As stated by Mr. Pelizza, "[a]ll of these tests can only be performed once the wells that are part of operations are installed." HRI Exhibit A at ¶ 197.. This statement is further supported by Mr. Bartels when he states, "[t]his sequential treatment [*Site Characterization* and *Operations*] of ISL wellfields...is the standard NRC methodology, developed over decades, used to protect groundwater and the environment." HRI Exhibit B at ¶ 41. Contrary to Abitz's conclusions, Mr. Bartels states, "[t]his sequential treatment of ISL well fields was decidedly not 'NRC Staff's decision...." *Id.* Based on this, Mr. Pelizza concludes that, "[i]t is inappropriate to treat the purposes of these two provisions as being the same." HRI Exhibit A at ¶ 197.

Further, "[a]t this stage in the CUP project, the litigation cannot reach beyond the adequacy of the protocol on the operating plan (Consolidated Operations Plan Rev. 2.0 or COP) because the mine must be built before the plan can be implemented and compliance is then left to inspection." *Id.* at ¶ 198 As stated by Mr. Pelizza, "[i]t takes years of continuous study to plan and develop an ISL uranium mine through its operational life to closure....This process is sequential, with each mine unit developed and tested as the mineral is progressively depleted from different parts of the ore body." *Id.* at ¶ 214. ISL uranium recovery operations must be done in this manner, because "[t]he installation of mine units prior to satisfying the requirements of [ISL] SRP § 5 guidance and after SRP §

2 characterization and licensing is completed would be a direct violation of NRC regulations and SRP Guidance." *Id.* at ¶ 216.

For example, with respect to statistical analyses,[28] "HRI's COP and...LC 10.22 require HRI to eliminate outliers consistent with EPA's 1989, 'Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Interim Guidance.' This NRC required methodology for outlier determination requires a rigorous statistical approach and has an accepted scientific basis. HRI will utilize the stated statistical analysis guidance for outlier analysis or method required by NRC." *Id.* at ¶ 219. HRI's license and the COP also prescribe standard operating procedures (SOPs) for activities involving radioactive materials, instructions for sequential well and well-field installation, determination of UCLs, and the establishment of restoration goals. The validity and feasibility of these *protocols* and prescriptive requirements are at issue here and not necessarily site-specific data.

Based on the incorporation of the COP, HRI's performance-based NRC license is specifically tailored to reflect this sequential treatment of ISL well-fields so that all proper well-field installation, testing, and monitoring is complete prior to the injection of *any* lixiviant into the proposed uranium recovery zones. Several of HRI's license conditions and the COP establish prescriptive requirements for constructing well-fields, establishing upper control limits (UCLs), pump testing requirements, and groundwater monitoring. *See* HRI Exhibit A at ¶ 206. Intervenors were given ample opportunity to challenge the performance-base nature of HRI's license in the Church Rock Section 8 proceeding and, in LBP-99-10, the Licensing Board determined that HRI's performance-

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[28] For further discussion on the viability of HRI's proposed statistical analysis protocol, *please see* the Affidavit of Mr. Ronald Christensen (attached as "HRI Exhibit E").

based license complies with NRC regulations. *See In the Matter of Hydro Resources, Inc.* (Crownpoint Uranium Project), LBP-99-10, 49 NRC 145 (February 19, 1999). Specifically, the Licensing Board responded to Intervenors' broad allegation that HRI's license leaves HRI practically unregulated by quoting License Condition 9.3 which states:

> "[t]he licensee shall conduct operations in accordance with all commitments, representations, and statements made in its license application submitted by cover letter dated April 25, 1988...and in the Crownpoint Uranium Project Consolidated Operations Plan (COP), Rev. 2.0, dated August 15, 1997-except where superseded by license conditions contained in this license. Whenever the licensee uses the words 'will' or 'shall' in the aforementioned licensee documents, it denotes an enforceable license requirement."

Thus, HRI is granted no "latitude" to operate the CUP in a manner outside the prescriptive requirements of its license and its commitments in the CUP. Therefore, Intervenors' reliance on the ISL SRP to demonstrate a deprivation of hearing rights is misguided.

Moreover, Intervenors' claim that NRC Staff does not have to approve relevant activities at the CUP sites is incorrect. Intervenors ignore the basic fundamental premise behind performance-based licensing which is that all licensed activities are subject, in one form or another, to NRC approval. Initially, as stated above, HRI's license, its conditions, and all incorporated procedures and commitments were subject to NRC approval and currently are being evaluated in this proceeding. After approval of these items, HRI is permitted to perform all *Site Characterization, Operations,* and other relevant activities associated with construction of a well-field and preparation for uranium recovery operations in accordance with the prescriptive requirements of its license and associated conditions, procedures, and commitments. These activities are conducted and finalized by a Safety and Environmental Review Panel (SERP), which is a fundamental component of a performance-based license, and the results of these activities are maintained on-site. As a further check on HRI's licensed activities, the SERP's findings and the results of licensed activities pursuant to license conditions and other requirements are subject to NRC inspection. Should NRC be dissatisfied with the SERP's actions, HRI would be required to rectify any problems or be subject to NRC enforcement action.

In summary, HRI's NRC performance-based license, including all incorporated procedures (e.g., the COP) and commitments (e.g., EPA Guidance for statistical analysis), provides prescriptive requirements for the construction, operation, and restoration of well-fields at each CUP site. HRI is not permitted to engage in *Site Characterization* or *Operations* activities outside of these prescriptive requirements. Further, NRC approval of HRI's license and associated requirements is only the first stage of the process. NRC retains authority to inspect all activities engaged in by the SERP, to require corrective action and, if necessary, to impose enforcement. These premises are the fundamental basis for the concept of performance-based licensing, which already has been litigated before Judge Bloch and approved. Based on this, Intervenors should be collaterally estopped from challenging the performance-based nature of HRI's license and, as such, Intervenors' allegations that they have been deprived of hearing rights should be rejected.

2. Intervenors' Reliance on Case Law is Misguided

Intervenors also rely on several case citations to demonstrate that they have been deprived of their hearing rights to challenge HRI's performance-based license.

Specifically, Intervenors rely on the cases of *Union of Concerned Scientists v. NRC*, *In the Matter of Consolidated Edison Co. of New York*, and *In the Matter of Wisconsin Power Co. and Wisconsin-Michigan Power Co.* to support their conclusions. *See* Intervenors' March 7, 2005, Written Presentation at 42 & 45.

Intervenors' reliance on these cases to support their argument is misguided as they address a type of adjudicatory proceeding that is vastly different from the instant proceeding. Each of Intervenors' cited cases involve "formal" "on-the-record" proceedings for nuclear power reactor applicants or licensees and are directly related to the Administrative Procedure Act's (APA's) provisions for such proceedings. *See* 5 U.S.C. § 554__. However, the instant proceeding is being conducted under NRC's Subpart L regulations for "informal" materials licensing proceedings. As a general proposition, NRC materials licensing proceedings, such as the instant proceeding regarding HRI's license, are conducted as "informal" proceedings and, as such, are not subject to the holdings in Intervenors' cited cases. Thus, Interveners' reliance on these cited cases provide no support for their allegations.

VII. CONCLUSION

For the reasons discussed above, HRI respectfully requests that the Presiding Officer reject each of Intervenors' arguments regarding groundwater, groundwater restoration, and financial assurance.

Respectfully Submitted,

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
E. Roy Hawkins, Presiding Officer
Dr. Richard F. Cole, Special Assistant
Dr, Robin Brett, Special Assistant

In the Matter of:	)	Docket No.: 40-8968-ML
Hydro Resources, Inc.	)	
P.O. Box 777	)	
Crownpoint, NM 87313	)	Date: April 21, 2005

CERTIFICATE OF SERVICE

THIS IS TO CERTIFY that a copy of the foregoing Hydro Resources, Inc.'s Response in Opposition to Intervenors' Written Presentation Regarding Groundwater, Groundwater Restoration and Financial Assurance in the above-captioned matter has been served upon the following via electronic mail and U.S. First Class Mail on this 21st day of April, 2005.

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April 21, 2005

BY ELECTRONIC MAIL AND U.S. FIRST CLASS MAIL

U.S. Nuclear Regulatory Commission
Office of the Secretary
Attn: Rulemaking and Adjudications Staff
Mail Stop: OWFN-16C1
Washington, DC 20555

Re: In the Matter of: Hydro Resources, Inc.
Docket No: 40-8968-ML

Dear Sir or Madam:

Please find attached for filing Hydro Resources, Inc.'s Response in Opposition to Intervenors' Written Presentation Regarding Groundwater, Groundwater Restoration and Financial Assurance in the above-captioned matter. Copies of the enclosed have been served on the parties indicated on the enclosed certificate of service. Additionally, please return a file-stamped copy in the self-addressed, postage prepaid envelope attached herewith.

If you have any questions, please feel free to contact me at (202) 496-0780. Thank you for your time and consideration in this matter.

Sincerely,

Anthony J. Thompson, Esq.
Christopher S. Pugsley, Esq.
Thompson & Simmons, PLLC.
Counsel of Record to HRI

Enclosures

(hydro resourcesCOVERLETTTER.doc)

EXHIBIT A

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before Administrative Judge
E. Roy Hawkins, Presiding Officer
Dr. Richard F. Cole, Special Assistant
Dr. Robin Brett, Special Assistant

In the Matter of:	)	
	)	Docket No.: 40-8958-ML
HYDRO RESOURCES, INC.	)	
P.O. Box 777	)	ASLBP No. 95-706-01-ML
Crownpoint, NM 87313	)	
	)	April 21, 2005

AFFIDAVIT OF MARK S. PELIZZA

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  E. COP § 8.0 CONTAINS HRI'S INSTRUCTIONS FOR STATISTICAL ANALYSIS.

  F. THE COP DESCRIBES HOW RESTORATION GOALS WILL BE ESTABLISHED.

  G. UCLS AND RESTORATION AVERAGING IN THE COP AND LICENSE IS JUSTIFIED BASED ON INDUSTRY PRACTICES AND SITE INFORMATION.

  H. THE UCL INDICATORS ARE SUFFICIENT.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before Administrative Judge
E. Roy Hawkins, Presiding Officer
Dr. Richard F. Cole, Special Assistant
Dr. Robin Brett, Special Assistant

In the Matter of:)
) Docket No.: 40-8958-ML
HYDRO RESOURCES, INC.)
P.O. Box 777) ASLBP No. 95-706-01-ML
Crownpoint, NM 87313)
) April 21, 2005

AFFIDAVIT OF MARK S. PELIZZA

Before me, the undersigned notary on this day appeared Mark S. Pelizza, a person known or identified to me, and who after being duly sworn deposes and says the following in response to the Intervenors Brief with Respect to Groundwater Protection, Groundwater Restoration and Surety Estimates Dated March 7, 2005.

I. PERSONAL.

1. My name is MARK S. PELIZZA; I reside at 3217 Breton Drive, Plano, Texas 75025. I am over 21 years of age; I never been convicted of a felony; and, I am fully capable of making this Affidavit.

2. The factual matters set out herein are within my personal knowledge or my corporate knowledge within my official capacity as set out herein. The opinions set out herein are based upon data and analytic techniques reasonably and customarily used by qualified professionals to form opinions and draw scientific and technical inferences for the purposes of important health, safety, environmental and regulatory decisions in the uranium recovery industry.

II. QUALIFICATIONS.

3. I hold a Bachelor of Science in Geology from Fort Lewis College in Geology and a Master of Science from Colorado School of Mines in Geological Engineering.

4. I am a Licensed Professional Geoscientist (TX Geology #2552) and Environmental Manager with over 26 years of experience in the in situ leach (*"ISL")* mineral recovery industry (predominantly uranium). In the uranium industry I also posses extensive experience in groundwater geochemistry and uranium health physics.

5. Professional Affiliations - I serve on the Board of Directors of both the New Mexico Mining Association and the Texas Mining and Reclamation Association.

6. I have served for nine years as Vice President of Health, Safety and Environmental Affairs with Uranium Resources, Inc., parent company to both HRI, Inc. and URI, Inc and five years as President of HRI, Inc. Both firms were founded to explore for uranium producible by *ISL* recovery techniques, acquire properties with uranium reserves suitable for *ISL*, license *ISL* uranium activities, operate *ISL* uranium facilities, and ultimately to close *ISL* uranium operations after uranium recovery is complete. In that capacity, I have directed health, safety and environmental programs, coordinated staff members and consultants, prepared applications for federal and state environmental permits and licenses, and negotiated the conditions of radioactive materials licenses and other permits. I served as a corporate liaison with lawmakers and regulatory agency staff, and represented the company and industry trade associations in activities such as rulemaking and legislation involving HRI/URI.

7. Prior to being named Vice President, I served Uranium Resources, Inc. as Environmental Manager with similar corporate environmental responsibilities. I was employed with Uranium Resources, Inc. for nearly 24 years. I have been employed as a health, safety and environmental professional with the *ISL* uranium industry for 26 years. I have taken an active leadership role with various professional trade organizations in developing the current in situ uranium industry rules, regulations and policies.

8. During my employment with Uranium Resources, Inc., I have personally supervised all radiological and non-radiological occupational health, safety and environmental programs for operations conducted by HRI/URI in New Mexico, Texas, and Wyoming. This includes radiological and non-radiological occupational and environmental baseline data collection, operational programs, restoration/reclamation programs and regulatory liaison. I have also been the primary managerial support representative for all environmental litigation involving Uranium Resources, Inc.

9. I have managed regulatory affairs, including matters related to radioactive materials, other environmental permitting, compliance and enforcement matters and bonding for closure costs on the following *ISL* uranium recovery projects:

A. Alta Mesa Uranium Project. An undeveloped *ISL* project in Brooks County, Texas. Conducted environmental studies, prepared permit/license applications, procured the Underground Injection Control ("UIC") Permit for *ISL* activities, the UIC Permit for deep well disposal, the initial Production Area Authorization ("PAA"), and the Air Control Permit.

B. Benavides Uranium Project. An *ISL* project in Duval County, Texas where production has ceased and mine closure obligations have all be successfully fulfilled. I conducted environmental studies, prepared permit/license applications, and procured the UIC Permit for the well fields used for *ISL* activities, four production area authorizations, the Air Control Permit, the surface discharge permit and the Agreement State Radioactive Materials License. I was responsible for groundwater restoration, surface decommissioning and license termination oversight. I was corporate Radiation Safety Officer ("RSO") for this project with oversight for the radiation safety, environmental protection programs and permit compliance during operations, aquifer restoration, and final reclamation and closure of the site. I reviewed and managed the "Closure Obligations" for this project.

C. Crownpoint Uranium Project ("CUP"). This is an undeveloped *ISL* project in McKinley County, New Mexico. For this project, I conducted the extensive environmental studies, required by state and federal authorities, prepared the necessary permit and license applications, and secured the necessary radioactive materials from NRC. I served as the technical support manager during the multi-year licensing hearing held on this matter by the Atomic Safety Licensing Board of the NRC.

Churchrock Site. This is an undeveloped subsite of the CUP in McKinley County, New Mexico. I have conducted the extensive environmental studies by state and federal authorities required for licensure and permitting, I prepared the permit and license applications, and I secured the UIC permit from the New Mexico regulatory authorities (the Aquifer Exemption from the U.S. EPA ("EPA")) and secured the necessary radioactive materials license from NRC. I served as the technical support manager during the multi-year licensing hearing held on this matter by the U. S. Atomic Safety Licensing Board of NRC.

Unit 1 Site. This is an undeveloped subsite of the CUP in McKinley County, New Mexico. For this project, I conducted environmental studies, prepared permit/license applications, and secured the NRC Source Materials License. I served as the technical support manager during lengthy public hearings conducted on the licensure of this project by the U. S. Atomic Safety Licensing Board of the NRC.

D. Kingsville Dome Uranium Project. This is an operational *ISL* project in Kleberg County, Texas. This facility is capable of processing and packaging uranium (yellow cake) from the Kingsville Dome site and from other nearby mine locations. For this project, I conducted environmental studies, prepared required permit and license applications to the Texas Department of Health/Bureau of Radiation Control and the Texas Commission on Environmental Quality (TCEQ) and procured the necessary UIC Permit for uranium production and a major expansion to that Permit, three Production Area Authorizations ("PAA's"), the requisite TCEQ Aquifer Exemptions (the Aquifer Exemption from the EPA) and the UIC Permit for on site deep well disposal, the Air Control Permit, and the agreement state Radioactive Materials License. I have served as corporate RSO for this project with oversight for the radiation safety, environmental protection and permit compliance. I have served as technical support manager during five administrative hearings for the permitting and licensing the project and its expansions.

E. Longoria Uranium Project. This is a former *ISL* mine located in Duval County, Texas. This mine has now concluded its production, and it has been successfully restored and closed in an environmentally sound manner in compliance with all applicable state and federal requirements. I successfully conducted environmental studies, prepared permit/license applications, and procured the UIC Permit for uranium production, two PAA's, the Air Control Permit, the surface discharge permit and the Radioactive Materials License. Groundwater restoration, surface decommissioning and license termination oversight. I was the corporate

RSO for this project with oversight for radiation safety, environmental protection and permit compliance during operations and reclamation. I reviewed and managed the "Closure Obligations" for this project.

F. Highland Uranium Project. This is an operational *ISL* project in Converse County, Wyoming. This facility processed uranium through the drying and packaging steps from on location as well as from other near-by mines. I performed extensive due-diligence investigations to determine environmental conditions and potential liabilities of this mine. I also reviewed sources of contamination in the plant area, wellfields and disposal site. I reviewed costs for reclamation activities at this mine.

G. Holiday/El Mesquite Uranium Project. This is a commercial uranium project in Duval County Texas. I developed contractor plans and procedures for final decommissioning and remediation including the health physics protocol, wellfield survey and remediation, equipment decontamination and closure. I reviewed and managed the costs of performing the "Closure Obligations" on this project.

H. Lamprecth Uranium Project. This is a commercial uranium project in Live Oak County, Texas. I reviewed the files of the TDH/BRC on this project, visited the site, and developed contractor plans and procedures for final decommissioning and remediation of the remaining plant site, wellfield soil survey and remediation and closure for this project.

I. North Platte Uranium Project. This is a reclaimed *ISL* pilot project in Converse County, Wyoming. Here, I conducted environmental studies, prepared all required permit/license applications, and procured the State UIC Permit for *ISL* activities, the surface discharge permit and NRC Source Materials License. I was responsible for groundwater restoration, surface decommissioning and license termination oversight. I was the corporate RSO for this project with oversight for radiation safety, environmental protection and permit compliance during operations and reclamation.

J. O'Hern Uranium Project. This is a commercial *ISL* uranium project in Duval County, Texas. I developed contractor plans and procedures for final decommissioning and remediation of this project, including wellfield soil survey and remediation and closure. I reviewed and managed the costs of performing the "Closure Obligations" on this project.

K. Palangana Uranium Project. This is a reclaimed *ISL* uranium project in Duval County, Texas. I served as RSO for this project with oversight for radiation safety, environmental protection and permit compliance.

L. Panna Maria Uranium Mine/Mill. This is a uranium mine and mill in Karnes County, Texas. I served on the team that conducted the environmental studies and prepared the license and permit applications for the mine.

M. Rosita Uranium Project. This is an *ISL* uranium recovery project in Duval County, Texas. I conducted environmental studies for this project, prepared permit/license applications, and procured the UIC Permit for the wellfield to mine the project and a major expansion to that permit, three PAA's, the requisite TCEQ Aquifer Exemptions (the Aquifer Exemption from the EPA), the UIC Permit for deep well disposal of wastes on-site, the Air Control Permit, and the agreement state Radioactive Materials License. I was the corporate RSO for this project with oversight for radiation safety, environmental protection and permit compliance during operations. I was the technical support manager for one administrative hearing for the permit on this project.

N. Vasquez Uranium Project. This is an as-yet undeveloped *ISL* project in Duval County, Texas. I conducted environmental studies, prepared permit/license applications, and procured the UIC Permit for production operations, the requisite TCEQ Aquifer Exemptions (the Aquifer Exemption from the EPA), the UIC Permit for deep well disposal, the initial PAA, the Air Control Permit and the Agreement State Radioactive Materials License.

O. West Cole Uranium Project. This is a successfully reclaimed *ISL* project in Webb County, Texas. For this project, I conducted environmental studies, prepared permit and license applications, and procured the UIC Permit for the wells needed for uranium recovery operations, the UIC Permit for the deep disposal well, the initial PAA, the Air Control Permit and the agreement state Radioactive Materials License. I developed contractor plans and procedures for final decommissioning and remediation including health physics protocol, wellfield survey and remediation, equipment decontamination and closure. I reviewed and managed the costs of performing the "Closure Obligations" on this project.

P. White Mesa Uranium Mill. A fully operational uranium mill that is licensed to accept conventional uranium ores alternate feedstocks from a variety of locations including those owned by the United States Government. The White Mesa mill is also a disposal site for certain types of radioactive waste including uranium byproduct material. I have served as co-leader for the ALARA audit team for that facility for seven years. Pursuant to license requirements, the annual audit is required to assure that the mill and associated disposal facilities are operating safely and in compliance with NRC regulations.

Q. Zamzow Uranium Project. This is a closed uranium project in Live Oak County Texas. For this project, I visited the site and developed contractor plans and procedures for final decommissioning and remediation of remaining plant site, wellfield soil survey and remediation and closure.

10. I have been tendered and qualified as an expert witness in a number of vigorously contested public hearings before state and federal administrative agencies, including:

A. Before TCEQ, formerly the Texas Natural Resource Conservation Commission, and before that the Texas Water Commission. Administrative Hearing, June 1984; Kingsville Dome Project. Expert in *ISL* technology, groundwater, well drilling and development groundwater restoration.

B. Before TCEQ. Administrative Hearing, 1986; Kingsville Dome Project, Texas. Expert in *ISL* technology, groundwater, well drilling and development and groundwater restoration.

C. Before the Texas Department of Health (TDH). Administrative Hearing, 1986; Kingsville Dome Project. Expert in *ISL* technology, health physics, environmental impacts, groundwater, reclamation and restoration.

D. Before TCEQ. Administrative Hearing, 1989. Kingsville Dome Project. Expert in *ISL* technology, groundwater, well drilling and development and groundwater restoration.

E. Before TDH. Administrative Hearing, 1989. Kingsville Dome Project. Expert in *ISL* technology, health physics, environmental impacts, groundwater, reclamation and restoration.

F. Before the New Mexico Environment Department Public Hearing, 1993. Church Rock Project DP-558. Expert in *ISL* technology, groundwater, well drilling and development groundwater restoration.

G. Before the New Mexico State Engineer, 1998. Church Rock Project Application G-11-a. Expert in *ISL* technology, groundwater, well drilling and development groundwater restoration.

H. Before TCEQ. Administrative Hearing, 1997. Rosita Project. Expert in *ISL* technology, groundwater, well drilling and development and groundwater restoration.

I. Before NRC/Atomic Safety & Licensing Board (ASLB). Federal Administrative Hearing, 1999. The CUP. Expert in *ISL* technology, health physics, waste disposal, environmental impacts, groundwater, reclamation and restoration reclamation costs.

III. MATERIALS PREPARED AND REVIEWED.

11. All the environmental studies and application documents that are required by NRC that culminated in the issuance of the Materials License were prepared under my direct involvement or supervision. I served as the technical support manager during Phase 1 and Phase 2 of this licensing hearing held on the CUP. As such I have review all technical presentations and legal briefs. I have had direct involvement or supervision over all technical experts who have responded in both Phase 1 and Phase 2 of this licensing hearing and as such have reviewed all of the expert submittals.

IV. THE EPA AQUIFER EXEMPTION AND UIC PERMIT PROTECT USDWs WATER QUALITY.

12. For a uranium orebody to be amenable to in situ leach recovery using the type of leach chemistry proposed at the CUP or anywhere else in the U.S., the ore must be <u>saturated</u> with relatively fresh water and the rock must have enough transitivity for water to flow from injector to producer wells. In other words, for ISL recovery to work, the ore must be situated in an aquifer. There are no ISL uranium mines that are not in aquifers.

13. The U.S. EPA's Underground Injection Control ("UIC") program is crafted to assure compliance with the Safe Drinking Water Act ("SDWA"). As required by LC 9.14, HRI can not operate Section 17, Unit 1 or Crownpoint without the requisite Aquifer Exemption and UIC

permits. When the aquifer exemption and IUC permit issued, HRI is in compliance with the provisions of the SDWA. Without such EPA authorization, HRI would face enforcement by EPA for willful violation of the SDWA and UIC regulations - with or without an NRC license.

14. Injection into an underground source of drinking water is prohibited (40CFR144.12) The UIC program as it applies nationwide provides EPA with the framework to allow ISL mineral development in specific *portions* of geologic strata which are also shared by underground sources of drinking water (USDWs).

15. EPA provides a mechanism in the regulations for an aquifer exemption if certain criteria are met, which permits injection into the exempt portion of the aquifer and permits mineral development.

16. An Aquifer exemption is specifically provided for in 40 CFR 144.8 as follows:

> "An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in § 146.3 may be determined under 40 CFR 144.8 to be an "exempted aquifer" if it meets the following criteria:
>
> (a) It does not currently serve as a source of drinking water; and
> (b) It cannot now and will not in the future serve as a source of drinking water because:
> (1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible;
> (2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;
> (3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or
> (4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or
> (c) The total dissolved solids content of the ground water are more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system."

17. Pursuant to LC 9.14, HRI must receive an Aquifer Exemption as described above before any mining can occur. EPA has issued aquifer exemptions under similar conditions at other ISL mines across the U.S. and drinking supplies have not been adversely affected. At the CUP, the uranium ore body shares the same Westwater Canyon Formation with many drinking water sources, yet the portion of the aquifer that HRI plans to mine meets the criteria of 40CFR144.8. The UIC program as it applies to the CUP allow ISL mineral development in *portions* of geologic strata which are not and can not be drinking water supplies with other portions of the strata used for drinking water supplies elsewhere.

18. Being mineralized (i.e. naturally occurring radionuclides), water within the exempted uranium ore would never be suitable for drinking water.

V. EXAMPLES OF ISL MINES IN AQUIFERS.

19. Unlike a more general site selection process such as for a factory, waste disposal site or power plant, the selection of the areas for mining is dictated by the location of the economic and recoverable ore. Based on recognition of the natural processes that have created this geological strata, EPA provides a mechanism which allows the mixed use of the aquifer as a USDW and for economic production, providing that the USDW can be protected.

20. Abitz ¶¶ 33,37 states that water outside of the ore zone meets drinking standards and therefore the CUP mines present a risk to water supplies. If Abitz were to review the existing conditions at other ISL projects he would understand the relationship of ISL operations to drinking water aquifers. For example URI's most recent ISL projects, Kingsville Dome, Rosita, and Vasquez are in regional drinking water aquifers and have been issued EPA aquifer exemptions pursuant to 40CFR144.8. Other projects, old and new, in Nebraska, Texas and Wyoming have had to satisfy the same regulatory requirements.

21. As shown in the Table below Kingsville Dome, Rosita, and Vasquez are in the Goliad Formation or Oakville Formations that are important regional water supply aquifers. Many other operations that were conducted in public water supply aquifers are also shown in the Table. Within one mile of the Kingsville Dome Project there are approximately 25 private water supply wells, all in the Goliad Aquifer. The City of Kingsville (Population ~25,000) draws its water supply from the same Goliad Aquifer 4 miles from the mine. Within one mile of the Rosita Project that are approximately 40 private water supply wells, all in the Goliad Aquifer. The City of San Diego (Population ~ 3000) draws its water supply from the same Goliad Aquifer 15 miles down gradient from the mine. URI samples many of the closest private wells near the mine and there has never been an adverse affect on any well.

22. Recognizing that aquifers outside ISL mine zones are used as a USDWs, EPA exempts that portion of the aquifer that is capable of mineral production. As shown in the Table below, all of the ISL mining operations in Texas have been developed in aquifers that are a USDW *regionally,* but which qualify for an aquifer exemption *locally.*

ISL Mining Operations in Texas

Company	Mine Name	Regional USDW
Caithness Mining	McBride	Oakville
Conoco	Trevino	Oakville
Everest Minerals	Hobson	Jackson
Everest Minerals	Las Palmas	Oakville
Everest Minerals	Mt Lucas	Goliad
Everest Minerals	Tex-1	Jackson
Intercontinental Energy	Pawnee	Oakville
Intercontinental Energy	Zamzow	Oakville
Mobil/Cogema	Holiday	Catahoula
Mobil/Cogema	El Mesquite	Catahoula
Mobil/Cogema	O'Hern	Catahoula
Tenneco/Cogema	West Cole	Catahoula
URI	Alta Mesa	Goliad
URI	Benavides	Catahoula
URI	Kingsville	Goliad
URI	Longoria	Catahoula
URI	Rosita	Goliad
URI	Vasquez	Oakville
U.S.Steel	Boots	Oakville
U.S.Steel	Burns	Oakville
U.S.Steel	Clay West	Oakville
U.S.Steel	Mosier	Oakville
U.S.Steel	Paulik	Oakville
Chevron	Palangana	Goliad
Westinghouse	Bruni	Catahoula
Westinghouse	Lamprecth	Oakville

VI. URANIUM AND ITS PROGENY MAKE GROUNDWATER NON POTABLE IN REDISTRIBUTED ORE.

A. URANIUM AND URANIUM PROGENY ARE SUBJECT TO EPA NATIONAL PRIMARY DRINKING WATER REGULATIONS AND LIMIT USE QUALITY.

23. As I will demonstrate below, water used for ISL mining is not suitable for drinking and can be reclaimed to constituent levels that are consistent with baseline to minimize the potential for post mining migration of constituents into adjacent USDWs.

24. Uranium and uranium-related elements such as radium and ^{222}Rn that are uranium's natural decay products are found in water in uranium deposits in New Mexico, Nebraska, Texas and Wyoming. When the mineralization is in sufficient concentrations, uranium and its progeny cause the natural groundwater in the ore zone to exceed federal and state drinking water limits for uranium and/or gross alpha (α) radiation, radium (^{222}Rn) and radon (^{226}Ra) rendering it potentially toxic for human and livestock consumption.

25. The EPA National Primary Drinking Water Regulations (NPDWRs) are legally enforceable standards that public water systems are required to satisfy. NPDWR MCLs for uranium and uranium progeny are listed below.

Contaminant	MCL[†]	Potential Health Effects from Ingestion of Water	Sources of Contaminant
Alpha particles	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation
Beta particles and photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation
^{226}Ra and ^{228}Radium	5 pCi/L	Increased risk of cancer	Erosion of natural deposits
Uranium	30 µg/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits

[†] **Maximum Contaminant Level (MCL)** - The highest level of a contaminant that is allowed in drinking water. MCLs are enforceable standards.

26. EPA has proposed a ^{222}Rn MCL at 300 pCi/L. [Federal Register: November 2, 1999 (Volume 64, Number 211)] The potential health hazards associated with ^{222}Rn are described at length therein. Given the widely accepted potential hazards of ^{222}Rn exposure described by EPA, in this Affidavit I include the 300 pCi/l ^{222}Rn MCL along with uranium and radium MCLs as a criteria to screen groundwater for suitability as a source of drinking water.

27. Dr. Fogerty and Dr. Molony[1] dedicate their entire affidavits to numerous studies that support the reasons for the EPA Uranium MCL. HRI accepts the EPA Uranium MCL for what it is, a legally enforceable drinking standard that *public water systems* must satisfy. However, sites that are permitted for Class III UIC activity and exempted under the provisions of the SDWA are not USDWs and will not serve as sources of drinking water for a *public water supply system.* Therefore, while the potential effects of long term consumption of uranium on rats, rabbits and humans is a valid concern, the SDWA and NRC regulations assure that there is no potential pathway for the injection of drinking water containing elevated levels of uranium.

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[1] See Fogerty and Molony Declaration in support of Intervenor's March 7, 2005 Brief.

28. Intervenor's argue that the .44 mg/l NRC standard is no longer protective with the promulgation of the EPA Uranium MCL of 30 μg/L, and that the license is defective. First, under the NRC regulatory scheme the *primary* restoration goal is natural, premining baseline. As Judge Bloch noted (LPB-99-30 at p.36) and the Commission reinforced, baseline uranium levels in the mining zone are likely to exceed the .44 mg/l (440 μg/l) NRC standard and the new EPA MCL of 30 μg/l as well so their relevance to public health is questionable in any event. However, when the FEIS was published in 1997, p. 4-27 presented HRI's rationale for all restoration criteria, including uranium:

> "groundwater restoration criteria are established on a parameter-by-parameter basis, with the primary goal of restoration to return all parameters to average premining baseline conditions. In the event that water quality parameters cannot be returned to average premining baseline levels, the secondary goal would be to return water quality to the maximum concentration limits as specified in EPA secondary and primary drinking water regulations (40 CFR part 141 and § 143.3). The secondary restoration goal for barium and fluoride will be set to the State of New Mexico primary drinking water standard, which is lower than federal standards. A value of 300 pCi/mL (0.44 mg/L) will be used for uranium. This concentration was obtained from 10 CFR Part 20; it is suitable for unrestricted release of natural uranium to water, and is below the State of New Mexico primary drinking water standard for uranium."

At the time of the FEIS the *secondary* restoration goals were designed to be the lower of EPA MCLs, State of New Mexico standards or the 10 CFR Part 20 release standard. The EPA uranium MCL was promulgated in December, 2003, and with the advent of that standard it is reasonable to now adopt the 30 μg/L as a secondary restoration standard for the CUP according to the rationale presented in the FEIS. Prior to December, 2003 there was no uranium MCL and HRI had no choice but to adopt the .44 mg/l standard.

29. The health issues that Fogerty and Molony highlighted as justification of the uranium MCL codified by EPA provide a solid basis to avoid using water with elevated levels of naturally occurring uranium as a USDW. For similar health reasons as described by Fogerty and Malone and the EPA decision documents, the water in the vicinity of ISL uranium projects that I described in §§ VII-X should not be used for drinking and could not be certified for a *public water supply system.* Uranium is ubiquitous in water in contact with uranium ore. We see this at the Church Rock site (Pelizza § VIII.A) and to a lesser amount at the Unit 1 site (Pelizza § VIII.B).

30. In addition to the limits that uranium place on the suitability of water for human consumption that are described by Fogerty and Molony, other uranium progeny are subject to EPA MCLs that EPA which require equal consideration vis-à-vis the quality of water for human consumption. In the case of dissolved ^{222}Rn at concentrations above 300 pCi/L the potential health impacts also present strong concerns about future use of such water as a USDW.

VII. US ISL OPERATIONS ARE REDISTRIBUTED ORE AND URANIUM AND ITS PROGENY MAKE GROUNDWATER NON POTABLE

A. WATER QUALITY

31. Uranium deposits that are amenable to the ISL recovery process have been found in New Mexico, Nebraska, Texas and Wyoming. ISL recovery operations from many of these deposits have a 30 plus year history. Throughout this period of time water quality information has been accumulated that provides definitive evidence of the nonpotability of water in and around uranium ore. This information demonstrates that baseline uranium levels in the mining zone are likely to exceed of 30 µg/l as well. (Pelizza at 35)

32. ISL operations, like those proposed for the CUP, must be conducted in *redistributed* ore. All of the examples that will be discussed in this section are ISL operations that have been conducted in *redistributed* ore with mineralogy which is similar to that of the CUP. All would be found in a broad oxidation/reduction transition regime[2] where the area upgrade is oxidized and downgrade is reduced. It is the reduction that causes the regional precipitation of the soluble uranium and the cumulative concentration of the ore. In addition all operations at the CUP will be conducted in sediments that have fluvial origin just as all Nebraska, Texas and Wyoming operations are conducted in sediments that have fluvial origin (Pelizza at XII).

33. Abitz's position appears to be that groundwater in contact with uranium ore in New Mexico is different than groundwater in contact with uranium ore as if uranium related mineralization does not impact water quality as in Nebraska, Texas and Wyoming. The Church Rock, Unit 1 and Crownpoint water quality evidence presented below when compared with water quality data at similar uranium deposits in other U.S. locations does not square with his proposition.

34. Those with experience in the uranium geology know that where present in nature, uranium mineralization leaves a distinct radiochemical footprint. It is the basis for geophysical logging which allows the delineation of ore. Where uranium ore is saturated by groundwater, the footprint extends itself into water. It is unreasonable to believe that uranium and uranium progeny may be accumulated in the rock and not manifest themselves in surrounding media.

35. Attachment A contains tabulated natural concentrations of uranium and uranium progeny measured at 124 mine units for ISL operations in Texas, Wyoming, Nebraska and New Mexico. Shown are values for uranium and ^{226}Ra. Where available, information on ^{222}Rn and gross α radiation and gross β radiation are also presented. The information presented in Attachment A is undisputable evidence that the water at ISL sites is not potable for drinking water. As shown, uranium or radium (and usually both) concentrations always exceed EPA MCLs.

36. The Attachment A shows that the amount by which uranium <u>or</u> radium concentrations exceed EPA MCLs is not marginal. The exceedances are often in multiples and even orders of magnitude. (i.e. water in uranium ore zones far exceeds relevant radionuclide MCLs).

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[2] See Affidavits of McCarn andLichnovsky

37. Attachment A provides ^{222}Rn and gross α radiation where the data is available. In all instances where ^{222}Rn and gross α radiation are measured, concentrations exceed EPA MCLs or proposed MCLs by a significant margin. These parameters cause the impacted water to be nonpotable.

38. The presence of uranium and uranium progeny in groundwater is a positive indicator of uranium in the rock and vice versa. As clearly stated by EPA, these contaminants are caused from the erosion of natural deposits. (Pelizza at 25) Those with experience in the uranium industry know that one common exploration technique is to measure uranium and its progeny from water sources such as springs to screen for the presence of economic uranium mineralization. Those with experience in the uranium recovery industry also know that considerable treatment is required to remove uranium and its progeny from water generated during conventional mining operations to meet surface discharge requirements. All of these traits are indicative of a radiochemical footprint that is associated with groundwater resources that are commingled with uranium ore. In addition to the broad industry wide example in this section, I will devote considerable discussion where I have direct project experience with the data in association with ISL uranium recovery sites that shows that this footprint is clear and should be expected wherever uranium mineralization is concentrated (i.e. ore).

39. It is this understanding of the uranium radiochemical footprint in groundwater water that EPA uses as the basis for Aquifer Exemptions (Pelizza at IV) for ISL uranium recovery facilities and therefore it is not reasonable to consider water in a uranium ore zone as being suitable for human consumption.

B. CONSTITUENTS DO NOT MIGRATE.

40. A thorough evaluation of water quality in and around established mine units will show that constituents do not migrate from the immediate ore zone. The detailed discussion below of the Texas locations and a Wyoming location and the Unit 1 location is on point in this regard.

41. For a Wyoming example, I have obtained data from Power Resources, Inc.'s mine unit reports that illustrated average radium concentrations from four mine units at its Highland location. At the Highland site the arithmetic average water quality analysis show that wells significantly exceed EPA MCLs for ^{226}Ra and would not qualify for a public water supply.

42. PRI established separate baseline for the production wellfield patterns and the monitor well ring. PRI's information presented in the table below demonstrates that: 1) the water in the ore zone is not now and will not in the future be potable because of concentrations or ^{226}Ra that exceed EPA MCLs. 2) the concentrations of ^{226}Ra are reduced significantly with distance from the ore - from Production Wells to Production Area Baseline Wells to the Monitor Well Ring.

43. So that while in the vicinity of the ore the water cannot serve as a USDW, the quality improves rapidly with distance from the ore zone because the radionuclides do not migrate. I will demonstrate that radionuclides do not migrate at the Unit 1 site below. (Pelizza at VIII.C) and at the Texas examples (Pelizza at IX)

Mine Unit	Production Pattern ^{226}Ra pCi/l	Monitor Well Ring ^{226}Ra pCi/l
A	675	106
B	313	6.2
C	703	48
D	651	21
E	630	22

VIII. URANIUM AND ITS PROGENY MAKE CUP GROUNDWATER NON POTABLE

44. In the San Juan Basin, water is recovered from the Westwater aquifer and uranium also occurs in commercial quantities in the Westwater aquifer. Because the water bearing sand is stratigraphically contiguous, questions raised by those unfamiliar with the ISL regulatory regime regarding public water supply quality, such as those raised in this case, are not unreasonable to consider. During the operations proposed by HRI, uranium values are elevated only in the area that is subjected to mining. Operations are conducted with redundant safeguards including an engineered wellfield that is operated in balance, over extraction (bleed) causing water to migrate towards the mining activity and monitor wells to verify effectiveness of these operational controls so that the activity has no impact on adjacent drinking water resources.

45. Even though water quality evaluation has been limited to the SRP § 2 pre-licensing Characterization at this point, premining uranium and/or uranium progeny are apparent at all the CUP locations and provide proof that these locations exhibit the same type of radiological footprint that exists at other ISL uranium recovery facilities. (Pelizza at VII(A))

A. CHURCH ROCK SECTION 17.

46. Water quality samples have been obtained from four (4) shafts on the Section 17 property. See Attachment B for analytical results. These conventional mining shafts are opened into the Westwater aquifer and were used for uranium mining in the Westwater aquifer. As such these shafts are exceptionally large diameter water wells and the water sampled by HRI represents local groundwater. It is the same water that will be baseline sampled per the COP and utilized as leach solution during ISL mining activities. The assertion by Abitz ¶ 16 that the water does not represent formation water because the samples are from mine shafts not "wells" is without merit.

47. The arithmetic average concentration of uranium and ^{226}Ra in the water samples that have been derived from Section 17 compared with MCLs are as follows:

Parameter	Average	EPA MCL
Uranium (ppb)	2,600	30
^{226}Ra (pCi/l)	40	5

48. Because of uranium and uranium related ^{226}Ra, water sampled from the Section 17 location does not meet EPA MCLs and would not qualify for a public water supply system.

49. Church Rock 17 is contiguous with Church Rock Section 8 and the orebody on Section 17 is the same orebody as underlying Section 8 so similar a similar chemical and radiological footprint in groundwater should be expected. See COP 2.0[3] Figure 1.4-8 for the location map.

50. The arithmetic average for uranium and ^{226}Ra in the water samples that have been derived from Section 8 area monitor wells to characterize water quality compared with MCLs is as follows:

Parameter	Average	Drinking Standard
Uranium (ppb)	1,800	30
^{226}Ra (pCi/l)	10.2	5

51. Because of uranium and uranium related ^{226}Ra, water sampled from the Section 8 wells do not meet EPA MCLs and would not qualify for a public water supply system.

52. Uranium and ^{226}Ra concentrations are consistent in the characterization of both Section 8 and Section 17 of the Church Rock area.

B. UNIT 1 WATER QUALITY.

53. Unit 1 has been sampled to a density of one baseline well per acre by Mobil Oil Corporation ("Mobil"). HRI purchased the entire Mobil database, which included all premining environmental analysis.

54. The wells in Unit 1 represent baseline wells in a planned production mine unit that was drilled by Mobil, yet never placed into production. HRI acquired the data but could not conduct additional tests on the wells because they had been plugged by Mobil. The mine unit was encircled by a ring of monitor wells that were spaced at 400 feet apart and 400 feet from the wellfield. There were 2 monitor wells completed in the first overlying aquifer, the Dakota. The absence of an underlying aquifer dictated that no underlying aquifer monitor wells were required.

55. The physical layout and the water quality information collected from this wellfield were reported by HRI to NRC (Attachment D, Letter to Mike Layton, 1996 and a scale version of the Mobil Operating Area map). Maximum concentrations and the arithmetic averages for uranium and uranium related progeny for this sample set are in the table below.

Unit 1 Uranium and Uranium Progeny Concentrations

Parameter	Production Baseline Max.	Production Baseline Avg.	Monitor Well Ring Max.	Monitor Well Ring Avg.	EPA MCL
Uranium (µg/l)	100	12	4	0	30

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[3] The CUP Consolidated Operations Plan Rev. 2.0 is duplicated in Attachment C.

^{226}Ra (pCi/l)	200	18.1	33	2.5	5
^{222}Rn (pCi/l)	1,100,000	140,677	32,000	22,721	300*
Gross α (pCi/l)	610	74	110	10	15
Gross β (pCi/l)	510	69	210	17	---

* Proposed

56. Given Abitz (1999 pp. 19-20) and Abitz ¶32 made note that the water in the ore zone at the Unit 1 wellfield commonly exceeded the ^{226}Ra plus ^{228}Ra drinking water standard which corroborates that the Unit 1 data presents an empirical example of how naturally occurring radioactive materials limit the drinking water use within the production zone of uranium deposits.

57. Faced with high ^{226}Ra values limiting water use quality, Abitz ¶69 claims that the water in the *mine zone is high quality drinking water because it could be mixed with water from* outside of the ore zone. The basic purpose of the relevant EPA and NRC regulatory requirements is to prevent the potential adverse impacts from mixing contaminated water from mining zones with uncontaminated water in adjacent USDWs. Accordingly, Abitz's suggestion is counterintuitive.

58. I was surprised that Abitz p.46 voiced an opinion that the Unit 1 groundwater is "high quality" drinking water. Moreover, his expert opinion did not include any consideration of the drinking water limitations at Unit 1 for other uranium related progeny that were provided in the Mobil data set and that are part of this hearing record. I find that by not considering the potential health impacts of ^{222}Rn and ^{222}Rn progeny as expressed by gross α radiation which exceed EPA MCLs, amounts to telling "half the truth" that Unit 1 is was "high quality" drinking water

59. As mentioned in ¶26 above, EPA has proposed a ^{222}Rn MCL at 300 pCi/L. [Federal Register: November 2, 1999 (Volume 64, Number 211)]. The Mobil information presented ^{222}Radon for each analysis. Production area average and high concentrations for ^{222}Radon are shown in the Table above. As shown, ^{222}Radon exceed the proposed ^{222}Radon MCL of 300 pCi/L by multiple orders of magnitude at the Unit 1 site. Radon alone would make the use of water from the Unit 1 site inappropriate for drinking water purposes.

60. Gross alpha (α) radiation is a measurement of generally short lived progeny of uranium, ^{226}Ra and radon for which there is a MCL. As shown in the table below gross α radiation exceeds the MCL of 15 pCi/l at the Unit 1 production area by nearly 5X.

61. Because of the uranium progeny contaminants ^{226}Ra, ^{222}radon and gross α water sampled from the Unit 1 mine unit does not meet EPA MCLs that apply for public water systems and could not be a public water supply.

62. The radioactive contamination described above is even more apparent if one considers the maximum values of the uranium progeny in the production zone, all which occur in the richest portion of the ore body. These same radiological features would be expected at any uranium deposit of similar grade that are monitored sufficiently to obtain production level data, be it in New Mexico, Wyoming or Texas. (Pelizza at § VII.A)

C. UNIT 1 CONSTITUENTS DO NOT MIGRATE.

63. Unit 1 water in the mine area (monitor well ring) has much lower radiological baseline than the production area wells. This is because, for a variety of reasons, radiological constituents do not move far in water. (Pelizza at 105)

64. To illustrate the rapid dissipation of uranium progeny contaminants the Unit 1 radionuclide concentrations described above are illustrated in Attachments E in map format, which shows the Unit 1 wellfield in plan with separate maps that illustrate contours of equal concentration for ^{226}Ra, gross α ,gross β, ^{222}Rn and uranium. From these maps it is apparent that the higher concentrations of radionuclides stay contained within the production area (i.e. the values are very low at the monitor wells). These maps document with empirical evidence that uranium and uranium progeny exist naturally in the Westwater Formation but as deposited they do not present a public health hazard on a regional basis because they do not migrate from the ore zone. This is consistent with the information presented for the Highland Mine in Wyoming (Pelizza at 40-43) and Texas Examples (Pelizza at IX).

D. CROWNPOINT WATER QUALITY.

65. Six Westwater wells CP-2, CP-3, CP-5, CP-6, CP-7 and CP-8 were completed in the Westwater sand and were used for hydrological testing and to establish general water quality characteristics with seasonal trends on Section 24 Crownpoint. This data was collected to provide a reasonably comprehensive description of preliminary (SRP § 2) baseline conditions. However, neither the well configuration nor the number of samples is sufficient to provide the baseline necessary for the pre-operational/operational (SRP § 5) baseline. In fact these wells were widely spaced over an area that exceeds the dimensions of the narrow ore zone. This sample program is consistent with the requirements of the SRP §2.7.3(4).

66. No statistical analysis other than simple averaging was performed and no proposal was made to use this information for any future compliance purpose (i.e. excursion UCLs or restoration criteria). Intervenors insistence that HRI has misrepresented data for baseline or for proposed primary restoration goal purposes is therefore without substance.

67. There has been no analysis for ^{222}Rn, gross α or gross β radiation at the Crownpoint location. However, the Crownpoint ore trend is an extension of the continuous Unit 1 trend[4].

68. One well of the six Westwater Wells exhibited ^{226}Ra concentrations that exceed the EPA MCL in every sample taken from the well. Because of the ^{226}Ra concentrations water from well CP2 could not qualify for a public water supply.

69. Abitz ¶38 complains that HRI and NRC were "unprofessional" in their use of ^{226}Ra and *averaging* of water quality data to achieve restoration goals. Previously, Abitz claimed that some unknown testing may have been performed on well CP-2[5] He no longer makes claims of unknown testing but rather claims that the treatment of the wells at the Crownpoint location

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[4] Attachment F is a map that shows the Crownpoint mineral fronts.

[5] Abitz (1999) p. 16

represent a variability between mining and monitoring wells and that HRI should separate baseline values for production area wells and monitor wells. As I specify in ¶199, HRI has not drilled production wells or monitor wells, proposed any restoration goals, conducted any statistical analysis to suggest what restoration goals may be, mixed wells for a baseline analysis or any other analysis recommended in SRP § 5, by LC 10.21 or 10.22 or in the COP § 8.6. Moreover, no wells used in characterization have been distinguished as "mining" or "monitoring". Wells have been drilled across he Crownpoint property for preliminary pump testing and water quality testing consistent with the SRP § 2.7.3 (4); to obtain a "reasonably comprehensive chemical and radiological analysis of water samples".

70. Apparently Abitz does not like the radiochemical footprint of uranium mineralization present at the Crownpoint site. Abitz would like to treat the analysis in CP2 as an outlier. However, this would not be correct. As NRC noted in the SRP § 5.7.8.3 (1) "...When an outlier is suspected, perhaps the easiest solution is to take another sample from the source well; if the repeat sample yields the same results then the outlier should not be discarded...." In the case of CP2 the well was sampled four times, once for each season and high ^{226}Ra values were present at each sample event so the data stays. The well reflects high ^{226}Ra at the site and that does not fit Abitz's model.

71. Abitz's ¶38 analysis of Crownpoint ^{226}Ra is unreasonable. The empirical ^{226}Ra analysis in CP2 shows concentrations that exceed MCLs by multiples; but after statistical manipulation Abitz simply ignores the presence of the contaminant and concludes that "all parameters meet drinking standards". Statistical nuancing does not make the ^{226}Ra go away.

72. Well CP2 shows that uranium related mineralization exists at the Crownpoint site, in that well. ^{226}Ra in uranium orbodies is no surprise, because evaluation of other ISL sites in New Mexico, Wyoming, Texas and Nebraska show that it is expected.

73. Abitz ¶ 38 objects that URI included trace metals but not common ions. However, this was done because the common ions potassium, chloride and sodium appear to represent constituents in residual drilling mud[6]. Knowing that this material is foreign to the formation it was logical to exclude the data. Conversely, ^{226}Ra is indigenous to uranium ore. It would not be introduced through the drilling program and the only source for the ^{226}Ra is the uranium orebody.

74. Given the radiochemical character of Unit 1, Church Rock and similar ISL sites across the western U.S., I would expect that as the Crownpoint location is developed and baseline wells installed to the density specified in LC 10.21 and the COP § 6.3 that the radiochemical character of water at the Crownpoint location will be similar at all locations.

IX DETAILED ANALYSIS OF TEXAS ISL SITES DEMONSTRATES THAT URANIUM MINERALIZATION IN REDISTRIBUTED URANIUM ORE AFFECTS GROUNDWATER QUALITY.

75. HRI's sister company in Texas, URI, Inc., is an ISL uranium producer. As such the company has collected a large quantity of premining water quality information that substantiates

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[6] Abitz 1999 p. 16 agrees.

the proposition that water quality in uranium ore zones is nonpotable. Moreover, the data that URI, Inc. has collected in and around the mineralized zone demonstrates that uranium and uranium progeny concentrations dissipate rapidly at short distances from the ore zone. This is empirical evidence that attenuation is strong, contrary to the theories presented by Abitz at ¶¶ 44-47. I personally have supervised the sampling of URI wells and therefore have direct knowledge of the results.

76. The tables and text below that present mine unit data for URI, Inc. present baseline data for well categories that have various relationships to the uranium mineralized zone as follows:

"Area Wide Baseline" are sparsely spaced pre BP/L (Base Permit/License) (i.e. SRP § 2) wells that are drilled over a lease, licensed/permitted and/or exempted area as part of the phased application process described in §XV. The ore zone is typically a small fraction of the lease, license/permit and/or exempted area so it is not uncommon for Area Wide Baseline Wells to "miss" and not be completed in the ore. The current well density at the Churchrock Section 17 site and the Crownpoint would fit squarely into the category of Area Wide Baseline Wells.

"Monitor Well Ring" is the wells that are drilled per the provisions of a BP/L at a distance from the ore body and are part of a MU (Mine Unit) development. URI, Inc.'s monitor wells are drilled at a distance of 400 feet from the wellfield patterns and spaces 400 feet apart, the same density that is proposed for the CUP. See COP 2.0 6.3 The Unit 1 Monitor Well Ring would fit squarely into this category of wells.

"Production Area Baseline Wells" are the MUA (i.e. SRP § 5) wells that are drilled per the provisions of a base license/permit within the production area wellfield and therefore very close or in the ore body. The URI, Inc. Production Area Baseline Wells are drilled at a density of one per four acres. The Unit 1 Production Area Baseline Wells would fit squarely into this category of wells.

"Production Wells" are wells that are injection or extraction wells drilled into ore for production purposes after the ore zone has been completely delineated through extensive, closely spaced drilling and as such conform closely to the geometry of the ore. Baseline sample information from these wells is not required by regulatory agencies under the terms of a BP/L. Therefore, there has been no data at this level of detail obtained for the CUP at this time.

B. VASQUEZ.

77. The Vasquez ISL uranium recovery project began operations in 2004. The mine is in the Oakville aquifer that is fluvial in origin and the uranium occurs in roll front ore bodies which are *redistributed.* One mine unit has been developed. URI, Inc. has collected water samples from the Vasquez site from Area Wide Baseline Wells, the Monitor Well Ring, Production Area Baseline Wells, and Production Wells[7]. The arithmetic average results of uranium and progeny analysis is presented in the Table below.

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[7] A complete set of this baseline data has been included in Attachment H. I would draw attention to the increasing density and quantity of analytical information that is required as MUs are developed during operations.

Vasquez In Situ Uranium Recovery PA (Mine Unit) 1
Uranium and Uranium Progeny Average Concentrations

Parameter	Area Wide Baseline Wells	Monitor Well Ring	Production Area Baseline Wells	Production Wells	EPA MCL
Uranium (ppb)	4	28	45	671	30
^{226}Ra 226 (pCi/l)	4.2	7.3	79	298	5
^{222}Rn (pCi/l)	N/A	N/A	N/A	280,098	300
Gross Alpha (pCi/l)	N/A	N/A	N/A	1,185	15
Gross Beta (pCi/l)	N/A	N/A	N/A	242	
Number Wells	2	29	12	42	

78. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from two (2) Area Wide Baseline wells. These wells do not exceed EPA MCLs.

79. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from 29 wells in the Monitor Well Ring. These wells do not exceed EPA MCLs for uranium but do exceed for ^{226}Ra and the water would not qualify for a public water supply system.

80. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from 12 Production Area Baseline wells. These wells exceed EPA MCLs for uranium and for ^{226}Ra and the water and would not qualify for a public water supply system.

81. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from 42 Production Wells. These wells significantly exceed EPA MCLs for uranium and for ^{226}Ra and the water would not qualify for a public water supply system.

82. In addition to regulatory requirements, URI, Inc. has conducted analysis and presented the arithmetic average water quality analysis for ^{222}Rn and gross α radiation from 42 Production Wells. These wells significantly exceed the proposed EPA MCLs for ^{222}Rn and gross α radiation and the water not qualify for a public water supply system.

83. The information presented in the Vasquez example demonstrates that: 1) the water in the ore zone is not now and will not in the future be potable because of naturally occurring concentrations or uranium and uranium progeny that exceed EPA MCLs. 2) that the concentrations of uranium and uranium progeny are reduced in groundwater to below EPA MCLs with distance from the ore zone (i.e. from Production Wells to Production Area Baseline Wells to the Monitor Well Ring and finally to the Area Wide Baseline wells). The chemical and radiochemical footprint is typical of that found uranium ore zone examples presented in ¶ 38.

84. Subsequent to being issued a base permit and license URI, Inc. was issued an Aquifer exemption by US EPA for the Vasquez project. (<u>See</u> Attachment I) This exemption was issued with the knowledge that the portion of the Goliad Aquifer is mineralized. Mine unit

development and subsequent Production Well, Production Area Baseline Well, and Monitor Well Ring development and water quality analysis was conducted after the Aquifer Exemption was issued.

B. KINGSVILLE DOME PRODUCTION AREA (MINE UNIT) 1.

85. The Kingsville Dome ISL uranium recovery project began operations in 1988. URI, Inc. has collected water samples from the Kingsville Dome site from Area Wide Baseline, the Monitor Well Ring, Production Area Baseline Wells, and Production Wells. The mine is in the Oakville aquifer that is fluvial in origin and the uranium occurs in roll front ore bodies which are *redistributed.* The arithmetic average results of uranium and progeny analysis is presented in the Table below. Supporting laboratory analysis is in Attachment J.

Kingsville Dome ISL PA (Mine Unit) 1
Uranium and Uranium Progeny Average Concentrations

Parameter	Area Wide Baseline	Monitor Well Ring	Production Area Baseline Wells	Production Wells	EPA MCL
Uranium (ppb)	27	57	164	3,905	30
^{226}Ra (pCi/l)	2.22	10.64	21.63	113	5
^{222}Rn (pCi/l)	N/A	N/A	N/A	61,336	300
Gross Alpha (pCi/l)	N/A	N/A	N/A	N/A	N/A
Gross Beta (pCi/l)	N/A	N/A	N/A	N/A	N/A
Number Wells	6	27	16	30 (14 ^{222}Rn)	

86. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from six (6) Area Wide Baseline wells. These wells do not exceed MCLs.

87. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from 27 wells in the Monitor Well Ring. These wells exceed EPA MCLs for uranium and for ^{226}Ra by a factor of approximately 2 and the water would not qualify for a public water supply system.

88. The arithmetic average water quality analysis for uranium and ^{226} Ra are presented from 16 Production Area Baseline wells. These wells exceed EPA MCLs for uranium and for ^{226}Ra by a factor of approximately 4 - 5 and the water would not qualify for a public water supply system.

89. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from 30 Production Wells. These wells significantly exceed EPA MCLs for uranium and for ^{226}Ra by large multiples and the water would not qualify as a public water supply system.

90. In addition to regulatory requirements, URI, Inc. has conducted analysis for 14 Production Wells and presented the arithmetic average water quality analysis for ^{222}Rn. These

wells significantly exceed the proposed EPA MCL for ^{222}Rn and the water would not qualify for a public water supply system.

91. The information presented in the Kingsville Dome production area example demonstrates that: 1) the water in the ore zone is not now and will not in the future be potable because of concentrations or uranium and uranium progeny that exceed EPA MCLs. 2) the concentrations of uranium and uranium progeny are reduced in groundwater to below EPA MCLs with distance from the ore zone (from Production Wells to Production Area Baseline Wells to the Monitor Well Ring and finally to the Area Wide Baseline wells). The chemical and radiochemical footprint is typical of that found uranium ore zone examples presented in ¶ 38.

92. Consistent with the Vasquez example, the decrease in concentration of radionuclides with distance from the ore zone shows natural attenuation. This real world example of actual conditions conflicts with the theory presented by Abitz at ¶¶ 44-57 where he predicts that attenuation will not be an important factor. Baseline uranium values at the Kingsville Dome site represent equilibrium[8], at concentrations that are consistent with those at Church Rock ¶ VIII.A. and both are well above EPA MCLs, but do not result in "widespread contamination" Abitz ¶ 94.

93. Subsequent to being issued a base permit and license URI, Inc. was issued an Aquifer Exemption by US EPA for the Kingsville Dome project. (See Attachment I) This exemption was issued with the knowledge that the portion of the Goliad Aquifer is mineralized. Mine unit development and subsequent Production Well, Production Area Baseline Well, and Monitor Well Ring development and water quality analysis was conducted after the aquifer exemption was issued.

C. KINGSVILLE DOME PRODUCTION AREA (MINE UNIT) 2.

94. The Kingsville Dome ISL uranium recovery project was expanded and resumed operations in 1996. URI, Inc. has collected water samples from the expanded Kingsville Dome site from the Monitor Well Ring, Production Area Baseline Wells, and Production Wells. The arithmetic average results of uranium and progeny analysis is presented in the Table below. Supporting laboratory analysis is in Attachment K.

Kingsville Dome ISL PA (Mine Unit) 2
Uranium and Uranium Progeny Average Concentrations

Parameter	Area Wide Baseline	Monitor Well Ring	Production Area Baseline Wells	Production Wells	EPA MCL
Uranium (ppb)	N/A	19	1890	2,994	30
^{226}Ra (pCi/l)	N/A	5.7	92	95	5
^{222}Rn (pCi/l)	N/A	N/A	N/A	141,275	300

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[8] A condition that Abitz does not believe is possible in a natural setting. In fact, all redistributed uranium ore is positioned along an oxidation/reduction interface and depending on where one looks uranium may be present in different oxidation states which will affect its solubility in water.

Gross Alpha (pCi/l)	N/A	N/A	N/A	N/A	N/A
Gross Beta (pCi/l)	N/A	N/A	N/A	N/A	N/A
Number Wells	0	40	5	77 (12 ^{222}Rn)	

95. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from 40 wells in the Monitor Well Ring. These wells do not exceed EPA MCLs for uranium and but do exceed marginally for ^{226}Ra and the water would not qualify for a public water supply system.

96. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from 5 Production Area Baseline wells. These wells exceed EPA MCLs for uranium and for ^{226}Ra by large multiples and the water would not qualify for a public water supply system.

97. The arithmetic average water quality analysis for uranium and ^{226}Ra are presented from 77 Production Wells. These wells exceed EPA MCLs for uranium and for ^{226}Ra by large multiples and the water would not qualify for a public water supply system.

98. In addition to regulatory requirements, URI, Inc. has conducted ^{222}Rn analysis for 12 Production Wells and presented the arithmetic average water quality analysis for. These wells significantly exceed proposed EPA MCL for ^{222}Rn and would not qualify for a public water supply system.

99. The information presented in the Kingsville Dome production area 2 example demonstrates that: 1) the water in the ore zone is not now and will not in the future be potable because of concentrations or uranium and uranium progeny that exceed EPA MCLs. 2) the concentrations of uranium and uranium progeny are reduced in groundwater to below EPA MCLs with distance from the ore zone (i.e. from Production Wells to Production Area Baseline Wells to the Monitor Well Ring and finally to the Area Wide Baseline wells). The chemical and radiochemical footprint is typical of that found uranium ore zone examples presented in ¶ 38.

100. Consistent with the Vasquez example, the decrease in concentration of radionuclides with distance from the ore zone shows natural attenuation. This real world example of actual conditions conflicts with the theory presented by Abitz at ¶¶ 44-57 where he predicts that attenuation will not be an important factor. Baseline uranium values at the Kingsville Dome site represent equilibrium, at concentrations that are consistent with those at Church Rock §A and both are well above EPA MCLs, but do not result in "widespread contamination" Abitz ¶94.

101. Subsequent to being issued a base permit and license URI, Inc. was issued an Aquifer Exemption by US EPA for the Kingsville Dome project. (See Attachment I) This exemption was issued with the knowledge that the portion of the Goliad Aquifer is mineralized. Mine unit development and subsequent Production Well, Production Area Baseline Well, and Monitor Well Ring development and water quality analysis was conducted after the Aquifer Exemption was issued.

102. The Kingsville Dome orebody that URI recovers uranium from is within a geologic strata named the Goliad sand. The Goliad sand is Fluvial in origin. (Attachment L) A number of

domestic water wells are present within ¼ mile of the Kingsville Dome license/permit boundary. With the exception of one well that is completed in extension of the uranium ore, these wells meet EPA MCLs for uranium and uranium progeny. I have supervised the sampling of these wells and audited the results over a twenty year period and know that there has been no impact on adjacent water quality.

103. The Goliad Aquifer also serves as a regional source for drinking water. The City of Kingsville (Pop. ~25,000) utilizes groundwater from wells that pump from the Goliad strata some 6 miles from URI's mine. These wells meet EPA MCLs for uranium and uranium progeny.

X. COMPARITIVE ANALYSIS OF REDISTRIBUTED CUP ORE DEPOSITS DEMONSTRATES THAT URANIUM MINERALIZATION AFFECTS GROUNDWATER QUALITY IN ORE ZONES.

104. The CUP uranium and uranium progeny radiochemistry presented in this affidavit is consistent with the radiochemical footprint at sights in Texas, Nebraska and Wyoming. The clear pattern is that water in ore zones is unfit for human consumption. At any location with similar uranium ore character, uranium and uranium progeny the water is rendered nonpotable because EPA MCLs are exceeded for one or more of uranium, ^{226}Ra, ^{222}Rn and gross α.

105. The detailed Power Resources, Inc. Highland data, Unit 1 data, the URI Kingsville Dome and Vasquez data are consistent in that uranium and uranium progeny have been shown not to migrate, supporting the proposition that concentrations of uranium, and uranium progeny dissipate rapidly with distance from the uranium ore zone. Even though all are in fluvial systems, none of the detailed examples presented would suggest that the formation is incapable of attenuation as described by Abitz ¶¶ 44-47. In all the cases presented, when comparing production wells that are completed in ore zone with monitor wells that are at a distance from the ore zone, concentrations of uranium and/or progeny progressively and rapidly decrease with distance. This results from precipitation (uranium), attenuation (uranium and ^{226}Ra) and half-life decay (^{222}Rn and its progeny). For this reason it is feasible and acceptable to utilize and exempt a mineralized portion of a stratigraphically contiguous aquifer for uranium production and utilize other unaffected portions as a USDWs within a relatively short distance from the ore zone.

106. Treatment is not a realistic or practical option. Treatment by mixing ore zone and adjacent drinking water sources runs counter to EPA and NRC regulatory requirements designed to prevent any such mixing. Treatment of water by removal of the contaminants is costly and results in a concentrated waste source term that would require disposal at an appropriately licensed/permitted facility. Thus, treatment is not practical because a universe of uncontaminated water exists outside of the mineralized area which use would be preferable. Finally, the treatment for the large quantities of ^{222}Rn that is dissolved in the water could require the dispersion of ^{222}Rn to the atmosphere. HRI has already addresses the issue of ^{222}Rn dispersion from ISL production and has proposed to assure satisfaction of 10 CFR 20-dose limits by engineering a pressurized ion exchange process. (FEIS § 2.1.2.1)

107. Intervenor's treatment option is unrealistic and is not adequate to justify the assertion that naturally contaminated water is "high quality". The water cannot be drinking water quality.

XI ISL URANIUM RECOVERY IS PERFORMED ONLY IN THE MINERALIZED ZONE OF THE AQUIFER WHICH IS LOCAL NOT REGIONAL.

A. OPERATIONS ARE DESIGNED TO PRODUCE FROM ONLY MINERALIZED SANDS

108. The economics of ISL operations necessitate that only the ore zone is leached and that leach solution is controlled. Wellfield patterns are engineered, wellfield operations are balanced, a negative production bleed is maintained and the ore zone is surrounded by horizontal and vertical monitor wells. Production economics dictate that leach solution in constrained to the ore zone. Environmental criteria complement this production reality.

109. In his conclusionary remarks Abitz ¶94 states that HRI ISL activities will cause widespread contamination. This remark lacks a technical basis and make no common sense. During mining "widespread contamination" would result in inefficient operations and after mining the ore horizon will have been restored.

B. REGULATION PROTECT REGIONAL USDWs

110. With over thirty years of regulated commercial operations that are similar to the CUP, in fluvial aquifers (Pelizza at XII.A), redistributed ore in roll fronts (Pelizza at XII.E), with adjacent USDWs and adjacent water supplies (Pelizza at V), there has never been an NRC licensee or an NRC Agreement State Licensee that has experienced "widespread contamination" of a USDW or adjacent water supply.

111. The EPA Program in 40 CFR 144 – 148 or the similar delegated State UIC programs were developed pursuant to the requirements of the SDWA and by design protect USDWs.

C. HYDROLOGY DOES NOT SUPPORT REGIONAL CONTAMINATION

112. Monitoring wells during operations assures that mining is contained locally within the mine zone. Monitoring, as proposed for the CUP has been highly successful in assuring that leach solution is contained at U.S. ISL sites. The fact the these sites are usually in fluvial systems and that the aquifers exhibit various degrees of heterogeneity has not mattered because the monitor wells are pump tested for functionality before mining begins pursuant to COP 8.5. Before monitoring ceases, restoration must be conducted. Intervenor's believe that if restoration is not completed to exact baseline the result will be widespread contamination. However, after restoration goals have been approved by the relevant regulatory agencies and the restoration has been completed there has never been a report of widespread contamination or an impacted water supply near any ISL uranium recovery site in the United States.

113. After mining a restoration variance from baseline or the secondary goal for certain water quality parameters may be required but the grant of such a variance must show that existing

water use will not be significantly degraded. The criteria for this level of variance are stated in the FEIS p. 4-27 and the COP § 10.4.1 as follows:

> "If a groundwater parameter listed in Table 8.6-1 can not be restored to its secondary goal, HRI will make a demonstration to NRC that leaving the parameter at the higher concentration will not threaten public health, and safety, and that, on a parameter-by-parameter basis, water use will not be significantly degraded. Additionally, it is possible that after groundwater restoration, the TDS secondary goal might be achieved, but the secondary goal for individual major ions that contribute to TDS might not be achieved because they do not have a secondary, or primary drinking water standard (for example bicarbonate, carbonate, calcium, magnesium, potassium). As a result, HRI will make a demonstration to NRC that leaving a parameter at higher than secondary goal concentrations does not threat public health, and safety, and that water use will not be significantly degraded."

114. Intervenor's have claimed that URI's restoration results in Texas were substandard and that surrounding water would be impacted. Intervenor's Brief p. 53 First, all Texas ISL mine sites have aquifer exemptions from EPA, so Intervenor's concerns with levels of uranium as dangerous for drinking sources are not appropriate. The water cannot be a USDW. Second, the Texas rules[9] prohibit existing water use from being impacted after restoration and require the permittee to demonstrate compliance with the rules before a modification is approved[10]. This type of demonstration was performed for every URI (and for that matter every other ISL operator in Texas) before a restoration table variance was granted. Intervenors criticize the modification without even reviewing the findings required by the rules and performed by the Texas Water Commission to assure that existing groundwater use would not be impacted. I know of no instance where there is evidence of harm outside of the mineralized zone after restoration and know of no evidence of harm that has been presented by the Intervenors.

115. Shown in the FEIS p. 3-35 the natural gradient for water at the Church Rock site is approximately 8.7 feet per year. This rate is exceedingly slow. In the event that an excursion occurs during operations, corrective action will be applied before "widespread" contamination takes place. Placed in proper context, I would note that the mine life, including restoration, for the entire Church Rock site is 9 years. COP Figure 1.4-1. So if there was no bleed, wellfield balancing or excursion controls at the Church Rock site, the water would migrate 87 feet over the mine life. Therefore, *widespread* in not an operative term! At this distance water would not even reach the monitor wells before restoration would be complete. A similar comparison could be made for Unit 1 and Crownpoint. And as I will elaborate below, one cannot consider the potential outside influence of the town wells on Crownpoint because the town wells will have been moved if HRI is ISL mining.

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[9] See Attachment M Texas Rules for amending a restoration table.

[10] See Also 10CFRPart 40 Criterion, which is based on EPA Resource Conservation and recovery Act (RCRA) standards in 40 CFR Part 192.02(c) and provides remediation of groundwater impacts from *conventional* uranium milling (i.e. baseline MCL or alternate concentration limits which is effectively consistent similar ISL restoration standards).

116. As noted above, natural mineralization in water is present in uranium ore zones that is indigenous to groundwater locally and has been present in the aquifer locally for millions of years, which is strong evidence that these minerals in groundwater stay in proximity to the source. Abitz provides a textbook primer on ISL oxidation chemistry and suggests that once the *formations* natural reduction capacity is lost in the mine zone it cannot return and that the down gradient reduction capacity will not be able to overcome the effects of the strong oxidization in mineralized zone. However, he provides no support to back up this assertion up, and common sense dictates that he is incorrect.

117. The area that is subject to mineral recovery is extremely small as compared to the size of the regional aquifer. It is logical that the regional reducing capacity of the aquifer will prevail over any small pockets of residual oxidation that may persist. The area of McKinley County is 3,484,160 acres. Assume for illustration purposes that the Westwater Aquifer underlies 50% of the County's area; then there is 1,742,080 acres of Westwater Aquifer in McKinley County. San Juan County is down gradient of the CUP sites and if we were to include San Juan County in this example, an additional 3,530,240 acres of Westwater Aquifer would be present. By comparison, HRI Church Rock wellfields patterns when fully developed will encompass approximately 60 acres; Crownpoint 125 acres; Unit 1 250 acres. These wellfields will be completed in a small fraction of the regional Westwater aquifer, will be restored so that uranium and other radionuclides are consistent with premining values to minimize or eliminate the potential for post mining migration to adjacent USDWs. The aquifer has shown the regional capacity to reduce[11] and precipitate uranium over a frontal length that extends from west of the Church Rock area, through Crownpoint, over to the Ambrosia Lake area, 60 or so miles, a much larger area than is planned at the CUP sites. Abitz's ¶¶44-51 unsubstantiated prediction that the regional aquifer will not be able to attenuate residual levels of similar concentrations of uranium to what exist at present is not logical.

D. INTERVENORS FUNDAMENTAL ASSUMPTION DOES NOT ACKNOWLEDGE THAT HRI'S NRC LICENSE PREVENTS CONTAMINATION OF WATER SUPPLY WELLS.

118. Reed's analysis assumed homogeneous conditions and provided the evidence that during mining *with a 1% bleed* and restoration *with a 12.5 % bleed* or other overextraction of water mine fluids would stay within the monitor well ring and would not impact the Crownpoint wells. I can not ascertain from any of the Wallace "calibrated" models if he considers a production or restoration bleed. While Intervenors disagree with homogeneous assumption in the Reed analysis, the subsequent NRC's evaluation of the Reed analysis (and in a round about way the Intervenors analysis as well) leads to the conclusion that to be safe the Crownpoint wells should be moved. Therefore, all analyses by Intervenors that wells may be impacted is mooted.

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[11] The broad regional nature of uranium roll front deposition is presented in the Affidavits of Lichnovsky and McCarn. And as both Intervenors and HRI agree the processes are ongoing today. Regional roll fronts require broad areas of upgradient meteoric oxidation to keep uranium mobile until that oxidized water which moves downgrade slowly encounters a zone of abundant reductant downdip. It is at this regional redox interface where the oxygenated water is reduced and uranium is deposited. Again, this process is active today. It is unreasonable to conclude that the Westwater Formation maintains capacity to absorb meteoric oxygen from expanses of slow moving ground water on a grand scale yet this same redox interface would be unable to absorb oxygen in similar form at a far smaller scale from slow moving groundwater that may exist after restoration from an ISL mine.

119. Specifically, the FEIS analysis vetted the issue at length and determined that as a matter of conservative regulation, by license condition HRI must move the Crownpoint town wells before any mining can occur at Crownpoint. FEIS p. 4-49 states:

> "...post-groundwater restoration impacts were determined to be acceptable by the NRC staff, provided the water quality at the well field met either the primary (baseline) or secondary restoration goal. Post-groundwater restoration impacts at the town of Crownpoint wells were judged to be acceptable if the water quality at the town wells did not exceed EPA's primary and secondary drinking water standards and the NRC standard of 0.44 mg/L for uranium. However, conservative analysis by the NRC staff suggests there is a potential risk that restoration of groundwater to the primary goal at the Crownpoint site may result in uranium concentrations at the town's drinking water wells that exceed the NRC standard of 0.44 mg/L, but still fall within the New Mexico Drinking Water Standard of 5 mg/L. The staff would require HRI to relocate the town of Crownpoint drinking wells to an alternate location with acceptable groundwater quality and quantity, prior to mining at the Crownpoint site, to ensure a continued source of high-quality water to the town of Crownpoint. This requirement is included as a mitigative measure in Section 4.3.3."

120. Given the requirement that the existing Crownpoint wells will no longer exist if there is to be ISL mining, future impact analysis must assume that they will no longer be providing a negative pressure gradient. However, this is not the approach that Intervenor's take in their presentations. Over and over, and integral to their presentations, the Intervenors reference to the impacts on the Crownpoint wells. Wallace Exhibit C even presents a video presentation that is wholly dependent on the Crownpoint wells existence.[12] It would have been appropriate for Wallace's video to have presented the picture without the Crownpoint town wells there because the Crownpoint wellfield that he simulates can not possibly be present without HRI being in violation of its license.

121. LC 10.27 states:

> "Prior to the injection of lixiviant at the Crownpoint site, the licensee shall:
>
> A) Replace the town of Crownpoint's water supply wells NTUA-1, NTUA-2, BIA-3, BIA-5, and BIA-6, construct the necessary water pipeline, and provide funds so the existing water supply systems of the Navajo Tribal Utility Authority (NTUA) and the Bureau of Indian Affairs (BIA) can be connected to the new wells. Any new wells, pumps, pipelines, and other changes to the existing water supply systems, made necessary by the replacement of the wells specified above, shall be made such that the systems can continue to provide at least the same quantity of water as the existing systems. The new wells shall be located so that the water

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[12] Although Wallace never explains the assumptions that went into his "calibrated" model, I strongly suspect that the Crownpoint wells are pumping a significant amount of water. It is not appropriate for Wallace to present his model with the existing Crownpoint wells operating because the license prohibits it.

quality at each individual well head does not exceed the EPA's primary and secondary drinking water standards, and does not exceed a concentration of 0.44 mg/L..{300pCi/L) uranium, as a result of *in situ* leach uranium extraction activities at the Unit 1 and Crownpoint sites. To determine the appropriate placement of the new wells, the licensee shall coordinate with the appropriate agencies and regulatory authorities, including, BIA, NTUA, the Navajo Nation Department of Water Development and Water Resources, and the Navajo Nation EPA.

B) Abandon and seal wells NTUA-1, NTUA-2, BIA-3, BIA-5 and BIA-6 in accordance with applicable requirements so these wells cannot become future pathways for the vertical movement of contaminants."

122. In all of the Phase II Groundwater legal and technical presentations, I could only find one reference to the LC 10.27 provision that requires HRI to move Crownpoint's existing water wells and only then in passing with the caveat that "...regardless of where the Crownpoint municipal well are located, HRI's operations at Crownpoint will endanger an underground source of drinking water in violation of the SDWA". (Intervenors Brief p. 34) This is an irresponsible response to a fundamental mitigation measure that is designed to protect the drinking water of Crownpoint. First, the aquifer would be exempted (Pelizza at § IV). Second, by the terms of LC 10.27 HRI will have to assure that the move to location of the wells assures "...water quality at each individual well head does *not exceed the EPA's primary and secondary drinking water standards...*". If not, HRI can not mine at Crownpoint. HRI does not take this provision lightly nor should the Intervenors.

123. Certainly if Intervenors believe their own channel theory they would be able to recommend a safe location to move the Crownpoint wells. By that theory water could not flow north or south of the channel (i.e. over its banks) thereby defining ideal replacement well locations. However, as I will state below, Intervenors channel theory has no merit. But, even with the unsupported underground theory, it will be impossible to impact the existing Crownpoint wells because they will not be there.

XII. ALL ISL SITES ARE IN FLUVIAL DEPOSITS WITH NO EVIDENCE OF PIPELINE CHANNELS.

A. HISTORICAL OPERATIONS HAVE NOT ENCOUNTERED CHANNEL ISSUES.

124. The Intervenors rehash their fundamental theory from Phase 1, which is that the Westwater aquifer is not homogeneous but rather is heterogeneous, and because of the heterogeneity of the sands, ISL recovery and restoration operations may be problematic. I have personally reviewed data from ISL facilities in Texas and Wyoming where the general geology is nearly identical to the geology found in the CUP ore bodies. For example, all of URI south Texas operations are within fluvial deposits with multiple stacked ore sands. (See South Texas Geology in Attachment L.) Both the Kingsville Dome and Rosita ISL Project, are in the fluvial Goliad Formation that is stratigraphically similar to the CUP ore zones. Detailed pump testing

has confirmed that the formation is functionally a single hydrological unit. Successful operations have been conducted in Texas for 30 years.

125. In Wyoming ISL mining is generally conducted in the Fort Union aquifer. The Fort Union aquifer is fluvial. (See Attachment N) Successful operations have been conducted in Wyoming for 30 years.

125. In Nebraska ISL mining is generally conducted in the Chadron aquifer. The Chadron aquifer is fluvial. (See Attachment O) Successful operations have been conducted in Nebraska for 15 years.

127. Intervenor's have not presented any evidence to demonstrate that subsurface channels cause widespread contamination problems during recovery or restoration operations in fluvial aquifers in Nebraska, Texas or Wyoming and the geology of the Westwater is virtually identical with that described in the Nebraska, Texas or Wyoming cited above. None of Intervenors "channel" problem theories have been documented. So in *real life* operations, years have passed without the negative affects that are predicted with regard to fluvial deposition and HRI has thoroughly refuted the Intervenors channel concepts in favor of a roll front homogeneous depositional model that is agreed upon within the expert scientific community.

128. HRI is staffed with a number of geologists and reservoir engineering technical experts who have evaluated the CUP ore zones for heterogeneity. (See Bartels and Lichnovsky Affidavits) Based on URI/HRI staffs many years' experience in the ISL business and subsequent evaluation of the CUP properties, HRI is confident that the Westwater in New Mexico operates hydrologically as a single homogeneous unit[13] and, therefore is amenable to controlled ISL uranium recovery and post mining restoration.

B. THE FLUVIAL GEOLOGY WILL NOT AFFECT MONITORING.

129. Staub 1999 p. 38 recommends that monitor wells spacing of 300 feet would be acceptable at Church Rock based on the "channel" theory.

130. Abitz ¶ 61 complains of well spacing, the potential for channels and that the monitor well spacing may not be adequate. However, none of the Intervenors have addressed the pump tests that are required to demonstrate the adequacy of monitor wells and it is these pump tests that are a key provision of the regulatory program to determine the adequacy of monitor wells. Required by LC 10.23 and detailed in COP 8.5[14] pump tests must be conducted before any mine unit can be placed into service.

> "HRI considers that the primary goal of pump testing in new mine areas for ISL is to determine the degree of communication between the mine zone, and (1) the overlying zones, and (2), the production zone monitor wells. This will reflect the effects of hydraulic pathways, such as unplugged holes, and other pathways, to the overlying zones, as well as ascertain the ability of production zone monitor

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[13] See Bloch (LBB-99-30 at II.A.) and the Affidavits of Lichnovsky and McCarn

[14] Operational pump testing is also addressed in the SRP § 5.7.8.3(4).

> wells to respond to changing flow conditions within the mining area. The degree of communication at the production zone monitor wells surrounding the mine zone will also directly indicate the magnitude of horizontal formation anisotropy."

131. At that time of the pump testing the monitor wells will have been installed and HRI will be able to have offered empirical proof that every monitor well will be functional. Pump tests will be conducted for every mine unit as it is developed. A dysfunctional monitor well would not draw down during the pump test. Or if is determined that an additional monitor well(s) is required, it will be installed. COP 8.5 goes on to say:

> "Of secondary importance, is the determination of the physical flow parameters (transmissivity, storage, permeability) of the producing horizon, since they are of only very general utility to the ISL operator."

132. Neither Abitz nor Wallace comment on the pump test plan vis á vis the adequacy of monitor wells, but rather they dwell more on the physical flow parameters that are of secondary importance.

133. Abitz opines that adjacent groundwater resources may be harmed at Churchrock because an excursion would move rapidly through channels and HRI would loose control. Regardless of the geology, water at Churchrock (or any other aquifer under artesian conditions) can move no faster than the regional groundwater gradient will allow, which is approximately 15 ft/year. Excursions must be corrected in 60 days or the equivalent of 2 feet of movement. Two feet of movement provides no basis for an exaggerated claim of loss of control. There is not a scientific or practical basis for Abitz's concern. Additionally there is no water well immediately down gradient at the Churchrock site, there is no basis for the concern that groundwater resources or the public could be harmed.

C. HRI'S APPLICATION DESCRIBE THE WESTWATER CANYON FORMATION AS A FLUVIAL SYSTEM

134. Intervenor's claim that HRI refers to the Westwater "homogeneous pile of sand"[15]. HRI has never made any such claim.

135. It is understandable why Abitz needs to go "over the top" with such a statement because the Intervenors model hinges on their channel theory that the Westwater Canyon Formation is a fluvial system wherein water may flow along "ancient channels". Unfortunately for the Intervenors, the channel argument is not technically sound.

135. In its applications and technical reports, HRI has characterized the Westwater Formation as a fluvial system. For example, within the Crownpoint Technical Report 1993, § 2.2.1.1 describes the Westwater Canyon Member as follows:

> "The Westwater Canyon Member consists of <u>interbedded fluvial</u> red, tan, and light gray arkosic <u>sandstone</u>, <u>claystone</u>, and <u>mudstone</u>. It is the major water-

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[15] Abitz ¶ 59

> bearing member of the Morrison. Regionally, the Westwater Canyon ranges in thickness from 50 to more than 260 feet, and exhibits a relatively uniform thickness of approximately 235 feet in the vicinity of the project area. This member is host for the major uranium deposits in the Morrison Formation. The uranium occurs in coarse-grained poorly sorted sandstone units within the Westwater Canyon and is closely associated with carbonaceous material which coats the sand grains." (emphasis included).

137. In the Churchrock Revised Environmental Report, 1993, § 2.6.2 HRI described the Mine Zone Geology as follows:

> "the Westwater was deposited as a broad alluvial fan sequence with a preponderance of thick arkosic sandstone on the west side of the San Juan Basin, shaling out to the east and northeast at the distal edge of the fan. At Churchrock (Crownpoint), the "A" (Westwater) sand consists of <u>medium to coarse-grained, moderately sorted conglomeratic sandstone with numerous clay clasts intermixed throughout the section</u>." (emphasis included).

138. HRI's representation has <u>not</u> been that the Westwater is homogenous. It has clearly been described as fluvial and moderately sorted, with numerous clay clasts intermixed throughout the section. HRI's representation has been that the Wastewater formation responds *hydrologica*lly as homogeneous sandstone unit. Not that the sandstone unit is physically homogenous.

139. Given that both sides are in agreement that the Westwater is fluvial, moderately sorted, with numerous clay clasts intermixed throughout the section what remains is to determine is whether there are channels of preferential flow in this system or if the system acts hydrologically for purposes of the scale of HRI's projects as a homogeneous system.

140. I would defer to the Affidavit of Lichnovski and Bartels in this matter with several additional comments. During graduate studies at Colorado School of Mines my focus was in the areas of Engineering Geology and *Geomorphology*. I studied the Geomorphology high energy, braided streams and streambed deposition along the Front Range of the Rocky Mountains. These streams exit narrow canyons and change to braided morphology and as their energy drops deposit alluvial fan type material. These streams are noted by repeated cycles of high energy flood and flash flood events where banks are cut, followed by periods of quiescence where low energy water deposits sediments. The cycle of cut and fill repeats itself – in human terms – perpetually. This cycle of cut and fill is similar to what occurred during the deposition of the Westwater system[16].

141. There are no simple channels in this mode of deposition – rather remnants of deposition cycles from various energy levels (sand size) after many "cuts" and "fills" become *hydrologically* interconnected. This results in a sheet shaped deposit of interconnected and interbedded lenses. In the case of an artesian aquifer, such as the Westwater, this mass of smaller cut and fill channels acts *hydrologically* as one sheet like unit and the regional flow

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[16] Abitz ¶7

responds to the gradient rather than along narrow tabular units. The regional flow of water is required for redistribution of uranium that has been described by Lichnovsky and McCarn.

142. I find no conflict in the outcrop description of Lucas, with the way HRI describes the Westwater in its applications and my description of cut and fill morphology above. What I find to be in conflict is Lucas's conclusion, which involves a giant leap by assuming that these individual sands are contiguous and would support preferential flow in a channelized conduit. Braided stream channel cut and fill is far too erratic to ever form a continuous pipeline or conduit because it would be so full of "leaks".

143. For this reason the antecedent potentiometric surface map that was prepared for Mobil Oil Corp and included in HRI's Application[17] shows a broad gradient, with water flow to the North, and not along a channel one way or another. This same regional gradient is shown in the FEIS p. 3-37 for the Churchrock site.

144. Finally I would refer to the *Stratigraphic* Cross sections that are in all of the CUP Applications (Pelizza at XIII) which represent a local analysis of stratigraphic conditions, not conditions 4 or 15 miles away as per Lucas[18]. Intervenors have failed to comment on these cross sections at all. These cross sections span entire HRI mine areas from monitor wells on either side of the ore zone. As such they are the most detailed, site specific geologic evidence that exists that illustrate the strata that will comprise the mine. They do not illustrate a "homogeneous pile of sand" but do represent interbedded sands, clays and silts that coalesce to form a continuous sheet across the mine sites. I find no evidence of a channel type stratigraphic feature on any of these cross sections that would influence monitor well functionality or that would suggest regional channels for groundwater flow. I will review cross sections from each CUP site in turn.

145. The Churchrock Application[19] contains five stratigraphic Cross Sections labeled A-A' through E-E'. Intervenors apparently claim that groundwater at the Church Rock site flows along channels that come from the West and then at the Church Rock site turn 90° to a North South direction[20]. In the event there was a channel type of configuration that trended north – south through Section 17 and into Section 8 it would be apparent on Cross Section A-A' because the cross section would bisect a channel formation. Section A-A' includes closely spaced geophysical logs for 10 exploration holes trending east (A) to west (A'). The resistivity curve (right line on geophysical logs) in the Westwater shows predominant sand with numerous lenses of silts and clays intermixed throughout. On the east side, hole 13/32 shows three subsidiary sand units in the Westwater, at approximately 905' to 912'; 919' to 1010'; 1020 to 1110' from surface respectively. Following this section west, these three subsidiary sand units maintain their form all the way to hole 04/42, where the a clay lenses cause a break at approximately 600' and then 704' from the surface. Numerous other markers can be traced from east to west. I can see

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[17] Attachment P

[18] Lucas ¶17

[19] Churchrock Revised Environmental Report, March 1993 § 2.6.2 (The referenced cross sections will be filed to the parties in an errata package as, as approve by the Presiding Officer, no later than April 29, 2005)

[20] Abitz ¶67

no indication of a "U" shaped channel morphology that would support the claim of a conduit for the preferential flow of groundwater.

146. The Unit 1 Application[21] contains two stratigraphic Cross Sections labeled A-A' and B-B'. Intervenors apparently claim that groundwater at the Unit site flows along channels that "dogleg" from North South to East West in the Unit 1 area. Cross Sections A-A' and B-B' follow the same path and would therefore be parallel with the axis of any such channel and are widely spaced spanning the area from Unit 1 to Crownpoint Section 24. In the event there was a channel that would serve as a preferential conduit all the way from Unit 1 to the Crownpoint site, (and then on the Crownpoint Town Wells) this channel should be a sand that can be reasonably correlated on the cross sections. Section A-A' includes geophysical logs for 15 exploration holes trending west (A) to east (A'). Section B-B' includes geophysical logs for 6 exploration holes in Unit 1 trending north (B) to south (B'). The resistivity curve (right line on geophysical logs) in the Westwater shows predominant sand with numerous lenses of silts and clays intermixed throughout. Numerous markers are present. I can see no sand that correlates to a channel or conduit that would support preferential flow of groundwater.

147. The Crownpoint Application[22] contains four stratigraphic Cross Sections labeled A-A' through D-D'. These cross sections are concentrated in the SE/4 of Section 24 and are constructed with closely spaced exploration holes. As such they provide a very detailed construction of the site geology which is fortunate because it is the location where intervenors claim the greatest threat to USDWs because of preferential flow channels. Intervenors claim that groundwater at the Crownpoint site flows along east – west trending channels. In the event there was a channel type of configuration that trended east – west through Section 24 and then into the Crownpoint town wells, it would be apparent on Cross Section A-A' and B-B' because the cross section would bisect the channel formation. Section A-A' includes closely spaced geophysical logs for 11 exploration holes trending north (A) to south (A'). The resistivity curve (right line on geophysical logs) in the Westwater shows predominant sand units with numerous lenses of silts and clays intermixed throughout. On the north side, hole 17-13 shows three (or possibly four) subsidiary sand units in the Westwater, at approximately 1800' to 1886'; 1895' to 1945'; 1950 to 2025' from surface respectively (the third sand has a clay break at 1966'). Following this section south, these three subsidiary sand units maintain their form all the way to hole17/13, where clay lenses causes a break at approximately 1850' and then 1930' from the surface. Numerous other markers can be traced from east to west. Section B-B' shows similar stratigraphic character with three or four predominant sand that can be measured across the site. I can see no indication of a "U" shaped channel morphology that would support the claim of a conduit for the preferential flow of groundwater. In addition these exploration holes are spaced at about 200 feet which is half the spacing of the proposed monitor wells and there is no evidence of narrow channel formation that would result in water flowing preferentially past monitor wells spaced at 400 feet.

D. NEW MEXICO.

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[21] Unit 1 Project, U.I.C. Application and Technical Report 1992, Appendix D-1. (The referenced cross sections will be filed to the parties in an errata package as, as approve by the Presiding Officer, no later than April 29, 2005)

[22] Supplementary Environmental Report, 1989 § 2.6 (The referenced cross sections will be filed to the parties in an errata package as, as approve by the Presiding Officer, no later than April 29, 2005)

148. Because the Westwater formation was deposited as a fluvial system, Abitz, Lucas and Wallace assert that "ancient" channels still exist and that these channels will control the fluid flow. As is mentioned previously, all URI's operations have been conducted in fluvial systems. I am also familiar with many of the other Texas ISL mines through my professional associations and all are or were conducted in fluvial systems, and I have never known of a case of preferred flow through channeling.

149. The Unit 1 wellfield was subjected to a hydrologic testing program by a consultant to Mobil Oil that was included in the Unit 1 Environmental Assessment, January 1992. (See Attachment E & P) The type of hydrologic testing performed by Mobil is very similar to the type of testing HRI proposes in the COP Rev. 2.0 § 8.5. It was performed for Mobil, in Mobil's first operating area, after licensing was complete.

150. The Unit 1water quality hydrologic testing information does not demonstrate a channel that facilitates concentrated fluid migration due to pumping the Crownpoint water wells as claimed in the Intervenors Brief p. 81-83. If there were a preferential pipeline as claimed, it would show up as increased radionuclide values on the east side of the wellfield in monitor wells. (Pelizza at 63 & 64) In this case, the monitor wells do not reflect any difference in water quality either toward or away from Crownpoint. For this same reason, flow from a preferential "pipeline" would not be a factor during mining.

151. More telling is the Antecedent map that was prepared for Mobil Oil. Water levels were taken August 15, 1982. At that time the town of Crownpoint water well infrastructure and use pattern was similar to that which exists today. (i.e. groundwater wells provide the town's water). Had channeling been present and a preferential conduit existed, it would show a drawdown in the channel as a result of pumping by the city and certainly a steep, "U" shaped gradient toward the town, within the confines of the channel in response to the pumping. In contrast the antecedent piezometric map that was prepared for Mobil Oil in Attachment P, shows a typical, regional gradient toward the north, with no evidence of preferential flow to support Wallace's conceptualized model. The Mobil data is real, measured information and the Wallace model is conceptual with no data support.

E. MINERALIZATION VS. CHANNELS.

152. Abitz ¶¶40-47 presents a convoluted view of uranium deposition in the Westwater Canyon by combining mixed theories and references of primary and secondary ore deposition. It is very difficult to understand how he uses these references to support his geochemical theories because the two types of ore bodies have such different depositional histories. Only secondary deposition is applicable to the CUP and as described in the affidavit of Lichnovsky, secondary uranium roll front mineralization occurs along a geochemical reduction/oxidation (redox) contact, not along stream channels. These contacts along a broad front are generally long and narrow roll fronts that are perpendicular or oblique to the direction of regional groundwater flow. For example, in his Exhibit V and in Table 7 Staub's reference to a channel is really a reference to the width of mineralization, not a channel.

153 Abitz ¶ 60 reference to McCarn (1997) suffers the same flaw, McCarn's map shows multiple, stacked mineral horizons (mineralized redox fronts) but not stream channels. The assertion that references indicate channels demonstrates a fundamental misunderstanding of uranium geology and without this theory, most of their hypothetical impacts go away. Transmissivity on either side of the redox front (the ore) is similar.

154. Abitz ¶ 43 recites his textbook understanding of uranium mineralization in the Westwater Canyon:

> "Uranium mineralization in the Westwater Canyon is a complex association of 1) primary ore deposits formed parallel to channels in the Westwater Canyon during the early history of the groundwater flow system, and 2) secondary ore bodies (roll-shapes that are discordant, or roughly perpendicular, to channel structure) formed much later, after oxidized water was introduced into the Morrison Formation rocks exposed by tectonic activity that began with the Laramide orogeny and continues today."

155. Abitz fails to understand that *only secondary* or *redistributed* ore bodies are amenable to ISL uranium recovery as proposed for the CUP. And I agree with Abitz's characterization of the primary and secondary ore. Furthermore, I agree with his assessment that redistribution continues today[23]. It continues because oxidized (and CO_2) rich groundwater continues to percolate in from the up gradient outcrop and flow regionally down dip. As has been the case since the Cretaceous time, this oxidized water dissolves uranium that "redistributes" it into crescent shaped roll fronts. The redistribution is ongoing because regionally an oxidation/reduction interface is present. Uranium is mobile in the oxidized state but precipitated when regional reduction is encountered.

156. Abitz's recital is general and would apply to all uranium orebodies in the Westwater formation across the span of the Grants Mineral Belt. It is well known among uranium miners that much of the ore that has been *conventionally* mined in the Ambrosia Lake area was primary ore. But the CUP is an ISL uranium recovery project and HRI has carefully evaluated all of the CUP properties to be sure that the uranium is amenable to ISL recovery. The ore within all of HRI's properties is secondary or redistributed ore and is amenable to ISL recovery.

157. Abitz says that primary ore is formed parallel to channels and that secondary ore is discordant or roughly perpendicular to the channel structure. Again, I agree. Unfortunately for Intervenors this characterization is contrary to their continuous representations that HRI's orbodies represent channels. IF, as Intervenors assert, the channels were present and IF they trended north-south at Church Rock and east-west at Crownpoint, then the longitudinal axis of the uranium orebodies would be in the channels IF the ore was *trend ore*. But the ore is not trend ore at the CUP locations, so then by Abitz own admission the deposition must be discordant or perpendicular with the channels. This would place the Intervenor's channels at 90° to what they suggest. IF there were channels filled with secondary ore the channels would be east west at

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[23] But I do not think he understands the regional geochemical processes that are in play that involve this ongoing redistribution. Because the source of regional oxidation from upgrade is large and requires a large and broadly applicable reduction to allow precipitation. Indeed, the degree of regional oxidant available dwarfs what may be introduced in an ISL site and which is essentially eliminated during the restoration process.

Churchrock and north south at Crownpoint/Unit 1 by Abitz reference – perpendicular to the front. But as strongly supported by McCarn and Lichnovsky, deposition of uranium rolls is not controlled by channels but is along a broad regional redox front that requires regional groundwater flow for the process to work.

158. Abitz ¶ 43 continues on with a series of references that discuss the control of uranium mineralization but he does not specify if these references are for trend ore or CUP type secondary ore. Based on a cursory review I would categorize these references as follows:

Reference	Primary or Secondary	Comments
Wright, 1980	Primary	Trend ore is found with plant materials.
Langford, 1980	Primary and/or Secondary	No mention of channel features.
Finch, 1980	Primary and/or Secondary	No mention of channel features.
Condon, 1995	Secondary	Crownpoint reference.
Galloway, 1980	Primary	Not clear or relevant.
Squyres, 1980	Primary	Orebodies same age as host rock.

159. Finally, Abitz's misunderstanding of the importance of the distinction between primary vs. secondary ore as it applies to the CUP, may explain why he relies upon the general oxidation scheme presented in his Declaration ¶¶ 44.- 57. Herein he asserts that once oxidized uranium becomes soluble and the reducing capacity of the entire *formation* will be destroyed so that water will then migrate rapidly down channels. It appears that his model contemplates primary ore in the channels[24]. As described above, secondary ore continues to be subject to redistribution today and the regional oxidation/reduction interface causes precipitation and accumulation *discordant or roughly perpendicular to the channel structure.* The very same regional oxidation/reduction interface is the reason that the reducing capacity of the Westwater is not destroyed and why uranium naturally attenuates as oxidized water moves down-gradient. As stated in Pelizza ¶117, the Westwater aquifer is huge compared to the mine area and the concept that a small amount of oxidation at a ISL mine site would destroy the regional reductant capacity is absurd.

XIII HRI'S DETAILED STRATIGRAPHIC CROSS SECTIONS ILLUSTRATE SUFFICIENT CONTIGUOUS AQUITARDS.

160. Lucas ¶17 asserts that outcrops that are miles away from the project site are a better source of geological information that geophysical log data. I strongly disagree. Outcrop analysis is a tool that is necessary for creating geologic maps and sample specimen collection, and even engineering design evaluation for work at the outcrop site itself. However, for mine engineering design, a distant outcrop is merely one data point. In essence it is a regional exploration lithology log just like that would be obtained by drilling. A design engineer or geologist would not depend on widely spaced drilling or outcrop data, 4 to 15 miles from the

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[24] Abitz ¶157 notes that secondary ore is deposited discordant or perpendicular to channels.

mine site. It does not give the needed information given the variable nature of geology. The same would be said for using distant information to determine geologic properties for mine environmental planning. Site information is what counts.

161. For this reason, every ISL uranium recovery project that I have been associated with, detailed stratigraphic cross sections constructed from exploration borehole geophysical logs were used to demonstrate that the geology *at the site* is amenable to ISL uranium recovery. To be amenable to ISL recovery the uranium must be redistributed, situated in a permeable saturated sandstone, and be *adequately confined* so that leaching can be controlled. In addition to the practical project engineering aspect of confinement, confinement is a fundamental environmental consideration because it must be shown that aquitards exist to prevent excursions into overlying and underlying sands. Therefore, the technical considerations that define the amenability for a uranium deposits to ISL uranium recovery and the environmental requirement of confinement are in accord.

161. ISL operations are conducted locally, (i.e., the exempted aquifer) and it is only the geologic conditions that exist over the local span of the wellfield patterns that matter in the context of lixiviant confinement. Project planners would never use geologic data miles from the mine ore deposit to determine the amenability for in situ leach because local not regional conditions must be evaluated. Likewise, it would be unreasonable to ascertain the quality of local geology for environmental parameters with distant information. This is why site geology is needed and site geology can only be provided by geophysical logs from the exploration holes.

162. The Church Rock Application materials[25] contained five stratigraphic cross sections that were constructed with actual geophysical log reductions arraigned stratigraphically. The top of the Westwater sand unit was used as datum. One cross section, E-E' transverses the entire Section 17 mine site and provides an excellent illustration of the stratigraphy across that site. 15 geophysical logs provide reference points. The clays[26] of the Brushy Basin are shown to immediately overly the Westwater sand and are marked by a strong break in the resistivity curve on the geophysical log. The break is well defined completely across the Section 17 property and shows that the Brushy Basin provides a aquitard separating the Westwater from the Dakota for both ISL production amenability and lixiviant confinement. Beneath the Westwater is the Recapture. This unit is not penetrated frequently during exploration; however four holes, 53/41, 46/38, 42/37 penetrate to show twenty or more feet of clay or siltstone which demonstrates the same type of confinement described for the Brushy Basin. I would note that holes 39/36, 35.5/33, 34/31, 32/38 which also penetrate the very top of the recapture, show a good deflection in the resistivity curve to verify the top of the recapture, but do not penetrate significantly.

163. The cross sections in the Unit 1 Application[27] demonstrate confinement. Two cross sections are provided that are constructed from 21 geophysical logs. The top of the Westwater

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[25] Churchrock Revised Environmental Report, March 1993 § 2.6.2 (The referenced cross sections will be filed to the parties in an errata package as, as approve by the Presiding Officer, no later than April 29, 2005)

[26] I would agree with Lucas that these clays contain lenses of nonclay materials that may include some silt and sand. But the general nature is clay and the unit serves as an aquitard for the purpose of confinement.

[27] Unit 1 Project, UIC Application and Technical Report 1992, Appendix D-1. (The referenced cross sections will be filed to the parties in an errata package as, as approve by the Presiding Officer, no later than April 29, 2005)

sand unit was used as datum. The clays of the Brushy Basin are shown to immediately overlie the Westwater sand and are marked by a strong break in the resistivity curve on the geophysical log. They are well defined completely across the Unit 1 property. This shows that the Brushy Basin provides a aquitard separating the Westwater from the Dakota for both ISL production amenability and lixiviant confinement to protect the overlying Dakota. Beneath the Westwater is the Recapture. This unit is penetrated by a number of the exploration holes and shows a good deflection in the resistivity curve to verify the top of the Recapture. This provides the local proof for the requisite underlying confinement.

164. Cross sections in the Crownpoint application materials[28] demonstrate confinement. Seven cross sections are provided that are constructed from numerous geophysical logs. The top of the Westwater sand unit was used as datum. The clays of the Brushy Basin are shown to immediately overly the Westwater sand and are marked by a strong break in the resistivity curve on the geophysical logs. They are well defined completely across the Crownpoint property. This shows that the Brushy Basin provides a confining aquitard for both ISL production amenability and lixiviant confinement to protect the overlying Dakota. Beneath the Westwater is the Recapture. This unit is penetrated by many exploration holes and shows a good deflection in the resistivity curve to verify the top of the Recapture. This provides the local proof for the requisite underlying confinement.

165. The site specific exploration information that is presented in the applications is not available in general literature but does provide unique and a more site specific and detailed depiction of local geology that can be found in the literature. The local data is far more representative of site conditions than the outcrop analogies of Lucas that are miles away. Lucas ¶ 17.

166. For these reasons cross sections provide the operational/licensing site characterization information that is described in SRP § 2.7.3 (3) as follows:

> "Hydrogeologic cross sections are recommended for illustrating the interpreted hydrostratigraphy. These cross sections should be constructed for the area within the license boundary. For very large or irregularly shaped well field areas, more than one cross section may be necessary. Cross sections must be based on borehole data collected during well installation or exploratory drilling."

167. Finally the *importance of pump tests* cannot be overstated. Geological cross sections provide a reasonable basis to demonstrate confinement. However, as an additive factor, multiple pump tests are required throughout the project life. Preliminary pump tests have been conducted at each site and demonstrate confinement as described in the application materials[29]. In addition, detailed operational pump tests will be conducted for each mine unit as required by the SRP § 5.7.8.3 (4) and in the COP § 8.5. These pump tests will confirm confinement on a MU basis or will dictate the need for additional monitoring or other corrective action.

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[28] Crownpoint Project In Situ Mining Technical Report, June 12 § 2.2.2. (The referenced cross sections will be filed to the parties in an errata package as, as approve by the Presiding Officer, no later than April 29, 2005)

[29] Churchrock Revised Environmental Report, March 1993 § 2.7'.2; Unit 1 Project, UIC Application and Technical Report 1992, Appendix I. Crownpoint Project In Situ Mining Technical Report, June 12, 1992 § 2.3.2.

IXV. RIGHTS TO BENEFICIALLY USE GROUNDWATER ARE PROPERLY ADMINISTERED AT THE CUP

168. In his declaration, Dr. Leeper presents extensive testimony pertaining to the importance of groundwater from the Dakota, the Westwater and the Cow Springs sandstone aquifers of the Morrison Formation to the population in Northwest New Mexico. HRI does not disagree with projections or the importance of the groundwater resource described by Leeper.

169. I would note that groundwater use in Northwest New Mexico is regulated for both consumptive use and quality protection and that with the regulatory provisions that are in place the quantity and quality of groundwater from the Dakota, the Westwater and the Cow Springs sandstone aquifers will be protected adequately.

170. I would agree that water quantity or consumptive use issues are a concern with *conventional* mining. However, the ISL process does not dewater an aquifer. The ISL process recirculates the water within the ore zone, over and over, until the mineral is depleted so the aquifer is not dewatered. Conventional mining requires that *all* water be removed from the ore horizon, and that the surrounding aquifer system both above and within, the ore horizons is continually drained during the life of recovery operations. Otherwise the mines and equipment necessary for recovery could not function. As a result, in situ recovery consumes much less water than open pit or underground mine dewatering and conventional milling and does not materially impact a aquifer for other users.

171. Environmental laws and regulations for ISL uranium recovery operations require that operations are conducted in accordance with EPA and NRC regulatory requirements that assure protection of drinking water resources. Wellfields must be properly designed, operated and monitored to assure that all impacts are local to the exempted portion of the aquifer (i.e. mine zone) and will not affect adjacent sources of drinking water.

172. Environmental laws and regulations for ISL uranium recovery operations require at the end of operations that groundwater in the exempted aquifer (i.e. mine zone) be restored, to consistent with baseline water quality conditions that existed prior to any ISL activity or to secondary goals. Conventional mines have no such groundwater restoration requirements.[30]

173. The New Mexico State Engineer administers water rights for the consumptive use of groundwater for all users, including the CUP. <u>See</u> Attachment Q, District Court Order Granting the NM State Engineers Office Jurisdiction over water rights at Church Rock Sections 8 and 17.

174. Sufficient water rights have been granted to allow production and groundwater restoration at Church Rock Sections 8 and 17. <u>See</u> Attachment W, HRI, Inc.'s Church Rock Water Rights Approval.

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[30] Again restoration is not intended to restore to drinking water source concentrations because the mine zone never was never and will never be a underground source of drinking water.

175. Sufficient water rights have been granted to allow production and groundwater restoration at Crownpoint Section 24. See Attachment R, HRI, Inc.'s Crownpoint Water Rights Approval.

176. HRI holds high a high priority water rights application for the Unit 1 Site that is pending action by the New Mexico State Engineer.

177. In approving a water rights permit the State Engineer must find that the granting the water rights will not impact the water rights of senior users. Therefore, while the Westwater Aquifer and other interconnected aquifers may serve as a water supply for others, granting HRI's applications cannot have any adverse impact on those users.

178. With the approval of HRI's water rights, the New Mexico State Engineer has determined that HRI's activities will not have any adverse affect on the availability of groundwater to other current users. Future water rights users must adjudicate their rights to water in the same way.

179. Issues pertaining to water quality at ISL facilities in general and the CUP in particular are local – not regional. After mining the potential for local impacts on adjacent sources of drinking water is mitigated by groundwater restoration. Outside of the mine area there is no impact is on water use. These facts have been proven over time as there has never been a report of water quality impairment near ISL uranium facilities after groundwater restoration has been completed and the mine closed.

180. Finally and most importantly as noted above, before mining any uranium property by underground injection, EPA must issue an Aquifer Exemption for the mineralized *portion* of the aquifer and a UIC permit. As a result, the water in the mine zone cannot now and will not in the future serve as a source of drinking water because of high naturally occurring concentrations of uranium, ^{226}Ra and/or ^{222}Rn. Again issues pertaining to water quality at ISL facilities in general and the CUP in particular are local to the mineralized zone – not regional.

XV. HISTORICAL ADMINISTRATION OF THE LICENSE/MINE UNIT ISL PROJECT DEVELOPMENT IN THE U.S.

181. Having managed environmental and regulatory affairs in the uranium industry for nearly 30 years, I have knowledge of how and why the current industry practices and the applicable regulatory programs of EPA and NRC have evolved. The regulation of ISL uranium recovery in general, and as is licensed for the CUP ("CUP"), is reflected in the approach that is described in the Standard Review Plan for In Situ Leach Uranium Extraction License Applications (NUREG-1569)[31].

182. Early in the regulation of ISL operations a potential conflicts developed between regulators (who wanted to maintain a high level of surveillance over mine development, testing

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[31] Specifically, with regard to hydrological characterization, baseline and other groundwater issues, the SRP is broken down into Section 2.0 Site Characterization and Section 5.0 Operations. At this stage in the development process HRI has conducted characterization as recommended in the SRP. The provisions of 5.0 and specifically 5.7.8 can only be fulfilled when operations have commenced and the equipment is available.

etc. above and beyond what was available in the level of characterization provided in a license application) and operators (who needed predictable timing in the development of new mine areas to allow for proper mine planning). By their nature, ISL operations have been developed sequentially, working one portion of the ore trend at a time; depleting an area and subsequently adding new reserves to production to maintain a steady flow of product which is necessary to assure a financially viable operation.

183. The need for sequential production area development has been accommodated by the License[32] /Mine Unit Authorization procedure. In step one the ISL operator procures a Base Permit/ License ("BP/L") wherein the feasibility of the project is reviewed and various global but specific operating requirements are prescribed. The BP/L contains the general provisions that apply to the project, i.e. the location of the project, how tests are to be conducted, which rules apply and the general permit provisions[33]. The opportunity is presented for the BP/L to be adjudicated before an administrative law judge where environmental, safety and public interest issues can be considered. The BP/L does not contain actual operational baseline values but it does prescribe the methods to calculate these values. With the BP/L approved, what remains is the fulfillment of the BP/L requirements during operations, which is subject to inspection.

184. Subsequently, in the Mine Unit Authorization (MUA) process individual wellfields are developed sequentially over the life of the project according to the specifications that are outlined in the BP/L. These studies include pump tests, water-sampling programs, data tabulation, and statistical analyses according to the instructions contained in the license, the applicable rules and regulations, the company's operating plan and standard operating procedures.

185. Typically the MUA documentation includes: (1) a restoration table, (2) a baseline water quality table, (3) control parameters upper limits (4) hydrologic testing results, (5) maps and other supporting documentation. (See COP 2.0 § 8.0) Each of these is, and must be, a straightforward report of data collected or reproducible calculation or analyses based on such data. A restoration table is produced by applying the arithmetic steps set out in the BP/L to the baseline water quality data gathered from wells in the mine unit. Finally, the MUA documentation contains the control parameters and their upper control limits ("UCLs") through formulas specified in the BP/L the company's operating plan. The preparation of MUA documentation is controlled by the BP/L conditions and is therefore a well defined exercise.

186. Once the MUA documentation is assembled and certified as required, the remainder of the well field and equipment can be installed, a process that generally requires 3 to 4 months. At that time the operator would have already invested in the uranium process plant, installed the baseline, monitoring wells and monitor well ring for the mine unit, conducted sampling of these wells and conducted requisite pump testing.

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[32] Today NRC Materials Licenses are Performance Based.

[33] In the case of the CUP, the Consolidated Operations Plan Rev. 2.0 ("COP") is incorporated by reference into the license.

187. Delaying a MUA through additional administrative processes could strand the multi million-dollar investment made to develop the mine and a hiatus in production that could force closure of the facility.

188. This process of obtaining a BP/L followed by obtaining MUAs is the sequence by which all ISL development has been conducted for the past thirty years in Texas, Wyoming and Nebraska and is consistent with the historic regulation of ISL operations by EPA and NRC and the delegated state UIC permitting agencies. There is no other practical way to conduct ISL mining.

189. I find it significant that with the history of sequential ISL mine unit development described above, in geologic conditions that are similar to those at CUP locations, the dire predictions regarding inadequate hydrologic analysis that have been described by Intervenors have not resulted in mine unit designs which have impacted adjacent underground sources of drinking water. To the contrary, the history of ISL uranium recovery in the United States is one of a well-regulated mineral recovery process, wherein the various standard mitigation measures have resulted in no impacts to adjacent nonexempted aquifers. The ISL process where sites may have gone full cycle from licensing-to-operations-to-restoration-to-license termination is well understood. Indeed, nowhere in the massive record of this proceeding is there any evidence of potentially significant impacts on public health and safety (including specifically adjacent sources of drinking water) from ISL uranium recovery[34].

190. In effect Intervenor's object[35] to the groundwater and financial security component of Performance Based Licensing that is described in LC 9.4 and the fact that the NRC provides for detailed operational analysis on a wellfield by wellfield basis and annual adjustment of surety based on updated circumstances.

XVI. HRI'S APPLICATION, THE PERFORMANCE BASED LICENSE AND THE CONSOLIDATED OPERATIONS PLAN FOLLOW STANDARD INDUSTRY PRACTICE AND NRC'S SRP.

A. NRC'S SRP GUIDANCE CLEARLY SPECIFIES PHASED ISL DEVELOPMENT.

191. The SRP for In Situ Extraction License Applications, June 2003 is the comprehensive NRC guidance document based on history regulating and industry practices for the ISL operations proposed at the CUP[36].

192. The SRP is clear that *operations* may not begin until licensing is complete. SRP, p xviii states:

> "The general licensing process is outlined in the flow diagram provided in Figure 1. An in situ leach source and byproduct material application may be denied or

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[34] LPB-99-30 p.47.

[35] Abitz ¶ 18

[36] Abitz ¶ 69 often reference earlier versions of the SPR. The June 2003 SRP supersedes the draft plans.

rejected under specific instances during the review process. Beginning construction of process facilities, well fields, or other substantial actions that would adversely affect the environment of the site, before the staff has concluded that the appropriate action is to issue the proposed license, is grounds for denial of the application [10 CFR 40.32(e)]." Underline added.

193. SPR Figure 2 *"Schematic of NRC Licensing and Inspection Process and Applicability to Different License Documents"* provides a one page illustration of the tiered approach to ISL regulation that is practiced by NRC. It shows the License Application: Details on how regulations will be met; and the Operating Plan: Details on how the facility will be operated, and basis for performance – based licensing. HRI's CUP can not proceed past these two steps of until licensing is complete.

194. SRP Figure 2 illustration illustrates the scope of NRC's inspection, implementation procedures, documenting specific steps that should be followed to implement commitments in the license and operating plan, individual facility personnel requirements to follow procedures and the operating plan. These steps are part of *operations* and follow the completion of licensing.

195. As clearly shown in SRP Figure 2, the purpose of the ISL Performance Based license and operations plan is to describe the procedure on how the information is collected. The remainder is a ministerial exercise left to inspection.

196. SRP Figure 2 is consistent with SRP guidance as a whole that is organized into functional groupings. SRP 2 is Site Characterization. SRP 5 is Operations. These section headings are self explanatory. With respect to groundwater, the Site Characterization section recommends "reasonably comprehensive chemical and radiological analysis obtained within and at locations away from the mineralized zone" (§ 2.7.3 (4)). The Operations section recommends much more detail "for each new wellfield" (§ 5.7.8.3 (1)).

197. Intervenor's[37] confuse the purpose of SRP § 2 and SRP § 5. It is inappropriate to treat the purposes of these two provisions as being the same. SRP § 2 provides guidance for "reasonably comprehensive" preliminary analysis to determine initial, general characteristics of local baseline conditions. This type of characterization has been completed for the CUP and the FEIS documents the results. Conversely, SRP § 5 analysis is intended for Operations – with respect to groundwater that means extensive baseline data from wellfields for the purpose of establishing restoration goals, excursion UCLs, and pump testing for hydraulic conditions. All of these tests can only be performed once the wells that are to be part of operations are installed.

198. At this stage in the CUP project, the litigation cannot reach beyond the adequacy of the protocol in the operating plan (Consolidated Operations Plan Rev. 2.0 or COP) because the mine must be built before the plan can be implemented and compliance is then left to inspection. What needs be reviewed now, and modified if necessary, are the license conditions and commitments in the COP to assure that the operating protocol are adequately protective.

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[37] Abitz ¶ 21

199. In this context Abitz ¶¶ 11,15, 20 complains that the data contained in HRI's application and reprinted in the FEIS are insufficient to define baseline. I agree if we are addressing preoperational/operational versus preliminary baseline. However, as stated, preoperational/operational baseline has not been established and was never intended to be established prior to licensing. HRI has not defined such baselines at any location at the CUP. HRI has drilled wells or used existing wells, conducted sampling or used existing sample data from various sources, at each location to characterize the site as required per pre-licensing criteria in SPR § 2. Samples have been taken in various locations within HRI's properties, and to the extent available adjacent to HRI's properties. These samples provide general knowledge of the water quality in and around the various CUP locations but do not attempt to (and because of their limited number statistically can not) provide detailed preoperational/operational baselines.

200. Therefore, when Abitz ¶¶ 16, 21,24,29 cites sample needs for monitor wells "inside" and "outside" the "production zone" and the "monitor well ring" and mixes the requirements of SRP § 2 and § 5 as if they are identical, he is confused. SRP § 2 and § 5 provide guidance for a different phases of ISL project life.

201. With regard to concerns over such items as production zone vs. monitor wells, sample multiples, statistical analyses, statistical methods, determination of UCL's, determination of restoration goals, wellfield pump tests, testing of monitor wells hydraulic conductivity (ore zone), testing of monitor well lack of hydraulic conductivity, etc. the relevant guidance is found in SRP § 5 – Operations. SRP § 5 is based on standard industry practice when the wellfield is to be installed and the test wells will be available. Any change in this approach would require a complete re-engineering of the methods upon which the ISL industry has operated since its inception.

202. As a professional in this industry for many years, I cannot envision any other regulatory approach that would provide for the predictable flow of feed for economically viable operations. Conversely, a lengthy review process for every mine unit would strand capital and provide for disruptions in an orderly mine planning and ruin project economics.

B. HRI'S LICENSE IS A PERFORMANCE BASED LICENSE.

203. Phase 1 of this hearing included the litigation of Performance Based Licensing. HRI's Performance Based License was upheld by the Presiding Officer[38] and the Commission[39]

204. License SUA-1580 and the COP incorporated by reference into the license in LC 9.3 contain many prescriptive protective measures to assure that only the exempted portion of the aquifer will be impacted during mining and that restoration operations will be properly conducted prior to license is termination. These provisions that assure that water quality impacts are local – not regional. (I.e. to the exempted aquifer and adjacent sources of drinking water are not adversely affected by ISL recovery).

205. Intervenor's witnesses do not address the *critical* conditions in the license that are required to mitigate the impacts of the CUP ISL operations. The ISL industry has been licensed

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[38] LPB-99-10 (February 19, 1999)

[39] LPB-99-22 (July 23, 1999)

and regulated by NRC or agreement state agencies for over 30 years using similar provisions to mitigate impacts. As I have noted above, and has been acknowledged by Judge Bloch, nothing in the record suggests, much less demonstrates that groundwater resources adjacent to the mined areas have been adversely impacted or affected in any way.

206. Major mitigating provisions in HRI's performance based License and the COP incorporated into the license that apply to groundwater are summarized below.

LC	COP	Description
9.4	1.8	Performance based licensing provision.
9.5	1.6/10.4.6	Restoration surety required.
9.8	9.12.4	Standard operating procedures required.
9.14	--	Permits required from appropriate authorities before operating.
10.1	3.2.1	Lixiviant composition limitation.
10.3	6.5.3	Formation fracture pressure limitation.
10.4	6.4	Casing material requirement.
10.6	--	CP emergency generating capacity requirement.
10.12	8.7.2	Excursion criteria.
10.13	8.7.2	Excursion time consequences.
10.14	--	Crownpoint and Unit 1 sites vertical excursion consequences.
10.15	--	Crownpoint site bleed continuity requirements.
10.16	--	Reimbursement requirement.
10.17	6.3	Production zone monitor well requirement.
10.18	--	Crownpoint and Unit 1 sites Dakota monitor well requirements.
10.19	--	Crownpoint and Unit 1 sites Dakota guard well requirements.
10.20	6.3	Churchrock vertical monitor well requirements
10.21	8.6.3	Restoration baseline data collection and statistical requirements.
10.22	8.6.4	UCL baseline data collection and statistical requirements.
10.23	8.5	Pump testing requirements.
10.24	6.4	Mechanical Integrity Testing
10.25	8.2	Cow Springs testing and monitoring requirements.
10.27	--	Crownpoint water well replacement requirement.
10.28	10.4.4	Limit CR17, U1 or Crownpoint mining until CR8 restoration demonstration is completed.
10.29	--	Project wide restoration plan after CR8 wellfield 1.
10.31	6.5.3	Step rate fracture testing requirement.
10.32	8.2	Cow Springs baseline requirements.
11.3	8.7	Groundwater monitoring requirements.
12.1	8.7.2	Excursion reporting requirements.

207. LC 9.8 requires that standard operating procedures ("SOPs") be established and followed for activities involving radioactive materials. As such these SOPs will provided quality assurance over every conceivable aspect of water and water quality testing and will be subject to NRC. The commitment to develop SOPs is a standard provision that is found repeatedly throughout the COP (for example pp. COP-88 & COP-89). Many of the Intervenor's concerns

are at the SOP level of detail.[40] If the Presiding Officer finds that modifying a particular procedural requirement is necessary, it would be appropriate for that finding to be included in a revision to the COP or to be incorporated into a SOP.

C. THE PRESCRIPTIVE REQUIREMENTS IN THE COP ARE INCORPORATED BY REFERENCE INTO HRI'S PERFORMANCE BASED LICENSE.

208. LC 9.3 specifically requires that HRI conduct operations in accordance with the COP as follows:

> "The licensee shall conduct operations in accordance with all commitments, representations, and statements made in its license application submitted by cover letter dated April 25, 1988 (as supplemented by the licensee submittals listed in Attachment A), and in the CUP Consolidated Operations Plan (COP), Rev. 2.0, dated August 15, 1997 - except where superseded by license conditions contained in this license. Whenever the licensee uses the words "will" or "shall" in the aforementioned licensee documents, it denotes an enforceable license requirement."

209. As such the COP functions as part of HRI's performance based license.

D. COP § 6.0 CONTAINS HRI'S DETAILED INSTRUCTIONS FOR SEQUENTIAL WELL AND WELLFIELD INSTALLATION.

210. To assure the quality of HRI's performance, well types, spacing, installation techniques, testing procedures, operations and instrumentation are described in detail in the COP and provide a basis for inspection by NRC.

211. The treatment of underlying aquifers, exploration holes, pump tests and preoperational baseline are all prescribed in the COP in detail. COP § 8.6.2 sets out the well configuration for establishing such baseline wells.

212. Shown on COP Figures 1.4-1 through 1.4-8 the installation of multiple mine units (wells and wellfields) will occur over a ~20 year mine life. There will be numerous sampling and testing cycles, wherein well adequacy is verified and water samples are taken and analyzed and the analysis transformed into restoration table values. All will be accomplished in accordance with the License, the COP and SOPs.

213. The assertion[41] that HRI has created artificially inflated baseline concentrations in establishing restoration goals is incorrect. As noted above, to date neither HRI nor NRC has proposed preoperational/operational baselines, enforceable UCL's or restoration values. Rather the information will be collected according to the protocols established in COP Rev. 2.0 § 8.6 that is consistent with SRP § 5. These protocols are based on standard industry practices. Thus

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[40] For example methods for baseline statistical analysis Abitz §A

[41] Abitz ¶ 19

complaints about when baseline water quality is determined are without merit because the well and wellfields from which baselines are to be determined will not be available until the site is developed according to the mine plan over a multi-year period.

214. It takes years of continuous study to plan and develop an ISL uranium mine through its operational life to closure. Engineers and geologists must revisit the previous day's analysis before the next well is drilled. Every day new information becomes available. Prior to placing monitor wells additional exploration and delineation work has to be conducted to assure the wells are properly placed. As wellfields or mine units are developed, but before wells can be sampled, they are pump tested to assure that the monitor wells are functional. The results in one mine unit may cause the engineer to make design changes in the next. This process is sequential, with each mine unit developed and tested as the mineral is progressively depleted from different parts of the orebody.

215. The economics of an ISL uranium recovery project do not allow for all developmental activity up front nor would it allow for repetitive interruptions, in the form of lengthy license reviews or worst yet litigation, each time a new production area or mine unit is needed. A uranium recovery operation needs to have a dependable supply of raw materials available timely to support an operation. Simple cash flow economics govern ISL uranium recovery because it is the sustained production of material and sale of this material that meets payroll and covers all other costs. To interrupt the flow of feed to the process facility is a guaranteed formula for creating economic chaos.

216. The installation of mine units prior the satisfying the requirements of SRP § 5 guidance, and after SRP § 2 characterization and licensing is completed, would be a direct violation of the NRC Regulations and SRP Guidance.

217. The only other alternative to the current industry practice of phased mine unit development would be some form of a lesser density global project baseline during SRP § 2 site characterization that could be used for the life of the project. HRI has already conducted a broad characterization as per SRP § 2 and I agree with the Intervenors[42] that the level of data collected to date is not satisfactory for SRP § 5 *baseline*. However, I submit that *any* level of data that is collected during the SRP § 2 characterization phase would be a substandard preoperational/operational baseline for two reasons: 1) Any level of sample density (population distribution for the purpose of statistics) that could be achieved as part of characterization would not approach that derived from operations (I.e. actual wellfield (1 per acre) and monitor wells); 2) Actual operational wells as sample points will be monitored to demonstrate excursion compliance and restoration, during and after operations, therefore these locations must be where the baseline samples are collected or one would never be able to make a positive "before and after" comparison. The only solution is, and always has been, the baseline sampling sequence described in the SRP § 2 and 5, the License and COP.

E. COP § 8.0 CONTAINS HRI'S INSTRUCTIONS FOR STATISTICAL ANALYSIS.

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[42] Abitz ¶ 18

218. Intervenor's believe that restoration standards and UCLs should be established prior to licensing and should be based on appropriate statistical methods for determining baseline[43]. For the reasons specified above baseline sampling/analysis and statistical methods have to be applied as mine units are developed. HRI agrees that proper statistical methods should be used.

219. HRI's COP and the License in LC 10.22 require HRI to eliminate outliers consistent with EPA's 1989, "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance"[44]. This NRC required methodology for outlier determination requires a rigorous statistical approach and has an accepted scientific basis. HRI will utilize the stated statistical analysis guidance for outlier analysis or method required by NRC.

220. Contrary to the assertion of Abitz[45], the COP requires three samples for baseline that will be subject to averaging unless it is found not to be warranted and then, only with NRC concurrence, single samples could be used. Specifically COP § 8.6.1 states:

> "Consistent with regulatory requirements, initially, HRI will collect three independent baseline water quality samples from each well. However, based on the consistent results of multiple samples from individual wells taken previously, HRI believes that multiple independent baseline water quality samples from each well will not be warranted. With the concurrence of NRC, HRI will sample each well once, and perform the requisite analysis to determine baseline water quality characteristics. It is with this presumed approval that the following portion of the Plan is drafted."

221. Thus Abitz is incorrect. The issue during this hearing is not whether HRI will take one sample vs. four[46]; it is whether there will be three samples vs. four. I have not observed any significant variability among the multiple samples analysis from the individual wells that have been used to characterize water quality that suggests that three samples are insufficient. Nor has evidence been presented by the other side. However, if the Presiding Officer is persuaded to change the number of samples per well stated in COP § 8.6.1, HRI would still desire that the stipulation providing the opportunity to reduce that sampling frequency if the empirical results warrant a reduction remains intact.

222. LC10.21 and COP 8.6.3 specify that preoperational/operational baseline conditions determine restoration criteria and UCLs. The COP well data shall be averaged for Production Zone (Production Pattern), Mine Area (Monitor Well Ring) and Overlying Zones as follows:

> "Baseline conditions are determined as follows:
>
> **a.** Production Zone (Production Pattern) Wells - Individual well data for each parameter are averaged. The resulting average is generally referred to as the production area average.

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[43] Abitz ¶ 19
[44] COP 8.6.3
[45] Abitz ¶ 23
[46] Abitz ¶ 24

b. Mine Area (Monitor Well Ring) Wells - Individual monitor well data for each parameter are averaged. The resulting average is generally referred to as the mine area average.

c. Overlying Zones - Individual monitor well data for each parameter are averaged. The resulting average is generally referred to as the non-production area average."

223. The assertion[47] that HRI plans to not to group production zone and monitor wells separately is false.

F. THE COP DESCRIBES HOW RESTORATION GOALS WILL BE ESTABLISHED.

224. HRI is responsible for determining groundwater restoration goals according to procedures described in the COP Rev. 2.0 § 8.7.3.8 & § 8.6.3. The well density p. 85, well spacing p. 85, parameter list p. 87, number of a samples p. 85, sampling protocol p.85 and QA p. 137-138 are all prescribed. What is left for HRI is to tabulate data and document results. HRI will use the production area baseline values to establish the primary baseline restoration goals.

225. Abitz ¶24 has complained that HRI has established baseline in a "skewed" manner because water was not obtained from the ore and nonore zones. As described in the COP Rev. 2.0 § 8.6.3, preoperational/operational baseline will be determined after the mine units have been installed for groundwater in the ore zone and nonore zone separately.

G. AVERAGING UCL AND RESTORATION VALUES IS JUSTIFIED BASED ON INDUSTRY PRACTICES AND SITE INFORMATION.

226. The standard industry practice is to use the arithmetic average for baselining groups of ISL wellfield data. I do not know of any other method used by the industry. It is with the knowledge of standard industry practice that COP 8.6.3 was developed.

227. It is reasonable to conclude that the distribution of uranium related progeny would correlate with the log normal distribution of uranium ore. However, uranium ore fronts are narrow and a finite number of monitor wells often are drilled so there are solid "hits" in the ore and solid "misses". Yet this data is real. Conceptually, a infinite amount of samples covering every portion of the ore would yield a lognormal distribution of uranium and uranium related progeny. Because this is impossible in the real world industry is forced to deal with a spaced sample well configuration such a one per acre[48]. With the knowledge of this ore geometry industry professionals and their regulators have accepted averages based on a lognormal distribution

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[47] Abitz ¶24

[48] It should be noted that an acre is 43607 square feet or about 210 feet by 210 feet. A uranium ore front is commonly 100 to 200 feet wide. So even at a density of one well per acre it will be impossible to sample uniformly to get an accurate distribution across the ore.

228. It is equally reasonable to assume that in the relatively small area that is encompassed by ore, the contribution of uranium and uranium related progeny in water (dissolved) would be proportional to the concentration of the ore.

229. It is not reasonable to statistically manipulate high radionuclide values out of a sample set because variability is so common over short distances[49]. Especially when those elements are know to be a unique component of the ore. Rather it is reasonable to incorporate all the values that have passed the outlier test into an average, because it will be the same distribution used to address completion of restoration.

230. The Unit1 example is the only location in the CUP where a sufficient population makes a preliminary statistical analysis possible[50] and Abitz has done the arithmetic[51]. In evaluating the examples of the statistical mean for normal distribution and the statistical median for non normal distribution provided by Abitz in Table 2 and Table 3[52], I find that the values are so similar that there is no material impact to baseline for UCL's or restoration criteria. Specifically, the Table 2 difference between Na, HCO_3,SO_4, Cl, Mo, U, and ^{226}Ra mean vs. median are so small that – using either for baseline would result is essentially the same primary restoration goal. Similarly, the Table 2 difference between Na, HCO_3, SO_4, Cl, Mo, U, and ^{226}Ra mean plus five standard deviation's vs. median plus five IQR's for UCLs is so small that either would fall far below the expected concentrations in leach solution and be robust UCLs[53]. For this reason HRI does not have a strong preference on the method required.[54]

231. As shown in the Table below, <u>if</u>[55] the available Unit 1 data were to be used, five standard deviations added to the baseline mean (average) is a conservative range when compared to leach solution chemistry[56]. The same Table also shows that the Median plus 5(IQR) would be equally conservative when compared to leach solution chemistry. Abitz ¶ 33 recommends the mean plus five standard deviations for Bicarbonate and Median plus 5(IQR) for Chloride. The concentration of either control parameter in leaching water is much greater than that being debated for UCL's and it makes the Intervenors arguments functionally meaningless regardless of the statistical approach. Either would work. Abitz's solution only provides for more "busy work" in the field. In provides no better protection of USDWs and by making "busy work" it distracts the field technician's from things that may be more important.

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[49] Abitz ¶38 where the ^{226}Ra values from the ore are discarded because the population is not normal.

[50] Abitz ¶31

[51] Abitz Tables 2 and 3

[52] I note that the method by which Abitz breaks out Production Wells for analysis and Monitor Wells for analysis is identical to the method that HRI is committed to in COP 8.6.3.

[53] Abitz has not provided any reason for the use of Mo or ^{226}Ra. I have explained in that Na, SO_4 Mo, and ^{226}Ra are poor choices for UCLs. (Pelizza at XVI.H.)

[54] In the Affidavit of Christenson he noted that the median plus five IQR is in the same interval as the mean plus 6.74 standard deviations. Very close!

[55] Of course this data will <u>not</u> be used because HRI does not know if its mine units will resemble the Mobil Mine unit. It may me larger or smaller or a different shape and the well locations will be different.

[56] Leach solution contains concentrations that are so much higher than the UCL or natural groundwater, that if an excursion occurred the result would be quickly recognized by a corresponding value that will be well above UCLs calculated by the mean plus five SDs or median plus five IQRs.

Parameter	Mean	Mean 5(sd)	Median	Median 5(IQR)	Leach Water
Conductivity (μmho)	399	460			5,000
Bicarbonate (mg/l) †	212	252	215	265	800-1,200
Chloride (mg/l) †	2.6	9.6	2	7	250-1,800
Uranium (μg/L) †	.057	.222	.05	.05	50,000-250,000

† Abitz Table 3

232. HRI is committed to using the EPA's 1989, "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance", the guidance Intervenors assert should be used[57]. If required, HRI will utilize this guidance to determine if a population is normal or lognormal. However, as noted above, unlike RCRA facilities, with ISL uranium mining operations a known local anomaly is present in the rock (uranium mineralization which is lognormally distributed), a strong geochemical interface is known and radionuclide constituents are present in the groundwater that is associated with this anomaly. Radionuclides are expected in a uranium ore body and it is not reasonable to extract them from the data if they pass NRC's recommended outlier test[58].

233. As stated, HRI will use whatever statistical test is required by NRC in determining baseline. If the Presiding Officer is persuaded that a statistical test is required other than an arithmetic average, HRI would modify its COP accordingly and perform the calculation in that manner when the wellfields are drilled on a mine unit basis and the sample analyses data are available.

H. THE UCL INDICATORS ARE SUFFICIENT

234. HRI's planned excursion monitoring program is clearly stated. (See COP Rev. 2.0 8.7.2 and SUA-1508 LC 10.12.) Abitz ¶35 claims that HRI's and the Staff's proposed excursion indicators are inadequate because of the parameters that are chosen and the way UCLs are calculated. The UCL statistics have been addressed above. HRI has proposed excursion indicators that are consistent with industry standards and other NRC licensees. The parameters proposed meet HRI's criteria for reliable indicators because, as shown it the preceding Table, their concentrations will be well below those anticipated in leach solution, they are parameters that are stable under various subsurface geochemical conditions, and they are parameters that can be measured rapidly and reliable by a field laboratory. Simply stated they are robust indicators. They have been found to be acceptable for this reason in the Section 8 portion of this proceeding and none of the conditions associated with Sec. 17, Unit 1 or Crownpoint are significantly different.

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[57] Abitz ¶ 19

[58] See SRP § 5.7.8.3(1)

235. Abitz ¶35 wants uranium used as an indictor because it is in high concentration and is in an oxidizing/carbonate solution. As was stated in affidavits for the Churchrock Section 8 portion of this hearing, HRI does not have a strong preference one way or another with regard to the use of uranium as an indicator. However, HRI, Inc. agrees with NRC staff that most trace metals including uranium will not stay in solution after they leave the oxidized area.

236. An important factor to consider in choosing a UCL indicator is laboratory turn around time. This consideration is not included in Abitz's evaluation. The practical fact is that HRI will operate a field laboratory manned with technicians that are capable of a limited rudimentary types of analyses. In the field lab HRI will be able to obtain monitor well samples and perform turn around very quickly (I.e. in 24 hours) for parameters such as bicarbonate, chloride and conductivity. Rapid turn around is important because a primary objective of operational monitoring for excursions is real time results. If there is a excursion it needs to be corrected ASAP[59]. As shown in the table below, HRI's proposed UCL parameters Bicarbonate and Chloride have rather simple titration methods of analyses. Conductivity is analyzed by a commercially available meter - again simple. Thus analyses are rapid. These indicators are also highly elevated in leach solution as compared to natural conditions that if one or more becomes elevated in a monitor well sample analyses, it would provide a positive indication that leach solution has excurted. More indicators are not needed.

237. If uranium is analyzed I would also classify it as a parameter that can be analyzed rapidly at the HRI lab for detection limits above 100 µg/l. For detection below 100 µg/l that Abitz suggests in his Table 3., the sample would need to be shipped to a commercial lab for a Fluorometric procedure.

248. The parameters Molybdenum, ^{226}Ra, Sodium, Sulfate, and Uranium (with low detection limit) require analysis in a commercial lab by a Flame AA, Emanation, and Gravimetric or Fluorometric procedure. Depending on the test, commercial lab turn around will be at least a month or more. The real time component of monitoring will have been lost. By this time the monitor well will be undergoing at least one other sampling cycle and if there had been an excursion detected corrective action should be underway. This is why the parameters Bicarbonate, Chloride and Conductivity have proven to be extremely efficient indicators at similar ISL projects.

Analytical Test Methods

Parameter	LLD	Commercial Lab Test Method	Commercial Lab Method No.	HRI Lab Test Method
Bicarbonate (mg/l)	1	Titration	310.1	ALKALINITY BY TITRATION WITH SULFURIC ACID
Chloride (mg/l)	1	$HgNO_3$	STD. Method 4500-C5 B	CHLORIDE IONS BY TITRATION WITH MERCURIC NITRATE
EC~25° C (µmho/cm)	1	Meter	120.1	CONDUCTIVITY METER
Molybdenum (mg/l)	0.01	Flame AA	246.1	
^{226}Ra (pCi/l)	0.1	Emanation	SM 7500 Ra-C	
Sodium (mg/l)	0.001	Flame AA	273.1	
Sulfate (mg/l)	1	Gravimetric	375.3	SULFATES BY THE BARIUM TURBIDIMETRIC METHOD
Uranium (µg/l)	100	Fluorometric	ASTM D2907	SPECTROPHOTOMETRIC

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[59] See LC 12.1

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XVII. THE USE OF REDUCTANTS

239. Abitz ¶ 96 states that reductants do not work. HRI has not precluded the use of reductants as a viable approach to reducing final uranium values to lower concentrations. The COP Rev. 2.0 and the License both require further detail from HRI as to the restoration plan. For example, the COP Rev. 2.0 at 161 states:

> "Prior to conducting mining operations, HRI will develop an updated groundwater restoration plan for the entire project. At a minimum, this plan will include a refined restoration schedule, and a general description of updated methodology of restoration, and post-restoration groundwater monitoring for the entire project."

240. LC 10.29 transforms this commitment in the plan into a requirement. This plan cannot be completed however until the wellfield has been put in place and relevant baseline information has been collected and tabulated. Additional restoration methods may be proposed in the plan such as the use of reductants. However, HRI will have to weigh the use of reductants with certain occupational safety concerns.

241. The Mobil pilot was different than that which has been proposed for the CUP because 1) The Mobil pilot was conducted in Cretaceous ore with high molybdenum content[60] and 2) the leaching process was terminated after only a fraction of the uranium reserve was depleted when head grades were still high at 145 mg/l[61] (145,000 µg/l). HRI's CUP properties are in Tertiary age ore and molybdenum is not present. HRI will deplete the uranium during the mining process so that the amount of uranium that is present in the leach solution after mining will be significantly less.

242. Abitz basis his presumption that reductants won't work on his theory that the "strong oxidizing" environment presented in §§B.(3-5) would overcome any influence of reductants. Rather than make that general assertion, it would have been appropriate for Abitz to perform the same analysis that he recommends in his text (I.e. an analysis of Eh couples, ...) If residual oxidation is the serious problem that he suggests, and the residual oxidation will leave uranium available for uncontrolled migration, then the same logic would dictate that addition of a strong reductant such as hydrogen sulfide would consume the residual oxygen, reverse or retard the residual oxidized state, which would stop uranium from migrating into the reduced sands because of precipitation. Absent oxygen, uranium is not soluble.

XVIII. HRI ESTIMATES FOR DECOMMISSIONING, DECONTAMINATION AND CLOSURE ARE SUFFICIENT.

243. In his Declaration Mr. Konwinski finds that HRI does not have an assured legal disposal location for 11.e(2) byproduct waste from ISL operations and decommissioning, that such options may be limited and that HRI has underestimated the cost for independent contractor

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[60] FEIS at 4-37.

[61] FEIS Table 4.13

decommissioning. As detailed below, Konwinski is incorrect because he did not consider all potential disposal sites that are available, miscalculated costs and overlooked core assumptions in HRI cost estimates.

244. Konwinski claims that HRI does not have an assured legal disposal location for its 11.e(2) Byproduct material because HRI has not contracted for ultimate disposal. He identifies the White Mesa Mill as HRI *planned* disposal site and notes that HRI has no current contract.

245. Konwinski ¶ 12 describes three options for 11.e(2) Byproduct disposal: 1) ENVIROCARE, Inc., 2) COGEMA Mining's Shirley Basin Mill, and 3) the White Mesa Mill and at ¶ 13 notes that the ENVIROCARE facility will not be available in the future.

246. The COP Rev. 2.0 establishes that a contract for disposal will be obtained prior to operations as follows:

> "Prior to beginning operations, HRI will develop, and maintain an agreement for the disposal of 11e (2) by-product material with a facility licensed by the NRC, or an Agreement State to accept such material." COP Rev 2.0§ 1.5.

247. License Condition 9.6 determines HRI's 11.e(2) byproduct disposal requirements and addresses contract requirements. LC 9.6 is applicable to the facility during operation and requires that the waste disposal agreement be maintained on site and if it expires it must be replaced in 90 days or injection (mining) must stop. At this time there has been no *beginning of operations.* There has been no mine development or production and no 11.e (2) byproduct material generated yet at any of HRI's sites.

248. Konwinski fails to present all of the disposal options in his affidavit. Specifically, Cotter Corporation operates a conventional uranium mill and tailings near Canon City, Colorado. Cotter has agreed to accept 11.e(2) byproduct waste from URI, Inc.'s Texas operations at the Canon city mill. See Attachment S, Letter from Cotter to URI with specific terms for accepting byproduct material from URI's Texas operations. Additionally, Waste Control Specialists in Texas is licensed to accept 11.e(2) byproduct material. See Attachment T License of Waste Controls Specialists. HRI would consider bids from Cotter and Waste Control Specialists in addition to IUC and COGEMA to meet the requirement of LC 9.6.

249. Konwinski ¶ 15. lists the disposal fee at the White Mesa Mill at $100 to $125 per cubic yard as the lowest cost option. I would note that Cotter has quoted URI, Inc. in writing a fee of $50 per cubic yard. Therefore, Konwinski's subsequent recalculation of costs is overstated.

250. Konwinski states that IUC is limited to accepting 500 cubic yards of solid material and that IUC's capacity *may* not be big adequate if HRI cannot decontaminate all of its buildings and concrete. HRI contacted IUC management who stated that there per source (i.e. HRI) limitation is 5000 cubic yards, not 500 cubic yards . Konwinski is off by a factor of 10. Also, as stated above other disposal options exist.

251. Konwinski ¶ 19 asserts that HRI accounts for disposal costs at $3.52 per cubic foot which is equal to $43.61 per cubic yard. Konwinski's math is in error. (i.e. HRI conversion of cubic feet to cubic yards used in the RAPs is $3.52 ft^3 X 27 ft^3 / yd^3 = $95.00 yd^3) Konwinski's assertion that HRI may be low by a factor of 2.87 and his subsequent analysis in ¶ 19 is erroneous.

252. Konwinski ¶ 21 is concerned because he finds no evidence where HRI has accounted for the cost of disposal of RO reject and brine concentration solids in the Crownpoint RAP. Konwinski's first error in this regard is that all RO reject is processed through the brine concentrator so that there will only be solids from the brine concentrator. See Crownpoint RAP § 2.3. Konwinski's second error is that he did not review budget line 88 in the RAP. See Crownpoint RAP § Attachment E-2-1 line 88. HRI budgeted $8,291 per month for brine concentration disposal ($99,492 per year or $696,444 over the 7 year restoration period). A similar line item is in the RAP for each location. Konwinski's concern is without merit.

253. Konwinski ¶ 21 notes that HRI has not estimated $45 per hour for loading/unloading and $150 per vehicle for decontamination and vehicle survey. I note that these amounts may vary from vendor to vendor. For example Cotter Attachment S quotes $35/$130 per hour for loading/unloading and decontamination and vehicle survey respectively. I agree that these amounts should be included in a surety estimate and annually updated pursuant to the provisions of LC 9.5. At this time however, HRI does not know what costs should be included, but even as calculated by Konwinski the cost is minor.

254. Konwinski ¶ 21 is concerned that the salary for a RSO should be increased by $45,000. I would note that the budget also includes and amount of $105,000 for an Environmental Manager. The Environmental Manager's supervisory responsibilities over the RSO are clearly stated in Crownpoint RAP § 2.7. As such he will have responsibility over radiological surveys and technician level responsibilities described for the RSO. In addition the Environmental Manager shall share in the responsibility of conducting surveys and other RSO functions as part of HRI's plan to share responsibilities among staff. Konwinski overlooks the fact that this level of management is budgeted and therefore his concern is without merit.

255. Konwinski states that the wastes should be containerized. I disagree. I have supervised the decommissioning of two commercial ISL plans, one Pilot plant, and most recently the complete reconstruction of URI, Inc.'s Kingsville Dome location in Texas. During these projects many truckloads of material were disposed of offsite. URI has always shipped in bulk because it is more efficient (i.e. it is desirable to limit the transports by weight). As stated in the Affidavit by Mike Maxson, in the event that material is drummed and stored onsite, it is standard procedure to empty the drums into bulk transports, and flatten the drums and ship them with the bulk material.

256. Konwinski is concerned that HRI does not consider the cost of disposing of wellhead casing. I have personally supervised the closure of two commercial ISL facilities and one pilot ISL facility. I have never known wellhead casing contamination to be a decontamination issue. If there is any surface contamination on wellhead casings, the acid/pressure wash process that is

commonly used by uranium recovery operators will moot the issue. Therefore the cost to dispose of wellheads is not a material issue.

257. Konwinski ¶ 27 concludes that HRI's surety is at a minimum $320,000 short for D & D because of: unloading, survey and decontamination costs at the disposal site; underestimation of the cost of an RSO; D & D of wellfield and satellite facilities; equipment removal and disposal and wellfield building removal. In 2004 URI, Inc. reconstructed buildings at its Kingsville Dome process facility including the contaminated dryer enclosure. The dryer enclosure is arguably the most contaminated structure at the facility. Even so, all scrap was routinely decontaminated and decommissioned and released for unrestricted use. Similarly HRI plans that all buildings will be decontaminated at the CUP. Therefore Konwinski's concerns that buildings should be budgeted for disposal are premature.

258. However, as stated above, Konwinski is not aware of the disposal fee at the Cotter disposal site that is lower than the IUC fee cited and he miscalculates the per yard cost used by HRI. making it impossible to follow his cost estimate. He fails to recognize the proper time to "fine tune" cost estimates, which are prior to beginning operations and that surety estimates are updated annually.

259. Konwinski's claims that HRI should increase the annual budget for a RSO by $45,000 neglect a budget assumption of $105,000 for an Environmental Manager. Similarly in concluding that at Crownpoint an additional $100,000 is required for restoration waste, he neglects to address HRI's additional proposed $696,444 for disposal of brine concentration wastes. HRI's budgeted amounts for both RSO and brine concentration wastes exceed Konwinski's alleged shortfalls. For this reason Konwinski concerns are without merit.

IXX PORE VOLUME DETERMINATION.

A. PORE VOLUME BACKGROUND

260. Abitz ¶ 81 objects to the method that HRI uses to calculate pore volumes and specifically how the horizontal and vertical flare factors were determined. This issue has been considered at length during this hearing process and I am surprised that Abitz raises it again. Specifically, the subject was one of the primary discussion topics at the oral hearing before Judge Moore on November 8, 2001.

261. The term "pore volume" (PV) is a term of convenience that has been conceived by the ISL industry to describe the quantity of free water in the pores of a given volume of rock. The units are provided in gallons. PV's provides a unit of reference that a miner can use to describe the amount of circulation that is needed to leach an ore body, or describe the times water must be flowed through a quantity of depleted ore to achieve restoration. PV's provide a way that a miner can take small-scale studies, such as studies in the laboratory, and scale these studies up to field level or to compare pilot scale studies[62] to commercial scale. Hence they provide a miner with an important technique for calculating ISL project economics and restoration costs.

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[62] I.e. such as the Section 9 Pilot. See FEIS p. 4-37.

262. PV's are calculated by determining the three dimensional volume of the rock (that is also the ore zone) and multiplying this number by the percent porosity. HRI used the "ore area" method to determine pore volumes[63], where the extent of ore of given grade within a mine unit is outlined and digitized to provide the ore area[64]. This area is then multiplied by the average ore thickness to provide the three dimensional volume of the ore that is to be leached. This volume is converted to a PV by multiplying the ore volume by the percent porosity and then converting to the units of measurement (i.e. gallons).

263. HRI correctly used the same methods to calculate adjusted pore volumes in the all the RAP cost estimates because they were the same as those that NRC reviewed in HRI submittals and that NRC used in the FEIS impact evaluation.

264. "Flare" factors are multipliers that are commonly used by the ISL industry to account for leach solution outside of the specific boundaries of the calculated ore PV and are generally accepted increases[65] that should be recognized in cost estimates. HRI uses flare factors of 1.5 for horizontal and 1.3 for vertical[66]. Horizontal increase is calculated by multiplying the measured or mapped area of the ore, in plan, and multiplying the actual area by 1.5. This yields the affected horizontal area. Likewise, vertical flare is calculated by multiplying the measures average thickness of the ore by 1.3. This yields the affected vertical area. Multiplying the affected horizontal times the affected vertical by porosity provides the affected pore volume for the surety cost estimation. This number is in turn multiplied by 9 to determine water treatment and disposal volumes that are entered into the model to calculate costs. The 1.5 for horizontal and 1.3 for vertical pore volume increase factors have been calculated by URI engineers based on operating experience at other restoration demonstrations and commercial operations and have been adequate for monitoring and reporting restoration progress at other operations. During the Churchrock restoration demonstration that is described in LC 10.28, HRI will use these factors to measure the number of pore volumes that are processed during the restoration demonstration.

265. The methods utilized in all three HRI RAP's to calculate pore volume and adjusted pore volumes are consistent with the methods used for the Mobil Section 9 Pilot that was conducted

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[63] Different operators have used different methods to determine the volume of the ore zone. For example, some use the "pattern method" where pattern dimensions are used to determine the area of the ore and then the area is multiplied by screen thickness to determine the volume of rock in the five spot. The pore volume of the five spot is calculated by multiplying the volume of rock by the percent porosity and then converting to the units of measurement (i.e. gallons). The total PV of a mine unit is calculated by adding all the five spot patterns in the mine unit. This method works well for existing ISL operations where the ore had been fully delineated and wellfield installed such as the existing projects in Wyoming.

[64] Future wellfield patterns will be constructed within the ore that is economic at the time. Patterns will be a subset of the overall "ore area".

[65] Flare outside of the ore zone is the norm. In the subsurface water moves in a radial pattern from injector to extractor in its path across the target ore. By choosing patterns carefully flare is minimized. However, as an expected component of ISL mining the flare factors are included in the bonding calculation as a deliberate cost contingency. There is a limit on acceptable flare; the horizontal monitor wells. If fluid is detected in the horizontal monitor wells it no longer simply flare but then becomes an excursion. An excursion requires immediate corrective action to draw it back to the mine zone or the bonding must be increased above the amount contemplated in this RAP to compensate for the increase in restoration cost. (See L.C. 10.13 which requires a bond increase if corrective action is not completed in 60 days)

[66] Combined pore volume flare factor is 1.95.

approximately three miles northwest of the Crownpoint site, which in turn were the basis for the NRC evaluation in the FEIS, and are consistent with the methods used by HRI throughout the CUP licensing process, and for HRI's submittals during the Subpart L hearing. HRI methods to calculate pore volume and adjusted pore volumes, and the factors that were used were not generic or arbitrary, but rather were consistently proposed, evaluated, litigated and applied throughout the NRC licensing process and this Subpart L proceeding. They have been upheld by the ASLB[67].

266. HRI presented the NRC with the Summary Report for the Mobil Section 9 In Situ Leach Pilot[68] as a part of the License Application support materials because the Pilot was a substantial field demonstration, and provided empirical results[69], for the ISL development that is proposed for the CUP. This Report was a compilation of the information from Mobil Oil Company's files and records that were developed when the Pilot was conducted. HRI utilized actual pattern dimensions and the actual number of gallons processed during the restoration to compile the summary report.

267. 59,173,469 gallons were circulated during restoration of the Section 9 Pilot, which equated to 16.7 adjusted pore volumes. It is from this data that NRC determined that after 8 – 10 pore volumes that TDS concentrations and specific conductance had reached a point where little improvement was realized with additional effort[70] and that the initial surety should be based on 9 pore volumes. The Table below shows how the adjusted pore volume was calculated using the pattern area, screen thickness, porosity, a horizontal pore volume increase factor of 1.5, and a vertical pore volume increase factor of 1.3. The methods of pore volume analysis utilized in the Summary Report form the foundation of the NRC impact evaluation in Section 4.3.1 of the FEIS which ultimately resulted in the staff determination that 9 pore volumes would be required for surety calculations[71].

Section 9 Pore Volume Calculation

ZONE	Pattern Area (ft2)	Tk (ft)	Vol (ft3)	Por	gal/ft3	PV (gal)	H-PIF	V-PIF	CPV (gal)	Gallons Processed	CPV Processed
Single	40,488	24	971,712	0.25	7.48	1,817,101	1.5	1.3	3,543,347	59,173,469	16.69

Explanation of Headings:

Area - Area of cut off grade mineralization.
Tk - Thickness of cut off grade mineralization.
Por - Estimated porosity of the rock.

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[67] LBP-99-30, August 20, 1999

[68] See Pelizza Affidavit January 19, 2001, Attachment 1.

[69] The Section 9 Pilot data provide actual ore zone dimensions and gallons processed so that actual pore volume can be processed. ENDAUM witness Lafferty Testimony May, 23 2001 ¶ 14 specifically recognizes the importance of knowing the quantity of water removed from the formation in calculating pore volumes ".... if the flare factor were increased, the number of pore volumes required should be decreased. This scenario may be true only if the total gallons of impacted groundwater where known." The value of the Section 9 Pilot, or any demonstration, is that it provides *known* variables to the equation that allows pore volume increase factors to be assigned. Given similar mining technology and geology, the pore volume increase factors from a demonstration, such as the Section 9 Pilot, can be applied to an analogous site such as the Crownpoint location.

[70] See FEIS p. 4-40

[71] See FEIS p. 4-40

PV - Straight pore volume without any correction.
H-PIF - Horizontal pore volume increase factor.
V-PIF - Vertical pore volume increase factor.
CPV - Corrected pore Volume.

268. So in fact Abitz ¶89 is correct that the flare factors were back calculated. Or rather that a pore volume was determined with assumed flare factors. One could choose larger flare factors but it would result in a smaller pore volume number; or smaller flare factor that would result in a larger pore volume number. What is fact is the pattern area, thickness, porosity, and gallons processed.

268. It is important that HRI continue to use the previously evaluated pore volume flare factors in the RAPs and in future restoration analyses for the NRC, so that projected and actual performance and costs can be measured *consistently*. Again, of prime importance is consistency in using flare factors, calculating all future pore volumes, including in the test that is described in COP § 10.4.4 the same way. In calculating the pore volume using the exact same flare factors, with known gallons flowed to achieve restoration in actual operations, one will be able to recalculate and increase or decrease in pore volumes in the annual surety adjustment required in the License.

B. CUT OFF GRADE AND ORE OUTLINE METHODOLOGY

269. Abitz ¶83 alleges that HRI does not define cut-off grade which may change with economic conditions. I agree that market conditions could result in mining marginal ore but the increase would be minor. Fortunately the LC 9.5 resolves this issue because HRI will have to notify NRC of a change in pore volume size at the time it learns that the grade of economic ore is decreased and will increase pore volume size. HRI will have to increase the surety as follows: "...If at any time it is found that well field restoration requires greater pore volumes of higher restoration costs, the value of the surety shall be adjusted upwards." Additionally, each year HRI will be required to update the surety which will include an adjustment for the new areas mined/restored. At this same time, HRI would reconcile the dimension of the mine zone that may result because of expansions into marginal ore reserves and include these changes in the surety adjustment.

270. Abitz ¶87 recommends that the area inside the monitor well ring be used to determine pore volumes. The recommendation is extreme, would encompass far more water that is actually impacted by mining and is contrary to industry practice. If, in the real world, a pore volume were to extend to the monitor well ring, then as a practical matter every monitor well would be on excursion status. This has never happened. Conversely, excursions only impact a few monitor wells, if at all. The license has also included a provision for restoration cost increases that may result from excursions. Namely, LC 10.3 states:

> "If an excursion is not corrected within 60 days of confirmation, the licensee shall either: (a) terminate injection of lixiviant within the well field until aquifer cleanup is complete: or (b) increase the surety in an amount to cover the full third party cost of correcting and cleaning up the excursion. The surety increase for horizontal and vertical excursions shall be calculated using the method described

on page 4-22. Section 4.3.1 of the FEIS. The surety increase shall remain in force until the NRC has verified that the excursion has been corrected and cleaned up."

271. LC 10.3 is crafted to resolve extraordinary restoration costs that result from leach solution migration outside of the wellfield area. Therefore the ultraconservative approach to pore volume proposed by Abitz ¶87. is unnecessary.

272. This concludes my Affidavit.

I declare on this 21st day of April in Washington D.C., under penalty of perjury that the foregoing is true and correct.

Mark S. Pelizza

Washington, D.C. }ss.

ACKNOWLEDGEMENT

SUBSCRIBED and SWORN TO before me, the undersigned authority, on April 21, 2005 by Mark S. Pelizza.

[Seal]

[Signature of Notary]

Mary Jane S. Snyder
Printed/typed name of Notary

Notary public for the District of Columbia. My commission expires 4-14-2010

ATTACHMENT A

Natural Water Quality Data at U.S. ISL Uranium Recovery Operations
Measured Concentrations of Uranium and Uranium Related Minerals*

Name	Unit #	Uranium (ug/l)		Radium (pCi/l)		Radon (pCi/l)		G. Alpha Radiation (pCi/l)		G. Beta Radiation (pCi/l)	
		Drinking Standard 30 ug/l		Drinking Standard 5 pCi/l		Drinking Standard 300 pCi/l		Drinking Standard 15 pCi/l		Drinking Standard 50 pCi/l	
		High	Average	High	Average	High	Average	High	Average	High	Average
Crow Butte	Mine Unit 1	241	92	566	230						
Crow Butte	Mine Unit 2	132	46	1,477	235						
Crow Butte	Mine Unit 3	425	115	687	165						
Crow Butte	Mine Unit 4	500	122	687	154						
Crow Butte	Mine Unit 5	171	72	693	166						
Crow Butte	Mine Unit 6	1,131	133	519	81						
Crow Butte	Mine Unit 7	660	110	575	142						
Crow Butte	Mine Unit 8		188		124						
Crow Butte	Mine Unit 9	1,800	100	807	164						
Churchrock Section 8	Area Wells	6,627	1,795	15	10						
Crownpoint	Area Wells	21	6	391	61						
Mobil Pilot	R & D	82	13	89	22						
Teton	R & D	120	no data	22	no data						
Mobil Southtrend	Area 1	100	12	200	18	1,100,000	140,677	610	74	510	69
Alta Mesa	Production Area 1	975	34	614	83						
Benavides	Production Area 1	314	83	546	83						
Benavides	Production Area 2	360	50	132	45						
Benavides	Production Area 3	300	120	433	173						
Benavides	Production Area 4	314	83	546	83						
Boots	Production Area 1	400	218	50	9						
Bruni	Production Area 1/Grid I	no data	331	no data	39						
Bruni	Production Area 2/Grid V	no data	210	no data	129						
Bruni	Production Area 3	682	324	437	148						
Bruni	Production Area 4	6,300	2,310	505	167						
Bruni	Production Area 5	3,660	461	470	91						
Bruni	Production Area 6/Grid III	<500	<500	68	13						
Burnes	Production Area 1	400	300	938	247						
Burns	Production Area 2	220	50	950	169						
Burns	Production Area 3	246	82	1,510	758						
Burns	Production Area 4	27	21	947	568						
Clay West	Production Area 1	<400	<400	1,040	235						
Clay West	Production Area 2	132	477	727	420						
El Mesquite	Production Area 1	90	39	7	3						
El Mesquite	Production Area 2	288	85	79	15						
El Mesquite	Production Area 3	3,310	840	545	117						
El Mesquite	Production Area 4	326	62	27	6						
El Mesquite	Production Area 5	238	97	16	10						
Gruy 7B	Production Area 1	1,850	1,120	382	272						
Gruy 7B	Production Area 2	64	45	43	24						
Gruy 7B	Production Area 3	1,000	730	197	159						
Hobson	Production Area 1	50	25	99	45						
Hobson Tex-1	Production Area 1-A	70	50	705	246						
Holiday	H-1	500	230	25	9						
Holiday	H-1 Extension	1,530	400	38	13						
Holiday	Production Area 2	435	111	24	5						
Holiday	Production Area 3	3,600	1,600	886	430						
Holiday	Production Area 4	58	36	10	7						
Holiday	Production Area 5	254	63	37	15						
Holiday	Production Area 6	1,690	368	38	20						
Holiday	Production Area 7	188	100	16	9						
Kingsville Dome	Production Area 1	927	164	48	22						
Kingsville Dome	Production Area 2	102,000	3,189	604	95	314,000	98,231				
Kingsville Dome	Production Area 3	1,540	289	239	34						
Lamprecht	Production Area 1 South	270	160	376	151						
Lamprecht	Production Area 2 North	490	400	500	243						
Lamprecht	Production Area 3	<900	<900	267	128						
Lamprecht	Production Area 4 Lower	<900	<900	500	290						
Las Palmas	Production Area 1	7,000	2,913	335	134						
Las Palmas	Production Area 2	2,120	566	352	92						
Las Palmas	Production Area 3	9,710	2,400	200	155						
Longoria	Production Area II	26	11	252	97						
Longoria	Production Area III	65	30	85	37						
McBride	Production Area 1	831	272	1,430	365						
Mt Lucas	Production Area 1	551	293	868	536						
Mt Lucas	EA-Pod	161	76	540	391						
Mt Lucas	H sand	187	77	611	315						
Mt Lucas	Production Area 4	373	97	216	151						
Mt Lucas	Production Area 5	628	258	498	323						
Mt Lucas	M-Sand PAA-6	178	125	336	225						
Mt Lucas	J Sand	80	47	87	56						
Mt Lucas	South J (PAA-8)	738	334	221	171						

Natural Water Quality Data at U.S. ISL Uranium Recovery Operations
Measured Concentrations* of Uranium and Uranium Related Minerals

Name	Unit #	Uranium (ug/l)		Radium (pCi/l)		Radon (pCi/l)		G. Alpha Radiation (pCi/l)		G. Beta Radiation (pCi/l)	
		Drinking Standard 30 ug/l		Drinking Standard 5 pCi/l		Drinking Standard 300 pCi/l		Drinking Standard 15 pCi/l		Drinking Standard 50 pCi/l	
		High	Average	High	Average	High	Average	High	Average	High	Average
Nell	*Production Area 1*	57	23	111	57						
OHeam	Production Area 1/Grid 1	628	212	82	39						
OHeam	Production Area 2/Grid II	no data	260	no data	46						
OHeam	Production Area 3/Grid III	1,000	400	no data	no data						
OHeam	Production Area 4/Grid IV	1,600	307	129	29						
Palangana Dome	Production Area 1	192	29	525	164						
Pawlik	Production Zone A	7	2	340	93						
Pawlik	Production Zone B	no data	2	119	23						
Pawnee	WF1	530	181	430	274						
Rosita	Production Area 1	1,200	350	431	183						
Rosita	Production Area 2	2,890	547	548	130						
Rosita	*Production Area 3*	3,050	1,093	642	94						
Trevino	Production Area 1	20	15	61	14						
Trevino	Production Area 2	61	36	40	19						
Vasquez	Production Area 1	270	45	261	79						
West Cole	Production Area 1	848	178	34	9						
West Cole	Production Area 2	2,460	662	54	20						
West Cole	Production Area 3	6,780	1,660	137	46						
Zamzow	Production Area 1	10	10	459	108						
Zamzow	Production Area 2	63	17	863	528						
Zamzow	Production Area 3	2	1	50	45						
Zamzow	Production Area 4	432	217	744	392						
Christianson Ranch	Mine Unit 2 - South	111	27	52	15						
Christensen Ranch	Mine Unit 2 - North	164	41	55	23						
Christensen Ranch	Mine Unit 3	470	75	248	81						
Christensen Ranch	Mine Unit 4	222	35	59	18						
Christensen Ranch	Mine Unit 5	75	23	244	68						
Christensen Ranch	Mine Unit 6	51	13	440	106						
Christensen Ranch	Mine Unit 7	957	33	245	69	1,002,000	no data				
Highland	R & D	no data	216	no data	127						
Highland	A	90	40	1,206	675						
Highland	WF B	620	60	1,035	316						
Highland	WF C	28,100	2,110	2,032	682						
Highland	WF D	5,540	1,070	1,734	651						
Highland	WF E	330	60	1,405	630						
Highland	WF F	150	30	650	592	1,079,965	533,053				
Highland	WF G	400	50	1,260	200	1,010,000	106,000				
Irigary	R & D	no data	98	no data	27						
Irigary	Units 1-9	18,600	480	248	39						
Irigary	E Field	81	40	43	28			no data	175.3	no data	199
Luenberger	*M Zone*	150	100	562	187						
North Butte	Mine Units 1 & 2	262	126	1,016	540						
North Platte	R & D	28	10	593	136			799	243.2	634	264
Reno Creek	R & D	287	150	768	437						
Ruth	R & D	250	10	175	16						
Smith Ranch	R & D	no data	280	no data	340						
Smith Ranch	Wellfield 1	168	65	1,963	734	no data	268,597				
Smith Ranch	Wellfield 3	670	80	1,090	268	525,000	176,732				
Smith Ranch	Wellfield 4	124	39	1,386	491	1,100,000	471,169				
Smith Ranch	4a	99	37	1,700	605						
Smith Ranch	Mine Unit 15	1,450	454	972	151						
Smith Ranch	*Mine Unit 1*	35	25	303	119						
Smith Ranch	Mine Unit 2	1,590	84	2,042	560						
Willow Creek	R & D	81	35	295	73						

*Yellow shade indicated that the measured concentration exceeds drinking water standards.

Natural Water Quality Data at U.S. ISL Uranium Recovery Operations
Uranium and Uranium Related Minerals Shown as % of Drinking Water Standards

Blue shade indicates water that is unfit for human consumption

Name	Unit #	Uranium (ug/l)		Radium (pCi/l)		Radon (pCi/l)		G. Alpha Radiation (pCi/l)		G. Beta Radiation (pCi/l)	
		Drinking Standard 30 ug/l		Drinking Standard 5 pCi/l		Drinking Standard 300 pCi/l		Drinking Standard 15 pCi/l		Drinking Standard 50 pCi/l	
		High	Average	High	Average	High	Average	High	Average	High	Average
Crow Butte	Mine Unit 1	803%	307%	1320%	4594%						
Crow Butte	Mine Unit 2	440%	453%	29540%	4690%						
Crow Butte	Mine Unit 3	1417%	383%	13740%	3300%						
Crow Butte	Mine Unit 4	1667%	407%	13740%	3086%						
Crow Butte	Mine Unit 5	570%	240%	13860%	3320%						
Crow Butte	Mine Unit 6	3770%	443%	10380%	1612%						
Crow Butte	Mine Unit 7	2200%	867%	21500%	2840%						
Churchrock Section 8	Area Wells	22090%	5983%	804%	204%						
Crownpoint	Area Wells	70%	21%	7826%	1220%						
Mobil Pilot	R & D	273%	43%	788%	432%						
Teton	R & D	400%	no data	432%	no data						
Mobil Southtrend	Area 1	333%	40%	4000%	1362%	366667%	46892%	4067%	493%	1020%	138%
Alta Mesa	Production Area 1	3250%	113%	12280%	1660%						
Benavides	Production Area 1	1047%	277%	10920%	1660%						
Benavides	Production Area 2	1200%	167%	2640%	804%						
Benavides	Production Area 3	1000%	400%	8660%	3462%						
Benavides	Production Area 4	1047%	277%	10920%	1660%						
Boots	Production Area 1	1333%	927%	1000%	189%						
Bruni	Production Area 1/Grid I	no data	103%	no data	780%						
Bruni	Production Area 2/Grid V	no data	700%	no data	2580%						
Bruni	Production Area 3	2273%	1089%	8740%	2960%						
Bruni	Production Area 4	21000%	7700%	10100%	3334%						
Bruni	Production Area 5	12200%	1537%	9400%	1810%						
Bruni	Production Area 6/Grid III			360%	260%						
Burnes	Production Area 1	1333%	1000%	18760%	4932%						
Burns	Production Area 2	733%	167%	19000%	8370%						
Burns	Production Area 3	820%	273%	30200%	15180%						
Burns	Production Area 4	190%	70%	18940%	11360%						
Clay West	Production Area 1			20800%	4700%						
Clay West	Production Area 2	440%	1590%	14540%	8400%						
El Mesquite	Production Area 1	300%	130%	132%	64%						
El Mesquite	Production Area 2	980%	283%	1582%	294%						
El Mesquite	Production Area 3	11033%	2800%	10900%	2334%						
El Mesquite	Production Area 4	1087%	207%	640%	124%						
El Mesquite	Production Area 5	793%	323%	320%	206%						
Gruy 7B	Production Area 1	6167%	8733%	7640%	5440%						
Gruy 7B	Production Area 2	213%	150%	1860%	480%						
Gruy 7B	Production Area 3	3333%	2433%	3940%	3180%						
Hobson	Production Area 1	167%	83%	1980%	802%						
Hobson Tex-1	Production Area 1-A	233%	187%	14100%	4920%						
Holiday	H-1	1667%	767%	800%	182%						
Holiday	H-1 Extension	5100%	1333%	760%	250%						
Holiday	Production Area 2	1450%	370%	476%	109%						
Holiday	Production Area 3	12000%	5333%	12720%	8596%						
Holiday	Production Area 4	193%	120%	190%	136%						
Holiday	Production Area 5	647%	210%	740%	298%						
Holiday	Production Area 6	5633%	1227%	1760%	892%						
Holiday	Production Area 7	827%	533%	320%	174%						
Kingsville Dome	Production Area 1	3090%	547%	958%	432%						
Kingsville Dome	Production Area 2	340000%	10830%	12080%	1890%	104667%	32744%				
Kingsville Dome	Production Area 3	6133%	969%	4780%	678%						
Lamprecht	Production Area 1 South	900%	633%	7614%	3014%						
Lamprecht	Production Area 2 North	1633%	1333%	10000%	4852%						
Lamprecht	Production Area 3	[illegible]	[illegible]	6340%	2552%						
Lamprecht	Production Area 4 Lower	[illegible]	[illegible]	10000%	5800%						
Las Palmas	Production Area 1	23333%	9710%	8700%	2672%						
Las Palmas	Production Area 2	7067%	1887%	17040%	1846%						
Las Palmas	Production Area 3	32367%	8000%	4000%	3100%						
Longoria	Production Area II	87%	37%	5040%	1940%						
Longoria	Production Area III	217%	100%	1700%	734%						
McBride	Production Area 1	2770%	907%	28800%	7300%						
Mt Lucas	Production Area 1	1837%	977%	13360%	10716%						
Mt Lucas	EA-Pod	537%	253%	10800%	7820%						
Mt Lucas	H sand	623%	257%	12220%	6292%						
Mt Lucas	Production Area 4	1243%	323%	4320%	3016%						
Mt Lucas	Production Area 5	2093%	860%	9960%	8460%						
Mt Lucas	M-Sand PAA-6	693%	417%	8720%	4508%						
Mt Lucas	J Sand	267%	157%	1740%	1124%						
Mt Lucas	South J (PAA-8)	2460%	1113%	4420%	3420%						
Neil	Production Area 1	190%	77%	2220%	1144%						
OHearn	Production Area 1/Grid 1	2093%	707%	1840%	780%						

Natural Water Quality Data at U.S. ISL Uranium Recovery Operations
Uranium and Uranium Related Minerals Shown as % of Drinking Water Standards

Blue shade indicates water that is unfit for human consumption

Name	Unit #	Uranium (ug/l) Drinking Standard 30 ug/l		Radium (pCi/l) Drinking Standard 5 pCi/l		Radon (pCi/l) Drinking Standard 300 pCi/l		G. Alpha Radiation (pCi/l) Drinking Standard 15 pCi/l		G. Beta Radiation (pCi/l) Drinking Standard 50 pCi/l	
		High	Average	High	Average	High	Average	High	Average	High	Average
OHearn	*Production Area 2/Grid II*	*no data*	867%	*no data*	924%						
OHearn	Production Area 3/Grid III	3333%	1333%	no data	no data						
OHearn	Production Area 4/Grid IV	6333%	1023%	2560%	590%						
Palangana Dome	Production Area 1	1640%	97%	10500%	3280%						
Pawlik	Production Zone A	23%	7%	6800%	1850%						
Pawlik	Production Zone B	no data	7%	2380%	454%						
Pawnee	WF1	1767%	603%	8600%	5480%						
Rosita	Production Area 1	4000%	1167%	8620%	3660%						
Rosita	Production Area 2	9633%	1823%	10960%	2606%						
Rosita	Production Area 3	10167%	3643%	12840%	1886%						
Trevino	Production Area 1	67%	50%	1218%	278%						
Trevino	Production Area 2	203%	120%	800%	380%						
Vasquez	Production Area 1	900%	150%	5220%	1579%						
West Cole	Production Area 1	2827%	593%	680%	181%						
West Cole	Production Area 2	8200%	12207%	1080%	392%						
West Cole	Production Area 3	22600%	15533%	2740%	820%						
Zamzow	Production Area 1	33%	33%	9180%	2158%						
Zamzow	Production Area 2	210%	57%	17260%	10560%						
Zamzow	Production Area 3	7%	3%	1000%	905%						
Zamzow	Production Area 4	1440%	723%	14880%	7840%						
Christianson Ranch	Mine Unit 2 - South	370%	90%	1046%	300%						
Christensen Ranch	Mine Unit 2 - North	547%	137%	1090%	454%						
Christensen Ranch	Mine Unit 3	1567%	251%	4960%	1626%						
Christensen Ranch	Mine Unit 4	740%	116%	1178%	356%						
Christensen Ranch	Mine Unit 5	250%	77%	4880%	1352%						
Christensen Ranch	Mine Unit 6	170%	42%	8800%	2120%						
Christensen Ranch	Mine Unit 7	3190%	111%	4900%	1388%	334000%	no data				
Highland	R & D	no data	720%	no data	2540%						
Highland	A	800%	133%	24120%	13500%						
Highland	WF B	2067%	200%	29700%	6320%						
Highland	WF C	93667%	7033%	40640%	3640%						
Highland	WF D	18467%	3567%	34680%	13020%						
Highland	WF E	1100%	200%	26100%	12600%						
Highland	WF F	800%	100%	13000%	11840%	359988%	177684%				
Highland	WF G	1333%	167%	25200%	4000%	336667%	35333%				
Irigary	R & D	no data	327%	no data	536%						
Irigary	Units 1-9	62000%	1600%	4954%	778%						
Irigary	E Field	270%	133%	852%	556%			no data	1169%	no data	398%
Luenberger	M Zone	500%	333%	11240%	3730%						
North Butte	Mine Units 1 & 2	873%	420%	20320%	10800%						
North Platte	R & D	93%	33%	11860%	2716%			6327%	1621%	1268%	528%
Reno Creek	R & D	857%	600%	15360%	6740%						
Ruth	R & D	833%	35%	3500%	828%						
Smith Ranch	R & D	no data	833%	no data	6800%						
Smith Ranch	Wellfield 1	1560%	217%	39260%	14680%	no data	89532%				
Smith Ranch	Wellfield 3	2233%	267%	21800%	6356%	175000%	68911%				
Smith Ranch	Wellfield 4	413%	130%	27728%	9822%	366667%	157056%				
Smith Ranch	4a	330%	123%	34000%	12108%						
Willow Creek	R & D	270%	118%	5900%	1464%						

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 1
Number of Wells Sampled:	111

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	241	92.2	30
Radium (pCi/l)	566	229.7	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 2
Number of Wells Sampled:	131

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	132	46	30
Radium (pCi/l)	1477	234.5	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 3
Number of Wells Sampled:	155

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	425	115	30
Radium (pCi/l)	687	165	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 4
Number of Wells Sampled:	261

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	500	122	30
Radium (pCi/l)	687	154.3	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 5
Number of Wells Sampled:	

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	171	72	30
Radium (pCi/l)	693	166	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 6
Number of Wells Sampled:	487

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1131	133	30
Radium (pCi/l)	519	80.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 7
Number of Wells Sampled:	479

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	660	110	30
Radium (pCi/l)	575	142	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 8
Number of Wells Sampled:	

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)		188	30
Radium (pCi/l)		124.4	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Nebraska
Mine:	Crow Butte
Wellfield Designation:	Mine Unit 9
Number of Wells Sampled:	63

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,800	100	30
Radium (pCi/l)	807	164	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Crow Butte Resources files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State: New Mexico
Mine: Churchrock Section 8 ★
Wellfield Designation: Area Wells
Number of Wells Sampled: 4

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	6,627	1,795	30
Radium (pCi/l)	15.2	10.2	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: HRI files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

★

State: New Mexico
Mine: Crownpoint
Wellfield Designation: Area Wells
Number of Wells Sampled: 6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	21	6.3	30
Radium (pCi/l)	391.3	61	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: HRI files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State: New Mexico
Mine: Mobil Pilot
Wellfield Designation: R & D
Number of Wells Sampled: 13

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	82	13	30
Radium (pCi/l)	89.4	21.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Mobil Oil Company files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

★

State: New Mexico
Mine: Teton
Wellfield Designation: R & D
Number of Wells Sampled: 1

Element	Value	Drinking Standard
Uranium (ug/l)	120	30
Radium (pCi/l)	2.7	5
Radon (pCi/l)	no data	300
G. Alpha Radiation (pCi/l)	no data	15
G. Beta Radiation (pCi/l)	no data	50

Source: UNC/Teton files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

★

State:	New Mexico
Mine:	Mobil Southtrend
Wellfield Designation:	Operating Area 1
Number of Wells Sampled:	26

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	100	12	30
Radium (pCi/l)	200	18.1	5
Radon (pCi/l)	1,100,000	140,677	300
G. Alpha Radiation (pCi/l)	610	74	15
G. Beta Radiation (pCi/l)	510	69	50

Source: Mobil Oil Company files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Alta Mesa
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	14

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	975	34	30
Radium (pCi/l)	614	83	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO3055-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Benavides
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	20

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	314	83	30
Radium (pCi/l)	546	83	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02312-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Benavides
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	21

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	360	50	30
Radium (pCi/l)	132	45.2	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02312-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Benavides
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	8

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	300	120	30
Radium (pCi/l)	433	173.1	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02312-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Benavides
Wellfield Designation:	Production Area 4
Number of Wells Sampled:	20

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	314	83	30
Radium (pCi/l)	546	83	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02312-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Boots
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	34

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	400	218	30
Radium (pCi/l)	50	9.45	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02154-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Bruni
Wellfield Designation:	Production Area 1/Grid I
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	no data	331	30
Radium (pCi/l)	no data	39	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01492-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Bruni
Wellfield Designation:	Production Area 2/Grid V
Number of Wells Sampled:	7

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	no data	210	30
Radium (pCi/l)	no data	129	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01492-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Bruni
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	682	324	30
Radium (pCi/l)	437	148	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01492-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Bruni
Wellfield Designation:	Production Area 4
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	6,300	2,310	30
Radium (pCi/l)	505	166.7	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01492-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Bruni
Wellfield Designation:	Production Area 5
Number of Wells Sampled:	22

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	3,660	461	30
Radium (pCi/l)	470	90.5	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01492-051

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Bruni
Wellfield Designation:	Production Area 6/Grid III
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	<500	<500	30
Radium (pCi/l)	68	13	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01492-061

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Burnes
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	2

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	400	300	30
Radium (pCi/l)	938	246.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01890-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Burns
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	43

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	220	50	30
Radium (pCi/l)	950	168.5	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01890-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Burns
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	246	82	30
Radium (pCi/l)	1510	758	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01890-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Burns
Wellfield Designation:	Production Area 4
Number of Wells Sampled:	2

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	27	21	30
Radium (pCi/l)	947	568	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01890-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Clay West
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	25

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	<400	<400	30
Radium (pCi/l)	1040	235	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2130-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Clay West
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	4

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	132	477	30
Radium (pCi/l)	727	420	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2130-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	El Mesquite
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	90	39	30
Radium (pCi/l)	6.62	3.2	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02155-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	El Mesquite
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	12

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	288	85	30
Radium (pCi/l)	79.1	14.7	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02155-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	El Mesquite
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	3,310	840	30
Radium (pCi/l)	545	116.7	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02155-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	El Mesquite
Wellfield Designation:	Production Area 4
Number of Wells Sampled:	13

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	326	62	30
Radium (pCi/l)	27	6.2	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02155-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	El Mesquite
Wellfield Designation:	Production Area 5
Number of Wells Sampled:	3

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	238	97	30
Radium (pCi/l)	16	10.3	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining Inc. files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Gruy 7B
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,850	1,120	30
Radium (pCi/l)	382	272	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02914-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Gruy 7B
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	3

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	64	45	30
Radium (pCi/l)	43	24	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02914-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Gruy 7B
Wellfield Designation	Production Area 3
Number of Wells Sampled:	3

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,000	730	30
Radium (pCi/l)	197	159	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02914-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Hobson
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	8

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	50	25	30
Radium (pCi/l)	99	45.1	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02208-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Hobson Tex-1
Wellfield Designation:	Production Area 1-A
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	70	50	30
Radium (pCi/l)	705	246	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02493-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Holiday
Wellfield Designation:	H-1
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	500	230	30
Radium (pCi/l)	25	9.1	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Holiday
Wellfield Designation:	H-1 Extension
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,530	400	30
Radium (pCi/l)	38	12.5	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Holiday
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	435	111	30
Radium (pCi/l)	23.8	5.45	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02156-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Holiday
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	3,600	1,600	30
Radium (pCi/l)	886	429.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02156-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Holiday
Wellfield Designation:	Production Area 4
Number of Wells Sampled:	2

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	58	36	30
Radium (pCi/l)	9.5	6.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02156-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Holiday
Wellfield Designation:	Production Area 5
Number of Wells Sampled:	12

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	254	63	30
Radium (pCi/l)	37	14.9	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02156-051

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Holiday
Wellfield Designation:	Production Area 6
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,690	368	30
Radium (pCi/l)	38	19.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02156-061

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Holiday
Wellfield Designation:	Production Area 7
Number of Wells Sampled:	2

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	188	100	30
Radium (pCi/l)	16	8.7	5
Radon (pCi/l)	*no data*	*no data*	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining Inc. files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State: Texas
Mine: Kingsville Dome
Wellfield Designation: Production Area 1
Number of Wells Sampled: 16

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	927	164	30
Radium (pCi/l)	47.8	21.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2827-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Kingsville Dome
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	112

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	102,000	3,189	30
Radium (pCi/l)	604	95	5
Radon (pCi/l) * 26 wells	314,000	98,231	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2827-021 & URI files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Kingsville Dome
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	46

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,540	289	30
Radium (pCi/l)	239	33.9	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2827-031 & URI files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State: Texas
Mine: Lamprecht
Wellfield Designation: Production Area 1 South
Number of Wells Sampled: 11

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	270	160	30
Radium (pCi/l)	375.7	150.7	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01949-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State: Texas
Mine: Lamprecht
Wellfield Designation: Production Area 2 North
Number of Wells Sampled: 10

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	490	400	30
Radium (pCi/l)	500	242.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01949-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Lamprecht
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	7

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	<900	<900	30
Radium (pCi/l)	267	127.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01949-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Lamprecht
Wellfield Designation:	Production Area 4 Lower Host Sand
Number of Wells Sampled:	8

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	<900	<900	30
Radium (pCi/l)	500	290	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01949-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Las Palmas
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	7,000	2,913	30
Radium (pCi/l)	335	133.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02441-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS
(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Las Palmas
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	2,120	566	30
Radium (pCi/l)	352	92.3	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02441-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Las Palmas
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	9,710	2,400	30
Radium (pCi/l)	200	155	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02441-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Longoria
Wellfield Designation:	Production Area II
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	26	11	30
Radium (pCi/l)	252	97	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02222-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Longoria
Wellfield Designation:	Production Area III
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	65	30	30
Radium (pCi/l)	85	36.7	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02222-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	McBride
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	4

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	831	272	30
Radium (pCi/l)	1,430	365	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02420-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Mt Lucas
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	551	293	30
Radium (pCi/l)	868	535.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02381-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Mt Lucas
Wellfield Designation:	EA-Pod
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	161	76	30
Radium (pCi/l)	540	391	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02381-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Mt Lucas
Wellfield Designation:	H sand
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	187	77	30
Radium (pCi/l)	611	314.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02381-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Mt Lucas
Wellfield Designation:	Production Area 4
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	373	97	30
Radium (pCi/l)	216	150.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02381-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Mt Lucas
Wellfield Designation:	Production Area 5
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	628	258	30
Radium (pCi/l)	498	323	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02381-051

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Mt Lucas
Wellfield Designation:	M-Sand PAA-6
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	178	125	30
Radium (pCi/l)	336	225.4	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02381-061

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Mt Lucas
Wellfield Designation:	J Sand
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	80	47	30
Radium (pCi/l)	87	56.2	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02381-071

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Mt Lucas
Wellfield Designation:	South J (PAA-8)
Number of Wells Sampled:	3

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	738	334	30
Radium (pCi/l)	221	171	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02381-081

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Nell
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	12

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	57	23	30
Radium (pCi/l)	111	57.2	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2202-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	OHearn
Wellfield Designation:	Production Area 1/Grid 1
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	628	212	30
Radium (pCi/l)	82	39	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01941-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	OHearn
Wellfield Designation:	Production Area 2/Grid II
Number of Wells Sampled:	4

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	no data	260	30
Radium (pCi/l)	no data	46.2	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	OHearn
Wellfield Designation	Production Area 3/Grid III
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,000	400	30
Radium (pCi/l)	no data	no data	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01941-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	OHearn
Wellfield Designation:	Production Area 4/Grid IV
Number of Wells Sampled:	11

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,600	307	30
Radium (pCi/l)	129	29.49	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR01941-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Palangana Dome
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	15

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	192	29	30
Radium (pCi/l)	525	164	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02051-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Pawlik
Wellfield Designation:	Production Zone A
Number of Wells Sampled:	8

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	7	2	30
Radium (pCi/l)	340	92.5	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Permit UR02368

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Pawlik
Wellfield Designation:	Production Zone B
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	no data	2	30
Radium (pCi/l)	119	22.7	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Permit UR02368

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Pawnee
Wellfield Designation:	WF1
Number of Wells Sampled:	3

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	530	181	30
Radium (pCi/l)	430	274	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02050-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Rosita
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	8

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,200	350	30
Radium (pCi/l)	431	183	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2880-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Rosita
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	17

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	2,890	547	30
Radium (pCi/l)	548	130.3	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2880-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Rosita
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	25

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	3,050	1,093	30
Radium (pCi/l)	642	94.3	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO2880-031 & URI files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Trevino
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	11

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	20	15	30
Radium (pCi/l)	60.9	13.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02407-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Trevino
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	61	36	30
Radium (pCi/l)	40	19	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02407-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Vasquez
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	12

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	270	45	30
Radium (pCi/l)	261	78.9	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization URO3050-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	West Cole
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	14

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	848	178	30
Radium (pCi/l)	34	9.04	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02643-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State: Texas
Mine: West Cole
Wellfield Designation: Production Area 2
Number of Wells Sampled: 11

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	2,460	662	30
Radium (pCi/l)	54	19.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02643-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	West Cole
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	14

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	6,780	1,660	30
Radium (pCi/l)	137	46	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02643-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Zamzow
Wellfield Designation:	Production Area 1
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	10	10	30
Radium (pCi/l)	459	107.9	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02108-011

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Zamzow
Wellfield Designation:	Production Area 2
Number of Wells Sampled:	7

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	63	17	30
Radium (pCi/l)	863	528	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02108-021

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Zamzow
Wellfield Designation:	Production Area 3
Number of Wells Sampled:	2

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	2	1	30
Radium (pCi/l)	50	45.25	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02108-031

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Texas
Mine:	Zamzow
Wellfield Designation:	Production Area 4
Number of Wells Sampled:	3

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	432	217	30
Radium (pCi/l)	744	392	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: TNRCC Production Area Authorization UR02108-041

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Bison Basin
Wellfield Designation:	R & D
Number of Wells Sampled:	

Mineral	Highest Value	Average	Drinking Standard
Uranium (ug/l)		1	30
Radium (pCi/l)			5
Radon (pCi/l)			300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Wyoming DEQ files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Christianson Ranch
Wellfield Designation:	Mine Unit 2 - South
Number of Wells Sampled:	17

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	111	27	30
Radium (pCi/l)	52.3	15	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Christensen Ranch
Wellfield Designation:	Mine Unit 2 - North
Number of Wells Sampled:	8

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	164	41	30
Radium (pCi/l)	54.5	22.7	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Christensen Ranch
Wellfield Designation:	Mine Unit 3
Number of Wells Sampled:	16

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	470	75.2	30
Radium (pCi/l)	248	81.3	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Christensen Ranch
Wellfield Designation:	Mine Unit 4
Number of Wells Sampled:	12

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	222	34.8	30
Radium (pCi/l)	58.9	17.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Christensen Ranch
Wellfield Designation:	Mine Unit 5
Number of Wells Sampled:	25

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	75	23.2	30
Radium (pCi/l)	244	67.6	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Christensen Ranch
Wellfield Designation:	Mine Unit 6
Number of Wells Sampled:	47

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	51	12.6	30
Radium (pCi/l)	440	106	5
Radon (pCi/l)	1,260,000	244,769	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Christensen Ranch
Wellfield Designation:	Mine Unit 7
Number of Wells Sampled:	31

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	957	33.2	30
Radium (pCi/l)	245	69.4	5
Radon (pCi/l)	1,002,000		300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Highland
Wellfield Designation:	R & D
Number of Wells Sampled:	no data

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	no data	216	30
Radium (pCi/l)	no data	127	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Wyoming DEQ files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Highland
Wellfield Designation:	A
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	90	40	30
Radium (pCi/l)	1,206	675	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Power Resources, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Highland
Wellfield Designation:	WF B
Number of Wells Sampled:	15

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	620	60	30
Radium (pCi/l)	1,035	316	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Power Resources, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Highland
Wellfield Designation:	WF C
Number of Wells Sampled:	25

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	28,100	2,110	30
Radium (pCi/l)	2,032	682	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Power Resources, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Highland
Wellfield Designation:	WF D
Number of Wells Sampled:	10

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	5,540	1,070	30
Radium (pCi/l)	1,734	651	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Power Resources, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Highland
Wellfield Designation:	WF E
Number of Wells Sampled:	30

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	330	60	30
Radium (pCi/l)	1,405	630	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Power Resources, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Highland
Wellfield Designation:	WF F
Number of Wells Sampled:	22

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	150	30	30
Radium (pCi/l)	650	592	5
Radon (pCi/l) *	1,079,965	533,053	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

* 4 wells

Source: Power Resources, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Highland
Wellfield Designation:	WF G
Number of Wells Sampled:	22

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	400	50	30
Radium (pCi/l)	1260	200	5
Radon (pCi/l)*	1,010,000	106,000	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

* 10 wells

Source: Power Resources, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Irigary
Wellfield Designation:	R & D
Number of Wells Sampled:	no data

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	no data	98	30
Radium (pCi/l)	no data	26.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Wyoming DEQ files, COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Irigary
Wellfield Designation:	Units 1-9
Number of Wells Sampled:	47

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	18600	480	30
Radium (pCi/l)	247.7	38.9	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Irigary
Wellfield Designation:	E Field
Number of Wells Sampled:	7

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	81	40	30
Radium (pCi/l)	42.6	27.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	175.3	15
G. Beta Radiation (pCi/l)	no data	199	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Luenberger
Wellfield Designation:	M Zone
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	150	100	30
Radium (pCi/l)	562	186.5	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Draft Environmental Statement Teton Project, NUREG-0925

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	North Butte
Wellfield Designation:	Mine Units 1 & 2
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	262	126	30
Radium (pCi/l)	1016	540	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	North Platte
Wellfield Designation:	R & D
Number of Wells Sampled:	5

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	28	10	30
Radium (pCi/l)	593	135.8	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	799	243.2	15
G. Beta Radiation (pCi/l)	634	264	50

Source: Wyoming DEQ files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Reno Creek
Wellfield Designation:	R & D
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	287	150	30
Radium (pCi/l)	768	437	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Wyoming DEQ files., Energy Fuels Nuclear files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS
(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Reno Creek
Wellfield Designation:	Mine Unit 1
Number of Wells Sampled:	6

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	--	--	30
Radium (pCi/l)	--	--	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Wyoming DEQ files., Energy Fuels Nuclear files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Ruth
Wellfield Designation:	R & D
Number of Wells Sampled:	9

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	250	10.4	30
Radium (pCi/l)	175	16.4	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Wyoming DEQ files, COGEMA Mining, Inc. files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Bill Smith
Wellfield Designation:	R & D
Number of Wells Sampled:	no data

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	no data	280	30
Radium (pCi/l)	no data	340	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Wyoming DEQ files.

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Smith Ranch
Wellfield Designation:	Wellfield 1
Number of Wells Sampled:	19

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	168	65	30
Radium (pCi/l)	1,963	734	5
Radon (pCi/l)	no data	268,597	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Rio Algom Mining Company files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Smith Ranch
Wellfield Designation:	Wellfield 3
Number of Wells Sampled:	32

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	670	80	30
Radium (pCi/l)	1,090	267.8	5
Radon (pCi/l)	525,000	176,732	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Rio Algom Mining Company files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Smith Ranch
Wellfield Designation:	Wellfield 4
Number of Wells Sampled:	20

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	124	39	30
Radium (pCi/l)	1,386	491.1	5
Radon (pCi/l)	1,100,000	471,169	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Rio Algom Mining Company files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Bill Smith
Wellfield Designation:	4a
Number of Wells Sampled:	10

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	99	37	30
Radium (pCi/l)	1,700	605.4	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Rio Algom Mining Company files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Bill Smith
Wellfield Designation:	Mine Unit 15
Number of Wells Sampled:	10

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	972	151	30
Radium (pCi/l)	1,450	454	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Rio Algom Mining Company files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State: Wyoming
Mine: Bill Smith
Wellfield Designation: Mine Unit 1
Number of Wells Sampled: 10

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)			30
Radium (pCi/l)			5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Rio Algom Mining Company files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Bill Smith
Wellfield Designation:	Mine Unit 2
Number of Wells Sampled:	10

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	1,590	84	30
Radium (pCi/l)	2,042	560	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Rio Algom Mining Company files

PRE-MINING URANIUM AND U RELATED ELEMENTS IN ISL WELLFIELDS

(highlighted where the drinking standard is exceeded)

State:	Wyoming
Mine:	Willow Creek
Wellfield Designation:	R & D
Number of Wells Sampled:	no data

Element	Highest Value	Average	Drinking Standard
Uranium (ug/l)	81	35.4	30
Radium (pCi/l)	295	73.2	5
Radon (pCi/l)	no data	no data	300
G. Alpha Radiation (pCi/l)	no data	no data	15
G. Beta Radiation (pCi/l)	no data	no data	50

Source: Wyoming DEQ files, COGEMA Mining, Inc. files.

ATTACHMENT B

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
FEBRUARY 2, 1996

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

IDENTIFICATION: CHURCHROCK
SECTION 17 #1 SHAFT
1-18-96

METHOD NUMBER			ANALYST	ANALYSIS DATE
ASTM D2907-83	URANIUM (NATURAL), MG/L -------	3.12	KUME	01-30-96
SM 7500-RA C.	RADIUM 226, PCI/L -------------	58	STRAUSS	02-01-96
	COUNTING ERROR, PCI/L -- +/-	1		
ANAL.CHEM.	THORIUM 230, PCI/L ------------	-0.2	CHAPA	01-31-96
46,12 (1974)	COUNTING ERROR, PCI/L -- +/-	0.4		

LAB. NO. M34-475

RESPECTFULLY SUBMITTED,

CARL F. CROWNOVER, PRES.

```
    GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM


    COMPANY:  URI, INC.                        REPORT DATE:  OCTOBER 6, 1993
    IDENTIFICATION:  SECTION 17
                     SHAFT 9-15-93
     \BORATORY:  JORDAN LABORATORIES, INC.

    MAJOR AND SECONDARY CONSTITUENTS

    ITEM             STORET      MG/L          EPM       CONDUCTANCE      %EPM

    CALCIUM(CA)      00915        44          2.20         114.40        10.31
    MAGNESIUM(MG)    00925        17          1.40          65.24         6.56
    SODIUM(NA)       00929       405         17.62         861.62        82.57
    POTASSIUM(K)     00937         4.8        0.12           8.64         0.56

                             TOTAL CATION     21.34

    CARBONATE(CO3)   00445         0          0.00           0.00         0.00
    BICARBONATE(HCO3)00440       492          8.06         351.42        37.59
    SULFATE(SO4)     00945       625         13.01         961.44        60.68
    CHLORIDE(CL)     00940        13          0.37          28.08         1.73
    NITRATE(NO3-N)   71851         0.76
    FLUORIDE(F)      00951         0.93          TOTAL    2390.84
    SILICA(SIO2)     00955        10

                             TOTAL ANION     21.44
                   TOTAL ION    1612                     ACCURACY CHECK
                                                                     RANGE
    TDS(180 C)       70300       1300            ION      0.995  (.96 TO 1.04)
     'OT ION-0.5 HCO3=           1366            TDS      0.951  (.90 TO 1.10)
     :(25 C)         00095       2000 UMHOS      EC       0.975  (.95 TO 1.05)
    EC(DIL)=105.0  X  22.2 =     2331 UMHOS
    ALK. AS CACO3    00410        403            RADIATION-PICOCURIES/LITER
    PH                             8.23          GROSS ALPHA         +/-
                                                 GROSS BETA          +/-
    MINOR AND TRACE CONSTITUENTS                 RADIUM 226    55    +/-    1

    ITEM            MG/L      ITEM            MG/L      ITEM            MG/L
    ARSENIC(AS)     0.001     MANGANESE(MN)   0.16      VANADIUM(V)    <0.01
    BARIUM(BA)      0.01      MERCURY(HG)    <0.0001    ZINC(ZN)        0.01
    CADMIUM(CD)    <0.0001    MOLY.(MO)       0.01      BORON(B)        0.40
    CHROM.(CR)     <0.01      NICKEL(NI)     <0.01      AMMONIA-N       0.03
    COPPER(CU)     <0.01      SELENIUM(SE)    0.001
    IRON(FE)        0.01      SILVER(AG)     <0.01
    LEAD(PB)       <0.001     URANIUM(U)      3.07

                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    !-!----!----!----!----!----!----!----!----!-!
  CA!                  *           *            !HCO3      ANALYST:
    !                   .            .          !
    !                   .              .        !            NIXON AND ALLEN
  MG!                   *                *      !SO4         ------------------
    !             .                 .           !
    .       .                  .                !          CHECKED BY:
\A                        *                     !CL
    .-!----!----!----!----!----!----!----!----!-!
                                                             ------------------
    LAB.NO:M31-8106
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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM


COMPANY:  URI, INC.                              REPORT DATE:  OCTOBER 6, 1993
IDENTIFICATION:  SECTION 17
                 GRAVEL HOLE 9-15-93
 \BORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM              STORET       MG/L          EPM        CONDUCTANCE       %EPM

CALCIUM(CA)       00915         4.3          0.21           10.92          1.22
MAGNESIUM(MG)     00925        11            0.90           41.94          5.23
SODIUM(NA)        00929       367           15.96          780.44         92.79
POTASSIUM(K)      00937         4.9          0.13            9.36          0.76

                          TOTAL CATION      17.2

CARBONATE(CO3)    00445        44            1.47          124.36          8.33
BICARBONATE(HCO3)00440        298            4.88          212.77         27.66
SULFATE(SO4)      00945       526           10.95          809.21         62.07
CHLORIDE(CL)      00940        12            0.34           25.81          1.93
NITRATE(NO3-N)    71851          0.02
FLUORIDE(F)       00951          0.42            TOTAL    2014.81
SILICA(SIO2)      00955          1

                          TOTAL ANION      17.64
                 TOTAL ION     1269                    ACCURACY CHECK
                                                                   RANGE
TDS(180 C)        70300       1070              ION      0.975  (.96 TO 1.04)
 'OT ION-0.5 HCO3=            1120              TDS      0.956  (.90 TO 1.10)
 :(25 C)          00095       1730 UMHOS        EC       0.983  (.95 TO 1.05)
-C(DIL)= 99.0  X  20.0 =      1980 UMHOS
ALK. AS CACO3     00410        318              RADIATION-PICOCURIES/LITER
PH                               9.17           GROSS ALPHA          +/-
                                                GROSS BETA           +/-
MINOR AND TRACE CONSTITUENTS                    RADIUM 226     7.4   +/-    0.3

ITEM             MG/L       ITEM            MG/L       ITEM             MG/L
ARSENIC(AS)     <0.001      MANGANESE(MN)   0.02       VANADIUM(V)     <0.01
BARIUM(BA)      <0.01       MERCURY(HG)    <0.0001     ZINC(ZN)        <0.01
CADMIUM(CD)     <0.0001     MOLY.(MO)       0.01       BORON(B)         0.24
CHROM.(CR)      <0.01       NICKEL(NI)     <0.01       AMMONIA-N        0.13
COPPER(CU)      <0.01       SELENIUM(SE)   <0.001
IRON(FE)        <0.01       SILVER(AG)     <0.01
LEAD(PB)        <0.001      URANIUM(U)      0.041

               %CATIONS      %ANIONS
   80   60   40   20    0    20   40   60   80
  |-|----|----|----|----|----|----|----|----|-|
CA|                    *      *                |HCO3     ANALYST:
  |                    .          .            |
  |                    .             .         |           NIXON AND ALLEN
MG|                    *                *      |SO4        ---------------
  |             .                  .           |
  .     .                       .              |         CHECKED BY:
\A                     *                       |CL
 .-|----|----|----|----|----|----|----|----|-|
                                                           ---------------
LAB.NO:M31-8107
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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: OCTOBER 6, 1993
IDENTIFICATION: SECTION 17
VH-1 9-15-93
BORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	45	2.25	117.00	10.73
MAGNESIUM(MG)	00925	17	1.40	65.24	6.68
SODIUM(NA)	00929	395	17.18	840.10	81.97
POTASSIUM(K)	00937	4.9	0.13	9.36	0.62
		TOTAL CATION	20.96		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	494	8.10	353.16	37.82
SULFATE(SO4)	00945	622	12.95	957.01	60.46
CHLORIDE(CL)	00940	13	0.37	28.08	1.73
NITRATE(NO3-N)	71851	0.10			
FLUORIDE(F)	00951	0.89	TOTAL	2369.95	
SILICA(SIO2)	00955	8			
		TOTAL ANION	21.42		

TOTAL ION 1600

TDS(180 C)	70300	1290
OT ION-0.5 HCO3=		1353
(25 C)	00095	1990 UMHOS
C(DIL)=104.1 X 22.2 =		2311 UMHOS
ALK. AS CACO3	00410	405
PH		8.21

ACCURACY CHECK

		RANGE
ION	0.979	(.96 TO 1.04)
TDS	0.954	(.90 TO 1.10)
EC	0.975	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	47	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.18	VANADIUM(V)	<0.01
BARIUM(BA)	<0.01	MERCURY(HG)	<0.0001	ZINC(ZN)	0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	0.39
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.10
COPPER(CU)	<0.01	SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	3.55		

```
              %CATIONS     %ANIONS
   80   60   40   20    0    20   40   60   80
  |-|----|----|----|----|----|----|----|----|-|
CA|                  *           *            |HCO3
  |                   .       .    .          |
  |                   .              .        |
MG|                   *                *      |SO4
  |             .                 .           |
  .       .                  .                |
NA                      *                     |CL
  .-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M31-8108

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
IDENTIFICATION: SECTION 17
VH-2 9-15-93
BORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: OCTOBER 6, 1993

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	44	2.20	114.40	10.33
MAGNESIUM(MG)	00925	17	1.40	65.24	6.58
SODIUM(NA)	00929	404	17.57	859.17	82.53
POTASSIUM(K)	00937	4.8	0.12	8.64	0.56
		TOTAL CATION	21.29		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	492	8.06	351.42	37.66
SULFATE(SO4)	00945	622	12.95	957.01	60.51
CHLORIDE(CL)	00940	14	0.39	29.60	1.82
NITRATE(NO3-N)	71851	0.06			
FLUORIDE(F)	00951	0.93	TOTAL	2385.48	
SILICA(SIO2)	00955	9			
		TOTAL ANION	21.40		

TOTAL ION 1608

TDS(180 C)	70300	1320
OT ION-0.5 HCO3=		1362
(25 C)	00095	1990 UMHOS
C(DIL)=104.5 X 22.2 =		2320 UMHOS
ALK. AS CACO3	00410	403
PH		8.23

ACCURACY CHECK

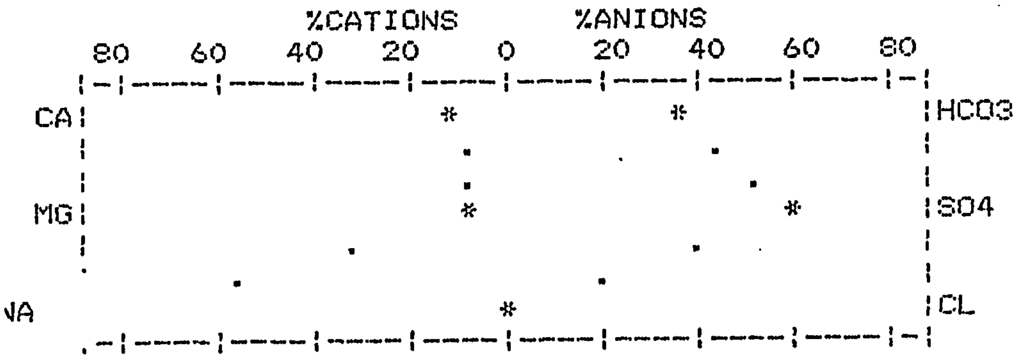
		RANGE
ION	0.995	(.96 TO 1.04)
TDS	0.969	(.90 TO 1.10)
EC	0.973	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	44	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.18	VANADIUM(V)	<0.01
BARIUM(BA)	<0.01	MERCURY(HG)	<0.0001	ZINC(ZN)	0.03
CADMIUM(CD)	0.0002	MOLY.(MO)	0.01	BORON(B)	0.38
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.06
COPPER(CU)	<0.01	SELENIUM(SE)	0.001		
IRON(FE)	<0.01	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	3.41		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M31-8109

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

Gravel Shaft

COMPANY: URANIUM RESOURCES, INC. REPORT DATE: SEPTEMBER [illegible] 1987
IDENTIFICATION: ~~OCR~~ SHAFT
6-29-87
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	9.4	0.47	24.44	3.31
MAGNESIUM(MG)	00925	5.8	0.48	22.37	3.38
SODIUM(NA)	00929	301	13.09	640.10	92.25
POTASSIUM(K)	00937	5.7	0.15	10.80	1.06
		TOTAL CATION	14.19		
CARBONATE(CO3)	00445	34	1.13	95.60	7.97
BICARBONATE(HCO3)	00440	185	3.03	132.11	21.37
SULFATE(SO4)	00945	468	9.74	719.79	68.69
CHLORIDE(CL)	00940	10	0.28	21.25	1.97
NITRATE(NO3-N)	71851	1.4			
FLUORIDE(F)	00951	0.25	TOTAL	1666.45	
SILICA(SIO2)	00955	<1			
		TOTAL ANION	14.18		

TOTAL ION 1021

TDS(180 C)	70300	993
TOT ION-0.5 HCO3=		928
EC(25 C)	00095	1440 UMHOS
EC(DIL)= 98.2 X 16.7 =		1640 UMHOS
ALK. AS CACO3	00410	208
PH		9.19

ACCURACY CHECK

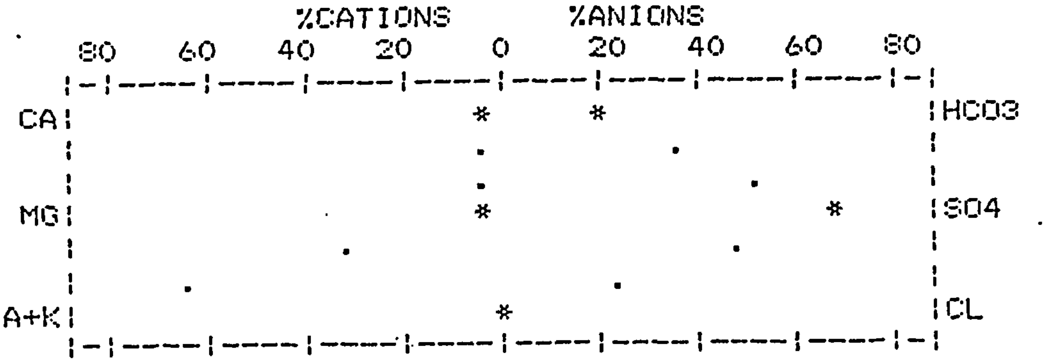
		RANGE
ION	1.001	(.96 TO 1.04)
TDS	1.070	(.90 TO 1.10)
EC	0.984	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

THORIUM 230	8.5	+/-	1.5
LEAD 210	5.6	+/-	3.2
RADIUM 226	1.0	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.19	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0024	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.28
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	10	SILVER(AG)			
LEAD(PB)	0.580	URANIUM(U).	0.003		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M25-4712

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  GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM


  COMPANY:  URANIUM RESOURCES, INC.           REPORT DATE:  SEPTEMBER 21, 1987
  IDENTIFICATION:  OCR SHAFT
                   6-30-87
  LABORATORY:  JORDAN LABORATORIES, INC.

  MAJOR AND SECONDARY CONSTITUENTS

  ITEM              STORET     MG/L          EPM       CONDUCTANCE       %EPM

  CALCIUM(CA)       00915       63           3.14         163.28         16.40
  MAGNESIUM(MG)     00925       15           1.23          57.32          6.42
  SODIUM(NA)        00929      336          14.62         714.92         76.34
  POTASSIUM(K)      00937        6.1         0.16          11.52          0.84

                           TOTAL CATION     19.15

  CARBONATE(CO3)    00445        0           0.00           0.00          0.00
  BICARBONATE(HCO3)00440      431           7.06         307.82         36.43
  SULFATE(SO4)      00945      574          11.95         883.11         61.66
  CHLORIDE(CL)      00940       13           0.37          28.08          1.91
  NITRATE(NO3-N)    71851        0.65
  FLUORIDE(F)       00951        0.62           TOTAL    2166.04
  SILICA(SIO2)      00955       12

                           TOTAL ANION      19.38
                  TOTAL ION    1451                      ACCURACY CHECK
                                                                  RANGE
  TDS(180 C)        70300      1320              ION      0.988  (.96 TO 1.04)
  TOT ION-0.5 HCO3=            1236              TDS      1.068  (.90 TO 1.10)
  EC(25 C)          00095      1800 UMHOS        EC       0.983  (.95 TO 1.05)
  EC(DIL)=106.5  X  20.0 =     2130 UMHOS
  ALK. AS CACO3     00410       353              RADIATION-PICOCURIES/LITER
  PH                              8.01           THORIUM 230    1.5  +/-   0.1
                                                 LEAD 210      18    +/-   4
  MINOR AND TRACE CONSTITUENTS                   RADIUM 226    68    +/-   1

  ITEM             MG/L      ITEM              MG/L       ITEM             MG/L
  ARSENIC(AS)     <0.001     MANGANESE(MN)     0.21       VANADIUM(V)
  BARIUM(BA)                 MERCURY(HG)      <0.0001     ZINC(ZN)
  CADMIUM(CD)      0.0004    MOLY.(MO)        <0.01       BORON(B)
  CHROM.(CR)                 NICKEL(NI)                   AMMONIA-N        0.15
  COPPER(CU)                 SELENIUM(SE)      0.003
  IRON(FE)         0.92      SILVER(AG)
  LEAD(PB)         0.003     URANIUM(U)        5.22

               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                 *            *            |HCO3      ANALYST:
   |                  .             .          |
   |                   .              .        |            NIXON AND ALLEN
 MG|                   *                 *     |SO4         ----------------
   |              .                .           |
   |        .                  .               |          CHECKED BY:
A+K|  *                  *                     |CL
   |-|----|----|----|----|----|----|----|----|-|
                                                            ----------------
   LAB.NO:M25-4713
```

ATTACHMENT C

CROWNPOINT URANIUM PROJECT
CONSOLIDATED OPERATIONS PLAN

HRI, Inc.
2929 Coors Road
Albuquerque, New Mexico

Revision 2.0
August 15, 1997

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CORPORATE ENVIRONMENTAL POLICY

HRI, Inc.'s environmental policy reflects the Company's continual commitment to environmental stewardship in all aspects of its business activities. The Company strives to maintain high standards in its design, construction, operations, and restoration activities in order to consistently operate in a manner that protects the environment. Through a rigorous environmental compliance review procedure, the Company continuously evaluates all aspects of its operations to ensure that it is operating safely, and in compliance with the multi-level state, and federal regulations applicable to the in situ uranium mining process.

This system includes a review of environmental regulations which impact the exploration, development, operation, and restoration/remediation activities of HRI; the development of safety, and environmental procedures, and regular internal audits of these areas to assess compliance; the promotion of waste minimization techniques; the utilization of environmental benign choices in operating strategies; providing leadership in environmental awareness, and emphasizing employee involvement, and effectiveness in safety, and environmental compliance on the job.

CORPORATE ALARA POLICY

HRI, Inc.'s ALARA policy reflects the same commitment stated in the Corporate Environmental Policy, with specific emphasis placed on maintaining occupational exposures to employees, contractors, and visitors, from the radiological, and toxic hazards of uranium, and its daughter products as low as reasonably achievable.

The Company strives to maintain high ALARA standards through engineering design, hands on management, and employee training. It is recognized that a successful ALARA program is the responsibility of everyone in the production of uranium; including management, the Radiation Safety Officer (RSO), and all workers. The Company continually evaluates, and provides the necessary resources, and incentives to ensure ALARA goals are met.

CROWNPOINT URANIUM PROJECT
CONSOLIDATED OPERATIONS PLAN

1.0 GENERAL DESCRIPTION

The Crownpoint Uranium Project (as collectively described in 1.1 below) has been the subject of a number of applications, reports, submittals, correspondence, and various other documentation which has been submitted to the United States Nuclear Regulatory Commission (USNRC). The general chronology of these submittals is specified in 1.2 below.

Because the licensing of the Crownpoint Uranium Project has taken a number of years, and included several additional mine locations with corresponding informational submittals, USNRC has expressed concern that the Application information has become disjointed for the purpose of "tiedown provisions" in the operating license. The purpose of this CONSOLIDATED OPERATIONS PLAN (COP) is to extract, and combine the information in previously submitted documents into one consolidated specification report. This document will contain all the specifications, and representations which have been articulated to NRC in the past under one cover.

1.1 Project Identification

Hydro Resources, Inc., (HRI)* a wholly-owned subsidiary of Uranium Resources, Inc. proposes to develop an in-situ uranium leach operation in McKinley County, New Mexico (Fig 1.1-1). The proposed project will consist of three separate facilities including the Churchrock, and Unit 1 Satellites, and the Crownpoint Central Plant (CCP). Each will have a nominal leaching capacity of 4000 gpm, and production capacity of 1 million Lbs. per year. Collectively, the CCP, and satellite facilities is referred to as the Crownpoint Uranium Project (CUP). The location of each is described separately below:

---

* Hydro Resources, Inc. is a Delaware Corporation licensed to do business in New Mexico. Because the name "Hydro Resources" was not available, the company operates as HRI, Inc. (also referred to as HRI). All references to Hydro Resources, Inc., and HRI should be considered interchangeable for the purposes of this report.

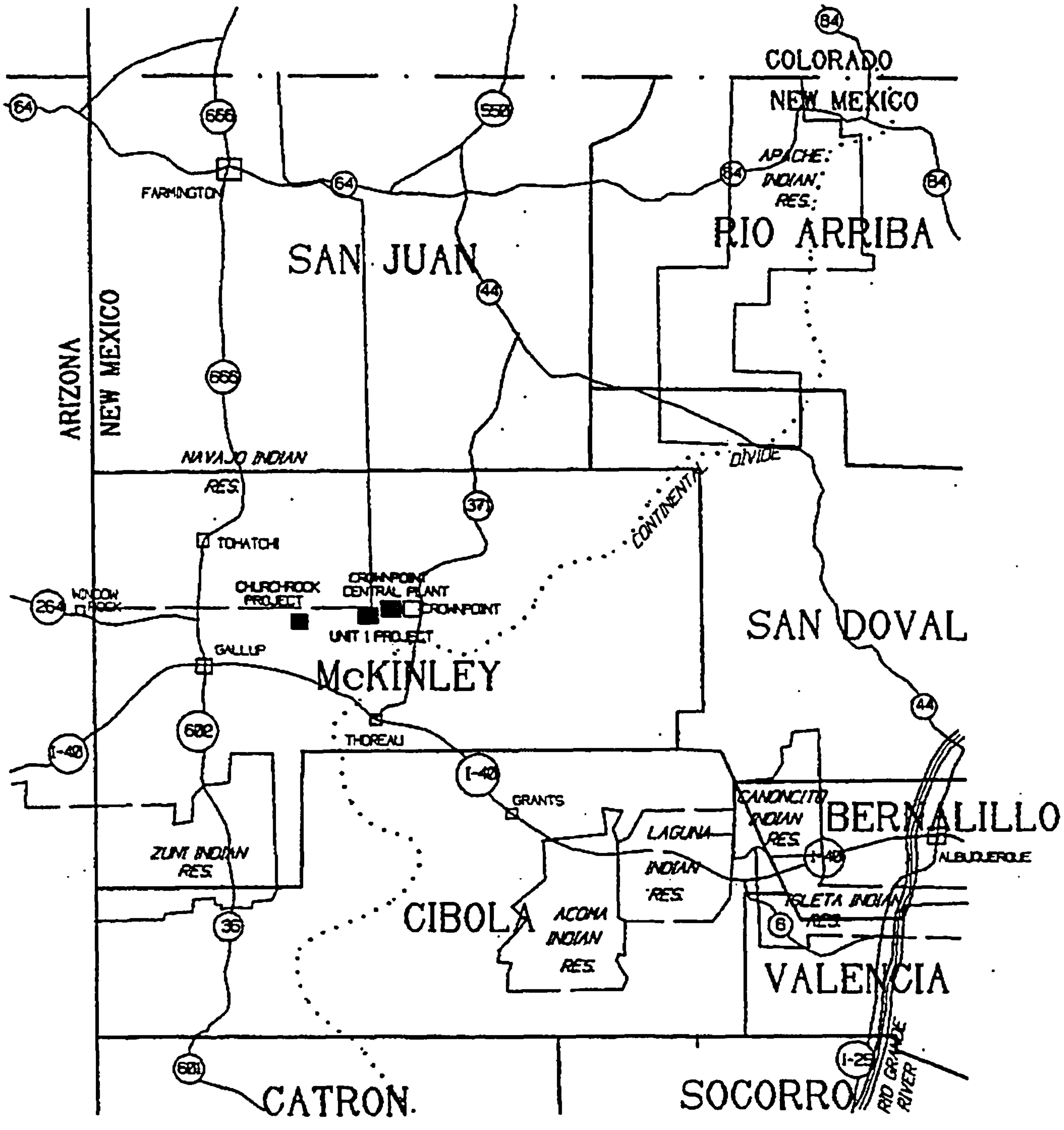


FIGURE 1.1-1
PROJECT AREAS LOCATION MAP

1.1.1 Crownpoint

The Crownpoint Central Plant (CCP) is located on the SE/4 of Section 24, Township 17 North, Range 13 West of McKinley County, New Mexico. Mining activities are anticipated within the license boundary as described herein.

T17N, R12W:

Beginning at a point on the NW corner of the SW/4 of Section 19, go 1,320′ East along the North line of the South half of Section 19 to a point at the NE corner of said tract of land;

THENCE South along the East line of said tract 2,640′ parallel with the West line to the SE corner of said tract of land;

THENCE West along the South line of said tract 1,320′ parallel with the North line of the SW corner of said tract of land;

THENCE North along the West line of said tract 2,640′ parallel to the East line to the point beginning for said tract of land located in Section 19.

Additionally,

Beginning at a point 650′ South of the NW quarter for a point of beginning for said tract of land located in the West half of Section 29, go 2,640′ East along the North line of said tract parallel to the South line of said W/2 of Section 29;

THENCE South along the East line of said tract 4,630′ parallel with the West line to the SE corner of said tract of land;

THENCE West along the South line of said tract 2,640′ parallel with the North line to the SW corner of said tract of land;

THENCE North along the West line of said tract 4,630′ parallel to the East line to the point of beginning for said tract of land located in Section 29.

T17N, R13W:

Beginning at a point on the NW corner of the SW/4 of Section 24, go 5,280′ East along the North line of the South half of Section 24 to a point at the NE corner of said tract of the SE/4;
THENCE South along the East line 2,640′ parallel with the West line to the SE corner of the SE/4 of said Section 24;

THENCE South along the East line 465′ parallel with the West line to a point on said East line which is the SE corner of said tract in Section 25;

THENCE West along the South line of said tract of land 2,640′ parallel with the North line of said tract;

THENCE North 465′ along the West line parallel with the East line to the NW corner of said tract of land located in Section 25;

THENCE West 2,640′ along the South line parallel with the North line to the SW/4 of Section of 24;

THENCE North along the West line 2,640′ parallel to the East line to the point of beginning.

The location of the Crownpoint mine is illustrated with respect to topography, and cultural features on Figure 1.1-2.

1.1.2 Churchrock

The process facility for the Churchrock satellite will be located in the SE/4, SE/4 of Section 8, T16N, R16W.

Mining could be located on one, or both of the parcels of land owned, or leased to HRI on Section 8, and 17, T16N, R16W as described below:

Section 8

SE/4 - 174.546 ac. Patent Mining Claims

Section 17

200.0 acres being NE/4, and the SE/4 NW/4

The location of the Churchrock property is illustrated with respect to the topography, and cultural features on Figure 1.1-3.

1.1.3 Unit 1

The process facility for the Unit 1 satellite will be located in the NE/4, SE/4 of Section 21, T17N, R13W.

Mining could be located on any of the parcels of land leased to HRI as described below.

Sections 15, 16, 21, 22, 23, and 24, T17N, R13W:

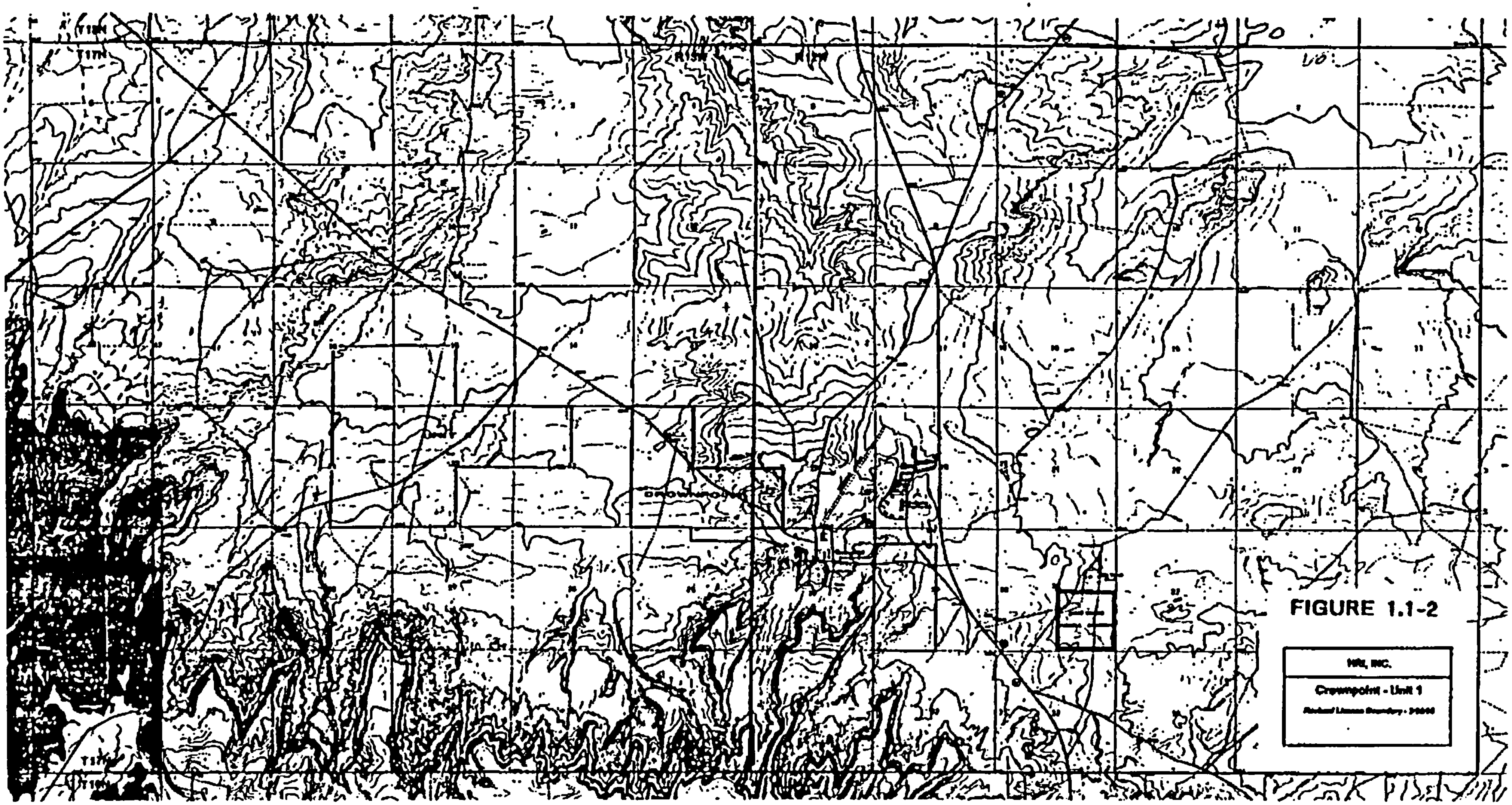
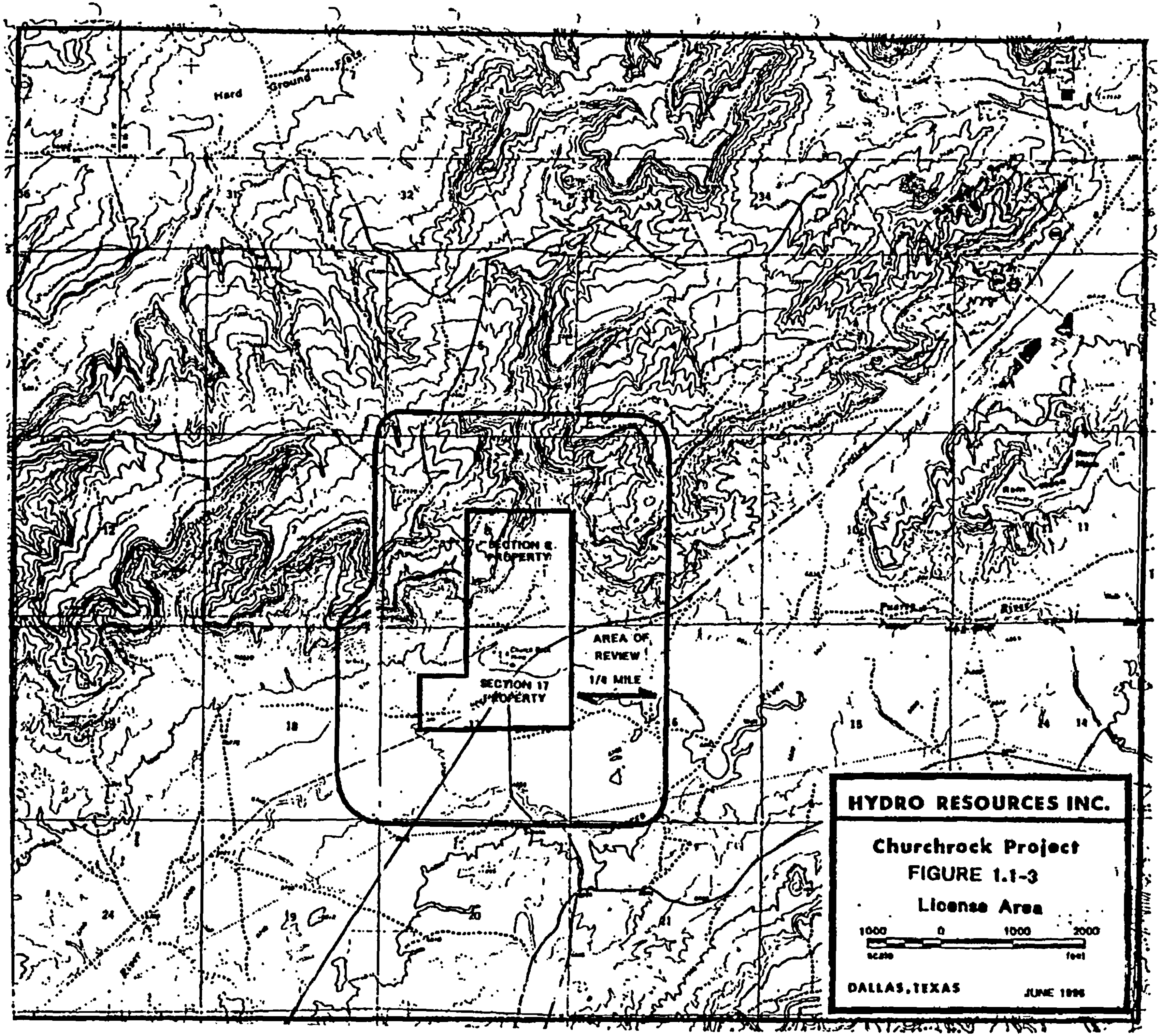


FIGURE 1.1-2

HRI, INC.

Crownpoint - Unit 1

Revised License Boundary - [illegible]



HYDRO RESOURCES INC.

Churchrock Project
FIGURE 1.1-3
License Area

DALLAS, TEXAS
JUNE 1996

Section 15; SW/4 - 160 acres
Section 16; SE/4 - 160 acres
Section 21; E/2 - 320 acres
Section 22; W/2 NE/4 - 480 acres
Section 23; NW/4 - 160 acres
Section 24; NW/4 - 160 acres

The location of the Unit 1 properties is illustrated with respect to topography, and cultural features in Figure 1.1-2.

1.2 History and Permitting of the Project

HRI initiated its License application in accordance with 10 CFR Part 51.45, by submitting an environmental report (ER) to the NRC by cover letter dated April 13, 1988. The ER was also provided to the BIA, BLM, and others.

An application for a State of New Mexico discharge plan was submitted at the same time the NRC License was initiated. Subsequently, by letter dated April 25, 1988, HRI submitted an application to the NRC for a source material license to commercially produce uranium at its Church Rock ISL project, McKinley County, New Mexico.

On October 12, 1988, HRI announced that it had acquired existing mine facilities in Crownpoint, formerly owned by Conoco, and Westinghouse Corporations, and proposed to conduct uranium recovery processing there. By letter dated May 8, 1989, HRI submitted a Supplemental Environmental Report addressing this change.

Discharge plan DP-558 which authorized in situ mining at the Churchrock section 8 location was approved by the New Mexico Environment Improvement Division (now NMED) on November 2, 1989. This approval was preceded by approval of an aquifer exemption by the US EPA on June 21, 1989.

An application was submitted for water rights at the Churchrock property to the New Mexico State Engineer on February 14, 1991. This application was protested by the Navajo Nation on jurisdictional grounds. On February 13, 1992, the application was conditionally denied because of excessive project water consumption.

The proposed mine plan was expanded when HRI acquired mineral interests involving leases on allotted lands which were designated Unit 1. HRI addressed adding these areas in a new ER dated January 1992, and submitted to the NRC on April 23, 1992.

Finally, the proposed project was again expanded to include mineral claims near the former Conoco/Westinghouse underground mine. The environmental report for this addition was submitted on July 31, 1992.

An application was submitted to the New Mexico Environmental Department on June 12, 1992, for authorization to mine on Section 24, and 19 of the Crownpoint Properties. This application was subsequently withdrawn.

A UIC application was submitted to EPA on October 9, 1992 which will authorize in situ mining on Unit 1 properties. This application was subsequently withdrawn.

In March of 1993, HRI submitted an application to amend DP-558 by adding the Section 17 property. A public hearing was conducted in October of 1993 on the amendment. The hearing was convened, and continued from time to time thereafter. The amendment was approved by NMED on October 7, 1994. EPA did not issue the requisite aquifer exemption for the property because of a question over regulatory jurisdiction.

In October, 1994 the Draft Environmental Impact Statement (DEIS) was released by an interagency review group consisting of the U.S. Nuclear Regulatory Commission (NRC), the U.S. Bureau of Land Management (BLM), and the U.S. Bureau of Indian Affairs (BIA). The review group was assisted by input from the Navajo Nation, the State of New Mexico, and other interested parties.

In February, 1995, NRC conducted public hearings on the Draft EIS. Thereafter, NRC compiled public comments, and other questions, and posed these to HRI as requests for additional information by letter dated Jan. 11, 1996, February 9, 1996, and July 15, 1996. HRI's responses to these documents were forwarded on to NRC on February 20, April 1, and August 15 respectively.

In July, 1996, HRI submitted a renewal application to NMED for DP-558. Also, in July, 1996, HRI submitted an application to NMED for a separate discharge plan for the Section 17 property. This bifurcation was designed to clearly distinguish between the two properties (Sections 8 & 17) for the purpose of providing flexibility in dealing with any future jurisdictional questions which might arise.

In August, 1996, HRI submitted an application for a discharge plan which will authorize in situ mining of the Crownpoint Property for the south half of Section 24.

In November, 1996, HRI submitted an application for an EPA UIC permit which will authorize in situ mining of the Unit 1 Property.

In February, 1997, the Final Environmental Impact Statement (FEIS) was released by an interagency review group consisting of the U.S. Nuclear Regulatory Commission (NRC), the U.S. Bureau of Land Management (BLM), and the U.S. Bureau of Indian Affairs (BIA).

1.3 In Situ Mining Technique

In situ mining involves the use of a leaching solution (lixiviant) to extract the mineral of interest from the geologic formation in which it occurs. This is accomplished by injecting the lixiviant through injection wells completed in the zone of interest, dissolving the target minerals, then recovering the pregnant lixiviant, or production fluid by pumping production wells. At HRI's properties, uranium will be extracted from roll front type deposits which contain an average ore grade of approximately 0.15 percent. The ore deposits are usually a few feet in thickness.

Various well patterns are typically used for uranium in situ mining at the CUP. Each wellfield area consists of groups of these patterns which are installed to correspond to the irregular geometry of the ore bodies.

At the CUP, the lixiviant consists of native groundwater to which gaseous carbon dioxide(or some form of sodium bicarbonate), and oxygen have been added. After the lixiviant is injected into injection wells, and recovered through production wells it is piped to the ion exchange facility where the uranium is removed by circulating the pregnant lixiviant through ion exchange resin. The barren lixiviant is returned to the wellfield. At the satellite projects, ion exchange resin, or yellowcake slurry will be transported in appropriate trailers to the CCP where it will be further processed to its final form. If resin is hauled, it will be returned to the IX system for further use after it has been stripped of uranium at the CCP.

Once the economic recovery limit of a mine area is reached, lixiviant injection is stopped, and the affected ground water is treated (restored) to return the water to a quality consistent with baseline as specified in Section 10, and/or as required by NRC, and other controlling regulatory authorities.

An extensive water monitoring program is required for in situ mining. Specifically designated wells are monitored for water level, and sampled for certain water quality parameters on a regular basis to ensure that the injected lixiviant stays within the defined production zone.

The chief components of an in situ uranium recovery facility include:

a. **Mining process**, where a lixiviant stream is continuously recirculated from the recovery plant into injection wells, through ore bearing, and a uranium-rich (pregnant) lixiviant is withdrawn (via production wells)and recirculated to the recovery plant;

b. The **recovery plant**, where uranium in the pregnant lixiviant is extracted, and the resulting barren lixiviant is recirculated through the wellfields.

c. **Yellowcake precipitation**, and **concentration** in the form of oxide (U3O8 or yellowcake) which may be shipped either as a wet solid, or slurry (in appropriate trailers), or as dry powder (in drums).

d. The CUP will utilize a **yellowcake dryer** to finish the dry product.

1.3.1 In Situ Mineral Extraction Preserves the Surface

Uranium mineralization makes up only a small portion of the total mass of uranium ore, therefore, after mining the structural integrity of the host aquifer is maintained, and no land subsidence occurs. However, as part of HRI's site reclamation plan, the company will monitor if depressions appear at the surface due to subsurface collapse, and return the land surface to its general contour as part of the projects surface reclamation activities.

1.3.2 Restoration

Once the economic recovery limit of a mine area is reached, lixiviant injection is stopped, and the affected ground water is treated (restored) to return the quality of water to preoperational baseline conditions, or quality of use, as appropriate.

1.3.3 Advantages of In Situ Uranium Mining

Uranium in situ mining is a proven technology that has been successfully demonstrated commercially in the states of Nebraska, Texas, and Wyoming. URI, HRI's affiliate, has extensive commercial experience in uranium in situ mining in the state of Texas from 1978 to the present. In situ mining of uranium is environmentally superior to conventional open pit uranium mining as evidenced by the following:

> **a.** In situ mining results in significantly less surface disturbance. Mine pits, waste dumps, haul roads, and tailings ponds are not needed.
>
> **b.** Compared to conventional mining, in situ mining reduces the short- and long-term exposure to the general population to extremely low levels because almost all of the source term remains underground in its natural location. Very little residual radioactive waste is produced, and there are no tailings. Land, and water are returned to their original, pre-mining use, and quality.
>
> **c.** In situ mining requires much less water than pit, or underground mine dewatering, or conventional milling.
>
> **d.** The lack of heavy equipment, haul roads, waste dumps, etc., result in virtually no air quality degradation at in situ mines.
>
> **e.** Fewer employees are needed at in situ mines, thereby reducing transportation, and socioeconomic concerns.
>
> **f.** Aquifers are not excavated, but remain intact during, and after in situ mining so they remains available for future uses. Not creating large excavations opens the surrounding land for grazing, or raising crops
>
> **g.** The technology of recirculating mine fluids through the ion exchange facility reduces the amount of solids to a negligible quantity, and tailings ponds are not used, thereby eliminating a major groundwater pollution concern.

1.4 Schedule for Mining Related Activities

Within the wellfield, individual wells will be shut down when they cease to be economically productive. When an entire segment of a wellfield has been depleted of uranium, restoration will be started via ground water sweeping, and/or reverse osmosis treatment, and brine concentration.

The projected general production, and restoration schedule for the CUP is show on Figure 1.4-1. It should be emphasized that this schedule is projected, and will ultimately be impacted by regulatory, and market influences. More detailed production, and restoration schedules are described below.

1.4.1 Crownpoint

The proposed mining plan at the CCP is summarized on Figure 1.4-2. Individual mine areas which are listed on Figure 1.4-2 are shown on 1.4-3.

Prior to the injection of lixiviant at the Crownpoint site, HRI will replace the town of Crownpoint water supply wells NTUA-1, NTUA-2, BIA-3, BIA-5, and BIA-6. In addition, HRI will construct a water system pipeline, and provide funds so that the Navajo Tribal Utility Authority (NTUA), and Bureau of Indian affairs (BIA) water supply systems can be connected. The wells, pumps, pipelines, and any other necessary changes to the existing water supply system will be made so the system can continue to provide the same quantity of water. The new wells will be located so that the water quality at each individual wellhead will not exceed EPA primary, and secondary drinking water standards, and a concentration of 0.44 mg/l uranium as a result of future *in situ* leach mining activities at the Unit 1, and Crownpoint sites. HRI will coordinate with the appropriate agencies, and regulatory authorities, including the BIA, and the Navajo Nation Division of Water Resources, and the Navajo Nation Environmental Protection agency (NNEPA), and the NTUA, to determine the appropriate placement of the new wells. Further, the existing wells will be abandoned, and sealed in accordance with applicable guidelines.

Within the wellfield, individual wells will be shut down when they cease to be economically productive. When an entire segment of a wellfield has been depleted of uranium, restoration will be started via ground water sweep, and/or reverse osmosis treatment, and brine concentration. The estimated productive/restoration life of the wellfields at CCP is about 16 years. All timing is subject to discovery of additional reserves which will, by necessity, extend the mine life before final decommissioning.

CUP Mine Plan

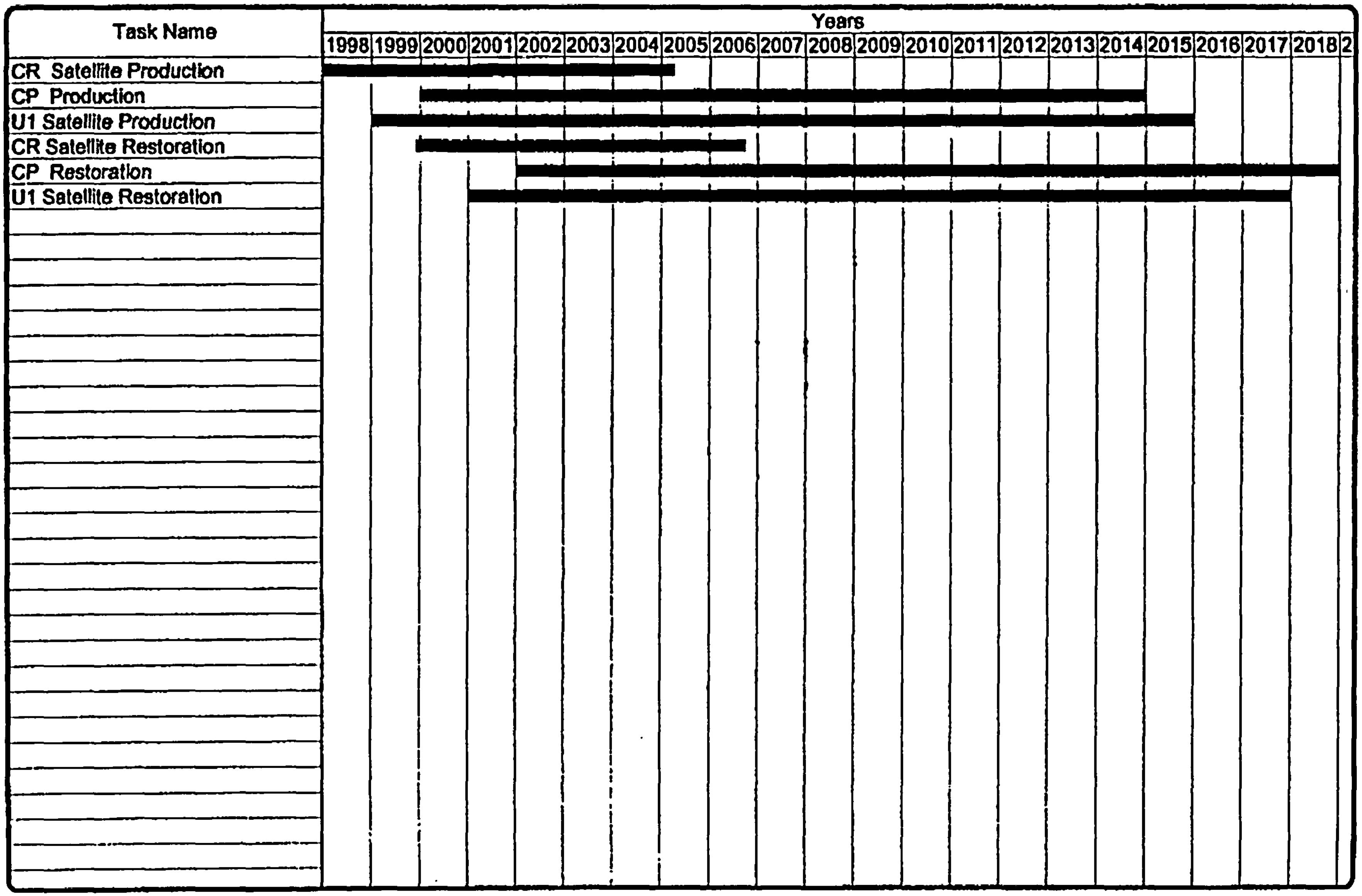


FIGURE 1.4-1

Mine Plan - Crownpoint 24 South 1/2

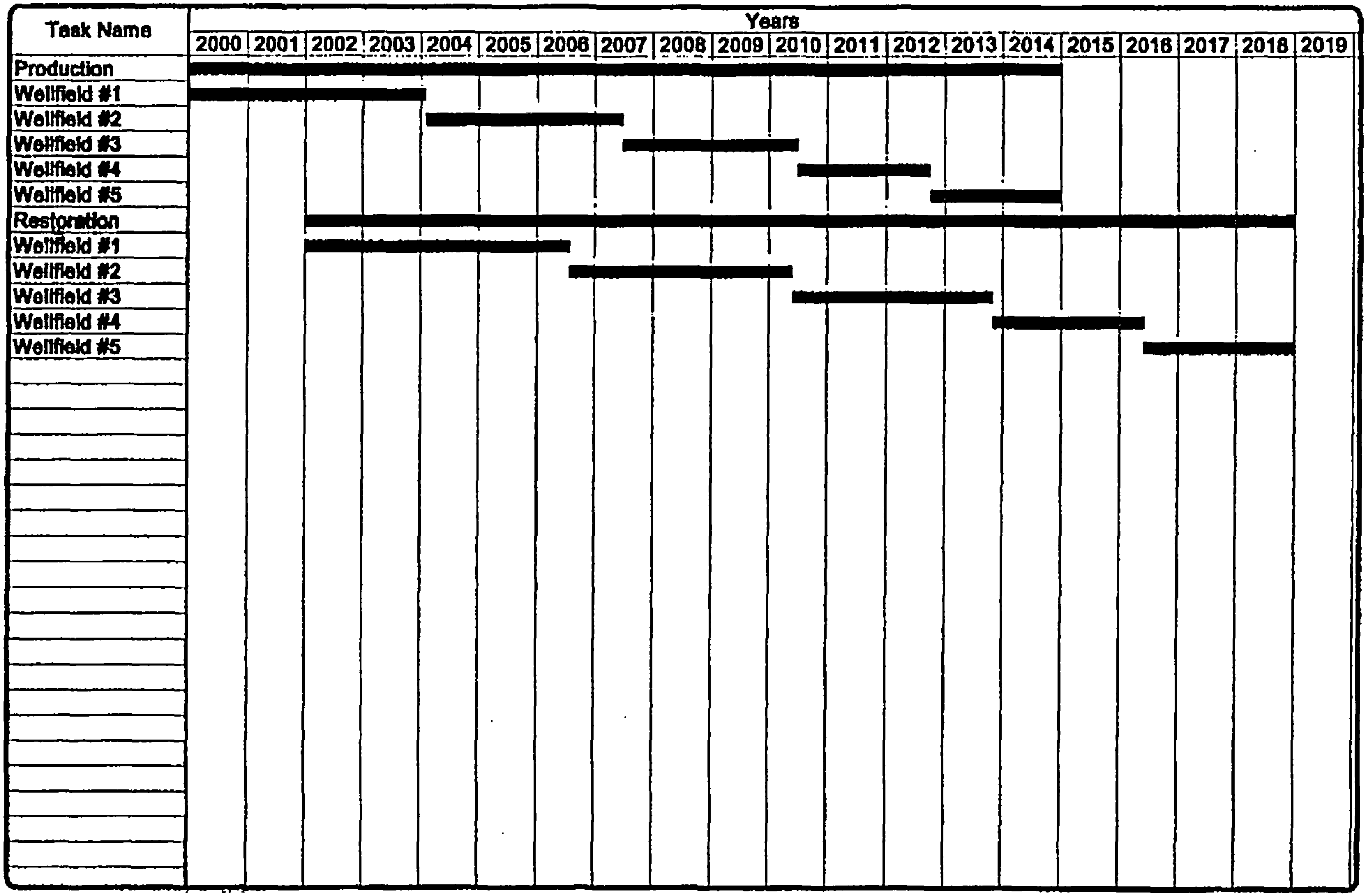


FIGURE 1.4-2

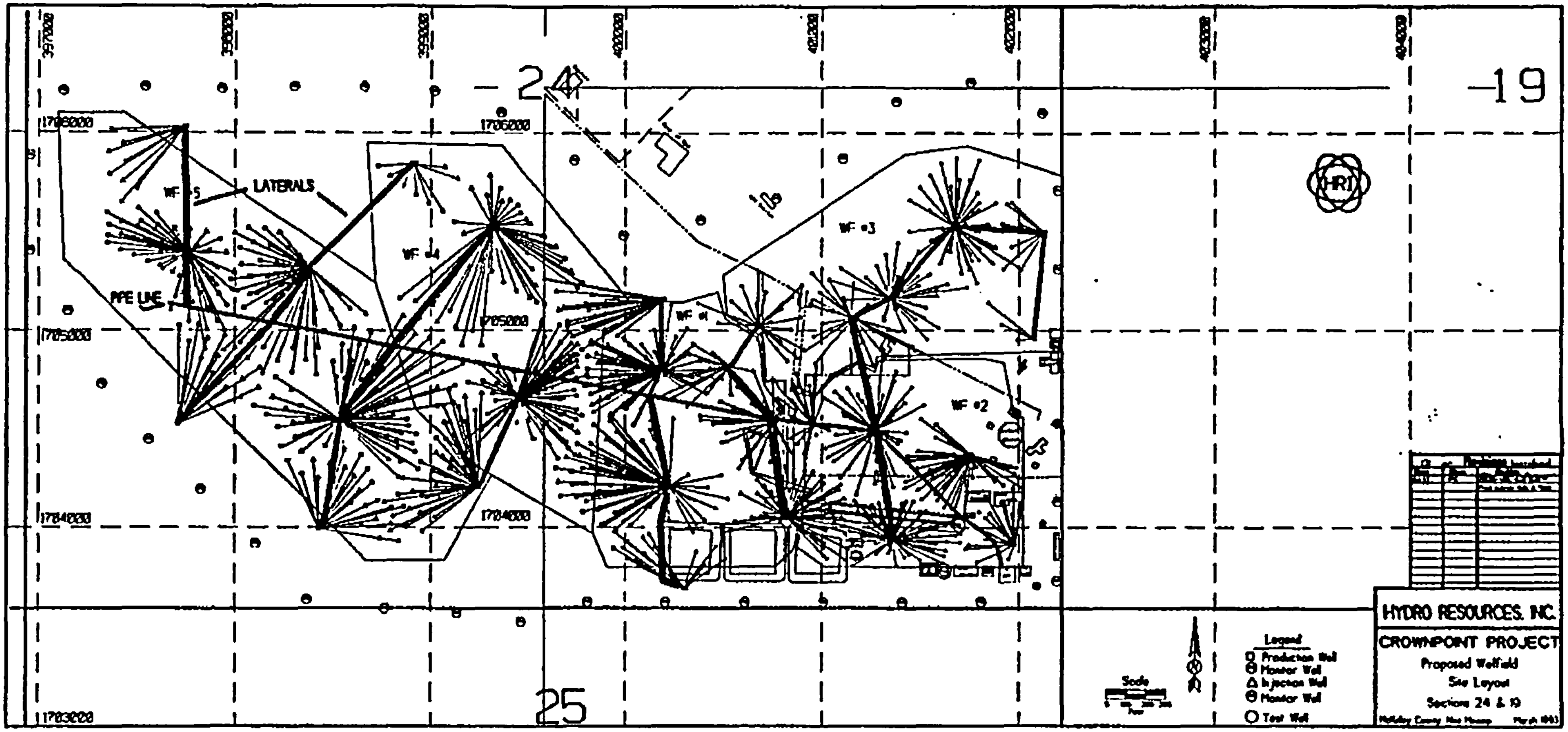
397000
398000
399000
400000
401000
402000
403000
404000
1706000
1705000
1704000
1703000
24
19
25
LATERALS
PIPE LINE
WF #1
WF #2
WF #3
WF #4
WF #5
HRI
HYDRO RESOURCES, INC.
CROWNPOINT PROJECT
Proposed Wellfield
Site Layout
Sections 24 & 19
McKinley County New Mexico
March 1993
Legend
Production Well
Monitor Well
Injection Well
Monitor Well
Test Well
Scale
Feet

FIGURE 1.4-3

1.4.2 Unit 1

The proposed mining plan at the Unit 1 Satellite Operating Area #1 is summarized on Figures 1.4-4, and 1.4-5. Within the wellfield, individual wells will be shut down when they cease to be economically productive. When an entire segment of a wellfield has been depleted of uranium, restoration will be started via ground water sweep, and/or reverse osmosis treatment, and brine concentration. The estimated productive/restoration life of Operating Area #1 is 6.5 years. All timing is subject to discovery of additional reserves which will, by necessity, extend the mine life before final decommissioning.

1.4.3 Churchrock

The proposed mining plan at Churchrock is summarized on Figures 1.4-6 through 1.4-8. Individual mine areas which are listed on Figures 1.4-6, and 1.4-7 are shown on Figure 1.4-8. Production will proceed first on Section 8. Within the wellfield, individual wells will be shut down when they cease to be economically productive. When an entire segment of a wellfield has been depleted of uranium, restoration will be started via ground water sweep, and/or reverse osmosis treatment, and brine concentration. The estimated productive/restoration life of the wellfields at Churchrock Section 8 is 5.5 years.

Production is scheduled to begin on Section 17 following Section 8 with the same production/restoration criteria stated above. The estimated production/restoration life of the well fields at Churchrock Section 17 is 4.5 years, including final decommissioning on Section 8 at the end of the project. All timing is subject to discovery of additional reserves which will, by necessity, extend the mine life before final decommissioning.

1.5 Waste Disposal

HRI will maintain an area within the restricted area boundary for storing contaminated materials prior to disposal. All contaminated pond residue, and other waste will be disposed of at an NRC-or Agreement State-licensed waste disposal site. Prior to beginning operations, HRI will develop, and maintain an agreement for the disposal of 11e(2) by-product material with a facility licensed by the NRC, or an Agreement State to accept such material. Liquid wastes will be disposed of by either surface irrigation, surface discharge, deep disposal well, or evaporation.

Unit 1 Operating Area 1

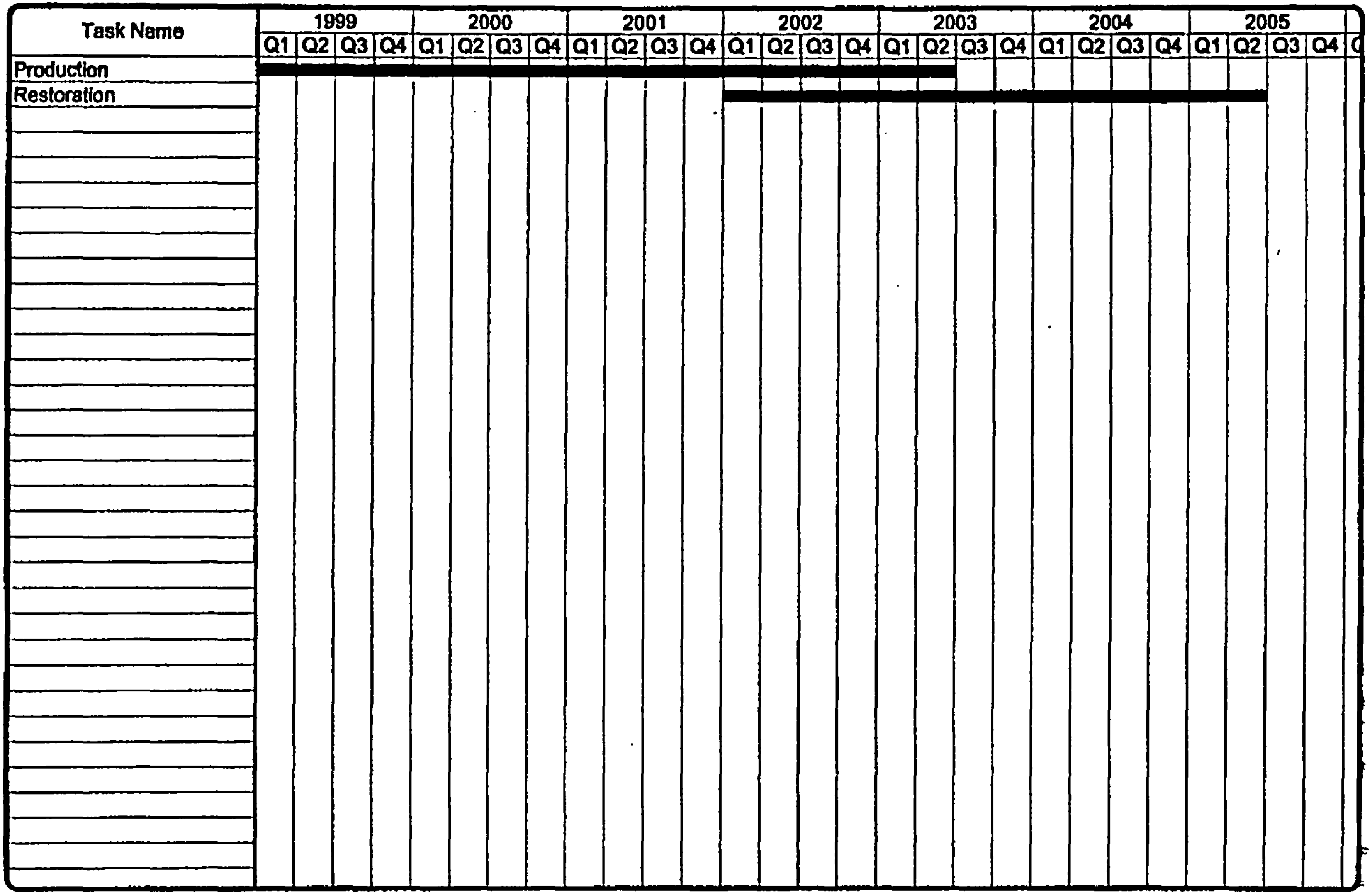


FIGURE 1.4-4

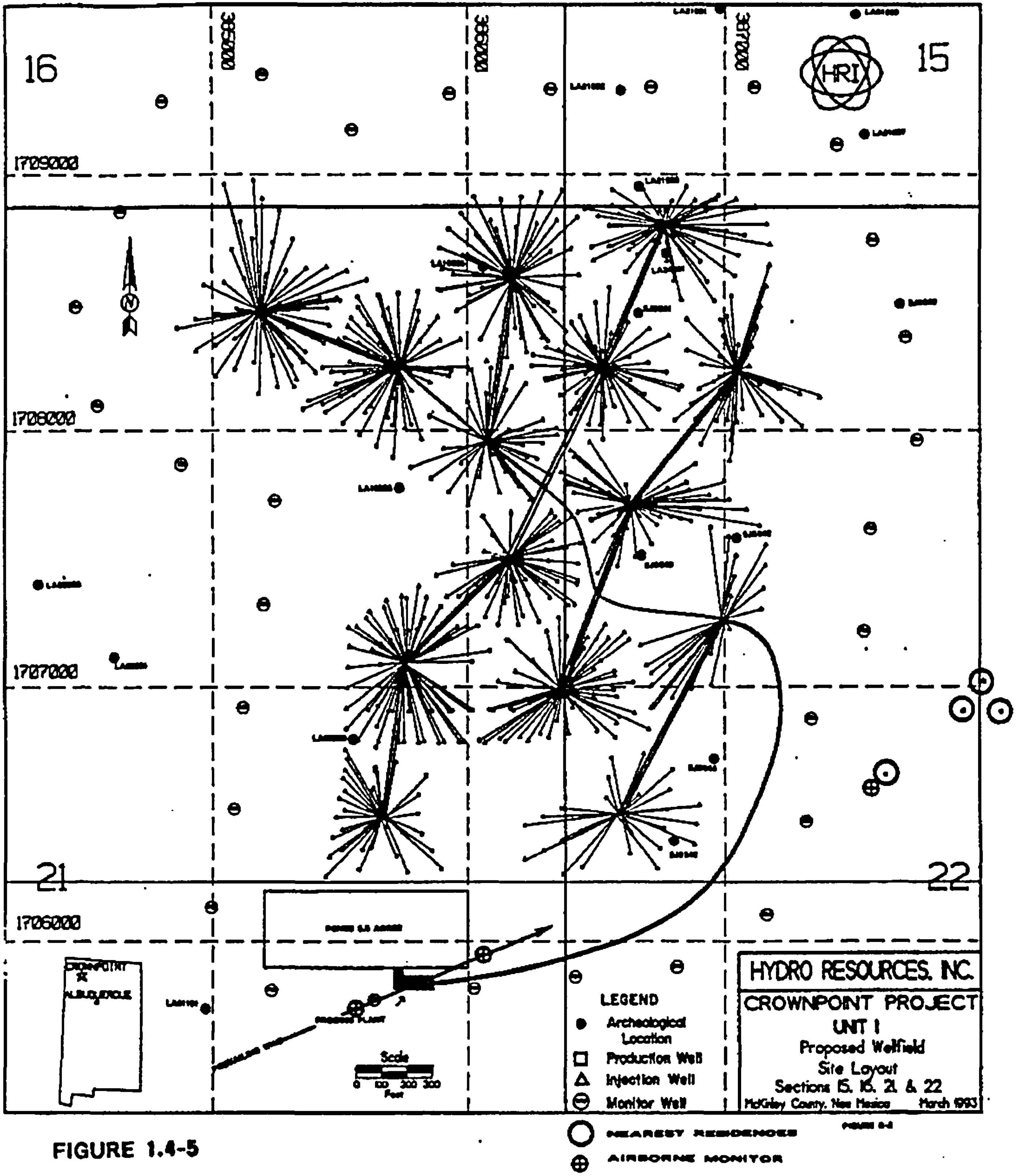

16
15
21
22
HRI
N
385000
386000
387000
1709000
1708000
1707000
1706000
CROWNPOINT
ALBUQUERQUE
Scale
0 100 200 300
Feet
LEGEND
Archeological Location
Production Well
Injection Well
Monitor Well
NEAREST RESIDENCES
AIRBORNE MONITOR
HYDRO RESOURCES, INC.
CROWNPOINT PROJECT
UNIT I
Proposed Wellfield
Site Layout
Sections 15, 16, 21 & 22
McKinley County, New Mexico
March 1993

FIGURE 1.4-5

Churchrock Section 8 Mine Plan

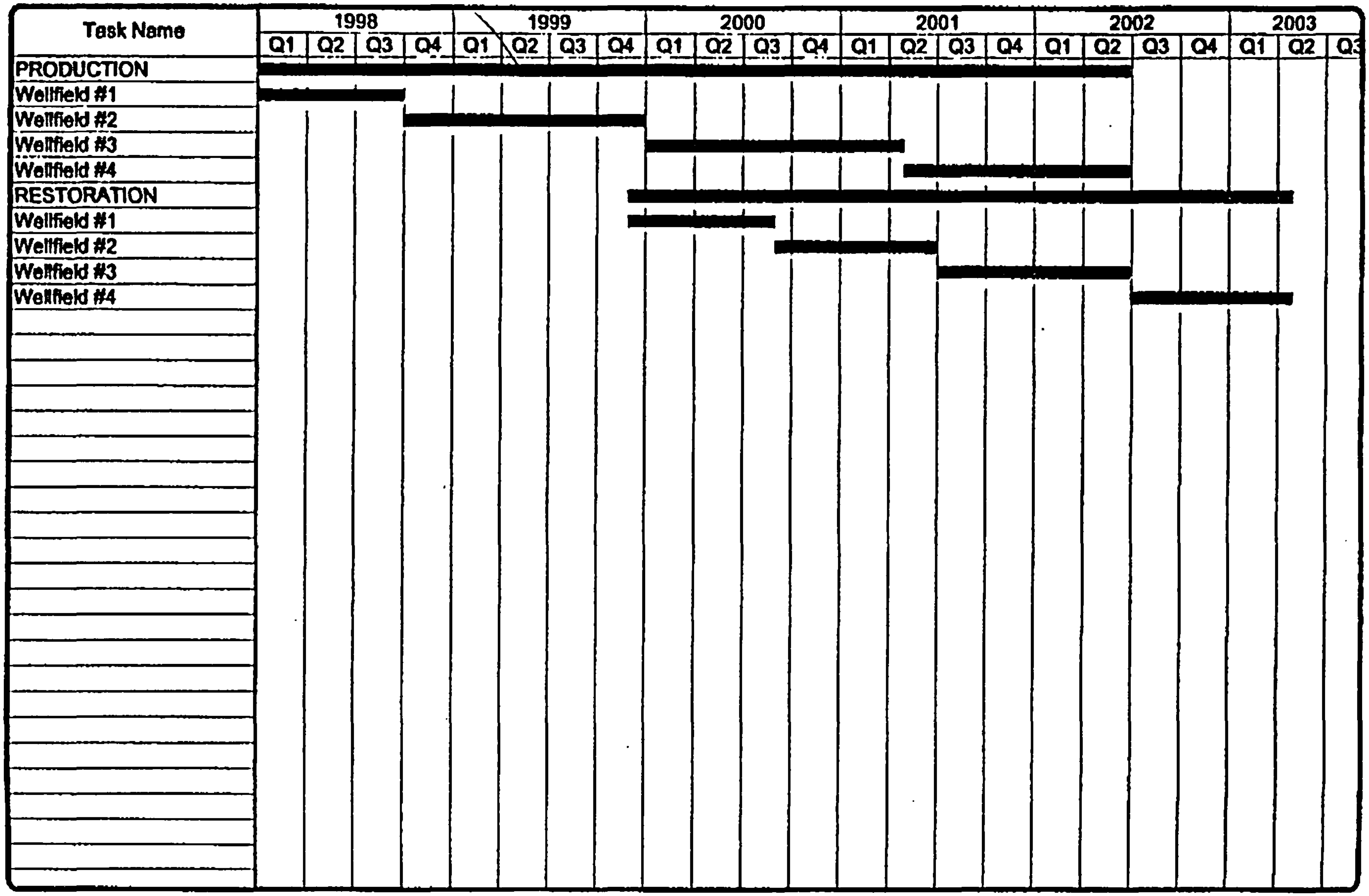


FIGURE 1.4-6

Churchrock Section 17 Mine Plan

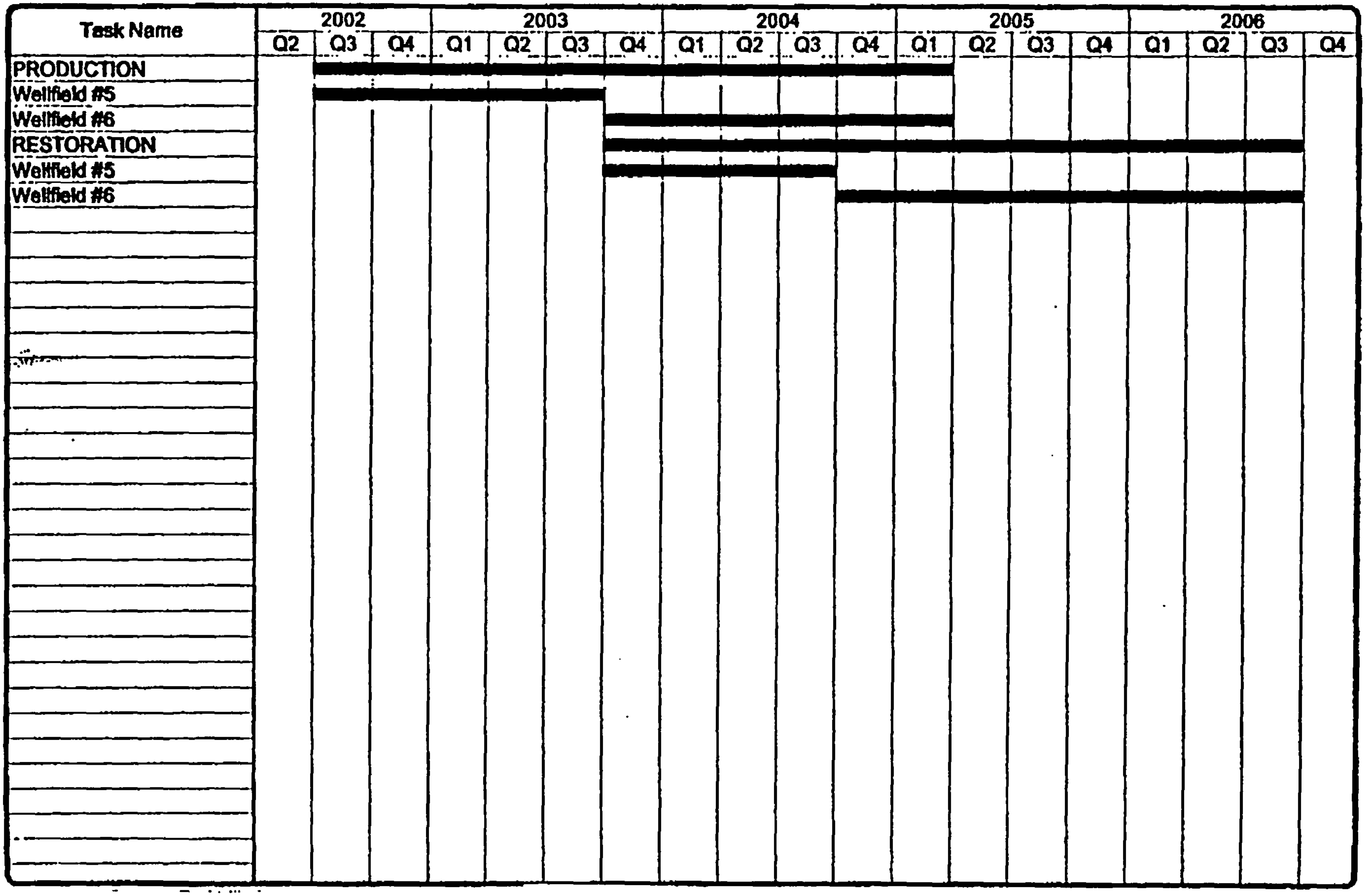


FIGURE 1.4-7

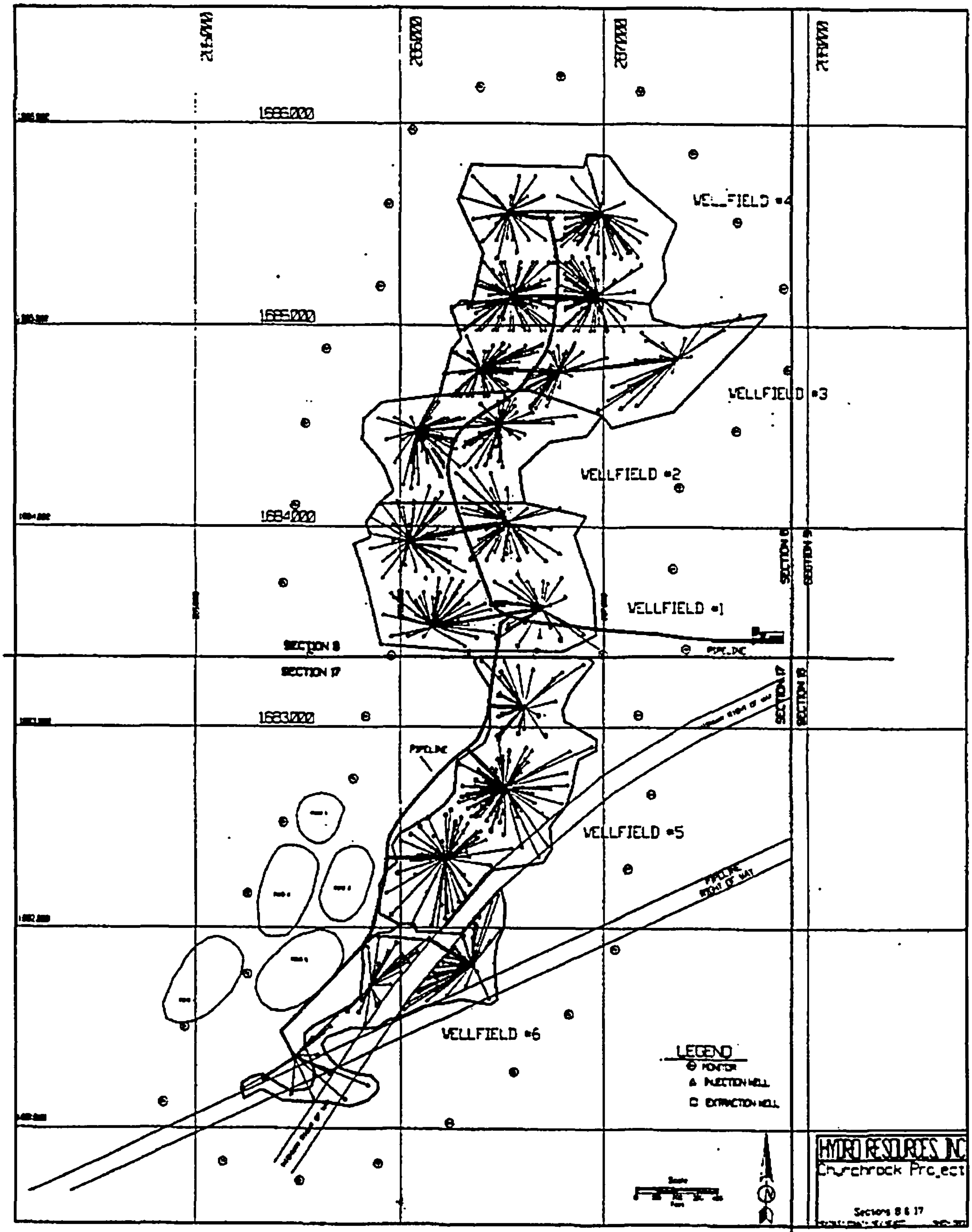

2066000
2067000
1686000
1685000
1684000
1683000
WELLFIELD #4
WELLFIELD #3
WELLFIELD #2
WELLFIELD #1
WELLFIELD #5
WELLFIELD #6
SECTION 8
SECTION 17
SECTION 8
SECTION 9
SECTION 17
SECTION 16
PIPELINE
PIPELINE
PIPELINE RIGHT OF WAY
LEGEND
MONITOR
INJECTION WELL
EXTRACTION WELL
Scale
Feet
N
HYDRO RESOURCES INC
Churchrock Project
Sections 8 & 17

FIGURE 1.4-8

1.6 Surety Bonding

HRI will provide financial security for mine closure, including surface, and subsurface restoration, and reclamation. The amount of the surety will be determined by the NRC based on cost estimates for completion of the approved reclamation plan by a third party in the event that HRI defaults. The surety will be reviewed annually by the NRC, and adjusted to reflect expansions in operations, changes in engineering design, and inflation. The amount of surety will also be subject to NMED, and/or EPA regulatory approval, and the form will meet the requirements of NMWQQC 5-210.B.17, and/or 40CFR144.63.

1.7 Cultural Resources Management

HRI will maintain, and implement a final cultural resources management plan for all mineral operating lease areas, and other land affected by licensed activities, pursuant to the National Historic Preservation Act Section 106 review, and consultation process. The plan will provide specific procedures to implement HRI's policy of avoiding cultural resources. The plan will include archaeological, and traditional cultural property surveys of all lease areas, identification of protection areas where human activity will be prohibited, archaeological testing (by an archaeologist contracted to HRI, and holding appropriate permits from the Navajo Nation, and the State of New Mexico) before subsurface disturbance occurs at a specific location, and archaeological monitoring during all ground disturbing construction, drilling, and operation activities. In the event that previously unidentified cultural resources, or human remains are discovered during project activities, the activity in the area will cease, appropriate protective action, and consultation will be conducted, and if indicated, the artifacts, or human remains will be evaluated for their significance.

1.8 NRC Performance Based Licensing (PBL)

Consistent with NRC licensing policy, HRI is planning operations to be consistent with PBL license format. Under the PBL format, HRI will ensure the proper implementation of the Performance Based Condition. Under this format HRI can:

a. Make changes in the facility, or process, as presented in the COP,

b. Make changes in the procedures presented in the COP,

c. Conduct tests, or experiments not presented in the COP, without prior NRC approval, if HRI ensures that the following conditions are met:

1. The change, test, or experiment does not conflict with any requirement specifically stated in the license (excluding material referenced in the Performance Based License Condition), or impair HRI's ability to meet all applicable NRC regulations.

2. There is no degradation in the essential safety, or environmental commitments in the license.

3. The change, test, or experiment is consistent with NRC's conclusions regarding actions analyzed, and selected in the Final Environmental Impact Statement.

If the provisions of 1.8 are not met, HRI is required to submit an application for a License Amendment to the NRC. HRI's determinations whether the above conditions are satisfied will be made by a Safety, and Environmental Review Panel (SERP). The SERP will consist of a minimum of three individuals. One member of the SERP will have expertise in management, and will be responsible for managerial, and financial approval changes; one member will have expertise in operations, and/or construction, and will have expertise in implementation of any changes; and, one will be the Environmental Manager. Additional members may be included in the SERP as appropriate to address technical aspects in several areas, such as health physics, ground water hydrology, surface water hydrology, specific earth sciences, and others. Temporary members, or permanent members other than the three identified above, may be outside consultants.

1.9 Maintaining Records

HRI will maintain records of any changes made pursuant to the Performance Based License Condition until license termination. The records will include written safety, and environmental evaluations made by the SERP that provide the basis for the determination that the particular change is in compliance with the requirements referred to above. HRI will furnish an Annual Report to NRC that describes such changes, tests, or experiments, including a summary of the safety, and environmental evaluation of each. In addition, HRI will annually revise the COP of the License Application to reflect changes made under this condition.

2.0 SURFACE FACILITIES

The proposed CUP will consist of three separate facilities including the Churchrock, and Unit 1 Satellites, and the Crownpoint Central Plant, or CCP. Each plant of the CUP will contain equipment used for production, and restoration. The CCP, and individual satellite plants will be similar except the CCP will contain a dryer, and yellowcake drum storage area. In Situ mining is planned for each location.

2.1 Processing Plant Equipment

At each site, including the CCP, and satellites, HRI will conduct uranium mineral extraction using columns containing IX resin, vessels to store various solutions, piping, and pumps. The proposed process pumps lixiviant from the wellfield through the columns, and returns it to the wellfield injection circuit. The IX system will be operated in a closed system under low but continuous pressure. When uranium is removed from the resins, the concentrated uranium solution will be stored, and processed in precipitation tanks. Precipitated uranium will be sent through the drying process, where it will be partly dewatered, washed, dried, and packaged for storage, and shipment.

The CCP (Figure 2.1-1), and satellite processing plants (Figure 2.1-2) will contain various vessels to hold, and process liquid solutions. The principal vessels will include IX columns, elution columns, and yellowcake precipitation tanks. Other tanks will hold barren eluant, and yellowcake slurry. HRI's COP includes general specifications for all vessels, and piping. The specifications cite applicable American Society for Testing, and Materials (ASTM) standards for plastic, and fiberglass components, and American Society of Metallurgical Engineers (ASME) guides for all steel vessels that will be operated under pressure.

The satellite facilities at Churchrock, and Unit 1 will produce resin loaded with uranyl carbonate complex, or yellowcake slurry, but the CCP will also include drying, and packaging equipment. Access to the yellowcake storage area will be restricted. Liquid oxygen tanks will be located in the well fields. Other chemical storage tanks may be located on a concrete pad near the retention ponds.

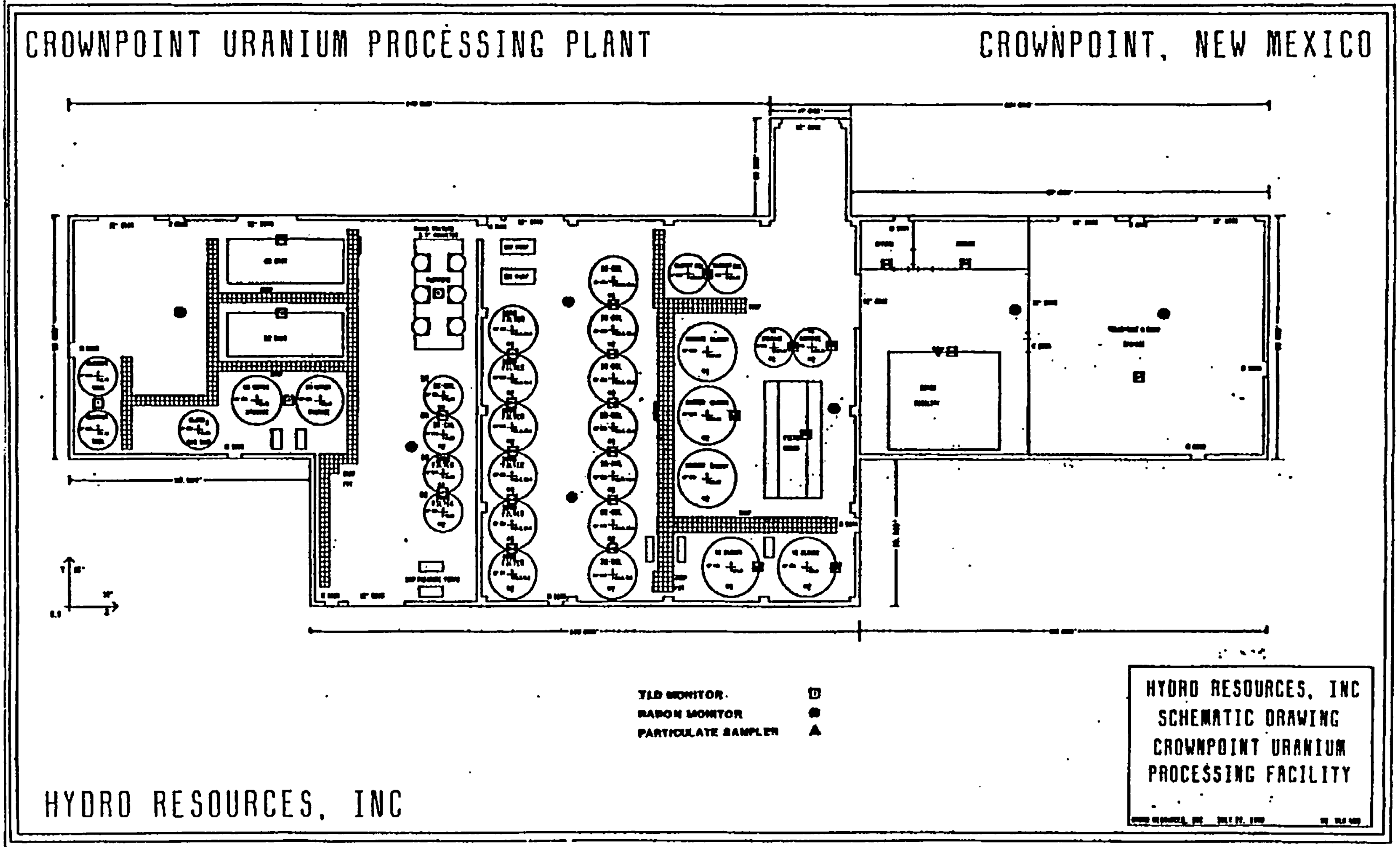
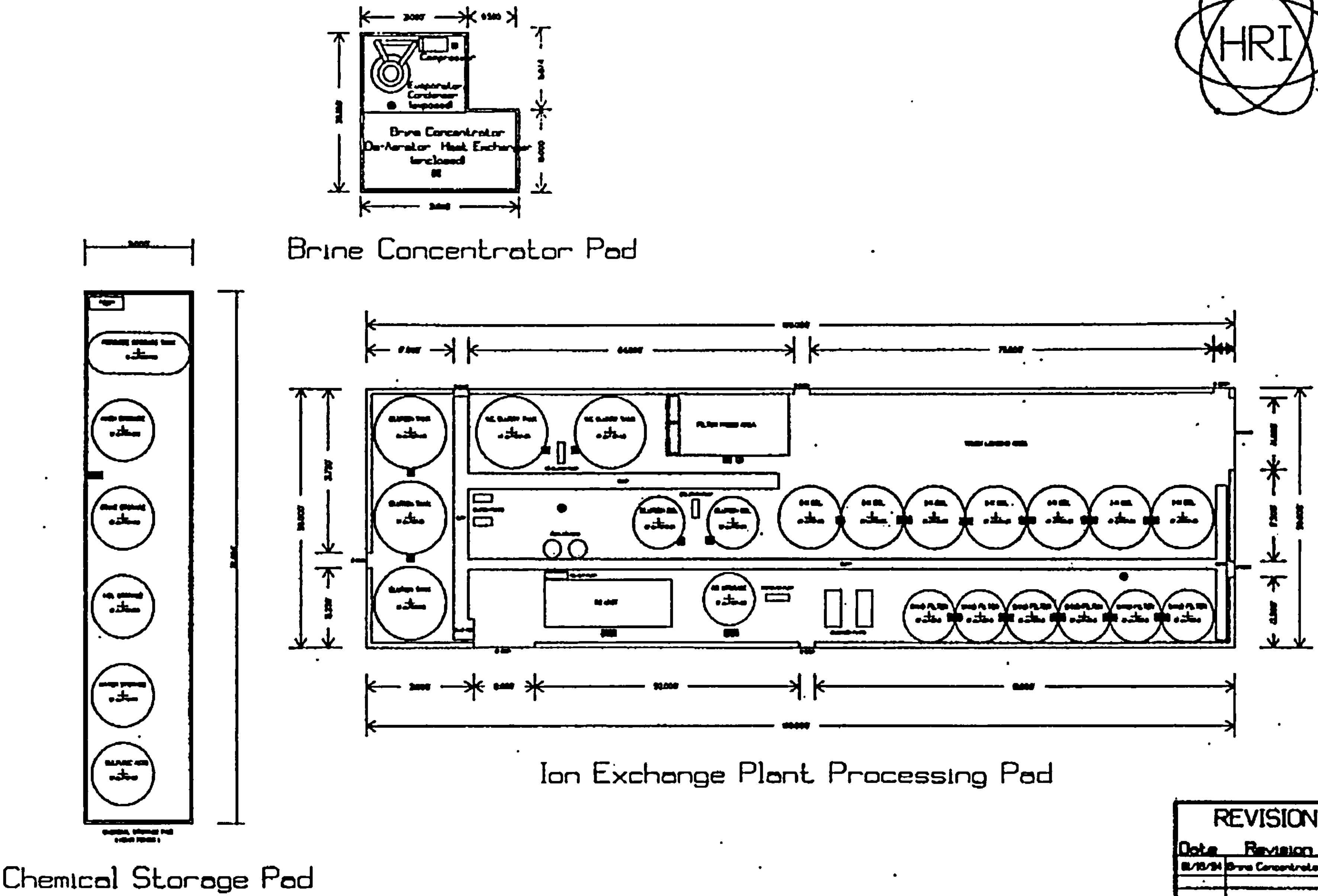

CROWNPOINT URANIUM PROCESSING PLANT
CROWNPOINT, NEW MEXICO
TLD MONITOR ▣
RADON MONITOR ●
PARTICULATE SAMPLER ▲
HYDRO RESOURCES, INC
SCHEMATIC DRAWING
CROWNPOINT URANIUM
PROCESSING FACILITY
HYDRO RESOURCES, INC

FIGURE 2.1-1



■ GAMMA RADIATION MONITOR
● RADON MONITOR
● PARTICULATE MONITOR

REVISION

Date	Revision	By
8/10/94	Brine Concentrator	MPG

HYDRO RESOURCES, INC

Ion Exchange Plant Location
Schematic Diagram
Churchrock Sec. 8 & Crownpoint Unit 1
Projects

McKinley County, New Mexico
Drawn By: R. L. [illegible]
December [illegible] 1993

FIGURE 2.1-2

Major structures to be provided at each facility initially include:

a. process pad, on which uranium ion exchange equipment will be located (Table 2.1-2);

b. waste retention ponds;

c. restoration treatment equipment also located in the processing plant;

d. office, and service building (laboratory control room, workshops, etc.);

e. production chemical storage pad, and;

f. brine concentrator pad.

Table 2.1-2 CUP Processing Equipment.

Restoration Equipment	Processing Equipment
Chemical Tanks	Chemical Tanks
Cleaners	Sand Filters
Mix Tank	Ion Exchange Columns
RO Water Storage	Pumps
Final Filters	Barren Eluant Columns*
RO Units	Yellowcake Slurry Tanks*
RO Ion Exchange	Yellowcake Storage Tanks*
RO Sand Filters	Filter Press*
Brine Concentrator	Dryer**

* If yellowcake is produced
** CCP Only

2.2 Process Pad

The process pad will be made of concrete, and provided with sumps, drains, and at least a 6 inch high curb at the periphery. Thicker footers will be provided where heavy processing equipment, and vessels will be located. The curb will be designed to confine, and hold potential spills in the plant, and potentially contaminated runoff from the processing equipment area. This spilled material will then be transferred into storage tanks, or lined retention ponds. The pad curb, and sump will be adequate to contain the volume of the largest tank on the pad.

2.3 Retention Ponds

Where practical at the CUP, retention ponds will be constructed such that all retained fluid is below ground level. This will eliminate the potential for embankment failure, and the need for

NRC Regulatory Guide 3.11 criteria. Retention ponds will be added as needed to accommodate the fluid handling requirements of the operation.

The purpose of retention ponds is to store waste, or restoration water until treatment, promote evaporative loss of water which cannot be discharged to the environment, and maintain control of source, and byproduct material found in the liquid effluents from solution mining. Initially, two, or more retention ponds will be constructed at each site. These ponds will occupy up to 6 acres. If below ground level construction is not possible, HRI commits to design, and construct its pond embankments to meet specifications in NRC Regulatory Guide 3.11, *Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills.*

Sixty days prior to beginning construction of wastewater retention ponds at any CUP production center, HRI will submit for NRC approval, detailed drawings, and analysis/calculations for the pond embankment locations, diversion channels, and erosion protection design. Additionally, HRI will demonstrate through detailed engineering analyses that the ponds, and diversion channels around the ponds will be stable under a probable maximum flood condition, in accordance with NRC Staff Technical Position #WM-8201, *Hydrologic Design Criteria for Tailings Retention Systems.* Included in this submittal will be HRI's planned SOP for inspecting, and maintaining the pond liners, and embankments, diversion channel, etc.

Standard provisions for the ponds will be two impermeable synthetic membrane liners: an inner 30 mil Hypalon liner, or equivalent, and an outer liner 36 mils thick made of Hypalon, or equivalent (1 mil=0.001 inch). A space 4 to 5 inches thick between the two liners will contain sand, or some other (granular) porous medium, and a drainage network of open piping, forming an underdrain leak detection system. The (inner) liner will provide secondary containment for any leakage that may occur. The ponds will be inspected daily for leakage. Fluid of any quantity found in the leak detection system will be cause for immediate corrective action, including immediate notification of NRC by telephone.

2.3.1 Churchrock Pond Design Features

Based on results of surface hydrological engineering analysis which HRI performed for the Churchrock Satellite process facility (Espey, Huston & Ass. Inc. 1993, 1996b), HRI concluded that the nearby, unnamed tributary of the Puerco River, and its overbanks do not affect the proposed satellite in the Probable Maximum Precipitation (PMP)/ Probable Maximum Flood (PMF) event. The Puerco River was not considered a flood hazard to the satellite due to its extreme horizontal separation from the site, more than 1 mile to the south. The backwater effects of the Puerco River on the unnamed tributary leading to the site are not considered substantial enough to warrant an in-depth investigation. The study concluded that a riprap diversion channel will be sufficient to route surface water reaching the proposed site. Further detailing of the channel is dependent on the proposed site grading, and will be part of the license condition.

2.3.2 Crownpoint Pond Design Features

In the event that HRI elects to maintain the existing on-site lined impoundments in their current location at the CCP, the channel, and erosion protection improvements as described in the following analysis will be performed.

A surface hydrological engineering analysis was performed to determine the adequacy of the existing drainage channel, and berms south, and west of the three impoundment ponds (Espey, Huston & Ass. Inc., 1996a). This channel was determined to be inadequately sized to carry a PMF event. A proposed solution was selected which is designed to prevent the PMF from overtopping the embankment, and to maintain effective erosion protection along its slope.

Initially, a surface water hydrologic analysis was performed for the site to determine a peak flow rate based on a PMP event. The selection of the PMP as a design storm based on NRC Staff Technical Position WM 8201 *Hydrologic Criteria for Tailings Retention Systems*. The particular PMP event selected is based on the criteria stated in Chapter 2: Design Flood Estimation from *Methodologies for Evaluating Long-Term Stabilization Designs of Uranium Mill Tailings Impoundments* prepared for the U.S. Nuclear Regulatory Commission, and HMR #49 *Probable Maximum Precipitation Estimates, Colorado River, and Great Basin Drainages* prepared by the National Weather Service. From these sources a 6-hour drainage average depth local-storm PMP was determined to be the most conservative PMP for this analysis.

Using USGS topography maps along with on-site 1"=100' scale topography maps, a 2.7 square mile drainage basin was determined for a design point approximately 3500 feet downstream of the existing facility site. This drainage basin was separated into drainage areas to determine how stormwater runoff reaches portions of the site. Soil Conservation Service (SCS) methodology was used to determine Runoff Curve Numbers (CN), and Time of Concentration (T) values. The CN values are conservatively estimated in the range of 87-88. The T values ranged from 20-45 minutes. This data was used in the U.S. Army Corps of Engineers (ACOE) HEC-1 Flood Hydrograph Computer Model, along with the calculated PMP, to calculate runoff hydrographs. From these hydrographs, peak flow rates were selected for use in calculating the PMF. Three rates were selected along the channel, and occur at approximately 2.5 hours into the 6-hour PMP, and are summarized in the Table 2.3-1.

Table 2.3-1 Hydrologic Summary Table

Location	Contributing Drainage Area	Peak Flow Rate for PMP
Upstream end of existing diversion channel (southeast corner of site)	1.37 mi^2	11428 cfs
Confluence of existing diversion channel, and arroyo (southwest corner of site)	1.75 mi^2	14516 cfs
Approximately 3500 feet downstream of the end of the diversion channel	2.73 mi^2	19599 cfs

To determine the PMF water surface profile, and channel velocities, an ACOE HEC-2 Water Surface Profile Computer Model was prepared. Supplemental information was determined using the ACOE HEC-RAS (River Analysis System) Computer Modeling Software. Topographical information for the channel, and its overbanks were determined using 1″=100′ scale on-site topography maps. Selection of other variables, such as surface roughness coefficients ('n' values), is based on a sensitivity analysis to determine the most conservative values.

Based on the existing conditions analysis, all three impoundment ponds are inundated by the PMF. The flooding of the westernmost pond (containing drill mud) is due in part by the backwater effect of the road, and culvert just to the northwest. However, the primary reason all three ponds are inundated is that the drainage channel is not adequately sized to accommodate the PMF. The high flows also produce high velocities within the channel as determined by the HEC-2 computer model. These velocities are sufficient to cause erosion of the existing embankment.

A proposed solution was selected that protects the two uppermost ponds, and abandons the use of the lowest pond (containing drill mud). This proposed solution begins by lowering, and widening the existing channel to a 40-foot bottom width with 3:1 sideslopes. The limits of this improvement fall between where the two arroyos reach the channel at the Southeast, and southwest corners of the site. The channel will expand to the south so as not to encroach on the existing embankment between the channel, and impoundment ponds. It will also be lowered to eliminate the concrete pad washout at the southwest corner, and to reduce the elevation of the PMF. Its slope will be approximately 0.005 with several small drops lined with rock riprap. In addition, rock riprap will be laid on the embankment between the impoundment ponds, and the channel to protect that slope from erosive velocities which still occur in this proposed condition, although at a reduced rate. Finally, the existing road, and culvert will be demolished, and converted to a low water crossing.

The riprap design for median rock size (D50), and layer thickness were determined by using methodologies described in *Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites* prepared for the NRC. Using the Safety Factors Method, a D50 size of approximately 16" has been preliminary determined based on flow depth, and channel slope. Additionally, the minimum thickness of the rock layer should be about three feet.

2.3.3 Unit 1 Pond Design Features

A qualitative description, and assessment of the surface water drainage conditions was conducted for the Unit 1 Satellite Site(Espey, Huston & Ass. Inc., 1996c). A portion of the Crownpoint, NM quadrangle, by USGS, and an aerial photo of the site, were used to conduct this qualitative analysis.

The Unit 1 Satellite is located approximately 3.5 miles west of Crownpoint. The proposed site lies on a high ridge between two existing shallow arroyos. These arroyos run from south to north, and begin on the north side of the access road to the site. The proposed site (building, and ponds) is no closer than 500 feet to either arroyo.

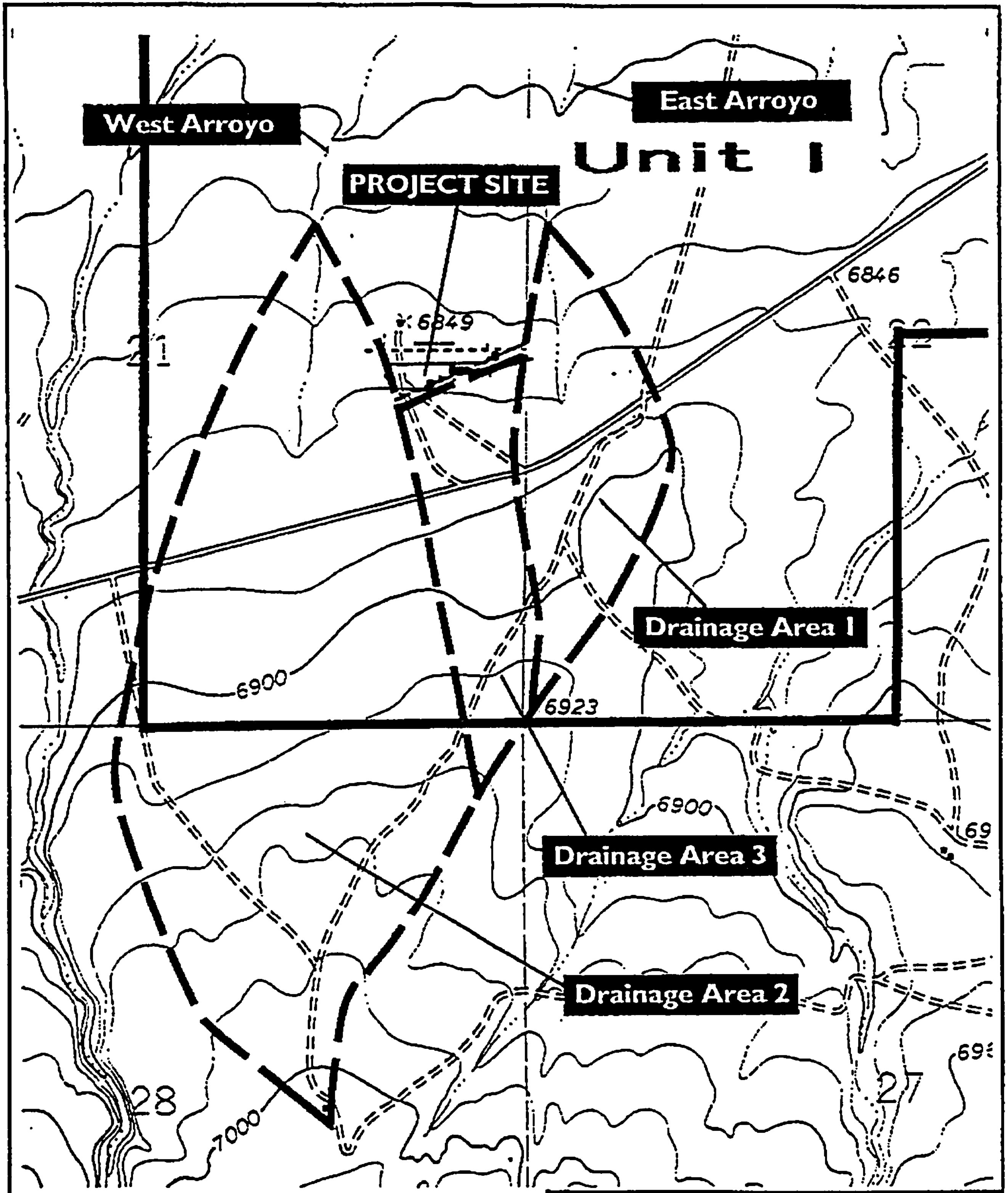
A Rational Method Calculation was performed to determine approximate flows reaching the arroyos in the vicinity of the project site during the Probable Maximum Precipitation (PMP) event. A full (100%) 1hr-1mi^2 PMP rainfall, adjusted for elevation, is approximately 8.9 inches. The rainfall depth is dependent on the rainfall duration for each drainage area. It was calculated by determining times of concentration (T_c) for the two small drainage areas leading to the arroyos, and using T_c as an approximate rainfall duration. The rainfall duration, and depth were then used to determine rainfall intensity for each drainage area.

A possible solution to route Drainage Area 3 away from the proposed site is a diversion channel that directs flows toward the East Arroyo. Table 2.3-2 shows a breakdown of existing, and proposed hydrologic characteristics of the Drainage Areas based on their delineations shown on Figure 2.3-1.

Table 2.3-2 HYDROLOGIC (RATIONAL METHOD) SUMMARY TABLE

	Drainage Area (A) (ac)	Time of Concentration (T_c) (min)	Intensity (I=rainfall depth/duration) (in/hr)	Runoff Coefficient (C) (-)	Peak PMP Flow Rate (Q=CIA) (cfs)
East Arroyo, Existing Conditions (DA1)	55	27	17.2	1.0	946
Drainage Area 3, Existing Conditions	45	33	14.6	1.0	657
East Arroyo, Proposed Conditions (DA1+DA3)	100	35	13.9	1.0	1390
West Arroyo, Existing, and Proposed Conditions (DA2)	230	55	9.5	10.	2185

Using Manning's equation, routing Drainage Area 3 towards the East Arroyo could be handled by a trapezoidal channel 3' deep, 8' wide, with 5:1 sideslopes, at an incline of 2%. The velocity in this proposed channel is about 10 feet per second (fps), but erosion should be of minor significance considering the horizontal separation from the proposed site. With both arroyos Figure 2.3-1 beginning near the site, there is not much opportunity to accumulate significant flows, or flooding elevations. With the flows listed above, overtopping of the arroyos will be likely to occur, but the 500 foot separation between the arroyos, and the site should be more than sufficient to avoid the Probable Maximum Flood (PMF) Floodplain. A more detailed look at arroyo flooding will be part of the license



SOURCE: USGS TOPOGRAPHIC QUAD., CROWNPOINT, N.M.

EH&A Espey, Huston & Associates, Inc.
Engineering & Environmental Consultants

FIGURE 2.3-1

SITE LOCATION AND
DRAINAGE AREA MAP
8/30/96

condition. Local on-site drainage, and diversion will also be handled at a later date through the site development plans, and part of the license condition. Local on-site drainage, and diversion will also be handled at a later date through the site development plans, and part of the license condition.

2.4 Tankage

2.4.1 Fiberglass Vessels

The standard utilized in the fabrication of fiberglass reinforced tanks conform to Voluntary Product Standard PS 15-69. This voluntary standard, initiated by the Society of Plastics Industry, Inc., developed under the Procedures for the Development of Voluntary Product Standards, published by the Department of Commerce. The purpose of this product standard is to establish a national basis for standard sizes, dimensions, and significant quality requirements for commercially available, glass-fiber-reinforced, chemical-resistant process equipment. Nomenclature used in the industry comes from American Society for Testing, and Materials (ASTM) Designation D883-69, Standard Nomenclature Relating to Plastics, and includes the following definitions:

a. Glass Content - Glass content will be determined in accordance of ASTM Designation D2584-67T, Tentative Method of Test for Ignition Loss of Cured Reinforced Resins.

b. Tensile Strength - Tensile strength will be determined in accordance with ASTM Designation D638-67T, Standard Method of Test for Tensile Properties of Plastics.

c. Flexural Strength - Flexural strength will be determined in accordance with Procedure A, and Table 1 of ASTM Designation D790-66, Standard Method of Test for Flexural Properties of Plastics.

d. Flexural Modulus - The tangent modulus of elasticity in flexure will be determined by ASTM Method D790-66.

e. Hardness - The hardness will be determined in accordance with ASTM Designation D2583-67, Standard Methods of Test for Indentation Hardness of Plastics by Means of a Barcol Impressor.

2.4.2 Vessel Design - Fiberglass

The design of vessel wall thickness is predicated on using a safety factor of 10 to 1; using mechanical property data for Glass Content, Tensile Strength, Flexural Strength, Flexural Modulus, and Hardness; utilizing a liquid specific gravity of 1.2; and temperatures of 180 degrees Farenheit. Glass content, tensile strength, flexural strength, flexural modulus, and hardness will be determined in accordance with the American Society for Testing Materials (ASTM).

2.4.3 Choice of Fiberglass

When bidding fiberglass vessels to commercial fabricators, HRI always requests conformity to Voluntary Product Standard PS 15-69. This standard addresses the criteria used in manufacturing fiberglass flanges, vents, elbows, tees, crosses, eccentric reducers, and the compounds. Finally, the resin of choice for most applications within the recovery operation is one that can stand up to acids, and bases over a broad pH spectrum.

2.4.4 Steel Vessels

Sand filters, and downflow ion exchange vessels will be fabricated from steel using the American Society of Metallurgical Engineers (ASME) guide of Section VIII, Division 1, for the design, and fabrication of pressure vessels. This design incorporates a safety factor of four times the design pressure at conditions specified by the end user. Pressure testing for at least one hour at 1.5 times maximum operating pressures is required to obtain ASME coding. HRI specifies all of its steel pressure vessels to be built to these standards.

2.4.5 Piping

Process piping within the plant facility will be made of steel, polyvinyl chloride (PVC), fiberglass, and high density polyethylene (HDPE) of varying diameters, and wall thickness which follow ASTM standards. Wherever applicable, the use of PVC, and HDPE piping will be utilized because of their superior rating for chemical resistivity.

a. PVC Piping - ASTM standards for PVC pipe, and fittings are divided among five groups. These groups are: Group A, Plastic Pipe Specifications; Group B, Plastic Pipe Fittings Specifications; Group C, Plastic Piping Solvents, Cements, and Joints; Group D, Methods of Test; and Group E, Recommended Practices. In addition, Product Standards have been established for each grouping. Type I, and II PVC are defined by manufacturer's recommended standards, and these standards originated from Product, and ASTM Standards.

Processing solutions are normally transferred under load pressures (<150 psig) within the plant facility. According to PS 21-70, and ASTM 1785, the maximum working pressure at 73.4 degrees Fahrenheit for 8 inch, schedule 40 PVC is 160 psig. Most PVC piping within the extraction facility will range below 6 inches in diameter. Maximum working pressure for 6 inch diameter PVC is 180 psig. Schedule 80 PVC, which has a wall thickness slightly larger than schedule 40, can sustain maximum operating pressures at higher levels. For example, 6 inch diameter schedule 80 PVC pipe has a maximum operating pressure of 280 psig.

All process piping will be designed in accordance with generally accepted engineering standards according to the flowrate, required pressure, and the medium being processed. Process pumps will also be sized to minimize required discharge pressures to achieve transfer requirements as specified.

b. Steel Piping - The use of steel piping will be minimized within the water treatment facility. However, if steel pipe is specified for a particular application, then the rated operating pressure for that pipe will be used in the design specifications. The construction of line steel pipe conforms to ASME A53 for standard plain end pipe. For example, Grade A pipe of dimensions 8 inches, 10 inches, and 12 inches have maximum operating pressures of 1,300, 1,200, and 1,400 psig respectively. These safe operating pressures far exceed any that will be employed at either the central plant, or satellite facilities.

HRI will employ all safety, and design features that have been successfully employed at its twin operations in Texas. The use of generally accepted engineering design will be utilized in the specification, and selection of piping, and tankage.

2.5 Yellowcake Dryer at Crownpoint

Yellow-cake slurry at Crownpoint will be dried by a batch-type rotary vacuum dryer system. The drying, and packaging will occur in the same area. Yellowcake drums awaiting shipment will be stored on a curbed concrete pad inside the restricted area.

a. a drying chamber, approximately 4 ft. by 12 ft., equipped with an internal mixing auger, and a mechanism for directly discharging the dried product into 55 gallon drums;

b. a bag filter to capture, and return to the drying chamber the entrained solid particles present in the exiting vapor stream;

c. a water-cooled condensing unit to cool, and liquefy water evaporated from the yellowcake slurry;

d. a vacuum pump, and;

e. a recirculating closed-loop hot oil heating system that uses a propane, or natural gas-fired, or electric boiler to heat the oil.

2.5.1 Operation of the Vacuum Dryer

A feed slurry, containing approximately 50% water by volume, is pumped into the drying chamber. Slurry transfer is made by hydraulic transport through a pumping loop. A complete batch (approximately 2500 kg of yellow-cake) obtained from the filter press is transferred to the dryer, and a record of the production inventory is kept by weighing the yellow-cake drums. Drying is achieved at about 100 degrees Celsius in a vacuum of 18 to 26 inches of mercury, with the hot oil recirculating around the drying chamber at about 230 degrees C. Drying progress is monitored by the rise in level of condensed water in the condenser column. Drying time is typically 9-14 hours per batch. Total cycle time including cooling, drum packaging, and refilling is about 16 to 24 hours.

HRI will, during all periods of yellowcake drying operations, ensure that the manufacturer recommended vacuum pressure is maintained in the drying chamber. This will be accomplished by continuously monitoring differential pressure, and installing instrumentation which will signal an audible alarm if air pressure differential falls below the manufacturers recommended levels. Yellowcake drying operations will be immediately suspended if any emission control equipment for the yellowcake drying, or packaging areas is not operating within the specifications for design performance.

2.5.2 Dryer Control of Particulates Emissions

The bag filter is designed to recover 99.5% of the solids entrained in the water vapor, and any solids escaping this filter are captured by the circulating sealant water within the vacuum pump. This water, which is kept cool by passage through a cooling tower, is periodically diverted to the production circuit to recover collected yellowcake particles, or is diverted to the wastewater circuit. The vapor discharge line from the vacuum pump is vented to the atmosphere.

2.5.3 Packaging

Dried yellowcake will be packaged in appropriately labeled, USDOT-approved, 55 gallon drums. Each drum in turn will be placed on a vibrating platform beneath the drying chamber, raised hydraulically, and secured at the rim to the dryer discharge chute. Drums will contain 650-1000 pounds of yellowcake. Filled drums will be lowered, covered, sealed, weighed, labeled, and moved to storage by means of forklift trucks, or dollies specifically designed for this purpose.

2.5.4 Transportation of Chemicals, and Reagents

HRI uses a number of reagents in the production of yellowcake. The primary reagents that will be transported are HCl, NaOH, $NaHCO_3$, H_2O_2, compressed liquid CO_2, liquid O_2, and NaCl. All transportation will be on paved roads except for a 9200 foot segment of unpaved, maintained road between Unit 1, and Navajo Highway #9, and a 1500 foot maintained segment of Church Road between Navajo #9, and the CCP.

2.5.5 Transportation To/From CCP

Because resin, or slurry will be transported from Churchrock, and UNIT I, and dried product will be transported from CCP, transportation safety must be addressed. At the maximum production rate of 1 million lbs. per year for each satellite it is anticipated that either 100 shipments of yellowcake, or 1000 shipments of resin will be transported from each satellite facility to the CCP per year. All transportation will be on paved roads except for a 9200 foot segment of unpaved, maintained road between the Unit 1 satellite, and Navajo Highway #9, and a 1500 foot maintained segment of Church Road between Navajo 9, and the CCP. Additionally, HRI will utilize the by-pass route so shipments of material will not pass through the town of Crownpoint. All delivery trucks used to transport project materials (resin, uranium slurry, yellowcake, etc.) will carry the appropriate certificates of safety inspections, and all delivery truck drivers will hold appropriate licenses. The transportation route is shown on Figure 2.5-1.

2.5.6 Transportation of Yellowcake to Conversion Plant

Following drying, and packaging of the yellowcake product, the product is sold to utilities. Yellowcake is sold, and transported from the CCP with the same precautions defined in 2.5.5 except that the yellowcake will be shipped south on Highway 371 to Interstate 40 near Thoreau. Depending on production levels, twenty to sixty shipments a year are anticipated.

2.6 Wellfields

2.6.1 Churchrock

Wellfields at the Churchrock satellite facility will be confined to T16N, R16W, Sections 8 & 17 as described in Section 1.1.2. The Churchrock satellite will consist of one mine unit which will be developed in two phases: the Section 8 phase, and the Section 17 phase. The mine area (the area completely contained within the monitor well ring) will consist of approximately 200 acres.

The layout of the wellfield is shown on Figure 1.4-8. It is in the floor of the valley, and will not be affected by the nearby escarpments. Fully developed, it will consist of multiple injection, and production wells which will feed into approximately 19 metering houses. All distribution lines from the individual wells to the meter house will be buried below frost depth. Main trunklines will be on the surface, or buried, and will lead from the meter houses to the Satellite plant on Section 8.

2.6.2 Crownpoint

Wellfields at the CCP will be confined to T17N, R12W, & R13W as described in Section 1.1.1. The initial operating area will consist of one mine unit on the south 1/2 of Section 24. The mine area (the area completely contained within the monitor well ring) will consist of approximately 355 acres. The layout of the initial wellfield is shown on Figure 1.4-3. The wellfield will be located on flat terrain. Fully developed it will consist of multiple injection, and production wells which will feed into approximately 25 metering houses. All distribution lines from the individual wells to the meter house will be buried below

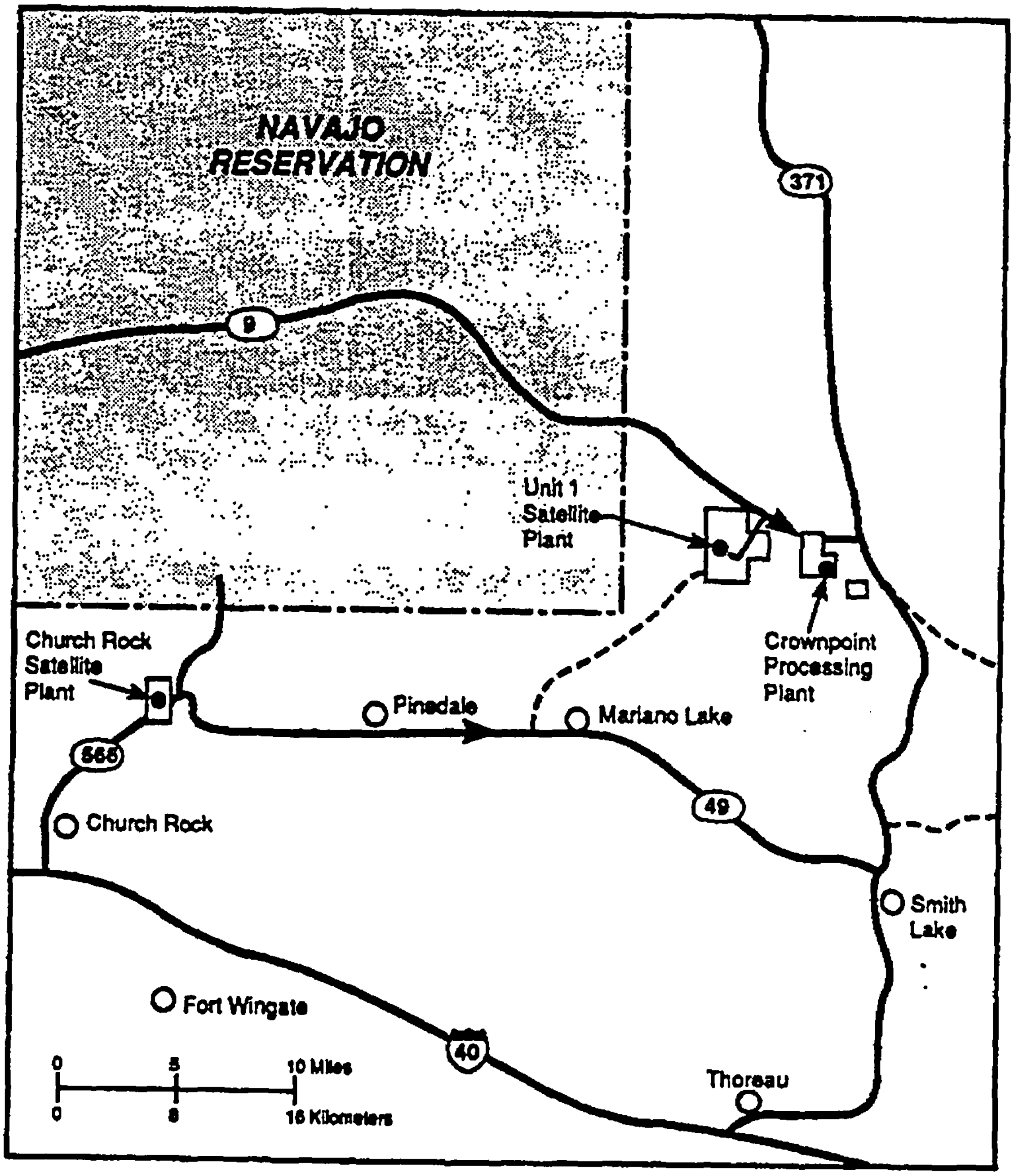


FIGURE 2.5-1 Haul routes for yellowcake slurry from satellite plants to the Crownpoint plant.

frost depth. Main trunklines will be on the surface, or buried, and will lead from the meter house to the adjacent CCP.

2.6.3 Unit 1

Wellfields at the Unit 1 satellite will be confined to T17N, R13W as described in Section 1.1.3. The initial operating area will consist of one mine unit centered in the land block. The mine area (the area completely contained within the monitor well ring) will consist of 750 acres when fully developed.

The layout of the initial wellfield is shown on Figure 1.4-5. It will consist multiple injection, and production wells which will feed into approximately 14 metering houses. All distribution lines from the individual wells to the meter house will be buried below frost depth. Main trunklines will be on the surface, or buried, and will lead from the meter house to the Satellite plant on Section 21.

2.7 Land Application of Approved Waste Water

Depending on restoration strategy, process waste water during restoration may be used for land application. This waste water will undergo appropriate treatment to remove uranium, and radium, and will have acceptable quality standards.

2.7.1 Churchrock

HRI has identified one property for possible acquisition for the purpose of licensed land application of approved waste water. Additionally, HRI has rights to a number of blocks of property topographically suitable for land application.

Section 16 - T16N, R16W - is property which is owned by the state of New Mexico. The property consists of 640 acres, of which most is pasture, and will be suitable for land application. Its proximity to the Churchrock satellite makes it an attractive location for land application. This will be the largest potential parcel that will be considered for land application. For the purpose of cumulative impact, the maximum affected area will be 640 acres.

HRI also has surface rights on additional properties:

a. The land south of Highway 566 in the NE/4 of Section 17, T16N, R16W, comprises approximately 80 acres of pasture which will be suitable for land application. HRI holds a surface lease on this property;

b. HRI owns federal mining claims on the NE/4, and W/2 of Section 8, T16N, R16W, which consists of 480 gross acres. Approximately 206 acres of this land consist of flat mesa which will be suitable for land application, and;

c. HRI owns federal mining claims on Section 12, T16N, R17W, which consists of 640 gross acres. Approximately 270 acres of this land consists of flat mesa which will be suitable for land application.

The Section 16 property is the preferable location for land application of approved waste water because of the following three reasons:

- it is the largest block of relatively flat property,
- it is reasonably near to the Churchrock satellite facility,
- it is at approximately the same elevation as the satellite.

HRI will commit to filing an application with the NRC at the time irrigation plans have been finalized. Such an application will contain information on the environmental conditions of the parcel of land to be used.

2.7.2 Crownpoint/Unit 1

The land application area for the CUP CCP mine, and Unit 1 Satellite is land owned by HRI on T17N, R13W, Section 12 (Figure 1.1-2). This land comprises 640 acres which are suitable for land application.

3.0 OPERATIONAL PROCESSES

3.1 Introduction

At the CUP, the lixiviant will consist of native ground water to which gaseous oxygen, and gaseous carbon dioxide, and/or sodium bicarbonate have been added. After the lixiviant is injected into injection wells, and recovered from production wells, the mine fluids are pumped to the processing plant where the uranium is removed by passing the pregnant (uranium rich) lixiviant across ion exchange resin.

Loaded ion exchange resin, or wet yellowcake is periodically trucked to the CCP for processing into yellowcake. Yellowcake is dryed, and then stored in drums for shipment to a purchaser at a UF_6 conversion, or other nuclear fuel cycle facility. Process flow sheets for the CCP, and satellites are shown on Figures 3.1-1, and 3.1-2 respectively.

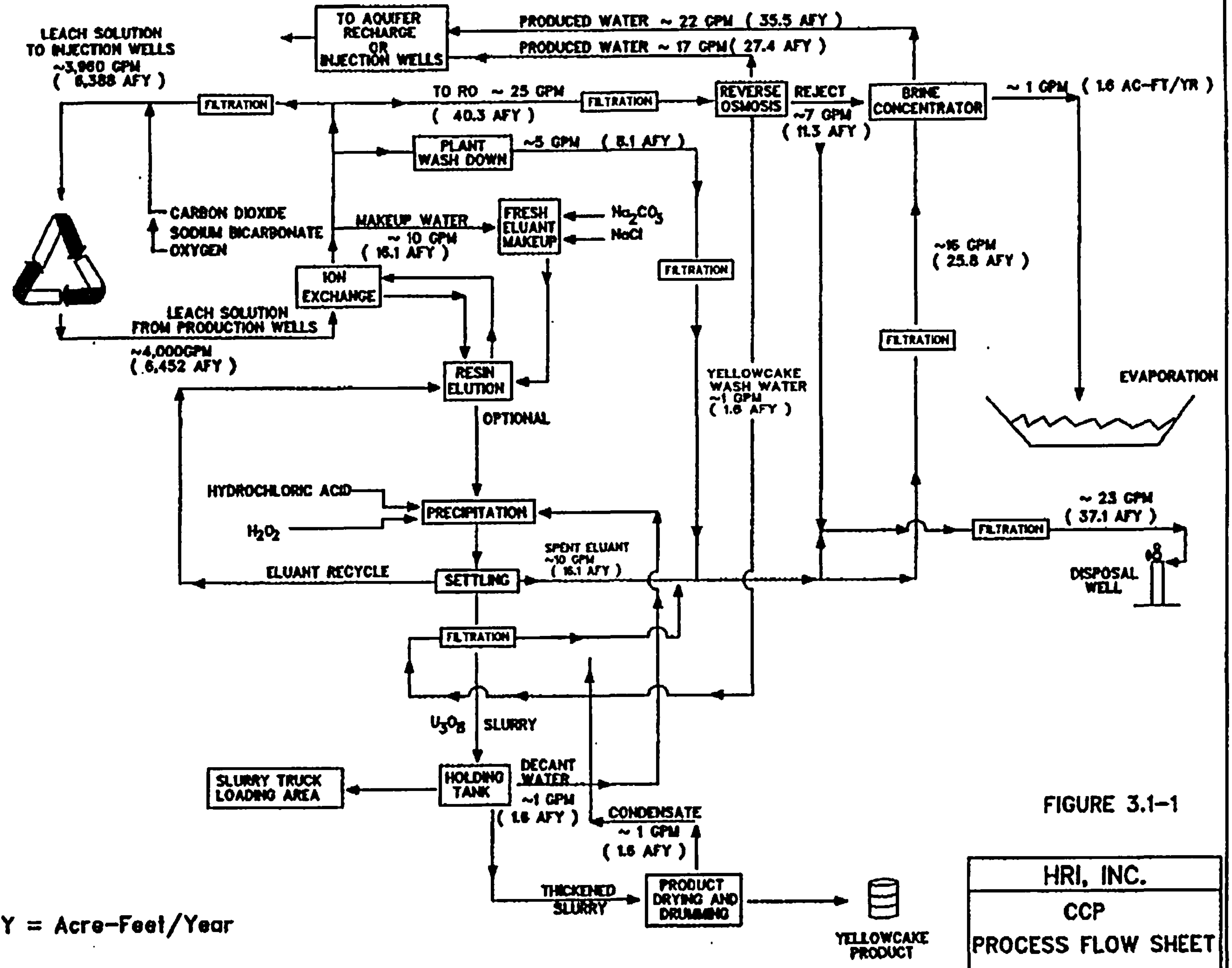
3.2 Lixiviant Injection/Recovery

Uranium, present in the host ore in a reduced insoluble form, will be oxidized by the lixiviant solution injected into the ore zone. Once uranium is oxidized, it complexes with bicarbonate anions in the groundwater, and becomes mobile. Mining will proceed with the continuous recirculation of fortified groundwater leaching solution through the uranium ore from the injection to the production wells. Uranium in the ore will react with the lixiviant to form a soluble uranyl dicarbonate complex.

$$2UO_2 + O_2 \rightarrow 2UO_3$$
$$UO_3 + 2NaHCO_3 \rightarrow NA_2UO_2(CO_3)_2 + H_2O$$

3.2.1 Lixiviant

The lixiviant, which is comprised of native ground water fortified with sodium bicarbonate, and/or gaseous carbon dioxide, and oxygen, is injected into injection wells. After passing through the ore zone, the pregnant lixiviant is pumped from production wells to the processing facility where the uranium is extracted by ion exchange onto resin. The resulting uranium depleted (barren) water will then be refortified with an oxidant such as O_2, or H_2O_2, and reinjected into the wellfield to repeat the leaching cycle. The lixiviant typically consists of the parameter concentrations shown in Table 3.2-1.



AFY = Acre-Feet/Year

FIGURE 3.1-1

HRI, INC.

CCP

PROCESS FLOW SHEET

B. Lichnovsky

REVISED MAY 8, 1997

CCP-PL4

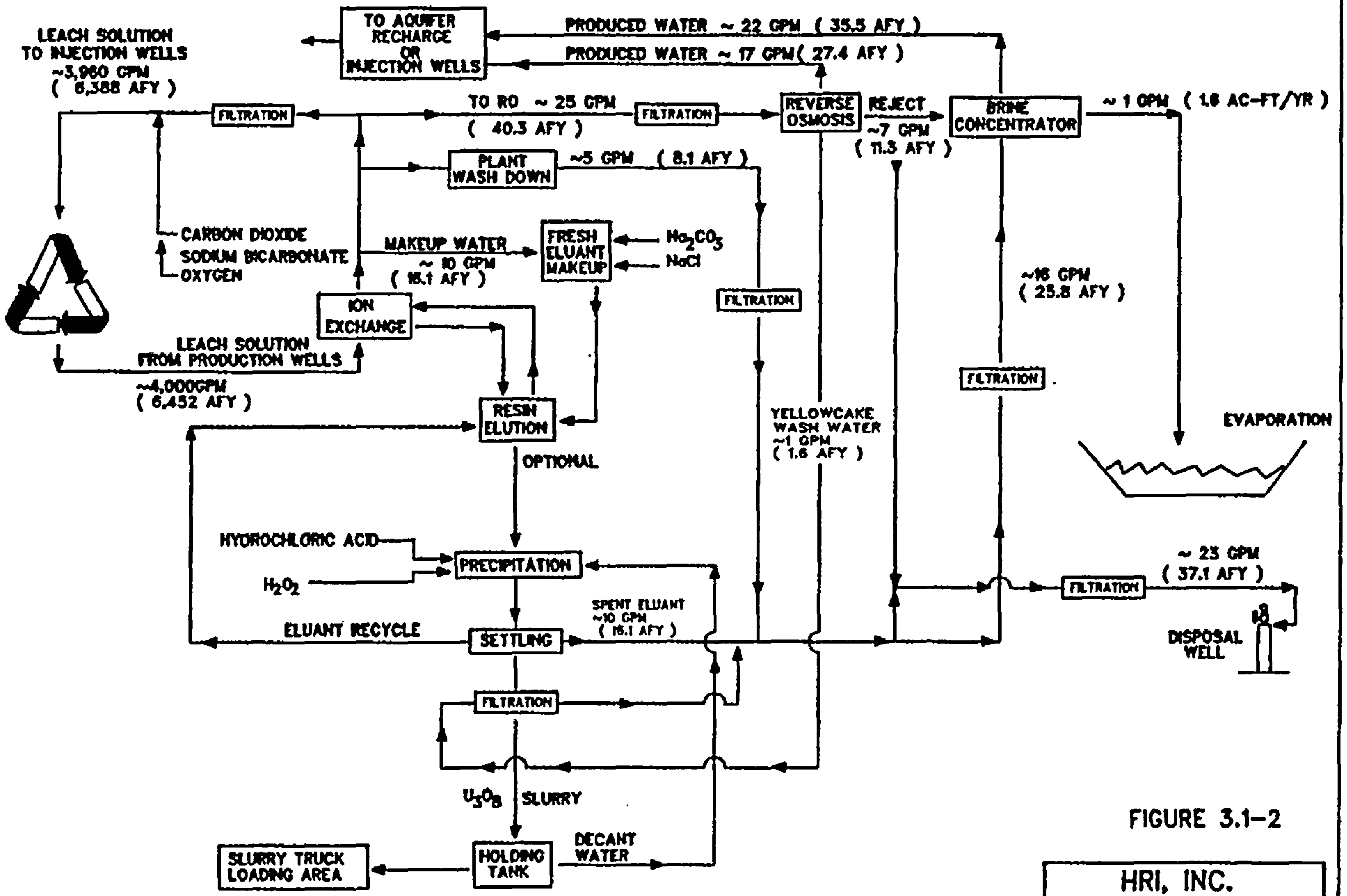


FIGURE 3.1–2

HRI, INC.

SATELLITE
PROCESS FLOW SHEET

AFY = Acre-Feet/Year

REVISED MAY 8, 1997

SATELIT2

Table 3.2-1 Projected Lixiviant Chemistry

Calcium	100 - 500
Magnesium	10 - 50
Sodium	500 - 1600
Potassium	25 - 250
Carbonate	0 - 500
Bicarbonate	800 - 1500
Sulfate	100 - 1700
Chloride	250 - 1800
Silica	25 - 50
Total Dissolved Solids	1500 - 5500
Uranium	50 - 250
226-Radium	100 or greater pCi/L
Conductivity	2500 - 7500 uS/cm
pH	6 - 9 standard units

3.2.2 Production Well Circulation

Injection, and production well operations are described in Section 6.5.

Injection well, and production well flow rates are monitored to assess operational conditions, and mineral royalties. The flow rate of each production, and injection well is determined by monitoring individual flow meters in each wellfield metering house.

The pressure of the injection trunk line is determined daily in each wellfield metering house. The surface injection pressures will not exceed the maximum surface pressures posted in each metering house.

Data records for these monitoring activities are maintained on-site.

3.3 Ion Exchange (IX)

The pregnant leaching solution containing the uranyl dicarbonate complex will be received at the processing plant through a network of wellfield piping, collection headers, and trunk pipelines, and will be pumped through the ion exchange columns, operated in series in a downflow mode. The entire system will be pressurized, precluding the elevation of gasses including radon in the process building, and the environment. Uranium will be exchanged on the reacting sites of the resin for chloride ion (if the resin is in chloride form) according to the following reaction:

$$Na_2UO_2(CO_3)_2 + 2RCl \rightarrow R_2\ UO_2(CO_3)_2 + 2NaCl,$$

where R is a reacting site of the ion exchange resin.

When the ion exchange resin in a column has captured uranium to its optimum loading capacity, uranium breakthrough will occur. That is, uranium concentration in the barren leach water exiting the IX column will begin to rise. At this point, the column will be taken out of the operating circuit, and another column with fresh ion exchange resin will be placed on-line.

After the uranium is removed by the ion exchange columns the process bleed is removed from the lixiviant stream. The bleed may be treated by R.O., and if it is, the "product", or cleaned water is returned to the lixiviant injection, or to the formation outside the wellfield pattern, or disposed of by a approved method. The process bleed insures that more water is withdrawn than is injected, thereby keeping the lixiviant laterally within the production zone.

The only factor which could threaten a continued process bleed is loss of power. Since natural groundwater flow near the wellfield is on the order of only a few feet per year (even when considering the pumping affects of Crownpoint town waterwells), the flow outward from the wellfield during the period of short term power outage (2-3 days for example) will not be significant, or measurable because of the exceedingly slow natural groundwater migration rate. Although it may not be necessary, HRI will have diesel generating capacity to maintain a cone of depression, and lighting in the event of power outage.

HRI will continue a bleed at the CUP properties until the well fields have been declared fully restored to the required permit/regulatory limits.

After the bleed is removed from the lixiviant stream exiting the IX columns, the uranium-depleted (barren) water will flow through the sand filters to remove any particulates, be refortified with requisite chemicals, and piped back to the wellfields for reinjection.

Sodium bicarbonate, and/or gaseous carbon dioxide is added as needed to the lixiviant, while oxidant is dissolved into the barren water prior to injection into the injection wells. The entire injection, production, ion exchange, and reinjection process is effectively a closed system. This allows retention of residual carbon dioxide, and oxygen during recirculation of the lixiviant.

3.4 Elution and Precipitation

Once loaded with complexed uranyl dicarbonate, resin is eluted in place within the IX column. A brine, and soda ash solution is used to remove the uranium from the resin. The following chemical reaction occurs:

$$R_2UO_2(CO_3)_2 + 2NaCl + Na_2CO_3 \rightarrow Na_4UO_2(CO_3)_3 + 2RCl$$

In the first elution step, partially enriched eluant (from the second step of the previous elution) will be sent through the fully loaded ion exchange bed to yield a uranium-rich (pregnant) eluant, and will be stored separately in a tank. In the second step of the process, barren eluant will be passed through the partially denuded resin bed to remove the majority of the residual uranium present on the resin. The resulting partially enriched eluant will be stored in a recycle tank, and used in the first step of the next elution cycle.

Uranium oxide is then precipitated from the pregnant eluant. Carbon dioxide gas (CO_2) generated during acidification of the pregnant eluant with hydrochloric acid will be vented to the atmosphere. This breaks the carbonate complex from the uranium. Peroxide is then added to further oxidize the uranium, and cause uranium oxide crystals to form, and precipitate. The precipitate will be allowed to settle. The supernatant liquid (barren eluant) will be decanted, and stored in two storage tanks, reconcentrated with salt (NaCl), and sodium carbonate, and reused in the uranium stripping circuit. A part of this stream will be discarded to the lined retention ponds periodically to keep accumulated impurities within limits.

3.5 Yellowcake Processing

As described in Section 3.4, pregnant eluant which contains uranyl di, and tricarbonate will be acidified using hydrochloric acid (HCl) to destroy the uranyl carbonate complex as shown below.

$$Na_4UO_2(CO_3)_3 + 6HCl \rightarrow UO_2Cl_2 + 4NaCl + 3CO_2 + 3H_2O$$
$$Na_2UO_2(CO_3)_2 + 4HCl \rightarrow UO_2Cl_2 + 2NaCl + 2CO_2 + 2H_2O$$

In the next step hydrogen peroxide will be added to the solution to oxidize the uranium even further, and cause it to precipitate according to the following reaction:

$$UO_2Cl_2 + H_2O_2 + xH_2O \rightarrow UO_4\ xH_2O + 2HCl$$

The crystalline uranyl peroxide slurry (UO_4 or yellowcake) may require pH adjustment, and then will be allowed to settle. The yellowcake will be further dewatered using a filter press. Finally, the yellowcake will be washed with a clean water to remove impurities such as sorbed chloride, and then dried at the CCP. Water left over from the dewatering, and drying will either be reused in the elution circuit, or sent to the waste pond. HRI's proposed operations at the CUP will result in a yearly production rate of approximately 3 million pounds of yellowcake.

3.6 Resin or Yellowcake Transport to the Central Plant

At the satellite plants, the resin may be eluted, and the uranium precipitated, and filtered. The resulting uranium slurry will be transported to the CCP for drying. HRI's proposal indicates yellowcake will be transported to the main processing plant in sole-use semi-trailer tankers designed, and placarded for this purpose, in accordance with the U.S. Department of Transportation requirements. The transportation route is described in Section 2.5.6.

4.0 WASTE MATERIAL DISPOSAL

4.1 General

There are three specific types of wastes which will be generated at the CUP sites. These include domestic sewage, non-radioactive contaminated solid wastes, and radioactive byproduct wastes. All solid, or liquid waste will be properly disposed, or treated to meet acceptable NRC, or other appropriate regulatory release standards.

HRI will return to the process circuit, maintain in wastewater retention ponds, or discharge as approved all liquid effluents from process waste streams, with the exception of domestic sewage as described in Section 4.2. HRI will demonstrate that any disposal method selected meets NRC's release limits for radionuclides (10 CFR Part 20) as well as standards from any other required permits. All changes to the liquid effluent disposal plan will have to be approved by license amendment.

4.2 Domestic Sewage

Domestic sewage from the CCP, and satellite office area will be serviced by a conventional septic tank/leach field system. This system will only receive waste water from restrooms, shower facilities, and miscellaneous sinks located throughout the office, and change rooms.

4.3 Non-Radioactive Wastes

Non-radioactive solid wastes generated at the project include office trash, boxes, miscellaneous wood packaging, and products, steel, and pipes. These materials will be stored in commercial sized dumpsters, and will be periodically disposed by a commercial waste disposal operation.

Waste oil from vehicle oil changes, and hydraulic equipment is stored in above ground tanks, or drums, and is periodically collected by a commercial used oil vendor for recycling.

4.4 Radioactive By-Product Wastes

4.4.1 Pre-Operational Wastes

Pre-operational wastes generated during wellfield development will include the cuttings obtained during well drilling, and the liquid wastes generated from water use in the drilling program, and in well development, and cleaning. They will both be confined to drilling mud pits. Both the solid, and liquid wastes will be generated as small, one-time, intermittent streams. The overall concentration of radionuclides in the drill muds will be below regulatory concern.

4.4.2 Process Plant

The major continuous stream of process waste will be the process bleed, amounting to about 1 percent of plant flowrate. The process bleed may be diverted to a waste treatment pond by a pipeline for treatment, and reduction in volume. The bleed may also be managed by an alternate process such as deep well disposal. The purified portion may be reinjected as aquifer recharge, and the concentrate will be evaporated. A small part of the purified portion may be withdrawn to meet process water needs. The entire concentrate may be further reduced by brine concentration.

Discontinuous liquid waste streams produced at the CCP, or satellites will include depleted eluant, and dilute process streams after uranium precipitation, filter wash water, and plant washdown waters. These wastes will be piped by pipeline to a waste retention pond, and managed in the same way as process bleed.

Normally, small quantities of solid radioactive waste such as spilled ion exchange resin will be produced at the plant. These materials will be collected, and held on the curbed storage area adjacent to the waste retention pond for subsequent disposal at a licensed byproduct waste disposal facility. Spilled yellowcake, if any, will be recovered.

4.4.3 Post-Operational Wastes

Post-operational wastes will be generated during the ground water restoration phase, and in connection with project decommissioning, and decontamination. Restoration of certain wellfields will proceed concurrently with production from other wellfields. The method of restoration to be employed will affect both quantity, and chemical composition of restoration waste streams.

According to the criteria set forth in Section 9, solid wastes will be characterized by scintillation probe, or mrem meter surveys, and separated into radioactive, and nonradioactive categories. Radioactive wastes will be appropriately packaged, and stored separately until their ultimate disposal at a licensed byproduct waste disposal facility. Other solid wastes will be disposed of at a suitable site, such as a landfill. The CUP will not generate any hazardous waste as defined by the Federal Resource Conservation, and Recovery Act.

Liquid wastes will be generated during the restoration phase at the rate of approximately 150-250 gpm. These wastes will be disposed of according to several options as described in Section 4.5.

4.5 Liquid Waste Management

The NRC regulations found in 10 CFR Part 20 limit radionuclide concentrations in effluents associated with solution mining process wastes. The limits are based upon radiological dose assessments. To ensure that all liquid wastes are accounted for, HRI will return all liquid effluents to the process circuit, or approved disposal systems. The solution mining industry has used various disposal methods for liquid waste streams, including evaporation ponds, deep-well injection, land application, and surface discharge under a National Pollution Discharge Elimination System (NPDES) permit. Each of these disposal methods is used to varying degrees in the industry for defined waste streams.

Guidance issued recently by NRC specifies that restoration wastewater from ISL operations is not considered to be byproduct material for purposes of section 11e.(2). In its Staff Technical Position entitled "Effluent Disposal At Licensed Uranium Recovery Facilities," DWM-95-01 (April 1995)(hereafter, the "STP"), NRC notes that there are two categories of effluent discharges from ISL operations: process wastewater, and mine wastewater (which is what is referred to in this Section as restoration wastewater). As the NRC notes, restoration wastewater (or mine wastewater) is subject to effluent limits for uranium that are established by EPA pursuant to the Clean Water act. According to the STP, these limits are set under the Clean Water Act because restoration water is not covered by NRC's regulations in 10 C.F.R. Part 20 (which sets out disposal requirements, and exposure limits for licensed materials). Therefore, restoration wastewater is not considered to be byproduct material, since if it were considered to be byproduct material, it will be subject to regulation under NRC's Part 20 regulations. By contrast, uranium levels in process wastewater are not regulated under EPA's Clean Water Act regulations. Instead, as indicated in the STP, discharges of process wastewater are required to comply with NRC's Part 20 regulations which is consistent with the understanding that process wastewater qualifies as 11e.(2) byproduct material.

HRI will treat all of its waste water streams, releasing only treated water that meets 10 CFR 20, or 40 CFR 440 release limits for radionuclides, and other parameters as is applicable. The State of New Mexico requires that any waste released in land application system meet State standards for irrigation. Authorization to use surface discharges, or deep well disposal will require separate permits.

4.5.1 Production

Liquid waste produced during production activities is described in 4.4.2 above. These wastes may be reduced in volume by reverse osmosis, and/or brine concentration. The purified, or product fraction of the reduced waste will meet 10CFR20 release criteria, and may be reinjected into the Westwater formation as aquifer recharge. The rejected portion of the reduced waste will be evaporated, or disposed by deep well injection.

4.5.2 Ground Water Restoration

Ground water produced during restoration (mine water drainage) will be generated at the CCP, and each satellite facility. The ground water restoration fluids will be generated during ground water sweep, and reverse osmosis activities. A detailed description of ground water restoration plans is included in Section 11.

The ground water sweep fluids will be treated for both uranium, and radium removal. (With respect to uranium, and radium, the quality of the treated ground water sweep fluids will be very similar to the quality of the barren leach solution.) The treated ground water sweep restoration water will contain less overall dissolved constituents than the barren leach solution due to the influx of natural, unaffected ground water, and as restoration proceeds, will resemble native formation water.

During the reverse osmosis stage of ground water restoration, the reject, or salt water stream from the RO, will constitute approximately one-quarter to one-third of the particular reverse osmosis equipment capacity. It is expected that the major inorganic constituents, represented by the TDS, will increase approximately two to four times that of the feed fluids.

4.5.2.1 Land Application and Surface Discharge

In order to acquire an EPA permit to surface discharge waste water a company must first be able to demonstrate that waste water quality, including Total Dissolved Solids (TDS), and radionuclides (uranium and radium) will comply with established NPDES standards. The treatment process for radionuclides is described below.

Land application is a disposal technique that uses agricultural irrigation equipment to broadcast waste water on a relatively large area of land. Land application has been used successfully by several solution mines. Water released in this fashion will require uranium, and radium removal as described below. At each site, irrigation will be regulated by irrigation standards adopted by the State of New Mexico, Environmental Department.

Contaminant concentrations will be determined during operations by monthly sampling of the parameters listed in NMWQCC 3.103.C. If a parameter is elevated above NMWQCC irrigation levels, it will be treated to reduce the contaminant below the standard, or as required by the NMED.

NMED will require that land application areas be properly permitted by an approved Discharge Plan prior to irrigation.

4.5.2.1.1 Uranium Treatment

Once the waste stream is pumped to the surface, the first step in treatment will be uranium removal. The uranium will be removed using the same process that was described in Section 3.3 - 3.6. HRI will maintain separate process circuits when treating restoration, and process water for uranium removal.

4.5.2.1.2 Radium Treatment

Following treatment for uranium removal, the solution will then be processed for the removal of Ra-226. Radium will be removed from discharge streams at the project by barium chloride precipitation. Currently accepted technology for radium reduction of mine waste streams involves the addition of approximately 10 to 20 mg/l of barium chloride to water. The barium chloride will form barium sulfate which in time will co-precipitate with soluble radium. Barium, and radium will form an insoluble salt with sulfate already found in the processing solution. If the concentration of sulfate is too low to efficiently cause precipitation, ammonium sulfate will be added to the waste stream prior to the barium chloride addition. Flocculates also may be added to enhance precipitation, and settling. This technology is well established.

4.5.3 Production and Restoration

4.5.3.1 Reverse Osmosis

Reverse osmosis is a water treatment process whereby the majority of dissolved "ions" are separated from the waste water, and concentrated into a smaller concentrated brine volume. The resulting product water typically meets, or exceeds drinking water standards, and during restoration activities, is reinjected back into the wellfield further diluting the underground mining solutions toward baseline quality. The concentrated brine system, representing 25-35% of the feed volume, must be disposed by either deep well disposal, surface evaporation, or further reduced in volume by brine concentration (a form of distillation).

Osmosis is a natural process that occurs in all living cells. With an appropriate semi-permeable membrane as a barrier to solutions of differing concentrations, naturally occurring osmotic pressure forces pure water from the dilute solution to pass through the membrane, and dilute the more concentrated solution. This process will continue until an equilibrium exists between the two solutions.

Reverse osmosis (R.O.) is a reversal of the natural osmotic process. By confining a concentrated solution against a semi permeable membrane, and applying a reverse pressure on the concentrate greater than the naturally occurring osmotic pressure, water will move across the membrane ("product water"), and out of the original concentrate, resulting in an even more concentrated solution ("brine"). The membrane rejects the passage of the majority of the dissolved solids while permitting the passage of water.

HRI, Inc. will likely utilize spiral wound, polyamide, thin film composite membranes, or equivalent for the CUP. These membranes were selected primarily for their inherent rejection characteristics across the range of dissolved solids likely found at the CCP. Spiral wound membranes have a greater ability to flush particulates through to brine (i.e. non-fouling), unlike their predecessor hollow filament membranes which were easily plugged by precipitates, and other micron-size debris.

The polyamide membrane composition can withstand a broad range of operating pH (1-12), whereas the cellulose diacetate membranes require a much narrower range of pH, near 5.5. This advantage translates into smoother, and less troublesome operating control of the reverse osmosis unit because of its tolerance to pH changes occurring within the feed solution. Another benefit of the polyamide membranes is the elimination of needed pH adjustment of the product water. This condition occurs because the hydrogen ion (H) passes more readily through the membrane wall than its reciprocal hydroxyl ion, causing a lowering of the pH in the product water when compared to the feed solution. However, one disadvantage of the polyamide membranes is their low tolerance of strong oxidants such as dissolved oxygen, or residual chlorine (disinfectant) As a result an oxygen scavenger such as sodium bisulfite might be added to R.O. feed water. The final product water will then be slightly on the reduced side electrochemically, thus aiding in the restoration of any oxidized ionic species.

Post-mining solutions from a depleted mine area will be directed to a surge tank in the plant area. Sodium bisulfite, and an anti-scalent will be added at this point, which is the only chemical pretreatment required. The solution may next be bulk-filtered across sand filters to remove all solids greater than 30 microns. Bag filters will then filter out the remaining solids greater than 3 microns. The solution at this point is ready for the reverse osmosis process.

To achieve reverse osmotic purification, the pretreated solution is pressurized to approximately 235 pounds per square inch (psi) by a centrifugal pump. The pressurized solution is directed to the first step of a two-stage reverse osmosis process. Approximately 50 percent of the total feed volume will be converted to product water in the first stage. The brine water of the first stage will then act as the feed for the second stage, which yields a overall product to brine ratio of 2-3:1. The brine generated will be disposed of by evaporation, and/or brine concentration, and evaporation. The quality of the product water will be vastly superior to that of the Westwater Formation. It is expected that the product water will be mixed with post-mining fluids before reinjection.

4.5.3.2 Deep Disposal Well

The most cost-effective method for disposal of waste water, and brines from in situ leach mining is the use of a deep disposal well. Injection of waste water, and brines into a deep geologic formation is used at URI's mining facility in south Texas, and is the preferred means of liquid waste disposal where technically feasible. Preferred geologic formations are repositories containing total dissolved solids (TDS) in excess of 10,000 ppm. Additionally, confinement from overlying fresh water aquifers must be demonstrated.

Wastes must be relatively neutral in the acid-base spectrum before being deep well injected. Calcium, and iron scaling inhibitors are often added prior to injection of the water which is continuously monitored for pressures, flowrates, and temperatures.

Mobil/TVA drilled a test well at Crownpoint to establish the availability of deep seated confined aquifers containing water in excess of 10,000 ppm TDS, which also met the confinement criteria. Two zones meeting these criteria were determined: the Abo, and Yeso Formations. If HRI plans to use deep well injection, it will require a permit from the New Mexico Environmental Department of Environment (NMED), or US EPA.

4.5.3.3 Brine Concentrator

A brine concentrator may be used for disposal of liquid waste. Costs related to a brine concentrator make it less advantageous than a deep disposal well. Before brine concentration of wastewater will be employed, water will be pretreated by ion exchange for uranium removal. Then, the effluent will be processed by reverse osmosis to produce a product water that can be reinjected in a Class V well outside the production pattern, or back into the wellfield during the restoration cycle. The RO reject stream will be treated with brine concentrator, and the resulting brine stream will be discharged to double-lined ponds for evaporation.

Brine concentration is a process that can literally process a waste stream into deionized water, and a solids slurry. Many electrical utilities in the Four Corners area, and paper ,and pulp companies have employed this technology for decades to handle their waste streams. The principle behind the process is based on the ideal Carnot cycle. More simply explained, an initial fixed volume of concentrated brine is heated to boiling temperature. The steam vapor created is mechanically compressed, resulting in a secondary steam vapor whose temperature is elevated (15-20 degrees) by the work consumed during compression. Distilled water is condensed from the secondary steam vapor onto internal heat exchangers. The heat loss during condensation is transferred to the circulating brine on the opposite side of the heat exchanger. The brine's temperature is raised, maintaining the internal boiling environment. This source of heat sustains the creation of primary steam used to feed the compressor. The cycle is continuous so long as energy is added at the compressor stage. The electrical power consumed in compressing, and elevating the temperature of the primary steam vapor produces a distilled product water. The resultant hyper-concentrated brine allows solid precipitate in the form of common salts as determined by the solution's limits for solubility. Systematic blowdown of the solid slurry is directed to a waste disposal pond. Typically, for each 100 gallons of waste brine treated, 99 gallons of distilled water, and 1 gallon of slurry solids are formed.

This technology provide a system which utilizes no more than 1-2 gallons per minute of groundwater during mining, and restoration, and which will generate a solid waste stream in the form of precipitated sludge. The sludge will be disposed as byproduct material.

4.5.3.4 Evaporation Ponds

The most costly method for disposal of waste water, and brines from in situ leach mining is the use of evaporation ponds. This system is similar to brine concentration in that liquid wastes are evaporated but unlike brine concentration the waters are not recondensed Since the vapor pressures of high TDS solutions are low, resulting from the additional attractive ionic forces in the waters, the solar evaporation rates will be lower than for ordinary fresh water (2.5 gpm per acre). Therefore, to dispose of the 150 to 250 gpm which will be produced during restoration at a given location:

a. approximately 100 acres of double-lined ponds will be required;

b. if a spraying system was installed in the ponds, the aerial evaporative extent required will be approximately 45 acres;

c. at the conclusion of mining, and restoration, the evaporative solids formed, and those solids blown into the ponds from the surrounding land will be disposed appropriately.

Volume reduction by solar evaporation from ponds will generally be used for all waste streams.

4.6 Contaminated Equipment

All contaminated equipment will be surveyed before the determination of its final disposition. The record of the survey will be completed on a form according to standard operating procedures. All equipment that does not meet the release requirements will be cleaned, and resurveyed, or be disposed only in an NRC-licensed disposal facility, such as a licensed tailings impoundment.

Any contaminated material accumulated at the site during operations, or reclamation may be disposed as byproduct material. Alternatively, contaminated equipment can be sold, or transferred to another source material license. This method will involve minimal decontamination, and all shipments will be subject to U.S. Department of Transportation requirements. Contaminated equipment having no salvage value will be stored in a restricted area until it can be shipped to a licensed waste disposal facility.

5.0 AIRBORNE EFFLUENT CONTROL SYSTEMS

5.1 Non-Radioactive Airborne Effluents

Non-radioactive airborne effluents are limited to fugitive dust from well field access roads. Due to the lack of significant fugitive dust from well field access roads, dust suppression of these areas is not required.

5.2 Radioactive Airborne Effluents

Radioactive airborne effluents are regulated by the Nuclear Regulatory Commission (NRC), and regulatory limits are specified in Appendix B of Code of Federal Regulations Chapter 10 Part 20 (10 CFR 20). One of the most significant potential airborne radioactive effluent is the release of 222-Rn gas which is present in the ore zone, and carried to the surface in the lixiviant. The second most significant potential airborne hazard is yellow cake which is natural uranium, and primarily a heavy metal toxic hazard as explicitly stated in 10 CFR 20.1201(e). Airborne hazard of uranium is primarily focused during the time of packaging yellowcake into drums in the dryer area, and is further restricted to personnel, packaging in the closed dryer building, who will wear the required respiratory protection equipment.

5.2.1 Radon Gas

At various points in the uranium production process, radon gas may be vented to the atmosphere. These points of discharge will depend on the technology used at the plant, and the need to minimize the doses received by workers, and the public. The use of alternate technologies introduce different sources of possible exposure by radon. Examples of these possible points of discharge include: 1) Periodic radon release from downflow ion-exchange columns; 2) Radon release in waste water, and; 3) Limited accidental release of radon, and lixiviant from a leak in the pressurized system. HRI will vent the radon gas in such a way as to conform with the standards imposed by MILDOS calculations, and will take appropriate measures to monitor, and abate radon exposure as required to protect both workers in the plant, and the public at large. HRI will use downflow IX columns, and a pressurized system to abate radon exposure to ALARA limits based on the best available technology.

Minor release from the plant will occur when individual IX columns are opened for resin transfer, or elution. At this stage of the process, the contents of one IX column will be transferred to open eluant, or precipitation vessels. Radon released will be limited to the fixed quantity of radon found dissolved in the water contained in one IX column. Radon escaping from the solution will be vented from the vessels through the ventilation system of processing buildings. In-plant monitoring will verify safe radon working levels are maintained in the plant.

The largest potential source of radon emissions from the proposed facilities is waste water. Typically, radon dissolved in waste water will equilibrate with atmospheric pressure upon discharge into a retention pond. Enhanced with the turbulence caused by the pond discharge outlet, radon gas will come out of solution, and escape to the atmosphere. HRI proposes to reduce this radon source by partially removing it in intermediate holding tanks using a vacuum pump, compressing the gas, and dissolving it in the lixiviant injection system.

The source term for radon gas (e.g. the quantity of gas that is released to the atmosphere from various locations within the in situ process) can be precisely measured by obtaining simultaneous samples and then conducting same time radon measurements on leach solution from the main trunkline on the pregnant side of the process facility ($Rn_{pregnant}$) and on the main trunkline of the barren side of the process facility (Rn_{barren}). The difference in the radon concentration ($Rn_{pregnant} - Rn_{barren}$) has been released to the atmosphere and therefore is the source term which will be entered into MILDOSE-AREA(1997) to determine compliance. The radon sampling schedule is stated in Table 9.5-1. Compliance will be demonstrated on an annual basis through modeling using measures radon release information from the previous year.

5.2.2 Airborne Yellowcake

HRI will use the vacuum dryer described in Section 2.5 in its yellowcake drying, and packaging system. The proposed vacuum dryer is designed to be a zero-emission device. Therefore, yellowcake emissions to the environment which may be of concern with open hearth type dryers will not be a concern at the CUP.

6.0 WELL DRILLING, INSTALLATION, COMPLETION, OPERATION

6.1 General

Several types of wells will be installed at the project site to facilitate the in situ mining process. Injection wells will be installed to allow the injection of the lixiviant. Production wells will be installed to allow the recovery (pumping) of the pregnant lixiviant (production fluid). Wells will be installed within the production zone to determine baseline water quality conditions, as well as monitor wells around the outside of the production zone (monitor well ring), to document the lateral control of the lixiviant. Monitor wells will be also installed in the first aquifer above the production zone to ensure that the lixiviant does not migrate vertically from the production zone.

Production, and injection wells will be constructed to assure that the well annulus is sufficiently cemented to prevent communication from the production zone to overlying aquifers penetrated by the well.

6.2 Production and Injection Wells

In the wellfield, injection wells will be arranged around production wells in patterns designed for optimum uranium recovery. The physical configuration of the mineralized ore zone, which is inferred from exploration geophysical logs, will determine production, and injection well depths, and the intervals from which uranium will be leached. Typically, well patterns used for uranium in situ mining will include, but will not be limited to, alternating single line drive, staggered line drive, and five spot. Each well field area consists of groups of these patterns which will be installed to correspond with the irregular geometry of the ore bodies as determined from geological interpretation.

6.3 Monitor Wells

An extensive ground water monitoring program will be required for in situ mining, and will be installed at the CUP for environmental monitoring. Selected wells will be monitored for water level, and sampled for certain water quality parameters on a regular basis to ensure that the injected lixiviant stays within the defined production zone. Locations of monitor wells will be chosen to maximize detection of potential excursions of leachate migration outside the production zone. Thus, with routine water quality determinations from monitor wells, early detection of this migration will be possible, allowing prompt remedial action, and excursion prevention.

6.3.1 Production Zone Monitor Wells Spacing and Depth

Production zone monitor wells will be completed in the ore-bearing aquifer, encircling each wellfield at a distance of no more than 400 feet from the peripheral production, or injection wells, and at spacing of not more than 400 feet apart. The angle formed by lines drawn from any production well to the two nearest monitor wells will not be greater than 75 degrees. The 400 foot spacing convention is widely used by the in situ industry throughout the United States. This spacing was originally determined through practical experience to locate monitor wells near enough to the operational areas to prevent broad areas of potential solution contamination, yet beyond the normal extent of the radially transported lixiviant.

At the Churchrock site, monitor wells will be located by treating production mine workings like they were injection, or production wells. Therefore, monitor wells will encircle each wellfield at a distance of 400 feet from the edge of the production, injection wells, and mine workings, and will be 400 feet apart. The angle formed by lines drawn from any production, injection well, or mine working to the two nearest monitor wells will not be greater than 75 degrees. This means that the detection of horizontal excursion will not be influenced by the presence of the mine workings.

6.3.2 Non-Production Zone Monitor Wells Spacing and Depth

Shallow monitor wells, or non-production zone monitor wells, will be completed in the aquifers overlying the ore zone. These wells will be located in the first overlying aquifer at a minimum of one well per every four acres of production wells. If a second overlying aquifer is identified, and evaluation of the thickness, and integrity of the intervening aquitard will conservatively require its monitoring, then wells will be spaced in the second overlying aquifer at one well per eight acres of production wells.

6.4 Well Construction

All holes will be rotary-drilled with rigs typically used to drill water wells, and capable of circulating drilling fluids to the surface. Casings for injection, production, and monitor wells will be either of steel, fiberglass, or PVC, and perforated, underreamed, or integral screened. A combination of fiberglass in the lower section of the hole, and PVC, or steel in the upper hole is also an option that may be used.

In addition to HRI's proposed construction specifications described herein, consistent with regulatory requirements, all CUP wells will also be completed to meet the following specifications.

a. Minimum design factors for tension (1.6 dry or 1.8 buoyant), collapse (1.125), and burst (1.0) that are incorporated into casing design.

b. Casing collars will have a minimum clearance of 0.4222 inches on all sides in the hole/casing annulus.

c. All waiting on cement times will be adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drill out.

d. All casing will be new, and reconditioned, and tested used casing that meets, or exceeds API standards for new casing.

e. Casing will be cemented back to the surface (150% calculated volume needed will be available on-site during cementing operations.)

f. Casing will have centralizers on every fourth joint (about every 120 to 150 feet) of casing, starting with the shoe joint, and up to the bottom of the collar.

g. Top plugs will be used to reduce contamination of cement by displacement fluid. A bottom plug of other acceptable technique will be utilized to help isolate the cement from contamination by the mud fluid being displaced ahead of the cement slurry.

h. All casing strings will be pressure tested to 125% of actual wellfield operating pressure, not to exceed 70 percent of the minimum burst strength (measured on surface usually using water, and the rig pump). If pressure declines more than 10 percent in 30 minutes, corrective action will be taken.

6.4.1 Installation Technique

As mentioned above, the production, injection, and monitor wells will be cased using various casing types, and techniques, which are generally dependent on the depth of the particular wellfield, and completion horizon. General well construction, and casing specifications were tabulated in Section 6.4 above. All holes will be rotary-drilled with rigs which are capable of circulating drilling fluids to the surface. The drill holes will be straight-drilled, or directionally drilled depending upon the surface locations of obstacles such as buildings, cliffs, roads, and archeological sites. The production, injection, and monitor wells will be cased using one of the following techniques:

a. single string of casing through the completion interval to be undreamed, or perforated;

b. single string of casing with cement basket, and plug assembly, and with integral screen across the completion interval;

c. dual size casing with the shallow larger casing set at pumping depth to accommodate large submersible pumps, and smaller diameter casing set through the completion interval (to be underreamed or perforated);

d. dual size steel casing (as above), except that a crossover is to be made to fiberglass through the completion interval to facilitate perforating, or underreaming;

e. Single string (or dual size as above) set to the top of completion interval. Below the casing, the hole will be drilled out (underreaming is optional), and screen is set below the casing across the completion zone. A k-packer will be set inside the casing at the top of the screen. Gravel pack sand ouside of the screen is optional.

Perforations, and underreaming will be used to open wells which have casing placed across the target completion interval. The perforated casing completion utilizes the typical shaped charge explosives used extensively in the oil industry, to place holes through the casing, cement, and into the formation. The underreamed casing completion uses a mechanical downhole tool to cut away casing, cement, and the filter cake on the sandface. Both techniques are effective ways to open the wellbore to the completion horizon. These completions provide good vertical isolation of the interval due to cement remaining above, and below the production-interval.

6.4.1.1 Churchrock

Wells will be constructed at the Churchrock satellite to perform at depths averaging approximately 825 foot depths. At this depth the maximum injection pressure will be 137 psig (825 ft. x 0.167 psi/ft = 137 psig --- see Section 6.5.3). The maximum allowable wellhead injection pressure (MAWHIP) will be determined as in Section 6.5.3, and posted, and monitored as described in section 6.6 to ensure that the formation fracture pressure is not exceeded.

The casing will be constructed of either threaded fiberglass casing, solvent-welded PVC casing, or steel. The minimum casing design factors tabulated in Section 6.4 will be used for determining casing specifications.

6.4.1.2 Crownpoint/Unit 1

Wells will be constructed at the CCP, and Unit 1 satellite to perform at depths of approximately 2200 feet. At this depth the maximum injection pressure will be 367 psig (2200 ft. x 0.167 psi/ft. = 367 psig --- see Section 6.5.3). The MAWHIP will be determined as in Section 6.5.3, and posted, and monitored as described in section 6.6 to ensure that the formation fracture pressure is not exceeded.

The casing for the upper wellbore will be constructed of either steel, or threaded fiberglass casing, or a combination of each. The minimum casing design factors tabulated in Section 6.4 will be used for determining casing specifications.

6.4.1.3 Cementing Program

As described in Section 6.4, all waiting on cement (WOC) times will be adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drill out, or further completion. When the casing is placed into the drill hole it will include centralizers spaced between 150 to 200 feet along the total casing length. The casing that is to be cemented through the completion interval will include a cap at the bottom with a large hole in its center to allow cement to circulate out, and upward through the casing borehole annulus. Casing that is set to the top of the completion interval will have a similar cap.

Once the casing is run into a well, it is cemented from bottom to top. The cement is pumped downward through the casing, through the weepholes in the cap, or basket, and up the annular volume between the casing, and borehole to the surface. The slurry volume will be sufficient to fill the annular volume, a portion of the lower casing volume, and to provide enough excess volume to fill any potential washouts with returns to the surface. After the entire slurry volume is pumped down the well, it is displaced in the casing with water to a depth considered sufficient to ensure that enough cement remains in the casing to properly seal the bottom weepholes. The well is sealed with a surface valve to prevent backflow of the displacement fluid, and cement slurry. The cement is allowed to cure undisturbed for at lease 48 hours to develop compressive strength prior to final well completion, and cleanup procedures.

6.4.1.4 Logging and Mechanical Integrity Testing

Subsequent to the well completion, certain cased-hole geophysical logs (single point, resistivity, gamma ray) may be used to survey the open interval, and length of the casing. The open interval, and possible casing leaks may be detected by the logs.

After the interval has been opened, and cleaned (through air jetting, cross jetting, pumping, etc.), and the well casing has been logged, a mechanical integrity test (MIT) is performed to further test the casing for possible leaks. An inflatable packer is run into the well to a depth directly above the open interval. The packer is inflated, and the casing is filled with water. The casing test pressure will vary with the maximum allowed injection pressure as described below. HRI will periodically retest the integrity of injection, and production wells at an interval of every five years.

In all cases, the well will be sealed, filled with water, and pressured up with air to at least 125% of the maximum allowable wellhead injection pressure (MAWHIP). The MAWHIP will be determined as in Section 6.5.3, and posted, and monitored as described in section 6.6 to ensure that the formation fracture pressure is not exceeded. For example, at an average depth of 825 feet at Churchrock, the MAWHIP will equal 137 psig (825 ft. x 0.167 psi/ft), and for 2200 feet at Crownpoint, MAWHIP will equal 367 psig (2200 ft. x 0.167 psi/ft). Operating pressure will vary with the depth of the well, and will be less than formation fracture pressure with a safety margin. After the test pressure is reached, the well is sealed to hold pressure, and allowed to stand for 30 minutes. After 30 minutes, the well is passed if less than 10% of the starting pressure is lost over the course of the test. If the pressure loss is greater than 10%, and the well fails the test, then action might be taken to locate, and repair the leak, and the MIT re-run. The subsequent MIT will be passed before the well is considered operational.

By determining MAWHIP by depth as described section 6.5.3, "in-line" injection pumps can be used at the wellhead (if desired) in order to increase the flowrate for selected wells where high rates are necessary to "balance" to their extractors.

Records of mechanical integrity, and construction details of the well will be recorded on a well completion report.

6.5 Well Operation

6.5.1 Production Flow Rates and Bleed

Each production well is operated at the maximum continuous flowrate achievable for that pattern area. The primary consideration in determining maximum continuous flowrate is to assure the wellfield is collectively balanced.

Generally, the overall injection flowrates into the wellfields will be less than the total extraction flowrate by an amount known as "process bleed", resulting in a hydraulic pressure sink which causes native groundwater outside of the ore zone to migrate into the wellfield. This process bleed is used to help protect the monitor wells against lixiviant excursion, and varies according ore geometry, well pattern, and magnitude, and direction of the natural groundwater velocity. Since the process lixiviant is simply the natural groundwater recirculated continuously from the extraction wells through the surface IX facilities, into the injection wells, through the ore zone, and back to the extraction wells, the system can never be over injected, even with no process bleed. Groundwater velocity studies for the proposed CUP ISL sites, indicate low natural groundwater velocities of 10 - 20 feet per year, which varies according to the natural hydraulic gradient, and is site specific. As a result, the amount of process bleed used in any portion of HRI's wellfields will also be site specific, incorporating affects of actual ore geometry, and overall wellfield pattern, and operation. Since groundwater issues are strongly debated, and process bleed is considered a consumptive use of groundwater, process bleed will be minimized in all cases, yet will be sufficient to protect the monitor wells against excursion.

The process bleed, or excess water production from the wellfield, is taken after uranium recovery, and will form the primary liquid waste stream from the wellfield.

The net extraction of minewater, or bleed will substantiate the 1/4 mile area of review as specified in NMWQCC 5-202.B.2, and 40CFR146.6.

6.5.2 Injection

The MAWHIP will be determined as described in Sections 6.5.3, 6.4.1.1, and 6.4.1.2. However, because the well casing is cemented into the bore hole, downhole pressures could substantially exceed the pressure rating of the well casing without adversely affecting the integrity of the well casing.

6.5.3 Formation Fracture Pressure

The terms "formation fracture pressure" as used throughout this COP, has the same definition, and could be use interchangeably with the term "parting pressure". HRI will maintain downhole injection pressures less than the formation fracture pressure. To ensure that the formation fracture pressure is not exceeded, the maximum wellhead surface injection pressure will be determined for each meterhouse, and posted near the injection trunk line pressure gauge nearest to the injection wellhead, and used to monitor injection pressure.

The fracture pressure must be sufficient to lift the rock, and water overlying the point of fracture, as well as, overcome the adhesive property of the rock which resists "tearing". Rock Mechanics, as a field of study, has shown that hydraulically induced fractures will be formed approximately perpendicular to the least principal stress of the rock unit. Typically, this means that horizontal fractures will be formed for depths from surface to 1000 - 2000 feet, and vertical fractures below 1000 - 2000 feet.

The Oil & Gas industry has considerable experience in estimating formation fracturing gradient through the thousands of wells that have been cemented, and/or purposefully fractured to enhance hydrocarbon production. Mathematical discussions of the fracture gradient have been presented (e.g., Hubbert and Willis in Underground Waste Management, and Environmental Implications, AAPG Memoir 18, 1972), as well as, empirical correlations developed by many of the Oil & Gas service companies (Halliburton, Dowell, EMCO). One such correlation, EMCO Services' Fracture Gradient Chart 13 (EMCO 133-0778) for New Mexico, Oklahoma, and West Texas indicates a fracture gradient of 0.645 psi per foot of depth (psi/ft) at 1,800 ft, and 0.655 psi/ft at 2,300 ft. Using Hubbert and Willis, the fracture gradient in northwestern New Mexico is estimated at 0.64 to 0.70 psi/ft. To include a safety factor, a more conservative fracture gradient of 0.60 psi/ft was assumed for the fracture calculations shown here.

The hydraulic pressure at any point in the wellbore is the sum of the surface pressure plus the pressure caused by the weight of the fluids contained in the wellbore. This in turn equals the surface pressure plus the pressure gradient of the wellbore fluids times depth:

downhole psig = surface psig + (fluid gradient, psi/ft) (depth, ft)

Since ISL lixiviant essentially has a specific gravity of one, the wellbore fluid gradient equals that of water: 0.433 psi per foot depth (psi/ft). Thus, the estimated maximum allowable wellhead pressure (Max WHP) in northwestern New Mexico which will not exceed the formation parting pressure equals:

Max WHP = (fracture gradient - wellbore fluid gradient) x depth to open interval

Max WHP, psig = (0.60 psi/ft - 0.433 psi/ft) x (open interval depth, ft)

Max WHP, psig = (0.167 psi/ft) x (depth to open interval, feet)

This is conservative in that the New Mexico Oil Conservation Division (NMOCD) generally uses 0.2 psi/ft (approximately 20% higher than 0.167) for the parting pressure for the Cretaceous geologic system in the San Juan Basin absent any fracture tests. Using 0.167 psi/ft, the maximum allowable wellhead injection pressure (MAWHIP) can be determined as a function of the average depth to the open interval: MAWHIP at Churchrock for a depth of 825 feet will equal 137 psig, and for Crownpoint at 2200 feet, equals 367 psig.

Considering the fracture pressures in the Crownpoint area, a considerable safety margin is included in the MAWHIP. As noted above, EMCO Services' Fracture Gradient Chart 13 (EMCO 133-0778) for New Mexico, Oklahoma, and West Texas indicates a fracture gradient of 0.645 psi/ft. at 1,800 ft., and 0.655 at 2,300 ft. This translates into a 381 psig surface fracture pressure if the production zone were at 1,800 ft., and a 511 psig fracture pressure if the production zone were at 2,300 ft. Using HRI's proposed method of determining MAWHIP, injection pressure for the 1800 foot well will be 301 psig, and for the 2300 foot well will be 384 psig. A safety factor of 27%, and 33% at 1,800 ft., and 2,300 ft. respectively.

Consistent with regulatory requirements, prior to the injection of lixiviant, HRI will conduct a Westwater Canyon aquifer step-rate injection test (fracture test)or acceptable equivalent within project site boundaries, but outside future wellfield areas at each of the three CUP sites. The parting pressure determined from these tests will be decreased by 25%, and used to determine the maximum allowable pressure gradient, and MAWHIP. They will be used in lieu of the estimates made above.

6.6 Wellfield Instrumentation

Injection, and production flow rates will be monitored in order that injection can be balanced with production across the entire wellfield, with the injection flow smaller than the production flow by the amount of the bleed rate. This information is also used for assessing operational conditions, and for determining mineral royalties.

A combination of meters will be used in the wellfield, and the plant, with differing accuracy's dependent on their use. Because hundreds of flow meters will be in use at any particular time, and because no meter is 100% accurate, the overall summation of injection flows seldom ever exactly equals that of extraction. Yet, by the very nature of the closed ISL system, injection flow actually does exactly equal that of extraction, minus the bleed rate. As a result, injection flows will be prorated to that of extraction (or vice versa) after the bleed rate is subtracted. In addition, since ISL is a continuous operation across 24 hours a day for every day of the year, some meters will require repair, and will give faulty readings until problems are identified, and corrected. A major portion of operational maintenance is spent in identifying, and repairing faulty flow meters. Thus, the procedure for determining final total flowrates will vary from time to time. Again, it is important to note that total injection flowrates can never actually be higher than total extraction in ISL because of the closed system.

Because elevations of the individual wells, depths to the open intervals, and distances from meterhouse to well (the frictional pressure loss) may vary considerably between injection wells, monitoring of MAWHIP will proceed in one of two ways:

a. The maximum allowable wellhead injection pressure (MAWHIP) will be determined for each injection well, and posted in the meterhouse. For these injection wells, a pressure gauge will be placed on the wellheads, or in the meterhouse, and pressure readings taken daily to ensure that the MAWHIP will not be exceeded.

b. A single maximum allowable injection pressure will be determined for the total meterhouse, and posted in the meterhouse. The injection trunkline in the meterhouse will be fitted with a pressure gauge, and pressure readings will be taken of that gauge daily to ensure that maximum allowable trunkline injection pressure will not be exceeded.

Data records for these monitoring activities will be maintained on-site.

7.0 PIPELINE SPECIFICATIONS AND CONSTRUCTION

The fluids handling system in New Mexico encompasses various pumps, meters, pipelines, fittings, and connections, and will generally consist of polyethylene, PVC, fiberglass, steel, and stainless steel materials, which are used universally in ISL. In materials technology, the ISL setting is considered both low pressure, and low temperature, allowing use of "off the shelf" items, and materials which are easily available. In all cases, the components of this fluid handling system will be rated to withstand ambient temperatures, and pressures of their environment, and the pressures, and temperatures of the fluids with which they will be in contact, using published, generally accepted ratings. The materials will be chemically resistant, over their useful life, to the fluids, and solids with which they are in contact. Specifications will be determined to maintain structural integrity throughout anticipated life of the component. As new materials become available, these same criteria will be used in determining their suitability. All wellfield piping systems, and equipment will either be housed in containment buildings, placed on the surface, or buried.

All piping, including fittings, will be static pressure tested to 100% of its designed working pressure for 20 minutes. The pressure testing method will consist of filling the piping to be tested with water, pressured by an external pressure source, to the designed working pressure. The piping to be tested will then be isolated from the external pressure source with positive shut-off valves, and held under pressure for twenty minutes. Piping that retains 90% of the original shut-in pressure after 20 minutes will be considered to be competent, and pressure leakage in excess of 10% will constitute a failure of test. The 10% leakage factor is to allow for material expansion under pressure with time, and thermal expansion, if applicable. Any visible leakage of fluids within the test section of piping will constitute a failure of the pressure test. Any pipe that fails its pressure test will be replaced, or repaired, and retested.

Pressure testing at 100% of the designed working pressure will make allowances for injection wellheads, and associated piping on the occasional injection wells that require higher than normal injection pressures to maintain the designed injection rate. It will also account for changes in elevation along the path of the piping, since piping that changes elevation over distance will be tested to the maximum pressure that will be induced at the point of testing (the location where test pressures will be recorded) during operations. It follows, since the pressure at that point will be the maximum encountered at that point during operations, the pressure at every other point in the piping will be at the maximum to be encountered during operations, regardless of that point's elevation.

8.0 HYDROGEOLOGICAL ASSESSMENT OF WELLFIELDS

Prior to wellfield development, it will be necessary to collect, and assemble detailed information on geologic, and hydrologic conditions, in order that ore zones can be defined, geologic, and hydrologic parameters quantified, well fields planned, hydrologic monitoring programs developed, and baseline ground water quality sufficiently determined. To accomplish the above, HRI will conduct an intensive multi-step program. The following subsections contain a detailed description of the types of data which have been, and will be, collected for proposed wellfields.

8.1 Overlying Zones

8.1.1 Churchrock

At the Churchrock property, the Brushy Basin member of the Morrison Formation, and the overlying Dakota Formation are water-bearing. Above the Dakota Formation is continuous Mancos Shale to the surface. The Brushy Basin "B" Sand as well as the Dakota Sandstone aquifer will be monitored. Above the Dakota Sandstone, there are no additional aquifers, because it is continuous Mancos Shale to the surface. Upper monitor wells completed in the Brushy Basin "B" Sand will be located with at a minimum of one well per every four acres of production area. Upper monitor wells completed in the Dakota Sandstone aquifer will be located with a minimum of one well per every eight acres of production area.

While mineralization stratigraphically above the Westwater is known to exist, HRI has not delineated the extent of this mineralization at this time. Therefore, the feasibility of producing the Brushy Basin, or the Dakota ore is presently unknown. If HRI determines that production is feasible in either the Brushy Basin, or the Dakota, the permitting of these intervals, and environmental monitoring will proceed using the same program which has been described for mining in the Westwater Sand. Specifically, UIC permits, or amendments of existing UIC permits, will be obtained which will authorize this mining. This will include the New Mexico discharge plan, and federal EPA permit, and aquifer exemption, as necessary. Operationally, HRI will request that monitor wells will be established in the sand being mined (Brushy, Dakota) at a spacing of 400 feet apart, and 400 feet from the closest injection/production well. The first overlying sand will be monitored at a density of one well per four acres, unless mining is conducted in the Dakota, in which case there is no overlying zone.

HRI has conducted pump tests at the Churchrock property which demonstrated that the sands overlying the Westwater are hydraulically separated. Additional pre-mining water quality, and hydrologic testing of production zone monitor wells, and overlying monitor wells will be conducted after the operating monitor wells are installed as will be described in Sections 8.5, and 8.6.

8.1.2 Crownpoint/Unit 1

In the vicinity of Crownpoint, and Unit 1, the Brush Basin member of the Morrison Formation is shale. This thick, contiguous shale overlays the production zone throughout the vicinity of the Crownpoint property. This is a regional shale which physically provides the aquitard between the Westwater, and the Dakota.

Above the Brushy Basin is the Dakota Formation. Above the Dakota is 600-700 feet of Mancos Shale. Thereafter, to the surface are a number of sands form the Mesa Verde Group, the lowermost being the Gallup Sandstone.

As specified in Section 8.5 HRI will run hydrological tests prior to mining to confirm the previous mine area pump tests, and verify that additional drilling activities have not created any new avenues for leakage.

HRI proposes to monitor the Dakota Fm. as the first overlying aquifer at both the CCP, and Unit 1 satellite. Wells will be spaced at a density of one per four acres.

HRI does not propose to place monitor wells in sand of the Mesa Verde group for the following reasons:

a) These sands are separated from the production zone by the Dakota, which will be monitored.

b) The massive Mancos shale which separates the Dakota from the Mesa Verde group make interformational transfer impossible.

c) Mechanical integrity test will assure that casing does not leak into shallow sands of the Mesa Verde group.

d) Sands of the Mesa Verde group are not substantial aquifers.

8.2 Underlying Zones

Underlying the host sand at Churchrock, Crownpoint, and Unit One, is the Recapture member, and then the Cow Springs member of the Morrison Formation. There is little site specific data on the thickness of the Recapture shale. However, the information which is available on drilling through the Recapture shale provide strong evidence of the shales quality as an aquitard. Specifically, the Recapture shale is 250 feet thick, and is high quality shale. Given that the Recapture has been minimally penetrated, there is little potential for interformational transfer of mine fluids which will effect the any underlying sand. The primary risk to any underlying water bearing sand will be deep drilling through the confining shale section which, if not properly abandoned, could provide a conduit for fluid migration.

HRI does not propose to monitor the Cow Springs aquifer. Prior to the injection of lixiviant at any of the three project sites, HRI will collect sufficient water quality data to generally characterize the water quality of the Cow Springs aquifer beneath the project sites, and will conduct sufficient hydrological confinement tests to determine if the Cow Springs aquifer beneath the sites is hydraulically confined from the Westwater Canyon aquifer.

8.3 Effects of Old Mine Workings at Churchrock

The mine tunnels at the Old Churchrock underground mine site are opened into the Brushy Basin, and the Westwater Canyon sands, both part of the Morrison formation. To the best of HRI's knowledge, the workings themselves do not extend up into the Dakota sand. However, the shaft does appear to be opened slightly into the Dakota, one to two feet at the very bottom of the sand. As evidenced by the mine workings in Section 17 of the Churchrock area, uranium mineralization occurs in the Brushy Basin sandstone, as well as the Westwater Canyon. In addition, geologic evaluation of this area shows that significant ISL uranium reserves are contained in the Dakota formation. If HRI's ongoing evaluation of the Churchrock geology indicate that mining in the sands overlying the Westwater is economically, and technically feasible, applications for ISL mining in those zones will be made to all appropriate regulating entities, and proper authorizations will be received by HRI before such mining occurs. HRI will monitor the aquifer immediately overlying any host mining sands with monitor wells spaced at one well per four acres. Thus, if mining is taking place in the Brushy Basin sandstone, HRI will propose that the Dakota sand will have monitor wells placed at one well per four acres in the area above the ISL mining. Although no aquifer has been identified above the Dakota sand in the Churchrock satellite area, HRI will undertake such monitoring if a "first overlying sand" is determined at the time of actual ISL mining in that zone.

8.4 Exploration Holes

HRI, Inc. has exploration drill hole survey locations for every exploration hole at each of the three CUP properties. The status of plugging records will be detailed for each property below.

8.4.1 Churchrock Property

Hydrologic testing, simultaneous with wellfield development, will further confirm that the production zone is confined. If during operational testing individual holes become suspect, they can be found because their locations are surveyed, and mapped, and corrective action (plugging) will be performed.

In addition to routine hydrological testing, and corrective action, wellfield operations, and the physical characteristics of the old exploration holes themselves allow containment of the leaching solutions as follows.

8.4.1.1 Operational Controls

During operations, more water is withdrawn than is injected (wellfield bleed), which creates lower pressure within, and around the wellfield area. Additionally, water levels in the zones overlying the production horizon are monitored. Any movement of water out of the production zone, and into the overlying intervals will be signaled by a water level in those formations higher that the original fluid level. In addition, the periodic samples taken from the monitor wells are chemically tested for leachate.

8.4.1.2 Borehole Characteristics

The weight of the abandonment fluid used in an exploration well is considerably heavier than water, and by itself will contain substantial pressure. A weight of about 9.5 ppg could be reasonably expected for the mud, but decreasing this even further to 9.2 ppg in the pressure calculation provides an additional level of confidence. The average depth to the top of the production horizon using the four baseline wells completed into the Westwater Canyon is 666 feet. Thus, the weight of the hole abandonment fluid, by itself, will generate a pressure of 30.1 psi.

The gel strength of a fluid is a measure of the shearing stress required to overcome the tendency of the fluid to remain static. The gel strength of the drilling mud left in a borehole, then, requires that a certain pressure be reached before the mud will even move. This is in addition to total mud weight. The shear stress, in units of pressure, can be calculate from the following:

pressure, psi = 0.00333 x (GS) x h / D
Where GS = gel strength, lb/100ft^2.
h = length of fluid column, feet.
D = wellbore diameter, inches.

From: Davis, Ken. E., *Factors Effecting the Area of Review for Hazardous Waste Disposal Wells,* PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON SUBSURFACE INJECTION OF LIQUID WASTES, New Orleans, LA; March, 1986.

Gel strength increases with time, and can range from about 20 lb/100 ft^2 to hundreds after the mud has set in the borehole for years. Low gel strength muds are preferable in drilling but can be expensive to purchase, thus relatively high gel muds are common. A gel strength of 50 lb/100 ft^2 is felt to be conservative, and was used in the pressure calculations. A wellbore diameter of 4.75 inches is typical of the size used for exploration wells. Using this with 660 feet as average height of the fluid column noted above, the mud in exploration holes will require 23.3 psi [0.00333 x 50 x 666/4.75] of pressure to overcome the fluid's gel strength.

The formations, especially clays, and shales, which have been penetrated by an exploration hole will slough into the well, and will also naturally squeeze across the wellbore closing it off. This trait is especially evident in drill holes left open for even a few days, when the borehold must be reamed again in order to get to the bottom. This plugging of the wellbore by pressing of clays into the borehole has been such a problem in the past in the Churchrock area, that, as early as the 1950's, additives were mixed into the drilling mud to minimize the effect, a very unusual practice for that time.

The physical characteristics of an exploration hole, drilled, and abandoned years ago, make leakage out of our production zone very unlikely. But nevertheless, the monitoring system is designed to alert the operator to a problem, including potential problems. This is the same monitoring system which will be in place even under the best conditions in which there were no old holes, or in which cement/Shur-Gel had been used in their plugging. That is, unplugged holes will not affect our ability to detect, and clean up any leaching solution outside of our wellfield.

Pump tests directly measure the integrity of the shales separating the production horizon from the overlying, and underlying sands. By itself, a pump test provides the best indication as to the continuity of the confining shales, and therefore, leakage potential of an aquifer. For this reason, a hydrologic test is considered necessary, even at a substantial cost to the company.

Pump tests provide a means of determining leakage potential, whether from unplugged wells, or high permeability general to the confining layers. A more detailed , theoretic analysis of a leaky system with the high permeability of the isolating clays is presented in the attachment: Popielak, R.S., and Sigel, J.;*Economic, and Environmental Implications of Leakage Upon In-Situ Uranium Mining*, Mining Engineering. August 1987, pp. 800-804. Part of the results of that study are noted in the abstract to the paper: "The potential for environmental impacts appear to be minor".

8.4.2 Crownpoint Property

Drilling at Crownpoint property began in the late 1960's, and early 1970's. Therefore, all plugging at the site was in compliance with the New Mexico State Engineers Regulation NMSA Section 69-3-6, which was promulgated in 1968.

HRI, Inc. has all of the plugging records which are available for the Crownpoint project.

Hydrologic testing that has been conducted at the Crownpoint property to date provides strong evidence that the production zone is confined from overlying zones. HRI, Inc. will conduct additional testing simultaneous with wellfield development. If former exploration boreholes become suspect during hydrologic testing, their locations are surveyed, and mapped so they can be readily located, and corrective action (plugging) will be performed.

8.4.3 UNIT 1 Property

Drilling at the UNIT 1 property began in the early 1970's by Mobil Oil. Therefore, all plugging at the site was in compliance with the New Mexico State Engineers Regulations NMSA Section 69-3-6, which promulgated in 1968.

HRI, Inc. has purchased Mobil's records which contain, to the best of our knowledge, all plugging reports.

Hydrologic testing that has been conducted at the UNIT 1 property by Mobil Oil provides additional strong evidence that the production zone is confined from overlying zones. HRI, Inc. will conduct additional testing simultaneous with wellfield development. As with other HRI properties, if individual holes become suspect during additional testing, their location are surveyed, and mapped so they can be readily located, and corrective action (plugging) performed.

8.5 Hydrologic Testing Plan

HRI considers that the primary goal of pump testing in new mine areas for ISL is to determine the degree of communication between the mine zone, and (1) the overlying zones, and (2), the production zone monitor wells. This will reflect the effects of hydraulic pathways, such as unplugged holes, and other pathways, to the overlying zones, as well as ascertain the ability of production zone monitor wells to respond to changing flow conditions within the mining area. The degree of communication at the production zone monitor wells surrounding the mine zone will also directly indicate the magnitude of horizontal formation anisotropy. Of secondary importance, is the determination of the physical flow parameters (transmissivity, storage, permeability) of the producing horizon, since they are of only very general utility to the ISL operator.

8.5.1 Single Well Test

Once an area has been adequately assessed from a geologic, and mineability standpoint, and the limits of the mine area are determined, and it becomes a proposed mine unit. Monitor wells (both overlying, and production zone), and baseline mining wells are installed. A hydrologic test is then designed with the primary (hydraulic communication), and secondary goals in mind. Sufficient data preceding the pumping test will be collected for each of the monitor wells to assure that they are adequately reacting to barometric, and/or antecedent conditions.

Initially, a single well, relatively central to the proposed mining area, will be produced at a constant flowrate to allow for analysis of the formation flow parameters of transmissivity, storage, and permeability. Only a portion of the wells surrounding this first pumping well will be formally analyzed for these parameters, since they are of little value in the actual operation of a ISL wellfield. At least three wells, at appropriate angles to the pumping well, will be used to mathematically determine horizontal formation anisotropy. Isopleths, showing the piezometric surface near the time of maximum pressure drawdown across the area, will be drawn to graphically depict this same anisotropy. If other wellfields are active in the area, they will be kept at flowrates as reasonably constant as possible during this segment of the hydrologic testing.

8.5.2 Multiple Well Tests

The pressure drawdown (cone-of-depression) caused by water production creates stress in the formation, and any potential hydraulic boundaries, or barriers, such as the overlying confining clays, and possible non-sealing faults. If the proposed mine area is sufficiently small, then the stress induced by pumping from a single well will adequately test potential barriers. Although the pressure drawdown decreases logarithmically with distance from the pumping well, the cone-of-depressions developed by multiple pumping wells are additive across the mine area, and can significantly increase the stress developed at any particular point. Since the ultimate goal of the hydrologic testing is to determine the degree of communication of the mine zone with the overlying, and production zone monitor wells, the second phase of the investigation, if needed (as determined by the observed maximum drawdowns across the proposed mine area developed by the single produced well), will involve producing multiple wells concurrently across the area, and observing the composite effect of the resulting pressure drawdown on the various monitor wells. Plots of the water levels versus time of pumping will be made for the overlying monitor wells, and evaluated for pressure responses to pumping from the mine zone. Maximum drawdowns will be tabulated for each of the production zone monitor wells to ensure that adequate response was achieved for those wells.

8.5.3 Mine Unit Hydrological Test Document

Following completion of the field data collection, data reduction, and data interpretation in accordance with accepted scientific techniques, and principles, the Mine Unit Hydrologic Test Document will be assembled, and available for regulatory review. In accordance with NRC requirements, the Mine Unit Hydrologic Test Document will be reviewed by a Safety, and Environmental Review Panel (SERP) to ensure that the results of the hydrologic testing, and the planned mining activities are consistent with technical requirements, and do not conflict with any requirement stated in the NRC license. A written report will be prepared by the SERP which evaluates safety, and environmental concerns, and demonstrates compliance with applicable NRC license requirements. The written SERP report will be maintained at the site.

The Mine Unit Hydrologic Test Document contains the following:

a. a description of the proposed mine unit (location, extent, etc.);

b. a map(s) showing the locations of the baseline mining wells, and all monitor wells;

c. geologic cross-sections, and cross section location maps.

d. isopach map of the overlying confining unit.

e. discussion of how the hydrologic test was performed, including well completion reports;

f. discussion of the results, and conclusions of the hydrologic test including raw data for the pumping test(s), drawdown match curves, potentiometric surface maps, water level graphs, drawdown maps, and when appropriate, directional transmissivity data, and graphs;

g. sufficient information to show that wells in the monitor well ring will be in adequate communication with the production patterns;

h. any other information pertinent to the area tested will be included, and discussed;

After appropriate review of Mine Unit Hydrologic Test Document, and subsequent authorization by the SERP, injection of lixiviant will begin in the new mining unit.

8.6 Baseline Water Quality Determination

8.6.1 General

The collection of baseline water quality data, and determination of baseline water quality conditions is very important as the Upper Control Limits (UCL's), and ground water restoration objectives are based on this data.

Consistent with regulatory requirements, initially, HRI will collect three independent baseline water quality samples from each well. However, based on the consistent results of multiple samples from individual wells taken previously, HRI believes that multiple independent baseline water quality samples from each well will not be warranted. With the concurrence of NRC, HRI will sample each well once, and perform the requisite analysis to determine baseline water quality characteristics. It is with this presumed approval that the following portion of the Plan is drafted.

8.6.2 Data Collection

Baseline water quality will be determined from water samples collected from wells installed in the various aquifers present as follows:

a. Monitor wells will be installed per the Mine Unit Hydrologic Test Document which is reviewed, and approved by the SERP. At a minimum wells will be installed at the following density:

1. production zone baseline wells - one per four acres from select injection, and extraction wells which are completed as mining progresses;

2. mine area monitor wells - spaced 400 feet apart, 400 feet from the wellfield patterns completed in the ore zone aquifer;

3. first overlying monitor wells - one per four acres completed in the first overlying aquifer;

4. second overlying monitor wells - one per eight acres completed in the second overlying aquifer.

b. Water quality samples will be obtained, and analyzed from the monitor wells described in **a** above. The sample well will be pumped during completion until water is free of mud, and foreign material, and until conductivity, and pH are reasonably constant in a natural range. As samples are taken during baseline sampling, the sampled well will be pumped for a sufficient amount of time to assure that sampled water is formation water. Sampling, preservation, analysis, and analytical quality control methods will be as defined in the current issues of *Methods for Chemical Analysis of Water, and Wastes (EPA - Technology Transfer)*.

The number of samples collected, and the parameters analyzed will be as follows:

1. Production Zone (Production Pattern) - One sample, collected, and analyzed for the parameters listed in Table 8.6-1. Prior to sampling, regulatory authorities are contacted in order that they can, if desired, collect split samples from the field sampling for comparative purposes.

2. Mine Area (Monitor Well Ring) - One sample, collected, and analyzed for the parameters in Table 8.6-1. Prior to sampling, regulatory authorities are contacted in order that they can, if desired, collect split samples from the field sampling for comparative purposes.

3. Overlying Zones - One sample for the parameters in Table 8.6-1. Prior to sampling, regulatory authorities are contacted in order that they can, if desired, collect split samples from the field sampling for comparative purposes.

8.6.3 Assessment of Baseline Water Quality Data

Baseline water quality is determined by averaging the data collected for each parameter, from each well, for each zone that is monitored. This average is used to determine the "well field average" for determining restoration criteria, and UCL's. The variability of the data is also calculated. Outliers are determined using accepted methods such as those specified in *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance* (Chapter 8, A Discussion of Outliers). Values determined to be high and low outliers are not used in the baseline calculations.

Baseline conditions are determined as follows:

a. Production Zone (Production Pattern) Wells - Individual well data for each parameter are averaged. The resulting average is generally referred to as the production area average.

b. Mine Area (Monitor Well Ring) Wells - Individual monitor well data for each parameter are averaged. The

Table 8.6-1 Water Quality Parameters with Lower Levels of Detection (LLD) and Primary, and Secondary Restoration Goals.

	LLD[1]	Primary	Secondary[3]
Alkalinity	1	WF AVG.	WF AVG.
Ammonium	0.01	WF AVG.	10.0
Arsenic	0.001	WF AVG.	0.05
Barium	0.01	WF AVG.	1[2]
Bicarbonate	1	WF AVG.	WF AVG.
Boron	0.01	WF AVG.	WF AVG.
Cadmium	0.001	WF AVG.	0.01
Calcium	0.001	WF AVG.	WF AVG.
Carbonate	1	WF AVG.	WF AVG.
Chloride	1	WF AVG.	250
Chromium	0.001	WF AVG.	0.05
Copper	0.001	WF AVG.	1
Electrical Conductivity ~25 degrees C (micromho/cm)	1	WF AVG.	WF AVG.
Fluoride	0.1	WF AVG.	2[2]
Iron	0.01	WF AVG.	0.3
Lead	0.01	WF AVG.	0.05
Magnesium	0.001	WF AVG.	WF AVG.
Manganese	0.001	WF AVG.	0.05
Mercury	0.0001	WF AVG.	0.002
Molybdenum	0.01	WF AVG.	WF AVG.
Nickel	0.01	WF AVG.	0.1
Nitrate	0.01	WF AVG.	10
pH (s.u.)	°0-14	WF AVG.	6.5-8.5
Potassium	0.01	WF AVG.	WF AVG.
Radium-226 (pCi/l)	0.1	WF AVG.	5
Selenium	.001	WF AVG.	.05
Silica	.01	WF AVG.	WF AVG.
Silver	.001	WF AVG.	WF AVG.
Sodium	0.001	WF AVG.	WF AVG.
Sulfate	1	WF AVG.	250
TDS	1	WF AVG.	500
Uranium	0.001	WF AVG.	.44[4]
Vanadium	0.1	WF AVG.	WF AVG.
Zinc	.001	WF AVG.	5

[1] mg/l unless otherwise noted. LLD may vary depending upon the laboratory that is used.

[2] NMWQCC 3-103 Standard.

[3] 40CFR141.62 or 143.3 unless otherwise noted.

[4] 10CFR20, Appendix B, Table 2.

resulting average is generally referred to as the mine area average.

c. Overlying Zones - Individual monitor well data for each parameter are averaged. The resulting average is generally referred to as the non-production area average.

Consistent with the PBL format, HRI will develop a Standard Operating Procedure (SOP) which addresses the statistical assessment of baseline water quality data, and the treatment of outlier data.

8.6.4 Upper Control Limits (UCL's)

8.6.4.1 General

As part of the detailed hydrogeological assessment, UCL's are determined based on the baseline water quality data. The UCL parameters are chloride, bicarbonate, and conductivity.

8.6.4.2 Determination of Upper Control Limits

The UCL's are based on the average baseline water quality data (i.e. mine area average, or non-production area average), and determined as follows:

a. Chloride UCL - baseline average of all monitor wells in the horizon to be monitored plus five standard deviations.

b. Bicarbonate UCL - baseline average of all monitor wells in the horizon to be monitored plus five standard deviations.

c. Conductivity UCL - baseline average of all monitor wells in the horizon to be monitored plus five standard deviations.

To ensure that the UCL's determined from the baseline data are accurate, the monitoring data collected at the onset of the operational monitoring program (at least the first two samples) will be compared with the appropriate UCL's, and baseline data. In the event that the data collected at the onset of the operational monitoring program shows that the baseline water quality data, and UCL's are not consistent with previously determined baseline values, and UCL's, additional baseline water quality data will be collected, and alternative UCL's will be proposed to the regulatory agencies.

Consistent with the PBLC format, HRI will develop a Standard Operating Procedure (SOP) which addresses the determination of UCL's, including the treatment of outlier data.

8.7 Operational Groundwater Monitoring Program

8.7.1 General

During production operations a carefully planned groundwater monitoring program is utilized to ensure that production fluids are contained within the defined production zone. If production fluids exit the production zone, increases in concentration of the UCL parameters chloride, bicarbonate, and conductivity at the affected monitoring wells will occur. If this situation occurs, and the concentration of the UCL parameters meet the criteria defined in Section 8.6, an excursion is present, and certain regulatory, and operational procedures are followed.

8.7.1.1 Monitoring Frequency and Reporting

Monitor wells installed in the production zone monitor well ring, and those installed in the overlying, and underlying aquifers (where applicable) will be sampled, and analyzed for the UCL parameters every two weeks during production operations unless unable to do so because of uncontrollable events such as snowstorms, flooding.

Monitoring data for the UCL parameters will be retained on site for review by the NRC.

8.7.1.2 Water Quality Sampling and Analysis Procedures

Water quality samples will be obtained from the monitor wells with air lifts, or submersible pumps. To assure that water within the well casing has been adequately displaced, and formation water is sampled, wells will be pumped a certain amount of time, based on the particular well's performance. A minimum of one (1) casing volume of water will be removed from the well prior to sampling. Prior to sampling, the electrical conductivity, and pH will be measured at periodic intervals, and recorded on field data sheets to demonstrate that water quality conditions have stabilized, and ensure that formation water is sampled. All data for each well will be periodically reviewed to ensure that both sampling, and analytical procedures are adequate.

Water quality samples will be analyzed for conductivity, chloride, and bicarbonate, usually within 48 hours of sampling, at the on-site laboratory. All analyses will be performed in accordance with accepted methods.

8.7.2 Excursions

An excursion will be declared if any two excursion indicators in any monitor well exceed their respective upper control limits (UCLs), or a single excursion indicator exceeds its UCL by 20 percent. A verification sample will be taken within 24 hours after results of the first analyses are received. If the second sample does not indicate UCLs are exceeded, a third sample will be taken within 48 hours after the second sampling data is acquired. If neither the second nor third sample indicate UCLs are exceeded, the first sample will be considered in error. If the second, or third sample contains the indicators above UCLs, an excursion will be confirmed.

Upon verification of an excursion, the EPA, or NMED, and NRC will be verbally notified within 24 hours, and notified in writing within seven days. Corrective actions, such as changes in pumping, or injection rates will be implemented as soon as possible. Corrective actions will continue until the excursion is mitigated. When excursion status is confirmed, corrective action will be required to return the water quality to the applicable upper control limit. During corrective action, sample frequency will be increased to weekly for the excursion indicators until the excursion is concluded.

In the event of a vertical excursion at the Crownpoint, and Unit 1 properties, HRI will explore any significant aquifer above the Dakota sandstone aquifer for vertical excursions, as opposed to just the deepest saturated sand of the Mesa Verde Group. The specific aquifers to be monitored in the event of a vertical excursion will be identified in HRI's 60-day excursion report as described in **a** below.

If an excursion has been confirmed, the following procedures will be applicable:

a. A written report describing the excursion event, corrective actions taken, and the corrective action results will be submitted to the NRC within 60 days of the excursion confirmation. The report will describe the excursion event, correction actions taken, and the results obtained. If wells are still on excursion at the time the report is submitted, the report will also contain a schedule for submittal of future reports to the NRC describing the excursion event, corrective actions taken, and the results obtained. In the case of a vertical excursion, the report will also contain a projected completion date when characterization of the extent of this vertical excursion will be completed.

b. In the event an excursion is not corrected within 60 days of confirmation, the HRI will terminate injection of lixiviant the vicinity of the monitor well within the wellfield on excursion until such time that aquifer cleanup is complete, or will provide an increase to the reclamation bond, in an amount that is agreeable to NRC, which will cover the full cost of correcting, and cleanup of the excursion. The bond increase will remain in force until the excursion has been corrected. The written 60-day excursion report will state, and justify which course of action will be followed.

An excursion is corrected, when all control parameters have been reduced to their upper control limit, or below. After the excursion is corrected, normal operations will be resumed.

Consistent with PBLC format, HRI will develop a standard Operating Procedure (SOP) which addresses regulatory agency reporting, and corrective actions to be taken in the event of an excursion.

8.7.3 Wellfield Development Documentation

Documentation of wellfield development will be maintained by the RSO, and approved by the SERP.

8.7.3.1 Previous Mining

Planning for previous mining activities is required only at the Churchrock Section 17 property.

As stated in Section 8.3, HRI has full knowledge of the locations of all previously mined workings. These workings were developed in the area of uranium mineralization, as will be all production patterns. Therefore, the mine area monitor wells will be placed outside the physical location of mine workings. HRI will verify that the mine area monitor wells are outside the locations of workings by superimposing their surveyed locations on existing surveyed maps which illustrate the working locations.

The location of non production zone monitor wells is discussed in Section 8.3.4. HRI will verify that non production monitor wells are placed proximal to raises by superimposing their exact locations on existing surveyed maps which illustrate the raise locations.

Documents, and maps showing the location of monitor wells will be maintained on sight for inspection.

8.7.3.2 Geologic Data

The geology of an individual mine area is evaluated in conjunction with wellfield development to assure proper placement of monitor, and production wells. The project geologist, and hydrologists will work together to compile the geologic/hydrologic data into a report. Included in this report will be:

a. a description of the proposed mine unit (location, extent, etc.);

b. a map(s) showing the locations of the baseline mining wells, and all monitor wells;

c. geologic cross-sections, and cross section location maps.

d. isopach map of the overlying confining unit.

e. discussion of how the hydrologic test was performed, including well completion reports;

f. discussion of the results, and conclusions of the hydrologic test including raw data for the pumping test(s), drawdown match curves, potentiometric surface maps, water level graphs;

g. sufficient information to show that wells in the monitor well ring will be in adequate communication with the production patterns;

h. any other information pertinent to the area tested will be included, and discussed.

This information will be maintained on sight for inspection.

8.7.3.3 Well Field Location

The license area location is described in Section 1.1.1 for the Crownpoint wellfields, Section 1.1.2 for the Churchrock wellfields, and Section 1.1.3 for the Unit 1 wellfields. Property boundaries are generally well marked, and HRI can not legally encroach these boundaries. Additionally, all wells will be surveyed. These mapped locations will also contain boundaries, and cultural features.

These maps will be maintained on sight for inspection.

8.7.3.4 Well Completion

Well location, and completion will be performed as described in Section 6.0. Monitor well functionality will be verified through hydrological testing, and reported as described in Section 8.5.

Details of the construction, completion, and testing of each well is maintained within a file for that well. This file will contain all geophysical logs associated with the well, field information, and the completion reports.

This information will be maintained on sight for inspection.

8.7.3.5 Well Integrity Testing

Only wells that pass the mechanical integrity testing (MIT) requirements specified in Section 6.4.1.4 will be used at the CUP. MIT results will be recorded on the completion reports.

This information will be maintained on sight for inspection.

8.7.3.6 Baseline Water Quality Data

Baseline water quality will be collected, analyzed, and evaluated according to the discussion set forth in Section 8.6. Statistical analysis, will be reviewed by the SERP, and the results documented, and filed.

This information will be maintained on sight for inspection.

8.7.3.7 Upper Control Limits

Baseline water quality will be collected, analyzed, and evaluated according to the discussion set forth in Section 8.6. Upper Control Limits (UCL's) analysis will be conducted according to the statistical procedures set out in Section 8.6.4. UCL results will be reviewed by the SERP, and the results documented, and filed.

This information will be maintained on sight for inspection.

8.7.3.8 Define Restoration Target Values

Baseline water quality will be collected, analyzed, and evaluated according to the discussion set forth in Section 8.6. Restoration Target analysis, will be conducted according to the statistical procedures set out in Section 8.6.3, and will be reviewed by the SERP, and the results documented, and filed.

This information will be maintained on sight for inspection.

8.7.3.9 Location of Monitor Wells

Monitor wells will be located according to the discussion set forth in Sections 6.3.1, 6.3.2, and 8.6.2. Baseline water quality will be collected, analyzed, and evaluated according to the discussion set forth in Section 6.3.1, 6.3.2, and 8.6.2. Details of the construction, completion, and testing of each well is maintained within a file for that well. This file will contain all geophysical logs associated with the well, field information, and the completion reports. Additionally, all well will be surveyed, and mapped. These maps will also contain boundaries, and cultural features. Monitor well completion reports and location maps will be reviewed by the SERP.

Monitor well completion reports, and location maps will be maintained on sight for inspection.

8.7.3.10 Hydrological Tests of Confinement

Mine unit pumping tests will be performed, and reported according to the methods, and procedures set forth in Section 8.5. The Mine Unit Hydrologic Test Document will be reviewed by a Safety, and Environmental Review Panel (SERP) to ensure that the results of the hydrologic testing, and the planned mining activities are consistent with technical requirements.

The Mine Unit Hydrologic Test Document will be maintained on sight for inspection.

8.7.3.11 Injection Pressures

Injection pressures of either individual wells, or trunk lines is determined daily at the injection well, or in each wellfield metering house. The surface wellhead pressures will not exceed the maximum surface pressures posted in each metering house.

Data records for these monitoring activities are maintained on-site.

8.7.3.12 Pump Test Confirmation of Monitor Well Locations

Mine unit pump testing will be performed, and reported according to the methods, and procedures set forth in Section 8.5. The primary goal of the mine unit pump test is to determine the degree of communication of the mine zone with the overlying, and production zone monitor wells. The primary results of the mine unit pump test will be recorded in the Mine Unit Hydrologic Test Document. The Mine Unit Hydrologic Test Document will be reviewed by a Safety, and Environmental Review Panel (SERP) to ensure that the results of the hydrologic testing, and the planned mining activities are consistent with technical requirements.

The Mine Unit Hydrologic Test Document will be maintained on sight for inspection.

8.7.3.13 Hydrologic Parameters

Of secondary importance, is the determination of the physical flow parameters (transmissivity, storage, permeability) of the producing horizon, since they are of only very general utility to the ISL operator. Physical flow parameters will be calculated from the data that is obtained during the mine unit pump test. Physical flow parameters will be recorded in the Mine Unit Hydrologic Test Document. The Mine Unit Hydrologic Test Document will be reviewed by a Safety, and Environmental Review Panel (SERP) to ensure that the results of the hydrologic testing, and the planned mining activities are consistent with technical requirements.

The Mine Unit Hydrologic Test Document will be maintained on sight for inspection.

9.0 RADIATION SAFETY

In accordance with 10 CFR 20.1101(b), and Regulatory Guides 8.10, and 8.31, HRI is committed to maintaining personnel occupational exposures to radioactive materials "as low as reasonably achievable", or ALARA. The following Radiation Safety Program is developed from operating experience at URI facilities gained from 1978 to the present. This program is designed to comply with the "new" Part 20 regulations which became mandatory January 1, 1994.

9.1 Uranium Production Facilities

9.1.1 Conventional Mining

Underground mines pose significant inhalation hazards from airborne uranium, and uranium decay progeny suspended in the mine air due to blasting, or other mining operations. Additionally, the buildup of 222-Rn, and its progeny can yield significant doses to the bronchial tissues of the lung, resulting in the most significant radiological doses in mining operations. The buildup of radon progeny in mining environments can result in air concentrations on the order of tens to hundreds of working levels, depending on emanation, ventilation, and other factors. The average exposure of all underground uranium miners in the U.S. in 1979 had an average exposure, for radon only, of about 3000 mrem per year, or 2.9 WLM (Working Level Months) [Cooper, W.E., 1981,, O'Riordan, M.C., et.al., 1981, Johnson, J.R. et.al, 1981].

9.1.2 Solution Mining

In situ mineral extraction applies engineering controls, and processes to insure the health, and safety of personnel, the public, and the protection of the environment. Mine solutions contain extracted soluble uranium circulated in a closed loop system through the processing plant, and back to the ore zone, and thus there is no overall airborne hazard of uranium, or uranium progeny. Unlike conventional mining which can use copious amount of water, solution mining conserves consumption of water by continually circulating mining fluids back to the mine zone. In situ mining extracts uranium while allowing the ore body to remain intact. This leaves the surrounding landscape open for grazing, or raising crops (URI's La Rosita and Kingsville Dome sites respectively). The final product is yellowcake, dried in a vacuum hopper with near zero emissions prior to shipment to an enrichment facility.

9.2 Product Material - Yellowcake

9.2.1 Chemical Form

Uranium in the ore body becomes soluble in the oxidized phase, and once oxidized, is mobilized by the bicarbonate (HCO_3^-) anion as a uranyl dicarbonate ($UO_2(CO_3)_2^{-2}$) anion. The mine leach solution is then pumped to the surface from the ore zone. The ion-exchange (IX) resin columns in the processing plant acts in a manner very similar to a domestic water softener. Uranyl dicarbonate anions are exchanged onto the surface of the IX resin, and displace two chloride ions (Cl^-). When fully charged, an NaCl brine solution is used to release the uranyl dicarbonate into an eluant, and to regenerate the IX resins. The eluant is then acidified with HCl, breaking the dicarbonate complex, and forming UO_2Cl_2. This is precipitated with hydrogen peroxide (H_2O_2) forming hydrated UO_4 as described in section 3.7. The uranium peroxide is then dried, and the product "yellowcake" packaged for transport.

9.2.2 Uranium - Naturally Occurring Radioactive Material

Uranium is widely distributed around the world with an average concentration in the earth's crust of 4 PPM. Uranium is a heavy metal, and is naturally radioactive. Natural uranium contains three isotopes 238-U (99.3%), 235-U (0.7%), and 234-U (0.006%). 238-U constitutes one of the main primordial radioactive decay series, and has a long radioactive decay half-life of 4.5 billion years.

238-U decays to 234-Th by alpha emission. Since 238-U has a long half-life, and its immediate decay progeny (234-Th, 234-Pa, and 234-U) have relatively much shorter half-lives, these isotopes are in secular equilibrium with the 238-U decay. Because of 238-U's long half-life, the specific activity of natural uranium is unusually low (0.68 mCi/g 10 CFR 20 App. B Footnote 3). With a half-life of a quarter of a million years, 234-U will not decay to produce significant progeny for several thousand years with a half-life of a quarter of a million years.

In the decay from 238-U to 234-U, alpha, beta, and gamma radiations are emitted. Radioactive emission include two alphas of about 4 MeV of energy each, five different betas with E_{max} ranging from 0.1 to 2.3 MeV, and seven gamma rays all of either rare frequency, or low energy of about 63 to 92 keV. A 55 gallon drum of yellowcake comes into secular equilibrium with 234-Th, and 234 Pa within several months of production. Measurement at

30 cm from the surface of the drum will yield an external exposure rate of 2 mrem/hr.

9.2.3 Metabolism and Toxicity

Natural uranium is primarily an internal hazard, and the chemical toxicity far exceeds the radiological hazard as explicitly stated in 10 CFR 20.1201(e). Uranium metabolically behaves somewhat like calcium, and will deposit on the bone surfaces. The three major organs which will receive the largest radiological dose from intake of uranium are the lung, bone, and kidney.

Table 9.2-1. Organ Dose Conversion Factors for Inhalation of Natural Uranium (Federal Guidance Report No.11 EPA-520/1-88-020 1988; secular equilibrium of 234-U with 238-U; class W)

Organ	Dose Conversion Factor (Sv/Bq)
gonad	7.11×10^{-9}
breast	7.13×10^{-9}
lung	1.51×10^{-5}
red marrow	2.04×10^{-7}
bone surface	3.12×10^{-6}
thyroid	7.12×10^{-9}
remainder	2.70×10^{-7}
Total:	1.87×10^{-5}

Most of the uranium is excreted out of the body, mostly contained in the feces, and a smaller fraction in the urine. The urinary clearance can vary widely depending on the solubility of the chemical form, and whether the intake pathway is ingestion, or inhalation. Soluble uranium will rapidly be eliminated while insoluble uranium will slowly convert to a soluble form in the body. Nephrons in the kidneys work hard to eliminate the heavy metal from the blood stream. Sufficient acute intakes of uranium will cause the kidneys to swell, with the risk of infection, and slightly higher intakes will cause permanent damage in the kidneys.

9.2.4 Solubility Class

All yellowcake at the CUP will be dried at a low temperature (less than 400° C) which will form the basis for using Class W throughout the entire process. In this form uranium forms a compound that can easily dissolve in the fluids in the lungs. The dust from this compound, when deposited in the lung, can cross through the lung tissue and enter the bloodstream. Most of it is then quickly filtered out by the kidneys and gradually excreted in the urine. The radiation dose to the kidneys is not as hazardous as the chemical action of the uranium on the kidney tissue.

9.3 Uranium Work Area

Any area in which employees potentially have access to yellowcake, i.e. product material, will be defined as a Uranium Work Area. The Uranium Work Area is within the Restricted Area. Offices, eating, drinking, and smoking areas will not be Uranium Work Areas, will not contain product material, nor will the employee(s) in these areas have access to yellowcake, and are also in the Restricted Area.

Areas which potentially contain yellowcake, and are candidates for designation as Uranium Work Areas are: the Filter Press Area, Elution Area, IX, and Sandfilters, RO Unit Area, Dryer Area, and YC Drum Storage. Engineering controls, and surveys will help monitor, and maintain airborne yellowcake within these designated areas. Additionally, employees will be required to survey for alpha contamination before leaving the Uranium Work Area.

Consistent with PBLC format, HRI will develop an SOP which describes the details of the areas which are designated Uranium Work Areas.

9.4 Instrumentation, Calibration, and Surveys

9.4.1 Instruments

Table 9.4-1 summarizes the types of radiation detection instruments which will be used at the CUP. All radiation monitoring, sampling, and detection equipment will be calibrated at least annually, and after each repair. The calibration records will be maintained on site.

Detector which will be used by HRI include ZnS scintillators, GM pancake probes, and NaI scintillators. Scintillation probes incorporate a photo multiplier tube (PMT). Filter air samples, and surface material swipes will be counted for alpha using a ZnS scintillator filter sample counter, and for alpha, and beta using an end window GM detector. External exposure will be monitored using a NaI-PMT detector which has a high efficiency for detecting gamma.

In addition, passive detectors such as TLD's, or electrolyte radon cups will be used in conjuction with the instruments below to monitor for maximum potential exposures. A few instruments most commonly used are listed in Table 9.4-1.

Table 9.4-1. Radiation Instrumentation Types, and General Specifications

1. Alpha Filter Sample Counter

- Scintillator: ZnS (Ag)
- Operating Voltage: 0.5-1.2 kV
- Weight: 1.9 kg
- Window: 0.4 mg/cm2
- Sample Holder: O-ring sealed stainless steel slide
- Sample Size: 2.54 cm diameter, 1.5 mm thick
- Tube Assembly: 3.8 cm diameter magnetically shielded photomultiplier tube
- Dynode String Resistance: 100 MW
- Compatibility: Model 177.

2. Pancake G-M Detector

- Window: 1.7 mg/cm2 mica, 15 cm2 active, 12 cm2 open
- Operating voltage: 0.9 kV
- Halogen quenched G-M
- Dead Time: 80 us
- Construction: Al housing, optional Pb shield
- Weight: 0.5 kg
- Compatibility: Models 3 and 177.

3. End Window G-M Detector

- Window: 1.7 mg/cm2 mica, 6 cm2 active, 5 cm2 open
- Operating voltage: 0.9 kV
- Halogen quenched G-M
- Dead Time: 200 us
- Construction: Al housing
- Weight: 0.5 kg
- Models 3 and 177.

4. Alpha Scintillator

- Scintillator: ZnS (Ag)
- Window: 0.8 mg/cm2 aluminized mylar, 76 cm2 active, 50 cm2 open
- Tube Assembly: 3.8 cm diameter magnetically shielded photomultiplier
- Dynode String Resistance: 100 MW
- Operating Voltage: 0.5-1.2 kV
- Weight: 0.9 kg
- Compatibility: Model 177.

5. General Purpose Survey Meter - Model 3

- Compatible Detectors: G-M, scintillation
- Threshold: 30 mV
- Weight: 1.6 kg
- Meter Dial: 0-2 mR/hr or 0-5k cpm
- Multipliers: x0.1, x1, x10, x100
- High Voltage: Adjustable 0.2-1.5 kV

6. Alarm Ratemeter - Model 177

- Compatible Detectors: G-M, scintillation
- Alarm Set: front panel with lock
- Reset: push-button to reset alarm
- Power: 120 VAC, 60 Hz single phase, <100 mA
- Battery: 6 V Pb-acid rechargeable, life of 50 hours in non-alarm condition
- Weight: 1.9 kg
- Meter Dial: 0-500 cpm, 0-1.5 kV
- Multipliers: x1, x10, x100, x1k
- Threshold: Adjustable 10-100 mV
- High Voltage: 0.2-1.5 kV
- Response: Fast - 4 seconds, Slow - 22 seconds for 10% to 90% of final reading

***Instrument Manufacturer**

Ludlum Measurement
P.O. Box 810 - 501 Oak Street
Sweetwater, TX 79556

9.4.2 In Plant Surveys

The process areas described in Table 9.4-2 are subjected to the surveys listed in Table 9.4-3. These surveys are described in more detail throughout this Section.

9.5 Environmental Monitoring

Environmental monitoring will generally follow the schedule shown on Table 9.5-1. All environmental monitoring will begin at each station, for each media being sampled, three months before operations begin.

All effluent releases will be subject to release limits specified in 10 CFR Part 20. HRI will not inject lixiviant prior to NRC'c review, and approval of a SOP level detail environmental monitoring plan. The plan will indicate SOPs such as sampling methods, and equipment, analytical procedures, and lower limits of detection. The plan will also indicate proposed environmental monitoring locations based on "as built" construction, and provide the rational for their selection. The approved NRC monitoring plan will form the basis for HRI's operational SOP which will describe the details of the environmental monitoring program.

9.6 External Radiation Exposure Monitoring Program

9.6.1 External Radiation Monitoring Plan

All personnel are issued dosimeters for at least the first year of operations. TLD personnel badges measure the external exposure to the individual on site. On at least a quarterly basis, the badges are read by the vendor, and reported on NRC Form 5, or equivalent. Issued TLDs are of a design for measuring mixed beta, and photon mixtures to accurately characterize the deep, eye, and shallow dose equivalents.

After the first year of operations, the monitoring data collected from these badges will be recorded, and reviewed to determine if exposures exceed the 500 mrem administrative action limit. If it is documented that after the first year of production operations that the annual dose to workers at assigned project locations is less than 10 percent of the 5 rem annual limit contained in 10 CFR 20.1201(a) then personnel TLD monitoring may be reduced, or eliminated at those locations at the descretion of the RSO.

Table 9.4-2. Process Area Radioactivity Monitoring Location.

All Process Facilities

1. Filter Press Area and YC Slurry Storage
Gamma - (TLDs)one on each yellowcake storage tank and one next to the filter press
Radon Progeny - one

2. Elution Area
Gamma - (TLDs) one at the base of barren eluant vessels and one between the eluant columns
Radon Progeny - one between the sand filters and the IX columns

3. IX and Sandfilters
Gamma - (TLDs) one between IX columns and sand filters
Radon Progeny - two at the IX and one at the sand filter.

4. RO Unit Area
Gamma - (TLDs) one between IX columns, one on the filter platform, one between the RO water storage tanks, one RO unit, and one between the cleaner tanks
Radon Progeny - one located by the IX columns

5. Chemical Storage Pad
Gamma - (TLDs) one located on the chemical storage pad

6. Exit Points
Alpha - thin window scintillator with an alarm rate meter

Areas only Concerning the Crownpoint Central Plant

7. Dryer Area
Gamma - (TLDs) one in the office, the shower, and the dryer room
Uranium - (low volume pump) continuous particulate filter sampling
Radon Progeny - one

8. YC Drum Storage
Gamma - (TLDs) one located central to the storage
Radon Progeny - one

**Additional monitoring are conducted or eliminated at the RSO's discretion.*

TABLE 9.4-3

SUMMARY OF SURVEY FREQUENCIES

Type of Survey	Type of Area	Survey Frequency	Lower Limit of Detection
1. Yellowcake	Filter press Special maintenance involving high air-borne concentrations of yellowcake.	Monthly grab samples Extra breathing zone grab samples.	1×10^{-11} uCi/ml
	Dryer Building downwind of Dryer Building	Continuous	
2. Radon Daughters	Scaffolding	Monthly radon daughter grab samples.	0.03 WL
	Tanks	As needed.	
3. External Radiation: Gamma	Throughout process facility	Quarterly	.1 mrem/hr.
4. Surface Contamination	Yellowcake areas	Daily	Visual
	Eating rooms, change rooms, control rooms, offices	Monthly	5,000 dpm alpha per 100 cm^2
5. Skin and Personal Clothing	Yellowcake workers who shower	Each day before leaving	1,000 dpm alpha per 100 cm^2
	do not shower		
6. Equipment to be released.	Equipment to be released that may be contaminated	Once before release	5,000 dpm alpha per 100 cm^2

Table 9.5-1
Environmental Monitoring
for Churchrock, Crownpoint and UNIT I Facilities

Type of Sample	Number	Location	Method	Frequency	Frequency	Type of Analysis
Air	3 (1 from each location)	Upwind and downwind of the plant site and at the nearest residence or occupied structure within 10 km of the plant site.	Continuous Track Etch	One sample per calendar year.	Each sample	RN-222
Process Fluids	1 from each lixiviant intake. 1 from lixiviant outlet.	Lixiviant trunk lines in amount of process	Grab	Quarterly	Each sample	RN-222
Water Groundwater	1 from each well	Potable, livestock, and irrigation water supply wells within a 2-1/2 mile license area.	Grab	Quarterly	Each sample	Natural U, RA-226, gross alpha, gross beta, pH
Water Monitor Wells	1 from each well	As designated in ED discharge plan.	Grab	2 samples per month	Each sample	Conductivity Cl, U, HCO3
Water Surface Water	1 from each impoundment and a minimum of two from each stream	Permanent impoundments and upstream and downstream in surface waters passing through the license area; also adjacent impoundments subject to drainage from the license area.	Grab	Quarterly	Each sample	Natural U and total and soluable RA-226
Sediment, Soil and Sludge Sediment	1 from each impoundment and a minimum of 2 from each stream	At surface water sampling locations	Grab	Annually	Each sample	Natural U and RA-226
Soil	1	Septic system drain field	Grab	Prior to requesting termination of license	Each sample	Natural U and RA-226
Sludge	1	Septic tank	Grab	Prior to sludge removal from tank and prior to requesting termination of the license.	Each sample	Natural U and RA-226

Consistent with the PBL format, HRI will develop a Standard Operating Procedure (SOP) which addresses the methods which will be used to establish, and record all doses to each employee from internal, and external sources received at the CUP.

9.6.2 External Radiation Monitoring Surveys

Quarterly surveys will be performed at specified locations throughout the Satellite buildings, and CP to assure that areas requiring posting as "Radiation Areas" are identified, posted, and monitored to assess external radiation conditions. "Radiation Areas" will be those areas exhibiting 5 to 100 mrem per hour at a distance of 30 cm from the source.

9.7 Airborne Radiation Monitoring Program

HRI's Airborne Radiation Monitoring Program will generally contain the provisions of U.S. Nuclear Regulatory Commission Regulatory Guide 8.25, Revision 1, *Air Sampling in the Workplace* and U.S. Nuclear Regulatory Commission Regulatory Guide 8.30, *Health physics Surveys in Uranium Mills*. The general components of the program are described below.

9.7.1 Airborne Uranium Particulate Monitoring

There is no potential for exposure to ore dust at the Crownpoint Uranium Project since the facility is an *in situ* uranium mine. However, there is the potential for exposure to yellowcake dust in certain areas of the CUP. All areas, including the filter press, drying, and packaging areas, have a potential for exposure to yellowcake dust.

There will be a continuous monitoring of airborne uranium particulates at the drying, and packaging areas. During periods of drying, and packaging activity, the filters of the continuous air monitors will be changed, and analyzed every several days as a decrease in airflow through the filter necessitates. At times when the dryer is operated discontinuously, the airborne monitor will be operated, and the filter analyzed for only the period of batch operation. During periods that drying, and packaging activities are not occurring, the filters will be changed, and analyzed on a weekly basis.

When non-routine work activities are performed in an area, or manner that could result in exposure to uranium particulates, area air samples, or breathing zone samples will be utilized to determine airborne uranium particulate levels.

Areas of the CUP, outside the drying, and packaging areas, and Satellite facilities will be monitored on a quarterly basis for airborne uranium. For all potential exposures, in the event that bioassay data is unavailable to quantify actual intakes, time studies, and/or actual occupancy times will be used to estimate the employees' exposure.

Consistent with the PBL format, HRI will develop a Standard Operating Procedure (SOP) which addresses the methods which will be used to monitor air particulates in the dryer at the CUP.

9.7.2 Radon Daughter Monitoring

Radon progeny will be routinely monitored on a monthly basis at the satellites, and the CCP.

Routine exposures to radon daughters will only be determined within the processing plant. The method of analysis is the modified Kusnetz method, or other commonly accepted method of measurement. Measurements are made in locations, and at times when there is a potential for the release of radon, or radon progeny.

Consistent with the PBL format, HRI will develop a Standard Operating Procedure (SOP) which addresses the details of radon monitoring at the CUP.

9.7.3 Airborne Effluent Environmental Monitoring

To ensure compliance with 10 CFR 20.1301, 20.1302, and 20.1501, HRI will maintain a continuous air monitoring program at three separate locations: upwind of the CPP, or satellite facility, downwind from the CPP, or satellite facility at the restricted area boundary, and downwind at the nearest residence. These sampling locations contain passive gamma, and radon monitoring devices that are changed out on a quarterly basis.

In addition to the monitoring described above, continuous passive monitoring for gamma, and radon will be performed at two locations (one upwind and one downwind) at the satellite facilities. These monitoring devices will be exchanged quarterly, and the results documented, and maintained on site.

9.8 Employee Exposure Records

Employee exposures at the CUP are monitored in accordance with USNRC Regulatory Guide 8.34, *Monitoring Criteria and Methods to Calculate Occupational Radiation Doses.* The employees will be monitored for internal exposure to yellowcake dust, see Section 9.9 "Bioassay Program", patterned after NUREG 8.22 *Bioassay at Uranium Mills.* A bioassay program will be utilized as a means of ensuring the adequacy of the monitoring, and respiratory protection programs for protection from airborne uranium dust, and from 222-Rn, and its decay progeny. HRI will advise each worker of their annual dose pursuant to the provisions of 10CFR20.2106 and U.S. Nuclear Regulatory Comission Regulatory Guide 8.7, Revision 1, *Instructions for Recording and Reporting Occupational Radiation Exposure Data.* A quarterly tabulation of annual dosage for all employees will be posted on a bulletin board in the central offices of the CCP, and the Satellites along with all other regulatory postings. The table will contain all the provisions of NRC Form 5, or equivalent for each employee.

According to the methods described in U.S. Nuclear Regulatory Comission Regulatory Guide 8.36, *Radiation Dose to the Embryo/Fetus,* declared pregnant women will have additional materials tabulated, and posted stating the annual dose to the embryo-fetus.

9.8.1 Time Period Airborne Exposure

In the event that bioassay data is unavailable to estimate actual intakes of yellowcake, employee exposure to airborne soluble uranium will be estimated for routine activities. The exposure estimates will be based on exposure times, and the concentrations of airborne uranium as determined from routine air monitoring, or non-routine air monitoring (i.e. breathing zone monitoring, or specific area air monitoring).

Routine exposures to uranium, and radon daughters will be only determined only for workers routinely exposed to airborne radionuclides in concentrations which are likely to result in annual exposures in excess of 10% of the ALI without respiratory protection. Routine exposures will be estimated using exposure times generated from semiannual time studies.

Non-routine exposures to uranium will result from performing non-routine operational, or maintenance tasks that have the potential for creating a significant exposure to airborne uranium. These types of exposures will be monitored utilizing a Radiation Work Permit (RWP). The RWP will specify the types of radiological monitoring required for the task, and the protective equipment, and clothing employees must wear while performing the task. The sampling results will be evaluated, and documented. This data, together with the employee's time in the area, will be used to estimate the non-routine exposure. Each employee's routine, and non-routine exposure to airborne uranium will be recorded weekly, and summarized annually.

Routine employee exposure to radon daughters will be determined by measured working levels. Similar to non-routine uranium exposures, non-routine radon daughter exposures will be monitored utilizing an RWP. Routine exposure times will be determined by semi-annual time studies, or actual occupancy times. Each employee's routine, and non-routine exposure to radon daughters will be recorded weekly, and summarized annually.

9.8.2 Airborne Uranium Exposure Calculation

The intake of uranium of soluble class W during the weekly, or annual period being evaluated is estimated using the following equation:

$$I_u = (S\ (c_i)(Dt_i)/(DAC))*(PF)$$

from i=1 to n

Where:

I_u - uranium intake (DAC-hours)

Dt_i - time worker is exposed to concentration (hours)

c_i - average concentration of uranium in the air (mCi/ml)

DAC - the derived air concentration value for soluble class W uranium from Appendix B of 10 CFR 20 (3E-10 mCi/ml per DAC)

PF - respirator protection factor from Appendix A of 10 CFR 20

n - number of exposures during the period of evaluation

9.8.3 Radon Progeny Exposure Calculation

As was discussed in Section 9.7.4, the modified Kusnetz, or commonly acceptable method for determining exposure to radon daughters will be utilized at the HRI's Crownpoint *in situ* uranium project, and satellite facilities. From the monitoring data collected, the employees intake of radon progeny will be calculated using the following equation:

$$I_r = (S\ (WL_i)(Dt_i)/(DAC))*(PF)$$

from i=1 to n

Where:

I_r - radon daughter intake (DAC-hours)

Dt_i - time of exposure to concentration WL_i (hours)

WL_i - average number of working levels in the air

DAC - the derived air concentration value for radon daughters from Appendix B of 10 CFR 20 (0.33 WL per DAC)

PF - respirator protection factor

n - number of exposure periods during the year

9.8.4 Bioassay Intake Calculation

When urine bioassay data is available, and the bioassay indicates significant uranium intake, worker airborne uranium intakes are calculated by using an intake conversion factor (ICF) similar to NUREG 8.22, and standards in HPS ANSI *Bioassay Programs for Uranium*. All uranium intake calculations are of soluble class W. Calculations of chronic vs. acute intake will be determined at the descretion of the RSO. Subsequent bioassays may be necessary to confirm an intake, and will supersede an unconfirmed previous bioassay.

$$I_{u\ acute} = S\ C_{u,i} / ICF_{acute,i} \text{ and}$$

$$I_{u\ chronic} = S\ C_{u,i}\ Dt_i / ICF_{chronic,i}\ ,$$

from i=1 to n

Where:

$C_{u,i}$ - urine bioassay concentration (mg/L)
$I_{u\ acute}$ - uranium acute intake (mg)
$I_{u\ chronic}$ - uranium chronic intake (mg)
Dt_i - time duration of worker chronic for bioassay i (days)
$ICF_{acute,i}$ - acute intake conversion factor for bioassay i (/L)
$ICF_{chronic,i}$ - chronic intake conversion factor for bioassay i (days/L)
n - number of intakes or bioassays during the period of evaluation

9.8.5 Action Levels Requiring Notification

Section 20.2203 of 10 CFR requires that overexposure reports be made to the appropriate NRC Regional Office if the intake of uranium, and/or radon exceeds the quantities specified in 10 CFR 20.1201. If the following exposure limits will be exceeded at the CUP, HRI will notify NRC.

a. Soluble Uranium - if an employee has an intake of more than 10 mg of soluble uranium in one week. This intake is in consideration of chemical toxicity.

b. Total Effective Dose Equivalent (TEDE) - if an employee exceeds the TEDE annual limit of 5 rem.

c. If an employee exceeds 4 WLM ^{222}Rn Progeny.

9.8.6 Administrative Action Levels

An administrative action level will be set at 3 mg of soluble uranium for a calendar week. An administrative action level will be set at 130 DAC-hours for exposure to insoluble uranium, and/or radon daughters for any calendar quarter. If the action level is exceeded, the RSO will initiate an investigation into the cause of the occurrence, determine any corrective actions that will reduce future exposures, and document the corrective actions taken. Results of the investigation will be reported to management.

The results of the TLD badges will be evaluated on a quarterly basis, and an administrative action level will be set at 300 mrem per quarter. If an employee's exposure exceeds this level, the RSO will investigate the reason for the exposure, and initiate corrective measures to prevent a recurrence.

The results of the bioassay program also will be used to evaluate the adequacy of the respiratory protection program at the facility. An abnormally high urinalysis will be investigated both to determine the cause of the high result, and determine if the exposure records adequately reflected that such an exposure may have actually occurred.

9.8.7 Airborne Radioactivity Areas

Any area, room, or enclosure will be designated "Airborne Radioactivity Area" as defined in 10 CFR 20.1003, if at any time the uranium concentration exceeds 1 DAC (3E-10 mCi/ml). It is anticipated that only the yellowcake dryer area will be posted as Airborne Radioactivity Areas as concentrations of soluble uranium may at times exceed 3E-10 mCi/ml. Because the predominant form of airborne uranium in these areas is comprised of yellowcake dried at 100 degrees Celsius, the uranium DAC for solubility class W is used (3E-10 mCi/ml).

Additionally, areas will be posted as "Airborne Radioactivity Areas" in the case that an individual present in the area without respiratory protection could exceed, during the hours an individual is present in a week, an intake of 10 percent of the ALI. Airborne radioactivity areas will be posted in accordance with 10 CFR 20.1902. HRI will avoid posting radiation hazard signs in areas that do not require them.

9.9 Bioassay Program

9.9.1 Persons to Be Monitored

Bioassays will be performed for all workers who are routinely exposed to airborne yellowcake, or excessive levels of yellowcake, such as may occur when maintenance work is performed in yellowcake areas.

9.9.2 Type of Bioassay

Bioassays will be by means of urinalysis capable of detecting the uranium content of the urine with a sensitivity of at least 1 mg/L of urine. Results will be obtained within 20 days of the collection, and corrected to standard urine specific gravity of 1.02.

$$C_{u\ \text{corrected}} = C_{u\ \text{measured}}\ (1.02 - 1)/(S_g - 1)$$

Where:

$C_{u\ \text{corrected}}$ - uranium concentration in urine corrected to standard specific gravity of 1.02 (mg/L)
$C_{u\ \text{measured}}$ - measured uranium concentration (mg/L)
S_g - measured specific gravity of the urine bioassay specimen

If an outside laboratory is used, results exceeding corrected concentration of 30 mg/L will be reported by telephone.

9.9.3 Frequency of Bioassay

Bioassays are conducted at least once each month for workers routinely exposed to yellowcake. This generally applies to individuals who are assigned to the Uranium Work Area. Individuals who work within the restricted area but not in the Uranium Work Area are not subject to routine bioassay.

Declared pregnant workers will have bioassay conducted at a minimum of once per month regardless of job assignment.

9.9.4 Actions Based on Bioassay Results

A corrected value of 30 mg/L under equilibrium conditions is considered the limiting value a worker may have for chemical toxicity. A value of 130 mg/L obtained within two weeks following a single intake of yellowcake indicates a value significantly large to cause kidney damage, according to the U.S.

Nuclear Regulatory Commission. In view of this, the following actions will be taken:

a. **Less than 15 mg/L** - none

b. **15 to 30 mg/L -**

   1. Confirm results (repeat urinalysis).
   2. Attempt to identify cause of high exposure.
   3. Take corrective measures, and/or limit worker exposure.

c. **Greater than 30 mg/L -**

   1. Take actions as given above for 15-30 mg/L.
   2. Notify the NRC in writing.
   3. Determine whether other workers could have been exposed, and perform additional bioassay measurements on them.
   4. Consider work restrictions to assure the worker does not exceed a uranium concentration of 30 mg/L in urine.

d. **Greater than 30 mg/L for four consecutive bioassays or greater than 130 mg/L for any 1 test -**

   1. Take actions given in c.
   2. Have additional urine samples tested for albumin.

9.9.5 Prevention of Specimen Contamination

Specimens are normally collected at the beginning of the work day before contamination in the workplace is possible. Clean, disposable containers are used, and the worker must wash his/her hands carefully prior to voiding, and then clearly print first, and last name, date of specimen donation, and Social Security Number.

9.9.6 Quality Control

The bioassays will be processed along with known control specimens of 15, 30 mg/L, and one blank to provide a means of assuring accuracy of the tests. New employees will be required to donate a baseline urine specimen for analysis. A program which tests for proteins using a dip-stick indicator will be established under the RSO's discretion in the RSO's lab by a designee soon after receiving the specimen. Then, an appropriate method of preservation will be employed for specimens which are stored for longer than one week according to ANSI standards of urine uranium bioassay sample preservation (such as refrigeration, or the addition of a small amount of HCl). The RSO has discretion in requesting a 24 hour urine specimen collection (1-2 L) for confirmatory analysis.

URI maintains a Standard Operating Procedure (SOP) which addresses current procedures for the bioassay program.

9.10 Contamination Control Program

The primary sources of potential surface contamination at the Crownpoint Uranium Project will be associated with precipitation, drying, and packaging activities. The recovery, and elution portions of the process will not present a significant surface contamination problem except for dried spills, or when special equipment maintenance is required. The primary method for control of surface contamination will be instruction in, and enforcement of, good housekeeping, and personal hygiene practices. Any visible yellowcake, or production fluid spills will be cleaned up as soon as possible to prevent drying, and possible suspension into the air which could pose an inhalation hazard. Plant operators will be instructed in the proper use of equipment, and the prevention of spills, and solution leaks at various stages of the process. Inadvertent contamination of designated clean areas will be controlled by instructing employees not to enter such areas with clothing, or equipment contaminated with radioactive materials. If yellowcake is detected in a designated clean area, the RSO will be notified immediately, the area will be promptly cleaned, and an investigation into the source of the contamination will be performed.

To ensure these administrative controls will be effective in controlling surface contamination, alpha contamination surveys will be performed monthly in process areas, and in designated clean areas.

Table 9.10-1 provides the limits for surface contamination.

9.10.1 Surface Contamination Control

Routine surveys in the Central Processing, and Satellite Facilities will consist of both a visual inspection for obvious signs of contamination, and instrument surveys to determine total alpha contamination. If the total alpha survey indicates total contamination greater than 1000 dpm/100 cm^2, a smear survey will be performed to determine the removable contamination. Results will be documented on the survey data sheet.

Table 9.10-1 Limits for Release to Uncontrolled Areas

Nuclide	Average[a]	Maximum[b]	Removable[c]
U-nat	5,000 dpm/100 cm2	15,000 dpm/100 cm2	1,000 dpm/100 cm^2
226-Ra	100 dpm/100 cm2	300 dpm/100 cm^2	20 dpm/100 cm^2

a. Averaged over no more than 1 m^2.

b. Applies to an area of not more than 100 cm^2.

c. Determined by smearing with dry filter, or soft absorbent paper, applying moderate pressure and assessing the amount of radioactive material on the smear.

Source: Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," and "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use, or Termination of License for Byproduct, Source, or Special Nuclear Material."

In non-Uranium Work Areas such as lunch rooms, offices, and change rooms, if the total alpha survey indicates contamination in excess of 1000 dpm/100 cm^2 (i.e. 20% of Table 9.10-1 removable limits) a smear test will be performed to assess the level of removable alpha activity. If smear test results indicate removable contamination greater than 200 dpm/100 cm^2, the area will be cleaned promptly, and resurveyed. The RSO will investigate the cause of the contamination, and implement corrective action to minimize the potential for a recurrence.

Uranium processing equipment that must be removed for maintenance, or repair will be thoroughly decontaminated to prevent the possibility of contamination in the maintenance shop. Any materials, or equipment being released from the project site to an unrestricted area will be surveyed for contamination prior to release. Should the survey indicate contamination in excess of the Table 9.10-1 limits, the equipment/material will be decontaminated, and surveyed again. The survey results will be documented, and maintained on site.

9.10.2 Personnel Contamination Control

Employees will maintain change rooms, showers, and lockers for clean clothing. An operable, and appropriately calibrated alpha survey meter will be made available for employee use at the exit of the change room.

Employees will be instructed in the use of the survey meter, techniques for minimizing contamination, for maintaining good industrial hygiene, and in basic decontamination methods. Also, employees will be instructed on methods, and procedures for good housekeeping practices within process areas to minimize the potential for contamination of personnel, and equipment. The RSO, or designee will perform unannounced spot check surveys for alpha contamination on workers leaving the Uranium Work Areas. These unannounced spot check surveys will be conducted on at least a quarterly basis.

Employees working in the precipitation, drying, and packaging areas, as well as those involved in process equipment maintenance, or repair, will maintain appropriate protective clothing, and equipment. Protective clothing will be laundered on site, or if a disposable type, will be disposed in a facility licensed to accept such wastes.

All employees with potential exposure to yellowcake, or yellowcake dust may shower, and change clothes each day prior to leaving the site. An employee who showers, and changes clothes will be considered to be free of significant contamination. In lieu of showering, employees who work in the Uranium Work Area are required to survey their clothing, shoes, hands, face, and hair with an "frisk", alpha survey instrument prior to leaving the site. These surveys, and/or showers will be documented, and maintained on site. Additionally, prior to entering a designated clean area (e.g. lunchroom) from processing areas, employees will be required to wash their face, and hands to ensure complete removal of possible contamination.

9.10.3 Transports and Shipments

Transport surveys demonstrate that the exposure levels are below the regulatory limits, and the truck surfaces are free of radioactive material.

9.10.3.1 Yellowcake Drum Transport Survey

Packaged drums filled with dry yellowcake located on the storage pad will be smear surveyed using filter paper before shipment. The truck, and trailer loaded with yellowcake drums will be surveyed for external exposure rate. The surface swipes, and external exposure surveys will be recorded, and included as part of the YC drum shipment papers. Shipment papers will include measured contents of each drum, drivers agreement, bill of lading, and instructions in case of accident, or spill.

Limits for Yellowcake Drum Transport

• removable alpha[1]	2,200 dpm/100 cm^2
• removable gamma/beta[1]	22,000 dpm/100 cm^2
• external exposure rate[2] at skin of trailer	2 mrem/hr

[1] 49CFR173.443
[2] 49CFR173.400

9.10.3.2 Yellowcake Drum Transport Labeling

Yellowcake is classified by the Department of Transportation as radioactive material of Low Specific Activity (LSA) according to 49 CFR 172-178. Each drum will be labeled on two sides with the drum number, net yellowcake weight, and radioactivity stickers including LSA, and Caution - Radioactive Material. Radioactive Material sticker is magenta against yellow background, and contains the following information:

Caution
Radioactive Material

Handle Carefully
No person will remain within 3 feet of this container unnecessarily
Principle radioactive contents: Natural Uranium (Oxide)
Activity of contents: 50 mCi (maximum)
Estimated radiation level at package surface
when packaged: 3.0 mrem/hr

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9.10.3.3 Slurry Transports

Yellowcake slurry will be transported in DOT approved slurry trailers which are placarded according to DOT specifications. Slurry transports will be surveyed before, and after positioning on the processing pad. Slurry transports will be surveyed in a manner similar to the drum transport survey using a portable external exposure rate meters. Filter swipe(s) will be taken, and counted for alpha.

Limits for Slurry Transports

•	removable alpha	1,000 dpm/100 cm^2
•	external exposure rate	200 mrem/hr

9.10.3.4 Shipping and Receiving Packages

All packages will be surveyed as soon as practicable after receipt, and prior to commercial ground carrier shipment. The RSO will be notified of any anticipated package shipments, and upon their receipt. The package will be surveyed for external exposure rate, surface alpha, and beta, and swipe survey for removable alpha, and beta. All packages will be required to have the DOT labeling for packages containing radioactive material with the correct UN number, and a Radioactive White I, Yellow II, or Yellow III label which includes the radionuclide(s), and quantity. For packages containing yellowcake samples for an independent laboratory analysis, they will also be labeled Low

Specific Activity (LSA). Packages received will be assessed for degradation, or loss of containment integrity.

9.10.3.5 Trash Surveys

Office trash, and other materials which are free of process contamination are disposed of in a municipal land fill. Loads of trash are surveyed for gamma activity before leaving the site. No survey will exceed two times background at the surface of the trash trailer. Records are maintained on site.

9.11 Respiratory Protection

9.11.1 Introduction and Policy Statement

In accordance with Subpart H, "Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas" of 10 CFR Part 20, "Standards for Protection Against Radiation" which permits licensees to make allowance for the use of respiratory protection in estimating exposures of individuals to airborne radioactive material, HRI will initiate a Respiratory Protection Program for the purpose of using the allowance similar to the U.S. Nuclear Regulatory Commission Regulatory Guide 8.15.

Whenever practicable, HRI will utilize engineering controls, such as ventilation, or process enclosure to preclude the use of respirators. However, when it is impracticable to apply process, or other engineering controls to limit concentrations of radioactive materials below those that define an airborne radioactivity area, other precautionary procedures, including increased surveillance, and air sampling, limitation of work times in the area(s), and respiratory protective equipment, will be used to maintain the intake of radioactive materials ALARA.

Respirators will be routinely used for certain operations within the dryer, and packaging areas, as well as for certain maintenance activities in these areas. Radiation work permits for non-routine jobs, and emergency situations may also require respirator usage. Employees will not enter areas where radioactive materials may exceed acceptable standards nor perform maintenance activities which may involve airborne releases until the RSO, or designee has evaluated the potential exposure, and selected the proper respiratory equipment, and other radiological protection controls.

9.11.2 Respiratory Protection Policies and Responsibilities

a. Respirators will be used only for operations where it is not feasible to prevent atmospheric contamination by effective engineering controls such as process enclosure, or ventilation. However, respirator use is no substitute for practicable engineering controls. Therefore, respirators will be used only while engineering controls are being evaluated/instituted, and during maintenance in tanks, or other enclosures that routinely contain radioactive materials, and/or other toxic materials. Only approved, or certified respiratory equipment will be used.

b. Respirators will be used routinely for operations within the drying, and packaging areas, and for certain other maintenance activities. Radiation work permits for special jobs, and emergency situations may also require respirator use. Employees will not be allowed to enter areas where radioactive contaminants may exceed acceptable standards nor perform maintenance activities which may involve airborne releases until the Radiation Safety Officer (RSO), or designee has evaluated the potential exposure, selected the proper respiratory equipment, and implemented other health physics controls as may be appropriate for the situation.

c. Employees will leave an area where respiratory protection is required at anytime for relief from respirator use in the event of equipment malfunction, physical, or psychological distress, procedural, or communication failure, significant deterioration of operating conditions, or any other condition that may require such relief.

d. Any individual required to wear a respirator to perform routine, or nonroutine tasks is also required to have a shaven face where nothing interferes with the seal of tight-fitting face pieces against the skin.

9.11.3 Employees Responsibilities

a. Using the respirator in accordance with instruction, and training provided by the RSO, or designee. For some types of respirators providing protection for individuals wearing corrective glasses is a serious problem. A proper seal cannot be established if the temple bars of the eye glasses extend through the sealing edge of the full facepieces. When a worker must wear corrective glasses as part of a facepiece, the facepiece, and lenses will be fitted by a qualified individual to provide both good vision, comfort, and a gas-tight fit.

b. Informing his Supervisor of any personal health problem that could be aggravated by the use of respiratory protection equipment.

c. Not modifying, or in any way altering the manufacturers design of the respirator.

d. Pre-use inspection, and reporting any observed, or suspected malfunctioning respirator to the RSO, or designee.

e. Using only those brands, and types of equipment for which he has been trained to use, and can obtain a satisfactory fit.

f. Checking the seal of the respirator by appropriate means prior to entering a harmful atmosphere.

g. Notifying his supervisor, the RSO, or designee whenever it is necessary to enter an area in which airborne radioactive contaminants may exceed acceptable standards, for the purpose of performing non-routine maintenance, or activities for which a standard operating procedure does not exist.

9.11.4 Supervisors Responsibilities

a. Notifying the RSO, or designee whenever it is necessary for an employee to enter an area in which airborne radioactive contaminants may exceed acceptable standards for the purpose of performing non-routine maintenance, or activities for which a standard operating procedure does not exist.

b. Enforcing the use of respirators in situations that require respiratory protection.

c. Consulting with the RSO, or designee for evaluation of exposure hazards whenever it is suspected that airborne radioactive or, toxic contaminants could exceed acceptable standards.

d. Notifying the RSO, or designee of any employee known to have an active medical work restriction, and obtain RSO clearance for such employee prior to assignment of any job requiring the use of respiratory protection.

9.11.5 The RSO or Designee Responsibilities

a. Providing necessary respiratory equipment to protect the health of the employee.

b. Maintaining equipment in serviceable condition.

c. The selection, and fitting of employees with the proper respirator, as well as instructing them in the correct use, and maintenance of the respirator.

d. Random inspections of respirator use.

e. Evaluating employee exposures, and work conditions, including monitoring of airborne radioactive contaminant concentrations during the time the employees are working, and determining when a urinalysis is required similar to NRC Regulatory Guide 8.22.

f. Establishing, and keeping records as required.

9.11.6 Respiratory Protective Equipment Selection

Several types of respiratory protection equipment are available, and have been chosen to offer protection against potential airborne radioactive hazards to be encountered. The function of respirator type selection is assigned to the RSO, designee, or the Director of Safety.

a. Several factors govern equipment selection. These include:

1. Nature, and extent of the hazard.
2. Work requirements, and conditions.
3. Respiratory equipment limitation.

b. The types of respirators that may be used at the Crownpoint Uranium Project are those specified in Appendix A of 10CFR20.

c. Protection Factors. The overall protection given by a certain respirator is defined in terms of its protection factor (PF). These are outlined in Table I, US NRC Regulatory Guide 8.15, and 10 CFR 20 Appendix A.

The PF is a measure of degree of protection afforded by a respirator defined as the ratio of the concentration of contaminants outside the face mask, or hood to that inside the equipment under conditions of use. For example, an air purifying half-mask may be used for protection in atmospheres with a contaminant concentration up to 10 times the permissible exposure limit. In the case of employee-measured intake of airborne radioactive contaminants, the ambient concentration in the air is divided by the protection factor to determine actual intake. The PFs are based on laboratory tests which show how much leakage can occur between face piece seal, and the face on a cross-section of different facial types, and sizes after each wearer was properly fitted with various types of equipment. Therefore, the PFs may only be used on those people who are found to have a satisfactory fit with the device they are wearing. (See NRC Regulatory Guide 8.15, or 10CFR20 App. A for appropriate protection factors.)

d. Air-Purifying Respirators. Air-purifying respirators remove nonradioactive gases, and vapors, or any Particulates from the ambient air to make it suitable for breathing. Air-purifying media consist of fiber filters, or sorbents used individually, or in combination, and are contained in a suitable protective casing that is designed for attachment to the respirator facepiece, or breathing tube. A filter is a fibrous medium used for the removal of airborne solid, or liquid particulates from the air stream entering the respirator enclosure. They are designed for a single type of particulate, or for various combinations of particulates such as dust, fumes, and mists. The protection factors apply for air-purifying respirators only when high efficiency particulate filters [above 99.97% removal efficiency by thermally generated 0.3 ppm dioctyl phthalate (DOP) test] are used in atmospheres not deficient in oxygen, and not containing radioactive gas, or vapor respiratory hazards.

Sorbents are used for chemically removing toxic gases, and vapors from the airstream entering the respirator enclosure. The sorbents may be used singly, or in a mixture, and multiple layers to give protection against a single gaseous contaminant, a class of contaminants (e.g., organic vapor, or acid gases), or combination of gases, and vapors. They are not, of themselves, effective against particulates. They are not approved for use for protection against radioactive gases, or vapor unless their efficiency against the gas, or vapor of interest has been well established.

9.11.7 Respiratory Training

Persons administering the Respiratory Protection Program (i.e. training, respirator selection, respiratory integrity testing, etc.) will have at least one year of work experience relevant to applied health physics, radiation protection, industrial hygiene (or related work), and respiratory protection. This experience will involve working with respiratory protective equipment, cleaning, maintenance, and fit testing (not strictly administrative). Additionally, a thorough understanding of the facilities' process, and equipment, and the hazards generated will be required. The RSO, or designee will conduct respirator training. Every employee who needs to wear a respirator for health protection must be trained in the proper selection, maintenance, and use of the respirator, and its limitations. Respirator training will be documented on a respirator training completion form. Additionally, when respirators have been used in atmospheres containing airborne uranium, employees will participate in a bioassay program consisting of urinalyses similar to NRC Regulatory Guide 8.22.

Training consists of:

a. Fitting which will be done by the RSO, or trained designee.

b. Testing face piece-to-face seal under normal face/head movements that could cause leakage to ensure a proper fit. The face-to-facepiece seal will be tested using irritant smoke.

c. Learning how to wear, adjust, and test for proper fit before each wearing, including the positive, and negative pressure fit checks.

d. Identifying the locations, and times that respiratory protection is required.

e. Learning how to identify the various respirator cartridges, and types of contaminants that each cartridge is designed to protect against.

f. Learning the proper maintenance, inspection, and storage of respirator protection devices.

Any individual with an active work restriction (temporary or permanent) will consult with his supervisor, the RSO, or designee before using any respirator.

9.11.8 Medical Approval

Medical examination (approval) is required for anyone who needs, or may have the need to wear a respirator. The medical examination is required to determine that an individual is medically fit to use the respiratory equipment. The frequency of medical examinations will be determined by a physician prior to the initial fitting of respirators, and thereafter at a frequency determined by a physician. An examination will be given every 5 years up to age 35, every 2 years up to age 45, and annually thereafter. The approval will be documented by the tester on the respirator training.

9.11.9 Pre-Use Inspection Procedure

The respirator will be inspected before each use to ensure it is in good operating condition. Any damage, or defective parts will be replaced before use. The following inspection procedure will be performed:

a. The facepiece will be checked for cracks, tears, and dirt. The facepiece, especially the face seal area, will be checked for distortions. The face seal area material will be pliable - not stiff.

b. All valves will be examined for signs of distortion, cracking, or tearing. Valve seats will be inspected for dirt, or cracking.

b. The head straps will be intact, and have good elasticity.

d. All plastic parts will be examined for signs of cracking, or fatiguing. All the gaskets will be checked for proper seating.

e. The lens in the full face mask will be clear, and free from cracking, or crazing. It will be checked for embrittlement.

f. Full face respirators with gas mask type canister will require pre-inspection of the canister. The expiration date located on the side label will be checked. The respirator will not be used if the date has past. The respirator will not be used if the seal is missing over the bottom opening, or where it threads onto the face mask.

g. When using supplied air the air filtering system will be connected to the instrument air line. The filters in the air filtering system will be checked, and replaced if necessary. The air line hose will be inspected for cracks; the rubber will be pliable, not stiff. Additionally, the hose connecting fittings will be checked to insure they are in good working order.

9.11.10 Assembly Instructions

Appropriate cartridges (high efficiency, organic vapor, or, acid/gas or, combination) will be attached securely to the facepiece at the side inhalation openings.

9.11.11 Putting on the Full Face Respirator

The following will be performed for full face respirators in a non-contaminated area.

a. The head straps will be adjusted to their full extended position.

b. The facepiece will be donned by grasping the head strap harness with the thumbs through the bands, spread outward.

c. The harness top will be pushed up the forehead, brushing hair upward from the face seal area. The donner will continue pushing up, and over the head until the harness is centered at the rear of the head, and the chin is fitted into the chin cup.

d. The facepiece will be centered on the face, and the wearer will pull both lower (neck) head straps at the same time towards the rear.

e. The two upper (temple) head straps will be tightened.

f. The forehead head strap(s) will then be tightened.

9.11.12 Putting on the Half Mask Respirator

The following will be performed in a non-contaminated area.

a. The respirator will be placed over the mouth, and nose. Then the head harness will be pulled over the crown of the head.

b. The bottom straps will be placed in back of the neck, and hooked together.

c. Tightening will require pulling the ends of the head harness, and the neck straps.

9.11.13 Fit Check

Before entering an area containing a hazardous atmosphere, the respirator wearer will be required to test the tightness of the seal of the respirator facepiece to the face by performing a negative or, positive pressure fit check. At the CUP, an random smoke fit test will be used as a spot check. These fit checks will be as follows:

a. Positive Pressure Fit Check - Place palm of hand over exhalation valve cover, and exhale gently. If the facepiece bulges slightly, and no leaks between the face, and facepiece are detected, a proper fit will be obtained. If air leakage is detected, reposition the respirator on the face, and/or readjust the tension of the head-straps to eliminate the leakage. Repeat the above steps until a tight seal is obtained. If one cannot achieve a proper fit, do not enter the contaminated area.

b. Negative Pressure Fit Check - Place the palms of the hands (alternatively$_1$ either pieces of cardboard or, plastic) over the open area of the filter cartridge, inhale gently, and hold your breath for five to ten seconds. If the facepiece collapses slightly, a proper fit has been obtained. If air leakage is detected, reposition the respirator on the face, and/or readjust the tension of the head straps to eliminate the leakage. Repeat the above steps until a tight seal is obtained. If one cannot achieve a proper fit, do not enter the contaminated area. If a tight seal cannot be achieved contact the RSO or, designee. DO NOT ENTER THE AREA WHERE THE RESPIRATOR IS REQUIRED.

To check the full face respirator with supplied air, the air is closed off, and the wearer inhales gently. The wearer then holds their breath for 10 seconds. A good fit is indicated if the mask remains collapsed toward the face while holding ones breath.

Half mask respirators require fit testing EVERY time the respirator will be put on since it is more difficult to achieve, and maintain an adequate fit with half masks than with other face pieces. At Crownpoint, a smoke fit test will be used as a spot check.

9.11.14 Respirator Maintenance

a. The primary purpose of the maintenance program will be to ensure that respiratory protective equipment will be kept ready for use. This part of the program will be very important to insure the safety of the wearer. Respirators will be cleaned, and maintained under the direction of the RSO, or designee. Each employee will be responsible for maintenance, and cleaning of the respiratory equipment they are using. The maintenance program will include the following.

1. Employee training in the approved methods for maintenance, and cleaning of respiratory equipment.

2. The decontamination, cleaning, and disinfecting of respiratory protective equipment.

3. Inspection, and testing of the respirator components for integrity, and operability.

4. Replacement of defective components, when necessary.

5. Maintenance of auxiliary equipment.

6. Appropriate storage for respiratory protective equipment.

7. Spot checks by the RSO, or designee for respirator contamination, proper respirator usage, respirator component integrity, correct cleaning practices, and proper respirator storage.

b. Respiratory Protective Equipment Cleaning, Sanitizing, and Maintenance - Hygienic procedures will be required for respirators being issued for use in environments containing airborne radionuclides, or other air contaminants. When operating in the dryer, and packaging areas, the respirator will require frequent cleaning, thereby avoiding the potential for radioactive material contaminating the inside of the facepiece. The employee will be responsible for ensuring the respiratory equipment in use will be in good working order, and the inside of the facepiece will be contamination free. Emergency devices (SCBA) require cleaning after each use.

c. Placement of used respirators in a container designated for dirty/contaminated respirators, returning them to the Environmental Laboratory.

d. Removal of filter cartridges from respirators before washing.

e. Washing the respirator in a dish washer using liquid soap, such as LIQUI-NOX. Following the wash, all parts are allowed to air dry at room temperature.

f. Inspection of all components for wear or, deterioration, especially the inhalation, exhalation valves, and seats.

g. Replacement of any worn components. Replacement parts are kept in the Environmental/Radiation Safety Lab.

h. A random swipe survey to be performed by the RSO or, designee with the results recorded on the respirator survey form. If any respirator survey indicates an alpha activity greater than 100 dpm/100 cm fixed alpha, the respirator will require re-cleaning, and surveying again.

i. Storing of the respirator in a clean plastic bag. Bags are found in the warehouse or, the Environmental Radiation Safety Lab.

j. Random inspections by the RSO or, designee of both respirator fit, and conditions during periods of use by employees. Any employee found to have a poor fit, and/or a respirator that will be unserviceable will be removed from the area, the employee refitted, and/or the respirator repaired. No protection factor will be used for the period of time the employee had an improper fit or, unserviceable respirator.

Consistent with the PBLC format, HRI will develop a Standard Operating Procedure (SOP) which addresses updated procedures for the respiratory program.

9.12 Quality Assurance

HRI will establish a Quality Assurance Program for all radiological, and non-radiological effluent, and environmental (including ground water) monitoring programs at the CUP. This Quality Assurance Program will address elements discussed in USNRC Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams, and the Environment."

9.12.1 Program Objectives and Elements

Quality assurance comprises those planned, and systematic actions which will be necessary to provide adequate confidence in the results of a monitoring program. Quality control will include those quality assurance actions that provide a means to control, and measure the characteristics of measurement equipment, and processes to established requirements. Therefore, quality assurance will include quality control.

The overall objectives of a Quality Assurance program are:

a. To identification of deficiencies in the sampling, and measurement processes to those responsible for these operations so that corrective action can be taken.

b. To obtain a measure of confidence in the results of the monitoring programs to assure regulatory agencies, and the public that the results are valid.

To achieve these objectives, a Quality Assurance plan has been developed that includes elements recommended in USNRC Regulatory Guide 4.15.

9.12.2 Organizational Structure and Responsibilities

Figure 9.12-1 shows the Environmental, and Radiation Safety organization, and reporting responsibilities at the Crownpoint Uranium Project. The responsibilities of those personnel involved in Quality Assurance will be follows:

9.12.2.1 V.P. of Health, Safety and Environmental Affairs

The Vice President of Health, Safety, and Environmental Affairs (VPHSE)will have the ultimate responsibility, and authority for the radiation safety, environmental compliance, and Quality Assurance program at the Crownpoint Uranium Project in addition to off-site project development activities. The VPHSE will provide corporate audit input to the Environmental Manager, and Radiation Safety Officer to ensure that all radiation safety, environmental compliance, and permitting/licensing programs will be conducted in a responsible manner, and in compliance with all

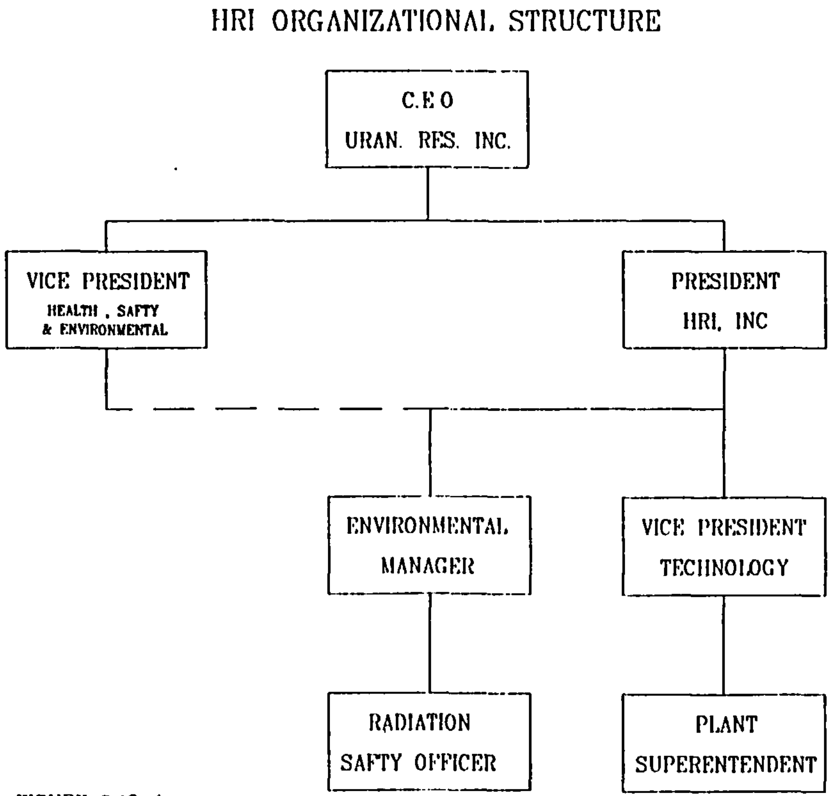

HRI ORGANIZATIONAL STRUCTURE
C.E O
URAN. RES. INC.
VICE PRESIDENT
HEALTH , SAFTY
& ENVIRONMENTAL
PRESIDENT
HRI, INC
ENVIRONMENTAL
MANAGER
VICE PRESIDENT
TECHNOLOGY
RADIATION
SAFTY OFFICER
PLANT
SUPERENTENDENT

FIGURE 9.12-1

applicable regulations, and permit/license conditions. The VPHSE will report directly to the CEO of Uranium Resources, Inc.

9.12.2.2 V.P. Technology

The CUP Vice President of Technology (VPT) will be directly responsible for all operations, including, implementing industrial, and radiation safety, and environmental protection. This includes all operating procedures, radiation safety programs, industrial safety programs, environmental, and ground water monitoring programs, associated quality assurance programs, and routine, and non-routine maintenance activities. The VPT will be also responsible for compliance with all regulatory license conditions, and regulations, and reporting requirements. The VPT will have the responsibility, and authority to terminate immediately any activity that is determined to be a threat to employees, or public health, or the environment as indicated in reports from the Environmental Manager, or RSO. The VPT will be a member of the ALARA Committee, and the ALARA Audit Team, and will report directly to the President of HRI.

9.12.2.3 Plant Superintendent

One Plant Superintendent will be present at each CUP location including the CCP, and the individual satellites. The Plant Superintendent is responsible for all plant operational and maintenance activity. He is authorized to carry out all directives from the Vice President of Technology. In lieu of direct action by the Vice President of Technology, he is authorized to change any operational and maintenance procedure that he deems to be unsafe. Subsequently, he must report any such change.

The Plant Superintendent will implement a training program for operation and maintenance personnel on work that could result in the exposure of personnel or the environment to radioactive materials in excess of established limits. He will annually review operation and maintenance personnel training documentation to verify adequacy of course content and training records.

The Plant Superintendent will be responsible for operational and maintenance procedures. Procedures will be based upon manufacturer's recommendations, inspection data and operating experience. He will conduct an annual review and approve operating and maintenance procedures and their revisions and institute a document control program to insure that operating documents and their revisions are issued only after they are properly reviewed and approved. He will keep a master file of operating and maintenance procedures and revisions.

9.12.2.4 Environmental Manager

The Environmental Manager (EM) will be responsible for the development, administration, and enforcement of all radiation protection, environmental, and ground water monitoring programs at the CUP.

The EM will assist in the development, review, and approval of sampling, and analysis procedures used at the CUP, and aid in the technical evaluation of laboratory data, as required. The EM will be also responsible for routine auditing of sampling quality assurance/quality control programs developed, and used at the CUP.

The EM will develop, and administer radiation protection programs to ensure that (1) employees will be afforded the optimum practical protection against radiation hazards, (2) exposure of employees to radiation, and radioactive materials will be maintained "As Low As Reasonably Achievable", and (3) all applicable regulatory requirements will be met. The EM also will provide technical guidance, and assistance to site personnel in the matter of radiation protection. The EM will have the authority to terminate immediately any activity that will be determined to be a threat to the employees, or public health, or the environment as indicated in reports from the CUP RSO. The EM will chair the ALARA Committee, be a member of the ALARA Audit team, and report directly to the President of HRI.

9.12.2.5 Radiation Safety Officer

The CUP Radiation Safety Officer (RSO) will be responsible for the daily supervision of the radiation safety, and environmental programs at the CUP. Responsibilities will include the development, and implementation of all radiation safety, and environmental programs, ensuring that all records will be correctly maintained, and assist the VPT in ensuring compliance with NRC regulations, and license conditions. The RSO will be designated as the Site QA Coordinator. The RSO will conduct training programs for the supervisors, and employees with regard to the proper application of radiation protection, and environmental control procedures. The RSO will personally inspects facilities to verify compliance with all applicable radiological health, and safety requirements, and the Quality Assurance Program. The RSO will be a member of the ALARA

Committee, assist management with the Annual ALARA Audit, and report directly to the EM.

9.12.2.6 Radiation Safety Technician

At least one RST will be present at each CUP location including the CCP, and the individual satellites. The Crownpoint RST will conduct environmental, and radiological surveys, collect air, water, soil, and vegetation samples, performs analyses, collects data for the radiation safety program; perform calculations of employee radiation exposures, keep records, and conduct various other activities associated with implementation of the environmental, and radiation protection programs. The RST will report all radiation protection data directly to the RSO prior to submittal to the EM. The RST will be a member of the ALARA Committee, assist management with the Annual ALARA Audit, and report directly to the RSO.

9.12.3 Qualifications and Training

Minimum technical qualifications, and experience required for personnel who will be responsible for developing, and administering the Crownpoint radiation, and environmental protection programs, and the Quality Assurance Program will be as follows:

9.12.3.1 VPHSE

The VPHSE will require a Bachelors degree in Engineering, or Science from an accredited college, or university, or equivalent work experience, plus a minimum of five years management experience in senior management of engineering, and operations functions. A Masters degree will qualify for two years work experience.

9.12.3.2 Vice President Technology

The position of VPT will require a Bachelors degree in Engineering, or Science from an accredited college, or university, or equivalent work experience, plus a minimum of five years supervisory experience. A Masters degree will qualify for two years work experience. Work experience will include industrial process/production experience, and industrial process/ production management.

9.12.3.3 Environmental Manager

The position of EM will require a bachelor's degree in the physical, or biological sciences, mathematics, or engineering from an accredited college, or university, and at least three years of experience in applied health physics, and radiation protection. Experience will be industry related. A Masters degree will qualify for two years work experience.

9.12.3.4 Radiation Safety Officer

The position of RSO will require a Bachelor's degree in physical, or biological sciences, engineering, or related discipline from an accredited college, or university, and at least three years of appropriate experience in environmental compliance, permitting, radiation protection, and technical supervision. At least two of the three years experience will be at an operation, and in a position where knowledge of radiation protection programs has been obtained. A Masters degree in Health Physics will qualify for two years work experience. This position will also require 40 hours of formal radiation protection training.

9.12.3.5 Radiation Safety Technician

The position of RST will require a minimum of a high school diploma, or alternatively, an equivalent combination of experience, and training in uranium mill radiation protection. A Bachelor's degree in physical, or biological sciences, engineering, or related discipline from an accredited college, or university with no experience will also be acceptable.

9.12.3.6 QA Training

Personnel performing quality related activities, such as radiological sampling, water quality sampling, and analysis, and environmental monitoring, will be trained in the principles, and techniques of the activities performed. The majority of the personnel involved in these quality related activities will be experienced professionals. Training of the field personnel (e.g., RST, samplers) will be achieved by an on-the-job training (OJT) program that will be specific to the activities performed, and will be administered by experienced professionals. This OJT training will be documented, and maintained on site. The training period will continue until the employee demonstrates proficiency as determined by observation of his/her working techniques, and by obtaining acceptable sampling, and analytical results.

9.12.3.7 Training Evaluation

At least annually, each individual who performs quality related activities will undergo a performance review by his immediate supervisor which will include an evaluation of the person's performance, adherence to written procedures, and knowledge of the nature, and goals of the Quality Assurance Program. This evaluation will be documented, and maintained on site.

9.12.4 Operating Procedures

HRI will establish Standard Operating Procedures (SOP's) for operational, and non-operational activities involving radioactive materials including quality related activities. Prior to implementation of new, or revised SOP's, they will be reviewed, and approved by the SERP to ensure that proper safety, and radiation safety principles, and practices have been included. Additionally, the EM will perform a documented audit of all existing operating procedures that deal with radioactive materials on an annual basis.

9.12.5 Ground and Surface Water Quality Monitoring Program

Additionally consistent with PBL license requirements, HRI will develop specific SOP's detailing the procedures for collecting water samples, and analyzing for the excursion parameters. Baseline water quality samples will be filtered, and preserved on site, and transported to an EPA approved laboratory for analysis. All baseline samples are preserved, and analyzed in accordance with accepted methods. Ten percent of the baseline samples are duplicated, and the duplicate sample sent to a second EPA approved laboratory for the purpose of comparative analysis.

For every 20 excursion monitor well samples, a duplicate sample, and a spiked sample are analyzed. The duplication begins with original sample aliquots, and allows the analyst to determine the precision of the analytical result. Standard addition spikes consist of the addition of a known amount of analyze to a duplicate sample aliquot. These spiked samples are useful in estimating the accuracy of an analytical result as well as identifying potential interferences.

The quarterly environmental ground, and surface water samples described in Section 9.4.2 are preserved on-site ,and transported to an EPA certified laboratory for analysis. The samples are preserved, and analyzed in accordance with accepted methods.

9.12.6 Airborne Effluent and Environmental Sampling Program

The air filters collected from the environmental stations are composited quarterly, and sent to an EPA certified laboratory for analysis. The passive radon, and gamma detectors are analyzed by the manufacturer.

9.12.7 Radiological Monitoring Program

9.12.7.1 Monitoring Locations

Figures 2.1-1, and 2.1-2 of the Operations Plan illustrate the monitoring locations, and the type of sampling performed at each location within the process areas at the CUP is described in Table 9.4-2.

9.12.7.2 Monitoring Equipment

Table 9.4-1 lists the specifications of typical radiation monitoring instruments that are used at the Crownpoint Uranium Project. A sufficient number of back up instruments will be available to insure that there will be operable instrumentation during calibration downtime, and in the event of maintenance problems.

9.12.7.3 Quality of Samples

Provisions will be made to ensure that representative samples are obtained by the use of proper sampling equipment, locations of sampling points, and sampling procedures.

Air samples may be composited for analysis if they are collected at the same location, and if they represent a sampling period of one calendar quarter, or less. Air samples collected for analysis of 222-Rn, and/or radon progeny will be analyzed using appropriate methods to minimize activity loss due to decay.

9.12.7.4 Lower Limit of Detection

The lower limit of detection for radiological, and environmental samples is determined similar to NRC Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills"; Regulatory Guide 8.30, "Health Physics Surveys in Uranium Mills"; and NUREG - 5849, "Manual for Conducting Radiological Surveys in Support of License Termination", Section 5.2 "Instrument Detection Sensitivity" In general for radiological detection of a mass sample when the gross, and background count times are equal, the Minimum Detectable Amount (MDA) is:

$$MDA = [2.71 + 4.65 (R_b)^{0.5}] / [2.22 E M (t_b)^{0.5}]$$

Where:

MDA - minimum detectable amount (pCi/g)
R_b - background count rate (cpm)
t_b - background count time (min)= gross count time
E - counter efficiency
M - sample mass (g)
2.22 - activity conversion factor (dpm/pCi)

9.12.7.5 Error Estimates

Whenever possible, results reported from the contract laboratory include estimates of uncertainty. The magnitude of the random error of the analysis to the 90% uncertainty level is reported (2 standard deviations).

9.12.7.6 Calibration

Individual SOP's are used for calibrating all sampling, and measuring equipment (in conjunction with the use of qualified calibration services using appropriate procedures). Procedures, and calibration methods used ensure that the equipment will operate with adequate accuracy, and stability over the range of its intended use. Calibration procedures may be compilations of published standard practices, manufacturers' instructions, or procedures written in-house. To the extent possible, calibration of radiation measuring equipment is performed using radionuclide standards traceable to the National Institute of Standards and Technology (NIST).

Calibrations are performed on radiation detection instruments at annual intervals. Equipment is recalibrated, or replaced after any repairs, or whenever it is suspected of being out of adjustment, excessively worn, or otherwise damaged, and not operating properly. Functional tests, i.e., routine checks performed to demonstrate that a given instrument is in working condition, are performed using sources that are not traceable to the NIST. Radiation detection instruments are function tested with a radiation check source before each day's use to ensure that they are responding to within +/- 20% of the reference reading for the check source. These function tests are documented, and maintained on site.

9.12.7.7 Quality of Results

A continuous program will be implemented for ensuring the quality of results, and for keeping random, and systematic uncertainties to a minimum. The procedure will ensure that samples, and measurements are obtained in a uniform manner, and that samples are not changed prior to analysis because of handling, or storage environment.

Procedures for computation of the concentration of radioactive materials include periodic independent verification of the results by a person other than the one performing the original calculation. The input data for computer calculations are verified by a knowledgeable individual. All computer programs are verified prior to initial use, and after each modification made by the manufacturer.

9.12.8 Field Sampling and Measurement Records

Field sampling, and measurement records are maintained at the Crownpoint Site. These records include:

a. Baseline Well Sampling Data Sheets;

b. Monitor Well Sampling Data Sheets;

c. Environmental Radiological Sampling Data Sheets;

d. Analytical Laboratory data sheets containing data on environmental samples, spikes, and duplicates;

e. Radiological measurement data sheets containing sampling, background measurement, and standardization data;

f. Instrument calibration records.

It will be the responsibility of the RSO to maintain all records pertaining to radiation measurement. The EM will be responsible for all records pertaining to baseline, and excursion monitor well water quality sample collection, and analysis.

A duplicate set of contract laboratories' analytical results will be maintained at an off site location.

One copy of each annual ALARA/QA/QC audit report as discussed in Section 9.12.12 will be kept at the site, and it will be the responsibility of the RSO to maintain this file. A second copy will be filed at the CCP.

All records will be maintained for five years, or until such time disposal is authorized by the USNRC if less than five years. All personnel radiation exposure files will be retained at the Corporate Office after CUP is closed.

9.12.9 Quality Assurance for Sampling

The quality assurance program for sampling can be broken down into the following areas:

a. Procedures used by the sampler which will define the details of sample location, sample frequency, number of samples, duration of sampling, sample volume, sample collection methods, and holding times, equipment used for sample collection, sample containers, pre-treatment of containers, type, and amount of preservative added, a replicate program, and chain of custody procedures.

b. SOP's will be prepared for calibration, and maintenance of equipment used for field measurement. These procedures will provide details for the standardization, use, and maintenance of the instruments

c. Random control checks are made by taking duplicate samples from specified points, and submitting these to the contract analytical laboratory. These checks will allow for the evaluation of the performance of the contract laboratory, and to some extent, the validity of sampling procedures. In the event that the results of the duplicate samples will not agree within acceptable tolerances, an audit will be performed to determine if the cause is due to sampling, preservation, and/or shipping methods, or the contract laboratory. Appropriate corrective action will be taken based on the results of the audit.

9.12.10 Quality Control in the Laboratory

9.12.10.1 Water Quality Laboratory

All baseline water quality samples will be sent to a contract EPA certified laboratory for analysis. HRI requires that the contract laboratory notify HRI should they no longer be EPA certified.

9.12.10.2 Radiochemical Laboratory

Environmental radio-chemical analysis will be conducted by an EPA certified contract laboratory. HRI will require that the contract lab notify HRI should they no longer be EPA certified.

9.12.10.3 Inter-Laboratory Analysis

As a further check on the Contract Laboratory, HRI will routinely submit duplicate samples to the laboratory, and a second EPA certified laboratory as described in Section 9.12.5. If the results of the duplicate analyses are not within acceptable tolerances, the laboratory will be advised, and must take the necessary corrective action to assure precise, and consistent data. The corrective action taken by the laboratory will be reported in writing to HRI.

9.12.10.4 On Site Laboratory

The goal of the Quality Assurance program of the on site laboratory will be to assure that data generated by the laboratory is scientifically valid, of known quality, and of sufficient quality to meet the regulatory agencies' requirements. The data must be reliable, defensible, and comparable to similar data generated by other laboratories. In order to meet this goal, the following plan will be implemented at the CUP laboratory:

a. All environmental samples received by the laboratory will be documented with the date received.

b. Records of field conductivity, and pH will be compared with the values obtained by the laboratory. Significant discrepancies will be investigated promptly to determine if the field, or laboratory measurements are in error. Appropriate corrective action will be taken based on the results of the investigation.

c. Checks will be made to ensure proper preservation, and storage techniques have been implemented where applicable.

d. Chemical analysis procedures will be documented, and maintained in the SOP manual.

e. Newly employed lab technicians will be fully trained, and their ability to accurately perform the analyses is documented.

f. Sample analysis information such as volume of sample, volume of titrant, absorbance, etc. will be permanently recorded as well as the initials of the technician performing the analysis.

g. One spike, and one duplicate analysis per 20 monitor well samples excursion will be performed, and the results evaluated.

h. Standards, and blanks, if necessary, will be run, and the results documented.

I. Results of the analyses will be entered on the proper forms, and copies of the forms will be distributed according to a prescribed distribution list. The original form will be maintained by the laboratory.

j. All calibration, maintenance, and repair records of laboratory instrumentation will be documented, and maintained on site.

9.12.11 Review and Analysis of Data

The radiological, and water quality data received from the on-site and contract laboratories will be reviewed by the RSO, and/or the Environmental Manager, or designee, who will be responsible for technically evaluating the data, and distributing it to the appropriate files.

The criteria for the technical evaluation of the data will be discussed below.

9.12.11.1 Water Quality Data

Water quality data will be evaluated for reasonableness, and agreement with previous analyses by the analyst, and the Environmental Manager in accordance with the procedure outlined in Section 9.12.11.3.

Cation-anion balance will be between 0.95 and 1.05.

The ratio of the measured total dissolved solids (TDS) at 180 degrees with the calculated TDS corrected for bicarbonate decomposition will be between 0.9 and 1.10.

9.12.11.2 Radiological Data

Radiological data received from the on-site, or contract laboratories will be reviewed for reasonableness, and agreement with previous analyses by the RSO who will be responsible for technically evaluating the data, and distributing it to the appropriate files.

The criteria for the technical evaluation discussed below.

The reviewer will verify that the detection limits are 10% or less than the appropriate values listed within the Tables in 10CFR20 Appendix B.

The reviewer will determine whether the data indicates exceedance of applicable limits, or are trending upwards toward a problem.

9.12.11.3 Data Comparison

The data on a given sample, or set of samples, and will be compared with the data from previous representative samples from the same population. If an individual result is within the precision, and accuracy range of the method being utilized, and agrees with results obtained on previous samples, the result will be considered acceptable. If the result is outside of this range, and does not agree with previous results, the data set will be evaluated for trends, other unusual distributions, or laboratory, and/or sampling error. The laboratory will then be notified, and asked to check calculations, and quality control checks. If no discrepancies are found, a new analysis will be requested on the sample provided that the maximum holding time for the sample has not been exceeded. If the maximum holding time has been exceeded, a resample will be requested. If the resample verifies that a significant change in water quality, or radiological conditions has occurred, the cause of this change will be determined. The results of this investigation will be documented, and reported to the Environmental Manager as soon as possible, and, if necessary, corrective action initiated. If the data indicates that exceedance of applicable limits has taken place, appropriate reporting, and documentation of corrective actions will be performed in accordance with NRC license, and permit requirements.

9.12.12 Quality Assurance/Quality Control Audits

An annual audit of the water quality sampling, and analysis program, radiological monitoring sampling, and Quality Assurance/Quality Control programs will be conducted in conjunction with the annual ALARA audit by the EM, and the VPHSE. The EM may designate individuals qualified in chemistry, and monitoring techniques who will not have direct responsibilities in the areas being audited to assist in the audit. Audit results will be reviewed with the RSO, the VPT, and the President of HRI. The results of the audit, and corrective actions to be taken, if required, will be documented, and maintained on site. An additional copy will be filed at the corporate office.

9.13 Security

HRI will minimize access, and provides accountability for all persons entering the CUP restricted area. Restricted areas will include the CCP, and individual satellites. The restricted area includes the facilities inside the fenced area of the CUP. This will include all buildings, and wellfield patterns, and associated equipment. Access to this area will be through the main gate which will be electronically controlled, and will only be opened by entering a combination into the key pad, or by contacting a HRI employee inside the property on the call box.

All non-employees entering the CUP will be required to log in at the main office after receiving visitor training or, as appropriate for the work they will be performing. The combination to the main gate will be changed at irregular intervals to ensure that the restricted area security is maintained.

9.14 Contingency Plan for Transportation Accidents

9.14.1 Purpose

This section identifies the procedures to be followed in the event of a highway transportation accident of uranium concentrate (yellowcake slurry or ion exchange resin) between the Unit 1 satellite, or Churchrock satellite, and CCP facility. Material shipped from Crownpoint will be dried, and packaged according to Department of Transportation (DOT) requirements. The shipper utilized by HRI will be licensed to transport the yellowcake product, in its dried form, and have an approved accident contingency plan, as part of the licensing process.

There are three major portions to the emergency response plan: immediate containment, accurate, and proper notification, and a conceptualized cleanup procedure with preplanned dedicated personnel, and equipment.

9.14.2 Shipments

To minimize the severity of an accident, the driver will be fully briefed on the nature of his load, and the necessary safety precautions. The special instructions for accidents will be verbally presented to him, and he will also carry written instructions with him accompanying the shipping papers. Additionally, a simple one page response letter will accompany the shipping papers detailing the nature of the problem. The letter will be used by persons encountering the accident, if the driver is unable to explain the nature of the material, and the preliminary containment procedures. An example of the emergency response letter, and the driver's manual accompanies this manual.

9.14.3 Initial Containment

The basic philosophy in spill containment will be to prevent the spread of the material, and to notify HRI personnel, and civil authorities.

a. Containment - each transporter will be equipped with the proper shipping papers, response letter of identification, and notification, driver's contingency manual, and the following equipment in a weatherproof box:

1. Polyethylene sheeting (2,000 square feet).
2. Shovels (2, short handle).
3. Disposable coveralls (3 pairs).
4. Rubber boots (3 pairs, mixed sizes).
5. Rubber gloves (4 pair).
6. Fiber tape (2 rolls).
7. Pocket knives (3).
8. Reflective warning signs, and polyethylene rope.
9. Respirators (3).

The drivers, or civil authorities immediately on the scene will cover any spilled material with the sheeting. Sufficient protective clothing will be available for the work. The equipment, and clothing will be wrapped in plastic after it is used (for future decontamination). The site will be secured from unauthorized personnel, and all civil authorities will be notified, and briefed on the situation. The initial notification, and precautions will be enumerated in the response letter, and the driver's manual.

The following are procedures, and containment:

1. Tank - not leaking

   a. Rope off area, and restrain people from tampering with any material. Request the police for assistance in keeping people about 50 feet from the accident.

   b. Assure everyone professional assistance, and equipment are on the way, and there is no danger with a sealed tank.

2. Tank - Leaking

   a. Rope off area, and caution everyone to stay away from the material. Use the police for assistance.

   b. Assure the police that there is no radiation danger, but potential dusts from the material is poisonous, and should not be inhaled.

c. Request to the civil authorities that the traffic be routed in such a fashion as to prevent tracking.

d. If possible, prevent the material from running into streets, gutters, sewers, etc. A simple method is utilizing dirt ditches, or dikes.

e. Minimize dispersion, and wear supplied respirators.

3. Fire Involved with Accident

a. If necessary, isolate area from entry by using civil authorities.

b. The material will not explode; but, if possible, keep the fire away.

c. If the tank is ruptured, use respirators to preclude material inhalation

b. Initial Notification - Initial notification will be from the driver, or the civil authorities who find the response letter, and the driver's manual. The HRI slurry tractor will be equipped with a cellular telephone to provide for the telephone communications. The people to be notified (by collect calls) are as follows:

Craig Bartels	Alburqurque	505/883-1777 Off 505/792-1412 Home
Mark S. Pelizza	Dallas	214/387-7777 Off 214/618-5780 Home
Salvador Chavez	Grants	505/786-5845 Off. 505/287-4165 Home

As soon as one of these individuals is notified, a company notification system is activated which will consist of management, clean-up team, and civil/regulatory notification. There will be duplication of notification in key areas to insure that notification is given. The basic system will be as follows:

x	xx	xxx
V.P.Technology will notify all:	V.P.H.S.& E. will notify all:	Plant Superintendent will notify all:
V.P.H.S.& E	V.P.Technology	V.P.Technology
Plant Superintendent	Plant Superintendent	V.P.H.S.& E

State Police	State Police	Clean-Up Team
Navajo Police	Navajo Police	Hospital
Clean-Up Team Leader	Clean-Up Team Leader	NRC
NRC	Clean-Up Team	

X. V.P.Technology Notifications

V.P.H.S.& E -	Mark S. Pelizza	214/387-7777 Off. 214/618-5780 Home
Plant Super. -	Salvador Chavez	505/786-5845 Off. 505/287-4165 Home
State Police		505/827-9001
Navajo Police (if on Indian lands)		505/786-5397

(If not New Mexico, see civil/regulatory list for State Police) Clean-Up Team Leader (notifies clean-up crew) Hospital (if necessary).

XX. V.P.H.S.& E Notifications

V.P.Technology_-	Craig Bartels	505/883-1777 Off 505/792-1412 Home
Plant Super -	Salvador Chavez	505/786-5845 Off. 505/287-4165 Home
State Police		505/827-9001
Navajo Police		505/786-5397

(If not New Mexico, see civil/regulatory list for State Police)
Clean-up Team Assistant Leader (notifies clean-up team)
Regulatory Agencies (see list)

XXX. Plant Superintendent Notifications

V.P.Technology_-	Craig Bartels	505/883-1777 Off. 505/792-1412 Home
V.P.H.S.& E -	Mark S. Pelizza	214/387-7777 Off. 214/618-5780 Home

Clean-up Team Leader (notifies clean-up team)

Hospital (if necessary)

Regulatory Agencies

New Mexico Environmental Department	(505) 827-0219
Navajo Environmental Protection Agency	(520) 871-7812
U.S. Nuclear Regulatory Commission	(301) 816-5100

9.14.4 Clean-Up Team Equipment

In order to handle effectively a uranium spill, the following equipment will be assembled, and stored in transportable containers for use by the clean-up team:

a. Coveralls - disposable (15 pair per size--medium large)
b. Gloves - rubber - long cuff (15 pairs)
c. Rubber boots - 15 pairs(3 size 9, 7 size 10, 5 size 12)
d. Shovels - (3 std. long handle, 3-scoop blade)
e. Plastic sheeting - 12 mil, 3200 square feet
f. Solvent glue for sheeting (3 cans/jars)
g. Hard hats (10)
h. Brooms (2) industrial floor
i. 55 gallon drum liners (50 bags)
j. Portable water sprayer (misting down powder)
k. Sample bottles (24)
l. Urine bottles (24)
m. Rope - 1-1/2 inch - 1000 feet
n. Warning signs - radioactive materials
o. Fiber tape - 6 rolls
p. Sump pump - 110 volt
q. Garden hose - 50 feet
r. Highway flashers
s. Respirators - 100 dust disposable

Additional Equipment from CCP:

a. Calibrated beta, gamma, alpha survey meter
b. Hydrochloric acid, 55 gallon drum w/dispensing pump
c. Product storage drums(25),55gallons w/lids, and bolts
d. Tools
e. Onan generator with fuel
f. Portable flood lights
g. Vacuum cleaner
h. Air compressor
i. Front end loader/back hoe
j. Radiotelephone, if possible
k. Camera with flash
l. Ore transport

9.14.5 Clean-Up Procedure

a. Set-up

1. Arrive at site, access situation, and assign team members to (1) collect/procure additional site specific equipment; (2) notify management of situation; and (3) brief civil authorities on procedures.

2. Issue protective clothing, and secure site from unauthorized entry.

3. Cover all spilled materials with plastic.

4. Set-up command post.

b. Protective Berming for Slurry spills_

1. Cover exposed material with plastic sheeting.

2. Construct a protective berm completely around the whole area including the working, or clean-up area.

3. if possible, construct a berm around the spilled material.

4. Construct a lined diked area for drum reloading, and contaminated equipment.

5. If possible, construct a lined area for trailer decontamination.

c. Clean-up - Clean-up will proceed with the clean-up of the trailer cleaning, and removal of the product, and finally the spill site.

1. Trailer Clean-up

    a. Remove spilled material by shovels, and/or vacuum cleaner into lined 55 gallon drum, and move to pad.

    b. Right trailer, if possible, and move off road surface to diked clean-up area.

    c. Clean exterior, and interior, and remove to nearest fully controlled site (plant) for final decontamination.

    d. Test for contamination.

2. Pavement Clean-up

a. If spill material has contacted the pavement, clean-up of this surface should be conducted next.

b. Using scoop shovels, load lined barrels.

c. Construct a two foot (2) wide plastic lined trench along the pavement edge.

d. Rinse the surface with an acid solution, and direct the solution to the lined ditch for pick up by the sump pump.

e. Continue until all signs of the materials are removed.

f. Neutralize surface with water, and collect final run-off for lab verification of clean-up.

3. Road Shoulder (soil) Clean-up

a. Using shovels, or loader, remove product to drum.

b. Remove six inches of top soil, and place in drums in area of direct spill.

c. After trailer is removed, and road is cleaned, begin to decontaminate plastic.

d. Place plastic in drums.

e. Place obviously contaminated soils in drums.

f. Remove trailer.

g. Remove majority of drums.

h. Begin final removal of all topsoil in affected area.

i. Conduct soil sampling in a grid fashion.

4. Final Clean-up

a. Do not remove outer protective berm if constructed.

b. Review grid soil samples with regulatory agencies, and get final clean-up approval.

c. Consult with highway department of reseeding program.

d. Remove protective berm after written verification from regulatory agencies.

e. Reseed area.

9.14.6 Personnel Protection

a. Identify everyone by name, and address who came in contact with the material.

b. Secure urine analysis from these individuals.

c. Report analysis to these individuals, and explain the results.

9.14.7 Response Letter

A letter containing the following information will be displayed in a prominent location within the cab of the transport vehicle in the event a outside individual discovers a accident.

This vehicle is transporting uranium yellowcake, or uranium ion exchange resin. The material is poisonous, and should not be inhaled, or injested. It is not a radiation hazard, or an explosive. You should try to keep the material off your clothing, and try not to track it about. The following steps will minimize spreading of the material.

a. Notify the Department of Public Safety, or County Sheriff, or Navajo Police, and request his assistance in guarding the site.

b. Find the plastic sheeting in the vehicle, and cover all spilled material.

c. The following people have the responsibility for handling the problem. CALL COLLECT as possible.

Craig Bartels	Alburqurque	505/883-1777 Off. 505/792-1412 Home
Mark S. Pelizza	Dallas	214/387-7777 Off. 214/618-5780 Home
Salvador Chavez	Grants	505/786-5845 Off. 505/287-4165 Home

d. Instruct one of the above on the situation. Please give him your name, and address. These people are trained in handling this problem.

e. Request assistance in preventing people from handling the material, or removing it until Hydro Resources, Inc. (HRI) personnel are present.

f. Give this letter, and all other shipping papers, and the driver's spill instructions manual to civil authorities.

9.14.8 Instructions to Driver

This section outline the type of instruction which will be maintained in the glove compartment of the transport for use by the driver in the case of an accident.

The material you are transporting is uranium concentrate, or uranium product.

a. Is not a radiation hazard in exposure of less than a few days;

b. Is poisonous, and should not be breathed, swallowed, or put in the mouth;

c. Should be kept to a small area, and off clothing, or body, and;

d. Is not explosive.

<u>In Case of an Accident</u>

a. Cover any spilled material with the plastic sheeting provided in the transporter utilizing equipment supplied in emergency equipment box. The box contains the following equipment:

1. Polyethylene sheeting (2,000 square feet)
2. Shovels (2, short handle)
3. Disposable coveralls (3 pair)
4. Rubber boots (3 pair, mixed sizes)
5. Rubber gloves (4 pairs)
6. Respirators (3, use only for dry product spills)
7. Fiber tape (2 rolls)
8. Pocket knives (3)
9. Warning signs, and guard rope (1/2 inch polyethylene)

After equipment is used, place under sheeting for later decontamination, and prevention of theft.

b. Notify the civil authorities of the nature of the problem by:

1. Giving them the accompanying letter;

2. Telling them the nature of the problem, and;

3. Requesting their help in securing the site from interference of bystanders, and notifying the HRI

personnel listed below as soon as possible. Call collect, and tell the operator that this is an emergency call. Call until one of the following individuals is notified.

Craig Bartels	Alburqurque	505/883-1777 Off. 505/792-1412 Home
Mark S. Pelizza	Dallas	214/387-7777 Off. 214/618-5780 Home
Salvador Chavez	Grants	505/786-5845 Off. 505/287-4165 Home

c. Initial containment prior to arrival of HRI

1. Containers not leaking

   a. Rope off area, and restrain people from tampering with any material. Request the police for assistance in keeping people about 20-25 feet from the accident.

   b. Assure everyone professional assistance, and equipment are on the way, and there is no danger with closed uncontaminated containers.

2. Drums/Tank Leaking

   a. Rope off area, and caution everyone to stay away from the material. Use the police for assistance.

   b. Assure the police that there is no radiation danger, but dusts from the material is poisonous, and should not be inhaled.

   c. Request to the civil authorities that the traffic be routed in such a fashion as to prevent tracking.

   d. If possible, prevent the material from running into streets, gutters, sewers, etc. A simple method is utilizing dirt ditches, dikes and, tarps.

   e. Minimize dispersion, and wear your supplied respirators.

3. Fire involved with accident

   a. If necessary, isolate area from entry by using civil authorities.

b. The material will not explode; but, if possible, keep the fire away.

c. If the tank is ruptured, use respirators to preclude material inhalation.

9.14.9 Instructions to Civil Authorities

Detailed instruction to civil authorities will be maintained in the glove compartment of the transport. They will be prominently marked, and contain the following information.

Hydro Resources, Inc. (HRI) has a fully trained, and equipped Clean-UP Team for this type of hazardous material. A notification system has been developed, and the following regulatory agencies have the responsibility for handling this problem. Hydro Resources will notify the responsible regulatory agencies. You may wish to call the Highway Patrol for assistance.

Regulatory Agencies

New Mexico Environmental Department	**(505) 827-0219**
Navajo Environmental Protection Agency	**(520) 871-7812**
U.S. Nuclear Regulatory Commission	**(301) 816-5100**

9.14.10 Coordination With Local Emergency Services

To assess the local response, HRI has held meetings with officials of the Crownpoint Health Care Facility. The main focus of the meeting was to discuss the capability of the health care facility to respond to an accident, specifically one that might involve a person whose skin, or clothing has product contamination. While discussing this topic the IHS officials expressed some concerns regarding the current lack of equipment, and personnel training needed to effectively respond to this type of scenario. Three other points that were raised included: (1) the need for a separate room equipped for cleaning an injured person whose clothing, or body might have surface contamination; (2) the need for on-going technical training because of the relatively high turnover in hospital staff, and (3) the need for hospital staff to feel comfortable with working in this situation.

HRI will, if allowed, provide proper survey equipment, on-going training for hospital staff, and a separate room equipped for decontamination. Additionally, HRI is proposing that a memorandum of understanding (MOU) be prepared which clearly outlines respective responsibilities.

One final, but equally important topic of discussion, included the suggestion that HRI hold a similar meeting with the hospital's Area Office, and the EMT.

Consistent with PBLC Format, HRI will develop an action plan as part of a SOP which will provide for equipping, and training Local Emergency Officials in the event an accident occurs involving source, or byproduct material.

9.15 Incident Response and Reporting Procedures

HRI has established incident response, and reporting procedures which will be put into effect in the event of any incident with potential significant radiological impacts, and/or regulatory reporting requirements. This plan will be reviewed annually, and revised as necessary to accurately reflect current operations. Up-to-date copies of the plan will be distributed to each supervisor, and each major work location. Proper reporting will ensure that appropriate individuals, and agencies are informed in a timely manner so that appropriate corrective actions can be taken. The initial incident review will center around the completion of a 10 CFR Part 20, and 40 incident reporting requirements. The requirements of 10 CFR 21, and 71, and 49 CFR 172, and 173 will also be considered during the review to determine specific follow-up, and reporting requirements.

Any unusual, or unplanned event with potential significant radiological impact will be evaluated, documented, and appropriately reported. The nature of the event will determine the actions to be taken. All information, data, and evaluations, along with the names, and times of regulatory agencies contacted in relation to respective incidents will be properly documented, and retained on site.

9.16 Management Control and Administrative Procedures

All principal work assignments will be conducted in accordance with written operating procedures. Supervisory, and management personnel will routinely observe their employees at work, and thus will be able to ensure adherence to the written procedures. If employees are found deviating from a procedure, they will be counseled by their supervisors, and instructed to adhere to the written instructions. Follow up supervision will ensure the success of the counseling session. Such deviations, and follow up counsel will be documented, and the documentation maintained on file at the project site. All new operating procedures which will affect radiation safety will be reviewed by the SERP. Review of all operating procedures involving radioactive materials by the RSO will be performed at least annually to ensure that radiation exposures will be maintained as low as is reasonably achievable.

Non-routine work, or maintenance activities which may result in significant personnel exposure to radioactive materials, and for which there is no SOP will be carried out in accordance with a Radiation Work Permit (RWP). These procedures include contacting the radiation safety staff prior to the start of work. The RSO, or RST will survey the area for radiation, and/or contamination levels, as appropriate, and conduct a discussion of precautions to be taken during the repair to keep personnel exposures as low as is reasonably achievable. Job supervisors will direct the work in such a manner as to minimize exposure to radiation, or airborne radioactive materials. Air samples will be taken as necessary to evaluate the exposures of all involved personnel. Additionally, techniques such as the use of respirators will be used to reduce exposures.

9.17 Inspections and Compliance Audits

The Crownpoint RSO will conduct weekly inspections of all work, and storage areas; his/her findings pertaining to compliance with license requirements, and radiation safety practices will be documented. The Crownpoint RSO, or designated radiation safety technician will conduct a daily walk-through inspection of all work, and storage areas of the CP to insure proper implementation of good radiation safety procedures. The results of these inspections are documented, and maintained on site.

Licensee management will conduct annual audits of the radiation protection, and ALARA program, under the direction of the EM, and the VPHSE. The Crownpoint RSO will accompany the audit team. The audit will address similar topics listed in Regulatory Guide 8.31, Section 2.3.3. The results of the audit will be reviewed, and approved by the President prior to submittal to NRC.

9.18 Training

Appropriate levels of safety training will be provided to all individuals who are permitted to gain access into restricted portion of the location. The level of training will be dependent on the visitor/employment status of an individual, and the ability of each individual to access various locations within the licensed area. Training will cover some topics according to NUREG 1159, *Training Manual for Uranium Mill Workers on Health Protection from Uranium,* with noted exception that the Crownpoint Uranium Project is not a mill but an *in situ* mine. Additionally training will include the appropriate materials described in U.S. Nuclear Regulatory Comission Regulatory Guide 8.13, *Instruction Concerning Prenatal Radiation Exposure,* U.S. Nuclear Regulatory Comission Regulatory Guide 8.29, *Instructions Concerning Risks from Occupational Radiation Exposure,* and U.S. Nuclear Regulatory Comission Regulatory Guide 8.31, *Information Relevant to Ensuring* *that Occupational Radiation Exposures at Uranium Mills Will Be As Low As Is Reasonably Achievable*. Each anticipated training level is broken out below.

9.18.1 Initial Training

All new employees will provide a slip authorizing the Employer to request from previous employers all records relative to occupational exposures to ionizing radiation. This report is to be obtained from the former employer, if possible. This will become a permanent part of the employees' Radiation Exposure Record in the Applicants' files, and will be kept current, and available at all times.

Training will be mandatory for all new employees in order for them to understand the potential problems of radiation exposure, and their own personal responsibility to adhere to all safety rules, particular Radiation Safety, for their own protection as well as others. Workers will be made knowledgeable of the procedures for making suggestions for better radiation protection, and the importance of working together in order to lower radiation exposure.

New employees, for their own safety, will be made aware of the, origin, location, and operation of job categories that require the strictest possible compliance with the Radiation Safety Program. New employees will be schooled in all aspects of Radiation Safety. This will ensure that all personnel can correctly apply Radiation Safety Protection as it relates to their primary duties, and to temporary placement in the Pant area. A follow-up safety session will be to be conducted with each new employee during the first three months of employment, and a written record maintained. Thereafter, an annual test by the RSO of each employees' understanding of the Radiation Safety Program will be conducted, and a record maintained on file.

9.18.2 Visitor Training

Visitor Training will be minimal, and visitors will be instructed as to the primary hazard at an *in situ* uranium mine, yellowcake ingestion. Visitors will be instructed to avoid contact with visible yellowcake in any location containing radioactive materials. Visitors will also be informed that the HRI performs routine surveys of the radiation levels, and surface contamination in any area which will be visited, and that safe conditions have been documented in each of these areas.

9.18.3 Clerical and Office Support Staff

Clerical, and office support staff, and non-operations technical staff will be employees who typically work outside the "Work Area". Particularly, they will not require frisking before leaving the work area on a regular basis. Their training will be an abridged version of that given to the operation staff. Training, and testing will be documented within the employees files.

9.18.4 Operations Personnel

Personnel who work within the "Work Area" will be provided Operations Personnel training. These individuals will typically be required to work with radioactive materials, and therefore, require more intense monitoring, and frisking before leaving the work area.

In addition to classroom training, employees will receive continuous on-the-job training (OJT) from plant supervisors, and the RSO. Plant employees job performance with respect to radiation protection will be appraised annually by his immediate supervisor, and the RSO to determine if retraining is necessary. A training evaluation sheet signed by the supervisor, and the RSO will be placed in the employees' personnel file. A training completion, and Radiation Safety Rules will be signed by the RSO, and the employee, and included in the employees' personnel file. The supervisor will be responsible for a continuous evaluation, and OJT as necessary to ensure the employees' exposure is maintained "As Low As Reasonably Achievable".

9.18.5 Supervisory Personnel

Supervisors will receive all training received at Operations Personnel Level instruction, and additional training which will be appropriate for supervisors including: ALARA philosophy, contamination control, and work practices. Supervisors will be required to be fluent in certain surveys which may be required prior to releasing equipment in the absence of the RSO/RST, and will be able to provide specific job related training, and evaluate their subordinates performance.

9.18.6 Prenatal Training

Female employees will be given training operations or, supervisory level depending on position of employment as above. Additionally, all female employees will be given instructions concerning prenatal radiation exposure, and controlling radiation dose in the case of pregnancy similar to U.S. NRC Regulatory Guide 8.13, *Instruction Concerning Prenatal Radiation Exposure*.

9.18.7 Special Training for Yellowcake Transport Accidents

HRI will select, and train capable personnel to prepare for a potential transport accident according to Section 9.14. A team will be supervised by the Production Manager, Environmental Manager, and Plant Superintendent, and must contain members from the Radiation Safety Department, and plant personnel. This team will have good background knowledge in radiation safety as per required in employee orientation. Further training in containment, recovery, decontamination, and the equipment needed to control such a spill will be given on an annual basis. In the event of any magnitude, the team will have been adequately trained, and provided with the equipment to contain, and decontaminate any accident site according to Section 9.14.

9.18.8 Training for the Radiation Safety Officer

Radiation Safety Officer training shall be on a biennial basis and include recognized schools or courses, if available, together with specialized topics such as the following:

a. Radiation measurement:
  1. Detector types and operation.
  2. Personnel monitoring methods.
  3. Survey techniques and methods.
  4. Quantitative and qualitative measurements.

b. Biological effects.

c. ALARA philosophy.

d. Audit techniques with respect to conformance with radiation practices and procedures by plant employees.

e. Rules and Regulations:
  1. 10 CFR 19.
  2. 10 CFR 20.
  3. Regulatory guides.
  4. Internal (administrative control) guides.
  5. License conditions
  6. Personnel monitoring.
  7. Work practices.

f. Methods for controlling radiation dose:
  1. Radiation control areas and posting requirements.
  2. Personnel and area cleanup methods.

10.0 RECLAMATION PLAN

10.1 General

Reclamation at the project site will be comprised of four major activities which include the following:

- Radiological decontamination of buildings, process vessels, and other structures, or affected areas.
- Removal, and reclamation of the CCP, Satellites, and auxiliary structures.
- Surface reclamation, and revegetation of restored well fields.
- Ground water restoration within affected wellfields, including production, and monitor well plugging.

The preliminary schedule for mining related activities, and restoration has been discussed in Section 2 of the COP. Decommissioning, and reclamation of the CCP, and Satellite sites will take place after mining is complete. Ground water restoration, and wellfield decommissioning will be accomplished as wellfields are completely mined out. Satellite facilities will also be decommissioned as soon as ground water restoration is complete, and they are no longer needed.

Pursuant to regulatory requirements, HRI will submit a detailed reclamation plan to the NRC for review, and approval at least 12 months prior to the planned final shutdown of mining operations. If depressions appear at the land surface due to subsurface collapse, HRI will return the land surface to its general contour as part of the project's surface reclamation activities. Before release of an area to unrestricted use, HRI will provide information to the NRC verifying that radionuclide concentrations meet applicable radiation standards.

Both the surface reclamation plan, and ground water restoration plan are intended to return areas affected by mining activities to a condition which supports the premining land use of sheep, and cattle grazing, and associated wildlife habitat.

10.2 Radiological Decontamination

All radiologically contaminated buildings, process vessels, and other structures, and affected areas will be decontaminated prior to final reclamation to unrestricted release standards in accordance with NRC requirements, or removed to the appropriate disposal facilities. Decontamination will include acid, and water washdown of structures, and concrete. The resulting waste water will be disposed by disposal well, brine concentration, and evaporation. Equipment which cannot be decontaminated will be dismantled, and disposed in an U.S. NRC licensed waste disposal facility, or utilized at another NRC licensed uranium facility. All uncontaminated foundations will be removed, or broken, and buried in place.

10.3 Reclamation and Revegetation

The purpose of the reclamation program will be to stabilize the site with self-sustaining vegetative cover, and to restore all land disturbed by mining, and related activities to a productive condition for livestock grazing, and wildlife habitat consistent with the present, and historical use of the area. Because of present overgrazing practices in the area, it is anticipated the reclamation program will substantially improve the project site. It is anticipated that future land use will be similar to current uses. Therefore, all revegetation treatments, and plant species used will be selected for their desirability as cover, and food for domestic, and native fauna, soil stability, and surface, and subsurface water conservation.

10.3.1 Wellfield

During drilling operations, topsoil will be carefully removed from drill pit locations, and separated from the subsoil. After the drilling is complete, and the subsoil will be replaced followed by the topsoil. The drill site will then be graded, and seeded as outlined in Section 10.3.4.

After ground water restoration is complete, all surface laterals, and pipelines will be removed. Any vegetation which has been disrupted will be reseeded.

10.3.2 Plant Areas

Topsoil will be stockpiled as necessary in the location of all new plant facilities including buildings, and ponds. Temporary grass will be established on these piles to prevent erosion.

After operations, all buildings, ponds, and equipment will be demolished, and removed from the CUP area. All contaminated material will be reused for licenses activities, decommissioned below release limits, and disposed of in an approved landfill, or disposed of in an approved byproduct disposal area.

Topsoil will be placed in the location where it was removed, and the area seeded as outlined in Section 10.3.4.

10.3.3 Wells

All production, and injection wells will be permanently plugged, and abandoned upon completion of ground water restoration and, stabilized in a manner which prevents interformational transfer of fluids. In particular, wells will be plugged from TD to surface with a neat cement with a weight of 15.6 ppg, or as otherwise determined by the New Mexico State Engineer. The casing will be cut off three feet from the surface and, the site seeded as outlined below.

10.3.4 Seeding Rates, Species, and Methods of Application

Species mixtures adapted to the climate, and soil conditions existing on the properties, with forage characteristics of palatability, tolerance to grazing, and availability for year-round use, will be established. General species, and treatments for revegetation will include varieties of species, and species mixtures that have been tested.

The following mixture of native plants, and rates of seeding are planned to be used for the various soil types that may occur on the disturbed areas. Normally, a maximum of three species of grass is used in the planned mixture (Table 10.3-1).

TABLE 10.3-1 POUNDS OF PURE LIVE SEED PER ACRE (KG/HA)

	Clay Site	Loamy Site	Sandy Site
Arriba Western Wheatgrass	6.4(7.3)	4.8(5.4)	6.4(7.2)
Alkali Sacaton	.8(.9)	.7(.8)	.5(.6)
Vaughn Sideoats Gramma		2.0(2.2)	1.6(1.8)
Paloma Indian Ricegrass			2.4(2.7)
Bandera Rocky Mtn. Penstemon			.3(.3)
Pastura Little Bluestem	.3(.3)	.6(.7)	
Fourwing Saltbrush	1.2(1.3)		
Rabbit Brush			

When surface conditions, and slopes permit, approved seed mixtures will be mechanically drilled with a drill suited to handling a variety of grass, and legume seeds. If situations occur where slopes are too steep, or rocky for seedling equipment, the mixture will be broadcast at approximately twice the recommended rate followed by harrowing, brush drag, or similar treatment to ensure seed coverage.

Mulch will be used in areas where water retention, soil temperature, or soil crusting are potential problems for seed germination, and seedling growth. The mulch will be spread, or blown uniformly over the area immediately after seeding. The mulch will consist of grass hay, straw, or woodchip applied at the rate of approximately 4.5 t/ha (2 ton/acre). It will be anchored mechanically with a mulch tiller, crimper, or if necessary with a chemical compound. Bark, wood chips, and jute netting may be used for special situation.

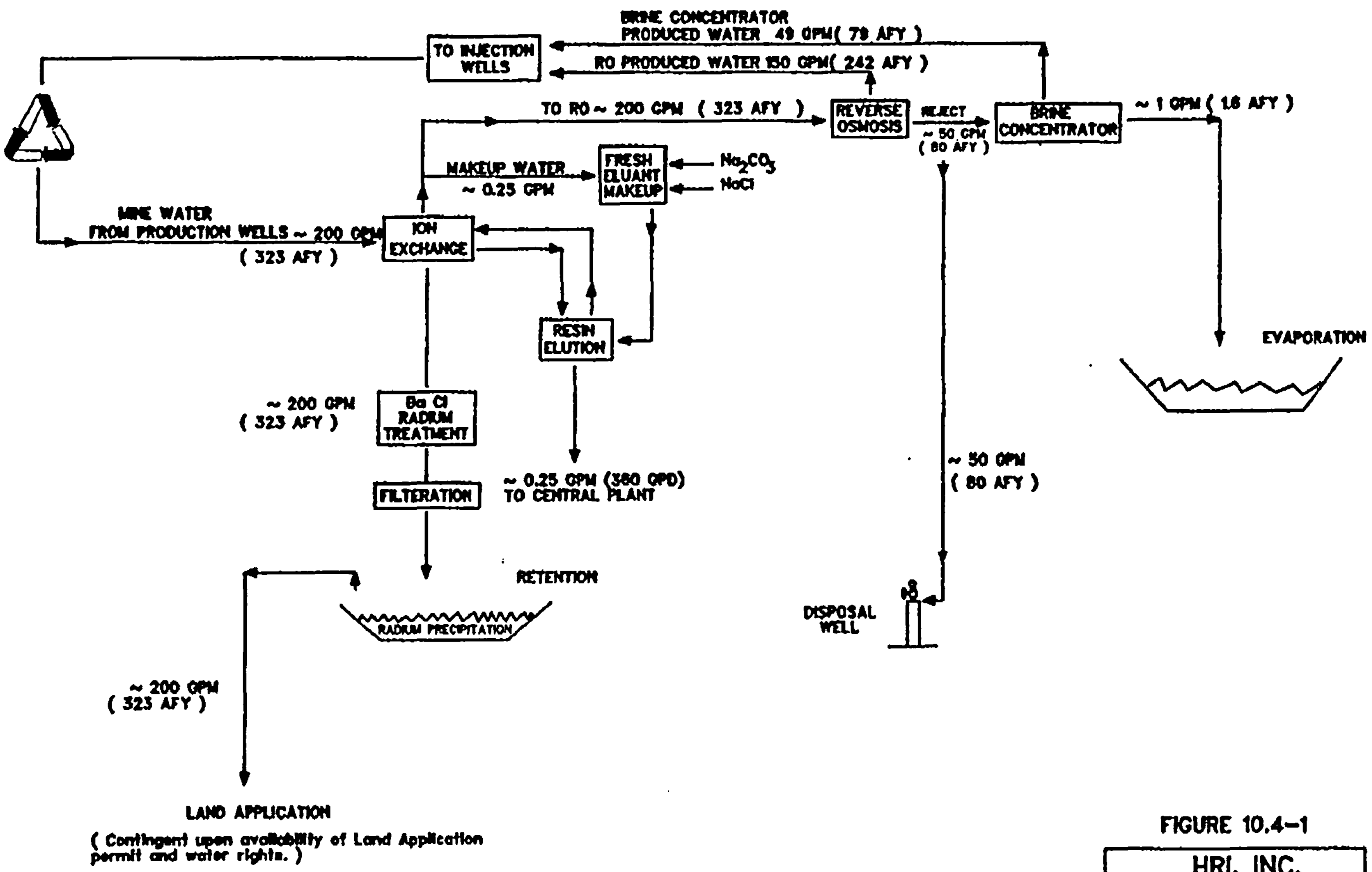
The limiting factor in establishment of plants in the Crownpoint area will be available moisture. However, fertilizer can be applied with proper moisture, to effectively establish seeded species. The need, and benefit of fertilizer will be determined by site specific soil analysis, and available moisture. When used, fertilizer will be placed near the drill row for maximum benefit. Broadcast application may be necessary in certain situations, but is less desirable than application with a drill because more fertilizer is required.

Time of seeding under nonirrigated conditions will be very critical in New Mexico. The most desirable time for seeding is during the season of the highest expected precipitation. New Mexico's precipitation records show the greatest moisture comes in McKinley County in July, August, and September. The seeding project will be completed 45 to 60 days before expected long dry periods, or freezing weather. Some species, e.g., Paloma Indian Ricegrass, and Fourwing Saltbush, will germinate in late winter if sufficient moisture is available, and good emergence of these species may occur from seedings in late fall, or early winter.

The mine site will be fenced for the life of the operation. After reclamation, seeded areas will be protected by fencing, herding, or other approved animal control techniques until vegetation is established.

10.4 Ground Water Restoration

Prior to conducting mining operations, HRI will develop a updated groundwater restoration plan for the entire project. At a minimum, this plan will include a refined restoration schedule, and a general description of updated methodology of restoration, and post-restoration groundwater monitoring for the entire project.



AFY = Acre-Feet/Year

REVISED AUG. 29, 1996
REVISED MAY 8, 1997

FIGURE 10.4-1

HRI, INC.

CHURCHROCK PROJECT
RESTORATION FLOW SHEET

RESTOR3

At this time, HRI proposes to use three groundwater restoration alternatives at each project site:

a. 100 percent groundwater sweep (ground water is pumped from the aquifer, but not returned to the aquifer);

b. Reverse osmosis treatment with 3 parts product, and 1 part reject, and;

c. Brine concentration, and reverse osmosis reject with 99 parts product, and 1 part reject.

Under the 100 percent groundwater sweep option, wastewater will be disposed of by land application. Under the reverse osmosis option, product water will be injected back into the production patterns, and wastewater will be concentrated, and evaporated, or injected into a deep disposal well, or both. HRI will have to acquire an injection permit from the appropriate State, or Federal agency before wastewater can be injected into a deep disposal well. If land application were the chosen option, appropriate State permits will have to be obtained.

Restoration of the production zone, be it conducted by reverse osmosis (RO) treatment, ground water sweep, or a combination of the two, will utilize the injection-extraction wellfield configuration which was employed during mining. By using the existing production wellfield pattern configuration, the efficient reservoir engineering design benefits that were employed during uranium production will be available for restoration. Ground water sweep, and R.O. technology has been widely utilized within the ISL industry, and the resulting restoration history highly is successful.

Restoration progress will be a routine part of the overall mine plan. The core test, and historical experience, by HRI has indicated that restoration to levels consistent with baseline can be achieved after approximately four to five pore volumes of ground water circulation. This is consistent with other industry experience where the sodium bicarbonate leach system was utilized.

10.4.1 Groundwater Restoration Criteria

HRI plans that groundwater restoration criteria be established on a parameter-by-parameter basis, with the primary goal of restoration to return all parameters to average pre-mining baseline conditions. To the extent that water quality parameters cannot be returned to the identical average pre-mining baseline levels, the secondary goal will be to return water quality to the maximum concentration limits as specified in EPA secondary, and primary drinking water regulations (40 CFR part 141 and § 143.3). The secondary restoration goal for barium, and fluoride will be set to the State of New Mexico primary drinking water standard, which is lower than federal standards. A value of 300 pCi/mL (0.44 mg/L) will be used for uranium. This concentration was obtained from 10 CFR Part 20; it is suitable for unrestricted release of natural uranium to water, and is below the State of New Mexico primary drinking water standard for uranium.

Under the conditions discussed above, HRI's secondary restoration goal will be equal to, or below both State of New Mexico, and EPA primary, and secondary drinking water standards. Table 8.6-1 lists the primary, and secondary restoration goals.

These restoration goals are consistent with the NRC Staff Technical Position Paper *Groundwater Monitoring at Uranium In Situ Solution Mines* (NRC 1981b). This document states that

> The following are recommended restoration targets:
>
> **a.** Restoration results in a return to baseline groundwater quality for all indicators in all affected groundwater, and in all restoration water quality monitor wells.
>
> **b.** Where the baseline concentration of a particular indicator is less than drinking water standards, the appropriate established State, and Federal criteria may be used to establish maximum permissible values for restoration purposes.

If a groundwater parameter listed in Table 8.6-1 can not be restored to its secondary goal, HRI will make a demonstration to NRC that leaving the parameter at the higher concentration will not threaten public health, and safety, and that, on a parameter-by-parameter basis, water use will not be significantly degraded. Additionally, it is possible that after groundwater restoration, the TDS secondary goal might be achieved, but the secondary goal for individual major ions that contribute to TDS might not be achieved because they do not have a secondary, or primary drinking water standard (for example bicarbonate, carbonate, calcium, magnesium, potassium). As a result, HRI will make a demonstration to NRC that leaving a parameter at higher than secondary goal concentrations does not threat public health, and safety, and that water use will not be significantly degraded.

10.4.2 Restoration Operations Are Engineered Soundly

The restoration of ground water at the COP has the benefit of a previously engineered array of injection, and production wells that were initially installed in a configuration to maximize sweep efficiently throughout the uranium orebody, and maximize uranium recovery. The same engineering principals hold for maximum sweep efficiently during the restoration phase. In other words, ground water restoration is performed uniformly throughout the mine zone, and verified statistically at individual sampling points. The engineering principle which assures restoration is sound.

10.4.3 Changes in Groundwater Chemistry are Minor

Leach solution is not significantly different than native ground water within the orebody. It is well documented that radionuclides limit the use of water (RA-226, RN-222 and U_3O_8) before mining in uranium-bearing aquifers. These are also the primary parameters which are elevated, and limit water use after restoration. Currently, the presence of high radionuclide concentrations at the CUP properties do not affect surrounding water supply wells. The mining process does not introduce new chemical species to the ground water system but does elevate certain species that are native to the host aquifer.

Specifically, the leaching solution utilized by HRI is simply ground water fortified with oxygen, and is benign compared to the acidic, or ammonia bicarbonate leaching solution that were used in earlier in-situ operations. Early leach solutions had the common trait of introducing foreign substances to the ground water during mining, which ultimately caused restoration difficulties. The proposed leaching solution for this project simply changes the oxidation state of the ground water, and utilize natural ionic materials within the water as complexing agents. The pH remains neutral, and restoration is centered around reducing naturally occurring constituents in ground water which become elevated as a result of the leaching process. Naturally occurring radioactive materials, especially uranium, which will be elevated during the mining process are the most significant parameter limiting premining use of the water and will be subjected to the closest scrutiny during restoration.

10.4.4 Documentation of Effectiveness

After production begins at any mine site at the CUP, HRI will immediately begin work on a field restoration demonstration, outside of the actual production, yet inside the monitor well ring, and within the target ore zone. Key elements of the restoration demonstration will be as follows:

a. An isolated restoration demonstration pattern, completed in the ore zone, constructed to the same basic configuration as the proposed production wellfield pattern, and operated under the same conditions as the proposed mining procedures.

b. Leaching of the pattern will be run for at least three months under commercial activity conditions using leaching agent concentrations equal to, or greater than is expected to be required for production.

c. After leaching phase, a complete chemical description of the produced fluid will be obtained, and a demonstration of a restoration will be initiated.

d. Sample analysis of key parameters, and fluids will be completed at least every week during the restoration demonstration.

e. Restoration will continue until the ground water is restored to levels consistent with baseline.

f. With each progress report, HRI will calculate, and submit the volume of ground water affected, expressed in pore volumes. Factors to be considered include: aerial extent, formation thickness, and porosity. Upon the completion of the restoration demonstration, the data, analysis, and conclusions will be compiled into a final report.

g. Authorization for expansion of mining into additional areas will be contingent upon the results of the restoration demonstration within the 24 month period.

In addition to the field restoration demonstration provisions stated above, prior to the injection of lixiviant at either the Unit 1, or Crownpoint site, HRI will complete the restoration demonstration at the Churchrock site. The demonstration will be conducted at a large enough scale to determine the number of pore volumes that will be required to restore a production-scale wellfield. Surety (bonding) for ground water restoration of these initial wellfields will be based on nine pore volumes. Surety will be maintained at this level until HRI can demonstrate the number of pore volumes required to restore a production-scale wellfield.

10.4.5 Restoration Progress

Restoration rates will be monitored through analysis of waters produced from the formation. A sample will be taken weekly from the composite production line and analyzed for conductivity, and uranium. This data will be compiled monthly, and reported biannually to the USNRC and UIC regulatory authorities.

When this data indicates that restoration is at, or near completion, each original baseline well will be sampled, and analyzed for the parameters listed in Table 10.4-1 below.

If the wellfield average value for each chemical parameter is consistent with baseline quality, restoration is considered to be complete.

Stability will be determined by three sample sets taken at two-month intervals from the original baseline wells, and analyzed for the parameters in Table 8.6-1.

Individual parameters that cannot be returned to baseline by reasonable efforts, on a mine-unit average basis, will be returned at least to concentration levels corresponding to the greatest potential premining use of the ground water, based upon established the drinking water standard. HRI has tabulated these restoration goals on Table 8.6-1, and described them in Section 10.4.1.

TABLE 10.4-1
WATER QUALITY PARAMETERS (SHORT LIST)

Ca HCO_3 Na SO_4 Cl TDS U-nat

10.4.6 Restoration Surety

Surety (bonding) for ground water restoration of the initial wellfields will be based on nine pore-volume estimates. The nine pore volume estimate is based on the submitted data. Depending on the parameter, and the test chosen, the pore volumes required to achieve the lesser water quality of the secondary restoration goal, or background, ranged from less than ore pore volume to greater than 28 pore volumes. However, plots of total dissolved solids, and specific conductivity values (an indirect measure of TDS) show little improvement with continued pumping after eight to ten pore volumes. The Mobil ground water demonstration is the largest restoration demonstration conducted in the local area to date. During ground water restoration activities, after 6.9, and 9.7 pore volumes, TDS concentrations were close to the TDS secondary restoration goal of 500 mg/l. Therefore, it is estimated that practical production scale ground water restoration activities will at most implement a nine pore volume restoration effort. Surety will be maintained at this level until the number of pore volumes required to restore the ground water quality of a production scale wellfield has been demonstrated as stated in Section 10.4.4.

10.4.7 Cost Reimbursement

When ground water restoration activities begin at the production-scale wellfield at either the Unit 1, or the Crownpoint sites, HRI will reimburse the Town of Crownpoint for increased pumping, and well work-over costs. Cost Reimbursement does not include smaller restoration demonstration wellfields.

As a conservative estimate of reimbursement amounts, HRI presents the worst case analysis of the most affected wells during operations in Table 10.7-1. Cost reimbursement will be ultimately based on actual affects.

Table 10.7.1

Conservative Case Showing Additonal Pumping Cost per Year Due to Lowered Water Levels at Crownpoint Town Water Wells Caused by ISL Mining & Restoration at Crownpoint / Unit 1

		Additional Cost Due to Crownpoint ISL Operation		Additional Cost Due to Unit 1 ISL Operation		Additional Cost Due to Crownpoint & Unit 1 ISL Operation	
Crownpoint Town Well	Average Summer Flowrate (gpm)	Drawdown (feet) [1]	Annual Cost ($)	Drawdown (feet) [3]	Annual Cost ($)	Drawdown (feet) [2]	Annual Cost ($)
BIA #3	79.4	53	$926	25	$437	78	$1,363
BIA #5	6.2	53	$72	25	$34	78	$106
BIA #6	100	51	$1,122	22	$484	73	$1,606
NTUA #1	27.7	55	$335	25	$152	80	$488
NTUA Conoco	58.7	44	$568	26	$336	70	$904

[1] Drawdown (feet) due to operation of HRI's Crownpoint ISL; estimated from figure shown as Attachment 60-1, HRI's response to NRC Q1 / 60.
[2] Drawdown (feet) due to operation of HRI's Crownpoint & Unit 1 ISL; estimated from figure shown as Attachment 60-2, HRI's response to NRC Q1 / 60.
[3] Drawdown (feet) due to operation of HRI's Unit 1 ISL; estimated by subtracting (1) from (2).

Typically, electrical amperage required by a submersible the pump is reasonably constant over a wide range of flowrates. However, conservatively assuming that amperage varies with hydraulic horsepower, the cost per year would be calculated as follows:

$$\frac{\$}{\text{year}} = \frac{(\text{gpm})\ (\text{head, feet})\ (0.746\ \text{kw/hp})\ (1440\ \text{min/day})\ (365\ \text{day/yr})\ (\$/\text{kw-hr})}{(3960)\ (60\ \text{min/hr})\ (\text{pump efficiency})\ (\text{motor efficiency})}$$

75% <-- Submersible pump efficiency (%).
75% <-- Motor efficiency (%).
$0.075 <-- Cost per Kw-hr ($).

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ATTACHMENT D

HRI, INC.

(A Subsidiary of Uranium Resources, Inc.)

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P.O. Box 777
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U1
HRI→NRC

June 18, 1996

Mr. Mike Layton
High-Level Waste & Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Mail Stop TWFN 7J-9
Washington, D.C. 20555

RE: Crownpoint Project

Dear Mr. Layton:

Please find enclosed water quality information which we have found for the Unit 1 property.

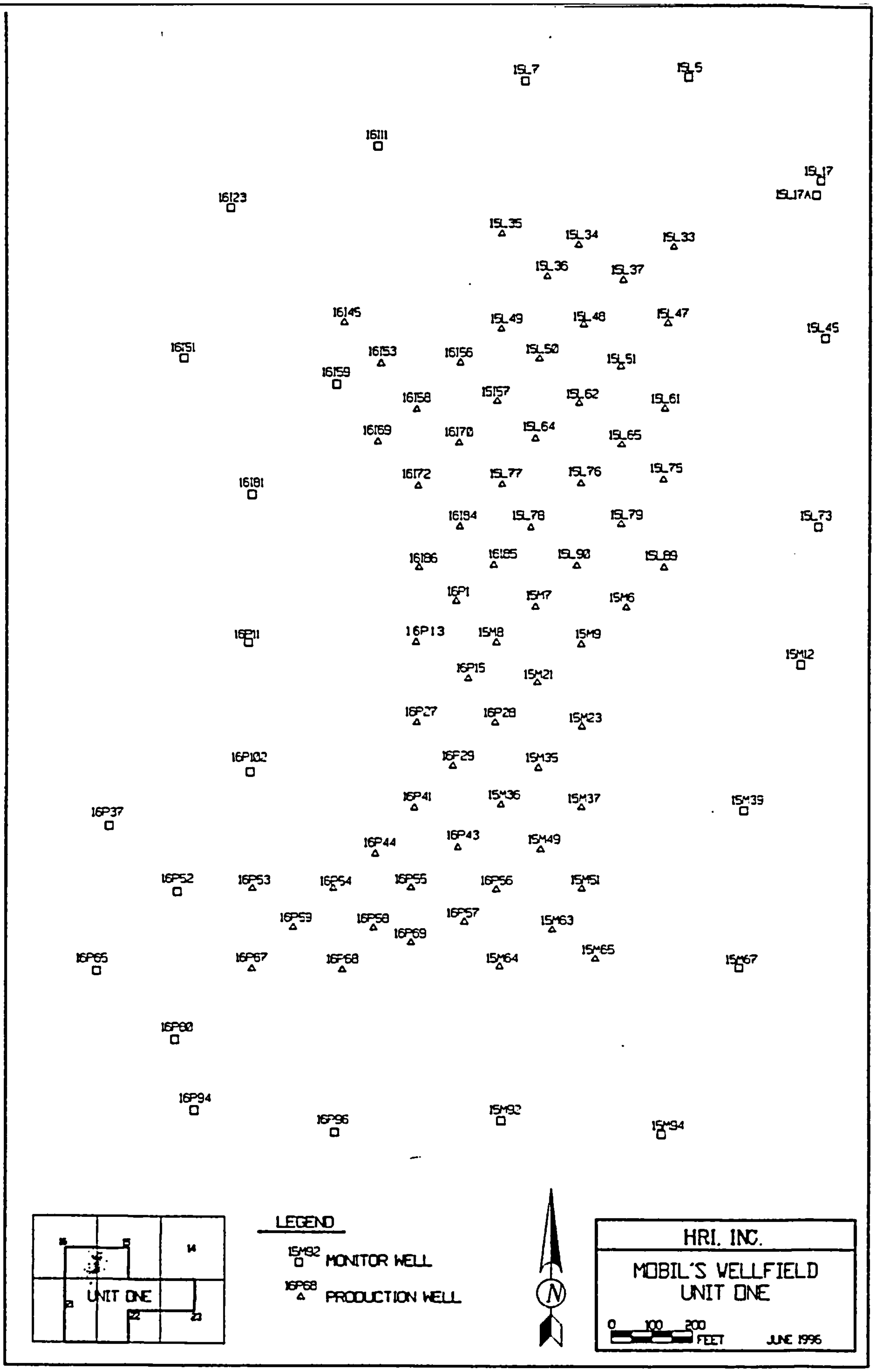
We believe the results of this information supports the finding in Response #52 to the NRC questions dated February 9, 1996.

Please feel free to contact me with any questions pertaining to this material.

Sincerely,

Mark S. Pelizza
Vice President
Health, Safety and Environmental Affairs

MSP/dlg
Encl.



HRI, INC.

MOBIL'S WELLFIELD
UNIT ONE

JUNE 1996

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY SUMMARY

PRODUCTION AREA WELLS

PARAMETER	MAXIMUM	MINIMUM	AVERAGE	STD. DEV.
CALCIUM (mg/l)	13.0	1.2	3.5	1.8
MAGNESIUM (mg/l)	0.33	0.00	0.08	0.04
SODIUM (mg/l)	1100	91	122	96
POTASSIUM (mg/l)	12.0	0.8	2.2	1.2
CARBONATE (mg/l)	120	0	14	12
BICARBONATE (mg/l)	220	89	200	13
SULFATE (mg/l)	44	20	33	5
CHLORIDE (mg/l)	34	<3	5	5
NITRATE (mg/l)	1.80	<.05	0.06	0.17
FLUORIDE (mg/l)	0.4	<.5	0.1	0.1
SILICA (mg/l)	22	11	19	1
TDS (mg/l)	386	240	286	21
CONDUCTIVITY (mMho)	460	370	415	16
PH (su)	9.1	8.3	8.7	0.1
ARSENIC (mg/l)	<.005	<.005	<.005	0.000
BARIUM (mg/l)	0.3	<.2	<.2	0.0
CADMIUM (mg/l)	<.005	<.005	<.005	0.000
CHROMIUM (mg/l)			<.005	0.000
COPPER (mg/l)	0.200	<.005	0.009	0.022
IRON (mg/l)	0.38	<.01	0.03	0.05
LEAD (mg/l)	0.053	<.005	0.003	0.006
MANGANESE (mg/l)	0.020	<.005	0.004	0.004
MERCURY (mg/l)	<.0001	<.0001	<.0001	0.000
MOLYBDENUM (mg/l)	0.016	<.005	0.005	0.003
NICKEL (mg/l)	<.02	<.02	<.02	0.00
SELENIUM (mg/l)	0.006	<.005	<.005	0.001
SILVER (mg/l)	0.000	<.005	<.005	0.000
URANIUM (mg/l)	0.100	<.001	0.005	0.012
ZINC (mg/l)	0.046	<.005	0.004	0.006
BORON (mg/l)	0.5	<.1	0.1	0.1
RADIUM 226 (pCi/l)	200.0	0.0	18.1	22.2
GROSS ALPHA (pCi/l)	610	1	74	107
GROSS BETA (pCi/l)	510	4	69	79
RADON (pCi/l)	1100000	4100	140677	194734

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY SUMMARY

MINE AREA WELLS

PARAMETER	MAXIMUM	MINIMUM	AVERAGE	STD. DEV.
CALCIUM (mg/l)	18.0	1.1	4.0	3.3
MAGNESIUM (mg/l)	9.20	0.00	0.21	0.69
SODIUM (mg/l)	170	82	104	10
POTASSIUM (mg/l)	5.5	0.7	1.7	0.8
CARBONATE (mg/l)	43	0	10	5
BICARBONATE (mg/l)	270	180	212	8
SULFATE (mg/l)	220	21	38	20
CHLORIDE (mg/l)	41	<3	6	10
NITRATE (mg/l)	0.07	<.05	0.00	0.01
FLUORIDE (mg/l)	0.3	<.5	0.1	0.1
SILICA (mg/l)	23	12	18	1
TDS (mg/l)	590	0	284	42
CONDUCTIVITY (mMho)	820	0	390	46
PH (su)	9.1	7.5	8.8	0.1
ARSENIC (mg/l)	<.005	<.005	<.005	0.000
BARIUM (mg/l)	0.4	<.2	<.2	0.0
CADMIUM (mg/l)	<.005	<.005	<.005	<.005
CHROMIUM (mg/l)	0.008	<.005	0.001	0.002
COPPER (mg/l)	0.980	<.005	0.072	0.209
IRON (mg/l)	1.00	<.01	0.05	0.11
LEAD (mg/l)	0.170	<.005	0.016	0.038
MANGANESE (mg/l)	0.034	<.005	0.003	0.004
MERCURY (mg/l)	<.0001	<.0001	<.0001	0.0000
MOLYBDENUM (mg/l)	0.012	<.005	0.002	0.003
NICKEL (mg/l)	0.02	<.02	<.02	0.00
SELENIUM (mg/l)	<.005	<.005	<.005	0.000
SILVER (mg/l)	<.005	<.005	<.005	0.000
URANIUM (mg/l)	0.004	<.001	<.001	0.000
ZINC (mg/l)	0.800	<.005	0.042	0.104
BORON (mg/l)	0.2	<.1	0.1	0.0
RADIUM 226 (pCi/l)	33.0	0.0	2.5	5.4
GROSS ALPHA (pCi/l)	110	0	10	17
GROSS BETA (pCi/l)	210	0	17	37
RADON (pCi/l)	320000	22	22721	45261

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY SUMMARY

DAKOTA FORMATION

PARAMETER	MAXIMUM	MINIMUM	AVERAGE	STD. DEV.
CALCIUM (mg/l)	18.0	16.0	17.0	0.5
MAGNESIUM (mg/l)	9.20	7.50	8.53	0.57
SODIUM (mg/l)	170	150	163	3
POTASSIUM (mg/l)	3.6	2.9	3.3	0.2
CARBONATE (mg/l)	0	0	0	0
BICARBONATE (mg/l)	270	250	263	8
SULFATE (mg/l)	220	187	209	6
CHLORIDE (mg/l)	6	<3	4	2
NITRATE (mg/l)	0.07	<.05	0.02	0.02
FLUORIDE (mg/l)	0.2	<.5	0.1	0.1
SILICA (mg/l)	21	15	18	2
TDS (mg/l)	590	536	554	16
CONDUCTIVITY (mMho)	820	740	786	21
PH (su)	7.7	7.5	7.6	0.1
ARSENIC (mg/l)	<.005	<.005	<.005	0.000
BARIUM (mg/l)	0.4	<.2	0.1	0.1
CADMIUM (mg/l)	<.005	<.005	<.005	<.005
CHROMIUM (mg/l)				
COPPER (mg/l)	0.005	<.005	0.001	0.001
IRON (mg/l)	0.02	<.01	0.01	0.01
LEAD (mg/l)	<.005	<.005	<.005	0.000
MANGANESE (mg/l)	0.034	0.030	0.032	0.000
MERCURY (mg/l)	<.0001	<.0001	<.0001	0.0000
MOLYBDENUM (mg/l)	0.008	<.005	0.002	0.002
NICKEL (mg/l)	<.02	<.02	<.02	0.00
SELENIUM (mg/l)	<.005	<.005	<.005	0.000
SILVER (mg/l)	<.005	<.005	<.005	0.000
URANIUM (mg/l)	0.003	<.001	0.001	0.001
ZINC (mg/l)	0.010	<.005	0.004	0.001
BORON (mg/l)	0.2	<.1	<.1	0.1
RADIUM 226 (pCi/l)	2.0	0.0	1.3	0.8
GROSS ALPHA (pCi/l)	5	0	2	2
GROSS BETA (pCi/l)	10	3	6	2
RADON (pCi/l)	4400	22	1175	1145

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L37

PARAMETER	SAMPLE #1 5-25-82	SAMPLE #2 8-3-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	1.8	1.8	1.8
MAGNESIUM (mg/l)	<.05	>.05	>.05
SODIUM (mg/l)	110	140	125
POTASSIUM (mg/l)	2.2	12.0	7.1
CARBONATE (mg/l)	19	120	70
BICARBONATE (mg/l)	210	89	150
SULFATE (mg/l)	44	25	35
CHLORIDE (mg/l)	4	<3	2
NITRATE (mg/l)	<0.05	<0.05	<0.05
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	11	19	15
TDS (mg/l)	288	386	337
CONDUCTIVITY (mMho)	445	455	450
PH (su)	8.9	8.8	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	0.014	<.005	0.007
IRON (mg/l)	0.03	0.01	0.02
LEAD (mg/l)	<.005	0.012	0.006
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	<.005
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.005	<.001	0.003
ZINC (mg/l)	<.005	0.019	0.010
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	5	8	6.5
GROSS ALPHA (pCi/l)	70	25	48
GROSS BETA (pCi/l)	75	71	73
RADON (pCi/l)	180000	140000	160000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L50

	SAMPLE #1	SAMPLE #2	SAMPLE 1&2
PARAMETER	6-2-82	7-28-82	AVERAGE
CALCIUM (mg/l)	1.2	2.0	1.6
MAGNESIUM (mg/l)	0.05	0.13	0.09
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	1.4	1.4	1.4
CARBONATE (mg/l)	14	14	14
BICARBONATE (mg/l)	190	200	195
SULFATE (mg/l)	30	41	36
CHLORIDE (mg/l)	<3	<3	<3
NITRATE (mg/l)	0.16	0.05	0.11
FLUORIDE (mg/l)	<.5	<.3	<.5
SILICA (mg/l)	20	19	20
TDS (mg/l)	290	326	308
CONDUCTIVITY (mMho)	425	415	420
PH (su)	8.4	8.9	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	0.110	0.055
IRON (mg/l)	0.01	0.38	0.20
LEAD (mg/l)	<.005	0.021	0.011
MANGANESE (mg/l)	0.008	0.008	0.008
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.013	0.007
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.012	<.001	0.006
ZINC (mg/l)	<.005	0.020	0.010
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	26	0	13
GROSS ALPHA (pCi/l)	120	5	63
GROSS BETA (pCi/l)	200	7	104
RADON (pCi/l)	8700	4100	6400

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L51

PARAMETER	SAMPLE #1 6-7-82	SAMPLE #2 8-3-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	4.7	3.5	4.1
MAGNESIUM (mg/l)	0.08	0.06	0.07
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	1.3	1.4	1.4
CARBONATE (mg/l)	10	12	11
BICARBONATE (mg/l)	210	210	210
SULFATE (mg/l)	36	28	32
CHLORIDE (mg/l)	16	12	14
NITRATE (mg/l)	0.10	0.05	0.08
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	20	20	20
TDS (mg/l)	338	308	323
CONDUCTIVITY (mMho)	425	440	433
PH (su)	8.5	9.0	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	0.01	0.04	0.03
LEAD (mg/l)	<.005	<.005	<.01
MANGANESE (mg/l)	<.005	<.005	<.01
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.005	0.003
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	0.007	0.004
BORON (mg/l)	0.1	0.5	0.3
RADIUM 226 (pCi/l)	28	24	26
GROSS ALPHA (pCi/l)	69	64	67
GROSS BETA (pCi/l)	150	92	121
RADON (pCi/l)	93000	180000	136500

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L64

PARAMETER	SAMPLE #1 5-25-82	SAMPLE #2 7-26-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.3	2.1	2.2
MAGNESIUM (mg/l)	<.05	0.06	0.03
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	1.4	1.3	1.4
CARBONATE (mg/l)	14	15	15
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	42	41	42
CHLORIDE (mg/l)	4	4	4
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	14	19	17
TDS (mg/l)	280	286	283
CONDUCTIVITY (mMho)	435	405	420
PH (su)	8.8	8.8	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	0.014	0.200	0.107
IRON (mg/l)	0.02	0.08	0.05
LEAD (mg/l)	<.005	0.005	0.003
MANGANESE (mg/l)	<.005	<.005	<.01
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.006	0.003
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.005	0.002	0.004
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	5	11	8
GROSS ALPHA (pCi/l)	100	66	83
GROSS BETA (pCi/l)	73	70	72
RADON (pCi/l)	260000	310000	285000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L65

PARAMETER	SAMPLE #1 6-1-82	SAMPLE #2 8-3-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	1.7	2.5	2.1
MAGNESIUM (mg/l)	0.07	0.09	0.08
SODIUM (mg/l)	96	110	103
POTASSIUM (mg/l)	1.2	1.2	1.2
CARBONATE (mg/l)	9	6	8
BICARBONATE (mg/l)	200	220	210
SULFATE (mg/l)	30	23	27
CHLORIDE (mg/l)	<3	13	7
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	20	19	20
TDS (mg/l)	270	306	288
CONDUCTIVITY (mMho)	430	425	428
PH (su)	8.6	8.9	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	0.01	0.01
LEAD (mg/l)	<.005	<.005	<.01
MANGANESE (mg/l)	<.005	<.005	<.01
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.003	<.001	0.002
ZINC (mg/l)	<.005	0.010	0.005
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	1	9	5
GROSS ALPHA (pCi/l)	2	28	15
GROSS BETA (pCi/l)	9	23	16
RADON (pCi/l)	49000	120000	84500

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L78

	SAMPLE #1	SAMPLE #2	SAMPLE 1&2
PARAMETER	5-18-82	7-26-82	AVERAGE
CALCIUM (mg/l)	2.3	2.9	2.6
MAGNESIUM (mg/l)	<.05	0.07	0.04
SODIUM (mg/l)	105	100	103
POTASSIUM (mg/l)	2.6	2.0	2.3
CARBONATE (mg/l)	14	10	12
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	24	36	30
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	<..5	0.1
SILICA (mg/l)	20	19	20
TDS (mg/l)	254	264	259
CONDUCTIVITY (mMho)	425	410	418
PH (su)	8.8	8.7	9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	0.2	0.1
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	0.020	0.010
IRON (mg/l)	<.01	0.01	0.01
LEAD (mg/l)	<.005	0.006	0.003
MANGANESE (mg/l)	<.005	<.005	<.01
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.010	0.008	0.009
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.001	<.001	0.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	3	3	3
GROSS ALPHA (pCi/l)	12	6	9
GROSS BETA (pCi/l)	9	5	7
RADON (pCi/l)	8700	15000	11850

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L79

PARAMETER	SAMPLE #1 6-7-82	SAMPLE #2 7-26-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.3	1.7	2.0
MAGNESIUM (mg/l)	<.05	0.06	0.03
SODIUM (mg/l)	110	120	115
POTASSIUM (mg/l)	0.9	0.8	0.9
CARBONATE (mg/l)	19	25	22
BICARBONATE (mg/l)	210	210	210
SULFATE (mg/l)	39	43	41
CHLORIDE (mg/l)	4	6	5
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	20	19	20
TDS (mg/l)	320	316	318
CONDUCTIVITY (mMho)	435	450	443
PH (su)	8.7	8.8	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	0.010	0.005
IRON (mg/l)	0.04	0.10	0.07
LEAD (mg/l)	<.005	0.015	0.008
MANGANESE (mg/l)	<.005	<.005	<.01
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.006	0.003
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	2	2	2
GROSS ALPHA (pCi/l)	3	3	3
GROSS BETA (pCi/l)	4	4	4
RADON (pCi/l)	14000	8400	11200

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M21

PARAMETER	SAMPLE #1 5-18-82	SAMPLE #2 7-21-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	4.4	3.9	4.2
MAGNESIUM (mg/l)	0.12	0.09	0.11
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	1.9	1.5	1.7
CARBONATE (mg/l)	10	7	9
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	20	34	27
CHLORIDE (mg/l)	12	5	9
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	19	18	19
TDS (mg/l)	256	290	273
CONDUCTIVITY (mMho)	430	400	415
PH (su)	8.4	8.8	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	0.3	0.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	0.02	<.01	0.01
LEAD (mg/l)	<.005	<.005	<.01
MANGANESE (mg/l)	0.010	<.005	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.010	0.010	0.010
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.2	0.1	0.15
RADIUM 226 (pCi/l)	2	2	2
GROSS ALPHA (pCi/l)	6	2	4
GROSS BETA (pCi/l)	6	7	7
RADON (pCi/l)	5400	5700	5550

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M35

PARAMETER	SAMPLE #1 5-11-82	SAMPLE #2 7-21-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.5	3.4	3.5
MAGNESIUM (mg/l)	0.10	0.09	0.10
SODIUM (mg/l)	97	97	97
POTASSIUM (mg/l)	1.7	1.5	1.6
CARBONATE (mg/l)	10	5	8
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	33	31	32
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	21	18	20
TDS (mg/l)	304	240	272
CONDUCTIVITY (mMho)	405	385	395
PH (su)	8.4	8.9	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	0.2	0.1
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.01
MANGANESE (mg/l)	0.009	<.005	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.014	0.006	0.010
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.002	<.001	0.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	2	2	2
GROSS ALPHA (pCi/l)	9	9	9
GROSS BETA (pCi/l)	10	8	9
RADON (pCi/l)	23000	10000	16500

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M49

PARAMETER	SAMPLE #1 5-11-82	SAMPLE #2 7-20-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	6.9	4.2	5.6
MAGNESIUM (mg/l)	0.08	0.06	0.07
SODIUM (mg/l)	100	96	98
POTASSIUM (mg/l)	2.5	1.7	2.1
CARBONATE (mg/l)	14	5	10
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	28	32	30
CHLORIDE (mg/l)	5	4	5
NITRATE (mg/l)	0.20	0.12	0.16
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	21	19	20
TDS (mg/l)	308	259	284
CONDUCTIVITY (mMho)	408	380	394
PH (su)	8.4	8.8	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	0.005	0.003
MANGANESE (mg/l)	0.008	<.005	0.004
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.009	<.005	0.005
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.012	0.010	0.011
ZINC (mg/l)	<.005	0.005	0.003
BORON (mg/l)	<.1	<.1	<.1
RADIUM 226 (pCi/l)	26	35	30.5
GROSS ALPHA (pCi/l)	78	67	73
GROSS BETA (pCi/l)	97	69	83
RADON (pCi/l)	200000	94000	147000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M6

PARAMETER	SAMPLE #1 5-18-82	SAMPLE #2 7-26-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.4	3.0	2.7
MAGNESIUM (mg/l)	0.08	0.09	0.09
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	1.5	1.2	1.4
CARBONATE (mg/l)	10	10	10
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	25	27	26
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	0.06	<.05	0.03
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	18	18	18
TDS (mg/l)	250	298	274
CONDUCTIVITY (mMho)	420	395	408
PH (su)	8.6	9.0	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	0.010	0.005
IRON (mg/l)	0.01	0.09	0.05
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.005	<.005	0.003
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.007	0.005	0.006
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.031	0.100	0.066
ZINC (mg/l)	<.005	0.005	0.003
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	3	5	4
GROSS ALPHA (pCi/l)	210	51	131
GROSS BETA (pCi/l)	89	28	59
RADON (pCi/l)	35000	5400	20200

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M63

PARAMETER	SAMPLE #1 5-11-82	SAMPLE #2 7-20-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	4.1	3.9	4.0
MAGNESIUM (mg/l)	0.11	0.10	0.11
SODIUM (mg/l)	100	95	98
POTASSIUM (mg/l)	1.9	1.4	1.7
CARBONATE (mg/l)	10	5	8
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	43	33	38
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	18	19	19
TDS (mg/l)	301	264	283
CONDUCTIVITY (mMho)	408	380	394
PH (su)	8.5	8.9	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	0.3	0.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	0.01	0.01
LEAD (mg/l)	<.005	0.005	0.003
MANGANESE (mg/l)	0.007	<.005	0.004
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.008	<.005	0.004
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.008	0.004	0.006
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	27	42	34.5
GROSS ALPHA (pCi/l)	100	71	86
GROSS BETA (pCi/l)	88	42	65
RADON (pCi/l)	240000	98000	169000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
ERATING AREA #1
W ER QUALITY REPORT

WELL 15M7

PARAMETER	SAMPLE #1 4-14-82	SAMPLE #2 8-17-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	6.5	2.0	4.3
MAGNESIUM (mg/l)	0.33	0.08	0.21
SODIUM (mg/l)	110	96	103
POTASSIUM (mg/l)	5.1	1.1	3.1
CARBONATE (mg/l)	9	10	10
BICARBONATE (mg/l)	180	210	195
SULFATE (mg/l)	33	36	35
CHLORIDE (mg/l)	34	<3	17
NITRATE (mg/l)	0.05	<.05	0.03
FLUORIDE (mg/l)	0.4	0.3	0.4
SILICA (mg/l)	21	17	19
TDS (mg/l)	340	250	295
CONDUCTIVITY (mMho)	460	400	430
PH (su)	8.5	8.8	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	0.005	0.010	0.008
IRON (mg/l)	0.01	0.30	0.16
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.007	0.010	0.009
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.008	0.009	0.009
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	0.006	0.006	0.006
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.011	0.001	0.006
ZINC (mg/l)	0.005	0.046	0.026
BORON (mg/l)	0.1	0.2	0.15
RADIUM 226 (pCi/l)	8	3	5.5
GROSS ALPHA (pCi/l)	16	7	12
GROSS BETA (pCi/l)	15	15	15
RADON (pCi/l)	186000	6000	96000

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16153

PARAMETER	SAMPLE #1 6-22-82	SAMPLE #2 7-28-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.9	2.9	2.9
MAGNESIUM (mg/l)	<.05	0.07	0.04
SODIUM (mg/l)	100	97	99
POTASSIUM (mg/l)	2.1	2.0	2.1
CARBONATE (mg/l)	9	10	10
BICARBONATE (mg/l)	200	200	200
SULFATE (mg/l)	31	39	35
CHLORIDE (mg/l)	4	4	4
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	0.3	0.3
SILICA (mg/l)	18	20	19
TDS (mg/l)	262	300	281
CONDUCTIVITY (mMho)	405	405	405
PH (su)	8.4	8.8	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.020	0.005	0.013
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.005	0.010	0.008
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.1	<.1	0.05
RADIUM 226 (pCi/l)	13	14	13.5
GROSS ALPHA (pCi/l)	32	31	32
GROSS BETA (pCi/l)	49	53	51
RADON (pCi/l)	110000	62000	86000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16i56

PARAMETER	SAMPLE #1 5-25-82	SAMPLE #2 7-28-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.3	2.2	2.3
MAGNESIUM (mg/l)	0.09	0.08	0.09
SODIUM (mg/l)	110	100	105
POTASSIUM (mg/l)	2.1	3.3	2.7
CARBONATE (mg/l)	19	33	26
BICARBONATE (mg/l)	180	170	175
SULFATE (mg/l)	40	43	42
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	0.3	0.3
SILICA (mg/l)	15	20	18
TDS (mg/l)	276	322	299
CONDUCTIVITY (mMho)	425	410	418
PH (su)	9.0	8.8	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	0.006	<.005	0.003
IRON (mg/l)	0.02	0.04	0.03
LEAD (mg/l)	<.005	0.007	0.004
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.009	0.005
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.002	<.001	0.001
ZINC (mg/l)	0.008	0.005	0.007
BORON (mg/l)	<.1	<.1	<.1
RADIUM 226 (pCi/l)	8	11	9.5
GROSS ALPHA (pCi/l)	37	34	36
GROSS BETA (pCi/l)	37	66	52
RADON (pCi/l)	100000	110000	105000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16169

PARAMETER	SAMPLE #1 6-22-82	SAMPLE #2 7-28-83	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.5	2.6	2.6
MAGNESIUM (mg/l)	<.05	0.09	0.05
SODIUM (mg/l)	100	94	97
POTASSIUM (mg/l)	1.9	1.4	1.7
CARBONATE (mg/l)	9	10	10
BICARBONATE (mg/l)	200	200	200
SULFATE (mg/l)	34	39	37
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	0.3	0.3
SILICA (mg/l)	18	19	19
TDS (mg/l)	264	276	270
CONDUCTIVITY (mMho)	400	395	398
PH (su)	8.5	8.8	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	0.010	0.005
MANGANESE (mg/l)	0.020	0.007	0.014
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	0.003	0.002
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	<.1	<.1	<.1
RADIUM 226 (pCi/l)	1	2	1.5
GROSS ALPHA (pCi/l)	1	5	3
GROSS BETA (pCi/l)	5	10	8
RADON (pCi/l)	4400	5000	4700

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16I70

PARAMETER	SAMPLE #1 5-25-82	SAMPLE #2 7-28-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.5	2.2	2.4
MAGNESIUM (mg/l)	0.10	0.08	0.09
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	1.9	4.2	3.1
CARBONATE (mg/l)	9	33	21
BICARBONATE (mg/l)	200	170	185
SULFATE (mg/l)	42	39	41
CHLORIDE (mg/l)	3	3	3
NITRATE (mg/l)	1.80	<.05	0.90
FLUORIDE (mg/l)	0.2	0.3	0.3
SILICA (mg/l)	17	20	19
TDS (mg/l)	260	312	286
CONDUCTIVITY (mMho)	425	415	420
PH (su)	8.7	8.9	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.009	0.005
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.2	<.1	0.1
RADIUM 226 (pCi/l)	7	9	8
GROSS ALPHA (pCi/l)	29	24	27
GROSS BETA (pCi/l)	57	84	71
RADON (pCi/l)	200000	110000	155000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16I84

PARAMETER	SAMPLE #1 5-18-82	SAMPLE #2 7-26-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.2	2.6	2.4
MAGNESIUM (mg/l)	0.06	0.07	0.07
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	2.9	1.5	2.2
CARBONATE (mg/l)	19	10	15
BICARBONATE (mg/l)	190	210	200
SULFATE (mg/l)	21	35	28
CHLORIDE (mg/l)	<3	<3	<3
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	20	19	20
TDS (mg/l)	256	298	277
CONDUCTIVITY (mMho)	425	400	413
PH (su)	8.8	8.9	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	0.03	0.02
LEAD (mg/l)	0.009	<.005	0.005
MANGANESE (mg/l)	0.005	0.012	0.009
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.008	0.005	0.007
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	0.001	0.001
ZINC (mg/l)	0.010	<.005	0.005
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	10	14	12
GROSS ALPHA (pCi/l)	32	28	30
GROSS BETA (pCi/l)	22	12	17
RADON (pCi/l)	34000	54000	44000

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P1

PARAMETER	SAMPLE #1 6-2-82	SAMPLE #2 7-21-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.9	4.2	4.1
MAGNESIUM (mg/l)	0.10	0.09	0.10
SODIUM (mg/l)	91	100	96
POTASSIUM (mg/l)	1.8	1.7	1.8
CARBONATE (mg/l)	9	10	10
BICARBONATE (mg/l)	190	200	195
SULFATE (mg/l)	28	34	31
CHLORIDE (mg/l)	9	5	7
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	21	21	21
TDS (mg/l)	260	250	255
CONDUCTIVITY (mMho)	420	400	410
PH (su)	8.7	8.9	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.006	0.003
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.003	0.001	0.002
ZINC (mg/l)	0.005	0.005	0.005
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	26	30	28
GROSS ALPHA (pCi/l)	110	73	92
GROSS BETA (pCi/l)	140	110	125
RADON (pCi/l)	360000	250000	305000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P15

PARAMETER	SAMPLE #1 5-18-82	SAMPLE #2 7-21-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.1	3.6	3.4
MAGNESIUM (mg/l)	0.11	0.11	0.11
SODIUM (mg/l)	100	97	99
POTASSIUM (mg/l)	1.7	1.4	1.6
CARBONATE (mg/l)	5	5	5
BICARBONATE (mg/l)	210	210	210
SULFATE (mg/l)	26	30	28
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	0.06	0.08	0.07
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	19	20	20
TDS (mg/l)	240	250	245
CONDUCTIVITY (mMho)	420	395	408
PH (su)	8.4	8.8	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.010	<.005	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.008	0.005	0.007
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	0.002	0.001
ZINC (mg/l)	<.005	0.005	0.003
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	6	57	31.5
GROSS ALPHA (pCi/l)	180	120	150
GROSS BETA (pCi/l)	160	130	145
RADON (pCi/l)	250000		250000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15P29

PARAMETER	SAMPLE #1 5-11-82	SAMPLE #2 7-21-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	13.0	7.9	10.5
MAGNESIUM (mg/l)	0.14	0.11	0.13
SODIUM (mg/l)	100	98	99
POTASSIUM (mg/l)	2.0	1.7	1.9
CARBONATE (mg/l)	10	5	8
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	32	32	32
CHLORIDE (mg/l)	24	12	18
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	<.5	<.5
SILICA (mg/l)	20	19	20
TDS (mg/l)	335	270	303
CONDUCTIVITY (mMho)	455	410	433
PH (su)	8.4	8.9	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.009	<.005	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.007	0.005	0.006
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.002	<.001	0.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	19	15	17
GROSS ALPHA (pCi/l)	48	31	40
GROSS BETA (pCi/l)	27	27	27
RADON (pCi/l)	49000	32000	40500

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P43

PARAMETER	SAMPLE #1 5-11-82	SAMPLE #2 7-20-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	8.3	3.9	6.1
MAGNESIUM (mg/l)	0.12	0.09	0.11
SODIUM (mg/l)	99	100	100
POTASSIUM (mg/l)	1.8	1.4	1.6
CARBONATE (mg/l)	10	10	10
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	30	33	32
CHLORIDE (mg/l)	10	4	7
NITRATE (mg/l)	0.17	<.05	0.09
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	19	19	19
TDS (mg/l)	316	274	295
CONDUCTIVITY (mMho)	460	378	419
PH (su)	8.3	8.9	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	0.022	<.005	0.011
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.008	0.005	0.007
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.008	<.005	0.004
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.002	<.001	0.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.2	0.1	0.15
RADIUM 226 (pCi/l)	71	68	69.5
GROSS ALPHA (pCi/l)	300	230	265
GROSS BETA (pCi/l)	130	100	115
RADON (pCi/l)	320000	230000	275000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P44

PARAMETER	SAMPLE #1 6-22-82	SAMPLE #2 8-25-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.5	3.3	3.4
MAGNESIUM (mg/l)	0.11	0.10	0.11
SODIUM (mg/l)	1100	100	600
POTASSIUM (mg/l)	2.8	3.7	3.3
CARBONATE (mg/l)	9	15	12
BICARBONATE (mg/l)	200	220	210
SULFATE (mg/l)	31	37	34
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	19	17	18
TDS (mg/l)	266	250	258
CONDUCTIVITY (mMho)	410	410	410
PH (su)	8.4	8.9	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	0.010	0.022	0.016
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	0.021	0.011
MANGANESE (mg/l)	0.015	0.006	0.011
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.009	0.005
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	3	3	3
GROSS ALPHA (pCi/l)	4	6	5
GROSS BETA (pCi/l)	10	11	11
RADON (pCi/l)	11000	8400	9700

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P57

PARAMETER	SAMPLE #1 5-11-82	SAMPLE #2 7-20-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	4.6	4.2	4.4
MAGNESIUM (mg/l)	0.13	0.11	0.12
SODIUM (mg/l)	98	97	98
POTASSIUM (mg/l)	1.9	1.5	1.7
CARBONATE (mg/l)	10	10	10
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	28	34	31
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	0.14	0.05	0.10
FLUORIDE (mg/l)	0.2	<.5	0.10
SILICA (mg/l)	19	20	20
TDS (mg/l)	302	266	284
CONDUCTIVITY (mMho)	410	375	393
PH (su)	8.4	8.8	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.010	<.005	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.008	<.005	0.004
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.010	0.008	0.009
ZINC (mg/l)	0.010	<.005	0.005
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	2	200	101
GROSS ALPHA (pCi/l)	610	440	525
GROSS BETA (pCi/l)	510	300	405
RADON (pCi/l)	1100000	890000	995000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P59

PARAMETER	SAMPLE #1 7-6-82	SAMPLE #2 8-25-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	4.2	4.4	4.3
MAGNESIUM (mg/l)	0.14	0.16	0.15
SODIUM (mg/l)	91	95	93
POTASSIUM (mg/l)	5.5	3.1	4.3
CARBONATE (mg/l)	14	12	13
BICARBONATE (mg/l)	210	210	210
SULFATE (mg/l)	34	44	39
CHLORIDE (mg/l)	4	2	3
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	22	17	20
TDS (mg/l)	290	300	295
CONDUCTIVITY (mMho)	370	395	383
PH (su)	8.6	8.9	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	0.01	0.14	0.08
LEAD (mg/l)	<.005	0.053	0.027
MANGANESE (mg/l)	0.007	0.010	0.009
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.016	0.008
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.005	0.017	0.011
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	14	17	15.5
GROSS ALPHA (pCi/l)	50	51	51
GROSS BETA (pCi/l)	44	52	48
RADON (pCi/l)	30000	54000	42000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P59

PARAMETER	SAMPLE #1 7-6-82	SAMPLE #2 8-25-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	4.2	4.4	4.3
MAGNESIUM (mg/l)	0.14	0.16	0.15
SODIUM (mg/l)	91	95	93
POTASSIUM (mg/l)	5.5	3.1	4.3
CARBONATE (mg/l)	14	12	13
BICARBONATE (mg/l)	210	210	210
SULFATE (mg/l)	34	44	39
CHLORIDE (mg/l)	4	2	3
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	22	17	20
TDS (mg/l)	290	300	295
CONDUCTIVITY (mMho)	370	395	383
PH (su)	8.6	8.9	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	0.01	0.14	0.08
LEAD (mg/l)	<.005	0.053	0.027
MANGANESE (mg/l)	0.007	0.010	0.009
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.016	0.008
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.005	0.017	0.011
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	14	17	15.5
GROSS ALPHA (pCi/l)	50	51	51
GROSS BETA (pCi/l)	44	52	48
RADON (pCi/l)	30000	54000	42000

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L17

PARAMETER	SAMPLE #1 8-23-82	SAMPLE #2 9-8-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	1.8	1.4	1.6
MAGNESIUM (mg/l)	<.05	<.05	0.00
SODIUM (mg/l)	110	100	105
POTASSIUM (mg/l)	1.1	0.9	1.0
CARBONATE (mg/l)	10	12	11
BICARBONATE (mg/l)	220	220	220
SULFATE (mg/l)	35	49	42
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	15	17	16
TDS (mg/l)	270	300	285
CONDUCTIVITY (mMho)	400	410	405
PH (su)	9.0	8.9	9.0
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	0.050	0.005	0.028
IRON (mg/l)	0.05	<.01	0.03
LEAD (mg/l)	0.013	<.005	0.007
MANGANESE (mg/l)	0.010	<.005	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.007	<.005	0.004
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.007	<.005	0.004
BORON (mg/l)	0.2	0.1	0.15
RADIUM 226 (pCi/l)	0	1	0.5
GROSS ALPHA (pCi/l)	5	0	3
GROSS BETA (pCi/l)	2	1	2
RADON (pCi/l)	630	1100	865

Source:
Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L17A

PARAMETER	SAMPLE #1 6-22-82	SAMPLE #2 8-23-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	1.1	1.1	1.1
MAGNESIUM (mg/l)	<.05	<.05	0 00
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	1.0	1.1	1.1
CARBONATE (mg/l)	10	12	11
BICARBONATE (mg/l)	210	220	215
SULFATE (mg/l)	30	36	33
CHLORIDE (mg/l)	<3	3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	18	16	17
TDS (mg/l)	271	270	271
CONDUCTIVITY (mMho)	425	420	423
PH (su)	8.5	8.8	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	0.02	0.01
LEAD (mg/l)	<.005	0.006	0.003
MANGANESE (mg/l)	<.005	0.010	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.007	0.009	0.008
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	0.007	0.004
BORON (mg/l)	<.1	<.1	<.1
RADIUM 226 (pCi/l)	1	1	1
GROSS ALPHA (pCi/l)	2	5	4
GROSS BETA (pCi/l)	9	6	8
RADON (pCi/l)	14000	12000	13000

Source:
Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L45

PARAMETER	SAMPLE #1 8-23-82	SAMPLE #2 9-8-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	1.9	1.4	1.7
MAGNESIUM (mg/l)	<.05	<.05	0.00
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	1.0	5.5	3.3
CARBONATE (mg/l)	15	43	29
BICARBONATE (mg/l)	220	180	200
SULFATE (mg/l)	37	35	36
CHLORIDE (mg/l)	<3	<3	<3
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	13	18	16
TDS (mg/l)	280	320	300
CONDUCTIVITY (mMho)	415	410	413
PH (su)	8.9	8.8	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	0.010	0.007	0.009
IRON (mg/l)	0.04	0.02	0.03
LEAD (mg/l)	0.007	<.005	0.004
MANGANESE (mg/l)	0.005	<.005	0.003
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.012	<.005	0.006
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.005	0.007	0 006
BORON (mg/l)	0.2	0.2	0.2
RADIUM 226 (pCi/l)	1	0	0.5
GROSS ALPHA (pCi/l)	2	6	4
GROSS BETA (pCi/l)	4	10	7
RADON (pCi/l)	270000	4400	137200

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L5

PARAMETER	SAMPLE #1 8-23-82	SAMPLE #2 9-8-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	1.9	1.4	1.7
MAGNESIUM (mg/l)	<.05	<.05	0.00
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	1.0	0.7	0.9
CARBONATE (mg/l)	15	12	14
BICARBONATE (mg/l)	220	230	225
SULFATE (mg/l)	46	39	43
CHLORIDE (mg/l)	3	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	15	16	16
TDS (mg/l)	270	300	285
CONDUCTIVITY (mMho)	420	415	418
PH (su)	8.9	9.1	
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	0.980	0.011	0.496
IRON (mg/l)	0.05	0.01	0.03
LEAD (mg/l)	0.170	<.005	0.085
MANGANESE (mg/l)	0.010	<.005	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.005	0.006	0.006
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.018	<.005	0.009
BORON (mg/l)	0.1	0.2	0.15
RADIUM 226 (pCi/l)	0	1	0.5
GROSS ALPHA (pCi/l)	23	5	14
GROSS BETA (pCi/l)	31	4	18
RADON (pCi/l)	330	350	340

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L7

	SAMPLE #1	SAMPLE #2	SAMPLE 1&2
PARAMETER	7-26-82	8-31-82	AVERAGE
CALCIUM (mg/l)	3.5	1.6	2.6
MAGNESIUM (mg/l)	0.09	<.05	0.05
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	2.2	1.1	1.7
CARBONATE (mg/l)	17	12	15
BICARBONATE (mg/l)	210	220	215
SULFATE (mg/l)	35	32	34
CHLORIDE (mg/l)	3	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	20	18	19
TDS (mg/l)	300	280	290
CONDUCTIVITY (mMho)	410	390	400
PH (su)	8.9	8.9	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)			
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	0.340	0.075	0.208
IRON (mg/l)	1.00	0.02	0.51
LEAD (mg/l)	0.150	<.005	0.075
MANGANESE (mg/l)	0.023	<.005	0.012
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.009	0.005	0.007
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.100	<.005	0.050
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	1	0	0.5
GROSS ALPHA (pCi/l)	3	0	2
GROSS BETA (pCi/l)	4	1	3
RADON (pCi/l)	1200	510	855

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L73

PARAMETER	SAMPLE #1 6-7-82	SAMPLE #2 8-23-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.9	2.4	2.7
MAGNESIUM (mg/l)	0.07	0.09	0.08
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	1.7	1.3	1.5
CARBONATE (mg/l)	19	10	15
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	36	43	40
CHLORIDE (mg/l)	6	<3	3
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	20	14	17
TDS (mg/l)	314	270	292
CONDUCTIVITY (mMho)	400	405	403
PH (su)	8.4	8.8	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.005	0.003
IRON (mg/l)	0.02	0.13	0.08
LEAD (mg/l)	0.008	0.013	0.011
MANGANESE (mg/l)	<.005	0.005	0.003
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.006	0.003
NICKEL (mg/l)	<.02	0.02	0.01
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	0.022	0.011
BORON (mg/l)	0.2	0.1	0.15
RADIUM 226 (pCi/l)	18	33	25.5
GROSS ALPHA (pCi/l)	48	110	79
GROSS BETA (pCi/l)	140	210	175
RADON (pCi/l)	320000	2300	161150

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M12

PARAMETER	SAMPLE #1 6-21-82	SAMPLE #2 9-1-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	4.5	2.2	3.4
MAGNESIUM (mg/l)	<.05	<.05	0.00
SODIUM (mg/l)	100	104	102
POTASSIUM (mg/l)	1.4	1.4	1.4
CARBONATE (mg/l)	9	6	8
BICARBONATE (mg/l)	200	220	210
SULFATE (mg/l)	29	32	31
CHLORIDE (mg/l)	8	3	6
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	19	19	19
TDS (mg/l)	274	260	267
CONDUCTIVITY (mMho)	410	405	408
PH (su)	8.4	8.7	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.005	0.003
IRON (mg/l)	<.01	0.02	0.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.007	<.005	0.004
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.010	<.005	0.005
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	5	2	3.5
GROSS ALPHA (pCi/l)	24	13	19
GROSS BETA (pCi/l)	22	28	25
RADON (pCi/l)	58000	26000	42000

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M39

PARAMETER	SAMPLE #1 6-7-82	SAMPLE #2 9-1-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.0	3.0	3.0
MAGNESIUM (mg/l)	0.09	0.06	0.08
SODIUM (mg/l)	97	105	101
POTASSIUM (mg/l)	1.3	1.5	1.4
CARBONATE (mg/l)	10	6	8
BICARBONATE (mg/l)	210	220	215
SULFATE (mg/l)	31	31	31
CHLORIDE (mg/l)	<3	<3	<3
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	20	18	19
TDS (mg/l)	246	270	258
CONDUCTIVITY (mMho)	383	395	389
PH (su)	8.3	8.9	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.005	0.003
IRON (mg/l)	0.01	<.01	0.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	2	1	1.5
GROSS ALPHA (pCi/l)	4	4	4
GROSS BETA (pCi/l)	4	9	7
RADON (pCi/l)	12000	17000	14500

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M67

	SAMPLE #1	SAMPLE #2	SAMPLE 1&2
PARAMETER	6-11-82	9-1-82	AVERAGE
CALCIUM (mg/l)	13.0	8.0	10.5
MAGNESIUM (mg/l)	0.11	0.08	0.10
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	2.2	2.4	2.3
CARBONATE (mg/l)	4	6	5
BICARBONATE (mg/l)	200	220	210
SULFATE (mg/l)	28	33	31
CHLORIDE (mg/l)	41	39	40
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	18	18	18
TDS (mg/l)	336	330	333
CONDUCTIVITY (mMho)	455	415	435
PH (su)	8.5	8.9	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.005	0.003
IRON (mg/l)	0.02	0.02	0.02
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.008	<.005	0.004
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.006	0.005	0.006
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	0	1	0.5
GROSS ALPHA (pCi/l)	1	3	2
GROSS BETA (pCi/l)	3	3	3
RADON (pCi/l)	1300	520	910

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M92

PARAMETER	SAMPLE #1 7-20-82	SAMPLE #2 9-1-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.2	2.8	3.0
MAGNESIUM (mg/l)	0.14	0.10	0.12
SODIUM (mg/l)	97	99	98
POTASSIUM (mg/l)	2.5	2.0	2.3
CARBONATE (mg/l)	10	6	8
BICARBONATE (mg/l)	210	220	215
SULFATE (mg/l)	36	32	34
CHLORIDE (mg/l)	3	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<..5	<.5
SILICA (mg/l)	19	19	19
TDS (mg/l)	278	250	264
CONDUCTIVITY (mMho)	375	400	388
PH (su)	8.7	8.9	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			0.005
COPPER (mg/l)	<.005	0.005	0.003
IRON (mg/l)	<.01	0.02	0.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.015	<.005	0.008
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	2	3	2.5
GROSS ALPHA (pCi/l)	6	8	7
GROSS BETA (pCi/l)	8	6	7
RADON (pCi/l)	6000	4200	5100

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15M94

PARAMETER	SAMPLE #1 7-20-82	SAMPLE #2 9-1-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	8.5	18.0	13.3
MAGNESIUM (mg/l)	0.74	5.80	3.27
SODIUM (mg/l)	110	170	140
POTASSIUM (mg/l)	2.8	4.3	3.6
CARBONATE (mg/l)	10	0	5
BICARBONATE (mg/l)	220	250	235
SULFATE (mg/l)	53	200	127
CHLORIDE (mg/l)	9	24	17
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	19	19	19
TDS (mg/l)	326	570	448
CONDUCTIVITY (mMho)	410	390	400
PH (su)	8.8	9.0	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.005	0.003
IRON (mg/l)	0.05	0.03	0.04
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.011	<.005	0.006
BORON (mg/l)	0.1	0.2	0.15
RADIUM 226 (pCi/l)	1	1	1
GROSS ALPHA (pCi/l)	7	5	6
GROSS BETA (pCi/l)	6	7	7
RADON (pCi/l)	2100	2600	2350

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15I11

PARAMETER	SAMPLE #1 7-13-82	SAMPLE #2 8-31-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	1.8	1.6	1.7
MAGNESIUM (mg/l)	<.05	<.05	0.00
SODIUM (mg/l)	110	110	110
POTASSIUM (mg/l)	1.3	1.0	1.2
CARBONATE (mg/l)	14	12	13
BICARBONATE (mg/l)	200	220	210
SULFATE (mg/l)	25	33	29
CHLORIDE (mg/l)	4	3	4
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	19	19	19
TDS (mg/l)	280	300	290
CONDUCTIVITY (mMho)	400	400	400
PH (su)	8.7	9.0	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			0.008
COPPER (mg/l)	0.005	0.020	0.013
IRON (mg/l)	<.01	0.01	0.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.800	0.006	0.403
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	0	0	0
GROSS ALPHA (pCi/l)	1	4	3
GROSS BETA (pCi/l)	2	0	1
RADON (pCi/l)	270	310	290

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15I23

PARAMETER	SAMPLE #1 7-13-82	SAMPLE #2 8-31-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.4	1.8	2.1
MAGNESIUM (mg/l)	0.05	<0.05	0.03
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	1.2	1.0	1.1
CARBONATE (mg/l)	9	6	8
BICARBONATE (mg/l)	210	220	215
SULFATE (mg/l)	31	34	33
CHLORIDE (mg/l)	5	<3	3
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	20	18	19
TDS (mg/l)	270	270	270
CONDUCTIVITY (mMho)	395	390	393
PH (su)	8.9	8.8	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.005	0.003
IRON (mg/l)	<.01	0.02	0.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	<.005	<.005
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	3	5	4
GROSS ALPHA (pCi/l)	5	5	5
GROSS BETA (pCi/l)	4	4	4
RADON (pCi/l)	410	3600	2005

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16151

PARAMETER	SAMPLE #1 7-13-82	SAMPLE #2 8-31-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.2	2.1	2.2
MAGNESIUM (mg/l)	0.05	<.05	0.03
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	1.2	1.0	1.1
CARBONATE (mg/l)	9	6	8
BICARBONATE (mg/l)	210	220	215
SULFATE (mg/l)	26	34	30
CHLORIDE (mg/l)	4	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	20	19	20
TDS (mg/l)	270	280	275
CONDUCTIVITY (mMho)	390	385	388
PH (su)	8.8	9.1	9.0
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.030	0.015
IRON (mg/l)	<.01	0.01	0.01
LEAD (mg/l)	0.010	0.005	0.008
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	0.004	0.002
ZINC (mg/l)	<.005	0.005	0.003
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	0	2	1
GROSS ALPHA (pCi/l)	0	10	5
GROSS BETA (pCi/l)	6	8	7
RADON (pCi/l)	10000	7200	8600

Source:
Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15I81

	SAMPLE #1	SAMPLE #2	SAMPLE 1&2
PARAMETER	7-13-82	8-31-82	AVERAGE
CALCIUM (mg/l)	2.1	1.6	1.9
MAGNESIUM (mg/l)	0.05	<.05	0.03
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	1.4	1.2	1.3
CARBONATE (mg/l)	9	6	8
BICARBONATE (mg/l)	210	220	215
SULFATE (mg/l)	22	21	22
CHLORIDE (mg/l)	4	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	20	19	20
TDS (mg/l)	230	230	230
CONDUCTIVITY (mMho)	385	395	198
PH (su)	8.9	8.9	8.9
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.015	0.008
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	0.006	<.005	0.003
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	0.006	0.003
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	0	0	0
GROSS ALPHA (pCi/l)	2	1	2
GROSS BETA (pCi/l)	1	2	2
RADON (pCi/l)	830	930	880

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P102

PARAMETER	SAMPLE #1 7-1-82	SAMPLE #2 8-25-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	11.0	3.5	7.3
MAGNESIUM (mg/l)	0.11	0.12	0.12
SODIUM (mg/l)	88	100	94
POTASSIUM (mg/l)	1.7	1.2	1.5
CARBONATE (mg/l)	5	6	6
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	29	37	33
CHLORIDE (mg/l)	25	5	15
NITRATE (mg/l)	0.06	0.05	0.06
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	23	15	19
TDS (mg/l)	270	250	260
CONDUCTIVITY (mMho)	340	400	370
PH (su)	9.1	8.8	9.0
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	0.011	0.100	0.056
IRON (mg/l)	<.01	0.16	0.08
LEAD (mg/l)	<.005	0.045	0.023
MANGANESE (mg/l)	0.009	0.010	0.010
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.007	0.004
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.010	0.013	0.012
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	2	0	1
GROSS ALPHA (pCi/l)	4	7	6
GROSS BETA (pCi/l)	30	4	17
RADON (pCi/l)	2200	1000	1600

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P11

	SAMPLE #1	SAMPLE #2	SAMPLE 1&2
PARAMETER	7-13-82	8-31-82	AVERAGE
CALCIUM (mg/l)	13.0	8.4	10.7
MAGNESIUM (mg/l)	0.11	0.10	0.11
SODIUM (mg/l)	100	100	100
POTASSIUM (mg/l)	1.6	1.3	1.5
CARBONATE (mg/l)	5	0	3
BICARBONATE (mg/l)	210	230	220
SULFATE (mg/l)	23	37	30
CHLORIDE (mg/l)	35	20	28
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	20	19	20
TDS (mg/l)	270	290	280
CONDUCTIVITY (mMho)	425	415	420
PH (su)	8.8	8.8	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.015	0.008
IRON (mg/l)	<.01	0.02	0.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	<.005	<.005	<.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	0.630	0.315
BORON (mg/l)	0.1	0.1	0.1
RADIUM 226 (pCi/l)	1	0	0.5
GROSS ALPHA (pCi/l)	5	2	4
GROSS BETA (pCi/l)	5	4	5
RADON (pCi/l)	550	1000	775

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P37

PARAMETER	SAMPLE #1 7-6-82	SAMPLE #2 8-6-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	2.9	3.4	3.2
MAGNESIUM (mg/l)	0.11	0.13	0.12
SODIUM (mg/l)	94	100	97
POTASSIUM (mg/l)	5.2	1.9	3.6
CARBONATE (mg/l)	15	6	11
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	27	33	30
CHLORIDE (mg/l)	3	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	0.3	0.3
SILICA (mg/l)	20	17	19
TDS (mg/l)	310	280	295
CONDUCTIVITY (mMho)	390	420	405
PH (su)	8.7	8.7	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.030	0.015
IRON (mg/l)	<.01	0.01	0.01
LEAD (mg/l)	0.005	0.025	0.015
MANGANESE (mg/l)	<.005	0.006	0.003
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	0.02	<.02	0.01
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	0.043	0.022
BORON (mg/l)	0.1	0.2	0.15
RADIUM 226 (pCi/l)	0	1	0.5
GROSS ALPHA (pCi/l)	3	5	4
GROSS BETA (pCi/l)	6	4	5
RADON (pCi/l)	520	930	725

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P65

PARAMETER	SAMPLE #1 7-1-82	SAMPLE #2 8-6-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.7	3.7	3.7
MAGNESIUM (mg/l)	0.11	0.14	0.13
SODIUM (mg/l)	82	100	91
POTASSIUM (mg/l)	1.7	1.5	1.6
CARBONATE (mg/l)	10	6	8
BICARBONATE (mg/l)	180	220	200
SULFATE (mg/l)	32	39	36
CHLORIDE (mg/l)	3	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	0.3	0.3
SILICA (mg/l)	20	19	20
TDS (mg/l)	230	280	255
CONDUCTIVITY (mMho)	350	390	370
PH (su)	8.6	8.8	8.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	0.010	0.095	0.053
IRON (mg/l)	<.01	0.06	0.03
LEAD (mg/l)	<.005	0.020	0.010
MANGANESE (mg/l)	0.005	0.005	0.005
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	0.009	<.005	0.005
BORON (mg/l)	<.1	0.2	0.1
RADIUM 226 (pCi/l)	7	7	7
GROSS ALPHA (pCi/l)	36	30	33
GROSS BETA (pCi/l)	55	23	39
RADON (pCi/l)	65000	100000	82500

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P94

PARAMETER	SAMPLE #1 7-6-82	SAMPLE #2 8-6-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.5	3.3	3.4
MAGNESIUM (mg/l)	0.13	0.15	0.14
SODIUM (mg/l)	90	100	95
POTASSIUM (mg/l)	2.4	1.6	2.0
CARBONATE (mg/l)	10	6	8
BICARBONATE (mg/l)	190	220	205
SULFATE (mg/l)	30	43	37
CHLORIDE (mg/l)	3	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	0.3	0.3
SILICA (mg/l)	21	12	17
TDS (mg/l)	280	270	275
CONDUCTIVITY (mMho)	370	400	385
PH (su)	8.6	8.9	8.8
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.013	0.007	0.010
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	0.02	<.02	0.01
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	0.009	0.005
BORON (mg/l)	0.1	0.2	0.15
RADIUM 226 (pCi/l)	1	2	1.5
GROSS ALPHA (pCi/l)	0	4	2
GROSS BETA (pCi/l)	5	4	5
RADON (pCi/l)	480	690	585

Source:
Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P96

PARAMETER	SAMPLE #1 6-21-82	SAMPLE #2 8-25-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	3.3	3.2	3.3
MAGNESIUM (mg/l)	0.11	0.11	0.11
SODIUM (mg/l)	100	97	99
POTASSIUM (mg/l)	1.5	1.4	1.5
CARBONATE (mg/l)	9	6	8
BICARBONATE (mg/l)	200	210	205
SULFATE (mg/l)	30	38	34
CHLORIDE (mg/l)	3	3	3
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	0.3	<.5	0.2
SILICA (mg/l)	20	16	18
TDS (mg/l)	262	230	246
CONDUCTIVITY (mMho)	380	385	383
PH (su)	8.3	8.9	8.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.250	0.125
IRON (mg/l)	0.30	0.01	0.16
LEAD (mg/l)	<.005	0.016	0.008
MANGANESE (mg/l)	0.010	0.005	0.008
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	0.012	0.006
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	<.001	<.001	<.001
ZINC (mg/l)	<.005	0.006	0.003
BORON (mg/l)	<.1	0.1	0.05
RADIUM 226 (pCi/l)	1	1	1
GROSS ALPHA (pCi/l)	0	8	4
GROSS BETA (pCi/l)	4	5	5
RADON (pCi/l)	870	970	920

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 16P101 (Dakota)

PARAMETER	SAMPLE #1 5-18-82	SAMPLE #2 7-21-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	18.0	17.0	17.5
MAGNESIUM (mg/l)	9.20	9.00	9.10
SODIUM (mg/l)	150	170	160
POTASSIUM (mg/l)	3.6	3.4	3.5
CARBONATE (mg/l)	0	0	0
BICARBONATE (mg/l)	250	260	255
SULFATE (mg/l)	187	220	204
CHLORIDE (mg/l)	5	6	6
NITRATE (mg/l)	<.05	0.07	0.04
FLUORIDE (mg/l)	0.2	<.5	0.1
SILICA (mg/l)	21	19	20
TDS (mg/l)	536	540	538
CONDUCTIVITY (mMho)	820	795	808
PH (su)	7.7	7.6	7.7
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	0.4	0.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	<.005	<.005
IRON (mg/l)	<.01	<.01	<.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.033	0.032	0.033
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	<.005	<.005	0.000
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.001	<.001	0.001
ZINC (mg/l)	0.010	<.005	0.005
BORON (mg/l)	0.1	<.1	0.05
RADIUM 226 (pCi/l)	2	2	2
GROSS ALPHA (pCi/l)	5	4	5
GROSS BETA (pCi/l)	10	6	8
RADON (pCi/l)	240	4400	2320

Source:

Mobil Oil Corporation
Southtrend Development Area
Operating Area #1
Baseline Water Quality Sampling Data

HRI UNIT 1
OPERATING AREA #1
WATER QUALITY REPORT

WELL 15L101 (Dakota)

PARAMETER	SAMPLE #1 8-23-82	SAMPLE #2 9-8-82	SAMPLE 1&2 AVERAGE
CALCIUM (mg/l)	16.0	17.0	16.5
MAGNESIUM (mg/l)	7.50	8.40	7.95
SODIUM (mg/l)	170	160	165
POTASSIUM (mg/l)	3.4	2.9	3.2
CARBONATE (mg/l)	0	0	0
BICARBONATE (mg/l)	270	270	270
SULFATE (mg/l)	220	210	215
CHLORIDE (mg/l)	4	<3	2
NITRATE (mg/l)	<.05	<.05	<.05
FLUORIDE (mg/l)	<.5	<.5	<.5
SILICA (mg/l)	15	17	16
TDS (mg/l)	550	590	570
CONDUCTIVITY (mMho)	740	790	765
PH (su)	7.6	7.5	7.6
ARSENIC (mg/l)	<.005	<.005	<.005
BARIUM (mg/l)	<.2	<.2	<.2
CADMIUM (mg/l)	<.005	<.005	<.005
CHROMIUM (mg/l)			<.005
COPPER (mg/l)	<.005	0.005	0.003
IRON (mg/l)	0.02	<.01	0.01
LEAD (mg/l)	<.005	<.005	<.005
MANGANESE (mg/l)	0.030	0.034	0.032
MERCURY (mg/l)	<.0001	<.0001	<.0001
MOLYBDENUM (mg/l)	0.008	<.005	0.004
NICKEL (mg/l)	<.02	<.02	<.02
SELENIUM (mg/l)	<.005	<.005	<.005
SILVER (mg/l)	<.005	<.005	<.005
URANIUM (mg/l)	0.003	<.001	0.002
ZINC (mg/l)	<.005	0.005	0.003
BORON (mg/l)	0.2	0.2	0.2
RADIUM 226 (pCi/l)	1	0	0.5
GROSS ALPHA (pCi/l)	0	0	0
GROSS BETA (pCi/l)	3	5	4
RADON (pCi/l)	38	22	30

Source:

Mobil Oil Corporation

Southtrend Development Area

Operating Area #1

Baseline Water Quality Sampling Data

Attachment 7
Mobil Operating Area Map

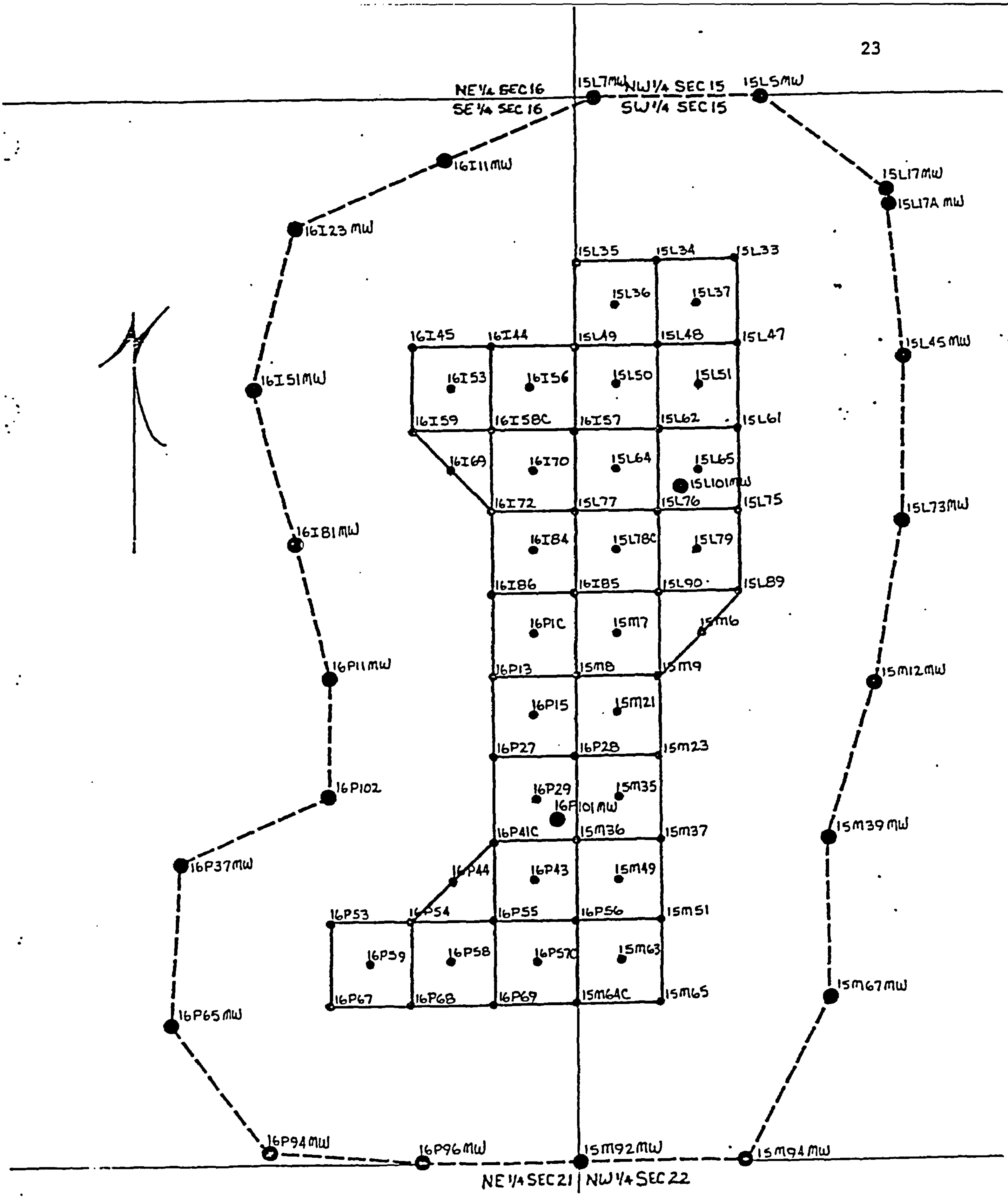
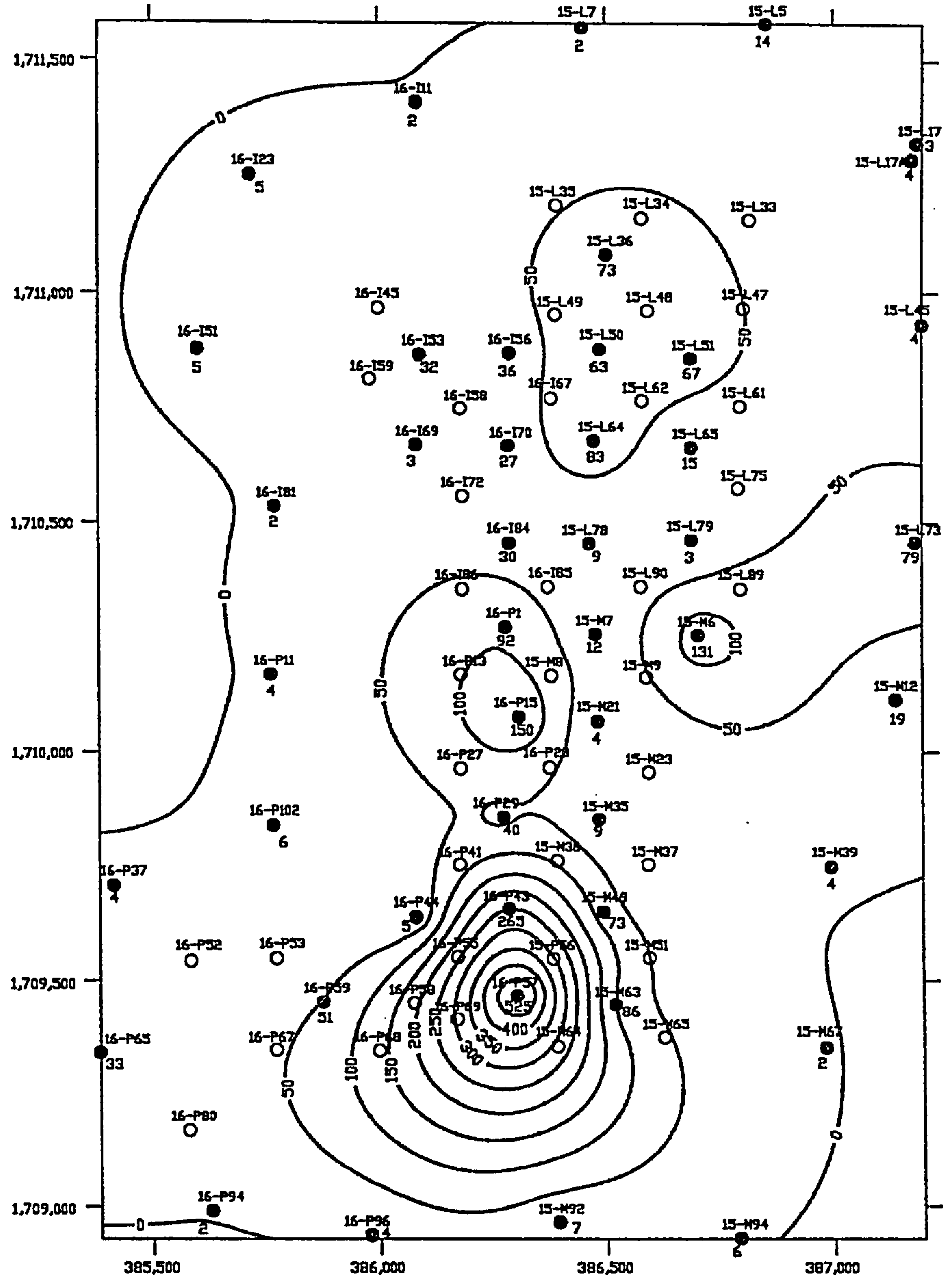


Figure 4. SOA I pattern and surrounding monitor well ring.

● Monitor Wells

• Production Wells

ATTACHMENT E



LEGEND

16-P94 ● WELL WITH DATA INFORMATION

16-P80 ○ WELL WITHOUT DATA INFORMATION

GROSS ALPHA
pCI/l

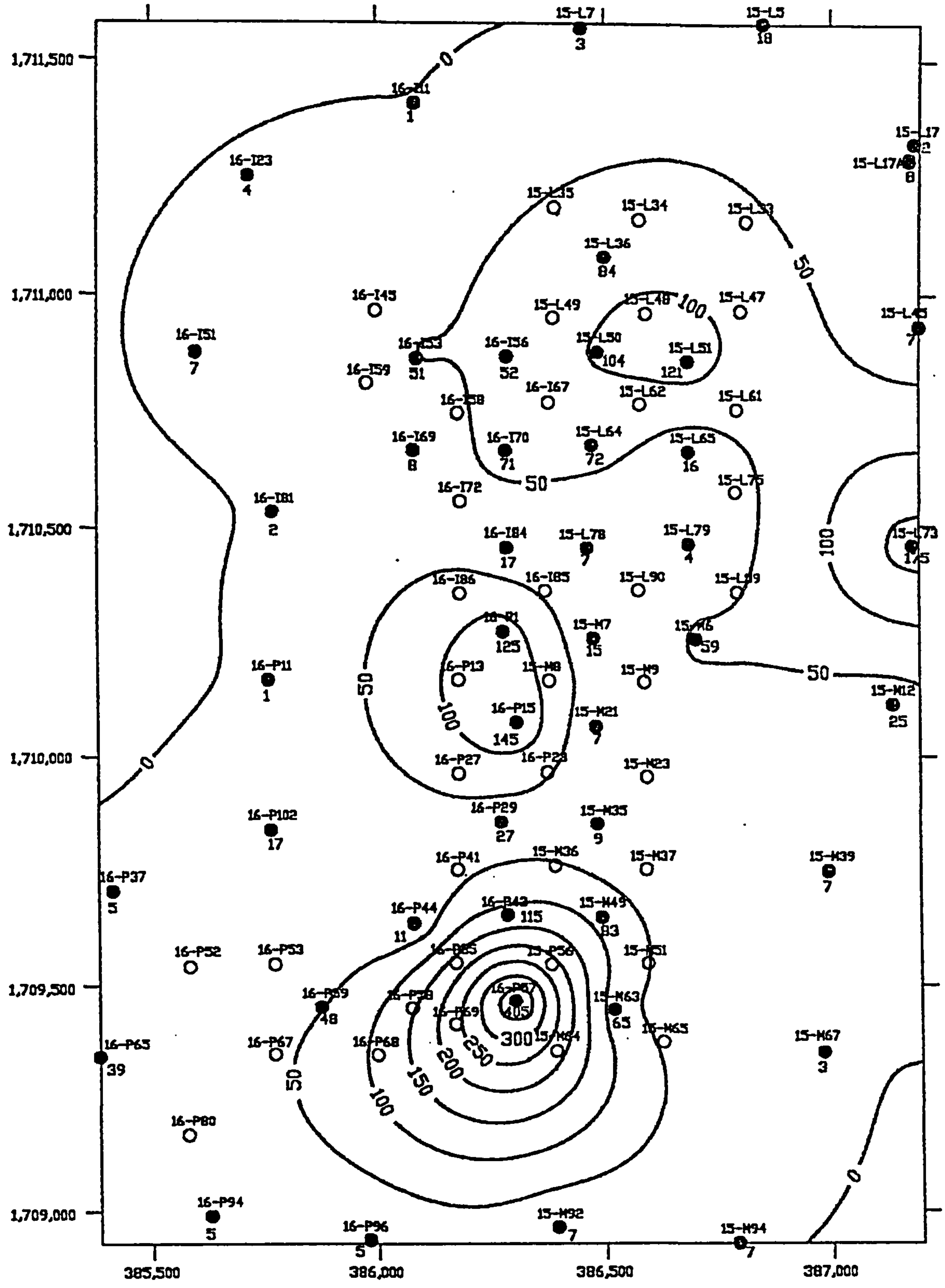
HRI, INC

MOBIL'S WELLFIELD WATER QUALITY GROSS ALPHA

0 100 200 FEET

JUNE 1996

mobilga-wellfield



LEGEND

16-P94 ●	WELL WITH DATA INFORMATION
16-P80 ○	WELL WITHOUT DATA INFORMATION

GROSS BETA
pCi/l

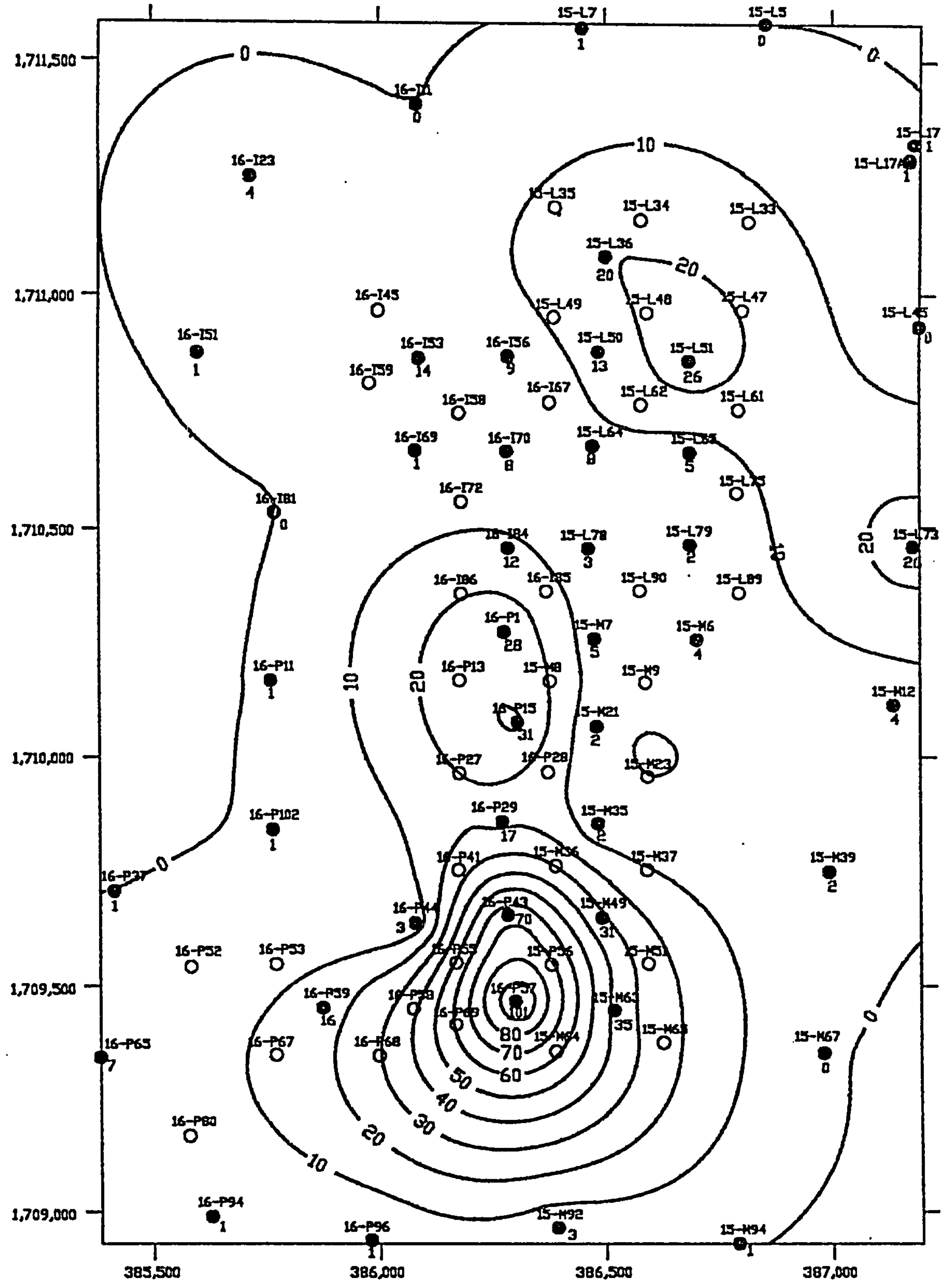
HRI, INC

MOBIL'S WELLFIELD
WATER QUALITY
GROSS BETA

0 100 200 FEET

JUNE 1996

mobiles-wellfield



LEGEND

16-P94 ● WELL WITH DATA INFORMATION

16-P80 ○ WELL WITHOUT DATA INFORMATION

RADIUM 226
pCi/l

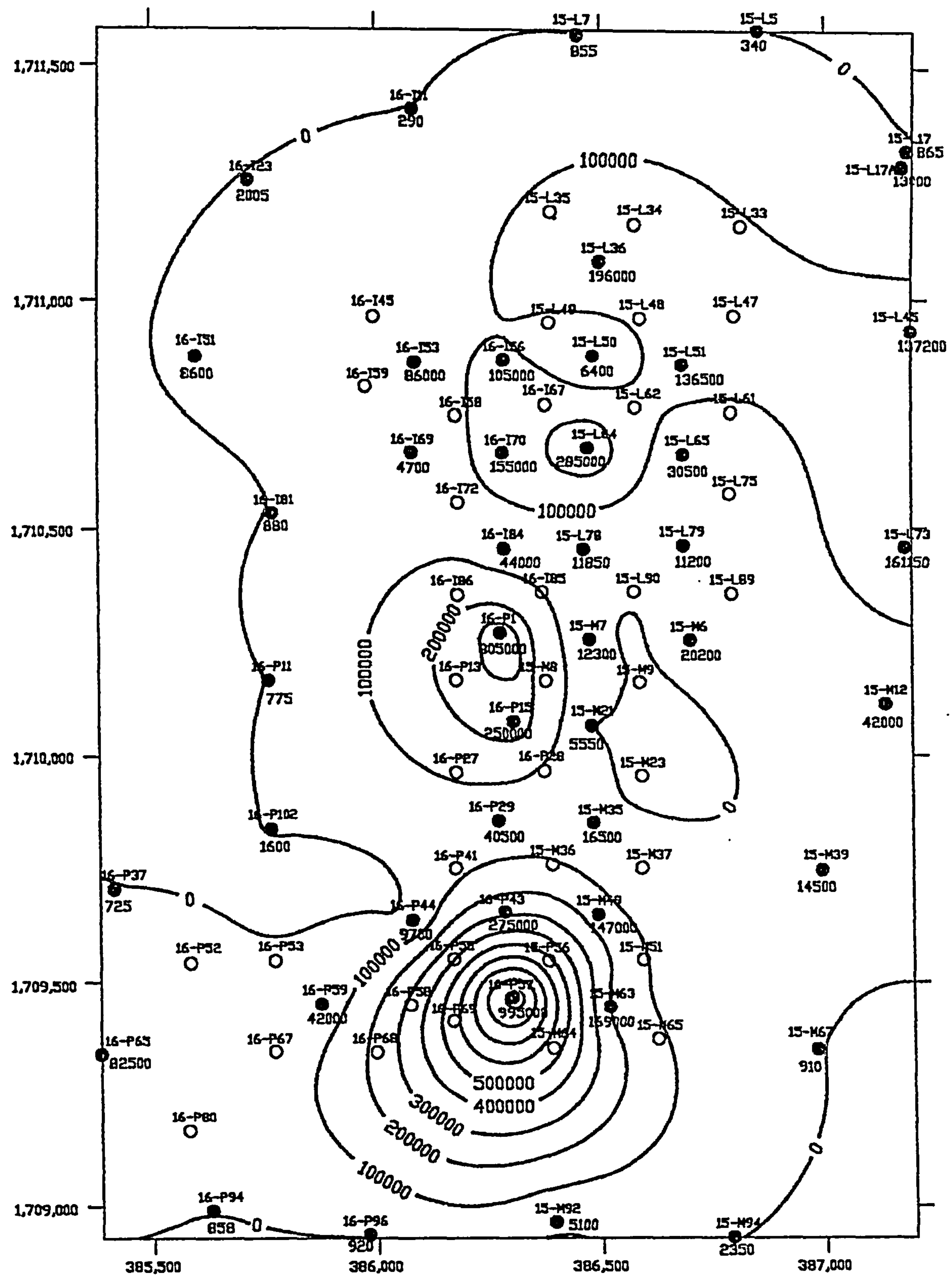
HRI, INC

MOBIL'S WELLFIELD WATER QUALITY RADIUM 226

0 100 200 FEET

JUNE 1996

mobiles-wellfield



LEGEND

● 16-P94 WELL WITH DATA INFORMATION

○ 16-P80 WELL WITHOUT DATA INFORMATION

RADON-222
pCi/l

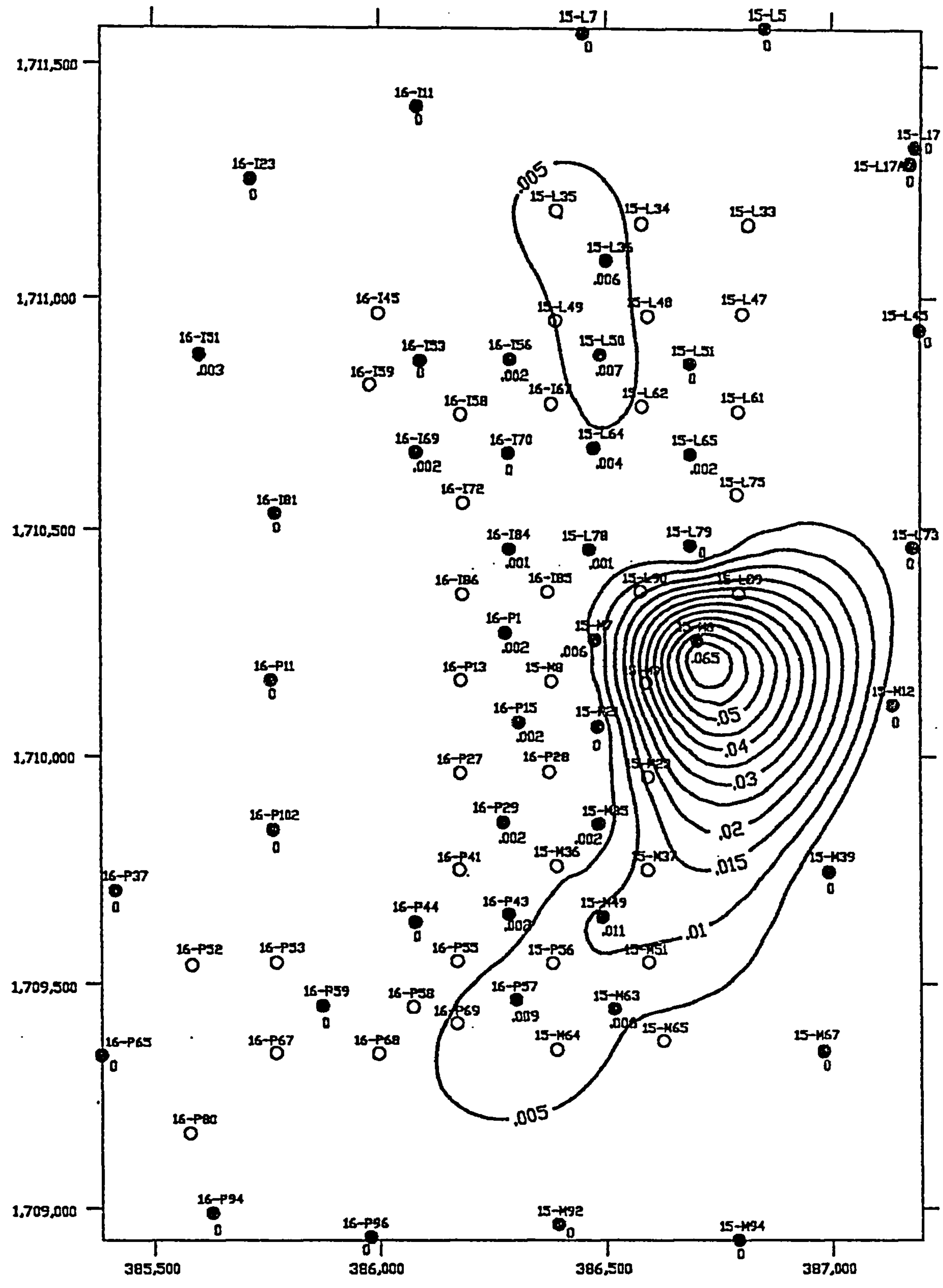
HRI, INC

MOBIL'S WELLFIELD
WATER QUALITY
RADON-222

0 100 200 FEET

JUNE 1996

mobiles-wellfield



LEGEND

16-P94 ● WELL WITH DATA INFORMATION

16-P80 ○ WELL WITHOUT DATA INFORMATION

URANIUM
pCi/l

HRI, INC

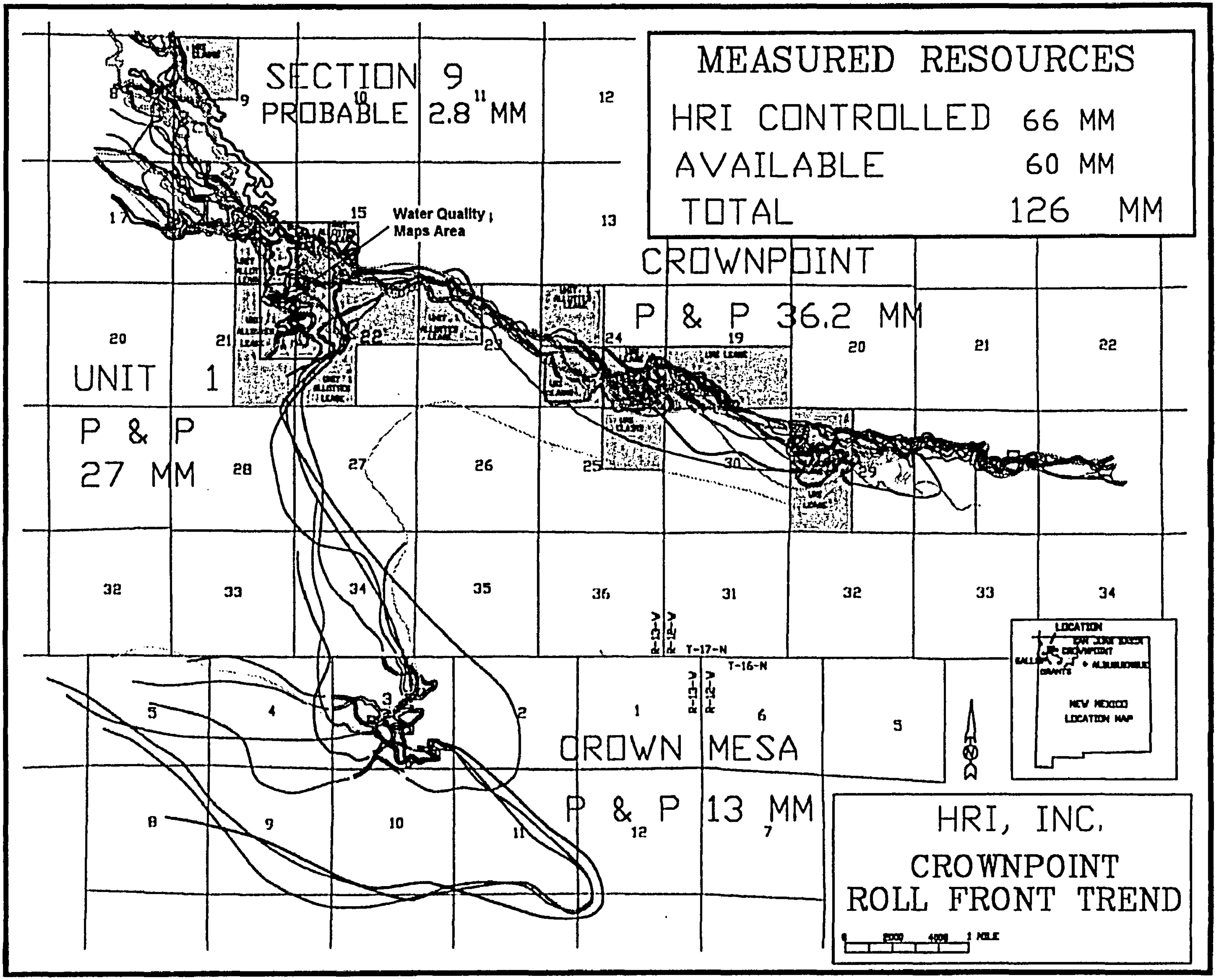
MOBIL'S WELLFIELD WATER QUALITY URANIUM

0 100 200 FEET

JUNE 1996

mobiles-wellfield

ATTACHMENT F


MEASURED RESOURCES
HRI CONTROLLED 66 MM
AVAILABLE 60 MM
TOTAL 126 MM
SECTION 9
PROBABLE 2.8 MM
Water Quality
Maps Area
CROWNPOINT
P & P 36.2 MM
UNIT 1
P & P
27 MM
CROWN MESA
P & P 13 MM
T-17-N
T-16-N
R-13-W
R-12-W
8
9
10
11
12
17
15
13
20
21
22
23
24
19
20
21
22
28
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26
25
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33
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36
31
32
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4
3
2
1
6
5
8
9
10
11
12
7
LOCATION
CROWNPOINT
GALLUP
GRANTS
ALBUQUERQUE
NEW MEXICO
LOCATION MAP
N
0
2000
4000
1 MILE
HRI, INC.
CROWNPOINT
ROLL FRONT TREND

ATTACHMENT G

groundwater in this area is of the very good quality exhibited by uranium and radium-226 water analyses for well CR-7. The differences between uranium and radium-226 values in groundwater from non-ore zones and the ore zone are clear (Tables 1 and 2). Accordingly, HRI should establish baseline water quality in the Church Rock area for non-ore and ore zones as indicated in Table 1.

It is important to note that some of the wells within the mineralized zones (CR-4 and CR-5) also meet the EPA promulgated UMTRA groundwater standard of 30 pCi/L for uranium-234 plus uranium-238 (which is the equivalent of 0.044 mg/L total uranium) and 5 pCi/L for radium-226 plus radium-228, when individual wells within the ore zone are treated as separate populations (Table 2), rather than combining all ore zone wells into one population (Table 1). That is, undisturbed groundwater in the mineralized zones is not necessarily unfit for human consumption. The elevated levels of uranium and radium-226 in groundwater from well CR-8 in Section 17 likely reflect previous underground mining operations carried out at the Church Rock mine in Section 17, which is directly south of and hydrologically upgradient from CR-8.

Crownpoint Water Quality

Groundwater quality in the Westwater Canyon Member was summarized in HRI's Crownpoint Project In Situ Mining Technical Report (June 1992). Major-ion chemistry of the water is similar to the Church Rock site (Table 1), that is the groundwater is dominantly a sodium/bicarbonate water of very good quality for human consumption. Most of the sampled wells at Crownpoint contain groundwater that meets all EPA primary and secondary drinking water standards. One well, CP-2, samples groundwater that does not meet the drinking water standards for total dissolved solids (TDS), chloride, and radium (Table 3), and this may be attributed to improper completion and development of the well, or the use of the well for unknown testing purposes.

TABLE 3

	CP-1	CP-2	CP-3	CP-4	CP-5	CP-6	CP-7	CP-8
TDS	380	2888	581	371	300	314	337	322
Chloride	15	1325	42	6.0	2.5	3.5	3.0	3.5
Uranium (mg/L)	0.006	0.014	0.004	0.001	0.012	0.001	0.001	0.004
Radium-226 (pCi/L)	0.9	391	1.8	0.8	1.0	0.5	0.4	0.8

Groundwater quality for CP-2 is poor, and the major-ion chemistry is uncharacteristic of the Westwater Canyon Member. Elevated levels of calcium (120 mg/L), magnesium (12 mg/L), potassium (847 mg/L), sulfate (70 mg/L), chloride (1325 mg/L), and radium-226 (391 pCi/L) distinguish this groundwater composition from indigenous water of the Westwater Canyon Member (calcium < 5 mg/L, magnesium < 2 mg/L, potassium < 10 mg/L, and Table 1). In my professional opinion, this indicates some anthropogenic source for the solute or slotting of the casing in a zone of poor water quality below or above the Westwater Canyon Member. HRI completion records do not indicate slotted casing outside of the Westwater Canyon Member, which suggests that solute was introduced into this well for some test purpose, or that drilling brine and mud were not succesfully removed during development of the well. If the well was not succesfully developed, remnants of solute from a chloride brine and elevated radium-226 activity, possibly from a barium-enriched mud used during drilling, ~~would remain~~ and contaminate groundwater samples removed from the well. The composition is not indigenous of the Westwater Canyon Member, and HRI should have omitted samples from well CP-2 when baseline water quality was established.

A second well, CP-3, does not meet the drinking water standard for TDS (Table 3). Relative to indigenous groundwater in the Westwater Canyon Member (potassium < 10 mg/L and Table 1), well CP-3 contains elevated levels of potassium (42 mg/L), sulfate (140 mg/L), and chloride (42 mg/L), causing the TDS of this water to exceed EPA drinking water standards. CP-3 is proximal to CP-2, and the elevated chloride and potassium values indicate that the poor CP-2 groundwater chemistry is affecting CP-3 groundwater quality. This is likely to be the result of dissolved constituents at CP-2 being pulled into the field of CP-3 during the HRI pump test at CP-5 (see HRI's Crownpoint Project In Situ Mining Technical Report, June 12, 1992). Elevated levels of sulfate in CP-3, relative to CP-2, may indicate introduction of a sulfate-rich water, possibly from the overlying Dakota Formation. HRI also failed to omit groundwater samples from well CP-3 when they established baseline conditions in the Westwater Canyon Member.

Well completion records for CP-1 through CP-8 show all wells to be slotted over multiple intervals in the Westwater Canyon Member, rather than at a specific ore-zone horizon. This may account for the lower uranium and radium-226 values relative to wells at Church Rock (Table 1). All groundwater samples from the ore and non-ore zones at Crownpoint meet EPA drinking water standards (Table 1), and are well below the EPA promulgated UMTRA standards of 30 pCi/L for uranium-234 plus uranium-238 (normally 0.044 mg/L total uranium) and 5 pCi/L for radium-226 plus radium-228. Based on HRI's Crownpoint Project In Situ Mining Technical Report (June 12,1992), ore-zone baseline in the Westwater Canyon Member near Crownpoint should be determined from wells CP-1, CP-4, CP-5, CP-7, and CP-8, and non-ore zone groundwater is represented by CP-6. These wells were grouped as described above to produce the Crownpoint non-ore and ore zone summary in Table 1. It was also noted above that HRI's use of CP-2 and CP-3 to establish baseline water quality is inappropriate, due to the presence of nonindigenous fluids in these wells. Therefore, these analyses have been omitted from the statistical averages presented in Table 1.

Unit 1 Water Quality

I reviewed 1982 groundwater quality data in the Westwater Canyon Member below HRI's Unit 1 area, as reported by Mr. Mark Pelizza of HRI in his June 18, 1996 letter to Mr. Mike Layton of the U.S. NRC, a copy of which is attached hereto as Exhibit G. In his June 18, 1996 letter, Mr. Pelizza included a base map showing the location of production and monitoring wells within HRI's Unit 1 and 1982 groundwater analyses obtained from Mobil Oil Corporation, the owner of the site in 1982. Several of the groundwater analyses could not be identified with a production well or monitoring well on the map, and thus, they were excluded from my evaluation. The following discussion is based on analytical results from 18 monitoring wells (i.e., wells surrounding the ore zone) and 24 production wells (i.e., wells within the ore zone). These results are attached to Mr. Pelizza's June 18th letter.

The groundwater at Unit 1 is similar in composition to indigenous water found in the Westwater Canyon Member near Crownpoint and Church Rock, and the same very good drinking water quality is demonstrated by analyses that show all primary and secondary drinking water standards are met in most locations. Exceptions are groundwater from several of the production wells within the ore zone that exceed the uranium-234 plus uranium-238 and radium-226 plus radium-228 EPA promulgated UMTRA standards (5 pCi/L radium) and from two monitoring wells that exceed the radium-226 UMTRA standard. A summary of the average uranium and radium-226 values for the production and monitoring wells is given in Table 4.

TABLE 4

	Production Wells	Monitoring Wells
Uranium (mg/L)	0.015	0.001[a]
Radium-226 (pCi/L)	19.6	1.9[b]

[a] All monitoring wells reported uranium as less than 0.001 mg/L, with the exception of a single analysis at 0.004 mg/L.

[b] Outlier values of 33 and 18 pCi/L removed.

Although there is no clear distinction between the major-ion composition of groundwater within the production and monitoring wells, groundwater in the ore zone can be distinguished by uranium and radium-226 values that are an order of magnitude above the groundwater collected by the monitoring wells. As noted in my discussion on water quality from the Church Rock site, a clear distinction should be made between groundwater in the ore zone and groundwater outside the ore zone to avoid elevating the baseline groundwater values for uranium and radium-226 in groundwater outside the ore zone.

Based on the above evaluation of groundwater quality in the Church Rock, Crownpoint, and Unit 1 areas, groundwater outside of the ore zones is of very good drinking water quality with respect to all primary and secondary drinking water standards, whereas groundwater within the ore zones commonly exceeds the radium-226 plus radium-228 standard and may exceed the uranium 234 plus uranium-238 standard. Only a small fraction of the groundwater in the Westwater Canyon Member is found in the braided ore zone deposits, yet the majority of groundwater samples are obtained from production wells placed in the ore zone. Therefore, the HRI statistical analysis, which treats all groundwater samples as the same population, is strongly biased to uranium and radium-226 values observed in the ore zone.

Q.5. With such distinct zones of water quality with respect to uranium and radium, what is your evaluation of how restoration goals need to be established for the Crownpoint Uranium Project?

A.5. The HRI license does not provide a role for the NRC in establishing restoration goals, other than directing that the baseline mean of the data collected shall be used to

ATTACHMENT H

Area Wide Wells

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: MARCH 20, 1989
IDENTIFICATION: VASQUEZ
VWW-1 2-14-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	84	4.19	217.88	19.78
MAGNESIUM(MG)	00925	38	3.13	145.86	14.78
SODIUM(NA)	00929	310	13.48	659.17	63.64
POTASSIUM(K)	00937	15	0.38	27.36	1.79
		TOTAL CATION	21.18		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	242	3.97	173.09	18.71
SULFATE(SO4)	00945	117	2.44	180.32	11.50
CHLORIDE(CL)	00940	525	14.81	1124.08	69.79
NITRATE(NO3-N)	71851	4.9			
FLUORIDE(F)	00951	0.53	TOTAL	2527.76	
SILICA(SIO2)	00955	67			
		TOTAL ANION	21.22		
	TOTAL ION	1403			

TDS(180 C)	70300	1330
TOT ION-0.5 HCO3=		1282
EC(25 C)	00095	2270 UMHOS
EC(DIL)=102.0	X 25.0 =	2550 UMHOS
ALK. AS CACO3	00410	198
PH		7.60

ACCURACY CHECK

		RANGE
ION	0.998	(.96 TO 1.04)
TDS	1.037	(.90 TO 1.10)
EC	1.009	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-
GROSS BETA		+/-
RADIUM 226	4.2	+/- 0.3

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.008	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0006	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.14
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.004		

```
                 %CATIONS      %ANIONS
      80   60   40   20    0    20   40   60   80
     |-|----|----|----|----|----|----|----|----|-|
   CA|                *         *                |HCO3
     |                .        .                 |
     |                 .      .                  |
   MG|                 *      *                  |SO4
     |             .               .             |
     |         .                       .         |
 NA+K|     *                                *    |CL
     |-|----|----|----|----|----|----|----|----|-|
```

FIGURE 15

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-951

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM           VWW-2

COMPANY:  URI, INC.                              REPORT DATE:  JULY 13, 1988
 DENTIFICATION:  GROUNDWATER VASQUEZ
                 6-2-88
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM              STORET       MG/L          EPM       CONDUCTANCE      %EPM

CALCIUM(CA)       00915         75          3.74          194.48        12.33
MAGNESIUM(MG)     00925         47          3.87          180.34        12.76
SODIUM(NA)        00929        510         22.18         1084.60        73.13
POTASSIUM(K)      00937         21          0.54           38.88         1.78

                         TOTAL CATION       30.33

CARBONATE(CO3)    00445          0          0.00            0.00         0.00
BICARBONATE(HCO3)00440         356          5.83          254.19        19.22
SULFATE(SO4)      00945        160          3.33          246.09        10.98
CHLORIDE(CL)      00940        751         21.18         1607.56        69.81
NITRATE(NO3-N)    71851         <0.01
FLUORIDE(F)       00951          1.1           TOTAL     3606.14
SILICA(SIO2)      00955         57

                         TOTAL ANION       30.34
                TOTAL ION     1978                    ACCURACY CHECK
                                                                RANGE
TDS(180 C)        70300       1890               ION       1.000  (.96 TO 1.04)
TOT ION-0.5 HCO3=             1800               TDS       1.050  (.90 TO 1.10)
EC(25 C)          00095       3080 UMHOS         EC        1.009  (.95 TO 1.05)
EC(DIL)=91.0    X 40.0  =     3640 UMHOS
ALK. AS CACO3     00410        292               RADIATION-PICOCURIES/LITER
PH                               8.04            GROSS ALPHA          +/-
                                                 GROSS BETA           +/-
MINOR AND TRACE CONSTITUENTS                     RADIUM 226    0.8    +/- 0.1

ITEM              MG/L       ITEM              MG/L       ITEM              MG/L
ARSENIC(AS)       0.005      MANGANESE(MN)     0.05       VANADIUM(V)
BARIUM(BA)                   MERCURY(HG)      <0.0001     ZINC(ZN)
CADMIUM(CD)      <0.0001     MOLY.(MO)        <0.01       BORON(B)
CHROM.(CR)                   NICKEL(NI)                   AMMONIA-N         0.15
COPPER(CU)                   SELENIUM(SE)     <0.001
IRON(FE)          0.12       SILVER(AG)
LEAD(PB)         <0.001      URANIUM(U)       <0.001

               %CATIONS        %ANIONS                          FIGURE 16
   80   60   40   20    0   20   40   60   80
  |-|----|----|----|----|----|----|----|----|-|
CA|                 *       *                 |HCO3        ANALYST:
  |                 .      .                  |
  |                 .     .                   |              NIXON AND ALLEN
MG|                 *     *                   |SO4          ------------------
                   .            .             |
  |         .                        .        |             CHECKED BY:
NA+K|  *                                   *  |CL
  |-|----|----|----|----|----|----|----|----|-'             ------------------

LAB.NO:M26-3596
```

Monitor Well Ring

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JANUARY 29, 1998
IDENTIFICATION: VASQUEZ MW #1
1-6-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	33	1.65	85.80	7.90
MAGNESIUM(MG)	20	1.64	76.42	7.85
SODIUM(NA)	385	16.75	819.08	80.22
POTASSIUM(K)	33	0.84	60.48	4.02
	TOTAL CATION	20.88		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	267	4.38	190.97	21.35
SULFATE(SO4)	141	2.94	217.27	14.33
CHLORIDE(CL)	468	13.20	1001.88	64.33
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.4	TOTAL	2451.89	
SILICA(SIO2)	38			
	TOTAL ANION	20.52		

TOTAL ION	1386
DS(180 C)	1240
OT ION-0.5 HCO3=	1253
EC(25 C)	2210 UMHOS
EC(DIL)= 96.8 X 25.0 =	2420 UMHOS
ALK. AS CACO3	219
PH	8.09

ACCURACY CHECK

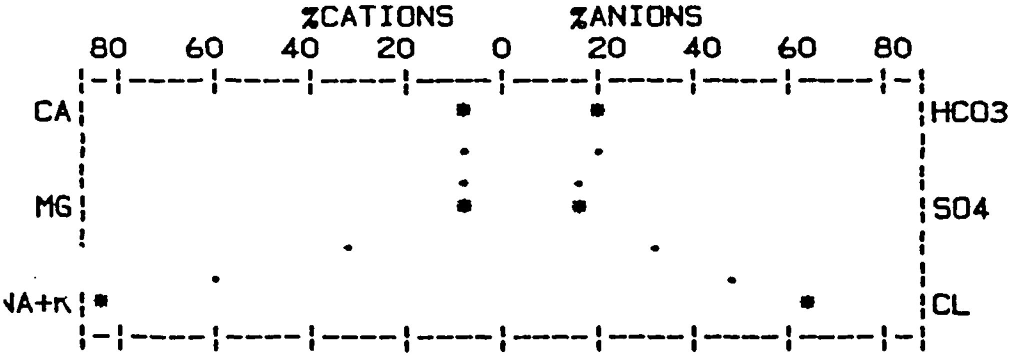
		RANGE
ION	1.018	(.96 TO 1.04)
TDS	0.990	(.90 TO 1.10)
EC	0.987	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	2.7	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.060	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.47	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.24
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.006		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-115

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JANUARY 20, 1998
DENTIFICATION: VASQUEZ MW #2
12-18-97
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	48	2.40	124.80	10.05
MAGNESIUM(MG)	32	2.63	122.56	11.01
SODIUM(NA)	420	18.27	893.40	76.48
POTASSIUM(K)	23	0.59	42.48	2.47
	TOTAL CATION	23.89		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	355	5.82	253.75	24.38
SULFATE(SO4)	164	3.41	252.00	14.29
CHLORIDE(CL)	519	14.64	1111.18	61.33
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	2800.17	
SILICA(SIO2)	46			
	TOTAL ANION	23.87		

TOTAL ION 1608

)S(180 C)	1440	
ıOT ION-0.5 HCO3=	1431	
EC(25 C)	2530 UMHOS	
EC(DIL)= 98.6 X 28.6 =	2820 UMHOS	
ALK. AS CACO3	291	
PH	7.62	

ACCURACY CHECK

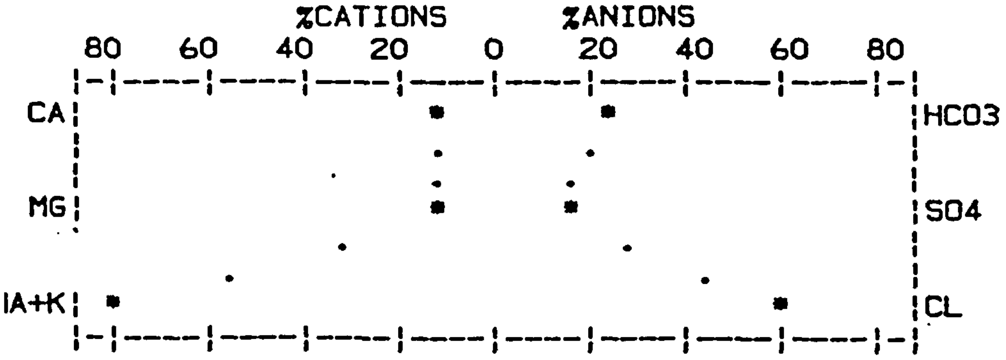
		RANGE
ION	1.001	(.96 TO 1.04)
TDS	1.007	(.90 TO 1.10)
EC	1.007	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.5	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.254	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.27	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.26
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.06	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.008		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M35-14231

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM ✓

COMPANY: URI, INC.
IDENTIFICATION: VASQUEZ MW #3A
1-22-98
LABORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: February 12, 1998

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	49	2.45	127.40	9.22
MAGNESIUM(MG)	40	3.29	153.31	12.39
SODIUM(NA)	465	20.23	989.25	76.17
POTASSIUM(K)	23	0.59	42.48	2.22
	TOTAL CATION	26.56		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	329	5.39	235.00	20.51
SULFATE(SO4)	139	2.89	213.57	11.00
CHLORIDE(CL)	638	18.00	1366.20	68.49
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	0.89	TOTAL	3127.22	
SILICA(SIO2)	47			
	TOTAL ANION	26.28		
TOTAL ION	1731			

TDS(180 C)	1550
TOT ION-0.5 HCO3=	1566
EC(25 C)	2660 UMHOS
EC(DIL)=105.9 X 28.6 =	3029 UMHOS
ALK. AS CACO3	270
PH	7.97

ACCURACY CHECK

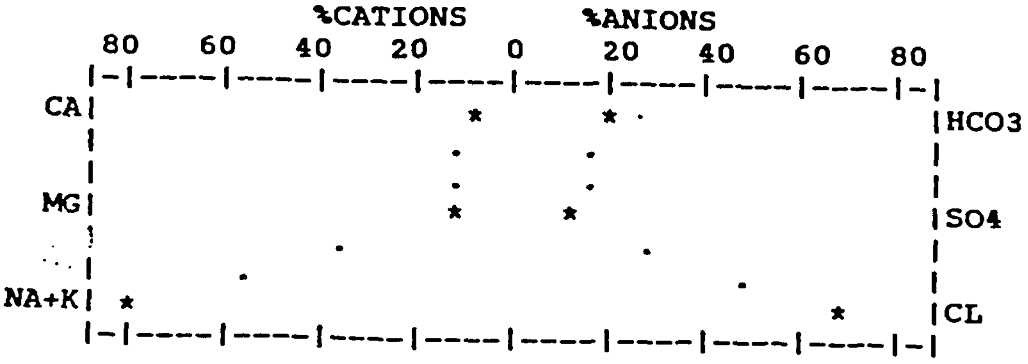
		RANGE
ION	1.011	(.96 TO 1.04)
TDS	0.990	(.90 TO 1.10)
EC	0.969	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.9	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.030	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.03	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.005		



ANALYST:
NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-657

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JANUARY 20, 1998
ENTIFICATION: VASQUEZ MW #4
12-18-97
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	70	3.49	181.48	12.77
MAGNESIUM(MG)	42	3.45	160.77	12.62
SODIUM(NA)	455	19.79	967.73	72.38
POTASSIUM(K)	24	0.61	43.92	2.23
	TOTAL CATION	27.34		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	426	6.98	304.33	25.77
SULFATE(SO4)	85	1.77	130.80	6.53
CHLORIDE(CL)	650	18.34	1392.01	67.70
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	0.90	TOTAL	3181.04	
SILICA(SIO2)	50			
	TOTAL ANION	27.09		

TOTAL ION 1803

S(180 C)	1600	
TOT ION-0.5 HCO3=	1590	
EC(25 C)	2890	UMHOS
EC(DIL)= 94.3 X 33.3 =	3140	UMHOS
ALK. AS CACO3	349	
PH	7.70	

ACCURACY CHECK

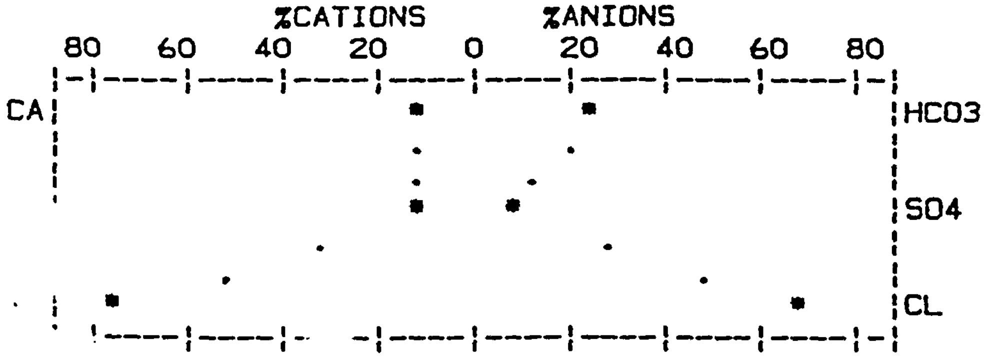
		RANGE
ION	1.009	(.96 TO 1.04)
TDS	1.006	(.90 TO 1.10)
EC	0.987	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	4.2	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.016	MANGANESE(MN)	0.03	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.02
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.06	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.024		



ANALYST:
NIXON AND ALLEN

CHECKED BY:

LAB.NO:M35-14232

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: FEBRUARY 10, 1998
IDENTIFICATION: VASQUEZ MW #5
1-19-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	73	3.64	189.28	11.83
MAGNESIUM(MG)	52	4.28	199.45	13.91
SODIUM(NA)	510	22.18	1084.60	72.11
POTASSIUM(K)	26	0.66	47.52	2.15
	TOTAL CATION	30.76		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	377	6.18	269.45	20.74
SULFATE(SO4)	124	2.58	190.66	8.66
CHLORIDE(CL)	746	21.04	1596.94	70.60
NITRATE(NO3-N)	0.01			
FLUORIDE(F)	0.93	TOTAL	3577.90	
SILICA(SIO2)	52			
	TOTAL ANION	29.80		

TOTAL ION 1961

TDS(180 C)	1760	
TOT ION-0.5 HCO3=	1772	
EC(25 C)	3140	UMHOS
EC(DIL)= 90.5 X 40.0 =	3620	UMHOS
ALK. AS CACO3	309	
PH	7.98	

ACCURACY CHECK

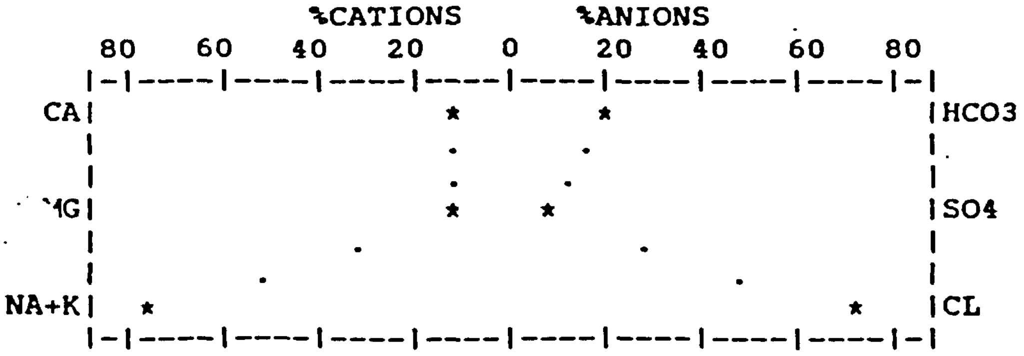
		RANGE
ION	1.032	(.96 TO 1.04)
TDS	0.993	(.90 TO 1.10)
EC	1.012	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.1	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.129	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.05	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	<0.001		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-464

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
IDENTIFICATION: VASQUEZ MW #6
1-6-98
ABORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: JANUARY 29, 1998

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	48	2.40	124.80	10.31
MAGNESIUM(MG)	29	2.38	110.91	10.23
SODIUM(NA)	405	17.62	861.62	75.72
POTASSIUM(K)	34	0.87	62.64	3.74
	TOTAL CATION	23.27		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	404	6.62	288.63	27.34
SULFATE(SO4)	112	2.33	172.19	9.62
CHLORIDE(CL)	541	15.26	1158.23	63.03
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	2779.02	
SILICA(SIO2)	54			
	TOTAL ANION	24.21		

TOTAL ION 1628

TDS(180 C)	1430
T ION-0.5 HCO3=	1426
EC(25 C)	2450 UMHOS
EC(DIL)= 95.5 X 28.6 =	2731 UMHOS
ALK. AS CACO3	331
PH	7.87

ACCURACY CHECK

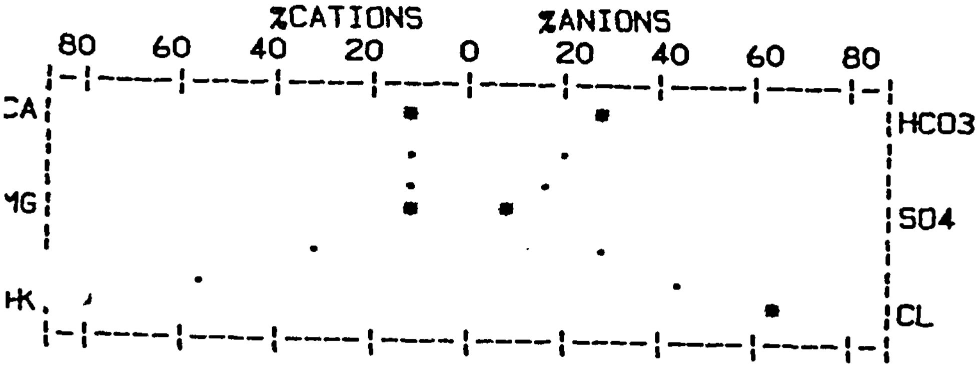
		RANGE
ION	0.961	(.96 TO 1.04)
TDS	1.003	(.90 TO 1.10)
EC	0.983	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.7	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.030	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.69
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	<0.001		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-116

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #7
1-22-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	66	3.29	171.08	10.48
MAGNESIUM(MG)	53	4.36	203.18	13.89
SODIUM(NA)	530	23.05	1127.15	73.43
POTASSIUM(K)	27	0.69	49.68	2.20
	TOTAL CATION	31.39		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	353	5.78	252.01	19.06
SULFATE(SO4)	129	2.69	198.79	8.87
CHLORIDE(CL)	775	21.86	1659.17	72.07
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	0.93	TOTAL	3661.05	
SILICA(SIO2)	51			
	TOTAL ANION	30.33		

TOTAL ION 1985

TDS(180 C)	1790
TOT ION-0.5 HCO3*	1808
EC(25 C)	3210 UMHOS
EC(DIL)* 90.5 X 40.0 =	3620 UMHOS
ALK. AS CACO3	289
PH	8.00

ACCURACY CHECK

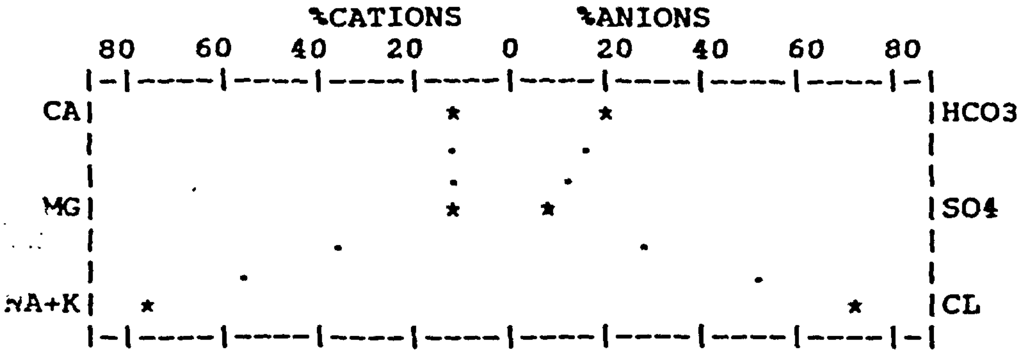
		RANGE
ION	1.035	(.96 TO 1.04)
TDS	0.990	(.90 TO 1.10)
EC	0.989	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.3	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.028	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.05	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.001		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-658

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM ✓

COMPANY: URI, INC.
REPORT DATE: FEBRUARY 10, 1998
IDENTIFICATION: VASQUEZ MW #8
1-19-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	65	3.24	168.48	10.32
MAGNESIUM(MG)	45	3.70	172.42	11.78
SODIUM(NA)	540	23.49	1148.66	74.81
POTASSIUM(K)	38	0.97	69.84	3.09
	TOTAL CATION	31.4		
CARBONATE(CO3)	7	0.23	19.46	0.76
BICARBONATE(HCO3)	332	5.44	237.18	17.93
SULFATE(SO4)	139	2.89	213.57	9.53
CHLORIDE(CL)	772	21.78	1653.10	71.79
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	0.97	TOTAL	3682.72	
SILICA(SIO2)	56			
	TOTAL ANION	30.34		

TOTAL ION 1995

TDS(180 C)	1800
TOT ION-0.5 HCO3=	1829
EC(25 C)	3220 UMHOS
EC(DIL)= 91.5 X 40.0 =	3660 UMHOS
ALK. AS CACO3	284
PH	8.41

ACCURACY CHECK

		RANGE
ION	1.035	(.96 TO 1.04)
TDS	0.984	(.90 TO 1.10)
EC	0.994	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.2	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.029	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.02	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.18
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.001		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *      *                 |HCO3
    |          .       .      .                 |
    |                  .     .                  |
  MG|                  *    *                   |SO4
    |             .               .             |
    |       .                          .        |
NA+K|  *                                    *   |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-465

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

✓

COMPANY: URI, INC.
DENTIFICATION: VASQUEZ MW #9
1-20-98
LABORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: February 11, 1998

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	76	3.79	197.08	11.27
MAGNESIUM(MG)	55	4.52	210.63	13.44
SODIUM(NA)	565	24.58	1201.96	73.09
POTASSIUM(K)	29	0.74	53.28	2.20
	TOTAL CATION	33.63		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	328	5.38	234.57	16.57
SULFATE(SO4)	160	3.33	246.09	10.26
CHLORIDE(CL)	842	23.75	1802.63	73.17
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.0	TOTAL	3946.23	
SILICA(SIO2)	55			
	TOTAL ANION	32.46		

TOTAL ION 2111

DS(180 C)	1920
OT ION-0.5 HCO3=	1947
EC(25 C)	3450 UMHOS
EC(DIL)= 96.3 X 40.0 =	3852 UMHOS
ALK. AS CACO3	269
PH	8.02

ACCURACY CHECK

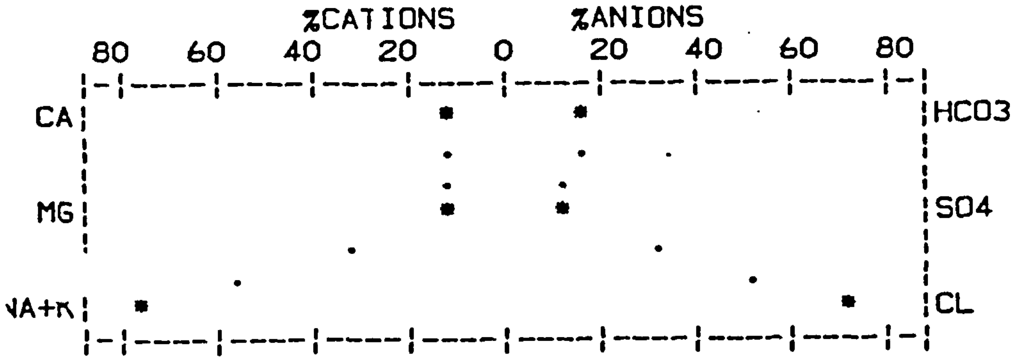
		RANGE
ION	1.036	(.96 TO 1.04)
TDS	0.986	(.90 TO 1.10)
EC	0.976	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	2.8	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.041	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.003		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-488

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JANUARY 29, 1998
IDENTIFICATION: VASQUEZ MW #10
1-6-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	68	3.39	176.28	11.62
MAGNESIUM(MG)	34	2.80	130.48	9.60
SODIUM(NA)	505	21.97	1074.33	75.29
POTASSIUM(K)	40	1.02	73.44	3.50
	TOTAL CATION	29.18		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	350	5.74	250.26	19.46
SULFATE(SO4)	137	2.85	210.62	9.66
CHLORIDE(CL)	741	20.90	1586.31	70.87
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	3501.72	
SILICA(SIO2)	56			
	TOTAL ANION	29.49		

TOTAL ION 1932

TDS(180 C)	1730
T ION-0.5 HCO3=	1757
EC(25 C)	3050 UMHOS
EC(DIL)=102.7 X 33.3 =	3420 UMHOS
ALK. AS CACO3	287
PH	7.99

ACCURACY CHECK

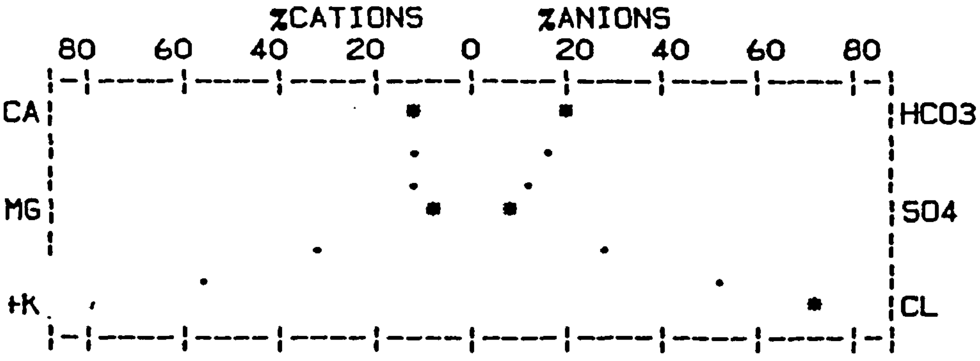
		RANGE
ION	0.989	(.96 TO 1.04)
TDS	0.985	(.90 TO 1.10)
EC	0.977	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.9	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.030	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.38
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.003		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-117

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #11
1-21-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	86	4.29	223.08	12.51
MAGNESIUM(MG)	52	4.28	199.45	12.49
SODIUM(NA)	570	24.79	1212.23	72.32
POTASSIUM(K)	36	0.92	66.24	2.68
	TOTAL CATION	34.28		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	360	5.90	257.24	17.79
SULFATE(SO4)	120	2.50	184.75	7.54
CHLORIDE(CL)	878	24.77	1880.04	74.68
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.0	TOTAL	4023.03	
SILICA(SIO2)	53			
	TOTAL ANION	33.17		

TOTAL ION 2156

TDS(180 C)	1980
TOT ION-0.5 HCO3=	1976
EC(25 C)	3540 UMHOS
EC(DIL)= 99.3 X 40.0 =	3972 UMHOS
ALK. AS CACO3	295
PH	7.57

ACCURACY CHECK

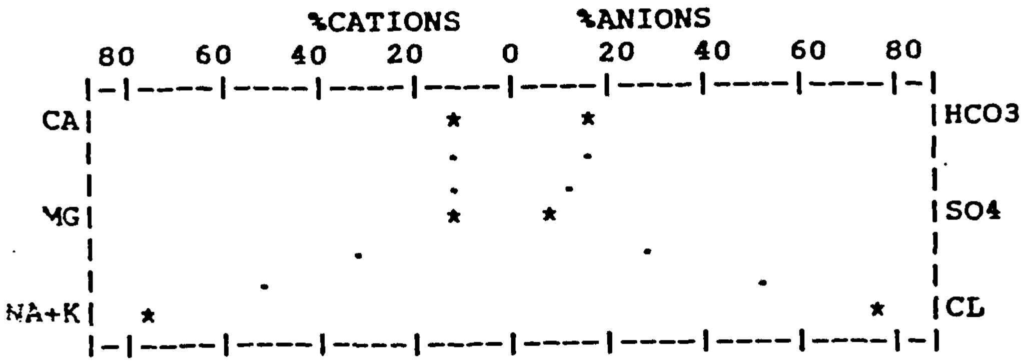
		RANGE
ION	1.033	(.96 TO 1.04)
TDS	1.002	(.90 TO 1.10)
EC	0.987	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	4.0	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.022	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.008		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-616

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM ✓

COMPANY: URI, INC. REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #12
1-22-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	46	2.30	119.60	7.63
MAGNESIUM(MG)	46	3.78	176.15	12.54
SODIUM(NA)	535	23.27	1137.90	77.21
POTASSIUM(K)	31	0.79	56.88	2.62
	TOTAL CATION	30.14		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	310	5.08	221.49	16.63
SULFATE(SO4)	112	2.33	172.19	7.63
CHLORIDE(CL)	820	23.13	1755.57	75.74
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	3639.77	
SILICA(SIO2)	50			
	TOTAL ANION	30.54		

TOTAL ION 1951

TDS(180 C)	1820
TOT ION-0.5 HCO3=	1796
EC(25 C)	3290 UMHOS
EC(DIL)= 89.3 X 40.0 =	3572 UMHOS
ALK. AS CACO3	254
PH	8.24

ACCURACY CHECK

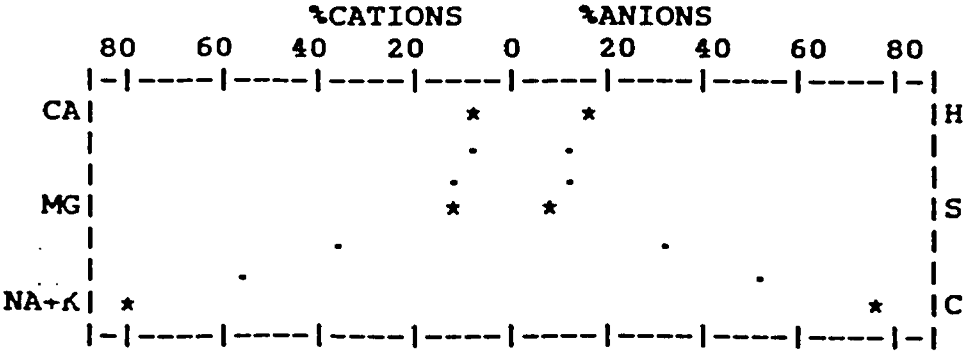
		RANGE
ION	0.987	(.96 TO 1.04)
TDS	1.013	(.90 TO 1.10)
EC	0.981	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	3.0	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.052	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.03	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.06
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.007		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-659

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #13
1-22-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	76	3.79	197.08	10.36
MAGNESIUM(MG)	66	5.43	253.04	14.84
SODIUM(NA)	610	26.53	1297.32	72.51
POTASSIUM(K)	33	0.84	60.48	2.30
	TOTAL CATION	36.59		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	360	5.90	257.24	16.17
SULFATE(SO4)	73	1.52	112.33	4.17
CHLORIDE(CL)	1030	29.06	2205.65	79.66
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	4383.14	
SILICA(SIO2)	51			
	TOTAL ANION	36.48		

TOTAL ION 2300

TDS(180 C)	2240	
TOT ION-0.5 HCO3=	2120	
EC(25 C)	3960	UMHOS
EC(DIL)=109.0 X 40.0 =	4360	UMHOS
ALK. AS CACO3	295	
PH	7.82	

ACCURACY CHECK

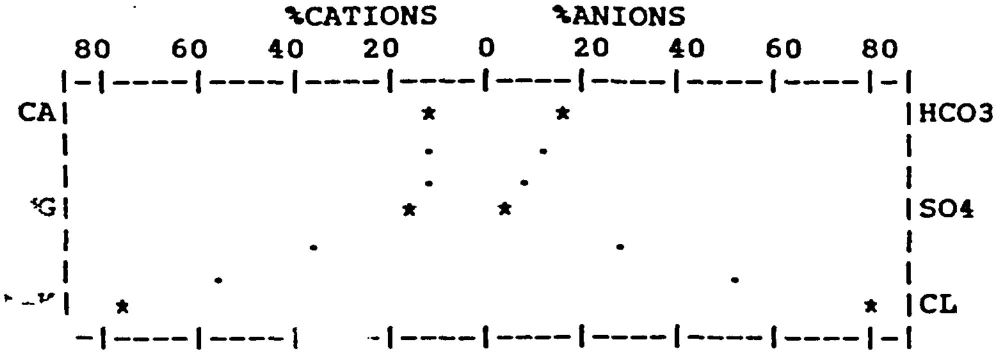
		RANGE
ION	1.003	(.96 TO 1.04)
TDS	1.057	(.90 TO 1.10)
EC	0.995	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	4.6	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.027	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	2.8	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.063		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-660

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #14
-1-27-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	108	5.39	280.28	11.11
MAGNESIUM(MG)	94	7.73	360.22	15.94
SODIUM(NA)	790	34.36	1680.20	70.85
POTASSIUM(K)	40	1.02	73.44	2.10
	TOTAL CATION	48.5		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	266	4.36	190.10	9.14
SULFATE(SO4)	171	3.56	263.08	7.46
CHLORIDE(CL)	1410	39.77	3018.54	83.39
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.0	TOTAL	5865.87	
SILICA(SIO2)	63			
	TOTAL ANION	47.69		
TOTAL ION	2943			

TDS(180 C)	2920
TOT ION-0.5 HCO3=	2810
EC(25 C)	5090 UMHOS
EC(DIL)= 88.3 X 66.7 =	5890 UMHOS
ALK. AS CACO3	218
PH	8.27

ACCURACY CHECK

		RANGE
ION	1.017	(.96 TO 1.04)
TDS	1.039	(.90 TO 1.10)
EC	1.004	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	9.8	+/-	0.3

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.006	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.012		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *    *                   |HCO3
    |          .       .    .                   |
    |                 .     .                   |
  MG|                 *     *                   |SO4
    |            .                .             |
    |        .                          .       |
NA+K|   *                                      *|CL
    |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-840

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #15
1-28-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	108	5.39	280.28	11.58
MAGNESIUM(MG)	95	7.81	363.95	16.78
SODIUM(NA)	745	32.41	1584.85	69.65
POTASSIUM(K)	36	0.92	66.24	1.98
	TOTAL CATION	46.53		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	275	4.51	196.64	9.90
SULFATE(SO4)	143	2.98	220.22	6.54
CHLORIDE(CL)	1350	38.08	2890.27	83.56
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	5602.45	
SILICA(SIO2)	57			
	TOTAL ANION	45.57		

TOTAL ION 2810

TDS(180 C)	2760	
TOT ION-0.5 HCO3=	2673	
EC(25 C)	4840	UMHOS
EC(DIL)=109.6 X 50.0 =	5480	UMHOS
ALK. AS CACO3	225	
PH	7.93	

ACCURACY CHECK

		RANGE
ION	1.021	(.96 TO 1.04)
TDS	1.033	(.90 TO 1.10)
EC	0.978	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	55	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.016	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.13	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.037		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *    *   .               |HCO3
    |                  .    .                   |
    |                 .     .                   |
  MG|                 *     *                   |SO4
    |            .                .             |
    |        .                          .       |
NA+K|   *                                      *|CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-842

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #16
1-27-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	120	5.99	311.48	11.46
MAGNESIUM(MG)	113	9.29	432.91	17.77
SODIUM(NA)	825	35.89	1755.02	68.66
POTASSIUM(K)	43	1.10	79.20	2.10
	TOTAL CATION	52.27		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	232	3.80	165.68	7.34
SULFATE(SO4)	164	3.41	252.00	6.59
CHLORIDE(CL)	1580	44.57	3382.86	86.08
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	6379.16	
SILICA(SIO2)	59			
	TOTAL ANION	51.78		

TOTAL ION 3137

TDS(180 C)	3160	
TOT ION-0.5 HCO3=	3021	
EC(25 C)	5490	UMHOS
EC(DIL)= 94.9 X 66.7 =	6330	UMHOS
ALK. AS CACO3	190	
PH	8.22	

ACCURACY CHECK

		RANGE
ION	1.009	(.96 TO 1.04)
TDS	1.046	(.90 TO 1.10)
EC	0.992	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	5.2	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.006	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	0.003		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.004		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *    *                   |HCO3
    |                  .    .                   |
    |                 .     .                   |
  MG|                 *     *                   |SO4
    |            .                .             |
    |        .                           .      |
NA+K|   *                                       |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-841

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #17
1-27-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	101	5.04	262.08	11.30
MAGNESIUM(MG)	99	8.14	379.32	18.25
SODIUM(NA)	700	30.45	1489.01	68.27
POTASSIUM(K)	38	0.97	69.84	2.17
	TOTAL CATION	44.6		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	246	4.03	175.71	8.97
SULFATE(SO4)	136	2.83	209.14	6.30
CHLORIDE(CL)	1350	38.08	2890.27	84.74
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.2	TOTAL	5475.37	
SILICA(SIO2)	58			
	TOTAL ANION	44.94		

TOTAL ION 2729

TDS(180 C)	2700	
TOT ION-0.5 HCO3=	2606	
EC(25 C)	4740	UMHOS
EC(DIL)=105.8 X 50.0 =	5290	UMHOS
ALK. AS CACO3	202	
PH	8.29	

ACCURACY CHECK

		RANGE
ION	0.992	(.96 TO 1.04)
TDS	1.036	(.90 TO 1.10)
EC	0.966	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	15	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.103	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.05	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	0.002		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.053		

```
               %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *    *                   |HCO3
    |                  .    .                   |
    |                 .     .                   |
  MG|                *      *                   |SO4
    |            .                .             |
    |        .                           .      |
NA+K|   *                                      *|CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-697

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM ✓

COMPANY: URI, INC. REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #18
1-27-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	96	4.79	249.08	11.15
MAGNESIUM(MG)	92	7.57	352.76	17.62
SODIUM(NA)	680	29.58	1446.46	68.85
POTASSIUM(K)	40	1.02	73.44	2.37
	TOTAL CATION	42.96		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	181	2.97	129.49	6.91
SULFATE(SO4)	162	3.37	249.04	7.84
CHLORIDE(CL)	1300	36.67	2783.25	85.26
NITRATE(NO3-N)	0.08			
FLUORIDE(F)	1.0	TOTAL	5283.53	
SILICA(SIO2)	56			
	TOTAL ANION	43.01		

TOTAL ION 2608

TDS(180 C)	2600
TOT ION-0.5 HCO3=	2518
EC(25 C)	4490 UMHOS
EC(DIL)=103.4 X 50.0 =	5170 UMHOS
ALK. AS CACO3	148
PH	8.26

ACCURACY CHECK

		RANGE
ION	0.999	(.96 TO 1.04)
TDS	1.033	(.90 TO 1.10)
EC	0.979	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	1.7	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.026	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.02
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.008		

```
               %CATIONS      %ANIONS
     80   60   40   20    0   20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *    *                   |HCO3
    |                  .    .                   |
    |                 .     .                   |
  MG|                 *     *                   |SO4
    |            .                .             |
    |        .                           .      |
NA+K|   *                                      *|CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-698

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #19
1-27-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	110	5.49	285.48	12.60
MAGNESIUM(MG)	92	7.57	352.76	17.38
SODIUM(NA)	680	29.58	1446.46	67.91
POTASSIUM(K)	36	0.92	66.24	2.11
	TOTAL CATION	43.56		
CARBONATE(CO3)	8	0.27	22.84	0.60
BICARBONATE(HCO3)	254	4.16	181.38	9.30
SULFATE(SO4)	187	3.89	287.47	8.70
CHLORIDE(CL)	1290	36.39	2762.00	81.39
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	5404.63	
SILICA(SIO2)	60			
	TOTAL ANION	44.71		
TOTAL ION	2718			

TDS(180 C)	2700
TOT ION-0.5 HCO3=	2591
EC(25 C)	4730 UMHOS
EC(DIL)=107.0 X 50.0 =	5350 UMHOS
ALK. AS CACO3	222
PH	8.46

ACCURACY CHECK

		RANGE
ION	0.974	(.96 TO 1.04)
TDS	1.042	(.90 TO 1.10)
EC	0.990	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	2.3	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.006	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	0.002		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.005		

```
               %CATIONS      %ANIONS
     80   60   40   20    0   20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *    *                   |HCO3
    |                 .     .                   |
    |                 :     .                   |
  MG|                 *     *                   |SO4
    |            .                .             |
    |        .                          .       |
NA+K|   *                                     * |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-699

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

✓

COMPANY: URI, INC.

REPORT DATE: February 12, 1998

IDENTIFICATION: VASQUEZ MW #20
1-27-98

LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	86	4.29	223.08	11.06
MAGNESIUM(MG)	86	7.07	329.46	18.23
SODIUM(NA)	610	26.53	1297.32	68.39
POTASSIUM(K)	35	0.90	64.80	2.32
	TOTAL CATION	38.79		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	239	3.92	170.91	10.17
SULFATE(SO4)	146	3.04	224.66	7.89
CHLORIDE(CL)	1120	31.59	2397.68	81.95
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	4707.91	
SILICA(SIO2)	55			
	TOTAL ANION	38.55		

TOTAL ION	2378
TDS(180 C)	2350
TOT ION-0.5 HCO3=	2259
EC(25 C)	4130 UMHOS
EC(DIL)= 93.8 X 50.0 =	4690 UMHOS
ALK. AS CACO3	196
PH	8.03

ACCURACY CHECK

		RANGE
ION	1.006	(.96 TO 1.04)
TDS	1.040	(.90 TO 1.10)
EC	0.996	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	83	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.485	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.69	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	0.010		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.303		

```
                 %CATIONS      %ANIONS
      80   60   40   20     0    20   40   60   80
     |-|----|----|----|----|----|----|----|----|-|
   CA|                  *     *                  |HCO3
     |          .       .    .                   |
     |                 .     .                   |
   MG|                *      *                   |SO4
     |            .                .             |
     |        .                          .       |
 NA+K|   *                                     * |CL
     |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-700

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ MW #21
1-27-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	96	4.79	249.08	12.42
MAGNESIUM(MG)	83	6.83	318.28	17.71
SODIUM(NA)	600	26.10	1276.29	67.69
POTASSIUM(K)	33	0.84	60.48	2.18
	TOTAL CATION	38.56		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	248	4.06	177.02	10.40
SULFATE(SO4)	148	3.08	227.61	7.89
CHLORIDE(CL)	1130	31.88	2419.69	81.70
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	4728.45	
SILICA(SIO2)	55			
	TOTAL ANION	39.02		

TOTAL ION 2394

TDS(180 C)	2380
TOT ION-0.5 HCO3*	2270
EC(25 C)	4220 UMHOS
EC(DIL)* 92.8 X 50.0 =	4640 UMHOS
ALK. AS CACO3	203
PH	8.02

ACCURACY CHECK

		RANGE
ION	0.988	(.96 TO 1.04)
TDS	1.048	(.90 TO 1.10)
EC	0.981	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	4.1	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.044	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.02	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.08
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.020		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *     *                  |HCO3
    |                 .     .                   |
    |                 .     .                   |
  MG|                 *     *                   |SO4
    |            .                .             |
             .                          .       |
NA+K|    *                                    * |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

Carl

LAB.NO:M36-701

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

URI, INC.
URI DALLAS ✓

COMPANY: URI, INC.
REPORT DATE: JANUARY 30, 1998
IDENTIFICATION: VASQUEZ MW #22
1-8-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	94	4.69	243.88	13.76
MAGNESIUM(MG)	52	4.28	199.45	12.56
SODIUM(NA)	555	24.14	1180.45	70.83
POTASSIUM(K)	38	0.97	69.84	2.85
	TOTAL CATION	34.08		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	294	4.82	210.15	14.30
SULFATE(SO4)	194	4.04	298.56	11.98
CHLORIDE(CL)	881	24.85	1886.12	73.72
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.4	TOTAL	4088.44	
SILICA(SIO2)	55			
	TOTAL ANION	33.71		

TOTAL ION 2164

TDS(180 C)	2100
TOT ION-0.5 HCO3=	2017
EC(25 C)	3570 UMHOS
EC(DIL)=101.0 X 40.0 =	4040 UMHOS
ALK. AS CACO3	241
PH	7.61

ACCURACY CHECK

		RANGE
ION	1.011	(.96 TO 1.04)
TDS	1.041	(.90 TO 1.10)
EC	0.988	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	1.1	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.023	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.05	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.60
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	0.005	URANIUM(U)	0.041		

```
               %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *      *                 |HCO3
    |                  .     .                  |
    |                  .     .                  |
  MG|                  *     *                  |SO4
    |             .               .             |
    |        .                         .        |
NA+K|   *                                   *   |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

by mle

LAB.NO:M36-189

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

✓

COMPANY: URI, INC.
REPORT DATE: JANUARY 30, 1998
IDENTIFICATION: VASQUEZ MW #23
1-8-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	98	4.89	254.28	14.15
MAGNESIUM(MG)	57	4.69	218.55	13.57
SODIUM(NA)	555	24.14	1180.45	69.85
POTASSIUM(K)	33	0.84	60.48	2.43
	TOTAL CATION	34.56		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	279	4.57	199.25	13.26
SULFATE(SO4)	218	4.54	335.51	13.17
CHLORIDE(CL)	899	25.36	1924.82	73.57
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.3	TOTAL	4173.34	
SILICA(SIO2)	56			
	TOTAL ANION	34.47		

TOTAL ION 2196

TDS(180 C)	2200
TOT ION-0.5 HCO3=	2057
EC(25 C)	3630 UMHOS
EC(DIL)=102.3 X 40.0 =	4092 UMHOS
ALK. AS CACO3	229
PH	7.54

ACCURACY CHECK

		RANGE
ION	1.003	(.96 TO 1.04)
TDS	1.070	(.90 TO 1.10)
EC	0.981	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.6	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.106	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.33	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.88
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	0.003	URANIUM(U)	0.020		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                 *      *                  |HCO3
    |                  .     .                  |
    |                  .     .                  |
  MG|                  *     *                  |SO4
    |             .               .             |
    |        .                         .        |
NA+K|   *                                   *   |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

Carl Crownover
by mlc

LAB.NO:M36-190

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

✓

COMPANY: URI, INC.
REPORT DATE: JANUARY 30, 1998
IDENTIFICATION: VASQUEZ MW #24
1-8-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	106	5.29	275.08	15.00
MAGNESIUM(MG)	69	5.67	264.22	16.08
SODIUM(NA)	540	23.49	1148.66	66.60
POTASSIUM(K)	32	0.82	59.04	2.32
	TOTAL CATION	35.27		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	290	4.75	207.10	13.51
SULFATE(SO4)	237	4.93	364.33	14.03
CHLORIDE(CL)	903	25.47	1933.17	72.46
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.2	TOTAL	4251.60	
SILICA(SIO2)	57			
	TOTAL ANION	35.15		

TOTAL ION 2235

TDS(180 C)	2200
TOT ION-0.5 HCO3=	2090
EC(25 C)	3670 UMHOS
EC(DIL)=104.5 X 40.0 =	4180 UMHOS
ALK. AS CACO3	238
PH	7.31

ACCURACY CHECK

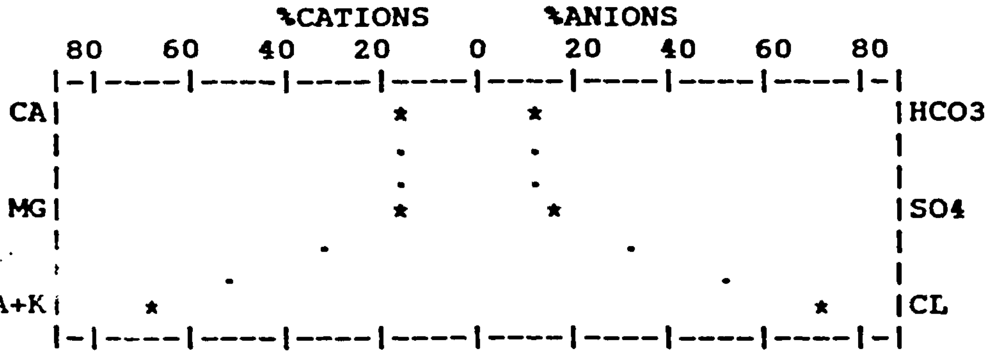
		RANGE
ION	1.003	(.96 TO 1.04)
TDS	1.053	(.90 TO 1.10)
EC	0.983	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.8	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.037	MANGANESE(MN)	0.04	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.04	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.63
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.012		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

Carl Crownover by mk

LAB.NO:M36-191

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

✓

COMPANY: URI, INC.
IDENTIFICATION: VASQUEZ MW #26
1-9-98
BORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: JANUARY 29, 1998

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	70	3.49	181.48	12.16
MAGNESIUM(MG)	40	3.29	153.31	11.46
SODIUM(NA)	485	21.10	1031.79	73.52
POTASSIUM(K)	32	0.82	59.04	2.86
	TOTAL CATION	28.7		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	305	5.00	218.00	17.70
SULFATE(SO4)	174	3.62	267.52	12.81
CHLORIDE(CL)	696	19.63	1489.92	69.49
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.3	TOTAL	3401.06	
SILICA(SIO2)	47			
	TOTAL ANION	28.25		

TOTAL ION	1850
TDS(180 C)	1750
T ION-0.5 HCO3=	1698
(25 C)	3020 UMHOS
EC(DIL)=101.5 X 33.3 =	3380 UMHOS
ALK. AS CACO3	250
PH	7.82

ACCURACY CHECK

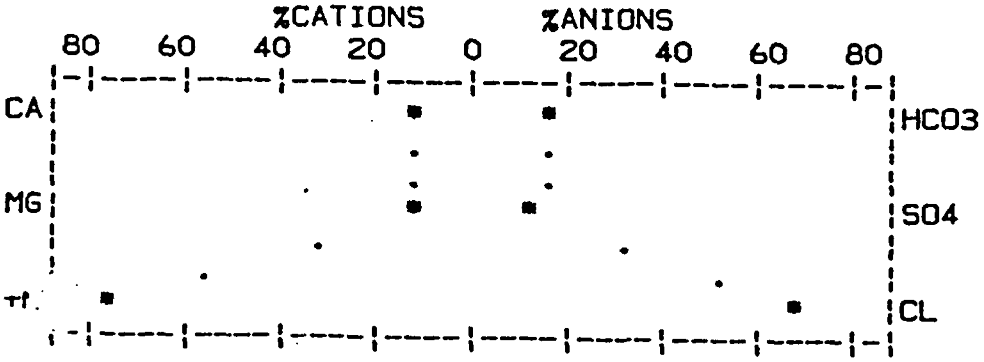
		RANGE
ION	1.016	(.96 TO 1.04)
TDS	1.031	(.90 TO 1.10)
EC	0.994	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.5	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.035	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.02	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.14
COPPER(CU)		SELENIUM(SE)	0.002		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.007		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-120

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: FEBRUARY 10, 1998
IDENTIFICATION: VASQUEZ MW #27
1-19-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	59	2.94	152.88	10.56
MAGNESIUM(MG)	39	3.21	149.59	11.53
SODIUM(NA)	475	20.66	1010.27	74.24
POTASSIUM(K)	40	1.02	73.44	3.67
	TOTAL CATION	27.83		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	299	4.90	213.64	18.22
SULFATE(SO4)	164	3.41	252.00	12.68
CHLORIDE(CL)	659	18.59	1410.98	69.11
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	3262.80	
SILICA(SIO2)	54			
	TOTAL ANION	26.90		

TOTAL ION 1790

TDS(180 C)	1630			
TOT ION-0.5 HCO3=	1641			
EC(25 C)	2880 UMHOS			
EC(DIL)= 96.4 X 33.3 =	3210 UMHOS			
ALK. AS CACO3	245			
PH	7.71			

ACCURACY CHECK

		RANGE
ION	1.035	(.96 TO 1.04)
TDS	0.994	(.90 TO 1.10)
EC	0.984	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	1.3	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.011	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	0.0002	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.14
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.032		

```
               %CATIONS      %ANIONS
     80   60   40   20    0   20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
CA  |                  *       *                |HCO3
    |                  .      .                 |
    |                  .      .                 |
MG  |                  *     *                  |SO4
    |             .               .             |
    |       .                         .         |
NA+K|  *                                   *    |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-466

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 24, 1998
IDENTIFICATION: VASQUEZ VMW-52
7-11-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	94	4.69	243.88	12.40
MAGNESIUM(MG)	70	5.76	268.42	15.23
SODIUM(NA)	608	26.45	1293.41	69.94
POTASSIUM(K)	36	0.92	66.24	2.43
	TOTAL CATION	37.82		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	301	4.93	214.95	13.51
SULFATE(SO4)	169	3.52	260.13	9.65
CHLORIDE(CL)	994	28.04	2128.24	76.84
NITRATE(NO3-N)	0.04			
FLUORIDE(F)	1.1	- TOTAL	4475.25	
SILICA(SIO2)	56			
	TOTAL ANION	36.49		

TOTAL ION 2329

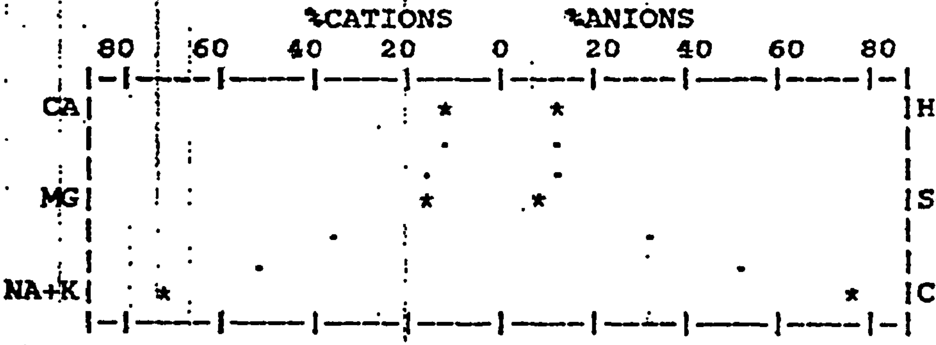
		ACCURACY CHECK		RANGE
TDS(180 C)	2250	ION	1.036	(.96 TO 1.04)
TOT ION-0.5 HCO3=	2179	TDS	1.033	(.90 TO 1.10)
EC(25 C)	3880 UMHOS	EC	0.992	(.95 TO 1.05)
EC(DIL)= 88.8 X 50.0 =	4440 UMHOS			
ALK. AS CACO3	247			
PH	7.66			

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.6	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.068	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.005		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-5203

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 24, 1998
IDENTIFICATION: VASQUEZ VMW-53
7-11-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	60	2.99	155.48	11.55
MAGNESIUM(MG)	41	3.37	157.04	13.02
SODIUM(NA)	435	18.92	925.19	73.08
POTASSIUM(K)	24	0.61	43.92	2.36
	TOTAL CATION	25.89		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	287	4.70	204.92	18.45
SULFATE(SO4)	143	2.98	220.22	11.70
CHLORIDE(CL)	631	17.80	1351.02	69.86
NITRATE(NO3-N)	0.09			
FLUORIDE(F)	1.2	TOTAL	3057.79	
SILICA(SIO2)	50			
	TOTAL ANION	25.48		

TOTAL ION 1672

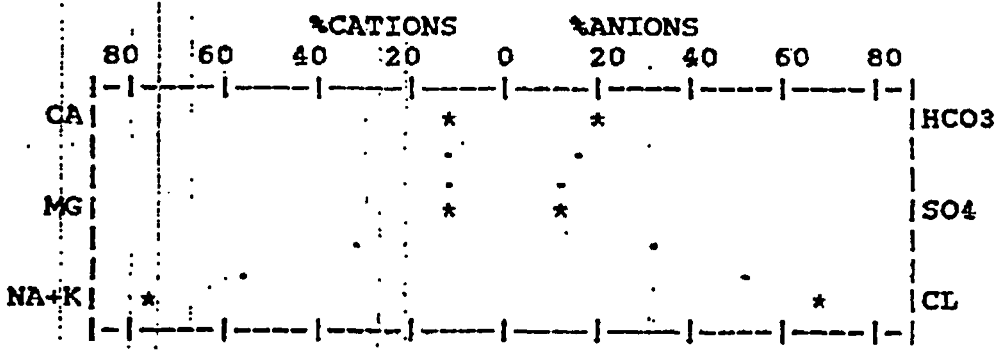
			ACCURACY CHECK		RANGE
TDS(180 C)	1580		ION	1.016	(.96 TO 1.04)
TOT ION-0.5 HCO3=	1529		TDS	1.033	(.90 TO 1.10)
EC(25 C)	2750 UMHOS		EC	0.991	(.95 TO 1.05)
EC(DIL)= 91.0 X 33.3 =	3030 UMHOS				
ALK. AS CACO3	235				
PH	8.02				

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	3.7	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.007	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.04	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.029		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-5204

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 24, 1998
IDENTIFICATION: VASQUEZ VMW-54
7-12-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	63	3.14	163.28	11.57
MAGNESIUM(MG)	41	3.37	157.04	12.42
SODIUM(NA)	460	20.01	978.49	73.76
POTASSIUM(K)	24	0.61	43.92	2.25
	TOTAL CATION	27.13		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	315	5.16	224.98	19.00
SULFATE(SO4)	161	3.35	247.57	12.33
CHLORIDE(CL)	661	18.65	1415.54	68.67
NITRATE(NO3-N)	0.11			
FLUORIDE(F)	1.1	TOTAL	3230.81	
SILICA(SIO2)	50			
	TOTAL ANION	27.16		

TOTAL ION 1776

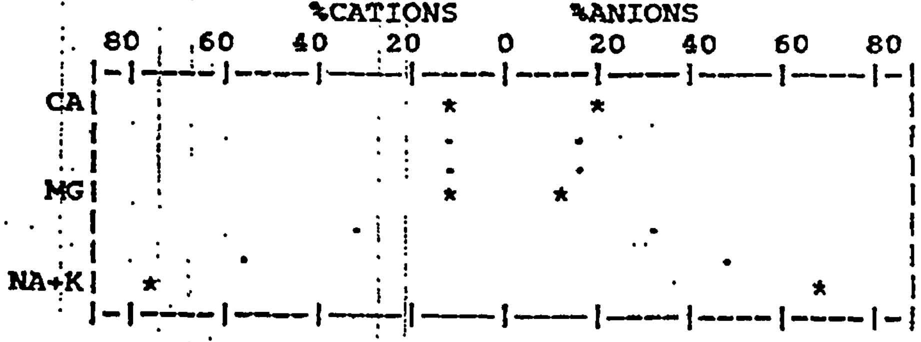
			ACCURACY CHECK		RANGE
TDS(180 C)	1710		ION	0.999	(.96 TO 1.04)
TOT ION-0.5 HCO3=	1619		TDS	1.056	(.90 TO 1.10)
EC(25 C)	2880	UMHOS	EC	0.972	(.95 TO 1.05)
EC(DIL)= 94.3 X 33.3 =	3140	UMHOS			
ALK. AS CACO3	258				
PH	8.00				

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	2.6	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.055	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.16	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N.	<0.01
COPPER(CU)		SELENIUM(SE)	0.002		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.042		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-5205

Production Area Baseline Wells

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: FEBRUARY 9, 1998
IDENTIFICATION: VASQUEZ BL-1
1-14-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	108	5.39	280.28	12.75
MAGNESIUM(MG)	80	6.58	306.63	15.56
SODIUM(NA)	670	29.14	1424.95	68.91
POTASSIUM(K)	46	1.18	84.96	2.79
TOTAL CATION		42.29		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	322	5.28	230.21	12.87
SULFATE(SO4)	105	2.19	161.84	5.34
CHLORIDE(CL)	1190	33.57	2547.96	81.80
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	5036.83	
SILICA(SIO2)	63			
TOTAL ANION		41.04		

TOTAL ION 2585

TDS(180 C)	2500
TOT ION-0.5 HCO3=	2424
EC(25 C)	4390 UMHOS
EC(DIL)= 97.6 X 50.0 =	4880 UMHOS
ALK. AS CACO3	264
PH	7.62

ACCURACY CHECK

		RANGE
ION	1.030	(.96 TO 1.04)
TDS	1.031	(.90 TO 1.10)
EC	0.969	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	27	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.025	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.11	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.18
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.075		

```
          %CATIONS      %ANIONS
  80   60   40   20    0    20   40   60   80
  |-|----|----|----|----|----|----|----|----|-|
CA|                  *     *                  |HCO3
  |                  .     .                  |
  |                 .     .                   |
MG|                 *     *                   |SO4
  |            .                 .            |
  |       .                           .       |
NA+K|  *                                   *  |CL
  |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-322

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: FEBRUARY 9, 1998
IDENTIFICATION: VASQUEZ BL-2
1-14-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	91	4.54	236.08	11.73
MAGNESIUM(MG)	64	5.26	245.12	13.60
SODIUM(NA)	640	27.84	1361.38	71.96
POTASSIUM(K)	41	1.05	75.60	2.71
	TOTAL CATION	38.69		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	344	5.64	245.90	14.48
SULFATE(SO4)	109	2.27	167.75	5.83
CHLORIDE(CL)	1100	31.03	2355.18	79.69
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	4687.01	
SILICA(SIO2)	73			
	TOTAL ANION	38.94		

TOTAL ION 2463

TDS(180 C)	2450	
TOT ION-0.5 HCO3=	2291	
EC(25 C)	4160	UMHOS
EC(DIL)= 94.4 X 50.0 =	4720	UMHOS
ALK. AS CACO3	282	
PH	7.72	

ACCURACY CHECK

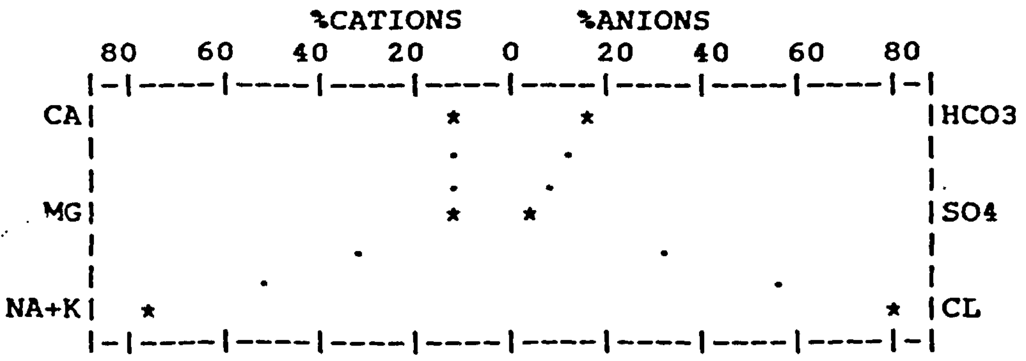
		RANGE
ION	0.994	(.96 TO 1.04)
TDS	1.069	(.90 TO 1.10)
EC	1.007	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	198	+/-	2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.013	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.049		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-323

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ BL-3
1-22-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	105	5.24	272.48	13.66
MAGNESIUM(MG)	80	6.58	306.63	17.16
SODIUM(NA)	590	25.66	1254.77	66.91
POTASSIUM(K)	34	0.87	62.64	2.27
	TOTAL CATION	38.35		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	298	4.88	212.77	12.55
SULFATE(SO4)	210	4.37	322.94	11.24
CHLORIDE(CL)	1050	29.62	2248.16	76.20
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.2	TOTAL	4680.39	
SILICA(SIO2)	54			
	TOTAL ANION	38.87		
TOTAL ION	2422			

TDS(180 C)	2450	
TOT ION-0.5 HCO3=	2273	
EC(25 C)	4060	UMHOS
EC(DIL)= 92.2 X 50.0 =	4610	UMHOS
ALK. AS CACO3	244	
PH	7.40	

ACCURACY CHECK

		RANGE
ION	0.987	(.96 TO 1.04)
TDS	1.078	(.90 TO 1.10)
EC	0.985	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	19	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.020	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.010		

```
                %CATIONS      %ANIONS
      80   60   40   20    0    20   40   60   80
      |-|----|----|----|----|----|----|----|----|-|
    CA|                  *     *                   |HCO3
      |                  .     .                   |
      |                  .     .                   |
    MG|                  *     *                   |SO4
      |             .               .              |
      |         .                         .        |
  NA+K|     *                                   *  |CL
      |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-662

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

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COMPANY: URI, INC.
IDENTIFICATION: VASQUEZ BL #4
1-20-98
LABORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: February 11, 1998

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	105	5.24	272.48	13.03
MAGNESIUM(MG)	80	6.58	306.63	16.36
SODIUM(NA)	630	27.40	1339.86	68.13
POTASSIUM(K)	39	1.00	72.00	2.49
	TOTAL CATION	40.22		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	334	5.47	238.49	13.86
SULFATE(SO4)	169	3.52	260.13	8.92
CHLORIDE(CL)	1080	30.47	2312.67	77.22
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	4802.26	
SILICA(SIO2)	59			
	TOTAL ANION	39.46		
TOTAL ION	2497			

TDS(180 C)	2420
TOT ION-0.5 HCO3=	2330
EC(25 C)	4180 UMHOS
EC(DIL)= 94.8 X 50.0 =	4740 UMHOS
ALK. AS CACO3	274
PH	7.62

ACCURACY CHECK

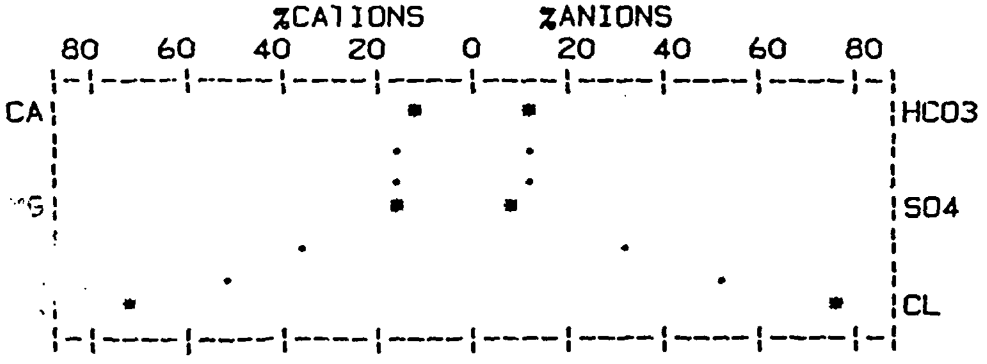
		RANGE
ION	1.019	(.96 TO 1.04)
TDS	1.039	(.90 TO 1.10)
EC	0.987	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	215	+/-	2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.016	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.023		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-486

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.　　REPORT DATE: FEBRUARY 9, 1998
IDENTIFICATION: VASQUEZ BL-5
1-16-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	100	4.99	259.48	12.96
MAGNESIUM(MG)	65	5.35	249.31	13.90
SODIUM(NA)	620	26.97	1318.83	70.07
POTASSIUM(K)	46	1.18	84.96	3.07
	TOTAL CATION	38.49		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	307	5.03	219.31	13.34
SULFATE(SO4)	201	4.18	308.90	11.09
CHLORIDE(CL)	1010	28.49	2162.39	75.57
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	4603.18	
SILICA(SIO2)	61			
	TOTAL ANION	37.70		

TOTAL ION 2411

ITEM	VALUE
TDS(180 C)	2270
TOT ION-0.5 HCO3=	2258
EC(25 C)	3940 UMHOS
EC(DIL)= 90.4 X 50.0 =	4520 UMHOS
ALK. AS CACO3	252
PH	7.50

ACCURACY CHECK

		RANGE
ION	1.021	(.96 TO 1.04)
TDS	1.005	(.90 TO 1.10)
EC	0.982	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	261	+/-	2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.191	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.82	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.270		

```
                %CATIONS     %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
CA  |                  *     *                  |HCO3
    |          .       .     .                  |
    |                  .     .                  |
MG  |                  *     *                  |SO4
    |             .               .             |
    |        .                         .        |
NA+K|   *                                    *  |CL
    |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-363

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: FEBRUARY 9, 1998
IDENTIFICATION: VASQUEZ BL-6
1-16-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	75	3.74	194.48	13.06
MAGNESIUM(MG)	47	3.87	180.34	13.51
SODIUM(NA)	467	20.31	993.16	70.91
POTASSIUM(K)	28	0.72	51.84	2.51
	TOTAL CATION	28.64		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	395	6.47	282.09	22.81
SULFATE(SO4)	124	2.58	190.66	9.09
CHLORIDE(CL)	685	19.32	1466.39	68.10
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	0.87	TOTAL	3358.96	
SILICA(SIO2)	52			
	TOTAL ANION	28.37		

TOTAL ION 1874

TDS(180 C)	1670
TOT ION-0.5 HCO3=	1676
EC(25 C)	2980 UMHOS
EC(DIL)=100.0 X 33.3 =	3330 UMHOS
ALK. AS CACO3	324
PH	7.48

ACCURACY CHECK

		RANGE
ION	1.010	(.96 TO 1.04)
TDS	0.996	(.90 TO 1.10)
EC	0.991	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	20	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.035	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.007		

```
               %CATIONS       %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
CA  |                  *        *               |HCO3
    |                  .       .                |
    |                  .     .                  |
MG  |                  *    *                   |SO4
    |             .              .              |
    |        .                        .         |
NA+K|   *                                  *    |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-364

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
IDENTIFICATION: VASQUEZ BL-7
1-16-98
LABORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: FEBRUARY 9, 1998

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	69	3.44	178.88	11.32
MAGNESIUM(MG)	47	3.87	180.34	12.73
SODIUM(NA)	510	22.18	1084.60	72.98
POTASSIUM(K)	35	0.90	64.80	2.96
	TOTAL CATION	30.39		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	337	5.52	240.67	18.54
SULFATE(SO4)	155	3.23	238.70	10.85
CHLORIDE(CL)	745	21.02	1595.42	70.61
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.1	TOTAL	3583.41	
SILICA(SIO2)	53			
	TOTAL ANION	29.77		

TOTAL ION 1952

TDS(180 C)	1770
TOT ION-0.5 HCO3=	1784
EC(25 C)	3140 UMHOS
EC(DIL)= 90.8 X 40.0 =	3632 UMHOS
ALK. AS CACO3	276
PH	7.48

ACCURACY CHECK

		RANGE
ION	1.021	(.96 TO 1.04)
TDS	0.992	(.90 TO 1.10)
EC	1.014	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	124	+/-	2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.215	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	1.2	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.059		

```
              %CATIONS      %ANIONS
      80   60   40   20    0    20   40   60   80
      |-|----|----|----|----|----|----|----|----|-|
    CA|                 *      *                  |HCO3
      |                 .     .                   |
      |                 .    .                    |
    MG|                 *    *                    |SO4
      |            .          .                   |
      |       .                     .             |
  NA+K| *                                    *    |CL
      |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-365

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM ✓

COMPANY: URI, INC.
IDENTIFICATION: VASQUEZ BL-8
1-16-98
LABORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: FEBRUARY 9, 1998

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	71	3.54	184.08	12.67
MAGNESIUM(MG)	47	3.87	180.34	13.85
SODIUM(NA)	455	19.79	967.73	70.83
POTASSIUM(K)	29	0.74	53.28	2.65
	TOTAL CATION	27.94		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	407	6.67	290.81	23.73
SULFATE(SO4)	110	2.29	169.23	8.15
CHLORIDE(CL)	679	19.15	1453.49	68.13
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	0.87	TOTAL	3298.96	
SILICA(SIO2)	52			
	TOTAL ANION	28.11		
TOTAL ION	1851			

TDS(180 C)	1640
TOT ION-0.5 HCO3=	1647
EC(25 C)	2950 UMHOS
EC(DIL)= 99.1 X 33.3 =	3300 UMHOS
ALK. AS CACO3	334
PH	7.61

ACCURACY CHECK

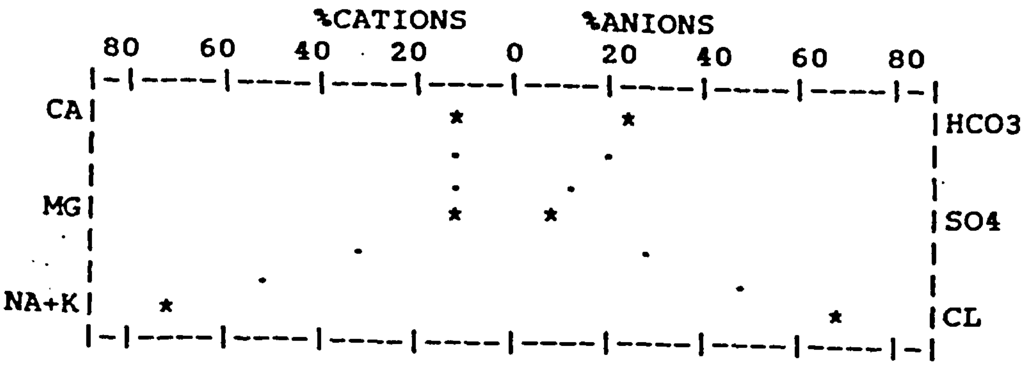
		RANGE
ION	0.994	(.96 TO 1.04)
TDS	0.996	(.90 TO 1.10)
EC	1.000	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	19	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.022	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.005		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-366

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ BL-9
1-21-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	70	3.49	181.48	12.23
MAGNESIUM(MG)	45	3.70	172.42	12.96
SODIUM(NA)	475	20.66	1010.27	72.39
POTASSIUM(K)	27	0.69	49.68	2.42
	TOTAL CATION	28.54		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	331	5.42	236.31	19.38
SULFATE(SO4)	155	3.23	238.70	11.55
CHLORIDE(CL)	685	19.32	1466.39	69.07
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.3	TOTAL	3355.25	
SILICA(SIO2)	55			
	TOTAL ANION	27.97		

TOTAL ION 1844

TDS(180 C)	1670
TOT ION-0.5 HCO3=	1679
EC(25 C)	2970 UMHOS
EC(DIL)= 99.1 X 33.3 =	3300 UMHOS
ALK. AS CACO3	271
PH	7.48

ACCURACY CHECK

		RANGE
ION	1.020	(.96 TO 1.04)
TDS	0.995	(.90 TO 1.10)
EC	0.984	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	12	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.006	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.020		

```
              %CATIONS      %ANIONS
   80   60   40   20     0    20   40   60   80
  |-|----|----|----|----|----|----|----|----|-|
CA|                  *       *                |HCO3
  |                  .      .                 |
  |                  .      .                 |
 G|                  *     *                  |SO4
  |             .               .             |
  |        .                        .         |
 K|  *                                   *    |CL
   -|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-613

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ BL-10
1-21-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	85	4.24	220.48	12.50
MAGNESIUM(MG)	62	5.10	237.66	15.04
SODIUM(NA)	545	23.71	1159.42	69.90
POTASSIUM(K)	34	0.87	62.64	2.56
	TOTAL CATION	33.92		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	354	5.80	252.88	17.46
SULFATE(SO4)	152	3.16	233.52	9.51
CHLORIDE(CL)	860	24.26	1841.33	73.03
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.2	TOTAL	4007.94	
SILICA(SIO2)	55			
	TOTAL ANION	33.22		

TOTAL ION 2148

TDS(180 C)	2000
TOT ION-0.5 HCO3=	1971
EC(25 C)	3530 UMHOS
EC(DIL)= 99.0 X 40.0 =	3960 UMHOS
ALK. AS CACO3	290
PH	7.46

ACCURACY CHECK

		RANGE
ION	1.021	(.96 TO 1.04)
TDS	1.015	(.90 TO 1.10)
EC	0.988	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	18	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.018	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.011		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                  *      *                 |HCO3
    |                  .      .                 |
    |                 .      .                  |
  MG|                 *     *                   |SO4
    |             .               .             |
    |        .                         .        |
NA+K|   *                                   *   |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-614

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: February 11, 1998
IDENTIFICATION: VASQUEZ BL #11
1-20-98
ABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	71	3.54	184.08	12.37
MAGNESIUM(MG)	46	3.78	176.15	13.21
SODIUM(NA)	475	20.66	1010.27	72.19
POTASSIUM(K)	25	0.64	46.08	2.24
	TOTAL CATION	28.62		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	321	5.26	229.34	18.93
SULFATE(SO4)	166	3.46	255.69	12.45
CHLORIDE(CL)	676	19.07	1447.41	68.62
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.3	TOTAL	3349.03	
SILICA(SIO2)	51			
	TOTAL ANION	27.79		

TOTAL ION 1832

TDS(180 C)	1670	
T ION-0.5 HCO3=	1672	
(25 C)	2900	UMHOS
EC(DIL)= 97.9 X 33.3 =	3260	UMHOS
ALK. AS CACO3	263	
PH	7.62	

ACCURACY CHECK

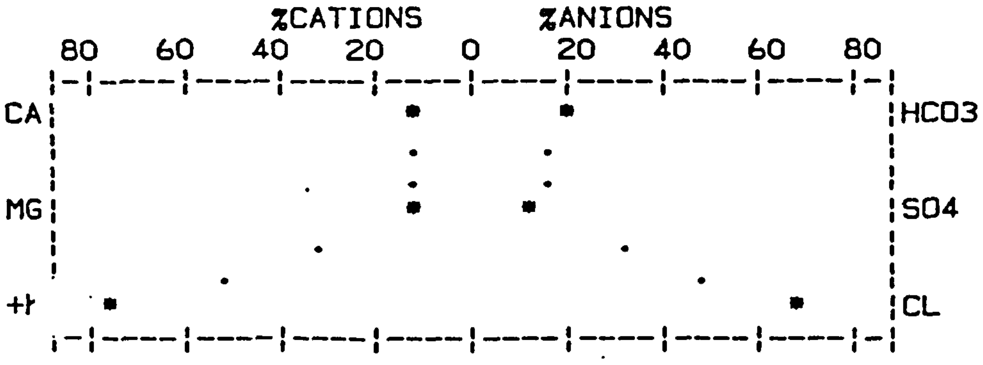
		RANGE
ION	1.030	(.96 TO 1.04)
TDS	0.999	(.90 TO 1.10)
EC	0.973	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	8.2	+/-	0.4

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.003	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.003		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-487

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: February 12, 1998
IDENTIFICATION: VASQUEZ BL-12
1-21-98
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	85	4.24	220.48	14.63
MAGNESIUM(MG)	53	4.36	203.18	15.04
SODIUM(NA)	453	19.70	963.33	67.95
POTASSIUM(K)	27	0.69	49.68	2.38
	TOTAL CATION	28.99		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	344	5.64	245.90	19.87
SULFATE(SO4)	147	3.06	226.13	10.78
CHLORIDE(CL)	698	19.69	1494.47	69.36
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	1.0	TOTAL	3403.18	
SILICA(SIO2)	53			
	TOTAL ANION	28.39		

TOTAL ION 1861

TDS(180 C)	1700
TOT ION-0.5 HCO3=	1689
EC(25 C)	3010 UMHOS
EC(DIL)=101.5 X 33.3 =	3380 UMHOS
ALK. AS CACO3	282
PH	7.45

ACCURACY CHECK

		RANGE
ION	1.021	(.96 TO 1.04)
TDS	1.007	(.90 TO 1.10)
EC	0.993	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	26	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.021	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0002	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	<0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.008		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                 *        *                |HCO3
    |                 .       .                 |
    |                 .      .                  |
  MG|                 *      *                  |SO4
    |             .               .             |
    |        .                        .         |
NA+K|   *                                  *    |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M36-615

Production Wells

TEL. 361-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
November 04, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1001
1455 10-7-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	3.22	10-27-04
		pci/L	
900.0	Gross Alpha Activity	3430	10-12-04
	Counting Error +/-	88	
900.0	Gross Beta Activity	390	10-12-04
	Counting Error +/-	15	
903.1	*Radon 222	196000	10-08-04
	Counting Error +/-	723	
7500 Ra C.	Radium 226	237	11-01-04
	Counting Error +/-	8	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4232

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-51

TEL. 361-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
November 16, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1001
1455 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH ---------------	7.45	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. -----------------	3370	Allen	11-15-04
		mg/L		
215.1	Calcium -----------------------	85	Merks	11-12-04
310.1	Bicarbonate -------------------	349	Merks	10-15-04
375.3	Sulfate -----------------------	177	Merks	11-04-04
4500-Cl$^-$ B.	Chloride ----------------------	829	Merks	10-21-04

Lab. No. M42-4232

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-10

TEL. 361-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

November 04, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1204
0907 10-7-04

Method Number				Analysis Date
D2907-83	Uranium, mg/L		0.526	10-27-04
			pci/L	
900.0	Gross Alpha Activity		998	10-12-04
	Counting Error	+/-	47	
900.0	Gross Beta Activity		200	10-12-04
	Counting Error	+/-	11	
903.1	*Radon 222		345000	10-08-04
	Counting Error	+/-	951	
7500 Ra C.	Radium 226		200	11-01-04
	Counting Error	+/-	7	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4233

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-51

TEL. 361-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

November 16, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1204
0907 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH	7.60	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3280	Allen	11-15-04
		mg/L		
215.1	Calcium	80	Merks	11-12-04
310.1	Bicarbonate	327	Merks	10-15-04
375.3	Sulfate	178	Merks	11-04-04
4500-Cl^- B.	Chloride	800	Merks	10-21-04

Lab. No. M42-4233

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-10

TEL. 361-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
November 04, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1210
0850 10-7-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.500	10-27-04
		pci/L	
900.0	Gross Alpha Activity	784	10-12-04
	Counting Error +/-	43	
900.0	Gross Beta Activity	100	10-12-04
	Counting Error +/-	8	
903.1	*Radon 222	284000	10-08-04
	Counting Error +/-	275	
7500 Ra C.	Radium 226	64	11-02-04
	Counting Error +/-	4	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4234

Respectfully Submitted,

CFC

Carl F. Crownover, Pres.

form: S1-51

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
November 16, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1210
0850 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH	7.53	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3360	Allen	11-15-04
		mg/L		
215.1	Calcium	108	Merks	11-12-04
310.1	Bicarbonate	295	Merks	10-15-04
375.3	Sulfate	202	Merks	11-04-04
4500-Cl$^-$ B.	Chloride	821	Merks	10-21-04

Lab. No. M42-4234

Respectfully Submitted,

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November 04, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1211
0905 10-7-04

Method Number				Analysis Date
D2907-83	Uranium, mg/L		3.73	10-27-04
			pci/L	
900.0	Gross Alpha Activity		3920	10-12-04
	Counting Error	+/-	113	
900.0	Gross Beta Activity		1140	10-12-04
	Counting Error	+/-	35	
903.1	*Radon 222		130000	10-08-04
	Counting Error	+/-	606	
7500 Ra C.	Radium 226		203	11-02-04
	Counting Error	+/-	7	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4235

Respectfully Submitted,

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November 16, 2004

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650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1211
0905 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH ---------------- 7.65		Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3470	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	79	Merks	11-12-04
310.1	Bicarbonate --------------------	348	Merks	10-15-04
375.3	Sulfate ------------------------	179	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	852	Merks	10-21-04

Lab. No. M42-4235

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November 04, 2004

URI, INC.
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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1212
0920 10-7-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.977	10-27-04
		pci/L	
900.0	Gross Alpha Activity	2331	10-12-04
	Counting Error +/-	73	
900.0	Gross Beta Activity	370	10-12-04
	Counting Error +/-	15	
903.1	*Radon 222	380000	10-08-04
	Counting Error +/-	1010	
7500 Ra C.	Radium 226	387	11-02-04
	Counting Error +/-	9	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4236

Respectfully Submitted,

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Report of Analysis

Identification: Vasquez
#1212
0920 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH	7.60	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3310	Allen	11-15-04
		mg/L		
215.1	Calcium	79	Merks	11-12-04
310.1	Bicarbonate	331	Merks	10-15-04
375.3	Sulfate	179	Merks	11-04-04
4500-Cl~ B.	Chloride	801	Merks	10-21-04

Lab. No. M42-4236

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November 04, 2004

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Report of Analysis

Identification: Vasquez
#1214
1015 10-7-04

Method Number				Analysis Date
D2907-83	Uranium, mg/L		0.644	10-27-04
			pci/L	
900.0	Gross Alpha Activity		850	10-14-04
	Counting Error	+/-	50	
900.0	Gross Beta Activity		281	10-14-04
	Counting Error	+/-	16	
903.1	*Radon 222		47300	10-08-04
	Counting Error	+/-	363	
7500 Ra C.	Radium 226		132	11-02-04
	Counting Error	+/-	6	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4237

Respectfully Submitted,

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November 16, 2004

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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1214
1015 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH	7.88	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3260	Allen	11-15-04
		mg/L		
215.1	Calcium	64	Merks	11-12-04
310.1	Bicarbonate	356	Merks	10-15-04
375.3	Sulfate	176	Merks	11-04-04
4500-Cl~ B.	Chloride	759	Merks	10-21-04

Lab. No. M42-4237

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November 04, 2004

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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1216
1015 10-7-04

Method Number				Analysis Date
D2907-83	Uranium, mg/L		2.97	10-27-04
			pci/L	
900.0	Gross Alpha Activity		2652	10-14-04
	Counting Error	+/-	92	
900.0	Gross Beta Activity		322	10-14-04
	Counting Error	+/-	18	
903.1	*Radon 222		183000	10-08-04
	Counting Error	+/-	676	
7500 Ra C.	Radium 226		128	11-02-04
	Counting Error	+/-	6	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4238

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November 16, 2004

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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1216
1015 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH --------------- 7.72		Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3450	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	105	Merks	11-12-04
310.1	Bicarbonate --------------------	264	Merks	10-15-04
375.3	Sulfate ------------------------	186	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	847	Merks	10-21-04

Lab. No. M42-4238

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November 04, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1221
1450 10-7-04

Method Number				Analysis Date
D2907-83	Uranium, mg/L		0.585	10-27-04
			pci/L	
900.0	Gross Alpha Activity		768	10-14-04
	Counting Error	+/-	49	
900.0	Gross Beta Activity		146	10-14-04
	Counting Error	+/-	12	
903.1	*Radon 222		111000	10-08-04
	Counting Error	+/-	539	
7500 Ra C.	Radium 226		46	11-02-04
	Counting Error	+/-	3	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4239

Respectfully Submitted,

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November 16, 2004

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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1221
1450 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH	7.52	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3350	Allen	11-15-04
		mg/L		
215.1	Calcium	88	Merks	11-12-04
310.1	Bicarbonate	393	Merks	10-15-04
375.3	Sulfate	183	Merks	11-04-04
4500-Cl⁻ B.	Chloride	788	Merks	10-21-04

Lab. No. M42-4239

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November 04, 2004

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650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1222
1325 10-7-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.407	10-27-04
		pci/L	
900.0	Gross Alpha Activity	849	10-14-04
	Counting Error +/-	51	
900.0	Gross Beta Activity	175	10-14-04
	Counting Error +/-	13	
903.1	*Radon 222	158000	10-08-04
	Counting Error +/-	650	
7500 Ra C.	Radium 226	273	11-02-04
	Counting Error +/-	8	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4240

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November 04, 2004

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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1228
1330 10-7-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.523	10-27-04
		pci/L	
900.0	Gross Alpha Activity	554	10-14-04
	Counting Error +/-	40	
900.0	Gross Beta Activity	66	10-14-04
	Counting Error +/-	11	
903.1	*Radon 222	28900	10-08-04
	Counting Error +/-	276	
7500 Ra C.	Radium 226	11	11-02-04
	Counting Error +/-	2	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4241

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November 16, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1222
1325 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH ----------------	7.48	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3260	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	100	Merks	11-12-04
310.1	Bicarbonate --------------------	346	Merks	10-15-04
375.3	Sulfate ------------------------	195	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	772	Merks	10-21-04

Lab. No. M42-4240

Respectfully Submitted,

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CORPUS CHRISTI, TEXAS
November 16, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1228
1330 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH	7.61	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3060	Allen	11-15-04
		mg/L		
215.1	Calcium	78	Merks	11-12-04
310.1	Bicarbonate	343	Merks	10-15-04
375.3	Sulfate	162	Merks	11-04-04
4500-Cl^- B.	Chloride	752	Merks	10-21-04

Lab. No. M42-4241

Respectfully Submitted,

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November 04, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1237
1540 10-7-04

Method Number				Analysis Date
D2907-83	Uranium, mg/L		0.712	10-27-04
			pci/L	
900.0	Gross Alpha Activity		1038	10-14-04
	Counting Error	+/-	60	
900.0	Gross Beta Activity		198	10-14-04
	Counting Error	+/-	15	
903.1	*Radon 222		193000	10-08-04
	Counting Error	+/-	724	
7500 Ra C.	Radium 226		221	11-02-04
	Counting Error	+/-	7	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4242

Respectfully Submitted,

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November 16, 2004

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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1237
1540 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH ----------------	7.46	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3690	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	160	Merks	11-12-04
310.1	Bicarbonate --------------------	337	Merks	10-15-04
375.3	Sulfate ------------------------	181	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	936	Merks	10-21-04

Lab. No. M42-4242

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November 04, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1238
1317 10-7-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	5.77	10-27-04
		pci/L	
900.0	Gross Alpha Activity	5511	10-14-04
	Counting Error	+/- 126	
900.0	Gross Beta Activity	508	10-14-04
	Counting Error	+/- 25	
903.1	*Radon 222	375000	10-08-04
	Counting Error	+/- 980	
7500 Ra C.	Radium 226	148	11-02-04
	Counting Error	+/- 6	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4243

Respectfully Submitted,

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November 16, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1238
1317 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH ---------------- 7.54		Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3270	Allen	11-15-04
		mg/L		
215.1	Calcium -------------------------	115	Merks	11-12-04
310.1	Bicarbonate ---------------------	336	Merks	10-15-04
375.3	Sulfate -------------------------	190	Merks	11-04-04
4500-Cl^- B.	Chloride ------------------------	789	Merks	10-21-04

Lab. No. M42-4243

Respectfully Submitted,

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November 04, 2004

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650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1276
1130 10-7-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.416	10-27-04
		pci/L	
900.0	Gross Alpha Activity	1164	10-14-04
	Counting Error +/-	63	
900.0	Gross Beta Activity	278	10-14-04
	Counting Error +/-	17	
903.1	*Radon 222	290000	10-08-04
	Counting Error +/-	855	
7500 Ra C.	Radium 226	219	11-02-04
	Counting Error +/-	7	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4244

Respectfully Submitted,

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November 16, 2004

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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1276
1130 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH ----------------	7.45	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3770	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	105	Merks	11-12-04
310.1	Bicarbonate --------------------	323	Merks	10-15-04
375.3	Sulfate ------------------------	196	Merks	11-04-04
4500-Cl^- B.	Chloride -----------------------	962	Merks	10-21-04

Lab. No. M42-4244

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CORPUS CHRISTI, TEXAS
November 04, 2004

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650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1277
1135 10-7-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	1.02	10-27-04
		pci/L	
900.0	Gross Alpha Activity	1327	10-14-04
	Counting Error +/-	69	
900.0	Gross Beta Activity	186	10-14-04
	Counting Error +/-	15	
903.1	*Radon 222	382000	10-08-04
	Counting Error +/-	970	
7500 Ra C.	Radium 226	195	11-02-04
	Counting Error +/-	7	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4245

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November 16, 2004

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650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#1277
1135 10-7-04

Method Number			Analyst	Analysis Date
150.1	pH ---------------	7.55	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3910	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	115	Merks	11-12-04
310.1	Bicarbonate --------------------	346	Merks	10-15-04
375.3	Sulfate ------------------------	207	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	988	Merks	10-21-04

Lab. No. M42-4245

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November 04, 2004

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650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez WF-1
#1230
1735 10-12-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.012	10-27-04
		pci/L	
900.0	Gross Alpha Activity	59	10-15-04
	Counting Error +/-	14	
900.0	Gross Beta Activity	37	10-15-04
	Counting Error +/-	8	
903.1	*Radon 222	187000	10-13-04
	Counting Error +/-	1450	
7500 Ra C.	Radium 226	18	11-02-04
	Counting Error +/-	3	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4311

Respectfully Submitted,

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CORPUS CHRISTI, TEXAS
November 16, 2004

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Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez WF-1
#1230
1735 10-12-04

Method Number			Analyst	Analysis Date
150.1	pH ----------------	7.38	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3200	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	69	Merks	11-12-04
310.1	Bicarbonate --------------------	345	Merks	10-15-04
375.3	Sulfate ------------------------	166	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	773	Merks	10-21-04

Lab. No. M42-4311

Respectfully Submitted,

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CORPUS CHRISTI, TEXAS
November 04, 2004

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez WF-1
#1243
1735 10-12-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.028	10-27-04
		pci/L	
900.0	Gross Alpha Activity	638	10-15-04
	Counting Error +/-	41	
900.0	Gross Beta Activity	174	10-15-04
	Counting Error +/-	14	
903.1	*Radon 222	383000	10-13-04
	Counting Error +/-	2180	
7500 Ra C.	Radium 226	150	11-02-04
	Counting Error +/-	6	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4312

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Report of Analysis

Identification: Vasquez WF-1
#1243
1735 10-12-04

Method Number			Analyst	Analysis Date
150.1	pH	7.37	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3130	Allen	11-15-04
		mg/L		
215.1	Calcium	73	Merks	11-12-04
310.1	Bicarbonate	348	Merks	10-15-04
375.3	Sulfate	164	Merks	11-04-04
4500-Cl~ B.	Chloride	752	Merks	10-21-04

Lab. No. M42-4312

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Report of Analysis

Identification: Vasquez WF-1
#1247
1759 10-12-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.003	10-27-04
		pci/L	
900.0	Gross Alpha Activity	36	10-15-04
	Counting Error +/-	12	
900.0	Gross Beta Activity	28	10-15-04
	Counting Error +/-	8	
903.1	*Radon 222	361000	10-13-04
	Counting Error +/-	557	
901.1M	Radium 226	6.9	11-02-04
	Counting Error +/-	1.9	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4313

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Report of Analysis

Identification: Vasquez WF-1
#1247
1759 10-12-04

Method Number			Analyst	Analysis Date
150.1	pH ---------------- 7.42		Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3180	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	77	Merks	11-12-04
310.1	Bicarbonate --------------------	339	Merks	10-15-04
375.3	Sulfate ------------------------	169	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	768	Merks	10-21-04

Lab. No. M42-4313

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Report of Analysis

Identification: Vasquez WF-1
#1248
1742 10-12-04

Method Number				Analysis Date
D2907-83	Uranium, mg/L		0.212	10-27-04
			pci/L	
900.0	Gross Alpha Activity		2690	10-15-04
	Counting Error	+/-	88	
900.0	Gross Beta Activity		561	10-15-04
	Counting Error	+/-	23	
903.1	*Radon 222		2900000	10-13-04
	Counting Error	+/-	5860	
7500 Ra C.	Radium 226		836	11-02-04
	Counting Error	+/-	14	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4314

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Report of Analysis

Identification: Vasquez WF-1
#1248
1742 10-12-04

Method Number			Analyst	Analysis Date
150.1	pH ---------------- 7.33		Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3210	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	75	Merks	11-12-04
310.1	Bicarbonate --------------------	348	Merks	10-15-04
375.3	Sulfate ------------------------	181	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	768	Merks	10-21-04

Lab. No. M42-4314

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Report of Analysis

Identification: Vasquez WF-1
#1255
1703 10-12-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.054	10-27-04
		pci/L	
900.0	Gross Alpha Activity	1050	10-15-04
	Counting Error +/-	56	
900.0	Gross Beta Activity	255	10-15-04
	Counting Error +/-	16	
903.1	*Radon 222	680000	10-13-04
	Counting Error +/-	2920	
7500 Ra C.	Radium 226	234	11-02-04
	Counting Error +/-	7	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4315

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Report of Analysis

Identification: Vasquez WF-1
#1255
1703 10-12-04

Method Number			Analyst	Analysis Date
150.1	pH ---------------- 7.37		Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3230	Allen	11-15-04
		mg/L		
215.1	Calcium ------------------------	80	Merks	11-12-04
310.1	Bicarbonate --------------------	336	Merks	10-15-04
375.3	Sulfate ------------------------	178	Merks	11-04-04
4500-Cl~ B.	Chloride -----------------------	786	Merks	10-21-04

Lab. No. M42-4315

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Report of Analysis

Identification: Vasquez WF-1
#1260
1735 10-12-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.246	10-27-04
		pci/L	
900.0	Gross Alpha Activity	351	10-15-04
	Counting Error +/-	35	
900.0	Gross Beta Activity	74	10-15-04
	Counting Error +/-	11	
903.1	*Radon 222	69000	10-13-04
	Counting Error +/-	1020	
7500 Ra C.	Radium 226	71	11-02-04
	Counting Error +/-	4	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4316

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Report of Analysis

Identification: Vasquez WF-1
#1260
1735 10-12-04

Method Number			Analyst	Analysis Date
150.1	pH --------------- 7.86		Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ------------------	3590	Allen	11-15-04
		mg/L		
215.1	Calcium -----------------------	113	Merks	11-12-04
310.1	Bicarbonate --------------------	309	Merks	10-15-04
375.3	Sulfate -----------------------	196	Merks	11-04-04
4500-Cl~ B.	Chloride ----------------------	914	Merks	10-21-04

Lab. No. M42-4316

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Report of Analysis

Identification: Vasquez WF-1
#1266
1740 10-12-04

Method Number			Analysis Date
D2907-83	Uranium, mg/L	0.080	10-27-04
		pci/L	
900.0	Gross Alpha Activity	107	10-15-04
	Counting Error +/-	19	
900.0	Gross Beta Activity	48	10-15-04
	Counting Error +/-	9	
903.1	*Radon 222	64100	10-13-04
	Counting Error +/-	861	
7500 Ra C.	Radium 226	11	11-02-04
	Counting Error +/-	2	

Analysts: Moore/Nixon

Calibration: Alpha - Th230 Beta - Cs137

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-4317

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Identification: Vasquez WF-1
#1266
1740 10-12-04

Method Number			Analyst	Analysis Date
150.1	pH	7.27	Merks	10-15-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3220	Allen	11-15-04
		mg/L		
215.1	Calcium	83	Merks	11-12-04
310.1	Bicarbonate	345	Merks	10-15-04
375.3	Sulfate	163	Merks	11-04-04
4500-Cl~ B.	Chloride	785	Merks	10-21-04

Lab. No. M42-4317

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Report of Analysis

Identification: #1301
Vasquez
12-14-04

Method Number			Analysis Date
150.1	pH	7.43	12-20-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3180	12-20-04
		mg/L	
215.1	Calcium	83	12-30-04
310.1	Bicarbonate	323	12-20-04
375.3	Sulfate	183	12-21-04
4500-Cl~ B.	Chloride	718	12-29-04
D2907-83	Uranium	0.015	12-29-04
		pci/L	
900.0	Gross Alpha Activity	278	12-20-04
	Counting Error +/-	31	
900.0	Gross Beta Activity	183	12-20-04
	Counting Error +/-	17	
903.1	*Radon 222	118000	12-17-04
	Counting Error +/-	540	
7500-Ra C.	Radium 226	46	01-07-05
	Counting Error +/-	2	

Analysts: Merks (pH, Calcium, Bicarbonate, Sulfate, Chloride)
Moore (Spec. Conductance, Uranium)
Nixon/Moore: Gross Alpha/Beta
Nixon (Radon 222, Radium 226)

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-5038

Signed:
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Report of Analysis

Identification: #1303
Vasquez
12-14-04

Method Number			Analysis Date
150.1	pH	8.19	12-20-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3180	12-20-04
		mg/L	
215.1	Calcium	40	12-30-04
310.1	Bicarbonate	406	12-20-04
375.3	Sulfate	71	12-21-04
4500-Cl~ B.	Chloride	736	12-29-04
D2907-83	Uranium	0.029	12-29-04
		pci/L	
900.0	Gross Alpha Activity	269	12-20-04
	Counting Error +/-	30	
900.0	Gross Beta Activity	55	12-20-04
	Counting Error +/-	13	
903.1	*Radon 222	12500	12-17-04
	Counting Error +/-	179	
7500-Ra C.	Radium 226	168	01-07-05
	Counting Error +/-	4	

Analysts: Merks (pH, Calcium, Bicarbonate, Sulfate, Chloride)
Moore (Spec. Conductance, Uranium)
Nixon/Moore: Gross Alpha/Beta
Nixon (Radon 222, Radium 226)

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-5039

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Report of Analysis

Identification: #1305
Vasquez
12-14-04

Method Number			Analysis Date
150.1	pH	8.03	12-20-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	2930	12-20-04
		mg/L	
215.1	Calcium	53	12-30-04
310.1	Bicarbonate	375	12-20-04
375.3	Sulfate	105	12-21-04
4500-Cl⁻ B.	Chloride	655	12-29-04
D2907-83	Uranium	0.018	12-29-04
		pci/L	
900.0	Gross Alpha Activity	105	12-20-04
	Counting Error +/-	20	
900.0	Gross Beta Activity	62	12-20-04
	Counting Error +/-	14	
903.1	*Radon 222	14800	12-17-04
	Counting Error +/-	190	
7500-Ra C.	Radium 226	13	01-07-05
	Counting Error +/-	1	

Analysts: Merks (pH, Calcium, Bicarbonate, Sulfate, Chloride)
Moore (Spec. Conductance, Uranium)
Nixon/Moore: Gross Alpha/Beta
Nixon (Radon 222, Radium 226)

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-5040

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Report of Analysis

Identification: #1307
Vasquez
12-14-04

Method Number			Analysis Date
150.1	pH ----------------	8.07	12-20-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C. ---------------------------	2550	12-20-04
		mg/L	
215.1	Calcium ----------------------	40	12-30-04
310.1	Bicarbonate ------------------	398	12-20-04
375.3	Sulfate ----------------------	117	12-21-04
4500-Cl$^-$ B.	Chloride ---------------------	507	12-29-04
D2907-83	Uranium ----------------------	0.021	12-29-04
		pci/L	
900.0	Gross Alpha Activity ------------------	600	12-21-04
	Counting Error ----------------- +/-	42	
900.0	Gross Beta Activity -------------------	90	12-21-04
	Counting Error ----------------- +/-	17	
903.1	*Radon 222 ----------------------------	177000	12-17-04
	Counting Error ----------------- +/-	672	
7500-Ra C.	Radium 226 ---------------------------	410	01-07-05
	Counting Error ----------------- +/-	6	

Analysts: Merks (pH, Calcium, Bicarbonate, Sulfate, Chloride)
Moore (Spec. Conductance, Uranium)
Nixon/Moore: Gross Alpha/Beta
Nixon (Radon 222, Radium 226)

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-5041

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Report of Analysis

Identification: #1309
Vasquez
12-14-04

Method Number			Analysis Date
150.1	pH	7.56	12-20-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	2950	12-20-04
		mg/L	
215.1	Calcium	70	12-30-04
310.1	Bicarbonate	409	12-20-04
375.3	Sulfate	81	12-21-04
4500-Cl~ B.	Chloride	663	12-29-04
D2907-83	Uranium	0.006	12-29-04
		pci/L	
900.0	Gross Alpha Activity	119	12-21-04
	Counting Error +/-	21	
900.0	Gross Beta Activity	50	12-21-04
	Counting Error +/-	12	
903.1	*Radon 222	123000	12-17-04
	Counting Error +/-	567	
7500-Ra C.	Radium 226	53	01-07-05
	Counting Error +/-	2	

Analysts: Merks (pH, Calcium, Bicarbonate, Sulfate, Chloride)
Moore (Spec. Conductance, Uranium)
Nixon/Moore: Gross Alpha/Beta
Nixon (Radon 222, Radium 226)

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-5042

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January 10, 2005

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Report of Analysis

Identification: #1311A
Vasquez
12-14-04

Method Number				Analysis Date
150.1	pH	7.62		12-20-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.		3060	12-20-04
		mg/L		
215.1	Calcium	54		12-30-04
310.1	Bicarbonate	372		12-20-04
375.3	Sulfate	119		12-21-04
4500-Cl~ B.	Chloride	693		12-29-04
D2907-83	Uranium	0.002		12-29-04
			pci/L	
900.0	Gross Alpha Activity		395	12-21-04
	Counting Error	+/-	36	
900.0	Gross Beta Activity		109	12-21-04
	Counting Error	+/-	15	
903.1	*Radon 222		235000	12-17-04
	Counting Error	+/-	765	
7500-Ra C.	Radium 226		190	01-07-05
	Counting Error	+/-	4	

Analysts: Merks (pH, Calcium, Bicarbonate, Sulfate, Chloride)
Moore (Spec. Conductance, Uranium)
Nixon/Moore: Gross Alpha/Beta
Nixon (Radon 222, Radium 226)

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-5043

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Report of Analysis

Identification: #1322
Vasquez
12-14-04

Method Number			Analysis Date
150.1	pH	7.78	12-20-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	3140	12-20-04
		mg/L	
215.1	Calcium	58	12-30-04
310.1	Bicarbonate	390	12-20-04
375.3	Sulfate	117	12-21-04
4500-Cl⁻ B.	Chloride	709	12-29-04
D2907-83	Uranium	0.009	12-29-04
		pci/L	
900.0	Gross Alpha Activity	2040	12-21-04
	Counting Error +/-	83	
900.0	Gross Beta Activity	265	12-21-04
	Counting Error +/-	23	
903.1	*Radon 222	742000	12-17-04
	Counting Error +/-	1300	
7500-Ra C.	Radium 226	1340	01-07-05
	Counting Error +/-	16	

Analysts: Merks (pH, Calcium, Bicarbonate, Sulfate, Chloride)
Moore (Spec. Conductance, Uranium)
Nixon/Moore: Gross Alpha/Beta
Nixon (Radon 222, Radium 226)

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-5044

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Report of Analysis

Identification: #1330
Vasquez
12-14-04

Method Number			Analysis Date
150.1	pH	7.73	12-20-04
120.1	Specific Conductance, umhos/cm @ 25 Deg.C.	2880	12-20-04
		mg/L	
215.1	Calcium	60	12-30-04
310.1	Bicarbonate	382	12-20-04
375.3	Sulfate	135	12-21-04
4500-Cl~ B.	Chloride	661	12-29-04
D2907-83	Uranium	0.064	12-29-04
		pci/L	
900.0	Gross Alpha Activity	46	12-21-04
	Counting Error +/-	15	
900.0	Gross Beta Activity	26	12-21-04
	Counting Error +/-	12	
903.1	*Radon 222	19000	12-17-04
	Counting Error +/-	224	
7500-Ra C.	Radium 226	4.6	01-07-05
	Counting Error +/-	0.3	

Analysts: Merks (pH, Calcium, Bicarbonate, Sulfate, Chloride)
Moore (Spec. Conductance, Uranium)
Nixon/Moore: Gross Alpha/Beta
Nixon (Radon 222, Radium 226)

*Note: Value reflects Radon 222 content at time of sampling.

Lab. No. M42-5045

Signed: ______________________
Carl F. Crownover, Pres.

form: S1-8

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
January 10, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Rosita
S.W. 4th Qtr.
Crews Hunting Camp Pond
12-20-04

Method Number			Analysis Date
150.1	pH	8.21	12-21-04
120.1	Specific Conductance	3500 umhos/cm @ 25 Deg.C.	12-21-04
D2907-83	Uranium, mg/L	0.040	12-21-04
900.0	*Gross Alpha Activity, pci/L	51	12-22-04
	Counting Error, pci/L	+/- 13	
900.0.	*Gross Beta Activity, pci/L	28	12-22-04
	Counting Error, pci/L	+/- 7	
7500-Ra C.	Radium 226, pci/L	20	01-07-05
	Counting Error, pci/L	+/- 1	

Analysts: Nixon & Moore
Calibration: Alpha - Th230 Beta - Cs137

*Note: EPA Method 900.0 is a drinking water screening procedure. Its application to waters of high total dissolved solids may result in unacceptably high counting errors due to limitation on sample size. Recommended max is 500 mg/L.

Alternate method for determining activity may be considered.

Lab. No. M42-5118

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S2-4

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
January 10, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Rosita
S.W. 4th Qtr.
Crews Large Pond
12-20-04

Method Number			Analysis Date
150.1	pH ---------------	8.09	12-21-04
120.1	Specific Conductance	3740 umhos/cm @ 25 Deg.C.	12-21-04
D2907-83	Uranium, mg/L ---------------------------	0.013	12-21-04
900.0	*Gross Alpha Activity, pci/L ------------	45	12-22-04
	Counting Error, pci/L ------------	+/- 13	
900.0.	*Gross Beta Activity, pci/L -------------	36	12-22-04
	Counting Error, pci/L ------------	+/- 7	
7500-Ra C.	Radium 226, pci/L ----------------------	10	01-07-05
	Counting Error, pci/L ------------	+/- 1	

Analysts: Nixon & Moore
Calibration: Alpha - Th230 Beta - Cs137

*Note: EPA Method 900.0 is a drinking water screening procedure. Its application to waters of high total dissolved solids may result in unacceptably high counting errors due to limitation on sample size. Recommended max is 500 mg/L.

Alternate method for determining activity may be considered.

Lab. No. M42-5119

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S2-4

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2234
1330 2-1-05
pH 7.57 EC 4440

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH ---------------- 7.57		Merks	02-07-05
		mg/L		
215.1	Calcium ------------------------	108	Merks	02-22-05
273.1	Sodium -------------------------	619	Merks	02-22-05
258.1	Potassium ----------------------	28	Merks	02-22-05
310.1	Carbonate ----------------------	0	Merks	02-07-05
310.1	Bicarbonate --------------------	310	Merks	02-07-05
375.3	Sulfate ------------------------	201	Merks	02-16-05
4500-Cl⁻ B.	Chloride -----------------------	1040	Merks	02-16-05
3111 D.	Silica -------------------------	57	Allen	02-16-05
206.3	Arsenic ------------------------	0.057	Allen	02-10-05
243.1	Manganese ----------------------	0.04	Allen	02-23-05
246.1	Molybdenum ---------------------	<0.1	Allen	02-23-05
270.3	Selenium -----------------------	0.002	Allen	02-10-05
D2907-83	Uranium ------------------------	0.055	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity -----------	465	*	02-07-05
	Counting Error ----------- +/-	77		
900.0	Gross Beta Activity ------------	148	*	02-07-05
	Counting Error ----------- +/-	35		
7500-Ra C.	Radium 226 ---------------------	174	Nixon	02-18-05
	Counting Error ----------- +/-	4		
903.1	**Radon 222 --------------------	191000	Nixon	02-03-05
	Counting Error ----------- +/-	985		

Lab. No. M43-440

*Analysts: Nixon/Moore
**Note: Value reflects Radon 222 content at time of sampling.

Signed:
Carl F. Crownover, Pres.

form: S1-44

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CORPUS CHRISTI, TEXAS
February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2271
1335 2-1-05
pH 7.12 EC 5300

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.31	Merks	02-07-05
		mg/L		
215.1	Calcium	200	Merks	02-22-05
273.1	Sodium	700	Merks	02-22-05
258.1	Potassium	32	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	451	Merks	02-07-05
375.3	Sulfate	676	Merks	02-16-05
4500-Cl~ B.	Chloride	1100	Merks	02-16-05
3111 D.	Silica	64	Allen	02-16-05
206.3	Arsenic	0.073	Allen	02-10-05
243.1	Manganese	0.08	Allen	02-23-05
246.1	Molybdenum	3.5	Allen	02-23-05
270.3	Selenium	0.006	Allen	02-10-05
D2907-83	Uranium	0.127	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	296	*	02-07-05
	Counting Error +/-	65		
900.0	Gross Beta Activity	150	*	02-07-05
	Counting Error +/-	34		
7500-Ra C.	Radium 226	79	Nixon	02-18-05
	Counting Error +/-	3		
903.1	**Radon 222	257000	Nixon	02-03-05
	Counting Error +/-	1120		

Lab. No. M43-441

*Analysts: Nixon/Moore
**Note: Value reflects Radon 222 content at time of sampling.

Signed: ____________
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CORPUS CHRISTI, TEXAS
February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2533
1340 2-1-05
pH 7.63 EC 4310

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.52	Merks	02-07-05
		mg/L		
215.1	Calcium	113	Merks	02-22-05
273.1	Sodium	606	Merks	02-22-05
258.1	Potassium	28	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	323	Merks	02-07-05
375.3	Sulfate	217	Merks	02-16-05
4500-Cl~ B.	Chloride	1040	Merks	02-16-05
3111 D.	Silica	58	Allen	02-16-05
206.3	Arsenic	0.046	Allen	02-10-05
243.1	Manganese	0.62	Allen	02-23-05
246.1	Molybdenum	0.1	Allen	02-23-05
270.3	Selenium	0.043	Allen	02-10-05
D2907-83	Uranium	0.020	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	3240	*	02-07-05
	Counting Error +/-	188		
900.0	Gross Beta Activity	747	*	02-07-05
	Counting Error +/-	68		
7500-Ra C.	Radium 226	2480	Nixon	02-18-05
	Counting Error +/-	15		
903.1	**Radon 222	41200	Nixon	02-03-05
	Counting Error +/-	442		

Lab. No. M43-442

*Analysts: Nixon/Moore
**Note: Value reflects Radon 222 content at time of sampling.

Signed:
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CORPUS CHRISTI, TEXAS
February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2535
1345 2-1-05
pH 7.69 EC 4250

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.64	Merks	02-07-05
		mg/L		
215.1	Calcium	108	Merks	02-22-05
273.1	Sodium	619	Merks	02-22-05
258.1	Potassium	27	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	307	Merks	02-07-05
375.3	Sulfate	208	Merks	02-16-05
4500-Cl⁻ B.	Chloride	1050	Merks	02-16-05
3111 D.	Silica	56	Allen	02-16-05
206.3	Arsenic	0.034	Allen	02-10-05
243.1	Manganese	0.04	Allen	02-23-05
246.1	Molybdenum	<0.1	Allen	02-23-05
270.3	Selenium	0.025	Allen	02-10-05
D2907-83	Uranium	0.026	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	997	*	02-07-05
	Counting Error +/-	109		
900.0	Gross Beta Activity	291	*	02-07-05
	Counting Error +/-	48		
7500-Ra C.	Radium 226	226	Nixon	02-18-05
	Counting Error +/-	5		
903.1	**Radon 222	244000	Nixon	02-03-05
	Counting Error +/-	1100		

Lab. No. M43-443

*Analysts: Nixon/Moore
**Note: Value reflects Radon 222 content at time of sampling.

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CORPUS CHRISTI, TEXAS
February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2549
1340 2-1-05
pH 7.64 EC 4070

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.60	Merks	02-07-05
		mg/L		
215.1	Calcium	100	Merks	02-22-05
273.1	Sodium	575	Merks	02-22-05
258.1	Potassium	27	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	318	Merks	02-07-05
375.3	Sulfate	193	Merks	02-16-05
4500-Cl⁻ B.	Chloride	962	Merks	02-16-05
3111 D.	Silica	55	Allen	02-16-05
206.3	Arsenic	0.040	Allen	02-10-05
243.1	Manganese	0.17	Allen	02-23-05
246.1	Molybdenum	<0.1	Allen	02-23-05
270.3	Selenium	0.002	Allen	02-10-05
D2907-83	Uranium	0.011	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	867	*	02-07-05
	Counting Error +/-	98		
900.0	Gross Beta Activity	205	*	02-07-05
	Counting Error +/-	43		
7500-Ra C.	Radium 226	534	Nixon	02-18-05
	Counting Error +/-	7		
903.1	**Radon 222	86600	Nixon	02-03-05
	Counting Error +/-	674		

Lab. No. M43-444

*Analysts: Nixon/Moore
**Note: Value reflects Radon 222 content at time of sampling.

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2550
1332 2-1-05
pH 6.85 EC 6420

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.18	Merks	02-07-05
		mg/L		
215.1	Calcium	356	Merks	02-22-05
273.1	Sodium	825	Merks	02-22-05
258.1	Potassium	39	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	600	Merks	02-07-05
375.3	Sulfate	1240	Merks	02-16-05
4500-Cl^- B.	Chloride	1310	Merks	02-16-05
3111 D.	Silica	72	Allen	02-16-05
206.3	Arsenic	0.097	Allen	02-10-05
243.1	Manganese	0.15	Allen	02-23-05
246.1	Molybdenum	9.2	Allen	02-23-05
270.3	Selenium	0.026	Allen	02-10-05
D2907-83	Uranium	0.246	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	1290	*	02-07-05
	Counting Error +/-	145		
900.0	Gross Beta Activity	369	*	02-07-05
	Counting Error +/-	49		
7500-Ra C.	Radium 226	308	Nixon	02-18-05
	Counting Error +/-	5		
903.1	**Radon 222	157000	Nixon	02-03-05
	Counting Error +/-	901		

Lab. No. M43-445

*Analysts: Nixon/Moore
**Note: Value reflects Radon 222 content at time of sampling.

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2552
1340 2-1-05
pH 7.56 EC 4340

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.33	Merks	02-07-05
		mg/L		
215.1	Calcium	105	Merks	02-22-05
273.1	Sodium	625	Merks	02-22-05
258.1	Potassium	29	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	312	Merks	02-07-05
375.3	Sulfate	206	Merks	02-16-05
4500-Cl~ B.	Chloride	1030	Merks	02-16-05
3111 D.	Silica	58	Allen	02-16-05
206.3	Arsenic	0.047	Allen	02-10-05
243.1	Manganese	0.05	Allen	02-23-05
246.1	Molybdenum	<0.1	Allen	02-23-05
270.3	Selenium	0.006	Allen	02-10-05
D2907-83	Uranium	0.016	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	322	*	02-07-05
	Counting Error +/-	63		
900.0	Gross Beta Activity	88	*	02-07-05
	Counting Error +/-	34		
7500-Ra C.	Radium 226	201	Nixon	02-18-05
	Counting Error +/-	4		
903.1	**Radon 222	101000	Nixon	02-03-05
	Counting Error +/-	700		

Lab. No. M43-446

*Analysts: Nixon/Moore
**Note: Value reflects Radon 222 content at time of sampling.

Signed: ______________________
Carl F. Crownover, Pres.

form: S1-44

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2208
1455 2-1-05
pH 7.95 EC 4210

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH --------------- 7.76		Merks	02-07-05
		mg/L		
215.1	Calcium	105	Merks	02-22-05
273.1	Sodium	625	Merks	02-22-05
258.1	Potassium	32	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	267	Merks	02-07-05
375.3	Sulfate	241	Merks	02-16-05
4500-Cl~ B.	Chloride	1020	Merks	02-16-05
3111 D.	Silica	53	Allen	02-16-05
206.3	Arsenic	0.200	Allen	02-10-05
243.1	Manganese	0.12	Allen	02-23-05
246.1	Molybdenum	0.3	Allen	02-23-05
270.3	Selenium	0.154	Allen	02-10-05
D2907-83	Uranium	3.22	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	2670	*	02-07-05
	Counting Error +/-	176		
900.0	Gross Beta Activity	712	*	02-07-05
	Counting Error +/-	68		
7500-Ra C.	Radium 226	105	Nixon	02-18-05
	Counting Error +/-	3		

Lab. No. M43-447

*Analysts: Nixon/Moore

Signed: ______________________
Carl F. Crownover, Pres.

form: S1-44

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2219
---- 2-1-05
pH 7.74 EC 4430

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH 7.82		Merks	02-07-05
		mg/L		
215.1	Calcium	105	Merks	02-22-05
273.1	Sodium	650	Merks	02-22-05
258.1	Potassium	28	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	298	Merks	02-07-05
375.3	Sulfate	219	Merks	02-16-05
4500-Cl^- B.	Chloride	1110	Merks	02-16-05
3111 D.	Silica	57	Allen	02-16-05
206.3	Arsenic	0.027	Allen	02-10-05
243.1	Manganese	0.25	Allen	02-23-05
246.1	Molybdenum	0.1	Allen	02-23-05
270.3	Selenium	0.021	Allen	02-10-05
D2907-83	Uranium	0.110	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	1050	*	02-07-05
	Counting Error +/-	114		
900.0	Gross Beta Activity	287	*	02-07-05
	Counting Error +/-	45		
7500-Ra C.	Radium 226	485	Nixon	02-18-05
	Counting Error +/-	7		

Lab. No. M43-448

*Analysts: Nixon/Moore

Signed: ____________________
Carl F. Crownover, Pres.

form: S1-44

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CORPUS CHRISTI, TEXAS
February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2321
1308 2-1-05
pH 7.47 EC 4530

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.87	Merks	02-07-05
		mg/L		
215.1	Calcium	120	Merks	02-22-05
273.1	Sodium	638	Merks	02-22-05
258.1	Potassium	28	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	331	Merks	02-07-05
375.3	Sulfate	188	Merks	02-16-05
4500-Cl⁻ B.	Chloride	1150	Merks	02-16-05
3111 D.	Silica	58	Allen	02-16-05
206.3	Arsenic	0.018	Allen	02-10-05
243.1	Manganese	0.86	Allen	02-23-05
246.1	Molybdenum	0.1	Allen	02-23-05
270.3	Selenium	0.062	Allen	02-10-05
D2907-83	Uranium	0.170	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	1570	*	02-07-05
	Counting Error +/-	138		
900.0	Gross Beta Activity	348	*	02-07-05
	Counting Error +/-	50		
7500-Ra C.	Radium 226	945	Nixon	02-18-05
	Counting Error +/-	9		

Lab. No. M43-450

*Analysts: Nixon/Moore

Signed: CFC
Carl F. Crownover, Pres.

form: S1-44

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2323
---- 2-1-05
pH 7.86 EC 4220

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.68	Merks	02-07-05
		mg/L		
215.1	Calcium	113	Merks	02-22-05
273.1	Sodium	631	Merks	02-22-05
258.1	Potassium	35	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	295	Merks	02-07-05
375.3	Sulfate	222	Merks	02-16-05
4500-Cl~ B.	Chloride	1070	Merks	02-16-05
3111 D.	Silica	57	Allen	02-16-05
206.3	Arsenic	0.046	Allen	02-10-05
243.1	Manganese	0.05	Allen	02-23-05
246.1	Molybdenum	0.2	Allen	02-23-05
270.3	Selenium	0.014	Allen	02-10-05
D2907-83	Uranium	0.140	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	451	*	02-07-05
	Counting Error +/-	74		
900.0	Gross Beta Activity	162	*	02-07-05
	Counting Error +/-	39		
7500-Ra C.	Radium 226	174	Nixon	02-18-05
	Counting Error +/-	4		

Lab. No. M43-451

*Analysts: Nixon/Moore

Signed: ______________
Carl F. Crownover, Pres.

form: S1-44

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2509
1510 2-1-05
pH 7.72 EC 4580

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH	7.76	Merks	02-07-05
		mg/L		
215.1	Calcium	130	Merks	02-22-05
273.1	Sodium	650	Merks	02-22-05
258.1	Potassium	30	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	294	Merks	02-07-05
375.3	Sulfate	219	Merks	02-16-05
4500-Cl~ B.	Chloride	1150	Merks	02-16-05
3111 D.	Silica	54	Allen	02-16-05
206.3	Arsenic	0.055	Allen	02-10-05
243.1	Manganese	0.07	Allen	02-23-05
246.1	Molybdenum	0.1	Allen	02-23-05
270.3	Selenium	0.014	Allen	02-10-05
D2907-83	Uranium	1.15	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	1460	*	02-07-05
	Counting Error +/-	131		
900.0	Gross Beta Activity	314	*	02-07-05
	Counting Error +/-	50		
7500-Ra C.	Radium 226	196	Nixon	02-18-05
	Counting Error +/-	4		

Lab. No. M43-452

*Analysts: Nixon/Moore

Signed: ______________________
Carl F. Crownover, Pres.

form: S1-44

TEL. 361-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
February 24, 2005

URI, INC.
650 S. Edmonds Lane, Suite 108
Lewisville, Texas 75067

Report of Analysis

Identification: Vasquez
#2510
1510 2-1-05
pH 7.74 EC 4380

Constituents as Ions

Method Number			Analyst	Analysis Date
150.1	pH ------------------ 7.62		Merks	02-07-05
		mg/L		
215.1	Calcium	114	Merks	02-22-05
273.1	Sodium	650	Merks	02-22-05
258.1	Potassium	30	Merks	02-22-05
310.1	Carbonate	0	Merks	02-07-05
310.1	Bicarbonate	294	Merks	02-07-05
375.3	Sulfate	231	Merks	02-16-05
4500-Cl⁻ B.	Chloride	1080	Merks	02-16-05
3111 D.	Silica	54	Allen	02-16-05
206.3	Arsenic	0.126	Allen	02-10-05
243.1	Manganese	0.08	Allen	02-23-05
246.1	Molybdenum	0.3	Allen	02-23-05
270.3	Selenium	0.005	Allen	02-10-05
D2907-83	Uranium	0.110	Moore	02-22-05
		pci/L		
900.0	Gross Alpha Activity	139	*	02-07-05
	Counting Error +/-	42		
900.0	Gross Beta Activity	65	*	02-07-05
	Counting Error +/-	27		
7500-Ra C.	Radium 226	64	Nixon	02-18-05
	Counting Error +/-	3		

Lab. No. M43-453

*Analysts: Nixon/Moore

Signed: ______________________
Carl F. Crownover, Pres.

form: S1-44

ATTACHMENT I

65

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

JUL 17 1998

Mr. Jeff Saitas
Executive Director
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Dear Mr. Saitas:

I am pleased to inform you EPA Region 6 has approved the Texas Natural Resource Conservation Commission's (TNRCC) revision request to exempt portions of two aquifers for the purposes of uranium mining. These exemptions are specific to:

1) that portion of the Oakville Sandstone Formation, underlying approximately 842 acres, at a depth of 150 to 210 feet subsurface, ten miles south-southeast of the City of Bruni in Duval County, Texas (a. k. a. the Vasquez Project); and

2) that portion of the Goliad Formation, underlying approximately 70 acres, at a depth of 140 to 260 feet subsurface, 11 miles northwest of the City of San Diego in Duval County, Texas (a. k. a. the Rosita Project).

The areal extent of the Vasquez and Rosita projects' exemptions are specifically defined in the Uranium Resources Incorporated (URI) applications as initially conveyed by TNRCC to Region 6 on September 17, 1997, and February 4, 1998, respectively. The Rosita Project is an extension to an exemption approved by Region 6 in October, 1988. Region 6 has approved these exemptions as non-substantial revisions to the TNRCC's Underground Injection Control program.

These approvals are based upon the criteria stipulated in Title 40 of the Code of Federal Regulations §146.4; wherein a portion of an aquifer may be exempted if: (a) that portion does not currently serve as a source of drinking water; and (b) it cannot now and will not, in the future, serve as a source of drinking water, because the aquifer is mineral producing or can be shown to contain minerals that are expected to be commercially producible. The record shows that these criteria have been met.

These exemptions apply only to the injection of fluids into those portions of the Oakville Sandstone and Goliad Formations as proposed in the applications. Injection of other fluids (e. g. hazardous wastes) or injection of fluids into other formations that qualify as underground sources of drinking water would require additional approval.

If you have any questions concerning this approval, please contact me or have your staff contact Larry Wright, Chief, Source Water Protection Branch at (214) 665-7150.

Sincerely yours,

Joan E. Brown
William B. Hathaway
Director
Water Quality Protection Division

cc: Ms. Alice Rogers
Texas Natural Resource Conservation Commission
Mr. John Santos
Texas Natural Resource Conservation Commission

Dick

file

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
ALLIED BANK TOWER AT FOUNTAIN PLACE
1445 ROSS AVENUE
DALLAS, TEXAS 75202

May 15, 1987

Mr. Larry R. Soward
Executive Director
Texas Water Commission
P.O. Box 13087, Capitol Station
Austin, TX 78711

Dear Mr. Soward:

I am pleased to inform you of EPA approval of your request to exempt a portion of the Goliad Formation from the Underground Injection Control (UIC) program requirement that no fluid may be injected into an Underground Source of Drinking Water (USDW). This approval is based upon the criteria stipulated in 40 CFR 144.7(b), 145.32, and 146.02 containing regulations allowing an aquifer to be exempted if: (a) it is not currently used as a drinking water supply, and (b) it cannot be used as a drinking water source in the future because it is mineral producing or can be shown by a permit applicant to contain minerals that are expected to be commercially producible. This approval allows injection for in-situ uranium mining only. If injection for other purposes (e.g., hazardous waste disposal) is planned into this aquifer, additional approval will be needed.

The approved exempted aquifer underlies the Uranium Resources, Incorporated, Kingsville Dome Mines Site, and is limited to the Upper Goliad Formation. A detailed description of the exempted aquifer remains as described in your April 15, 1986 and February 11, 1987, submittals.

If you have any questions concerning this approval, please contact me or have your staff contact John H. Walker at (214) 655-7160. Thank you for your continued cooperation.

Sincerely yours,

Robert E. Layton Jr., P. E.
Regional Administrator

RECEIVED
MAY 20 1987
[illegible] SOLID
WASTE DIVISION

RECEIVED
MAY 29 1987

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

July 1, 1994

REPLY TO: 6W-SU

Mr. Anthony C. Grigsby
Executive Director
Texas Natural Resource Conservation
Commission
P.O. Box 13087
Austin, TX 78711-3087

Dear Mr. Grigsby:

I am pleased to inform you of EPA approval of your request for an aquifer exemption extension for a portion of the Goliad Formation from the Underground Injection Control (UIC) program requirement that no fluid may be injected into an Underground Source of Drinking Water (USDW). This approval is based upon the criteria stipulated in 40 CFR §144.7(b) & (c)(1), §145.32, and §146.4 containing regulations allowing an aquifer to be exempted if: (a) It does not currently serve as a source of drinking water; and (b) it cannot be used as a drinking water source in the future because it is mineral producing or can be shown by a permit applicant to contain minerals that are expected to be commercially producible. This approval will allow injection for in-situ uranium mining only. If injection for other purposes (e.g. hazardous waste) is planned into this aquifer, additional approval will be needed.

The approved exempted portion of the aquifer underlies the Uranium Resources, Inc. Kingsville Dome Project in Kleberg County and is limited to the Upper Goliad Formation. A detailed description of the exempted portion of the aquifer remains in the exemption extension request and subsequent comment letters.

We recommend that in future Production Area Authorization (PAA) actions that closer monitor well spacing and more frequent monitor well sampling be incorporated in PAA's that are in closer proximity to private water wells located in the buffer zone.

RECEIVED
JUL 7 1994
UIC, URANIUM, AND
RADIOACTIVE WASTE

If you have any questions concerning this approval, please contact me or have your staff contact Brian Graves at (214) 655-7193. Thank you for your continued cooperation.

Sincerely Yours,

J T Ferguson for

Myron O. Knudson, P.E.
Director
Water Management Division (6W)

cc: Alice Hamilton Rogers (TNRCC)

ATTACHMENT J

Monitor Well Ring

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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-29

PERMIT NO.               WELL NO.KVD MW22   SAMPLE NO.29
PROD.AREA NO.            SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC               MINE:

SMP |    DATE  | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |          |     |      |                 | NORMAL WATER LEVEL:             MSL
 2  |          |     |      |                 | PUMP:SET@:          MSL;        GPM
 3  |          |     |      |                 | BOT.OF:CASING        SCR        (MSL)
 4  |          |     |      |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-15-87                       DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET     MG/L      F          EPM       ECF    (C)X(D)    % EPM
                               (A)      (B)         (C)       (D)
CALCIUM     (CA)     00915  27.9     =20.04X  1.39       X52.0=  72           8.70
MAGNESIUM   (MG)     00925  5.19     =12.16X  .43        X46.6=  20           2.70
SODIUM      (NA)     00929  322      =22.99X  14.01      X48.9=  685         87.60
POTASSIUM    (K)     00937  6.38     =39.10X  .16        X72.0=  12           1.00
                              TOTAL CATION = 15.99

CARBONATE (CO3)      00445  45       =30.00X  1.5        X84.6=  127          9.60
BICARB.   (HCO3)     00440  273      =61.02X  4.47       X43.6=  195         28.70
SULFATE    (SO4)     00945  194      =48.03X  4.04       X73.9=  298         25.90
CHLORIDE   (CL)      00940  197      =35.45X  5.56       X75.9=  422         35.70
NITRATE (NO3-N)      71851  .32                         TOTAL =  1831
FLUORIDE    (F)      00951  .57
SILICA   (SIO2)      00955  18.3
                              TOTAL ANION  = 15.57

      TOTAL ION             1089.66
TDS (180 C)          70300  928
TDS =TI-.5 HCO3          =  953                          ACCURACY CHECK
EC   (25 C)          00095  1630    UMHOS               ION    1.03      0.96 TO 1.04
EC   (DILUTE)= 99 X 18   =  1780    UMHOS               TDS    0.97      0.90 TO 1.10
ALK. AS CACO3        00410  299                         EC     0.97      0.95 TO 1.05
PH                   00403  8.83

                              % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
           CA                       *        *              HCO3
                 |****|****|****|****|****|****|****|****|
           MG                        *      *               SO4
                 |****|****|****|****|****|****|****|****|
           NA+K*                                 *          CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                ITEM          MG/L              ITEM         MG/L
ARSENIC   (AS) 0.003           MANGANESE(MN) <0.01          URANIUM    (U) 0.061
CADMIUM   (CD) 0.02            MERCURY   (HG) <0.001        AMMONIA-N      0.18
IRON      (FE) <0.01           MOLY.     (MO) <0.01         RA 226(PCI/L)  9.02
LEAD      (PB) <0.02           SELENIUM  (SE) 0.002                   +/-  1.08

REMARKS:                                                    CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-25

PERMIT NO.              WELL NO.KVD MW18   SAMPLE NO.25
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC              MINE:

SMP |   DATE  | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:               MSL
 2  |         |     |     |                 | PUMP:SET@:           MSL;         GPM
 3  |         |     |     |                 | BOT.OF:CASING        SCR         (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:               MSL

DATE RECEIVED:  10-15-87                     DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM      ECF    (C)X(D)    % EPM
                              (A)     (B)        (C)      (D)
CALCIUM     (CA)     00915   13      =20.04X   .65       X52.0=  34          4.20
MAGNESIUM   (MG)     00925   4.47    =12.16X   .37       X46.6=  17          2.40
SODIUM      (NA)     00929   326     =22.99X   14.18     X48.9=  693        92.30
POTASSIUM    (K)     00937   6.55    =39.10X   .17       X72.0=  12          1.10
                               TOTAL CATION = 15.37

CARBONATE (CO3)      00445   36      =30.00X   1.2       X84.6=  102         8.00
BICARB.   (HCO3)     00440   227     =61.02X   3.72      X43.6=  162        24.90
SULFATE    (SO4)     00945   198     =48.03X   4.12      X73.9=  305        27.60
CHLORIDE    (CL)     00940   209     =35.45X   5.9       X75.9=  447        39.50
NITRATE (NO3-N)      71851   .69                        TOTAL =  1772
FLUORIDE     (F)     00951   .56
 ILICA    (SIO2)     00955   18.3
                               TOTAL ANION  = 14.94

      TOTAL ION              1039.57
TDS (180 C)          70300   916
TDS =TI-.5 HCO3            = 926                           ACCURACY CHECK
EC  (25 C)           00095   1570    UMHOS            ION    1.03       0.96 TO 1.04
EC  (DILUTE)= 94 X 18      = 1690    UMHOS            TDS    0.99       0.90 TO 1.10
ALK. AS CACO3        00410   246                      EC     0.95       0.95 TO 1.05
PH                   00403   9.16

                               % CATION   % ANION
                  80   60   40   20    0    20   40   60   80
                   |****|****|****|****|****|****|****|****|
              CA                      *     *                  HCO3
                   |****|****|****|****|****|****|****|****|
              MG                      *      *                 SO4
                   |****|****|****|****|****|****|****|****|
              NA+K*                             *              CL
                   |****|****|****|****|****|****|****|****|
                  80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM          MG/L             ITEM          MG/L
ARSENIC   (AS) 0.004          MANGANESE(MN) <0.01           URANIUM    (U) 0.030
 ADMIUM   (CD) 0.01           MERCURY   (HG) <0.001         AMMONIA-N      0.02
IRON      (FE) 0.02           MOLY.     (MO) <0.01          RA 226(PCI/L)  2.06
LEAD      (PB) <0.02          SELENIUM  (SE) 0.003                   +/-   0.38

REMARKS:                                                    CHECKED BY: DJJ/RKP

CL:RP-0583    TDWR-0678 (REV. 4-6-83)                    ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-24

PERMIT NO.              WELL NO.KVD MW17   SAMPLE NO.24
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC              MINE:

SMP |    DATE  | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                  UMHOS
 1  |          |     |     |                 | NORMAL WATER LEVEL:               MSL
 2  |          |     |     |                 | PUMP:SET@:          MSL;          GPM
 3  |          |     |     |                 | BOT.OF:CASING          SCR        (MSL)
 4  |          |     |     |                 | LAND SURFACE DATUM:               MSL

DATE RECEIVED:  10-15-87                     DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM            STORET    MG/L      F         EPM       ECF    (C)X(D)    % EPM
                                (A)      (B)        (C)       (D)
CALCIUM     (CA)       00915  22.8    =20.04X  1.14       X52.0=  59          7.10
MAGNESIUM   (MG)       00925  4.74    =12.16X  .39        X46.6=  18          2.40
SODIUM      (NA)       00929  331     =22.99X  14.4       X48.9=  704        89.60
POTASSIUM   (K)        00937  5.92    =39.10X  .15        X72.0=  11          0.90
                               TOTAL CATION = 16.08

CARBONATE (CO3)        00445  30      =30.00X  1          X84.6=  85          6.20
BICARB.   (HCO3)       00440  266     =61.02X  4.36       X43.6=  190        27.10
SULFATE   (SO4)        00945  228     =48.03X  4.75       X73.9=  351        29.50
CHLORIDE  (CL)         00940  212     =35.45X  5.98       X75.9=  454        37.20
NITRATE (NO3-N)        71851  .46                        TOTAL =  1872
FLUORIDE    (F)        00951  .53
SILICA    (SIO2)       00955  18.5
                               TOTAL ANION  = 16.09

      TOTAL ION               1119.95
TDS (180 C)            70300  970
TDS =TI-.5 HCO3           =   987                         ACCURACY CHECK
EC   (25 C)            00095  1670    UMHOS          ION    1.00      0.96 TO 1.04
EC   (DILUTE)= 99 X 18.18= 1800    UMHOS             TDS    0.98      0.90 TO 1.10
ALK. AS CACO3          00410  269                    EC     0.96      0.95 TO 1.05
PH                     00403  8.66

                              % CATION   % ANION
                   80    60    40    20     0    20    40    60    80
                    |****|****|****|****|****|****|****|****|
               CA                        *        *               HCO3
                    |****|****|****|****|****|****|****|****|
               MG                         *       *               SO4
                    |****|****|****|****|****|****|****|****|
               NA+K*                                *             CL
                    |****|****|****|****|****|****|****|****|
                   80    60    40    20     0    20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM          MG/L                ITEM          MG/L              ITEM            MG/L
ARSENIC   (AS) 0.010            MANGANESE(MN) 0.01           URANIUM    (U) 0.045
CADMIUM   (CD) 0.01             MERCURY   (HG) <0.001        AMMONIA-N       0.12
IRON      (FE) <0.01            MOLY.     (MO) <0.01         RA 226(PCI/L) 2.15
LEAD      (PB) <0.02            SELENIUM  (SE) <0.001                  +/-   0.38

REMARKS:                                                     CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-31

PERMIT NO.           WELL NO.KVD MW25   SAMPLE NO.31
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
COMPANY:URANIUM RESOURCES INC           MINE:

SMP |    DATE | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |         |     |      |                 | NORMAL WATER LEVEL:             MSL
 2  |         |     |      |                 | PUMP:SET@:          MSL;        GPM
 3  |         |     |      |                 | BOT.OF:CASING        SCR        (MSL)
 4  |         |     |      |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-15-87                  DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F        EPM      ECF    (C)X(D)    % EPM
                              (A)     (B)       (C)      (D)
CALCIUM    (CA)      00915  25.5    =20.04X  1.27      X52.0=  66          7.60
MAGNESIUM  (MG)      00925  5.15    =12.16X  .42       X46.6=  20          2.50
SODIUM     (NA)      00929  342     =22.99X  14.88     X48.9=  727        88.80
POTASSIUM  (K)       00937  6.9     =39.10X  .18       X72.0=  13          1.10
                              TOTAL CATION = 16.75

CARBONATE (CO3)      00445  51      =30.00X  1.7       X84.6=  144        10.60
BICARB.  (HCO3)      00440  236     =61.02X  3.87      X43.6=  169        24.10
SULFATE    (SO4)     00945  219     =48.03X  4.56      X73.9=  337        28.40
CHLORIDE   (CL)      00940  210     =35.45X  5.92      X75.9=  450        36.90
NITRATE (NO3-N)      71851< .1                        TOTAL =  1926
FLUORIDE    (F)      00951  .58
SILICA   (SIO2)      00955  19.7
                              TOTAL ANION  = 16.05

      TOTAL ION             1115.93
TDS (180 C)          70300  960
TDS =TI-.5 HCO3         =   998                         ACCURACY CHECK
EC  (25 C)           00095  1670   UMHOS           ION   1.04      0.96 TO 1.04
EC  (DILUTE)= 103X 18   =   1850   UMHOS           TDS   0.96      0.90 TO 1.10
ALK. AS CACO3        00410  279                    EC    0.96      0.95 TO 1.05
PH                   00403  9.11

                               % CATION    % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                   *       *                 HCO3
                 |****|****|****|****|****|****|****|****|
            MG                    *       *                SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                           *              CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM          MG/L               ITEM          MG/L               ITEM          MG/L
ARSENIC   (AS) 0.002          MANGANESE(MN) 0.01            URANIUM    (U) 0.014
CADMIUM   (CD) 0.01           MERCURY   (HG) <0.001         AMMONIA-N      0.14
IRON      (FE) 0.02           MOLY.     (MO) <0.01          RA 226(PCI/L)  5.21
LEAD      (PB) <0.02          SELENIUM  (SE) 0.001                    +/-  0.86

REMARKS:                                                    CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-30

PERMIT NO.             WELL NO.KVD MW23   SAMPLE NO.30
PROD.AREA NO.          SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
COMPANY:URANIUM RESOURCES INC             MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:             MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL;        GPM
 3  |         |     |     |                 | BOT.OF:CASING         SCR      (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-15-87                  DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM         STORET    MG/L      F        EPM      ECF     (C)X(D)    % EPM
                             (A)      (B)       (C)      (D)
CALCIUM     (CA)    00915  19.1    =20.04X  .95        X52.0=  50          5.90
MAGNESIUM   (MG)    00925  4.7     =12.16X  .39        X46.6=  18          2.40
SODIUM      (NA)    00929  335     =22.99X  14.57      X48.9=  713        90.80
POTASSIUM    (K)    00937  5.14    =39.10X  .13        X72.0=  9           0.80
                             TOTAL CATION = 16.04

CARBONATE (C03)     00445  21      =30.00X  .7         X84.6=  59          4.50
BICARB.   (HC03)    00440  325     =61.02X  5.33       X43.6=  232        34.20
SULFATE    (S04)    00945  194     =48.03X  4.04       X73.9=  298        25.90
CHLORIDE    (CL)    00940  196     =35.45X  5.53       X75.9=  420        35.40
NITRATE (N03-N)     71851< .1                         TOTAL =  1799
 LUORIDE     (F)    00951  .65
SILICA   (SI02)     00955  17.5
                             TOTAL ANION  = 15.6

      TOTAL ION            1118.19
TDS (180 C)         70300  968
TDS =TI-.5 HC03          = 956                             ACCURACY CHECK
EC   (25 C)         00095  1630   UMHOS               ION   1.03       0.96 TO 1.04
EC   (DILUTE)= 99 X 18   = 1780   UMHOS               TDS   1.01       0.90 TO 1.10
ALK. AS CAC03       00410  301                        EC    0.99       0.95 TO 1.05
PH                  00403  8.7

                            % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *         *            HC03
                 |****|****|****|****|****|****|****|****|
            MG                      *      *               S04
                 |****|****|****|****|****|****|****|****|
            NA+K*                             *            CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM          MG/L              ITEM          MG/L
 RSENIC   (AS) 0.001            MANGANESE(MN) 0.01          URANIUM    (U) 0.007
CADMIUM   (CD) 0.01             MERCURY   (HG) <0.001       AMMONIA-N      0.18
IRON      (FE) 0.01             MOLY.     (MO) 0.02         RA 226(PCI/L) 1.06
LEAD      (PB) <0.02            SELENIUM (SE) 0.002                   +/-  0.39

REMARKS:                                                    CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-42

PERMIT NO.              WELL NO.KVD MW24   SAMPLE NO.42
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:        ,BY:
OMPANY:URANIUM RESOURCES INC               MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:               UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:            MSL
 2  |        |     |     |                 | PUMP:SET@:         MSL;        GPM
 3  |        |     |     |                 | BOT.OF:CASING       SCR        (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:            MSL

DATE RECEIVED:  10-17-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM       ECF     (C)X(D)    % EPM
                              (A)     (B)        (C)       (D)
CALCIUM    (CA)      00915  5.15    =20.04X   .26       X52.0=   13          1.70
MAGNESIUM  (MG)      00925  3.81    =12.16X   .31       X46.6=   15          2.00
SODIUM     (NA)      00929  341     =22.99X   14.83     X48.9=   725        94.90
POTASSIUM   (K)      00937  8.58    =39.10X   .22       X72.0=   16          1.40
                               TOTAL CATION = 15.62

CARBONATE (CO3)      00445  61      =30.00X   2.03      X84.6=   172        13.00
BICARB.   (HCO3)     00440  142     =61.02X   2.33      X43.6=   101        14.90
SULFATE    (SO4)     00945  191     =48.03X   3.98      X73.9=   294        25.40
CHLORIDE    (CL)     00940  259     =35.45X   7.31      X75.9=   555        46.70
NITRATE (NO3-N)      71851< .02                         TOTAL =  1891
LUORIDE     (F)      00951  .49
ILICA   (SIO2)       00955  18.2
                               TOTAL ANION  = 15.65

     TOTAL ION              1030.25
TDS (180 C)         70300   1000
TDS =TI-.5 HCO3         =   959                          ACCURACY CHECK
EC   (25 C)         00095   1670    UMHOS           ION    1.00       0.96 TO 1.04
EC   (DILUTE)= 103X 18   =  1850    UMHOS           TDS    1.04       0.90 TO 1.10
ALK. AS CACO3       00410   219                     EC     0.98       0.95 TO 1.05
PH                  00403   9.5

                              % CATION    % ANION
                 80    60    40    20     0     20    40    60    80
                   |****|****|****|****|****|****|****|****|
             CA                              *   *            HCO3
                   |****|****|****|****|****|****|****|****|
             MG                             *      *          SO4
                   |****|****|****|****|****|****|****|****|
             NA+K*                                      *     CL
                   |****|****|****|****|****|****|****|****|
                 80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                ITEM        MG/L              ITEM          MG/L
 RSENIC    (AS) 0.002          MANGANESE(MN) <0.01          URANIUM     (U) 0.048
ADMIUM     (CD) <0.01          MERCURY   (HG) <0.001        AMMONIA-N       0.18
IRON       (FE) 0.02           MOLY.     (MO) 0.09          RA 226(PCI/L)  202
LEAD       (PB) <0.02          SELENIUM  (SE) 0.003                  +/-    0.38

REMARKS:                                                    CHECKED BY: DJJ/RKF
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-1

PERMIT NO.              WELL NO.KVD MW1    SAMPLE NO.1
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC              MINE: <0.001

SMP |    DATE  | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |          |     |      |                 | NORMAL WATER LEVEL:             MSL
 2  |          |     |      |                 | PUMP:SET@:          MSL;        GPM
 3  |          |     |      |                 | BOT.OF:CASING       SCR         (MSL)
 4  |          |     |      |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-09-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM           STORET     MG/L     F          EPM       ECF     (C)X(D)    % EPM
                                (A)     (B)         (C)       (D)
CALCIUM     (CA)     00915   19.8     =20.04X   .99       X52.0=   51          6.40
MAGNESIUM   (MG)     00925   4.98     =12.16X   .41       X46.6=   19          2.60
SODIUM      (NA)     00929   320      =22.99X   13.92     X48.9=   681        89.70
POTASSIUM   (K)      00937   8        =39.10X   .2        X72.0=   15          1.30
                               TOTAL CATION = 15.52

CARBONATE (CO3)      00445   9        =30.00X   .3        X84.6=   25          1.90
BICARB.   (HCO3)     00440   312      =61.02X   5.11      X43.6=   223        32.30
SULFATE   (SO4)      00945   209      =48.03X   4.35      X73.9=   322        27.50
CHLORIDE  (CL)       00940   214      =35.45X   6.04      X75.9=   458        38.20
NITRATE (NO3-N)      71851<  .02                         TOTAL =   1794
FLUORIDE    (F)      00951   .59
SILICA    (SIO2)     00955   17.5
                               TOTAL ANION  = 15.8

      TOTAL ION              1114.89
TDS (180 C)          70300   956
TDS =TI-.5 HCO3          =   959                             ACCURACY CHECK
EC  (25 C)           00095   1584    UMHOS              ION    0.98      0.96 TO 1.04
EC  (DILUTE)=      X     =   1730    UMHOS              TDS    1.00      0.90 TO 1.10
ALK. AS CACO3        00410   271                        EC     0.96      0.95 TO 1.05
PH                   00403   8.27

                               % CATION    % ANION
                80    60    40    20     0     20    40    60    80
                 |****|****|****|****|****|****|****|****|
            CA                     *         *                 HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *       *                  SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                              *               CL
                 |****|****|****|****|****|****|****|****|
                80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM         MG/L              ITEM          MG/L
ARSENIC   (AS) <0.01          MANGANESE(MN) <0.001        URANIUM    (U) 0.19
CADMIUM   (CD) <0.01          MERCURY   (HG) <0.01        AMMONIA-N      0.80
IRON      (FE) <0.02          MOLY.     (MO) 0.001        RA 226(PCI/L) 0.29
LEAD      (PB) 0.01           SELENIUM  (SE) 0.002                +/-

REMARKS:                                                 CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-2

PERMIT NO.              WELL NO.KVD MW2    SAMPLE NO.2
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC              MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:               UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:            MSL
 2  |        |     |     |                 | PUMP:SET@:          MSL;       GPM
 3  |        |     |     |                 | BOT.OF:CASING        SCR       (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:            MSL

DATE RECEIVED:  10-09-87                  DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F        EPM      ECF    (C)X(D)    % EPM
                              (A)     (B)       (C)      (D)
CALCIUM     (CA)     00915   26.1    =20.04X   1.3      X52.0=   68          6.10
MAGNESIUM   (MG)     00925   4.86    =12.16X   .4       X46.6=   19          2.50
SODIUM      (NA)     00929   326     =22.99X   14.18    X48.9=   693        88.30
POTASSIUM    (K)     00937   6.83    =39.10X   .17      X72.0=   13          1.10
                               TOTAL CATION = 16.05

CARBONATE (CO3)      00445   30      =30.00X   1        X84.6=   85          6.20
BICARB.   (HCO3)     00440   276     =61.02X   4.52     X43.6=   197        27.80
SULFATE    (SO4)     00945   224     =48.03X   4.66     X73.9=   345        28.70
CHLORIDE    (CL)     00940   215     =35.45X   6.06     X75.9=   460        37.30
NITRATE (NO3-N)      71851<  .1                        TOTAL =   1880
FLUORIDE     (F)     00951   .57
SILICA    (SIO2)     00955   17.4
                               TOTAL ANION  = 16.24

      TOTAL ION              1126.86
TDS (180 C)          70300   984
TDS =TI-.5 HCO3          =   989                          ACCURACY CHECK
EC   (25 C)          00095   1605    UMHOS             ION    0.99      0.96 TO 1.04
EC   (DILUTE)= 99 X 18.18=   1800    UMHOS             TDS    0.99      0.90 TO 1.10
ALK. AS CACO3        00410   276                       EC     0.96      0.95 TO 1.05
PH                   00403   8.7

                               % CATION    % ANION
                  80    60    40    20     0     20    40    60    80
                   |****|****|****|****|****|****|****|****|
              CA                        *        *               HCO3
                   |****|****|****|****|****|****|****|****|
              MG                         *       *               SO4
                   |****|****|****|****|****|****|****|****|
              NA+K*                                *             CL
                   |****|****|****|****|****|****|****|****|
                  80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM          MG/L                 ITEM          MG/L          ITEM            MG/L
 ARSENIC   (AS) 0.001           MANGANESE(MN) 0.01          URANIUM    (U) 0.002
CADMIUM    (CD) <0.01           MERCURY   (HG) <0.001       AMMONIA-N      0.14
IRON       (FE) <0.01           MOLY.     (MO) <0.01        RA 226(PCI/L)  0.63
LEAD       (PB) <0.02           SELENIUM  (SE) 0.002                  +/-  0.29

REMARKS:                                                    CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-3

PERMIT NO.               WELL NO.KVD MW3    SAMPLE NO.3
PROD.AREA NO.            SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC               MINE:

SMP |    DATE  | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |          |     |      |                 | NORMAL WATER LEVEL:              MSL
 2  |          |     |      |                 | PUMP:SET@:         MSL;          GPM
 3  |          |     |      |                 | BOT.OF:CASING      SCR           (MSL)
 4  |          |     |      |                 | LAND SURFACE DATUM:              MSL

DATE RECEIVED:  10-09-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

     ITEM          STORET    MG/L     F        EPM       ECF    (C)X(D)    % EPM
                             (A)     (B)       (C)       (D)
CALCIUM    (CA)     00915  26.4    =20.04X  1.32      X52.0=  69          7.80
MAGNESIUM  (MG)     00925  5.24    =12.16X  .43       X46.6=  20          2.50
SODIUM     (NA)     00929  346     =22.99X  15.05     X48.9=  736        88.70
POTASSIUM   (K)     00937  6.72    =39.10X  .17       X72.0=  12          1.00
                            TOTAL CATION = 16.97

CARBONATE (CO3)     00445  44      =30.00X  1.47      X84.6=  124         8.60
BICARB.  (HCO3)     00440  219     =61.02X  3.59      X43.6=  156        21.10
SULFATE   (SO4)     00945  257     =48.03X  5.35      X73.9=  395        31.40
CHLORIDE   (CL)     00940  235     =35.45X  6.63      X75.9=  503        38.90
NITRATE (NO3-N)     71851< .04                      TOTAL =  2015
FLUORIDE    (F)     00951  .53
SILICA   (SIO2)     00955  17
                            TOTAL ANION  = 17.04

     TOTAL ION             1156.93
TDS (180 C)        70300  1110
TDS =TI-.5 HCO3        =  1047                        ACCURACY CHECK
EC  (25 C)          00095  1725   UMHOS             ION    1.00     0.96 TO 1.04
EC  (DILUTE)=     X    =  1930   UMHOS             TDS    1.06     0.90 TO 1.10
ALK. AS CACO3       00410  253                      EC     0.96     0.95 TO 1.05
PH                  00403  8.6

                        % CATION   % ANION
               80   60   40   20    0    20   40   60   80
                |****|****|****|****|****|****|****|****|
            CA                      *    *                   HCO3
                |****|****|****|****|****|****|****|****|
            MG                       *      *                SO4
                |****|****|****|****|****|****|****|****|
            NA+K*                             *              CL
                |****|****|****|****|****|****|****|****|
               80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

      ITEM       MG/L              ITEM          MG/L          ITEM          MG/L
 ARSENIC   (AS) 0.001          MANGANESE(MN) <0.01         URANIUM   (U) 0.010
 [illegible]                   MERCURY  (HG) <0.001        AMMONIA-N     0.24
 [illegible]                   MOLY.    (MO) <0.01         RA 226(PCI/L) 1.17
 [illegible]                   SELENIUM (SE) 0.001                 +/-   0.36

REMARKS:                                                   CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-4

PERMIT NO.               WELL NO.KVD MW4    SAMPLE NO.4
PROD.AREA NO.            SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC               MINE:

SMP |    DATE  | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |          |     |      |                 | NORMAL WATER LEVEL:              MSL
 2  |          |     |      |                 | PUMP:SET@:          MSL;         GPM
 3  |          |     |      |                 | BOT.OF:CASING        SCR         (MSL)
 4  |          |     |      |                 | LAND SURFACE DATUM:              MSL

DATE RECEIVED:  10-09-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L      F         EPM       ECF     (C)X(D)    % EPM
                              (A)      (B)        (C)       (D)
CALCIUM    (CA)      00915  19.6    =20.04X  .98        X52.0=  51          6.40
MAGNESIUM  (MG)      00925  4.97    =12.16X  .41        X46.6=  19          2.70
SODIUM     (NA)      00929  318     =22.99X  13.83      X48.9=  676        89.90
POTASSIUM   (K)      00937  6.21    =39.10X  .16        X72.0=  11          1.00
                               TOTAL CATION = 15.38

CARBONATE (CO3)      00445  30      =30.00X  1          X84.6=  85          6.30
BICARB.   (HCO3)     00440  297     =61.02X  4.87       X43.6=  212        30.80
SULFATE   (SO4)      00945  199     =48.03X  4.14       X73.9=  306        26.20
CHLORIDE   (CL)      00940  206     =35.45X  5.81       X75.9=  441        36.70
NITRATE (NO3-N)      71851< .1                        TOTAL =   1801
FLUORIDE    (F)      00951  .55
SILICA   (SIO2)      00955  17
                               TOTAL ANION  = 15.82

      TOTAL ION             1098.43
TDS (180 C)         70300   956
TDS =TI-.5 HCO3           = 950                            ACCURACY CHECK
EC  (25 C)          00095   1549   UMHOS              ION   0.97        0.96 TO 1.04
EC  (DILUTE)= 99 X 18     = 1780   UMHOS              TDS   1.01        0.90 TO 1.10
ALK. AS CACO3       00410   263                       EC    0.99        0.95 TO 1.05
PH                  00403   8.32

                               % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
           CA                         *         *            HCO3
                 |****|****|****|****|****|****|****|****|
           MG                          *       *             SO4
                 |****|****|****|****|****|****|****|****|
           NA+K*                                *            CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                 ITEM         MG/L                ITEM          MG/L
 RSENIC   (AS) 0.001             MANGANESE(MN) 0.01            URANIUM    (U) 0.002
CADMIUM   (CD) 0.01              MERCURY   (HG) <0.001         AMMONIA-N      0.03
IRON      (FE) <0.01             MOLY.     (MO) <0.01          RA 226(PCI/L) <0.18
LEAD      (PB) <0.02             SELENIUM (SE) 0.001                   +/-   0.14

REMARKS:                                                       CHECKED BY: DJJ/RKF

CL:RR-0583     TDWR-0479 (REV. 4-6-83)                         ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-5

PERMIT NO.                WELL NO.KVD MW5    SAMPLE NO.5
PROD.AREA NO.             SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
OMPANY:URANIUM RESOUCES INC                 MINE:

SMP |   DATE | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                     UMHOS
 1  |        |     |      |                 | NORMAL WATER LEVEL:                  MSL
 2  |        |     |      |                 | PUMP:SET@:          MSL;             GPM
 3  |        |     |      |                 | BOT.OF:CASING        SCR             (MSL)
 4  |        |     |      |                 | LAND SURFACE DATUM:                  MSL

DATE RECEIVED:  10-09-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM           STORET    MG/L     F         EPM       ECF    (C)X(D)     % EPM
                               (A)     (B)        (C)       (D)
CALCIUM     (CA)      00915  22.1    =20.04X  1.1        X52.0=  57           7.20
MAGNESIUM   (MG)      00925  4.11    =12.16X  .34        X46.6=  16           2.20
SODIUM      (NA)      00929  316     =22.99X  13.75      X48.9=  672         89.60
POTASSIUM    (K)      00937  6.31    =39.10X  .16        X72.0=  12           1.00
                               TOTAL CATION = 15.35

CARBONATE (CO3)       00445  30      =30.00X  1          X84.6=  85           6.50
BICARB.   (HCO3)      00440  273     =61.02X  4.47       X43.6=  195         29.20
SULFATE    (SO4)      00945  201     =48.03X  4.18       X73.9=  309         27.30
CHLORIDE    (CL)      00940  201     =35.45X  5.67       X75.9=  430         37.00
NITRATE (NO3-N)       71851< .1                         TOTAL =  1776
FLUORIDE     (F)      00951  .54
 ILICA    (SIO2)      00955  17.6
                               TOTAL ANION  = 15.32

     TOTAL ION               1071.76
TDS (180 C)           70300  920
TDS =TI-.5 HCO3            = 935                            ACCURACY CHECK
EC   (25 C)           00095  1572    UMHOS           ION    1.00       0.96 TO 1.04
EC   (DILUTE)= 94 X 18.18= 1710    UMHOS             TDS    0.98       0.90 TO 1.10
ALK. AS CACO3         00410  273                     EC     0.96       0.95 TO 1.05
PH                    00403  8.55

                            % CATION   % ANION
                 80   60   40   20    0    20   40   60   80
                  |****|****|****|****|****|****|****|****|
             CA                     *       *                 HCO3
                  |****|****|****|****|****|****|****|****|
             MG                      *      *                 SO4
                  |****|****|****|****|****|****|****|****|
             NA+K*                            *               CL
                  |****|****|****|****|****|****|****|****|
                 80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM          MG/L               ITEM         MG/L
RSENIC   (AS) 0.001            MANGANESE(MN) <0.01             URANIUM     (U) 0.004
ADMIUM   (CD) 0.01             MERCURY   (HG) <0.001           AMMONIA-N       0.02
IRON     (FE) <0.01            MOLY.     (MO) <0.01            RA 226(PCI/L) <0.44
LEAD     (PB) <0.02            SELENIUM  (SE) 0.001                      +/-  0.43

REMARKS:                                                       CHECKED BY: DJJ/RKP

CL:RP-0583    TDWR-0678 (REV. 4-6-83)                      ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-6

PERMIT NO.           WELL NO.KVD MW6    SAMPLE NO.6
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC           MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:             MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL;        GPM
 3  |         |     |     |                 | BOT.OF:CASING        SCR        (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-09-87                   DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET     MG/L     F        EPM      ECF    (C)X(D)    % EPM
                               (A)     (B)       (C)      (D)
CALCIUM     (CA)     00915  15.6    =20.04X  .78       X52.0=  40          5.10
MAGNESIUM   (MG)     00925  4.05    =12.16X  .33       X46.6=  16          2.20
SODIUM      (NA)     00929  320     =22.99X  13.92     X48.9=  681        91.60
POTASSIUM    (K)     00937  6.47    =39.10X  .17       X72.0=  12          1.10
                              TOTAL CATION = 15.2

CARBONATE (CO3)      00445  30      =30.00X  1         X84.6=  85          6.50
BICARB.   (HCO3)     00440  270     =61.02X  4.42      X43.6=  193        28.90
SULFATE    (SO4)     00945  189     =48.03X  3.94      X73.9=  291        25.80
CHLORIDE   (CL)      00940  210     =35.45X  5.92      X75.9=  450        38.70
NITRATE (NO3-N)      71851< .04                       TOTAL =  1768
 FLUORIDE    (F)     00951  .61
SILICA   (SIO2)      00955  16
                              TOTAL ANION  = 15.28

      TOTAL ION             1061.77
TDS (180 C)         70300   900
TDS =TI-.5 HCO3         =   927                          ACCURACY CHECK
EC  (25 C)          00095   1592  UMHOS               ION   0.99      0.96 TO 1.04
EC  (DILUTE)= 98 X 18   =   1760  UMHOS               TDS   0.97      0.90 TO 1.10
ALK. AS CACO3       00410   271                       EC    1.00      0.95 TO 1.05
PH                  00403   8.55

                             % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *       *              HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *      *               SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                              *           CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM         MG/L            ITEM          MG/L
ARSENIC   (AS) 0.001            MANGANESE(MN) <0.01          URANIUM    (U) 0.006
CADMIUM   (CD) 0.01             MERCURY   (HG) <0.001        AMMONIA-N      0.13
IRON      (FE) 0.01             MOLY.     (MO) <0.01         RA 226(PCI/L) <0.31
LEAD      (PB) <0.02            SELENIUM (SE) 0.001                   +/-   0.30

REMARKS:                                                     CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-7

PERMIT NO.           WELL NO.KVD MW7    SAMPLE NO.7
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC           MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:             UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:          MSL
 2  |        |     |     |                 | PUMP:SET@:        MSL;       GPM
 3  |        |     |     |                 | BOT.OF:CASING       SCR      (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:          MSL

DATE RECEIVED:  10-09-87                  DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F        EPM      ECF    (C)X(D)    % EPM
                             (A)     (B)       (C)      (D)
CALCIUM    (CA)    00915  19.5     =20.04X  .97      X52.0=  51          6.40
MAGNESIUM  (MG)    00925  4.81     =12.16X  .4       X46.6=  18          2.60
SODIUM     (NA)    00929  315      =22.99X  13.7     X48.9=  670        89.80
POTASSIUM   (K)    00937  6.94     =39.10X  .18      X72.0=  13          1.20
                           TOTAL CATION = 15.25

CARBONATE (CO3)    00445  21       =30.00X  .7       X84.6=  59          4.60
BICARB.  (HCO3)    00440  285      =61.02X  4.67     X43.6=  204        30.50
SULFATE   (SO4)    00945  196      =48.03X  4.08     X73.9=  302        26.60
CHLORIDE   (CL)    00940  208      =35.45X  5.87     X75.9=  445        38.30
NITRATE (NO3-N)    71851  1.04                      TOTAL =  1762
FLUORIDE    (F)    00951  .52
SILICA   (SIO2)    00955  17.4
                           TOTAL ANION  = 15.32

      TOTAL ION           1075.21
TDS (180 C)        70300  968
TDS =TI-.5 HCO3        =  933                              ACCURACY CHECK
EC   (25 C)        00095  1577   UMHOS               ION    1.00      0.96 TO 1.04
EC   (DILUTE)= 95 X 18.18= 1730  UMHOS               TDS    1.04      0.90 TO 1.10
ALK. AS CACO3      00410  268                        EC     0.98      0.95 TO 1.05
PH                 00403  8.49

                              % CATION   % ANION
                 80   60   40   20    0    20   40   60   80
                  |****|****|****|****|****|****|****|****|
            CA                     *         *            HCO3
                  |****|****|****|****|****|****|****|****|
            MG                      *       *             SO4
                  |****|****|****|****|****|****|****|****|
            NA+K*                              *          CL
                  |****|****|****|****|****|****|****|****|
                 80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                ITEM       MG/L                ITEM       MG/L
ARSENIC   (AS) 0.001           MANGANESE(MN) 0.01          URANIUM    (U) 0.042
CADMIUM   (CD) 0.01            MERCURY   (HG) <0.001       AMMONIA-N      0.04
IRON      (FE) <0.01           MOLY.     (MO) <0.01        RA 226(PCI/L) 0.36
LEAD      (PB) <0.02           SELENIUM (SE) 0.002                  +/-  0.36

REMARKS:                                                   CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-8

PERMIT NO.             WELL NO.KVD MW8    SAMPLE NO.8
ROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
OMPANY:URANIUM RESOURCES INC              MINE: 0.004

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:              MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL;         GPM
 3  |         |     |     |                 | BOT.OF:CASING         SCR        (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:              MSL

DATE RECEIVED:  10-09-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM       ECF    (C)X(D)    % EPM
                              (A)     (B)        (C)       (D)
CALCIUM     (CA)     00915   17.4    =20.04X   .87       X52.0=  45           5.70
MAGNESIUM   (MG)     00925   5.3     =12.16X   .44       X46.6=  20           2.90
SODIUM      (NA)     00929   320     =22.99X   13.92     X48.9=  681         90.40
POTASSIUM    (K)     00937   6.35    =39.10X   .16       X72.0=  12           1.00
                               TOTAL CATION = 15.39

CARBONATE (CO3)      00445   15      =30.00X   .5        X84.6=  42           3.20
BICARB.   (HCO3)     00440   294     =61.02X   4.82      X43.6=  210         31.30
SULFATE    (SO4)     00945   194     =48.03X   4.04      X73.9=  298         26.20
CHLORIDE    (CL)     00940   214     =35.45X   6.04      X75.9=  458         39.20
NITRATE (NO3-N)      71851   2                         TOTAL =   1766
LUORIDE      (F)     00951   .53
SILICA    (SIO2)     00955   17.2
                               TOTAL ANION  = 15.4

     TOTAL ION               1085.78
TDS (180 C)         70300    968
TDS =TI-.5 HCO3            = 939                         ACCURACY CHECK
EC  (25 C)           00095   1613    UMHOS             ION    1.00       0.96 TO 1.04
EC  (DILUTE)=     X        = 1730    UMHOS             TDS    1.03       0.90 TO 1.10
ALK. AS CACO3        00410   266                       EC     0.98       0.95 TO 1.05
PH                   00403   8.39

                               % CATION   % ANION
                  80    60    40    20     0     20    40    60    80
                   |****|****|****|****|****|****|****|****|
              CA                       *        *               HCO3
                   |****|****|****|****|****|****|****|****|
              MG                       *       *                SO4
                   |****|****|****|****|****|****|****|****|
              NA+K*                                *            CL
                   |****|****|****|****|****|****|****|****|
                  80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L              ITEM         MG/L             ITEM         MG/L
RSENIC   (AS) 0.01          MANGANESE(MN) <0.001         URANIUM    (U) 0.18
CADMIUM  (CD) 0.02          MERCURY  (HG) <0.01          AMMONIA-N      0.96
IRON     (FE) <0.02         MOLY.    (MO) 0.002          RA 226(PCI/L) 0.35
LEAD     (PB) 0.01          SELENIUM (SE) 0.021                   +/-

REMARKS:                                                 CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:C402-71447-14

PERMIT NO.                 WELL NO.KVD MW14    SAMPLE NO.14
PROD.AREA NO.              SUBMITTED BY.URI    DATE COLLECTED:         [illegible]
COMPANY:URANIUM RESOURCES INC                  MINE:

SMP |   DATE  | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |         |     |     |                  | NORMAL WATER LEVEL:              MSL
 2  |         |     |     |                  | PUMP:SET@:              MSL      GPM
 3  |         |     |     |                  | BOT.OF:CASING           ELE      (MSL)
 4  |         |     |     |                  | LAND SURFACE DATUM:              MSL

DATE RECEIVED:  10-09-87                     DATE REPORTED:  [illegible]

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

    ITEM            STORET    MG/L      F         EPM      ECF    (C)X(D)   % EPM
                              (A)      (B)        (C)      (D)
CALCIUM      (CA)   00915   [illegible] -20.04X   .61     X52.0=   32        4.06
MAGNESIUM    (MG)   00925   [illegible]  12.16)   .34     X46.6=   16        [illegible]
SODIUM       (NA)   00929   326       22.99     14.18     X48.9=   693      92.60
POTASSIUM    (K)    00937   7.0       39.10     .18       X72.0=   13        1.20
                            TOTAL CATION = 15.[illegible]

CARBONATE   (CO3)   00445   60        30.00     2.0       X5[illegible]  163      [illegible].70
BICARB.    (HCO3)   00440   17[illegible]  61.02X   2.8[illegible]  X43.6=  124  19.20
SULFATE    (SO4)    00945   [illegible]  48.03  [illegible].89  X73.[illegible]  25[illegible]  26.30
CHLORIDE   (CL)     00940   209       35.45     5.9       X75.4=   447      [illegible].60
NITRATE (AS N)      00620   [illegible]                   [illegible] = [illegible]
FLUORIDE   (F)      00950   [illegible]
SILICA     [illegible]  00955  [illegible]
                            TOTAL ANION = 14.81

     TOTAL [illegible]        [illegible]
TDS (180 C)         70300   890
[illegible] HCO3            [illegible]                            [illegible]
  [illegible]       00095   153[illegible]  [illegible]          [illegible]   1.0[illegible]   [illegible]
  [illegible]  X 15  = 1710  UMHOS                               TDS   [illegible]   0.[illegible] TO 1.1[illegible]
  [illegible]       00410   2[illegible]1                         EC    [illegible]   0.[illegible] TO [illegible]
  [illegible]       00400   9.34
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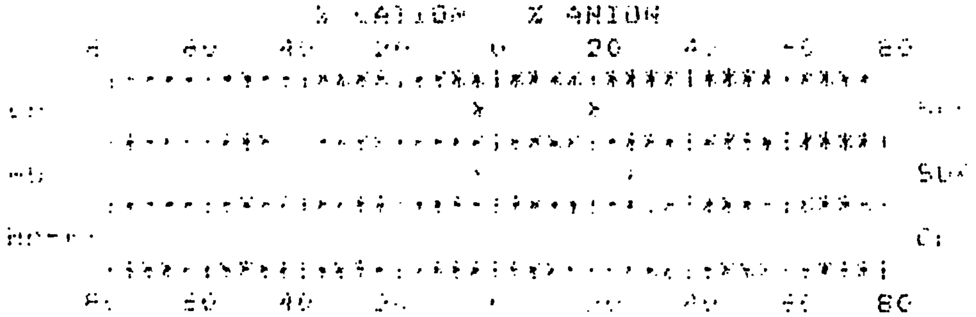

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MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L             ITEM              MG/L            ITEM          MG/L
ARSENIC  (AS) 0.003          MANGANESE(MN) <0.01           URANIUM   [illegible]
CADMIUM  (CD) 0.01           MERCURY  (HG) <0.002          AMMONIUM  [illegible]
IRON     (FE) <0.01          MOLY.    (MO) <0.01           RA 226 [illegible]
LEAD     (PB) <0.02          SELENIUM (SE) 0.003                      [illegible]

REMARKS:                                                   CHECKED BY. [illegible]

CL:RP-0583    TDWR-0678 (REV. 4-6-83)                 ALL METHODS [illegible]
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-13

PERMIT NO.           WELL NO.KVD MW13   SAMPLE NO.13
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC           MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:             UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:          MSL
 2  |        |     |     |                 | PUMP:SET@:        MSL;       GPM
 3  |        |     |     |                 | BOT.OF:CASING       SCR      (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:          MSL

DATE RECEIVED:  10-09-87                   DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM        STORET    MG/L    F       EPM     ECF   (C)X(D)   % EPM
                            (A)    (B)      (C)     (D)
CALCIUM    (CA)    00915  18.1   =20.04X  .9       X52.0=  47        5.80
MAGNESIUM  (MG)    00925  4.29   =12.16X  .35      X46.6=  16        2.30
SODIUM     (NA)    00929  322    =22.99X  14.01    X48.9=  685      90.40
POTASSIUM   (K)    00937  8.93   =39.10X  .23      X72.0=  16        1.50
                           TOTAL CATION = 15.49

CARBONATE (CO3)    00445  62     =30.00X  2.07     X84.6=  175      13.50
BICARB.   (HCO3)   00440  201    =61.02X  3.29     X43.6=  144      21.50
SULFATE    (SO4)   00945  195    =48.03X  4.06     X73.9=  300      26.50
CHLORIDE   (CL)    00940  209    =35.45X  5.9      X75.9=  447      38.50
NITRATE (NO3-N)    71851  1.12                    TOTAL =  1830
FLUORIDE    (F)    00951  .51
SILICA   (SIO2)    00955  18.1
                           TOTAL ANION  = 15.32

      TOTAL ION           1040.05
TDS (180 C)        70300  880
TDS =TI-.5 HCO3         = 940                          ACCURACY CHECK
EC    (25 C)       00095  1563   UMHOS             ION   1.01     0.96 TO 1.04
EC  (DILUTE)= 97 X 18   = 1750   UMHOS             TDS   0.94     0.90 TO 1.10
ALK. AS CACO3      00410  268                      EC    0.96     0.95 TO 1.05
PH                 00403  9.08

                            % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *     *                HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *       *              SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                                *         CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM       MG/L              ITEM       MG/L            ITEM       MG/L
ARSENIC  (AS) 0.004           MANGANESE(MN) <0.01       URANIUM   (U) 0.031
CADMIUM  (CD) 0.01            MERCURY  (HG) <0.001      AMMONIA-N     0.23
IRON     (FE) <0.01           MOLY.    (MO) <0.01       RA 226(PCI/L) 2.32
LEAD     (PB) <0.02           SELENIUM (SE) 0.003                +/-  0.40

REMARKS:                                                CHECKED BY: DJJ/RKP

CL:RP-0583    TDWR-0678 (REV. 4-6-83)                ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-12

PERMIT NO.              WELL NO.KVD MW12   SAMPLE NO.12
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
:OMPANY:URANIUM RESOURCES INC              MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                    UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:                 MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL;            GPM
 3  |         |     |     |                 | BOT.OF:CASING        SCR            (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:                 MSL

DATE RECEIVED:  10-09-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

     ITEM          STORET    MG/L     F         EPM       ECF    (C)X(D)    % EPM
                             (A)     (B)        (C)       (D)
CALCIUM    (CA)     00915  25.3    =20.04X  1.26      X52.0=  66          8.10
MAGNESIUM  (MG)     00925  5.24    =12.16X  .43       X46.6=  20          2.80
SODIUM     (NA)     00929  313     =22.99X  13.61     X48.9=  666        87.90
POTASSIUM   (K)     00937  7.61    =39.10X  .19       X72.0=  14          1.20
                             TOTAL CATION = 15.49

CARBONATE (CO3)     00445  35      =30.00X  1.17      X84.6=  99          7.70
BICARB.  (HCO3)     00440  261     =61.02X  4.28      X43.6=  186        28.20
SULFATE   (SO4)     00945  197     =48.03X  4.1       X73.9=  303        27.00
CHLORIDE   (CL)     00940  200     =35.45X  5.64      X75.9=  428        37.10
NITRATE (NO3-N)     71851  1.51                      TOTAL =  1782
-LUORIDE    (F)     00951  .52
.ILICA   (SIO2)     00955  17.3
                             TOTAL ANION  = 15.19

     TOTAL ION             1063.48
TDS (180 C)        70300   916
TDS =TI-.5 HCO3         =  933                           ACCURACY CHECK
EC  (25 C)          00095  1563   UMHOS           ION    1.02      0.96 TO 1.04
EC  (DILUTE)= 93 X 18.18= 1690    UMHOS           TDS    0.98      0.90 TO 1.10
ALK. AS CACO3       00410  273                    EC     0.95      0.95 TO 1.05
PH                  00403  8.94

                          % CATION    % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
           CA                      *        *                HCO3
                 |****|****|****|****|****|****|****|****|
           MG                       *       *                SO4
                 |****|****|****|****|****|****|****|****|
           NA+K*                              *              CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L               ITEM          MG/L               ITEM          MG/L
RSENIC    (AS) 0.004           MANGANESE(MN) <0.01         URANIUM    (U) 0.025
ADMIUM    (CD) 0.01            MERCURY   (HG) <0.001       AMMONIA-N      0.18
IRON      (FE) 0.01            MOLY.     (MO) <0.01        RA 226(PCI/L)  0.98
LEAD      (PB) <0.02           SELENIUM  (SE) 0.002                  +/-  0.30

REMARKS:                                                   CHECKED BY: DJJ/RKP

CL:PP-0583     TDWR-0478 (REV. 4-6-83)                     ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-11

PERMIT NO.                WELL NO.KVD MW11   SAMPLE NO.11
PROD.AREA NO.             SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC                MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                   UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:                MSL
 2  |         |     |     |                 | PUMP:SET@:           MSL;          GPM
 3  |         |     |     |                 | BOT.OF:CASING          SCR         (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:                MSL

DATE RECEIVED:  10-09-87                     DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F          EPM       ECF    (C)X(D)    % EPM
                              (A)     (B)         (C)       (D)
CALCIUM    (CA)      00915  20.7     =20.04X  1.03       X52.0=  54          6.80
MAGNESIUM  (MG)      00925  4.97     =12.16X  .41        X46.6=  19          2.70
SODIUM     (NA)      00929  311      =22.99X  13.53      X48.9=  662        89.10
POTASSIUM   (K)      00937  8.05     =39.10X  .21        X72.0=  15          1.40
                              TOTAL CATION = 15.18

CARBONATE (CO3)      00445  62       =30.00X  2.07       X84.6=  175        13.70
BICARB.  (HCO3)      00440  201      =61.02X  3.29       X43.6=  144        21.80
SULFATE   (SO4)      00945  186      =48.03X  3.87       X73.9=  286        25.70
CHLORIDE   (CL)      00940  207      =35.45X  5.84       X75.9=  443        38.80
NITRATE (NO3-N)      71851  2.3                         TOTAL =  1798
FLUORIDE    (F)      00951  .52
SILICA   (SIO2)      00955  17.9
                              TOTAL ANION  = 15.07

     TOTAL ION              1021.44
TDS (180 C)          70300  920
TDS =TI-.5 HCO3          =  921                              ACCURACY CHECK
EC  (25 C)           00095  1613   UMHOS               ION    1.01       0.96 TO 1.04
EC  (DILUTE)= 96 X 18    =  1730   UMHOS               TDS    1.00       0.90 TO 1.10
ALK. AS CACO3        00410  268                        EC     0.96       0.95 TO 1.05
PH                   00403  8.97

                              % CATION   % ANION
                  80   60   40   20    0    20   40   60   80
                   |****|****|****|****|****|****|****|****|
              CA                     *     *                  HCO3
                   |****|****|****|****|****|****|****|****|
              MG                      *     *                 SO4
                   |****|****|****|****|****|****|****|****|
              NA+K*                              *            CL
                   |****|****|****|****|****|****|****|****|
                  80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                 ITEM        MG/L               ITEM         MG/L
 RSENIC   (AS) 0.004           MANGANESE(MN) <0.01          URANIUM    (U) 0.017
CADMIUM   (CD) 0.01            MERCURY   (HG) <0.001        AMMONIA-N      0.14
IRON      (FE) 0.02            MOLY.     (MO) <0.01         RA 226(PCI/L)  0.34
LEAD      (PB) <0.02           SELENIUM  (SE) 0.002                   +/-  0.26

REMARKS:                                                    CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-10

PERMIT NO.           WELL NO.KVD MW10   SAMPLE NO.10
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
 OMPANY:URANIUM RESOURCES INC           MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:               MSL
 2  |        |     |     |                 | PUMP:SET@:          MSL;          GPM
 3  |        |     |     |                 | BOT.OF:CASING        SCR          (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:               MSL

DATE RECEIVED:  10-09-87                     DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM           STORET     MG/L     F          EPM      ECF    (C)X(D)   % EPM
                                 (A)    (B)         (C)      (D)
CALCIUM    (CA)      00915   23        =20.04X   1.15       X52.0=  60          7.30
MAGNESIUM  (MG)      00925   5.48      =12.16X   .45        X46.6=  21          2.90
SODIUM     (NA)      00929   319       =22.99X   13.88      X48.9=  679        88.60
POTASSIUM   (K)      00937   7.22      =39.10X   .18        X72.0=  13          1.10
                               TOTAL CATION = 15.66

CARBONATE (CO3)      00445   30        =30.00X   1          X84.6=  85          6.40
BICARB.   (HCO3)     00440   279       =61.02X   4.57       X43.6=  199        29.40
SULFATE    (SO4)     00945   191       =48.03X   3.98       X73.9=  294        25.60
CHLORIDE    (CL)     00940   212       =35.45X   5.98       X75.9=  454        38.50
NITRATE (NO3-N)      71851   1.76                          TOTAL =  1805
FLUORIDE     (F)     00951   .51
SILICA    (SIO2)     00955   17.3
                              TOTAL ANION  = 15.53

      TOTAL ION              1086.27
TDS (180 C)          70300   980
TDS =TI-.5 HCO3          =   947                            ACCURACY CHECK
EC  (25 C)           00095   1614   UMHOS              ION   1.01      0.96 TO 1.04
EC  (DILUTE)= 94 X 18.18=    1710   UMHOS              TDS   1.03      0.90 TO 1.10
ALK. AS CACO3        00410   278                       EC    0.95      0.95 TO 1.05
PH                   00403   8.57

                              % CATION   % ANION
                 80   60   40   20    0    20   40   60   80
                  |****|****|****|****|****|****|****|****|
             CA                    *        *                 HCO3
                  |****|****|****|****|****|****|****|****|
             MG                     *      *                  SO4
                  |****|****|****|****|****|****|****|****|
             NA+K*                              *             CL
                  |****|****|****|****|****|****|****|****|
                 80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM          MG/L             ITEM          MG/L            ITEM          MG/L
ARSENIC   (AS) 0.004        MANGANESE(MN) 0.01          URANIUM     (U) 0.027
CADMIUM   (CD) 0.01         MERCURY   (HG) <0.001       AMMONIA-N       0.22
IRON      (FE) 0.01         MOLY.     (MO) <0.01        RA 226(PCI/L) 0.22
LEAD      (PB) <0.02        SELENIUM  (SE) 0.002                  +/-   0.27

REMARKS:                                                CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-9

PERMIT NO.              WELL NO.KVD MW9    SAMPLE NO.9
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
COMPANY:URANIUM RESOURCES INC              MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:              MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL;         GPM
 3  |         |     |     |                 | BOT.OF:CASING          SCR       (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:              MSL

DATE RECEIVED:  10-09-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM       ECF    (C)X(D)    % EPM
                              (A)     (B)        (C)       (D)
CALCIUM     (CA)     00915  20.1    =20.04X  1          X52.0=  52          6.50
MAGNESIUM   (MG)     00925  5.74    =12.16X  .47        X46.6=  22          3.00
SODIUM      (NA)     00929  318     =22.99X  13.83      X48.9=  676        89.30
POTASSIUM    (K)     00937  7.15    =39.10X  .18        X72.0=  13          1.20
                              TOTAL CATION = 15.46

CARBONATE (CO3)      00445  21      =30.00X  .7         X84.6=  59          4.60
BICARB.   (HCO3)     00440  279     =61.02X  4.57       X43.6=  199        30.00
SULFATE    (SO4)     00945  191     =48.03X  3.98       X73.9=  294        26.10
CHLORIDE    (CL)     00940  212     =35.45X  5.98       X75.9=  454        39.30
NITRATE (NO3-N)      71851  1.93                       TOTAL =  1769
FLUORIDE    (F)      00951  .51
SILICA    (SIO2)     00955  17.2
                              TOTAL ANION  = 15.23

      TOTAL ION             1073.63
TDS (180 C)          70300  972
TDS =TI-.5 HCO3          =  934                          ACCURACY CHECK
EC  (25 C)           00095  1575   UMHOS             ION    1.02      0.96 TO 1.04
EC  (DILUTE)= 93 X 18.18= 1690   UMHOS             TDS    1.04      0.90 TO 1.10
ALK. AS CACO3        00410  263                      EC     0.96      0.95 TO 1.05
PH                   00403  8.42

                               % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                    *         *             HCO3
                 |****|****|****|****|****|****|****|****|
            MG                     *       *              SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                             *           CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                ITEM        MG/L               ITEM        MG/L
ARSENIC  (AS) 0.003            MANGANESE(MN) 0.01            URANIUM    (U) 0.021
CADMIUM  (CD) 0.01             MERCURY   (HG) <0.001          AMMONIA-N      0.04
IRON     (FE) 0.02             MOLY.     (MO) <0.01           RA 226(PCI/L) 0.42
LEAD     (PB) <0.02            SELENIUM  (SE) 0.002                    +/-   0.29

REMARKS:                                                  CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-26

PERMIT NO.              WELL NO.KVD MW19   SAMPLE NO.26
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC              MINE: 0.004

SMP |    DATE  | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |          |     |     |                 | NORMAL WATER LEVEL:             MSL
 2  |          |     |     |                 | PUMP:SET@:          MSL;        GPM
 3  |          |     |     |                 | BOT.OF:CASING        SCR        (MSL)
 4  |          |     |     |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-15-87                     DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F          EPM       ECF    (C)X(D)    % EPM
                              (A)     (B)         (C)       (D)
CALCIUM    (CA)     00915  22.9    =20.04X  1.14       X52.0=  59          7.10
MAGNESIUM  (MG)     00925  6.07    =12.16X  .5         X46.6=  23          3.10
SODIUM     (NA)     00929  326     =22.99X  14.18      X48.9=  693        68.60
POTASSIUM   (K)     00937  6.94    =39.10X  .18        X72.0=  13          1.10
                              TOTAL CATION = 16

CARBONATE (CO3)     00445  9       =30.00X  .3         X84.6=  25          1.90
BICARB.  (HCO3)     00440  325     =61.02X  5.33       X43.6=  232        34.50
SULFATE   (SO4)     00945  198     =48.03X  4.12       X73.9=  305        26.70
CHLORIDE   (CL)     00940  202     =35.45X  5.7        X75.9=  432        36.90
NITRATE (NO3-N)     71851  1.82                      TOTAL =  1782
'LUORIDE    (F)     00951  .53
SILICA   (SIO2)     00955  18.7
                              TOTAL ANION  = 15.45

      TOTAL ION            1116.96
TDS (180 C)         70300  944
TDS =TI-.5 HCO3         =  954                           ACCURACY CHECK
EC  (25 C)          00095  1590   UMHOS              ION   1.04       0.96 TO 1.04
EC  (DILUTE)=     X     =  1780   UMHOS              TDS   0.99       0.90 TO 1.10
ALK. AS CACO3       00410  281                       EC    1.00       0.95 TO 1.05
PH                  00403  8.58

                              % CATION    % ANION
                 80    60    40    20     0     20    40    60    80
                  |****|****|****|****|****|****|****|****|
            CA                        *          *              HCO3
                  |****|****|****|****|****|****|****|****|
            MG                         *       *                SO4
                  |****|****|****|****|****|****|****|****|
            NA+K*                                *              CL
                  |****|****|****|****|****|****|****|****|
                 80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                 ITEM         MG/L               ITEM         MG/L
ARSENIC   (AS) 0.02             MANGANESE(MN) <0.001          URANIUM    (U) 0.08
CADMIUM   (CD) <0.01            MERCURY   (HG) <0.01          AMMONIA-N      1.94
IRON      (FE) <0.02            MOLY.     (MO) 0.007          RA 226(PCI/L) 0.39
LEAD      (PB) <0.01            SELENIUM  (SE) 0.032                 +/-

REMARKS:                                                      CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-27

PERMIT NO.              WELL NO.KVD MW20   SAMPLE NO.27
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC              MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:              UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:           MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL;      GPM
 3  |         |     |     |                 | BOT.OF:CASING         SCR    (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:           MSL

DATE RECEIVED:  10-15-87                   DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM       ECF    (C)X(D)    % EPM
                              (A)     (B)        (C)       (D)
CALCIUM     (CA)    00915  23.2    =20.04X  1.16       X52.0=  60          7.30
MAGNESIUM   (MG)    00925  4.95    =12.16X  .41        X46.6=  19          2.60
SODIUM      (NA)    00929  325     =22.99X  14.14      X48.9=  691        89.10
POTASSIUM    (K)    00937  6.31    =39.10X  .16        X72.0=  12          1.00
                             TOTAL CATION = 15.87

CARBONATE (CO3)     00445  42      =30.00X  1.4        X84.6=  118         9.00
BICARB.  (HCO3)     00440  269     =61.02X  4.41       X43.6=  192        28.40
SULFATE   (SO4)     00945  193     =48.03X  4.02       X73.9=  297        25.90
CHLORIDE   (CL)     00940  202     =35.45X  5.7        X75.9=  432        36.70
NITRATE (NO3-N)     71851  .82                        TOTAL =  1821
FLUORIDE    (F)     00951  .6
SILICA   (SIO2)     00955  18.2
                             TOTAL ANION  = 15.53

     TOTAL ION             1085.08
TDS (180 C)         70300  920
TDS =TI-.5 HCO3         =  951                       ACCURACY CHECK
EC  (25 C)          00095  1590   UMHOS         ION   1.02      0.96 TO 1.04
EC  (DILUTE)= 97 X 18   =  1750   UMHOS         TDS   0.97      0.90 TO 1.10
ALK. AS CACO3       00410  291                  EC    0.96      0.95 TO 1.05
PH                  00403  9.01

                               % CATION    % ANION
                   80   60   40   20    0    20   40   60   80
                    |****|****|****|****|****|****|****|****|
               CA                      *        *             HCO3
                    |****|****|****|****|****|****|****|****|
               MG                       *      *              SO4
                    |****|****|****|****|****|****|****|****|
               NA+K*                              *           CL
                    |****|****|****|****|****|****|****|****|
                   80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                 ITEM        MG/L                ITEM        MG/L
ARSENIC   (AS) 0.003        MANGANESE(MN) <0.01        URANIUM    (U) 0.337
CADMIUM   (CD) 0.01         MERCURY  (HG) <0.001       AMMONIA-N      0.04
IRON      (FE) <0.01        MOLY.    (MO) <0.01        RA 226(PCI/L) 13.5
LEAD      (PB) <0.02        SELENIUM (SE) 0.005                 +/-  1.3

REMARKS:                                               CHECKED BY: DJJ/RKP

CL:PP-0583     TDWR-0478 (REV. 4-6-83)                 ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-28

PERMIT NO.              WELL NO.KVD MW21   SAMPLE NO.28
ROD.AREA NO.            SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
OMPANY:URANIUM RESOURCES INC               MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:              MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL;         GPM
 3  |         |     |     |                 | BOT.OF:CASING        SCR         (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:              MSL

DATE RECEIVED:  10-15-87                 DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F          EPM       ECF    (C)X(D)    % EPM
                              (A)     (B)         (C)       (D)
CALCIUM    (CA)     00915  16.3    =20.04X   .81        X52.0=   42          5.10
MAGNESIUM  (MG)     00925  4.99    =12.16X   .41        X46.6=   19          2.60
SODIUM     (NA)     00929  336     =22.99X   14.62      X48.9=   715        91.60
POTASSIUM   (K)     00937  4.72    =39.10X   .12        X72.0=   9           0.80
                              TOTAL CATION = 15.96

CARBONATE (CO3)     00445  15      =30.00X   .5         X84.6=   42          3.10
BICARB.  (HCO3)     00440  343     =61.02X   5.62       X43.6=   245        35.30
SULFATE   (SO4)     00945  191     =48.03X   3.98       X73.9=   294        25.00
CHLORIDE   (CL)     00940  207     =35.45X   5.84       X75.9=   443        36.60
NITRATE (NO3-N)     71851< .1                          TOTAL =   1809
 LUORIDE    (F)     00951  .59
SILICA   (SIO2)     00955  16.7
                              TOTAL ANION  = 15.94

      TOTAL ION            1135.4
TDS (180 C)         70300  988
TDS =TI-.5 HCO3         =  964                           ACCURACY CHECK
EC  (25 C)          00095  1660   UMHOS                ION    1.00     0.96 TO 1.04
EC  (DILUTE)= 100X  18   = 1800   UMHOS                TDS    1.02     0.90 TO 1.10
ALK. AS CACO3       00410  306                         EC     1.00     0.95 TO 1.05
PH                  00403  8.6

                              % CATION    % ANION
                   80    60    40    20     0     20    40    60    80
                    |****|****|****|****|****|****|****|****|
               CA                       *         *              HCO3
                    |****|****|****|****|****|****|****|****|
               MG                       *      *                 SO4
                    |****|****|****|****|****|****|****|****|
               NA+K*                              *              CL
                    |****|****|****|****|****|****|****|****|
                   80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

      ITEM          MG/L                ITEM          MG/L             ITEM          MG/L
 RSENIC   (AS) 0.004         MANGANESE(MN) 0.03          URANIUM    (U) 0.023
CADMIUM   (CD) 0.03          MERCURY   (HG) <0.001       AMMONIA-N      0.13
IRON      (FE) 0.02          MOLY.     (MO) 0.01         RA 226(PCI/L) 11.6
LEAD      (PB) <0.02         SELENIUM (SE) 0.003                   +/-   1.2

REMARKS:                                                 CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-15

PERMIT NO.           WELL NO.KVD MW27   SAMPLE NO.15
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
COMPANY:URANIUM RESOURCES INC           MINE: 0.001

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:            UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:         MSL
 2  |        |     |     |                 | PUMP:SET@:        MSL;      GPM
 3  |        |     |     |                 | BOT.OF:CASING       SCR     (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:         MSL

DATE RECEIVED:  10-09-87                   DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET   MG/L  ·  F       EPM      ECF    (C)X(D)   % EPM
                             (A)     (B)      (C)      (D)
CALCIUM    (CA)      00915  25      =20.04X  1.25     X52.0=  65          7.40
MAGNESIUM  (MG)      00925  4.94    =12.16X  .41      X46.6=  19          2.40
SODIUM     (NA)      00929  346     =22.99X  15.05    X48.9=  736        89.20
POTASSIUM   (K)      00937  6.27    =39.10X  .16      X72.0=  12          0.90
                             TOTAL CATION = 16.87

CARBONATE (CO3)      00445  47      =30.00X  1.57     X84.6=  133         9.70
BICARB.  (HCO3)      00440  237     =61.02X  3.88     X43.6=  169        24.00
SULFATE   (SO4)      00945  218     =48.03X  4.54     X73.9=  335        28.00
CHLORIDE   (CL)      00940  220     =35.45X  6.21     X75.9=  471        38.30
NITRATE (NO3-N)      71851< .1                       TOTAL =  1940
FLUORIDE    (F)      00951  .56
SILICA   (SIO2)      00955  18.2
                             TOTAL ANION  = 16.2

      TOTAL ION             1123.07
TDS (180 C)         70300   960
TDS =TI-.5 HCO3         =   1005                         ACCURACY CHECK
EC  (25 C)           00095  1615   UMHOS             ION   1.04      0.96 TO 1.04
EC  (DILUTE)= 102.5X18  =   1850   UMHOS             TDS   0.96      0.90 TO 1.10
ALK. AS CACO3        00410  273                      EC    0.95      0.95 TO 1.05
PH                   00403  8.94

                               % CATION    % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                    *       *                HCO3
                 |****|****|****|****|****|****|****|****|
            MG                     *       *               SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                             *            CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM          MG/L                ITEM         MG/L              ITEM         MG/L
ARSENIC   (AS) 0.001             MANGANESE(MN) <0.01           URANIUM    (U) 0.008
CADMIUM   (CD) 0.01              MERCURY   (HG) <0.001         AMMONIA-N      0.21
IRON      (FE) <0.01             MOLY.     (MO) <0.01          RA 226(PCI/L) 17.6
LEAD      (PB) <0.02             SELENIUM  (SE) 0.001                   +/-   1.1

REMARKS:                                                       CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-32

PERMIT NO.              WELL NO.KVD MW26   SAMPLE NO.32
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC              MINE:

SMP |    DATE  | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |          |     |      |                 | NORMAL WATER LEVEL:             MSL
 2  |          |     |      |                 | PUMP:SET@:         MSL;         GPM
 3  |          |     |      |                 | BOT.OF:CASING        SCR        (MSL)
 4  |          |     |      |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-15-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM      ECF    (C)X(D)    % EPM
                              (A)     (B)        (C)      (D)
CALCIUM     (CA)     00915  29.3    =20.04X  1.46      X52.0=  76          8.80
MAGNESIUM   (MG)     00925  6.01    =12.16X  .49       X46.6=  23          3.00
SODIUM      (NA)     00929  333     =22.99X  14.48     X48.9=  708        87.20
POTASSIUM   (K)      00937  6.95    =39.10X  .18       X72.0=  13          1.10
                              TOTAL CATION = 16.61

CARBONATE (CO3)      00445  21      =30.00X  .7        X84.6=  59          4.30
BICARB.   (HCO3)     00440  291     =61.02X  4.77      X43.6=  208        29.10
SULFATE    (SO4)     00945  227     =48.03X  4.73      X73.9=  349        28.80
CHLORIDE   (CL)      00940  220     =35.45X  6.21      X75.9=  471        37.80
NITRATE (NO3-N)      71851< .06                       TOTAL =  1907
FLUORIDE     (F)     00951  .54
SILICA   (SIO2)      00955  18.2
                              TOTAL ANION  = 16.41

      TOTAL ION             1153.06
TDS (180 C)          70300  1020
TDS =TI-.5 HCO3           = 1008                        ACCURACY CHECK
EC  (25 C)           00095  1720   UMHOS             ION   1.01      0.96 TO 1.04
EC  (DILUTE)= 104X 18     = 1870   UMHOS             TDS   1.01      0.90 TO 1.10
ALK. AS CACO3        00410  274                      EC    0.98      0.95 TO 1.05
PH                   00403  8.69

                             % CATION    % ANION
                  80   60   40   20    0    20   40   60   80
                   |****|****|****|****|****|****|****|****|
              CA                      *       *                 HCO3
                   |****|****|****|****|****|****|****|****|
              MG                       *      *                 SO4
                   |****|****|****|****|****|****|****|****|
              NA+K*                             *               CL
                   |****|****|****|****|****|****|****|****|
                  80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                ITEM        MG/L              ITEM        MG/L
ARSENIC  (AS) 0.001          MANGANESE(MN) 0.01            URANIUM    (U) 0.039
CADMIUM  (CD) 0.02           MERCURY  (HG) <0.001          AMMONIA-N      0.02
IRON     (FE) <0.01          MOLY.    (MO) <0.01           RA 226(PCI/L) 15.8
LEAD     (PB) <0.02          SELENIUM (SE) 0.002                     +/-  1.0

REMARKS:                                                   CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-23

PERMIT NO.               WELL NO.KVD MW16   SAMPLE NO.23
PROD.AREA NO.            SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC               MINE:

SMP |    DATE  | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |          |     |      |                 | NORMAL WATER LEVEL:             MSL
 2  |          |     |      |                 | PUMP:SET@:        MSL;          GPM
 3  |          |     |      |                 | BOT.OF:CASING       SCR         (MSL)
 4  |          |     |      |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-15-87                     DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM           STORET    MG/L     F         EPM       ECF    (C)X(D)    % EPM
                               (A)     (B)        (C)       (D)
CALCIUM    (CA)      00915  22.7    =20.04X  1.13      X52.0=  59          7.30
MAGNESIUM  (MG)      00925  5.67    =12.16X  .47       X46.6=  22          3.00
SODIUM     (NA)      00929  315     =22.99X  13.7      X48.9=  670        88.60
POTASSIUM   (K)      00937  6.7     =39.10X  .17       X72.0=  12          1.10
                              TOTAL CATION = 15.47

CARBONATE (CO3)      00445  30      =30.00X  1         X84.6=  85          6.50
BICARB.   (HCO3)     00440  251     =61.02X  4.11      X43.6=  179        26.90
SULFATE    (SO4)     00945  208     =48.03X  4.33      X73.9=  320        28.30
CHLORIDE   (CL)      00940  207     =35.45X  5.84      X75.9=  443        38.20
NITRATE (NO3-N)      71851  1.62                      TOTAL =  1790
FLUORIDE    (F)      00951  .49
SILICA   (SIO2)      00955  18.2
                              TOTAL ANION  = 15.28

     TOTAL ION              1066.38
TDS (180 C)          70300  925
TDS =TI-.5 HCO3          =  941                         ACCURACY CHECK
EC  (25 C)           00095  1610   UMHOS            ION   1.01      0.96 TO 1.04
EC  (DILUTE)= 95 X 18.18=  1730   UMHOS            TDS   0.98      0.90 TO 1.10
ALK. AS CACO3        00410  256                     EC    0.97      0.95 TO 1.05
PH                   00403  8.57

                           % CATION   % ANION
                  80   60   40   20    0    20   40   60   80
                   |****|****|****|****|****|****|****|****|
              CA                      *        *               HCO3
                   |****|****|****|****|****|****|****|****|
              MG                       *       *               SO4
                   |****|****|****|****|****|****|****|****|
              NA+K*                               *            CL
                   |****|****|****|****|****|****|****|****|
                  80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

      ITEM         MG/L                ITEM          MG/L               ITEM          MG/L
 ARSENIC   (AS) 0.004          MANGANESE(MN) <0.01          URANIUM    (U) 0.039
 CADMIUM   (CD) 0.02           MERCURY   (HG) <0.001        AMMONIA-N      0.04
IRON       (FE) <0.01          MOLY.     (MO) <0.01         RA 226(PCI/L) 2.91
LEAD       (PB) <0.02          SELENIUM (SE) 0.001                   +/-  0.58

REMARKS:                                                    CHECKED BY: DJJ/RKP

CL:PP-0587     TWDB-0478 (REV. 4-6-83)                      ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-22

PERMIT NO.           WELL NO.KVD MW15   SAMPLE NO.22
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
COMPANY:URANIUM RESOURCES INC           MINE: 0.002

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:              UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:           MSL
 2  |        |     |     |                 | PUMP:SET@:        MSL;        GPM
 3  |        |     |     |                 | BOT.OF:CASING       SCR       (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:           MSL

DATE RECEIVED:  10-15-87                      DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM         STORET    MG/L    F       EPM      ECF   (C)X(D)    % EPM
                             (A)    (B)      (C)      (D)
CALCIUM    (CA)    00915  23      =20.04X  1.15     X52.0=  60         6.80
MAGNESIUM  (MG)    00925  5.76    =12.16X  .47      X46.6=  22         2.80
SODIUM     (NA)    00929  345     =22.99X  15.01    X48.9=  734       89.40
POTASSIUM   (K)    00937  6.3     =39.10X  .16      X72.0=  12         1.00
                           TOTAL CATION = 16.79

CARBONATE (CO3)    00445  9       =30.00X  .3       X84.6=  25         1.80
BICARB.   (HCO3)   00440  318     =61.02X  5.21     X43.6=  227       31.80
SULFATE    (SO4)   00945  224     =48.03X  4.66     X73.9=  345       28.40
CHLORIDE    (CL)   00940  221     =35.45X  6.23     X75.9=  473       38.00
NITRATE (NO3-N)    71851  .98                      TOTAL =  1898
FLUORIDE     (F)   00951  .51
SILICA   (SIO2)    00955  17.2
                           TOTAL ANION  = 16.4

     TOTAL ION            1170.75
TDS (180 C)        70300  970
TDS =TI-.5 HCO3         = 1012                          ACCURACY CHECK
EC   (25 C)        00095  1730   UMHOS             ION   1.02     0.96 TO 1.04
EC   (DILUTE)=    X     = 1840   UMHOS             TDS   0.96     0.90 TO 1.10
ALK. AS CACO3      00410  276                      EC    0.97     0.95 TO 1.05
PH                 00403  8.5

                              % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *         *              HCO3
                 |****|****|****|****|****|****|****|****|
            MG                       *       *               SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                              *             CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM       MG/L                ITEM       MG/L
ARSENIC   (AS) 0.01             MANGANESE(MN) <0.001          URANIUM    (U) 0.15
CADMIUM   (CD) 0.02             MERCURY   (HG) <0.01          AMMONIA-N      6.25
IRON      (FE) <0.02            MOLY.     (MO) 0.002          RA 226(PCI/L) 0.61
LEAD      (PB) <0.01            SELENIUM  (SE) 0.027                  +/-

REMARKS:                                                CHECKED BY: DJJ/RKP

CL:RP-0593    TDWR-0678 (REV. 4-6-83)                ALL METHODS EPA APPROVED
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Production Area Baseline Wells

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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-64

PERMIT NO.           WELL NO.1EX        SAMPLE NO.64
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
COMPANY:URANIUM RESOURCES INC           MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:             UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:          MSL
 2  |        |     |     |                 | PUMP:SET@:        MSL;       GPM
 3  |        |     |     |                 | BOT.OF:CASING       SCR      (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:          MSL

DATE RECEIVED:  10-26-87                   DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET   MG/L    F        EPM      ECF    (C)X(D)   % EPM
                             (A)    (B)       (C)      (D)
CALCIUM    (CA)    00915  17.5   =20.04X  .87      X52.0=  45         5.10
MAGNESIUM  (MG)    00925  5.57   =12.16X  .46      X46.6=  21         2.70
SODIUM     (NA)    00929  355    =22.99X  15.44    X48.9=  755       91.30
POTASSIUM   (K)    00937  5.9    =39.10X  .15      X72.0=  11         0.90
                           TOTAL CATION = 16.92

CARBONATE (CO3)    00445  71     =30.00X  2.37     X84.6=  200       14.30
BICARB.  (HCO3)    00440  212    =61.02X  3.47     X43.6=  151       21.00
SULFATE   (SO4)    00945  199    =48.03X  4.14     X73.9=  306       25.00
CHLORIDE   (CL)    00940  233    =35.45X  6.57     X75.9=  499       39.70
NITRATE (NO3-N)    71851< .1                     TOTAL =  1988
FLUORIDE    (F)    00951  .6
SILICA   (SIO2)    00955  19.4
                           TOTAL ANION  = 16.55

      TOTAL ION           1119.07
TDS (180 C)        70300  1000
TDS =TI-.5 HCO3        =  1013                        ACCURACY CHECK
EC  (25 C)         00095  2100   UMHOS           ION   1.02      0.96 TO 1.04
EC  (DILUTE)= 105X 18  =  1890   UMHOS           TDS   0.99      0.90 TO 1.10
ALK. AS CACO3      00410  293                    EC    0.95      0.95 TO 1.05
PH                 00403  8.54

                            % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *     *                 HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *      *                SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                               *           CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM          MG/L                ITEM         MG/L              ITEM        MG/L
ARSENIC   (AS) 0.001             MANGANESE(MN) 0.01           URANIUM    (U) 0.060
CADMIUM   (CD) <0.01             MERCURY   (HG) <0.001        AMMONIA-N       0.28
IRON      (FE) <0.01             MOLY.     (MO) <0.01         RA 226(PCI/L) 28.0
LEAD      (PB) <0.02             SELENIUM  (SE) 0.001                 +/-    1.7

REMARKS:                                                      CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-65

PERMIT NO.           WELL NO.2EX          SAMPLE NO.65
PROD.AREA NO.        SUBMITTED BY:URI     DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC             MINE: 0.003

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:              UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:           MSL
 2  |        |     |     |                 | PUMP:SET@:         MSL;       GPM
 3  |        |     |     |                 | BOT.OF:CASING        SCR      (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:           MSL

DATE RECEIVED:  10-26-87                  DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

     ITEM         STORET    MG/L     F        EPM      ECF    (C)X(D)    % EPM
                            (A)     (B)       (C)      (D)
CALCIUM    (CA)    00915  19.8   =20.04X  .99       X52.0=  51          5.80
MAGNESIUM  (MG)    00925  5.64   =12.16X  .46       X46.6=  22          2.70
SODIUM     (NA)    00929  352    =22.99X  15.31     X48.9=  749        90.30
POTASSIUM   (K)    00937  7.39   =39.10X  .19       X72.0=  14          1.10
                            TOTAL CATION = 16.95

CARBONATE (CO3)    00445  48     =30.00X  1.6       X84.6=  135         9.80
BICARB.  (HCO3)    00440  224    =61.02X  3.67      X43.6=  160        22.40
SULFATE   (SO4)    00945  227    =48.03X  4.73      X73.9=  349        28.80
CHLORIDE   (CL)    00940  227    =35.45X  6.4       X75.9=  486        39.00
NITRATE (NO3-N)    71851< .1                       TOTAL =  1966
FLUORIDE    (F)    00951  .53
ILICA    (SIO2)    00955  18.5
                            TOTAL ANION  = 16.4

     TOTAL ION            1129.96
TDS (180 C)        70300  1020
TDS =TI-.5 HCO3         = 1018                         ACCURACY CHECK
EC  (25 C)         00095  1710   UMHOS            ION    1.03      0.96 TO 1.04
EC  (DILUTE)= 104X 18   = 1870   UMHOS            TDS    1.00      0.90 TO 1.10
ALK. AS CACO3      00410  263                     EC     0.95      0.95 TO 1.05
PH                 00403  8.53

                              % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *      *                 HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *       *                SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                              *             CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM       MG/L               ITEM        MG/L              ITEM        MG/L
RSENIC   (AS) 0.003          MANGANESE(MN) <0.01          URANIUM    (U) 0.116
ADMIUM   (CD) <0.01          MERCURY  (HG) <0.001         AMMONIA-N      0.27
IRON     (FE) <0.01          MOLY.    (MO) <0.01          RA 226(PCI/L) 36.2
LEAD     (PB) <0.02          SELENIUM (SE) 0.006                  +/-   2.1

REMARKS:                                                  CHECKED BY: DJJ/RKP

CI:RP-0583    TDWR-0678 (REV. 4-6-83)                     ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-66

PERMIT NO.           WELL NO.3EX        SAMPLE NO.66
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:        ,BY:
COMPANY:URANIUM RESOUCES INC            MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:             MSL
 2  |        |     |     |                 | PUMP:SET@:          MSL;        GPM
 3  |        |     |     |                 | BOT.OF:CASING         SCR       (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-26-87                      DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F       EPM       ECF    (C)X(D)   % EPM
                              (A)     (B)      (C)       (D)
CALCIUM    (CA)      00915  14.9   =20.04X  .74        X52.0=  39         4.70
MAGNESIUM  (MG)      00925  5.14   =12.16X  .42        X46.6=  20         2.70
SODIUM     (NA)      00929  332    =22.99X  14.44      X48.9=  706       91.70
POTASSIUM   (K)      00937  5.85   =39.10X  .15        X72.0=  11         1.00
                              TOTAL CATION = 15.75

CARBONATE (CO3)      00445  30     =30.00X  1          X84.6=  85         6.60
BICARB.  (HCO3)      00440  266    =61.02X  4.36       X43.6=  190       28.80
SULFATE   (SO4)      00945  188    =48.03X  3.91       X73.9=  289       25.80
CHLORIDE   (CL)      00940  208    =35.45X  5.87       X75.9=  445       38.80
NITRATE (NO3-N)      71851  1.71                      TOTAL =  1785
FLUORIDE    (F)      00951  .5
SILICA   (SIO2)      00955  20.1
                              TOTAL ANION  = 15.14

      TOTAL ION             1072.2
TDS (180 C)         70300   944
TDS =TI-.5 HCO3           = 939                             ACCURACY CHECK
EC  (25 C)          00095   1580   UMHOS               ION   1.04      0.96 TO 1.04
EC  (DILUTE)= 97 X 18     = 1750   UMHOS               TDS   1.01      0.90 TO 1.10
ALK. AS CACO3       00410   268                        EC    0.98      0.95 TO 1.05
PH                  00403   8.28

                               % CATION    % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                       *       *                HCO3
                 |****|****|****|****|****|****|****|****|
            MG                       *      *                 SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                               *             CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM          MG/L                 ITEM          MG/L              ITEM         MG/L
ARSENIC  (AS) 0.004             MANGANESE(MN) <0.01            URANIUM   (U) 0.927
CADMIUM  (CD) <0.01             MERCURY   (HG) <0.001          AMMONIA-N      0.07
IRON     (FE) 0.26              MOLY.     (MO) <0.01           RA 226(PCI/L) 16.8
LEAD     (PB) <0.02             SELENIUM (SE) 0.014                     +/-   1.5

REMARKS:                                                       CHECKED BY: DJJ/RKP

CL:RP-0583    TDWR-0678 (REV. 4-6-83)                       ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-43

PERMIT NO.              WELL NO.1I          SAMPLE NO.43
PROD.AREA NO.           SUBMITTED BY:URI    DATE COLLECTED:          ,BY:
OMPANY:URANIUM RESOURCES INC                MINE:

SMP |    DATE  | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                  UMHOS
 1  |          |     |      |                 | NORMAL WATER LEVEL:               MSL
 2  |          |     |      |                 | PUMP:SET@:         MSL;           GPM
 3  |          |     |      |                 | BOT.OF:CASING        SCR          (MSL)
 4  |          |     |      |                 | LAND SURFACE DATUM:               MSL

DATE RECEIVED:  10-20-87                      DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM           STORET     MG/L     F         EPM       ECF    (C)X(D)    % EPM
                                (A)     (B)        (C)       (D)
CALCIUM     (CA)      00915   21.6    =20.04X  1.08      X52.0=  56          7.00
MAGNESIUM   (MG)      00925   5.74    =12.16X  .47       X46.6=  22          3.00
SODIUM      (NA)      00929   316     =22.99X  13.75     X48.9=  672        88.80
POTASSIUM    (K)      00937   6.86    =39.10X  .18       X72.0=  13          1.20
                                TOTAL CATION = 15.48

CARBONATE (CO3)       00445   32      =30.00X  1.07      X84.6=  90          6.90
BICARB.   (HCO3)      00440   261     =61.02X  4.28      X43.6=  186        27.40
SULFATE   (SO4)       00945   200     =48.03X  4.16      X73.9=  308        26.70
CHLORIDE   (CL)       00940   216     =35.45X  6.09      X75.9=  462        39.00
NITRATE (NO3-N)       71851< .1                         TOTAL =  1809
FLUORIDE    (F)       00951   .54
 ILICA   (SIO2)       00955   18.1
                                TOTAL ANION  = 15.6

      TOTAL ION               1077.94
TDS (180 C)          70300   1030
TDS =TI-.5 HCO3           =  947                         ACCURACY CHECK
EC  (25 C)           00095   1660    UMHOS           ION    0.99       0.96 TO 1.04
EC  (DILUTE)= 104X 17     =  1770    UMHOS           TDS    1.09       0.90 TO 1.10
ALK. AS CACO3        00410   267                     EC     0.98       0.95 TO 1.05
PH                   00403   8.72

                             % CATION    % ANION
               80    60    40    20     0     20    40    60    80
                 |****|****|****|****|****|****|****|****|
           CA                              *      *               HCO3
                 |****|****|****|****|****|****|****|****|
           MG                               *     *               SO4
                 |****|****|****|****|****|****|****|****|
           NA+K*                                     *            CL
                 |****|****|****|****|****|****|****|****|
               80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

      ITEM        MG/L                  ITEM        MG/L                ITEM        MG/L
RSENIC    (AS) 0.001            MANGANESE(MN) 0.01              URANIUM    (U) 0.018
ADMIUM    (CD) <0.01            MERCURY   (HG) <0.001           AMMONIA-N      0.28
IRON      (FE) 0.07             MOLY.     (MO) 0.14             RA 226(PCI/L) 13.7
LEAD      (PB) <0.02            SELENIUM  (SE) 0.001                     +/-  1.3

REMARKS:                                                        CHECKED BY: DJJ/RKP

CL:RP-0583    TDWR-0678 (REV. 4-6-83)                        ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-44

PERMIT NO.           WELL NO.2-I        SAMPLE NO.44
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC           MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:              UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:           MSL
 2  |        |     |     |                 | PUMP:SET@:         MSL;       GPM
 3  |        |     |     |                 | BOT.OF:CASING        SCR      (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:           MSL

DATE RECEIVED:  10-20-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM        STORET    MG/L    F       EPM       ECF   (C)X(D)   % EPM
                             (A)   (B)       (C)     (D)
CALCIUM    (CA)    00915  19.9   =20.04X  .99       X52.0=  52        6.30
MAGNESIUM  (MG)    00925  5.99   =12.16X  .49       X46.6=  23        3.10
SODIUM     (NA)    00929  325    =22.99X  14.14     X48.9=  691      89.60
POTASSIUM   (K)    00937  6.24   =39.10X  .16       X72.0=  11        1.00
                           TOTAL CATION = 15.78

CARBONATE (CO3)    00445  38     =30.00X  1.27      X84.6=  107       8.30
BICARB.  (HCO3)    00440  267    =61.02X  4.38      X43.6=  191      28.50
SULFATE   (SO4)    00945  179    =48.03X  3.73      X73.9=  275      24.30
CHLORIDE    (CL)   00940  212    =35.45X  5.98      X75.9=  454      38.90
NITRATE (NO3-N)    71851< .1                       TOTAL =  1804
 LUORIDE    (F)    00951  .57
SILICA   (SIO2)    00955  18.9
                           TOTAL ANION  = 15.36

      TOTAL ION           1072.7
TDS (180 C)        70300  1020
TDS =TI-.5 HCO3         = 939                              ACCURACY CHECK
EC  (25 C)         00095  1630   UMHOS              ION   1.03     0.96 TO 1.04
EC  (DILUTE)= 103X 17   = 1750   UMHOS              TDS   1.09     0.90 TO 1.10
ALK. AS CACO3      00410  282                       EC    0.97     0.95 TO 1.05
PH                 00403  8.66

                            % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                     *        *              HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *      *               SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                                 *           CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM       MG/L              ITEM       MG/L             ITEM       MG/L
 RSENIC  (AS) 0.003           MANGANESE(MN) <0.01        URANIUM   (U) 0.043
CADMIUM  (CD) <0.01           MERCURY  (HG) <0.001       AMMONIA-N     0.25
IRON     (FE) 0.02            MOLY.    (MO) 0.02         RA 226(PCI/L) 25.0
LEAD     (PB) <0.02           SELENIUM (SE) 0.001                 +/-  1.8

REMARKS:                                                 CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-45

PERMIT NO.              WELL NO.3-I         SAMPLE NO.45
PROD.AREA NO.           SUBMITTED BY:URI    DATE COLLECTED:         ,BY:
 OMPANY:URANIUM RESOURCES INC               MINE:

SMP |    DATE  | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |          |     |     |                 | NORMAL WATER LEVEL:              MSL
 2  |          |     |     |                 | PUMP:SET@:          MSL;         GPM
 3  |          |     |     |                 | BOT.OF:CASING         SCR        (MSL)
 4  |          |     |     |                 | LAND SURFACE DATUM:              MSL

DATE RECEIVED:  10-20-87                    DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM      ECF     (C)X(D)    % EPM
                              (A)     (B)        (C)      (D)
CALCIUM     (CA)     00915  15.3    =20.04X  .76       X52.0=  40          4.70
MAGNESIUM   (MG)     00925  4.57    =12.16X  .38       X46.6=  18          2.30
SODIUM      (NA)     00929  340     =22.99X  14.79     X48.9=  723        91.10
POTASSIUM    (K)     00937  12.1    =39.10X  .31       X72.0=  22          1.90
                              TOTAL CATION = 16.24

CARBONATE (CO3)      00445  52      =30.00X  1.73      X84.6=  147        10.90
BICARB.  (HCO3)      00440  243     =61.02X  3.98      X43.6=  174        25.00
SULFATE   (SO4)      00945  177     =48.03X  3.69      X73.9=  272        23.20
CHLORIDE   (CL)      00940  230     =35.45X  6.49      X75.9=  492        40.80
NITRATE (NO3-N)      71851< .1                       TOTAL =   1888
FLUORIDE    (F)      00951  .59
SILICA   (SIO2)      00955  18.8
                              TOTAL ANION  = 15.89

      TOTAL ION             1093.46
TDS (180 C)         70300   975
TDS =TI-.5 HCO3         =   972                          ACCURACY CHECK
EC  (25 C)          00095   1650   UMHOS             ION   1.02      0.96 TO 1.04
EC  (DILUTE)= 100X 18   =   1800   UMHOS             TDS   1.00      0.90 TO 1.10
ALK. AS CACO3       00410   287                      EC    0.95      0.95 TO 1.05
PH                  00403   8.91

                               % CATION    % ANION
                  80   60   40   20    0    20   40   60   80
                   |****|****|****|****|****|****|****|****|
              CA                       *      *                HCO3
                   |****|****|****|****|****|****|****|****|
              MG                       *      *                SO4
                   |****|****|****|****|****|****|****|****|
              NA+K*                               *            CL
                   |****|****|****|****|****|****|****|****|
                  80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L               ITEM          MG/L               ITEM          MG/L
ARSENIC  (AS) 0.006             MANGANESE(MN) <0.01          URANIUM    (U) 0.021
CADMIUM  (CD) <0.01             MERCURY  (HG) <0.001         AMMONIA-N      0.85
IRON     (FE) 0.03              MOLY.    (MO) 0.03           RA 226(PCI/L) 12.7
LEAD     (PB) <0.02             SELENIUM (SE) 0.002                  +/-   1.3

REMARKS:                                                     CHECKED BY: DJJ/RKP

CL:RP-0583    TDWR-0678 (REV. 4-6-83)                      ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-46

PERMIT NO.               WELL NO.4-I          SAMPLE NO.46
PROD.AREA NO.            SUBMITTED BY:URI     DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC                 MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:             MSL
 2  |         |     |     |                 | PUMP:SET@:           MSL;       GPM
 3  |         |     |     |                 | BOT.OF:CASING         SCR       (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-20-87                      DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM      ECF    (C)X(D)    % EPM
                              (A)     (B)        (C)      (D)
CALCIUM    (CA)      00915  22.2    =20.04X   1.11     X52.0=   58         6.50
MAGNESIUM  (MG)      00925  5.58    =12.16X   .46      X46.6=   21         2.70
SODIUM     (NA)      00929  348     =22.99X   15.14    X48.9=   740       89.20
POTASSIUM   (K)      00937  10.7    =39.10X   .27      X72.0=   20         1.60
                             TOTAL CATION = 16.98

CARBONATE (CO3)      00445  35      =30.00X   1.17     X84.6=   99         7.00
BICARB.   (HCO3)     00440  246     =61.02X   4.03     X43.6=   176       24.20
SULFATE    (SO4)     00945  239     =48.03X   4.98     X73.9=   368       29.90
CHLORIDE    (CL)     00940  230     =35.45X   6.49     X75.9=   492       38.90
NITRATE (NO3-N)      71851< .1                        TOTAL =   1974
FLUORIDE     (F)     00951  .49
SILICA    (SIO2)     00955  18.9
                             TOTAL ANION  = 16.67

      TOTAL ION             1155.97
TDS (180 C)          70300  1050
TDS =TI-.5 HCO3         =   1033                             ACCURACY CHECK
EC  (25 C)           00095  1750   UMHOS                ION    1.02      0.96 TO 1.04
EC  (DILUTE)= 106X 18   =   1910   UMHOS                TDS    1.02      0.90 TO 1.10
ALK. AS CACO3        00410  260                         EC     0.97      0.95 TO 1.05
PH                   00403  8.78

                              % CATION   % ANION
                   80    60    40    20     0     20    40    60    80
                    |****|****|****|****|****|****|****|****|
               CA                       *       *                  HCO3
                    |****|****|****|****|****|****|****|****|
               MG                        *       *                 SO4
                    |****|****|****|****|****|****|****|****|
               NA+K*                                *              CL
                    |****|****|****|****|****|****|****|****|
                   80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

      ITEM        MG/L                ITEM          MG/L                ITEM          MG/L
ARSENIC   (AS) 0.001            MANGANESE(MN) <0.01              URANIUM    (U) 0.077
CADMIUM   (CD) <0.01            MERCURY   (HG) <0.001            AMMONIA-N      0.30
IRON      (FE) 0.05             MOLY.     (MO) 0.06              RA 226(PCI/L) 47.6
LEAD      (PB) <0.02            SELENIUM  (SE) <0.001                      +/-  2.4

REMARKS:                                                         CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-54

PERMIT NO.                WELL NO.5-I          SAMPLE NO.54
PROD.AREA NO.             SUBMITTED BY:URI     DATE COLLECTED:         ,BY:
OMPANY:URANIUM RESOURCES INC                   MINE: 0.001

SMP |    DATE | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                 UMHOS
 1  |         |     |      |                  | NORMAL WATER LEVEL:              MSL
 2  |         |     |      |                  | PUMP:SET@:          MSL;         GPM
 3  |         |     |      |                  | BOT.OF:CASING         SCR        (MSL)
 4  |         |     |      |                  | LAND SURFACE DATUM:              MSL

DATE RECEIVED:  10-22-87                      DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F          EPM       ECF    (C)X(D)    % EPM
                              (A)     (B)         (C)       (D)
CALCIUM    (CA)     00915  21.6    =20.04X  1.08       X52.0=  56           6.20
MAGNESIUM  (MG)     00925  5.27    =12.16X  .43        X46.6=  20           2.50
SODIUM     (NA)     00929  363     =22.99X  15.79      X48.9=  772         90.30
POTASSIUM   (K)     00937  7.32    =39.10X  .19        X72.0=  13           1.10
                              TOTAL CATION = 17.49

CARBONATE (CO3)     00445  38      =30.00X  1.27       X84.6=  107          7.60
BICARB.  (HCO3)     00440  335     =61.02X  5.49       X43.6=  239         32.70
SULFATE   (SO4)     00945  185     =48.03X  3.85       X73.9=  285         22.90
CHLORIDE   (CL)     00940  219     =35.45X  6.18       X75.9=  469         36.80
NITRATE (NO3-N)     71851< .1                         TOTAL =  1961
FLUORIDE    (F)     00951  .6
SILICA   (SIO2)     00955  18.2
                              TOTAL ANION  = 16.79

     TOTAL ION             1193.09
TDS (180 C)         70300  965
TDS =TI-.5 HCO3          = 1026                                ACCURACY CHECK
EC   (25 C)         00095  1650   UMHOS               ION    1.04       0.96 TO 1.04
EC   (DILUTE)= 104X 18   = 1870   UMHOS               TDS    0.94       0.90 TO 1.10
ALK. AS CACO3       00410  338                        EC     0.95       0.95 TO 1.05
PH                  00403  8.8

                              % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *         *               HCO3
                 |****|****|****|****|****|****|****|****|
            MG                       *      *                 SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                             *               CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM        MG/L              ITEM          MG/L
RSENIC   (AS) 0.003            MANGANESE(MN) 0.01          URANIUM    (U) 0.030
CADMIUM  (CD) 0.01             MERCURY  (HG) <0.001        AMMONIA-N      0.33
IRON     (FE) 0.06             MOLY.    (MO) 0.04          RA 226(PCI/L) 19.2
LEAD     (PB) <0.02            SELENIUM (SE) <0.001                  +/-  1.5

REMARKS:                                                   CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-69

PERMIT NO.           WELL NO.6I          SAMPLE NO.69
PROD.AREA NO.        SUBMITTED BY:URI    DATE COLLECTED:          ,BY:
 OMPANY:URANIUM RESOUCES INC             MINE: 0.001

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |         |     |     |                 | NORMAL WATER LEVEL:             MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL:        GPM
 3  |         |     |     |                 | BOT.OF:CASING         SCR       (MSL)
 4  |         |     |     |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-26-87                       DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F         EPM       ECF    (C)X(D)    % EPM
                              (A)     (B)        (C)       (D)
CALCIUM     (CA)     00915  10.1    =20.04X  .5          X52.0=  26          3.10
MAGNESIUM   (MG)     00925  4.26    =12.16X  .35         X46.6=  16          2.10
SODIUM      (NA)     00929  350     =22.99X  15.22       X48.9=  744        93.30
POTASSIUM    (K)     00937  9.87    =39.10X  .25         X72.0=  18          1.50
                              TOTAL CATION = 16.32

CARBONATE (CO3)      00445  42      =30.00X  1.4         X84.6=  118         8.70
BICARB.   (HCO3)     00440  260     =61.02X  4.26        X43.6=  186        26.50
SULFATE    (SO4)     00945  189     =48.03X  3.94        X73.9=  291        24.50
CHLORIDE    (CL)     00940  229     =35.45X  6.46        X75.9=  490        40.20
NITRATE (NO3-N)      71851< .02                         TOTAL =  1889
FLUORIDE     (F)     00951  .6
SILICA    (SIO2)     00955  16.8
                              TOTAL ANION  = 16.06

      TOTAL ION             1111.65
TDS (180 C)         70300   1030
TDS =TI-.5 HCO3         =   982                            ACCURACY CHECK
EC  (25 C)           00095  1710   UMHOS              ION   1.02       0.96 TO 1.04
EC  (DILUTE)= 100X 18    =  1800   UMHOS              TDS   1.05       0.90 TO 1.10
ALK. AS CACO3        00410  283                       EC    0.95       0.95 TO 1.05
PH                   00403  8.58

                            % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *       *              HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *      *               SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                             *            CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM         MG/L               ITEM         MG/L
ARSENIC   (AS) 0.02             MANGANESE(MN) <0.001           URANIUM    (U) 0.68
CADMIUM   (CD) 0.03             MERCURY   (HG) 0.01            AMMONIA-N      13.0
IRON      (FE) <0.02            MOLY.     (MO) 0.014           RA 226(PCI/L) 0.9
LEAD      (PB) <0.01            SELENIUM  (SE) 0.072                 +/-

REMARKS:                                                       CHECKED BY: DJJ/RKP

CL:RP-0583     TDWR-0478 (REV. 4-6-83)                       ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-55

PERMIT NO.                WELL NO.7-I          SAMPLE NO.55
PROD.AREA NO.             SUBMITTED BY:URI     DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC                  MINE:

SMP |    DATE | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                  UMHOS
 1  |         |     |      |                 | NORMAL WATER LEVEL:               MSL
 2  |         |     |      |                 | PUMP:SET@:          MSL;          GPM
 3  |         |     |      |                 | BOT.OF:CASING          SCR        (MSL)
 4  |         |     |      |                 | LAND SURFACE DATUM:               MSL

DATE RECEIVED:  10-22-87                        DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM           STORET    MG/L     F         EPM       ECF    (C)X(D)    % EPM
                               (A)     (B)        (C)       (D)
CALCIUM     (CA)     00915   21.7    =20.04X  1.08      X52.0=   56          6.30
MAGNESIUM   (MG)     00925   6.2     =12.16X  .51       X46.6=   24          3.00
SODIUM      (NA)     00929   355     =22.99X  15.44     X48.9=   755        89.40
POTASSIUM    (K)     00937   9.29    =39.10X  .24       X72.0=   17          1.40
                              TOTAL CATION = 17.27

CARBONATE (CO3)      00445   41      =30.00X  1.37      X84.6=   116         8.30
BICARB.   (HCO3)     00440   228     =61.02X  3.74      X43.6=   163        22.50
SULFATE    (SO4)     00945   235     =48.03X  4.89      X73.9=   362        29.50
CHLORIDE   (CL)      00940   234     =35.45X  6.6       X75.9=   501        39.80
NITRATE (NO3-N)      71851<  .1                        TOTAL =   1994
FLUORIDE     (F)     00951   .53
SILICA   (SIO2)      00955   19.6
                              TOTAL ANION  = 16.6

      TOTAL ION              1150.42
TDS (180 C)          70300   1030
TDS =TI-.5 HCO3          =   1036                          ACCURACY CHECK
EC  (25 C)           00095   1740     UMHOS            ION   1.04       0.96 TO 1.04
EC  (DILUTE)= 107X 18    =   1930     UMHOS            TDS   0.99       0.90 TO 1.10
ALK. AS CACO3        00410   255                       EC    0.97       0.95 TO 1.05
PH                   00403   8.85

                              % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                        *       *              HCO3
                 |****|****|****|****|****|****|****|****|
            MG                         *       *             SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                                 *          CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

      ITEM         MG/L                 ITEM          MG/L               ITEM          MG/L
ARSENIC  (AS) 0.002             MANGANESE(MN) 0.02             URANIUM   (U) 0.077
CADMIUM  (CD) 0.01              MERCURY  (HG) <0.001           AMMONIA-N       0.36
IRON     (FE) 0.03              MOLY.    (MO) 0.09             RA 226(PCI/L) 21.6
LEAD     (PB) <0.02             SELENIUM (SE) 0.001                      +/-   1.6

REMARKS:                                                       CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-56

PERMIT NO.              WELL NO.8-I           SAMPLE NO.56
PROD.AREA NO.           SUBMITTED BY:URI      DATE COLLECTED:         ,BY:
COMPANY:URANIUM RESOURCES INC                 MINE:

SMP |    DATE  | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMHOS
 1  |          |     |     |                 | NORMAL WATER LEVEL:             MSL
 2  |          |     |     |                 | PUMP:SET@:         MSL;         GPM
 3  |          |     |     |                 | BOT.OF:CASING        SCR        (MSL)
 4  |          |     |     |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  10-22-87                       DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F          EPM       ECF     (C)X(D)    % EPM
                              (A)     (B)         (C)       (D)
CALCIUM     (CA)    00915   23.4    =20.04X   1.17      X52.0=   61         7.20
MAGNESIUM   (MG)    00925   5.91    =12.16X   .49       X46.6=   23         3.00
SODIUM      (NA)    00929   332     =22.99X   14.44     X48.9=   706       88.80
POTASSIUM   (K)     00937   6.25    =39.10X   .16       X72.0=   12         1.00
                              TOTAL CATION = 16.26

CARBONATE (CO3)     00445   17      =30.00X   .57       X84.6=   48         3.50
BICARB.   (HCO3)    00440   264     =61.02X   4.33      X43.6=   189       26.90
SULFATE   (SO4)     00945   226     =48.03X   4.71      X73.9=   348       29.30
CHLORIDE  (CL)      00940   229     =35.45X   6.46      X75.9=   490       40.20
NITRATE (NO3-N)     71851<  .1                        TOTAL =   1877
FLUORIDE    (F)     00951   .51
SILICA   (SIO2)     00955   19
                              TOTAL ANION  = 16.07

     TOTAL ION              1123.17
TDS (180 C)         70300   1030
TDS =TI-.5 HCO3         =   991                          ACCURACY CHECK
EC   (25 C)         00095   1730   UMHOS             ION    1.01      0.96 TO 1.04
EC   (DILUTE)= 100X 18  =   1800   UMHOS             TDS    1.04      0.90 TO 1.10
ALK. AS CACO3       00410   245                      EC     0.96      0.95 TO 1.05
PH                  00403   8.42

                                % CATION    % ANION
                 80    60    40    20     0     20    40    60    80
                  |****|****|****|****|****|****|****|****|
            CA                           *        *                 HCO3
                  |****|****|****|****|****|****|****|****|
            MG                            *       *                 SO4
                  |****|****|****|****|****|****|****|****|
            NA+K*                                    *              CL
                  |****|****|****|****|****|****|****|****|
                 80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L              ITEM         MG/L              ITEM          MG/L
ARSENIC  (AS) 0.001          MANGANESE(MN) 0.01          URANIUM    (U) 0.180
CADMIUM  (CD) 0.01           MERCURY   (HG) <0.001       AMMONIA-N      0.18
IRON     (FE) 0.05           MOLY.     (MO) 0.05         RA 226(PCI/L) 42.1
LEAD     (PB) <0.02          SELENIUM  (SE) <0.001                 +/-   2.3

REMARKS:                                                 CHECKED BY: DJJ/RKP

CL:RP-0583    TDWR-0678 (REV. 4-6-83)                  ALL METHODS EPA APPROVED
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-57

PERMIT NO.              WELL NO.9-I           SAMPLE NO.57
PROD.AREA NO.           SUBMITTED BY:URI      DATE COLLECTED:          ,BY:
COMPANY:URANIUM RESOURCES INC                 MINE: 0.002

SMP |    DATE  | T(C)| PH   |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                  UMHOS
 1  |          |     |      |                 | NORMAL WATER LEVEL:               MSL
 2  |          |     |      |                 | PUMP:SET@:          MSL;          GPM
 3  |          |     |      |                 | BOT.OF:CASING          SCR        (MSL)
 4  |          |     |      |                 | LAND SURFACE DATUM:               MSL

DATE RECEIVED:  10-22-87                         DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET     MG/L      F          EPM       ECF    (C)X(D)    % EPM
                               (A)      (B)         (C)       (D)
CALCIUM     (CA)     00915   21      =20.04X   1.05      X52.0=   54          6.20
MAGNESIUM   (MG)     00925   5.58    =12.16X   .46       X46.6=   21          2.70
SODIUM      (NA)     00929   351     =22.99X   15.27     X48.9=   747        90.10
POTASSIUM    (K)     00937   6.79    =39.10X   .17       X72.0=   13          1.00
                               TOTAL CATION = 16.95

CARBONATE (CO3)      00445   41      =30.00X   1.37      X84.6=   116         8.10
BICARB.   (HCO3)     00440   288     =61.02X   4.72      X43.6=   206        27.80
SULFATE    (SO4)     00945   212     =48.03X   4.41      X73.9=   326        26.00
CHLORIDE   (CL)      00940   229     =35.45X   6.46      X75.9=   490        38.10
NITRATE (NO3-N)      71851< .04                        TOTAL =   1973
FLUORIDE    (F)      00951   .52
SILICA   (SIO2)      00955   18.5
                               TOTAL ANION  = 16.96

      TOTAL ION              1173.43
TDS (180 C)          70300   975
TDS =TI-.5 HCO3            = 1029                          ACCURACY CHECK
EC   (25 C)          00095   1670    UMHOS             ION    1.00       0.96 TO 1.04
EC   (DILUTE)= 104X 18     = 1870    UMHOS             TDS    0.95       0.90 TO 1.10
ALK. AS CACO3        00410   304                       EC     0.95       0.95 TO 1.05
PH                   00403   8.62

                               % CATION    % ANION
                  80    60    40    20     0     20    40    60    80
                   |****|****|****|****|****|****|****|****|
              CA                      *        *                 HCO3
                   |****|****|****|****|****|****|****|****|
              MG                       *       *                 SO4
                   |****|****|****|****|****|****|****|****|
              NA+K*                               *              CL
                   |****|****|****|****|****|****|****|****|
                  80    60    40    20     0     20    40    60    80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

       ITEM        MG/L                 ITEM         MG/L               ITEM          MG/L
ARSENIC   (AS) 0.002          MANGANESE(MN) <0.01          URANIUM     (U) 0.130
CADMIUM   (CD) 0.01           MERCURY   (HG) <0.001        AMMONIA-N       0.08
IRON      (FE) 0.05           MOLY.     (MO) 0.08          RA 226(PCI/L) 43.5
LEAD      (PB) <0.02          SELENIUM (SE) 0.003                   +/-   2.2

REMARKS:                                                   CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-70

PERMIT NO.           WELL NO.10I        SAMPLE NO.70
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:           ,BY:
COMPANY:URANIUM RESOUCES INC            MINE: 0.001

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:             UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:          MSL
 2  |        |     |     |                 | PUMP:SET@:        MSL;       GPM
 3  |        |     |     |                 | BOT.OF:CASING       SCR      (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:          MSL

DATE RECEIVED:  10-26-87                   DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM        STORET    MG/L    F       EPM     ECF   (C)X(D)   % EPM
                            (A)    (B)      (C)     (D)
CALCIUM    (CA)    00915  17.4   =20.04X  .87     X52.0=   45        5.40
MAGNESIUM  (MG)    00925  4.73   =12.16X  .39     X46.6=   18        2.40
SODIUM     (NA)    00929  338    =22.99X  14.7    X48.9=   719      91.20
POTASSIUM   (K)    00937  6.02   =39.10X  .15     X72.0=   11        0.90
                           TOTAL CATION = 16.11

CARBONATE (CO3)    00445  54     =30.00X  1.8     X84.6=   152      11.40
BICARB.  (HCO3)    00440  224    =61.02X  3.67    X43.6=   160      23.20
SULFATE   (SO4)    00945  199    =48.03X  4.14    X73.9=   306      26.20
CHLORIDE   (CL)    00940  219    =35.45X  6.18    X75.9=   469      39.10
NITRATE (NO3-N)    71851  .35                     TOTAL =  1880
FLUORIDE    (F)    00951  .53
SILICA   (SIO2)    00955  18.1
                           TOTAL ANION  = 15.79

      TOTAL ION           1081.13
TDS (180 C)        70300  972
TDS =TI-.5 HCO3         = 969                             ACCURACY CHECK
EC  (25 C)         00095  1660   UMHOS             ION   1.02     0.96 TO 1.04
EC  (DILUTE)= 100X 18   = 1800   UMHOS             TDS   1.00     0.90 TO 1.10
ALK. AS CACO3      00410  273                      EC    0.96     0.95 TO 1.05
PH                 00403  8.48

                            % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *      *               HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *       *              SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                               *          CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM      MG/L              ITEM       MG/L            ITEM       MG/L
ARSENIC  (AS) 0.001           MANGANESE(MN) <0.01       URANIUM    (U) 0.009
CADMIUM  (CD) 0.01            MERCURY  (HG) <0.001      AMMONIA-N      0.39
IRON     (FE) 0.02            MOLY.    (MO) <0.01       RA 226(PCI/L) 23.1
LEAD     (PB) <0.02           SELENIUM (SE) <0.001               +/-  1.1

REMARKS:                                                CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING       MARK
FILE #:6402-W51315-11
                                   I-11
PERMIT NO.                WELL NO.161            SAMPLE NO.11
PROD.AREA NO.             SUBMITTED BY:          DATE COLLECTED:          ,BY:
  MPANY:URANIUM RESOURCES INC.                   MINE:

SMP |    DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:                UMH
 1  |         |     |     |                 | NORMAL WATER LEVEL:             MSL
 2  |         |     |     |                 | PUMP:SET@:          MSL;        GPM
 3  |         |     |     |                 | BOT.OF:CASING        SCR        (MS
 4  |         |     |     |                 | LAND SURFACE DATUM:             MSL

DATE RECEIVED:  8-NOV-85                     DATE REPORTED:  17-DEC-85

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM           STORET    MG/L      F          EPM       ECF     (C)X(D)     % EPM
                               (A)      (B)         (C)       (D)
CALCIUM     (CA)     00915  10.1    =20.04X  .5           X52.0=  26          3.20
MAGNESIUM   (MG)     00925  2.8     =12.16X  .23          X46.6=  11          1.50
SODIUM      (NA)     00929  342     =22.99X  14.88        X48.9=  727        94.10
POTASSIUM    (K)     00937  7.9     =39.10X  .2           X72.0=  15          1.30
                              TOTAL CATION = 15.81

CARBONATE (CO3)      00445  0       =30.00X  0            X84.6=  0           0.00
BICARB.   (HCO3)     00440  251     =61.02X  4.11         X43.6=  179        26.10
SULFATE    (SO4)     00945  81      =48.03X  1.69         X73.9=  125        10.70
CHLORIDE    (CL)     00940  352     =35.45X  9.93         X75.9=  754        63.10
NITRATE (NO3-N)      71851< .1                           TOTAL =  1837
FLUORIDE     (F)     00951  .63
   ICA    (SIO2)     00955  16.9
                              TOTAL ANION  = 15.73

      TOTAL ION             1064.43
TDS (180 C)          70300  944
TDS =TI-.5 HCO3          =  939                          ACCURACY CHECK
EC   (25 C)          00095  1680   UMHOS            ION   1.01       0.96 TO 1.0
EC  (DILUTE)= 119X 15    =  1785   UMHOS            TDS   1.01       0.90 TO 1.1
ALK. AS CACO3        00410  205                     EC    0.97       0.95 TO 1.0
PH                   00403  7.82

                             % CATION    % ANION
                 80   60   40   20    0    20   40   60   80
                  |****|****|****|****|****|****|****|****|
             CA                        *       *             HCO3
                  |****|****|****|****|****|****|****|****|
             MG                         *  *                 SO4
                  |****|****|****|****|****|****|****|****|
             NA+K*                                    *      CL
                  |****|****|****|****|****|****|****|****|
                 80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM          MG/L                 ITEM          MG/L               ITEM           MG/L
(   ENIC   (AS) 0.001            MANGANESE(MN) <0.01           URANIUM     (U) 0.008
L.  MIUM   (CD) <0.01            MERCURY  (HG) 0.0002          AMMONIA-N       <0.01
IRON       (FE) 0.11             MOLY.    (MO) <0.1            RA 226(PCI/L) 0.66
LEAD       (PB) <0.02            SELENIUM (SE) <0.001                   +/-  0.31

REMARKS:                                                       CHECKED BY: DJJ/RKP

CL:RP-0583     TDWR-0678 (REV  4-6-87)
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-73

PERMIT NO.           WELL NO.KVD 13I    SAMPLE NO.73
PROD.AREA NO.        SUBMITTED BY:URI   DATE COLLECTED:         ,BY:
COMPANY:URANIUM RESOUCES INC            MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:            UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:         MSL
 2  |        |     |     |                 | PUMP:SET@:        MSL;      GPM
 3  |        |     |     |                 | BOT.OF:CASING       SCR     (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:         MSL

DATE RECEIVED:  10-30-87                   DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L     F       EPM      ECF    (C)X(D)    % EPM
                              (A)     (B)      (C)      (D)
CALCIUM    (CA)    00915  14.3   =20.04X  .71      X52.0=  37        4.30
MAGNESIUM  (MG)    00925  3.9    =12.16X  .32      X46.6=  15        2.00
SODIUM     (NA)    00929  349    =22.99X  15.18    X48.9=  742      92.90
POTASSIUM   (K)    00937  5.21   =39.10X  .13      X72.0=  10        0.80
                           TOTAL CATION = 16.34

CARBONATE (CO3)    00445  36     =30.00X  1.2      X84.6=  102       7.60
BICARB.  (HCO3)    00440  266    =61.02X  4.36     X43.6=  190      27.60
SULFATE   (SO4)    00945  179    =48.03X  3.73     X73.9=  275      23.60
CHLORIDE   (CL)    00940  231    =35.45X  6.52     X75.9=  495      41.20
NITRATE (NO3-N)    71851  .95                     TOTAL =  1866
FLUORIDE    (F)    00951  .56
SILICA   (SIO2)    00955  9.1
                           TOTAL ANION  = 15.81

      TOTAL ION           1095.02
TDS (180 C)        70300  988
TDS =TI-.5 HCO3         = 962                            ACCURACY CHECK
EC  (25 C)         00095  1720   UMHOS            ION    1.03     0.96 TO 1.04
EC  (DILUTE)= 100X 18   = 1800   UMHOS            TDS    1.03     0.90 TO 1.10
ALK. AS CACO3      00410  279                     EC     0.96     0.95 TO 1.05
PH                 00403  8.45

                            % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                     *       *              HCO3
                 |****|****|****|****|****|****|****|****|
            MG                     *      *               SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                             *           CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM         MG/L                ITEM         MG/L                ITEM         MG/L
ARSENIC  (AS) 0.005          MANGANESE(MN) <0.01          URANIUM    (U) 0.156
CADMIUM  (CD) <0.01          MERCURY  (HG) <0.001         AMMONIA-N        0.21
IRON     (FE) <0.01          MOLY.    (MO) <0.01          RA 226(PCI/L)    12.1
LEAD     (PB) <0.02          SELENIUM (SE) 0.009                   +/-     0.8

REMARKS:                                                  CHECKED BY: DJJ/RKP
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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING

FILE #:6402-W83312-4

I-12

CORE LAB
CORE LABORATORIES INC

PERMIT NO. WELL NO.PBL-4 SAMPLE NO.4
PROD.AREA NO. SUBMITTED BY: DATE COLLECTED:7-11-83 ,BY:
COMPANY:URANIUM RESOURCES INC. MINE: KINGSVILLE DOME

SMP	DATE	T(C)	PH	SPEC.COND.(UMHOS)		
1					NORMAL WATER LEVEL:	MSL
2					PUMP:SET@: MSL;	GPM
3					BOT.OF:CASING SCR	(MSL)
4					LAND SURFACE DATUM:	MSL

SPEC.COND.@WELL: UMHOS

DATE RECEIVED: 7-12-83 DATE REPORTED: 8-19-83

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

ITEM	STORET	MG/L (A)	F (B)	EPM (C)	ECF (D)	(C)X(D)	% EPM
CALCIUM (CA)	00915	14	=20.04X	.7	X52.0=	36	4.30
MAGNESIUM (MG)	00925	4	=12.16X	.33	X46.6=	15	2.00
SODIUM (NA)	00929	346	=22.99X	15.05	X48.9=	736	92.30
POTASSIUM (K)	00937	9	=39.10X	.23	X72.0=	17	1.40
		TOTAL CATION	=	16.31			
CARBONATE (CO3)	00445	26	=30.00X	.87	X84.6=	73	5.30
BICARB. (HCO3)	00440	237	=61.02X	3.88	X43.6=	169	23.70
SULFATE (SO4)	00945	229	=48.03X	4.77	X73.9=	352	29.20
CHLORIDE (CL)	00940	242	=35.45X	6.83	X75.9=	518	41.80
NITRATE (NO3-N)	71851	.5			TOTAL =	1916	
FLUORIDE (F)	00951	.6					
SILICA (SIO2)	00955	17					
		TOTAL ANION	=	16.35			

TOTAL ION		1125.1
TDS (180 C)	70300	972
TDS =TI-.5 HCO3	=	1007
EC (25 C)	00095	1750 UMHOS
EC (DILUTE)= 19.1X100	=	1910 UMHOS
ALK. AS CACO3	00410	237
PH	00403	8.71

ACCURACY CHECK

ION	1.00	0.96 TO 1.04
TDS	0.97	0.90 TO 1.10
EC	1.00	0.95 TO 1.05

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                            % CATION   % ANION
                80   60   40   20    0    20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                      *      *               HCO3
                 |****|****|****|****|****|****|****|****|
            MG                      *       *              SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                              *           CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0    20   40   60   80
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MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC (AS)	0.022	MANGANESE(MN)	0.03	URANIUM (U)	0.016
CADMIUM (CD)	<0.01	MERCURY (HG)	<0.0002	AMMONIA-N	.098
IRON (FE)	<0.01	MOLY. (MO)	0.2	RA 226(PCI/L)	0.84
LEAD (PB)	<0.02	SELENIUM (SE)	0.001	+/-	0.33

REMARKS:

CHECKED BY: DJJ/RKP

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GROUND WATER ANALYSIS REPORT-INSITU URANIUM MINING
FILE #:6402-71447-39

PERMIT NO.              WELL NO.KVD 12-D   SAMPLE NO.39
PROD.AREA NO.           SUBMITTED BY:URI   DATE COLLECTED:          ,BY:
 OMPANY:URANIUM RESOURCES INC              MINE:

SMP |   DATE | T(C)| PH  |SPEC.COND.(UMHOS)| SPEC.COND.@WELL:              UMHOS
 1  |        |     |     |                 | NORMAL WATER LEVEL:           MSL
 2  |        |     |     |                 | PUMP:SET@:          MSL;      GPM
 3  |        |     |     |                 | BOT.OF:CASING        SCR      (MSL)
 4  |        |     |     |                 | LAND SURFACE DATUM:           MSL

DATE RECEIVED:  10-17-87                      DATE REPORTED:  11-17-87

MAJOR AND SECONDARY CONSTITUENTS (GROUP NO. 1)

      ITEM          STORET    MG/L      F         EPM      ECF    (C)X(D)    % EPM
                              (A)      (B)        (C)      (D)
CALCIUM    (CA)     00915  1.59     =20.04X  .08       X52.0=  4            0.50
MAGNESIUM  (MG)     00925  .26      =12.16X  .02       X46.6=  1            0.10
SODIUM     (NA)     00929  382      =22.99X  16.62     X48.9=  813         98.30
POTASSIUM   (K)     00937  6.86     =39.10X  .18       X72.0=  13           1.10
                              TOTAL CATION = 16.9

CARBONATE (CO3)     00445  44       =30.00X  1.47      X84.6=  124          9.10
BICARB.   (HCO3)    00440  412      =61.02X  6.75      X43.6=  294         41.60
SULFATE    (SO4)    00945  49       =48.03X  1.02      X73.9=  75           6.30
CHLORIDE   (CL)     00940  248      =35.45X  7         X75.9=  531         43.10
NITRATE (NO3-N)     71851  1.78                       TOTAL =  1855
FLUORIDE    (F)     00951  .81
SILICA    (SIO2)    00955  20.4
                              TOTAL ANION  = 16.24

     TOTAL ION             1166.7
TDS (180 C)         70300  1000
TDS =TI-.5 HCO3        =  961                           ACCURACY CHECK
EC  (25 C)          00095  1710   UMHOS           ION    1.04      0.96 TO 1.04
EC  (DILUTE)= 100X 18   = 1800   UMHOS           TDS    1.04      0.90 TO 1.10
ALK. AS CACO3       00410  411                    EC     0.97      0.95 TO 1.05
PH                  00403  8.9

                            % CATION   % ANION
                80   60   40   20    0   20   40   60   80
                 |****|****|****|****|****|****|****|****|
            CA                       *         *            HCO3
                 |****|****|****|****|****|****|****|****|
            MG                       * *                    SO4
                 |****|****|****|****|****|****|****|****|
            NA+K*                               *           CL
                 |****|****|****|****|****|****|****|****|
                80   60   40   20    0   20   40   60   80

MINOR AND TRACE CONSTITUENTS (GROUP NO. 2)

     ITEM        MG/L                ITEM        MG/L                ITEM          MG/L
 RSENIC   (AS) 0.001           MANGANESE(MN) <0.01           URANIUM    (U) 0.005
CADMIUM   (CD) <0.01           MERCURY   (HG) <0.001          AMMONIA-N      0.06
IRON      (FE) 0.05            MOLY.     (MO) 0.05            RA 226(PCI/L) <0.16
LEAD      (PB) <0.02           SELENIUM (SE) 0.001                    +/-   0.20

REMARKS:                                                      CHECKED BY: DJJ/RKP
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Production Wells

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4002
3-29-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	11	0.55	28.60	3.12
MAGNESIUM(MG)	2.2	0.18	8.39	1.02
SODIUM(NA)	378	16.44	803.92	93.25
POTASSIUM(K)	18	0.46	33.12	2.61
	TOTAL CATION	17.63		
CARBONATE(CO3)	7	0.23	19.46	1.35
BICARBONATE(HCO3)	226	3.70	161.32	21.76
SULFATE(SO4)	261	5.43	401.28	31.94
CHLORIDE(CL)	271	7.64	579.88	44.94
NITRATE(NO3-N)	0.02			
FLUORIDE(F)	0.60	TOTAL	2035.96	
SILICA(SIO2)	17			
	TOTAL ANION	17.00		

TOTAL ION 1192

TDS(180 C)	1090
TOT ION-0.5 HCO3=	1079
EC(25 C)	1800 UMHOS
EC(DIL)=100.5 X 20.0 =	2010 UMHOS
ALK. AS CACO3	197
PH	8.59

ACCURACY CHECK

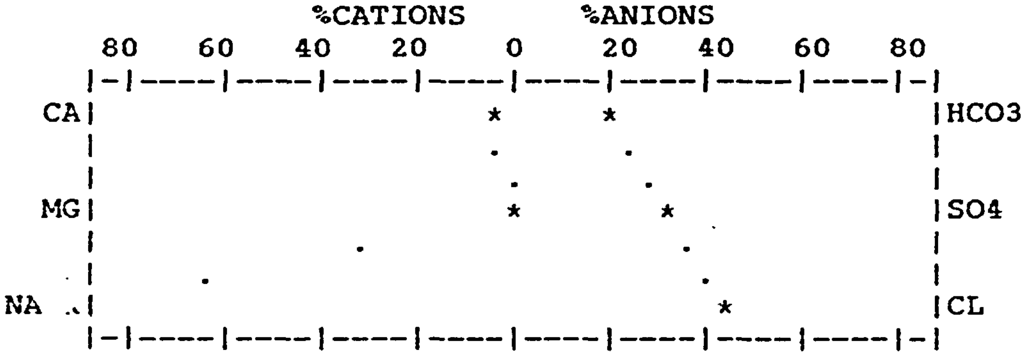
		RANGE
ION	1.037	(.96 TO 1.04)
TDS	1.010	(.90 TO 1.10)
EC	0.987	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	14	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.003	MANGANESE(MN)	<0.01	VANADIUM(V)	<0.01
BARIUM(BA)	0.09	MERCURY(HG)	<0.0001	ZINC(ZN)	<0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	2.0	BORON(B)	1.0
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.45
COPPER(CU)	0.01	SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	0.390		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M34-2324

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4009
3-30-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	21	1.05	54.60	6.34
MAGNESIUM(MG)	5.4	0.44	20.50	2.66
SODIUM(NA)	340	14.79	723.23	89.31
POTASSIUM(K)	11	0.28	20.16	1.69
	TOTAL CATION	16.56		
CARBONATE(CO3)	5	0.17	14.38	1.04
BICARBONATE(HCO3)	248	4.06	177.02	24.94
SULFATE(SO4)	244	5.08	375.41	31.20
CHLORIDE(CL)	247	6.97	529.02	42.81
NITRATE(NO3-N)	0.03			
FLUORIDE(F)	0.56	TOTAL	1914.33	
SILICA(SIO2)	19			
	TOTAL ANION	16.28		
TOTAL ION	1141			

TDS(180 C)	1010	
TOT ION-0.5 HCO3=	1017	
EC(25 C)	1680	UMHOS
EC(DIL)=112.0 X 16.7 =	1870	UMHOS
ALK. AS CACO3	211	
PH	8.46	

ACCURACY CHECK

		RANGE
ION	1.017	(.96 TO 1.04)
TDS	0.993	(.90 TO 1.10)
EC	0.977	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	152	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	0.01	VANADIUM(V)	<0.01
BARIUM(BA)	0.16	MERCURY(HG)	<0.0001	ZINC(ZN)	<0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.32	BORON(B)	1.2
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.19
COPPER(CU)	0.01	SELENIUM(SE)	0.004		
IRON(FE)	0.05	SILVER(AG)	<0.01		
LEAD(PB)	0.003	URANIUM(U)	0.229		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                   *       *               |HCO3
    |                    .       .              |
    |                    .       .              |
  MG|                    *        *             |SO4
    |             .                .            |
    |      .                        .           |
NA  |                                *          |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M34-2325

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4014
3-30-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	23	1.15	59.80	6.89
MAGNESIUM(MG)	7.3	0.60	27.96	3.59
SODIUM(NA)	338	14.70	718.83	88.02
POTASSIUM(K)	9.6	0.25	18.00	1.50
	TOTAL CATION	16.7		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	285	4.67	203.61	28.58
SULFATE(SO4)	239	4.98	368.02	30.48
CHLORIDE(CL)	237	6.69	507.77	40.94
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	0.56	TOTAL	1904.00	
SILICA(SIO2)	19			
	TOTAL ANION	16.34		

TOTAL ION 1158

TDS(180 C)	1010	
TOT ION-0.5 HCO3=	1016	
EC(25 C)	1710	UMHOS
EC(DIL)= 94.0 X 20.0 =	1880	UMHOS
ALK. AS CACO3	234	
PH	8.24	

ACCURACY CHECK

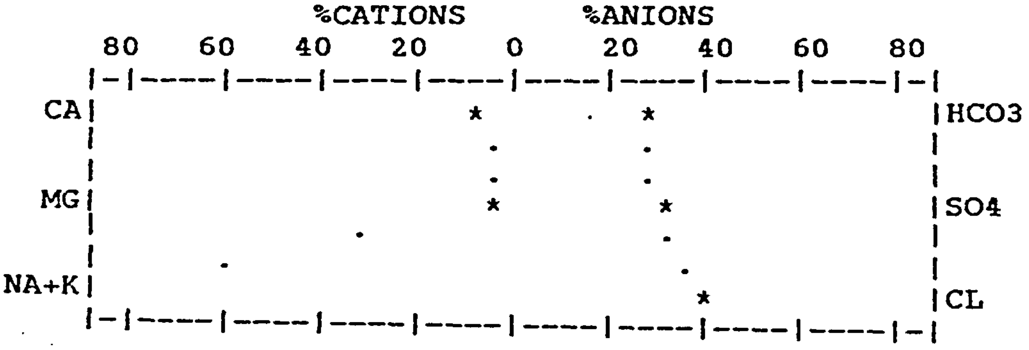
		RANGE
ION	1.022	(.96 TO 1.04)
TDS	0.994	(.90 TO 1.10)
EC	0.987	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	62	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.004	MANGANESE(MN)	<0.01	VANADIUM(V)	<0.01
BARIUM(BA)	0.09	MERCURY(HG)	<0.0001	ZINC(ZN)	<0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.55	BORON(B)	1.2
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.14
COPPER(CU)	<0.01	SELENIUM(SE)	0.007		
IRON(FE)	0.05	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	0.153		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M34-2326

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4025
3-30-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	18	0.90	46.80	5.60
MAGNESIUM(MG)	4.6	0.38	17.71	2.36
SODIUM(NA)	333	14.48	708.07	90.11
POTASSIUM(K)	12	0.31	22.32	1.93
	TOTAL CATION	16.07		
CARBONATE(CO3)	5	0.17	14.38	1.08
BICARBONATE(HCO3)	266	4.36	190.10	27.59
SULFATE(SO4)	234	4.87	359.89	30.82
CHLORIDE(CL)	227	6.40	485.76	40.51
NITRATE(NO3-N)	0.05			
FLUORIDE(F)	0.56	TOTAL	1845.03	
SILICA(SIO2)	20			
	TOTAL ANION	15.80		

TOTAL ION 1120

TDS(180 C)	983	
TOT ION-0.5 HCO3=	987	
EC(25 C)	1660	UMHOS
EC(DIL)=107.8 X 16.7 =	1800	UMHOS
ALK. AS CACO3	226	
PH	8.45	

ACCURACY CHECK

		RANGE
ION	1.017	(.96 TO 1.04)
TDS	0.996	(.90 TO 1.10)
EC	0.976	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	43	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	0.01	VANADIUM(V)	<0.01
BARIUM(BA)	0.11	MERCURY(HG)	<0.0001	ZINC(ZN)	<0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.82	BORON(B)	1.2
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.11
COPPER(CU)	<0.01	SELENIUM(SE)	0.002		
IRON(FE)	0.03	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	0.513		

```
              %CATIONS     %ANIONS
   80   60   40   20    0    20   40   60   80
  |-|----|----|----|----|----|----|----|----|-|
CA|                    *       *              |HCO3
  |                    .       .              |
  |                    .       .              |
MG|                    *        *             |SO4
  |             .                .            |
  |      .                       .            |
NA|                               *           |CL
  |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M34-2327

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4030
3-30-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	21	1.05	54.60	6.57
MAGNESIUM(MG)	5.8	0.48	22.37	3.00
SODIUM(NA)	325	14.14	691.45	88.49
POTASSIUM(K)	12	0.31	22.32	1.94
	TOTAL CATION	15.98		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	285	4.67	203.61	29.45
SULFATE(SO4)	234	4.87	359.89	30.71
CHLORIDE(CL)	224	6.32	479.69	39.85
NITRATE(NO3-N)	<0.01			
FLUORIDE(F)	0.67	TOTAL	1833.93	
SILICA(SIO2)	20			

TOTAL ANION 15.86

TOTAL ION 1127

TDS(180 C)	1000	
TOT ION-0.5 HCO3=	985	
EC(25 C)	1660 UMHOS	
EC(DIL)=108.4 X 16.7 =	1810 UMHOS	
ALK. AS CACO3	234	
PH	8.08	

ACCURACY CHECK

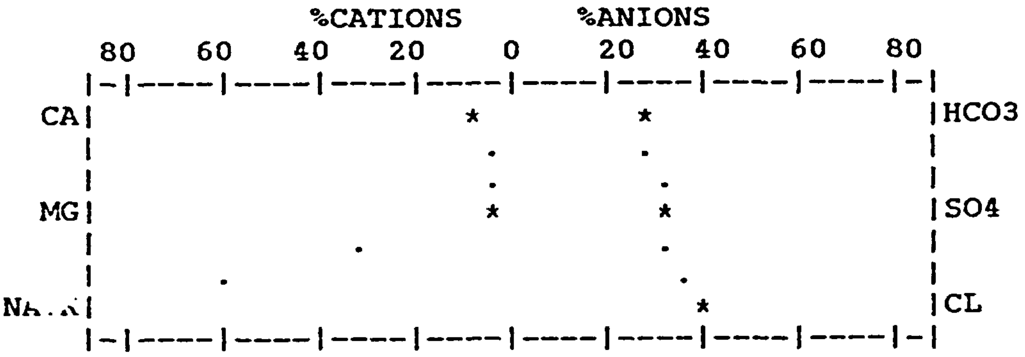
		RANGE
ION	1.008	(.96 TO 1.04)
TDS	1.015	(.90 TO 1.10)
EC	0.987	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	62	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.011	MANGANESE(MN)	0.01	VANADIUM(V)	<0.01
BARIUM(BA)	0.06	MERCURY(HG)	<0.0001	ZINC(ZN)	0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.89	BORON(B)	1.2
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.21
COPPER(CU)	<0.01	SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	1.61		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M34-2328

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4050-A
4-2-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	11	0.55	28.60	3.38
MAGNESIUM(MG)	0.11	0.01	0.47	0.06
SODIUM(NA)	350	15.22	744.26	93.55
POTASSIUM(K)	19	0.49	35.28	3.01
	TOTAL CATION	16.27		
CARBONATE(CO3)	58	1.93	163.28	11.41
BICARBONATE(HCO3)	66	1.08	47.09	6.39
SULFATE(SO4)	310	6.45	476.66	38.14
CHLORIDE(CL)	264	7.45	565.46	44.06
NITRATE(NO3-N)	0.13			
FLUORIDE(F)	0.76	TOTAL	2061.08	
SILICA(SIO2)	20			
	TOTAL ANION	16.91		

TOTAL ION 1099

TDS(180 C)	1020
TOT ION-0.5 HCO3=	1066
EC(25 C)	1730 UMHOS
EC(DIL)= 99.5 X 20.0 =	1990 UMHOS
ALK. AS CACO3	150
PH	9.68

ACCURACY CHECK

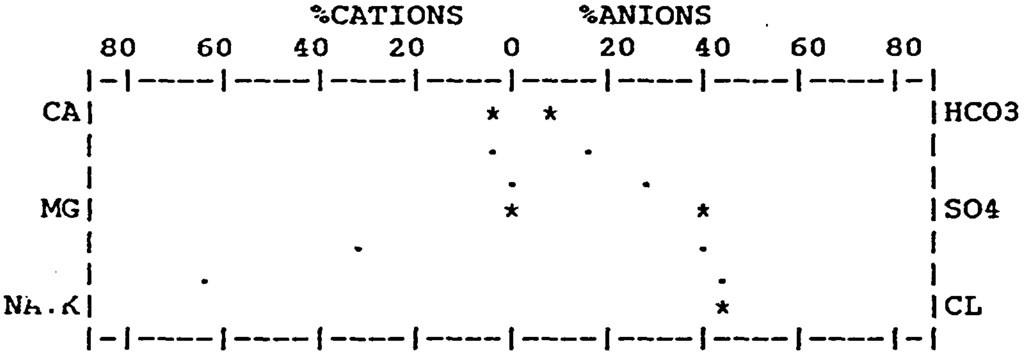
		RANGE
ION	0.962	(.96 TO 1.04)
TDS	0.957	(.90 TO 1.10)
EC	0.966	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	11	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.026	MANGANESE(MN)	<0.01	VANADIUM(V)	0.06
BARIUM(BA)	0.07	MERCURY(HG)	<0.0001	ZINC(ZN)	<0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	1.0	BORON(B)	0.92
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.62
COPPER(CU)	<0.01	SELENIUM(SE)	0.187		
IRON(FE)	0.14	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	0.513		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M334-2329

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4057
3-29-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	12	0.60	31.20	3.76
MAGNESIUM(MG)	1.8	0.15	6.99	0.94
SODIUM(NA)	338	14.70	718.83	92.22
POTASSIUM(K)	19	0.49	35.28	3.07
	TOTAL CATION	15.94		
CARBONATE(CO3)	31	1.03	87.14	6.42
BICARBONATE(HCO3)	112	1.84	80.22	11.46
SULFATE(SO4)	252	5.25	387.98	32.71
CHLORIDE(CL)	281	7.93	601.89	49.41
NITRATE(NO3-N)	0.04			
FLUORIDE(F)	0.93	TOTAL	1949.52	
SILICA(SIO2)	14			
	TOTAL ANION	16.05		

TOTAL ION 1062

TDS(180 C)	1060	
TOT ION-0.5 HCO3=	1006	
EC(25 C)	1720	UMHOS
EC(DIL)= 95.5 X 20.0 =	1910	UMHOS
ALK. AS CACO3	144	
PH	9.24	

ACCURACY CHECK

		RANGE
ION	0.993	(.96 TO 1.04)
TDS	1.054	(.90 TO 1.10)
EC	0.980	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	24	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.020	MANGANESE(MN)	0.01	VANADIUM(V)	<0.01
BARIUM(BA)	0.04	MERCURY(HG)	<0.0001	ZINC(ZN)	<0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	1.8	BORON(B)	0.84
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	1.1
COPPER(CU)	<0.01	SELENIUM(SE)	0.004		
IRON(FE)	0.03	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	0.304		

```
                 %CATIONS      %ANIONS
      80   60   40   20    0    20   40   60   80
     |-|----|----|----|----|----|----|----|----|-|
   CA|                    *   *                  |HCO3
     |                    .     .                |
     |                     .     .               |
   MG|                     *       *             |SO4
     |             .                 .           |
     |     .                          .          |
 NA.K|                                 *         |CL
     |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M34-2330

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4061-A
3-29-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	10	0.50	26.00	2.87
MAGNESIUM(MG)	2.3	0.19	8.85	1.09
SODIUM(NA)	375	16.31	797.56	93.57
POTASSIUM(K)	17	0.43	30.96	2.47
	TOTAL CATION	17.43		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	135	2.21	96.36	13.18
SULFATE(SO4)	267	5.56	410.88	33.15
CHLORIDE(CL)	319	9.00	683.10	53.67
NITRATE(NO3-N)	0.10			
FLUORIDE(F)	0.83	TOTAL	2053.71	
SILICA(SIO2)	17			
	TOTAL ANION	16.77		

TOTAL ION 1143

TDS(180 C)	1160			
TOT ION-0.5 HCO3=	1076			
EC(25 C)	1930 UMHOS			
EC(DIL)=103.5 X 20.0 =	2070 UMHOS			
ALK. AS CACO3	111			
PH	8.04			

ACCURACY CHECK

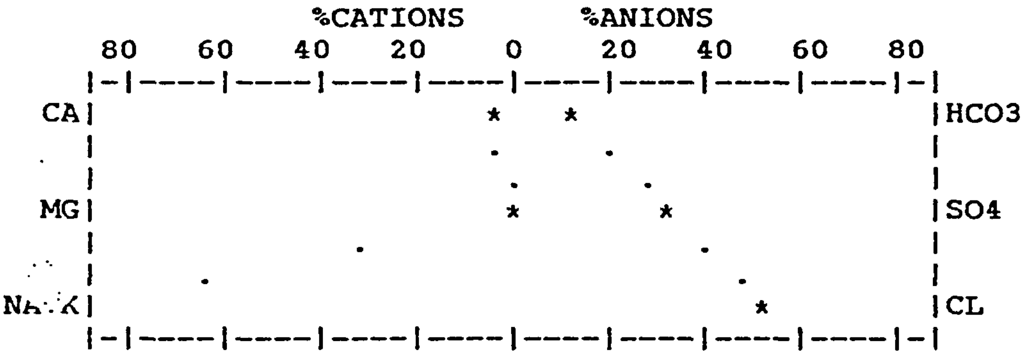
		RANGE
ION	1.039	(.96 TO 1.04)
TDS	1.078	(.90 TO 1.10)
EC	1.008	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	66	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.043	MANGANESE(MN)	<0.01	VANADIUM(V)	<0.01
BARIUM(BA)	0.03	MERCURY(HG)	<0.0001	ZINC(ZN)	<0.01
CADMIUM(CD)	<0.0001	MOLY.(MO)	4.0	BORON(B)	1.0
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.46
COPPER(CU)	<0.01	SELENIUM(SE)	0.166		
IRON(FE)	0.02	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	2.20		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M34-2331

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: MAY 13, 1996
IDENTIFICATION: KVD WELL #4073-A
3-29-96
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	10	0.50	26.00	2.94
MAGNESIUM(MG)	2.8	0.23	10.72	1.35
SODIUM(NA)	365	15.88	776.53	93.47
POTASSIUM(K)	15	0.38	27.36	2.24
	TOTAL CATION	16.99		
CARBONATE(CO3)	0	0.00	0.00	0.00
BICARBONATE(HCO3)	168	2.75	119.90	16.70
SULFATE(SO4)	278	5.79	427.88	35.15
CHLORIDE(CL)	281	7.93	601.89	48.15
NITRATE(NO3-N)	0.27			
FLUORIDE(F)	0.90	TOTAL	1990.28	
SILICA(SIO2)	15			
	TOTAL ANION	16.47		

TOTAL ION 1136

TDS(180 C)	1080			
TOT ION-0.5 HCO3=	1052			
EC(25 C)	1790 UMHOS			
EC(DIL)= 98.0 X 20.0 =	1960 UMHOS			
ALK. AS CACO3	138			
PH	8.26			

ACCURACY CHECK

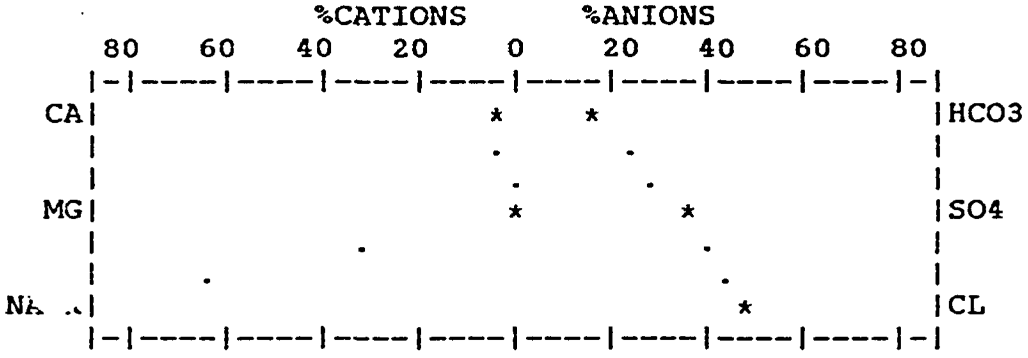
		RANGE
ION	1.032	(.96 TO 1.04)
TDS	1.027	(.90 TO 1.10)
EC	0.985	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	37	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	0.01	VANADIUM(V)	<0.01
BARIUM(BA)	0.03	MERCURY(HG)	<0.0001	ZINC(ZN)	0.02
CADMIUM(CD)	<0.0001	MOLY.(MO)	2.8	BORON(B)	0.99
CHROM.(CR)	<0.01	NICKEL(NI)	<0.01	AMMONIA-N	0.44
COPPER(CU)	<0.01	SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)	<0.01		
LEAD(PB)	<0.001	URANIUM(U)	0.305		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M34-2332

0371

PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 14, 1997

NC.
Merit Drive, Suite 1020, LB12
as, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7512
3:20 PM 9-24-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	2.2	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	1.86	Owen	10-01-97
SM 7500-Ra C.	Radium 226, pci/L ---------	604	Strauss	10-02-97
	Counting Error, pci/L +/-	3		
Radon Emanation	*Radon 222, pci/L ----------	94600	Strauss	09-25-97
	Counting Error, pci/L +/-	200		

* Value reflects Radon 222 content as of 3:20 PM 9-24-97.

Lab. No. M35-11229

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Extraction Well #7504A
9:00 AM 9-25-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.05	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.041	Owen	10-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	44	Strauss	10-09-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	17800	Strauss	09-29-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 9:00 AM 9-25-97.

Lab. No. M35-11389

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7502A
10:15 AM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.04	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.087	Owen	10-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	19	Strauss	10-02-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	52500	Strauss	09-24-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 10:15 AM 9-23-97.

Lab. No. M35-11169

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7311
10:05 AM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.06	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.220	Owen	10-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	47	Strauss	10-02-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	115000	Strauss	09-24-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:05 AM 9-23-97.

Lab. No. M35-11168

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7310
10:05 AM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.05	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.202	Owen	10-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	36	Strauss	10-02-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	96800	Strauss	09-24-97
	Counting Error, pci/L +/-	200		

* Value reflects Radon 222 content as of 10:05 AM 9-23-97.

Lab. No. M35-11167

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7306
10:15 AM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	1.1	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.137	Owen	10-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	82	Strauss	10-02-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	89200	Strauss	09-24-97
	Counting Error, pci/L +/-	200		

* Value reflects Radon 222 content as of 10:15 AM 9-23-97.

Lab. No. M35-11166

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7506A
10:10 AM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	11	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	23.5	Owen	10-06-97
SM 7500-Ra C.	Radium 226, pci/L ---------	178	Strauss	10-02-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	32000	Strauss	09-24-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 10:10 AM 9-23-97.

Lab. No. M35-11170

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7516
9:50 AM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.11	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	2.22	Owen	10-01-97
SM 7500-Ra C.	Radium 226, pci/L --------- Counting Error, pci/L +/-	321 2	Strauss	10-02-97
Radon Emanation	*Radon 222, pci/L ---------- Counting Error, pci/L +/-	31500 100	Strauss	09-24-97

* Value reflects Radon 222 content as of 9:50 AM 9-23-97.

Lab. No. M35-11171

Respectfully Submitted,

Carl F. Crownover, Pres.

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7521
10:00 AM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.30	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.873	Owen	10-01-97
SM 7500-Ra C.	Radium 226, pci/L ---------	16	Strauss	10-02-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	80200	Strauss	09-24-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 10:00 AM 9-23-97.

Lab. No. M35-11172

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7525
9:50 AM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.04	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.033	Owen	10-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	265	Strauss	10-02-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	72900	Strauss	09-24-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 9:50 AM 9-23-97.

Lab. No. M35-11173

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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CORPUS CHRISTI, TEXAS
October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7308
9:50 PM 9-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.07	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.100	Owen	10-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	79	Strauss	10-02-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	53700	Strauss	09-25-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 9:50 PM 9-23-97.

Lab. No. M35-11227

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

October 14, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Ext. Well #7507
3:40 PM 9-24-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	8.4	Nixon	10-03-97
ASTM D2907-83	Uranium (Natural), mg/L ---	22.2	Owen	10-06-97
SM 7500-Ra C.	Radium 226, pci/L ---------	212	Strauss	10-02-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	59500	Strauss	09-25-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 3:40 PM 9-24-97.

Lab. No. M35-11228

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7504A
KVD Lateral 28 - Baseline
9:00 AM 9-25-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate	317	Merks	10-10-97
EPA 600 375.3	Sulfate	199	Merks	11-26-97
SM 4500-Cl~ B.	Chloride	219	Merks	12-01-97
EPA 600 215.1	Calcium	19	Allen	12-02-97
EPA 600 236.1	Iron	0.04	Mitschke	11-25-97
EPA 600 246.1	Molybdenum	0.03	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural)	0.040	Owen	10-23-97

Lab. No. M35-11364

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7512
KVD Lateral 28 - Baseline
3:20 PM 9-24-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate	549	Merks	10-10-97
EPA 600 375.3	Sulfate	1580	Merks	11-26-97
SM 4500-Cl^- B.	Chloride	708	Merks	12-01-97
EPA 600 215.1	Calcium	238	Allen	12-02-97
EPA 600 236.1	Iron	0.03	Mitschke	11-25-97
EPA 600 246.1	Molybdenum	1.7	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural)	0.248	Owen	10-23-97

Lab. No. M35-11365

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7525
KVD Lateral 28 - Baseline
9:50 AM 9-23-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate	371	Merks	10-10-97
EPA 600 375.3	Sulfate	805	Merks	11-26-97
SM 4500-Cl~ B.	Chloride	490	Merks	12-01-97
EPA 600 215.1	Calcium	90	Allen	12-02-97
EPA 600 236.1	Iron	0.02	Mitschke	11-25-97
EPA 600 246.1	Molybdenum	0.02	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural)	0.029	Owen	10-23-97

Lab. No. M35-11372

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7311
KVD Lateral 28 - Baseline
10:05 AM 9-23-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate ----------------	304	Merks	10-10-97
EPA 600 375.3	Sulfate --------------------	194	Merks	11-26-97
SM 4500-Cl~ B.	Chloride -------------------	212	Merks	12-01-97
EPA 600 215.1	Calcium --------------------	18	Allen	12-02-97
EPA 600 236.1	Iron -----------------------	0.02	Mitschke	11-25-97
EPA 600 246.1	Molybdenum -----------------	0.04	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural) ----------	0.169	Owen	10-23-97

Lab. No. M35-11371

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7521
KVD Lateral 28 - Baseline
10:00 AM 9-23-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate	296	Merks	10-10-97
EPA 600 375.3	Sulfate	637	Merks	11-26-97
SM 4500-Cl~ B.	Chloride	452	Merks	12-01-97
EPA 600 215.1	Calcium	67	Allen	12-02-97
EPA 600 236.1	Iron	0.01	Mitschke	11-25-97
EPA 600 246.1	Molybdenum	0.05	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural)	0.371	Owen	10-23-97

Lab. No. M35-11370

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7502
KVD Lateral 28 - Baseline
10:15 AM 9-23-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate	309	Merks	10-10-97
EPA 600 375.3	Sulfate	210	Merks	11-26-97
SM 4500-Cl$^-$ B.	Chloride	216	Merks	12-01-97
EPA 600 215.1	Calcium	18	Allen	12-02-97
EPA 600 236.1	Iron	0.12	Mitschke	11-25-97
EPA 600 246.1	Molybdenum	0.02	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural)	0.079	Owen	10-23-97

Lab. No. M35-11369

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7310
KVD Lateral 28 - Baseline
10:05 AM 9-23-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate	317	Merks	10-10-97
EPA 600 375.3	Sulfate	198	Merks	11-26-97
SM 4500-Cl~ B.	Chloride	216	Merks	12-01-97
EPA 600 215.1	Calcium	18	Allen	12-02-97
EPA 600 236.1	Iron	0.02	Mitschke	11-25-97
EPA 600 246.1	Molybdenum	0.03	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural)	0.183	Owen	10-23-97

Lab. No. M35-11368

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7516
KVD Lateral 28 - Baseline
9:50 AM 9-23-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate	505	Merks	10-10-97
EPA 600 375.3	Sulfate	1510	Merks	11-26-97
SM 4500-Cl^- B.	Chloride	805	Merks	12-01-97
EPA 600 215.1	Calcium	228	Allen	12-02-97
EPA 600 236.1	Iron	0.20	Mitschke	11-25-97
EPA 600 246.1	Molybdenum	0.08	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural)	2.21	Owen	10-23-97

Lab. No. M35-11367

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: Extraction Well 7306
KVD Lateral 28 - Baseline
10:15 AM 9-23-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate ---------------	310	Merks	10-10-97
EPA 600 375.3	Sulfate ------------------	226	Merks	11-26-97
SM 4500-Cl~ B.	Chloride -----------------	248	Merks	12-01-97
EPA 600 215.1	Calcium ------------------	23	Allen	12-02-97
EPA 600 236.1	Iron ---------------------	0.03	Mitschke	11-25-97
EPA 600 246.1	Molybdenum ---------------	1.1	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural) ---------	0.216	Owen	10-23-97

Lab. No. M35-11366

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

December 3, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

URI, INC.
URI DALLAS
DEC · 8 1997
RECEIVED

Report of Analysis

Identification: Extraction Well 7308
KVD Lateral 28 - Baseline
9:50 PM 9-23-97

Method Number		mg/L	Analyst	Analysis Date
EPA 600 310.1	Bicarbonate	316	Merks	10-10-97
EPA 600 375.3	Sulfate	195	Merks	11-26-97
SM 4500-Cl~ B.	Chloride	211	Merks	12-01-97
EPA 600 215.1	Calcium	18	Allen	12-02-97
EPA 600 236.1	Iron	0.02	Mitschke	11-25-97
EPA 600 246.1	Molybdenum	0.03	Mitschke	11-25-97
ASTM D2907-83	Uranium (Natural)	0.103	Owen	10-23-97

Lab. No. M35-11363

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-45

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 27, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Extraction Well #7504A
11:20 AM 10-2-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L	1.7	Nixon	10-23-97
ASTM D2907-83	Uranium (Natural), mg/L	14.6	Owen	10-21-97
SM 7500-Ra C.	Radium 226, pci/L	70	Strauss	10-23-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L	36000	Strauss	10-03-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 11:20 AM 10-2-97.

Lab. No. M35-11624

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
October 27, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Extraction Well #7701
11:10 AM 10-2-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	4.8	Nixon	10-23-97
ASTM D2907-83	Uranium (Natural), mg/L ---	41.6	Owen	10-21-97
SM 7500-Ra C.	Radium 226, pci/L ---------	153	Strauss	10-23-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	27000	Strauss	10-03-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 11:10 AM 10-2-97.

Lab. No. M3S-11625

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

PAA1 Baseline Averages

Well #	Uranium µg/l	^{226}Ra pCi/l	^{222}Rn pCi/l
1EX	60	28	
2EX	116	36.2	
3EX	927	18.1	
1I	18	13.7	
2I	43	25	
3I	21	12.7	
4I	77	47.6	
5I	30	19.2	
6I	680	13	
7I	77	21.6	
8I	180	42.1	
9I	130	43.5	
10I	9	23.1	
11I	8	0.66	
12I (PBL4)	16	0.84	
13I	156	12.1	
4002	390	14	
4009	229	152	
4014	153	62	
4025	513	43	
4030	1610	62	
4050-A	513	11	
4057	304	24	
4061	2200	66	
4073-A	305	37	
7502A	87	19	52500
7311	220	47	115000
7310	202	36	96800
7306	137	82	89200
7506A	23500	178	32000
7516	2220	321	31500
7521	873	16	80200
7525	33	265	72900
7308	100	79	53700
7525	29		
7311	169		
7521	371		
7502	79		
7310	183		
7516	2210		
7306	216		
7507	22200	212	59500
7512	1860	604	94600
7504	41	44	17800
7504A	14600	70	36000
7701	41600	153	27000
Average	2,602	76	61,336
MW16	39	2.91	
MW17	45	2.15	
MW18	30	2.06	
MW19	80	1.94	
MW20	337	13.5	
MW21	23	11.6	
MW22	61	9.02	
MW23	7	1.06	
MW24	48	202	
MW25	14	5.21	
MW26	39	15.8	
MW27	8	17.6	

ATTACHMENT K

Production Area Baseline Wells

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JUNE 20,, 1989
IDENTIFICATION: KVD PAA-2
BL-1047 6-1-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	21	1.05	54.60	6.80
MAGNESIUM(MG)	00925	4.9	0.40	18.64	2.59
SODIUM(NA)	00929	318	13.83	676.29	89.57
POTASSIUM(K)	00937	6.3	0.16	11.52	1.04
		TOTAL CATION	15.44		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	333	5.46	238.06	34.89
SULFATE(SO4)	00945	206	4.29	317.03	27.41
CHLORIDE(CL)	00940	209	5.90	447.81	37.70
NITRATE(NO3-N)	71851	0.28			
FLUORIDE(F)	00951	0.60	TOTAL	1763.94	
SILICA(SIO2)	00955	25			
		TOTAL ANION	15.65		
	TOTAL ION	1124			

TDS(180 C)	70300	1010
TOT ION-0.5 HCO3=		958
EC(25 C)	00095	1610 UMHOS
EC(DIL)=106.6 X 16.7 =		1780 UMHOS
ALK. AS CACO3	00410	273
PH		8.18

ACCURACY CHECK

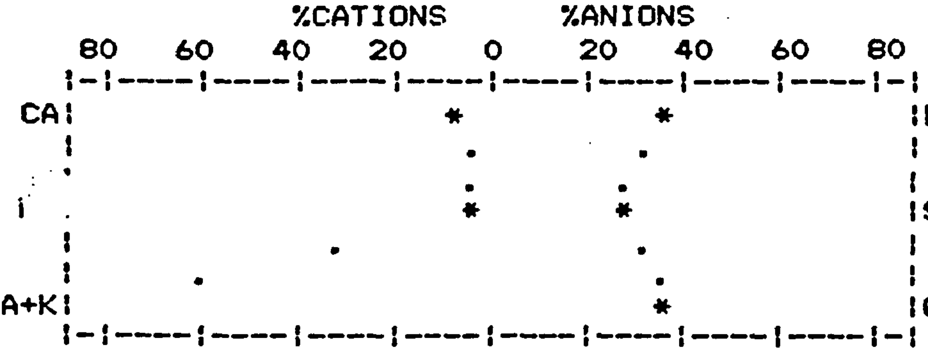
		RANGE
ION	0.987	(.96 TO 1.04)
TDS	1.055	(.90 TO 1.10)
EC	1.009	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	96	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.36	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.11
COPPER(CU)		SELENIUM(SE)	0.017		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	3.72		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3652

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC.
IDENTIFICATION: KVD PAA-2
BL-547 6-5-89
LABORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: JUNE 21, 1989

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	12	0.60	31.20	4.04
MAGNESIUM(MG)	00925	3.9	0.32	14.91	2.15
SODIUM(NA)	00929	315	13.70	669.93	92.19
POTASSIUM(K)	00937	9.3	0.24	17.28	1.62
		TOTAL CATION	14.86		
CARBONATE(CO3)	00445	16	0.53	44.84	3.50
BICARBONATE(HCO3)	00440	246	4.03	175.71	26.62
SULFATE(SO4)	00945	213	4.43	327.38	29.26
CHLORIDE(CL)	00940	218	6.15	466.79	40.62
NITRATE(NO3-N)	71851	0.36			
FLUORIDE(F)	00951	0.65	TOTAL	1748.03	
SILICA(SIO2)	00955	22			
		TOTAL ANION	15.14		
TOTAL ION		1056			

TDS(180 C)	70300	976
TOT ION-0.5 HCO3=		933
EC(25 C)	00095	1590 UMHOS
EC(DIL)=103.0 X 16.7 =		1720 UMHOS
ALK. AS CACO3	00410	228
PH		8.66

ACCURACY CHECK

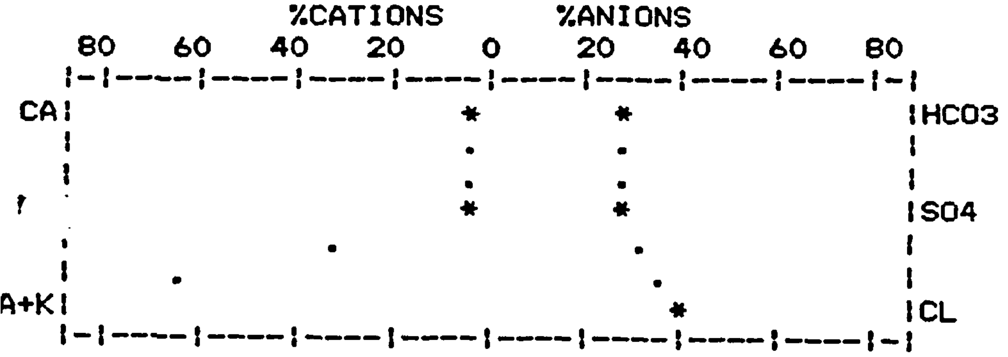
		RANGE
ION	0.982	(.96 TO 1.04)
TDS	1.046	(.90 TO 1.10)
EC	0.984	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	31	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.004	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.29	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.08
COPPER(CU)		SELENIUM(SE)	0.005		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	0.017	URANIUM(U)	1.20		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3679

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY:	URI, INC.	REPORT DATE:	JUNE 20,, 1989
IDENTIFICATION:	KVD PAA-2 BL-1491 6-2-89		
LABORATORY:	JORDAN LABORATORIES, INC.		

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	35	1.75	91.00	10.83
MAGNESIUM(MG)	00925	6.2	0.51	23.77	3.16
SODIUM(NA)	00929	315	13.70	669.93	84.78
POTASSIUM(K)	00937	7.8	0.20	14.40	1.24
		TOTAL CATION	16.16		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	307	5.03	219.31	31.22
SULFATE(SO4)	00945	225	4.68	345.85	29.05
CHLORIDE(CL)	00940	227	6.40	485.76	39.73
NITRATE(NO3-N)	71851	1.2			
FLUORIDE(F)	00951	0.60	TOTAL	1850.02	
SILICA(SIO2)	00955	29			
		TOTAL ANION	16.11		
TOTAL ION		1154			

TDS(180 C)	70300	1060	
TOT ION-0.5 HCO3=		1000	
EC(25 C)	00095	1670	UMHOS
EC(DIL)= 91.5 X 20.0 =		1830	UMHOS
ALK. AS CACO3	00410	252	
PH		8.15	

ACCURACY CHECK

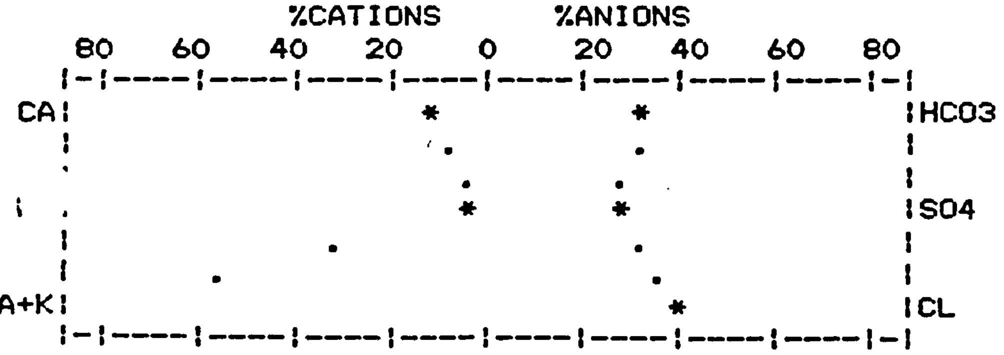
		RANGE
ION	1.003	(.96 TO 1.04)
TDS	1.060	(.90 TO 1.10)
EC	0.989	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	157	+/-	2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.84	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.11
COPPER(CU)		SELENIUM(SE)	0.008		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	3.75		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3655

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JUNE 20,, 1989
IDENTIFICATION: KVD PAA-2
BL-1240 6-1-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	17	0.85	44.20	5.25
MAGNESIUM(MG)	00925	5.2	0.43	20.04	2.66
SODIUM(NA)	00929	338	14.70	718.83	90.85
POTASSIUM(K)	00937	8.0	0.20	14.40	1.24
		TOTAL CATION	16.18		
CARBONATE(CO3)	00445	1	0.03	2.54	0.18
BICARBONATE(HCO3)	00440	305	5.00	218.00	30.41
SULFATE(SO4)	00945	239	4.98	368.02	30.29
CHLORIDE(CL)	00940	228	6.43	488.04	39.11
NITRATE(NO3-N)	71851	0.56			
FLUORIDE(F)	00951	0.62	TOTAL	1874.07	
SILICA(SIO2)	00955	34			
		TOTAL ANION	16.44		

TOTAL ION 1176

TDS(180 C)	70300	1070
TOT ION-0.5 HCO3=		1024
EC(25 C)	00095	1720 UMHOS
EC(DIL)= 93.5 X 20.0 =		1870 UMHOS
ALK. AS CACO3	00410	252
PH		8.32

ACCURACY CHECK

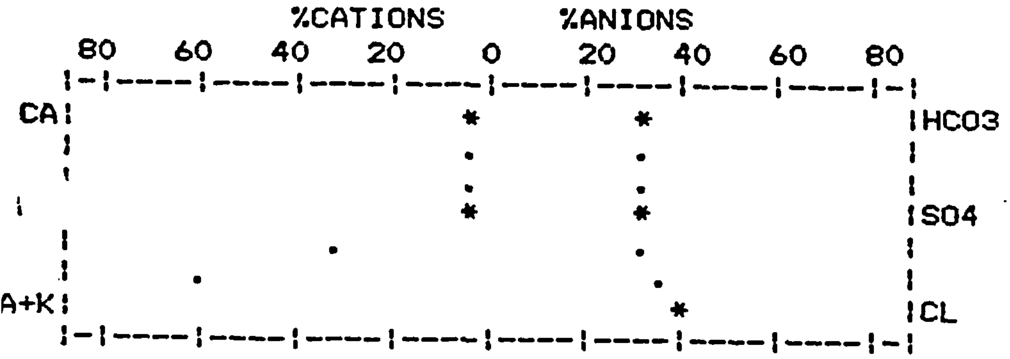
		RANGE
ION	0.984	(.96 TO 1.04)
TDS	1.045	(.90 TO 1.10)
EC	0.998	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	35	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.017	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.34	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.20
COPPER(CU)		SELENIUM(SE)	0.010		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.505		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3653

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JUNE 20,, 1989
IDENTIFICATION: KVD PAA-2
BL-1265 6-2-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	23	1.15	59.80	7.08
MAGNESIUM(MG)	00925	5.5	0.45	20.97	2.77
SODIUM(NA)	00929	331	14.40	704.16	88.62
POTASSIUM(K)	00937	9.7	0.25	18.00	1.54
		TOTAL CATION	16.25		
CARBONATE(CO3)	00445	2	0.07	5.92	0.42
BICARBONATE(HCO3)	00440	296	4.85	211.46	29.23
SULFATE(SO4)	00945	237	4.93	364.33	29.72
CHLORIDE(CL)	00940	239	6.74	511.57	40.63
NITRATE(NO3-N)	71851	0.09			
FLUORIDE(F)	00951	0.57	TOTAL	1896.21	
SILICA(SIO2)	00955	27			
		TOTAL ANION	16.59		

TOTAL ION		1171
TDS(180 C)	70300	1060
TOT ION-0.5 HCO3=		1023
EC(25 C)	00095	1720 UMHOS
EC(DIL)= 94.0 X 20.0 =		1880 UMHOS
ALK. AS CACO3	00410	247
PH		8.38

ACCURACY CHECK

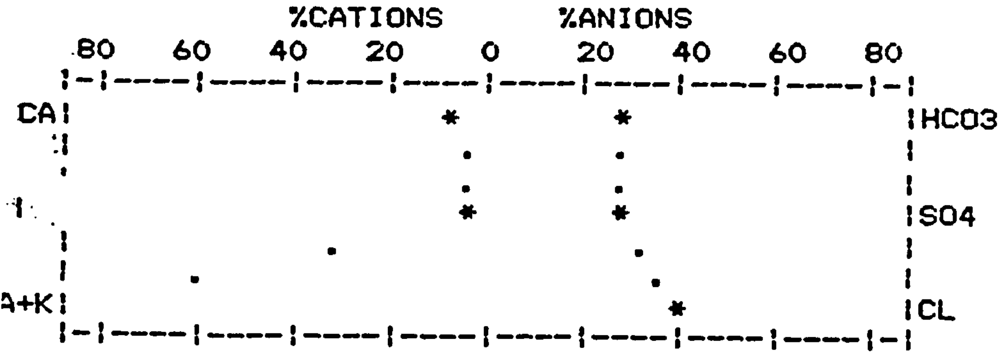
		RANGE
ION	0.980	(.96 TO 1.04)
TDS	1.036	(.90 TO 1.10)
EC	0.991	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	139	+/-	1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.05	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.23
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.254		



ANALYST:
NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3654

Monitor Well Ring

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-63 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	17	0.85	44.20	5.87
MAGNESIUM(MG)	00925	5.1	0.42	19.57	2.90
SODIUM(NA)	00929	300	13.05	638.15	90.12
POTASSIUM(K)	00937	6.4	0.16	11.52	1.10
		TOTAL CATION	14.48		
CARBONATE(CO3)	00445	7	0.23	19.46	1.55
BICARBONATE(HCO3)	00440	312	5.11	222.80	34.53
SULFATE(SO4)	00945	174	3.62	267.52	24.46
CHLORIDE(CL)	00940	207	5.84	443.26	39.46
NITRATE(NO3-N)	71851	2.4			
FLUORIDE(F)	00951	0.62	TOTAL	1666.47	
SILICA(SIO2)	00955	19			
		TOTAL ANION	14.80		
	TOTAL ION	1051			

TDS(180 C)	70300	914	
TOT ION-0.5 HCO3=		895	
EC(25 C)	00095	1550	UMHOS
EC(DIL)=100.6 X 16.7 =		1680	UMHOS
ALK. AS CACO3	00410	268	
PH		8.52	

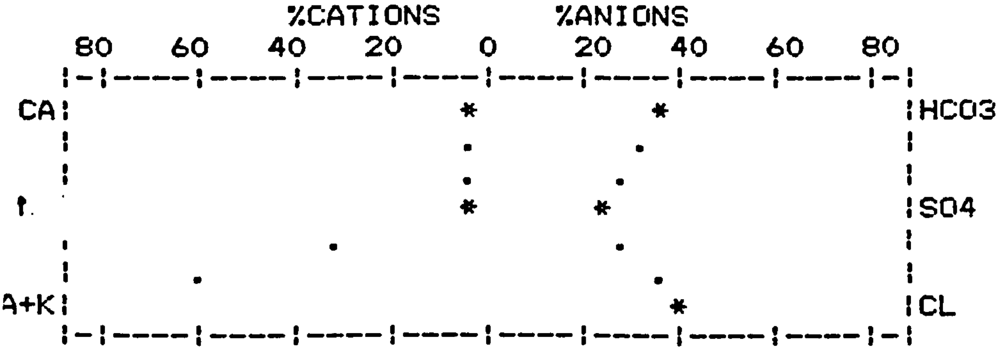
ACCURACY CHECK

		RANGE
ION	0.978	(.96 TO 1.04)
TDS	1.022	(.90 TO 1.10)
EC	1.008	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0007	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.20
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.015		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4094

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-64 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	21	1.05	54.60	6.82
MAGNESIUM(MG)	00925	5.7	0.47	21.90	3.05
SODIUM(NA)	00929	315	13.70	669.93	88.96
POTASSIUM(K)	00937	7.0	0.18	12.96	1.17
		TOTAL CATION	15.4		
CARBONATE(CO3)	00445	18	0.60	50.76	3.98
BICARBONATE(HCO3)	00440	298	4.88	212.77	32.40
SULFATE(SO4)	00945	176	3.66	270.47	24.30
CHLORIDE(CL)	00940	210	5.92	449.33	39.31
NITRATE(NO3-N)	71851	2.4			
FLUORIDE(F)	00951	0.60	TOTAL	1742.72	
SILICA(SIO2)	00955	20			
		TOTAL ANION	15.06		

TOTAL ION 1074

	STORET		
TDS(180 C)	70300	961	
TOT ION-0.5 HCO3=		925	
EC(25 C)	00095	1560	UMHOS
EC(DIL)=101.8 X 16.7 =		1700	UMHOS
ALK. AS CACO3	00410	274	
PH		8.74	

ACCURACY CHECK

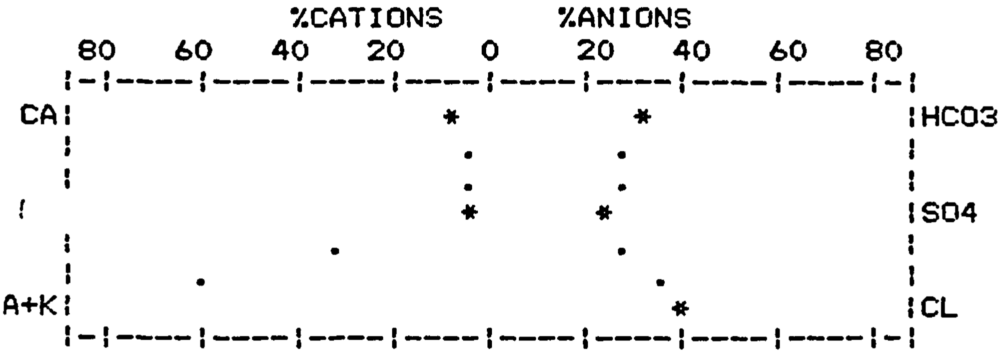
		RANGE
ION	1.023	(.96 TO 1.04)
TDS	1.039	(.90 TO 1.10)
EC	0.976	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0003	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.09
COPPER(CU)		SELENIUM(SE)	0.002		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.015		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4095

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM


COMPANY:  URI, INC.                        REPORT DATE:  JULY 6, 1989
IDENTIFICATION:  KVD PAA-2
                 MW-65     6-16-89
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM             STORET      MG/L         EPM       CONDUCTANCE      %EPM

CALCIUM(CA)      00915        16          0.80          41.60         5.41
MAGNESIUM(MG)    00925         5.1        0.42          19.57         2.84
SODIUM(NA)       00929       308         13.40         655.26        90.54
POTASSIUM(K)     00937         6.9        0.18          12.96         1.22

                         TOTAL CATION     14.8

CARBONATE(CO3)   00445        18          0.60          50.76         3.96
BICARBONATE(HCO3)00440       275          4.51         196.64        29.77
SULFATE(SO4)     00945       187          3.89         287.47        25.68
CHLORIDE(CL)     00940       218          6.15         466.79        40.59
NITRATE(NO3-N)   71851         2.8
FLUORIDE(F)      00951         0.67          TOTAL    1731.04
SILICA(SIO2)     00955        21

                         TOTAL ANION     15.15
               TOTAL ION    1058                     ACCURACY CHECK
                                                                RANGE
TDS(180 C)       70300       963             ION      0.977  (.96 TO 1.04)
TOT ION-0.5 HCO3=            921             TDS      1.046  (.90 TO 1.10)
EC(25 C)         00095       1580 UMHOS      EC       0.994  (.95 TO 1.05)
EC(DIL)=103.0  X  16.7 =    1720 UMHOS
ALK. AS CACO3    00410       255             RADIATION-PICOCURIES/LITER
PH                             8.83          GROSS ALPHA        +/-
                                             GROSS BETA         +/-
MINOR AND TRACE CONSTITUENTS                 RADIUM 226         +/-

ITEM            MG/L      ITEM            MG/L      ITEM            MG/L
ARSENIC(AS)     0.006     MANGANESE(MN)  <0.01      VANADIUM(V)
BARIUM(BA)                MERCURY(HG)    <0.0001    ZINC(ZN)
CADMIUM(CD)    <0.0001    MOLY.(MO)       0.01      BORON(B)
CHROM.(CR)                NICKEL(NI)                AMMONIA-N       0.01
COPPER(CU)                SELENIUM(SE)    0.001
IRON(FE)        0.02      SILVER(AG)
LEAD(PB)       <0.001     URANIUM(U)      0.010

               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                    *       *              |HCO3      ANALYST:
   |                    .       .              |
   |                    .       .              |            NIXON AND ALLEN
   |                    *      *               |SO4         ------------------
   |             .               .             |
   |      .                       .            |          CHECKED BY:
A+K|                               *           |CL
   |-|----|----|----|----|----|----|----|----|-|
                                                            ------------------

LAB.NO:M27-4096
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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY:  URI, INC.                         REPORT DATE:  JULY 6, 1989
IDENTIFICATION:  KVD PAA-2
                 MW-66     6-16-89
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM             STORET      MG/L          EPM        CONDUCTANCE      %EPM

CALCIUM(CA)      00915        17           0.85          44.20          5.69
MAGNESIUM(MG)    00925         5.3         0.44          20.50          2.95
SODIUM(NA)       00929       310          13.48         659.17         90.23
POTASSIUM(K)     00937         6.8         0.17          12.24          1.14

                         TOTAL CATION     14.94

CARBONATE(CO3)   00445         7           0.23          19.46          1.51
BICARBONATE(HCO3)00440       299           4.90         213.64         32.13
SULFATE(SO4)     00945       187           3.89         287.47         25.51
CHLORIDE(CL)     00940       221           6.23         472.86         40.85
NITRATE(NO3-N)   71851         2.6
FLUORIDE(F)      00951         0.62           TOTAL    1729.54
SILICA(SIO2)     00955        21

                         TOTAL ANION     15.25
                TOTAL ION     1077                   ACCURACY CHECK
                                                                 RANGE
TDS(180 C)       70300       945            ION       0.980  (.96 TO 1.04)
TOT ION-0.5 HCO3=            928            TDS       1.019  (.90 TO 1.10)
EC(25 C)         00095       1590 UMHOS     EC        0.995  (.95 TO 1.05)
EC(DIL)=103.0  X  16.7 =     1720 UMHOS
ALK. AS CACO3    00410       257            RADIATION-PICOCURIES/LITER
PH                             8.45         GROSS ALPHA        +/-
                                            GROSS BETA         +/-
MINOR AND TRACE CONSTITUENTS                RADIUM 226         +/-

ITEM             MG/L       ITEM             MG/L       ITEM             MG/L
ARSENIC(AS)      0.008      MANGANESE(MN)    <0.01      VANADIUM(V)
BARIUM(BA)                  MERCURY(HG)      <0.0001    ZINC(ZN)
CADMIUM(CD)     <0.0001     MOLY.(MO)         0.01      BORON(B)
CHROM.(CR)                  NICKEL(NI)                  AMMONIA-N        0.06
COPPER(CU)                  SELENIUM(SE)      0.001
IRON(FE)         0.03       SILVER(AG)
LEAD(PB)        <0.001      URANIUM(U)        0.012

               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   !-!----!----!----!----!----!----!----!----!-!
 CA!                    *        *             !HCO3
   !                    .       .              !
   !                    .       .              !
                        *      *               !SO4
   !             .               .             !
   !      .                       .            !
A+K!                               *           !CL
   !-!----!----!----!----!----!----!----!----!-!

LAB.NO:M27-4097
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-67 6-17-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	13	0.65	33.80	4.45
MAGNESIUM(MG)	00925	4.8	0.39	18.17	2.67
SODIUM(NA)	00929	307	13.35	652.82	91.44
POTASSIUM(K)	00937	8.2	0.21	15.12	1.44
		TOTAL CATION	14.6		
CARBONATE(CO3)	00445	16	0.53	44.84	3.51
BICARBONATE(HCO3)	00440	268	4.39	191.40	29.05
SULFATE(SO4)	00945	191	3.98	294.12	26.34
CHLORIDE(CL)	00940	220	6.21	471.34	41.10
NITRATE(NO3-N)	71851	2.5			
FLUORIDE(F)	00951	0.60	TOTAL	1721.61	
SILICA(SIO2)	00955	20			
		TOTAL ANION	15.11		
	TOTAL ION	1051			

.DS(180 C)	70300	950	
TOT ION-0.5 HCO3=		917	
EC(25 C)	00095	1580 UMHOS	
EC(DIL)=102.4	X 16.7 =	1710 UMHOS	
ALK. AS CACO3	00410	246	
PH		8.72	

ACCURACY CHECK

		RANGE
ION	0.966	(.96 TO 1.04)
TDS	1.036	(.90 TO 1.10)
EC	0.993	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.010	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0005	MOLY.(MO)	0.02	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.07
COPPER(CU)		SELENIUM(SE)	0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.013		

```
               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                    *       *              |HCO3
   |                    .       .              |
   |                    .       .              |
 r .                    *       *              |SO4
   .             .               .             |
   |     .                        .            |
A+K|                               *           |CL
   |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4098

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

:OMPANY: URI, INC.   REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-68 6-17-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	15	0.75	39.00	5.08
MAGNESIUM(MG)	00925	4.9	0.40	18.64	2.71
SODIUM(NA)	00929	309	13.44	657.22	91.00
POTASSIUM(K)	00937	7.2	0.18	12.96	1.22
		TOTAL CATION	14.77		
CARBONATE(CO3)	00445	7	0.23	19.46	1.52
BICARBONATE(HCO3)	00440	299	4.90	213.64	32.30
SULFATE(SO4)	00945	184	3.83	283.04	25.25
CHLORIDE(CL)	00940	220	6.21	471.34	40.94
NITRATE(NO3-N)	71851	2.2			
FLUORIDE(F)	00951	0.62	TOTAL	1715.29	
SILICA(SIO2)	00955	19			
		TOTAL ANION	15.17		
	TOTAL ION	1068			

TDS(180 C)	70300	933
TOT ION-0.5 HCO3=		918
EC(25 C)	00095	1590 UMHOS
EC(DIL)=103.0 X 16.7 =		1720 UMHOS
ALK. AS CACO3	00410	257
PH		8.58

ACCURACY CHECK

		RANGE
ION	0.974	(.96 TO 1.04)
TDS	1.016	(.90 TO 1.10)
EC	1.003	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.004	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.06
COPPER(CU)		SELENIUM(SE)	0.002		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.015		

```
               %CATIONS      %ANIONS
    80   60   40   20    0   20   40   60   80
   !-!----!----!----!----!----!----!----!----!-!
 CA!                    *        *             !HC03
   !                    .       .              !
   !                    .       .              !
   !                    *      *               !S04
   !             .               .             !
   !      .                       .     .      !
A+K!                               *           !CL
   !-!----!----!----!----!----!----!----!----!-!
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4099

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-69 6-17-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	17	0.85	44.20	5.61
MAGNESIUM(MG)	00925	5.7	0.47	21.90	3.10
SODIUM(NA)	00929	314	13.66	667.97	90.17
POTASSIUM(K)	00937	6.6	0.17	12.24	1.12
		TOTAL CATION	15.15		
CARBONATE(CO3)	00445	4	0.13	11.00	0.84
BICARBONATE(HCO3)	00440	303	4.97	216.69	32.21
SULFATE(SO4)	00945	198	4.12	304.47	26.70
CHLORIDE(CL)	00940	220	6.21	471.34	40.25
NITRATE(NO3-N)	71851	1.7			
FLUORIDE(F)	00951	0.62	TOTAL	1749.81	
SILICA(SIO2)	00955	20			
		TOTAL ANION	15.43		

TOTAL ION 1091

TDS(180 C)	70300	987
TOT ION-0.5 HCO3=		939
EC(25 C)	00095	1610 UMHOS
EC(DIL)=104.2 X 16.7 =		1740 UMHOS
ALK. AS CACO3	00410	254
PH		8.43

ACCURACY CHECK

		RANGE
ION	0.982	(.96 TO 1.04)
TDS	1.051	(.90 TO 1.10)
EC	0.994	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.002	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.02
COPPER(CU)		SELENIUM(SE)	0.004		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.019		

```
               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   !-!----!----!----!----!----!----!----!----!-!
 CA!                    *        *             !HC03
   !                    .        .             !
   !                    .       .              !
 t                      *       *              !S04
   .             .               .             !
   !      .                       .            !
A+K!                               *           !CL
   !-!----!----!----!----!----!----!----!----!-!
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4100

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 5, 1989
IDENTIFICATION: KVD PAA-2
D-44 6-17-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	3.8	0.19	9.88	1.03
MAGNESIUM(MG)	00925	0.24	0.02	0.93	0.11
SODIUM(NA)	00929	406	17.66	863.57	95.56
POTASSIUM(K)	00937	24	0.61	43.92	3.30
		TOTAL CATION	18.48		
CARBONATE(CO3)	00445	37	1.23	104.06	6.45
BICARBONATE(HCO3)	00440	468	7.67	334.41	40.24
SULFATE(SO4)	00945	83	1.73	127.85	9.08
CHLORIDE(CL)	00940	299	8.43	639.84	44.23
NITRATE(NO3-N)	71851	0.04			
FLUORIDE(F)	00951	1.2	TOTAL	2124.46	
SILICA(SIO2)	00955	27			
		TOTAL ANION	19.06		

TOTAL ION 1349

TDS(180 C)	70300	1130	
TOT ION-0.5 HCO3=		1115	
EC(25 C)	00095	1970 UMHOS	
EC(DIL)= 94.1	X 22.2 =	2089 UMHOS	
ALK. AS CACO3	00410	446	
PH		8.84	

ACCURACY CHECK

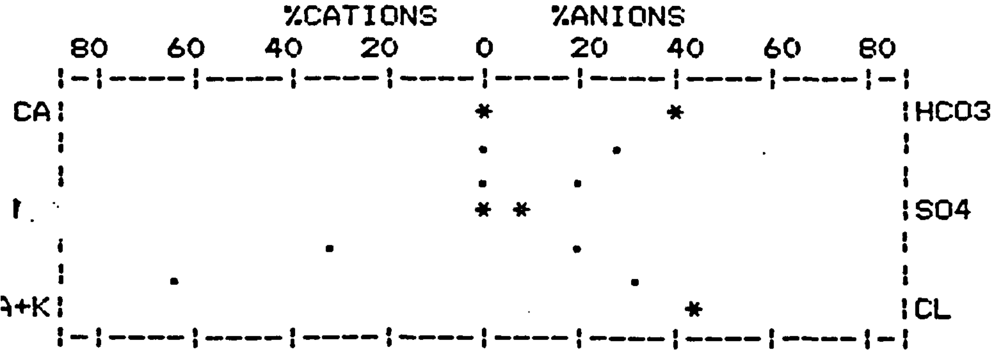
		RANGE
ION	0.970	(.96 TO 1.04)
TDS	1.013	(.90 TO 1.10)
EC	0.983	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.25
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.06	SILVER(AG)			
LEAD(PB)	0.011	URANIUM(U)	0.002		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4060

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 5, 1989
IDENTIFICATION: KVD PAA-2
D-45 6-18-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	22	1.10	57.20	6.70
MAGNESIUM(MG)	00925	5.2	0.43	20.04	2.62
SODIUM(NA)	00929	338	14.70	718.83	89.47
POTASSIUM(K)	00937	8.0	0.20	14.40	1.22
		TOTAL CATION	16.43		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	409	6.70	292.12	42.09
SULFATE(SO4)	00945	142	2.96	218.74	18.59
CHLORIDE(CL)	00940	222	6.26	475.13	39.32
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.73	TOTAL	1796.47	
SILICA(SIO2)	00955	85			
		TOTAL ANION	15.92		

TOTAL ION 1232

TDS(180 C)	70300	1080	
TOT ION-0.5 HCO3=		1027	
EC(25 C)	00095	1710 UMHOS	
EC(DIL)= 90.0 X 20.0 =		1800 UMHOS	
ALK. AS CACO3	00410	335	
PH		8.06	

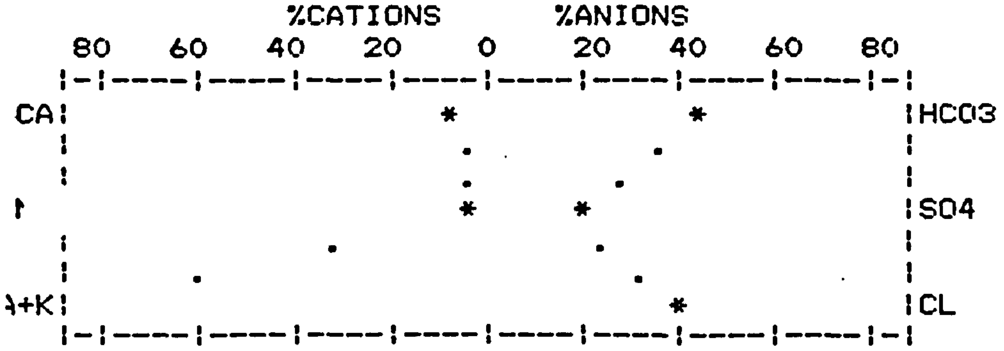
ACCURACY CHECK

		RANGE
ION	1.032	(.96 TO 1.04)
TDS	1.051	(.90 TO 1.10)
EC	1.002	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.002	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.03
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.05	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.020		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4061

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

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 OMPANY:  URI, INC.                            REPORT DATE:  JULY 5, 1989
IDENTIFICATION:  KVD PAA-2
                 D-46      6-18-89
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM               STORET      MG/L          EPM       CONDUCTANCE       %EPM

CALCIUM(CA)        00915        5.0          0.25          13.00          1.61
MAGNESIUM(MG)      00925        2.4          0.20           9.32          1.29
SODIUM(NA)         00929      344           14.96         731.54         96.33
POTASSIUM(K)       00937        4.5          0.12           8.64          0.77

                          TOTAL CATION      15.53

CARBONATE(CO3)     00445       50            1.67         141.28         10.51
BICARBONATE(HCO3)00440        405            6.64         289.50         41.79
SULFATE(SO4)       00945       42            0.87          64.29          5.48
CHLORIDE(CL)       00940      238            6.71         509.29         42.23
NITRATE(NO3-N)     71851       <0.01
FLUORIDE(F)        00951        0.70           TOTAL     1766.87
SILICA(SIO2)       00955       18

                          TOTAL ANION       15.89
                 TOTAL ION     1110                   ACCURACY CHECK
                                                                  RANGE
TDS(180 C)         70300       941             ION      0.977  (.96 TO 1.04)
TOT ION-0.5 HCO3=              907             TDS      1.037  (.90 TO 1.10)
EC(25 C)           00095      1650 UMHOS       EC       1.008  (.95 TO 1.05)
EC(DIL)=106.6  X  16.7 =      1780 UMHOS
ALK. AS CACO3      00410       416             RADIATION-PICOCURIES/LITER
PH                               9.07          GROSS ALPHA          +/-
                                               GROSS BETA           +/-
MINOR AND TRACE CONSTITUENTS                   RADIUM 226           +/-

ITEM             MG/L       ITEM             MG/L        ITEM              MG/L
ARSENIC(AS)     <0.001      MANGANESE(MN)   <0.01        VANADIUM(V)
BARIUM(BA)                  MERCURY(HG)     <0.0001      ZINC(ZN)
CADMIUM(CD)     <0.0001     MOLY.(MO)       <0.01        BORON(B)
CHROM.(CR)                  NICKEL(NI)                   AMMONIA-N         0.13
COPPER(CU)                  SELENIUM(SE)    <0.001
IRON(FE)          0.27      SILVER(AG)
LEAD(PB)        <0.001      URANIUM(U)      <0.001

               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   !-!----!----!----!----!----!----!----!----!-!
 CA!                     *         *           !HCO3        ANALYST:
   !                     .      .              !
   !                     .   .                 !              NIXON AND ALLEN
   !                     **                    !SO4         ----------------
   !             .           .                 !
   !     .                      .              !            CHECKED BY:
A+K!                                *          !CL
   !-!----!----!----!----!----!----!----!----!-!            ----------------
                                                                     ✓
LAB.NO:M27-4062
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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

 OMPANY:  URI, INC.                           REPORT DATE:  JULY 6, 1989
.DENTIFICATION:  KVD PAA-2
                 MW-70     6-17-89
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM                STORET      MG/L         EPM       CONDUCTANCE      %EPM

CALCIUM(CA)         00915        14          0.70          36.40         4.71
MAGNESIUM(MG)       00925         4.5        0.37          17.24         2.49
SODIUM(NA)          00929       313         13.61         665.53        91.59
POTASSIUM(K)        00937         7.1        0.18          12.96         1.21

                          TOTAL CATION      14.86

CARBONATE(CO3)      00445         4          0.13          11.00         0.85
BICARBONATE(HCO3)00440          303          4.97         216.69        32.65
SULFATE(SO4)        00945       167          3.89         287.47        25.56
CHLORIDE(CL)        00940       221          6.23         472.86        40.93
NITRATE(NO3-N)      71851         0.50
FLUORIDE(F)         00951         0.55          TOTAL    1720.15
SILICA(SIO2)        00955        22

                          TOTAL ANION       15.22
                  TOTAL ION    1077                     ACCURACY CHECK
                                                                RANGE
.DS(180 C)          70300       982             ION      0.976  (.96 TO 1.04)
TOT ION-0.5 HCO3=               925             TDS      1.061  (.90 TO 1.10)
EC(25 C)            00095      1590 UMHOS       EC       0.988  (.95 TO 1.05)
EC(DIL)=101.8  X  16.7 =       1700 UMHOS
ALK. AS CACO3       00410       254             RADIATION-PICOCURIES/LITER
PH                                8.43          GROSS ALPHA         +/-
                                                GROSS BETA          +/-
MINOR AND TRACE CONSTITUENTS                    RADIUM 226          +/-

ITEM              MG/L      ITEM             MG/L       ITEM             MG/L
ARSENIC(AS)       0.008     MANGANESE(MN)   <0.01       VANADIUM(V)
BARIUM(BA)                  MERCURY(HG)     <0.0001     ZINC(ZN)
CADMIUM(CD)     <0.0001     MOLY.(MO)        0.01       BORON(B)
CHROM.(CR)                  NICKEL(NI)                  AMMONIA-N        0.05
COPPER(CU)                  SELENIUM(SE)     0.001
IRON(FE)          0.02      SILVER(AG)
LEAD(PB)         <0.001     URANIUM(U)       0.020

                %CATIONS         %ANIONS
    80   60   40   20    0   20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                    *        *             |HCO3
   |                    .        .             |
   |                    .       .              |
  r|                    *      *               |SO4
   |             .               .             |
   |      .                       .            |
A+K|                               *           |CL
   |-|----|----|----|----|----|----|----|----|-|

LAB.NO:M27-4101
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-52 6-15-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	14	0.70	36.40	4.56
MAGNESIUM(MG)	00925	3.7	0.30	13.98	1.96
SODIUM(NA)	00929	326	14.18	693.40	92.44
POTASSIUM(K)	00937	6.4	0.16	11.52	1.04
		TOTAL CATION	15.34		
CARBONATE(CO3)	00445	18	0.60	50.76	3.84
BICARBONATE(HCO3)	00440	296	4.85	211.46	31.05
SULFATE(SO4)	00945	211	4.39	324.42	28.10
CHLORIDE(CL)	00940	205	5.78	438.70	37.00
NITRATE(NO3-N)	71851	0.02			
FLUORIDE(F)	00951	0.67	TOTAL	1780.65	
SILICA(SIO2)	00955	21			
		TOTAL ANION	15.62		

TOTAL ION 1102

TDS(180 C)	70300	1000	
TOT ION-0.5 HCO3=		954	
EC(25 C)	00095	1610 UMHOS	
EC(DIL)=105.4	X 16.7 =	1760 UMHOS	
ALK. AS CACO3	00410	273	
PH		8.70	

ACCURACY CHECK

		RANGE
ION	0.982	(.96 TO 1.04)
TDS	1.048	(.90 TO 1.10)
EC	0.989	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-
GROSS BETA		+/-
RADIUM 226		+/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.011	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0001	MOLY.(MO)	0.06	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.13
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.007		

```
              %CATIONS      %ANIONS
    80   60   40   20   0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                    *        *             |HCO3
   |                    .        .             |
   |                    .       .              |
|                        *      *              |SO4
   |             .               .             |
   |     .                       .             |
A+K|                              *            |CL
   |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

Alfriemon

LAB.NO:M27-4083

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC.
REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-53 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	15	0.75	39.00	5.05
MAGNESIUM(MG)	00925	3.3	0.27	12.58	1.82
SODIUM(NA)	00929	315	13.70	669.93	92.19
POTASSIUM(K)	00937	5.4	0.14	10.08	0.94
		TOTAL CATION	14.86		
CARBONATE(CO3)	00445	22	0.73	61.76	4.79
BICARBONATE(HCO3)	00440	288	4.72	205.79	30.99
SULFATE(SO4)	00945	196	4.08	301.51	26.79
CHLORIDE(CL)	00940	202	5.70	432.63	37.43
NITRATE(NO3-N)	71851	0.81			
FLUORIDE(F)	00951	0.65	TOTAL	1733.28	
SILICA(SIO2)	00955	20			
		TOTAL ANION	15.23		

TOTAL ION 1068

TDS(180 C)	70300	949
TOT ION-0.5 HCO3=		924
EC(25 C)	00095	1580 UMHOS
EC(DIL)=103.0 X 16.7 =		1720 UMHOS
ALK. AS CACO3	00410	272
PH		8.91

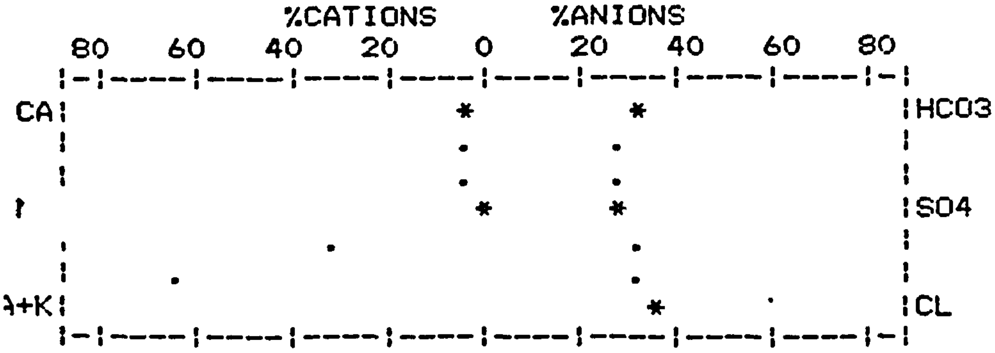
ACCURACY CHECK

		RANGE
ION	0.976	(.96 TO 1.04)
TDS	1.027	(.90 TO 1.10)
EC	0.992	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.004	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.02	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.16
COPPER(CU)		SELENIUM(SE)	0.002		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	0.001	URANIUM(U)	0.014		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4084

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-54 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	15	0.75	39.00	4.85
MAGNESIUM(MG)	00925	4.5	0.37	17.24	2.39
SODIUM(NA)	00929	327	14.22	695.36	91.92
POTASSIUM(K)	00937	5.1	0.13	9.36	0.84
		TOTAL CATION	15.47		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	353	5.78	252.01	36.79
SULFATE(SO4)	00945	198	4.12	304.47	26.23
CHLORIDE(CL)	00940	206	5.81	440.98	36.98
NITRATE(NO3-N)	71851	0.09			
FLUORIDE(F)	00951	0.65	TOTAL	1758.42	
SILICA(SIO2)	00955	21			
		TOTAL ANION	15.71		
	TOTAL ION	1130			

TDS(180 C)	70300	970
TOT ION-0.5 HCO3=		954
EC(25 C)	00095	1620 UMHOS
EC(DIL)=104.8 X 16.7 =		1750 UMHOS
ALK. AS CACO3	00410	289
PH		8.24

ACCURACY CHECK

		RANGE
ION	0.985	(.96 TO 1.04)
TDS	1.017	(.90 TO 1.10)
EC	0.995	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA	+/-
GROSS BETA	+/-
RADIUM 226	+/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0001	MOLY.(MO)	0.02	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.07
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.016		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
CA  |                    *         *            |HCO3
    |                    .        .             |
    |                    .       .              |
                         *       *              |SO4
    |             .              .              |
    |     .                       .             |
A+K |                              *            |CL
    |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4085

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM


COMPANY:  URI, INC.                        REPORT DATE:  JULY 6, 1989
IDENTIFICATION:  KVD PAA-2
                 MW-55     6-16-89
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM             STORET      MG/L          EPM       CONDUCTANCE      %EPM

CALCIUM(CA)      00915        10          0.50          26.00         3.33
MAGNESIUM(MG)    00925         3.5        0.29          13.51         1.93
SODIUM(NA)       00929      323          14.05         687.05        93.60
POTASSIUM(K)     00937         6.6        0.17          12.24         1.13

                         TOTAL CATION     15.01

CARBONATE(CO3)   00445        17          0.57          48.22         3.69
BICARBONATE(HCO3)00440      305           5.00         218.00        32.34
SULFATE(SO4)     00945      196           4.08         301.51        26.39
CHLORIDE(CL)     00940      206           5.81         440.98        37.58
NITRATE(NO3-N)   71851         0.25
FLUORIDE(F)      00951         0.65          TOTAL    1747.51
SILICA(SIO2)     00955        21

                         TOTAL ANION     15.46
               TOTAL ION    1089                     ACCURACY CHECK
                                                                 RANGE
TDS(180 C)       70300      995              ION      0.971  (.96 TO 1.04)
TOT ION-0.5 HCO3=           937              TDS      1.062  (.90 TO 1.10)
EC(25 C)         00095     1590 UMHOS        EC       0.979  (.95 TO 1.05)
EC(DIL)=102.4  X  16.7 =    1710 UMHOS
ALK. AS CACO3    00410      278              RADIATION-PICOCURIES/LITER
PH                             8.75          GROSS ALPHA        +/-
                                             GROSS BETA         +/-
MINOR AND TRACE CONSTITUENTS                 RADIUM 226         +/-

ITEM            MG/L      ITEM            MG/L      ITEM            MG/L
ARSENIC(AS)     0.007     MANGANESE(MN)  <0.01      VANADIUM(V)
BARIUM(BA)                MERCURY(HG)    <0.0001    ZINC(ZN)
CADMIUM(CD)     0.0002    MOLY.(MO)       0.03      BORON(B)
CHROM.(CR)                NICKEL(NI)                AMMONIA-N       0.01
COPPER(CU)                SELENIUM(SE)    0.002
IRON(FE)        0.01      SILVER(AG)
LEAD(PB)       <0.001     URANIUM(U)      0.027

              %CATIONS      %ANIONS
   80   60   40   20    0    20   40   60   80
  |-|----|----|----|----|----|----|----|----|-|
CA|                    *        *             |HCO3      ANALYST:
  |                    .        .             |
  |                    .       .              |            NIXON AND ALLEN
  |                     *      *              |SO4         ------------------
  |             .               .             |
  |     .                       .             |          CHECKED BY:
A+K|                             *            |CL
  |-|----|----|----|----|----|----|----|----|-|
                                                           ------------------

LAB.NO:M27-4086
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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-56 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	14	0.70	36.40	4.51
MAGNESIUM(MG)	00925	3.9	0.32	14.91	2.06
SODIUM(NA)	00929	330	14.35	701.72	92.52
POTASSIUM(K)	00937	5.5	0.14	10.08	0.90
		TOTAL CATION	15.51		
CARBONATE(CO3)	00445	10	0.33	27.92	2.12
BICARBONATE(HCO3)	00440	311	5.10	222.36	32.78
SULFATE(SO4)	00945	206	4.29 9	317.03	27.57
CHLORIDE(CL)	00940	207	5.84	443.26	37.53
NITRATE(NO3-N)	71851	0.04			
FLUORIDE(F)	00951	0.67	TOTAL	1773.67	
SILICA(SIO2)	00955	25			
		TOTAL ANION	15.56		

TOTAL ION 1113

TDS(180 C)	70300	997
TOT ION-0.5 HCO3=		958
EC(25 C)	00095	1610 UMHOS
EC(DIL)=104.8 X 16.7 =		1750 UMHOS
ALK. AS CACO3	00410	271
PH		8.65

ACCURACY CHECK

		RANGE
ION	0.997	(.96 TO 1.04)
TDS	1.041	(.90 TO 1.10)
EC	0.987	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.009	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.05	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.02
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	0.001	URANIUM(U)	0.017		

```
                 %CATIONS          %ANIONS
    80    60    40    20     0     20    40    60    80
   |-|-----|-----|-----|-----|-----|-----|-----|-----|-|
 CA|                          *       *                 |HCO3
   |                          .       .                 |
   |                          .      .                  |
 r .                          *      *                  |SO4
   .                  .              .                  |
   |       .               .          .                 |
A+K|                                  *                 |CL
   |-|-----|-----|-----|-----|-----|-----|-----|-----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4087

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-57 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	9.6	0.48	24.96	3.10
MAGNESIUM(MG)	00925	4.0	0.33	15.38	2.13
SODIUM(NA)	00929	334	14.53	710.52	93.86
POTASSIUM(K)	00937	5.4	0.14	10.08	0.90
		TOTAL CATION	15.48		
CARBONATE(CO3)	00445	23	0.77	65.14	4.94
BICARBONATE(HCO3)	00440	253	4.15	180.94	26.62
SULFATE(SO4)	00945	220	4.58	338.46	29.38
CHLORIDE(CL)	00940	216	6.09	462.23	39.06
NITRATE(NO3-N)	71851	0.09			
FLUORIDE(F)	00951	0.62	TOTAL	1807.71	
SILICA(SIO2)	00955	20			
		TOTAL ANION	15.59		

TOTAL ION 1086

TDS(180 C)	70300	993
TOT ION-0.5 HCO3=		959
EC(25 C)	00095	1630 UMHOS
EC(DIL)=108.4 X 16.7 =		1810 UMHOS
ALK. AS CACO3	00410	245
PH		8.94

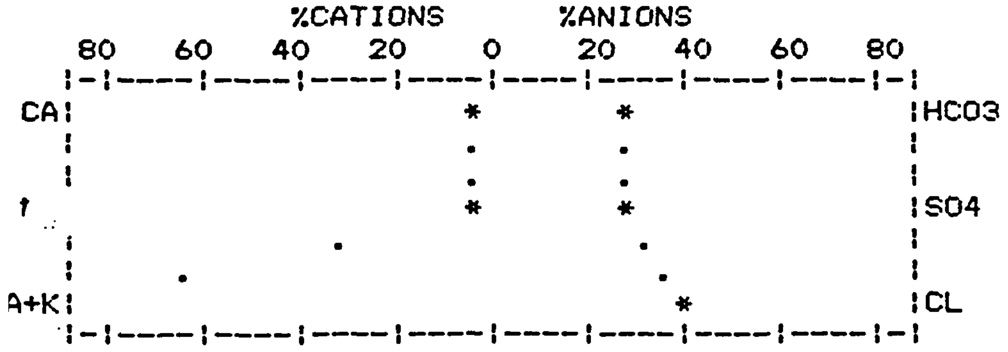
ACCURACY CHECK

		RANGE
ION	0.993	(.96 TO 1.04)
TDS	1.035	(.90 TO 1.10)
EC	1.001	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.002	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.09	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.05
COPPER(CU)		SELENIUM(SE)	0.002		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.026		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

Carl Kinnison

LAB.NO:M27-4088

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM


COMPANY:  URI, INC.                              REPORT DATE:  JULY 6, 1989
IDENTIFICATION:  KVD PAA-2
                 MW-58     6-16-89
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM                STORET      MG/L         EPM        CONDUCTANCE       %EPM

CALCIUM(CA)         00915         8.4        0.42          21.84           2.88
MAGNESIUM(MG)       00925         3.5        0.29          13.51           1.99
SODIUM(NA)          00929       315         13.70         669.93          93.84
POTASSIUM(K)        00937         7.4        0.19          13.68           1.30

                            TOTAL CATION     14.6

CARBONATE(CO3)      00445        18          0.60          50.76           4.04
BICARBONATE(HCO3)00440          316          5.18         225.85          34.88
SULFATE(SO4)        00945       167          3.48         257.17          23.43
CHLORIDE(CL)        00940       198          5.59         424.28          37.64
NITRATE(NO3-N)      71851        <0.01
FLUORIDE(F)         00951         0.67          TOTAL    1677.03
SILICA(SIO2)        00955        19

                            TOTAL ANION     14.85
                  TOTAL ION     1053                     ACCURACY CHECK
                                                                     RANGE
TDS(180 C)          70300       939             ION       0.983  (.96 TO 1.04)
TOT ION-0.5 HCO3=               895             TDS       1.049  (.90 TO 1.10)
EC(25 C)            00095       1550 UMHOS      EC        1.002  (.95 TO 1.05)
EC(DIL)=100.6  X  16.7 =        1680 UMHOS
ALK. AS CACO3       00410        289            RADIATION-PICOCURIES/LITER
PH                                8.72          GROSS ALPHA         +/-
                                                GROSS BETA          +/-
MINOR AND TRACE CONSTITUENTS                    RADIUM 226          +/-

ITEM             MG/L       ITEM             MG/L        ITEM             MG/L
ARSENIC(AS)     <0.001      MANGANESE(MN)   <0.01        VANADIUM(V)
BARIUM(BA)                  MERCURY(HG)     <0.0001      ZINC(ZN)
CADMIUM(CD)     <0.0001     MOLY.(MO)       <0.01        BORON(B)
CHROM.(CR)                  NICKEL(NI)                   AMMONIA-N         0.01
COPPER(CU)                  SELENIUM(SE)    <0.001
IRON(FE)          0.03      SILVER(AG)
LEAD(PB)        <0.001      URANIUM(U)       0.002

               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   !-!----!----!----!----!----!----!----!----!-!
 CA!                    *         *            !HCO3        ANALYST:
   !                    .        .             !
   !                    .       .              !              NIXON AND ALLEN
   !                     *     *               !SO4           ---------------
   !             .              .              !
   !     .                       .             !            CHECKED BY:
A+K!                              *            !CL
   !-!----!----!----!----!----!----!----!----!-!              ---------------

LAB.NO:M27-4089
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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-59 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	13	0.65	33.80	4.44
MAGNESIUM(MG)	00925	4.6	0.38	17.71	2.60
SODIUM(NA)	00929	309	13.44	657.22	91.80
POTASSIUM(K)	00937	6.6	0.17	12.24	1.16
		TOTAL CATION	14.64		
CARBONATE(CO3)	00445	11	0.37	31.30	2.44
BICARBONATE(HCO3)	00440	283	4.64	202.30	30.61
SULFATE(SO4)	00945	204	4.25	314.08	28.03
CHLORIDE(CL)	00940	209	5.90	447.81	38.92
NITRATE(NO3-N)	71851	1.8			
FLUORIDE(F)	00951	0.60	TOTAL	1716.46	
SILICA(SIO2)	00955	18			
		TOTAL ANION	15.16		
	TOTAL ION	1061			

TDS(180 C)	70300	984
TOT ION-0.5 HCO3=		919
EC(25 C)	00095	1590 UMHOS
EC(DIL)=102.4 X 16.7 =		1710 UMHOS
ALK. AS CACO3	00410	250
PH		8.76

ACCURACY CHECK

		RANGE
ION	0.966	(.96 TO 1.04)
TDS	1.071	(.90 TO 1.10)
EC	0.996	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-
GROSS BETA		+/-
RADIUM 226		+/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.08	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.02
COPPER(CU)		SELENIUM(SE)	0.003		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.031		

```
               %CATIONS      %ANIONS
    80   60   40   20    0   20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
CA |                    *        *             |HCO3
   |                    .      .               |
   |                    .      .               |
M  .                    *      *               |SO4
   .             .               .             |
   |     .                        .            |
+K |                               *           |CL
   |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4090

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-60 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	10	0.50	26.00	3.59
MAGNESIUM(MG)	00925	4.4	0.36	16.78	2.59
SODIUM(NA)	00929	296	12.88	629.83	92.60
POTASSIUM(K)	00937	6.8	0.17	12.24	1.22
		TOTAL CATION	13.91		
CARBONATE(CO3)	00445	17	0.57	48.22	4.01
BICARBONATE(HCO3)	00440	275	4.51	196.64	31.74
SULFATE(SO4)	00945	169	3.52	260.13	24.77
CHLORIDE(CL)	00940	199	5.61	425.80	39.48
NITRATE(NO3-N)	71851	2.4			
FLUORIDE(F)	00951	0.57	TOTAL	1615.63	
SILICA(SIO2)	00955	20			
		TOTAL ANION	14.21		
	TOTAL ION	1000			

TDS(180 C)	70300	915
TOT ION-0.5 HCO3=		863
EC(25 C)	00095	1490 UMHOS
EC(DIL)= 97.6 X 16.7 =		1630 UMHOS
ALK. AS CACO3	00410	253
PH		8.80

ACCURACY CHECK

		RANGE
ION	0.979	(.96 TO 1.04)
TDS	1.061	(.90 TO 1.10)
EC	1.009	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.013	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.06
COPPER(CU)		SELENIUM(SE)	0.003		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.028		

```
              %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                    *        *             |HCO3
   |                    .       .              |
   |                    .       .              |
|                       *      *               |SO4
   |             .              .              |
   |     .                        .            |
A+K|                               *           |CL
   |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4091

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-61 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	15	0.75	39.00	5.10
MAGNESIUM(MG)	00925	4.1	0.34	15.84	2.31
SODIUM(NA)	00929	310	13.48	659.17	91.64
POTASSIUM(K)	00937	5.5	0.14	10.08	0.95
		TOTAL CATION	14.71		
CARBONATE(CO3)	00445	8	0.27	22.84	1.80
BICARBONATE(HCO3)	00440	364	5.97	260.29	39.75
SULFATE(SO4)	00945	79	1.64	121.20	10.92
CHLORIDE(CL)	00940	253	7.14	541.93	47.54
NITRATE(NO3-N)	71851	0.79			
FLUORIDE(F)	00951	1.1	TOTAL	1670.35	
SILICA(SIO2)	00955	30			
		TOTAL ANION	15.02		
	TOTAL ION	1070			

TDS(180 C)	70300	948
TOT ION-0.5 HCO3=		888
EC(25 C)	00095	1570 UMHOS
EC(DIL)=101.2 X 16.7 =		1690 UMHOS
ALK. AS CACO3	00410	312
PH		8.40

ACCURACY CHECK

		RANGE
ION	0.979	(.96 TO 1.04)
TDS	1.067	(.90 TO 1.10)
EC	1.012	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.023	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.07
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.06	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.017		

```
               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                    *          *           |HCO3
   |                    .        .             |
   |                    .     .                |
   :                    *   *                  |SO4
   .             .             .               |
   |      .                       .            |
 +K|                                 *         |CL
   |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4092

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-62 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	15	0.75	39.00	5.10
MAGNESIUM(MG)	00925	5.4	0.44	20.50	2.99
SODIUM(NA)	00929	307	13.35	652.82	90.82
POTASSIUM(K)	00937	6.2	0.16	11.52	1.09
		TOTAL CATION	14.7		
CARBONATE(CO3)	00445	1	0.03	2.54	0.20
BICARBONATE(HCO3)	00440	321	5.26	229.34	35.07
SULFATE(SO4)	00945	183	3.81	281.56	25.40
CHLORIDE(CL)	00940	209	5.90	447.81	39.33
NITRATE(NO3-N)	71851	2.6			
FLUORIDE(F)	00951	0.65	TOTAL	1685.08	
SILICA(SIO2)	00955	19			
		TOTAL ANION	15.00		
TOTAL ION		1070			

	STORET	
.DS(180 C)	70300	954
TOT ION-0.5 HCO3=		909
EC(25 C)	00095	1570 UMHOS
EC(DIL)=100.6 X 16.7 =		1680 UMHOS
ALK. AS CACO3	00410	265
PH		8.38

ACCURACY CHECK

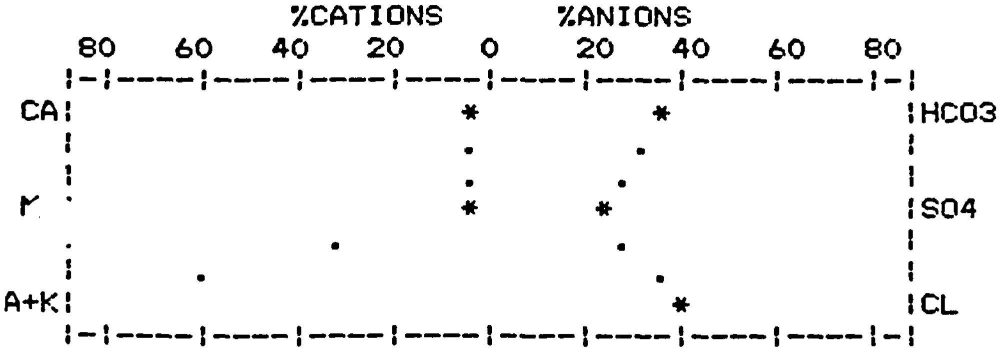
		RANGE
ION	0.980	(.96 TO 1.04)
TDS	1.049	(.90 TO 1.10)
EC	0.997	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.005	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0017	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.20
COPPER(CU)		SELENIUM(SE)	0.006		
IRON(FE)	0.06	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.020		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4093

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JUNE 23, 1989
IDENTIFICATION: KVD PAA-2
MW-44 6-12-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	74	3.69	191.88	20.14
MAGNESIUM(MG)	00925	10	0.82	38.21	4.48
SODIUM(NA)	00929	313	13.61	665.53	74.29
POTASSIUM(K)	00937	8.0	0.20	14.40	1.09
		TOTAL CATION	18.32		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	382	6.26	272.94	34.78
SULFATE(SO4)	00945	163	3.39	250.52	18.83
CHLORIDE(CL)	00940	296	8.35	633.77	46.39
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.67	TOTAL	2067.24	
SILICA(SIO2)	00955	25			
		TOTAL ANION	18.00		
	TOTAL ION	1272			

TDS(180 C)	70300	1140	
TOT ION-0.5 HCO3=		1081	
EC(25 C)	00095	1860	UMHOS
EC(DIL)=103.0 X 20.0 =		2060	UMHOS
ALK. AS CACO3	00410	313	
PH		7.37	

ACCURACY CHECK

		RANGE
ION	1.018	(.96 TO 1.04)
TDS	1.055	(.90 TO 1.10)
EC	0.996	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	8.2	+/-	0.3

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.06	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.06	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.14
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.005		

```
               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                *             *            |HCO3
   |                 .          .              |
                       .       .               |
 MG|                    *     *                |SO4
   |              .             .              |
   |        .                     .            |
A+K|  *                              *         |CL
   |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB NO:M27-2820

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JUNE 23, 1989
IDENTIFICATION: KVD PAA-2
MW-45 6-13-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	70	3.49	181.48	18.40
MAGNESIUM(MG)	00925	9.1	0.75	34.95	3.95
SODIUM(NA)	00929	334	14.53	710.52	76.59
POTASSIUM(K)	00937	7.9	0.20	14.40	1.05
		TOTAL CATION	18.97		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	350	5.74	250.26	30.34
SULFATE(SO4)	00945	220	4.58	338.46	24.21
CHLORIDE(CL)	00940	305	8.60	652.74	45.45
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.62	TOTAL	2182.81	
SILICA(SIO2)	00955	24			
		TOTAL ANION	18.92		
	TOTAL ION	1321			

TDS(180 C)	70300	1200
TOT ION-0.5 HCO3=		1146
EC(25 C)	00095	1940 UMHOS
EC(DIL)= 97.3 X 22.2 =		2160 UMHOS
ALK. AS CACO3	00410	287
PH		7.47

ACCURACY CHECK

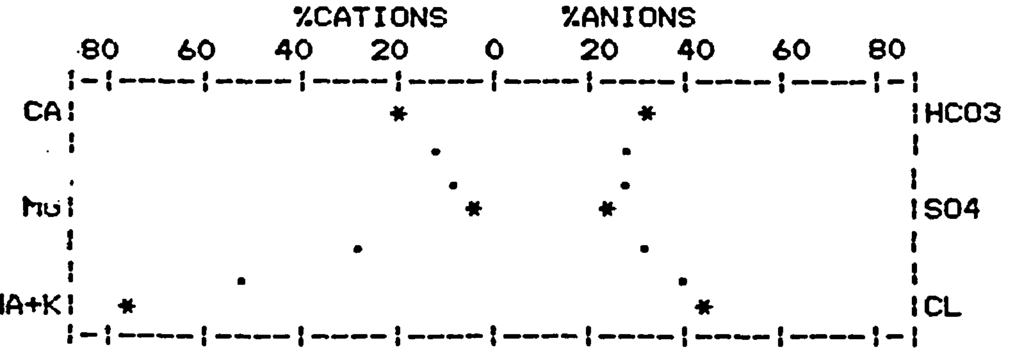
		RANGE
ION	1.003	(.96 TO 1.04)
TDS	1.047	(.90 TO 1.10)
EC	0.990	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	7.8	+/-	0.4

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.001	MANGANESE(MN)	0.06	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.06	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.15
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.006		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3900

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-47 6-18-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	45	2.25	117.00	12.62
MAGNESIUM(MG)	00925	8.8	0.72	33.55	4.04
SODIUM(NA)	00929	338	14.70	718.83	82.45
POTASSIUM(K)	00937	6.2	0.16	11.52	0.90
		TOTAL CATION	17.83		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	333	5.46	238.06	30.32
SULFATE(SO4)	00945	225	4.68	345.85	25.99
CHLORIDE(CL)	00940	279	7.87	597.33	43.70
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.60	TOTAL	2062.14	
SILICA(SIO2)	00955	20			
		TOTAL ANION	18.01		
	TOTAL ION	1256			

TDS(180 C)	70300	1130
TOT ION-0.5 HCO3=		1089
EC(25 C)	00095	1860 UMHOS
EC(DIL)=101.5 X 20.0 =		2030 UMHOS
ALK. AS CACO3	00410	273
PH		7.72

ACCURACY CHECK

		RANGE
ION	0.990	(.96 TO 1.04)
TDS	1.038	(.90 TO 1.10)
EC	0.984	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.04	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	<0.001		

```
               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   !-!----!----!----!----!----!----!----!----!-!
 CA!                  *          *             !HCO3
   !                   .        .              !
   !                   .        .              !
   !                    *      *               !SO4
   !             .               .             !
   !       .                      .            !
A+K!*                              *           !CL
   !-!----!----!----!----!----!----!----!----!-!
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

Carl Tiemann

LAB.NO:M27-4079

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-48 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	67	3.34	173.68	17.00
MAGNESIUM(MG)	00925	10	0.82	38.21	4.17
SODIUM(NA)	00929	352	15.31	748.66	77.91
POTASSIUM(K)	00937	7.1	0.18	12.96	0.92
		TOTAL CATION	19.65		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	354	5.80	252.88	28.99
SULFATE(SO4)	00945	227	4.73	349.55	23.64
CHLORIDE(CL)	00940	336	9.48	719.53	47.38
NITRATE(NO3-N)	71851	0.06			
FLUORIDE(F)	00951	0.65	TOTAL	2295.47	
SILICA(SIO2)	00955	25			
		TOTAL ANION	20.01		
	TOTAL ION	1379			

TDS(180 C)	70300	1230	
TOT ION-0.5 HCO3=		1202	
EC(25 C)	00095	2020	UMHOS
EC(DIL)=104.1 X 22.2 =		2311	UMHOS
ALK. AS CACO3	00410	290	
PH		8.10	

ACCURACY CHECK

		RANGE
ION	0.982	(.96 TO 1.04)
TDS	1.023	(.90 TO 1.10)
EC	1.007	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-
GROSS BETA		+/-
RADIUM 226		+/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.08	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.20	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.04
COPPER(CU)		SELENIUM(SE)	0.006		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	0.001	URANIUM(U)	0.272		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                 *          *              |HCO3
    |                  .         .              |
    |                   .       .               |
    |                    *      *               |SO4
    |              .              .             |
    |        .                      .           |
 A+K| *                               *         |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4162

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC.
REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-49 6-18-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	21	1.05	54.60	6.62
MAGNESIUM(MG)	00925	5.3	0.44	20.50	2.78
SODIUM(NA)	00929	327	14.22	695.36	89.72
POTASSIUM(K)	00937	5.5	0.14	10.08	0.88
		TOTAL CATION	15.85		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	339	5.56	242.42	33.92
SULFATE(SO4)	00945	195	4.06	300.03	24.77
CHLORIDE(CL)	00940	240	6.77	513.84	41.31
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.62	TOTAL	1836.84	
SILICA(SIO2)	00955	20			
		TOTAL ANION	16.39		
	TOTAL ION	1153			

TDS(180 C)	70300	1020
TOT ION-0.5 HCO3=		984
EC(25 C)	00095	1690 UMHOS
EC(DIL)=109.6 X 16.7 =		1830 UMHOS
ALK. AS CACO3	00410	278
PH		7.81

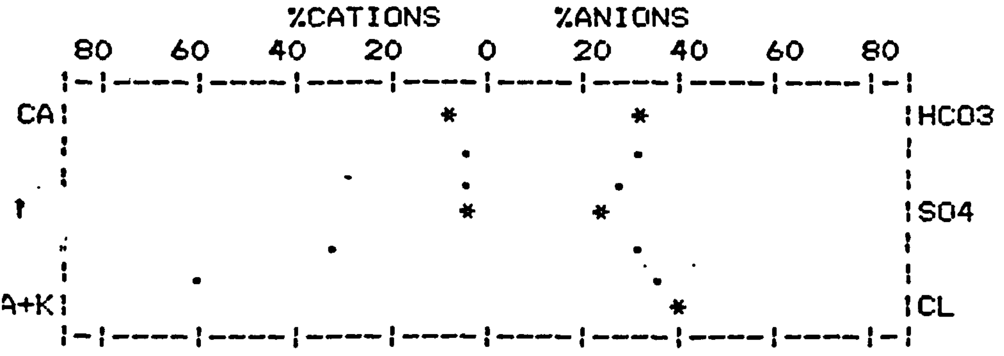
ACCURACY CHECK

		RANGE
ION	0.967	(.96 TO 1.04)
TDS	1.037	(.90 TO 1.10)
EC	0.996	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.03
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.16	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.004		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4080

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-50 6-17-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	14	0.70	36.40	4.44
MAGNESIUM(MG)	00925	4.4	0.36	16.78	2.28
SODIUM(NA)	00929	335	14.57	712.47	92.45
POTASSIUM(K)	00937	5.2	0.13	9.36	0.82
		TOTAL CATION	15.76		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	360	5.90	257.24	36.83
SULFATE(SO4)	00945	187	3.89	287.47	24.28
CHLORIDE(CL)	00940	221	6.23	472.86	38.89
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.65	TOTAL	1792.58	
SILICA(SIO2)	00955	21			
		TOTAL ANION	16.02		
	TOTAL ION	1148			

TDS(180 C)	70300	1000
TOT ION-0.5 HCO3=		968
EC(25 C)	00095	1610 UMHOS
EC(DIL)=106.6 X 16.7 =		1780 UMHOS
ALK. AS CACO3	00410	295
PH		8.13

ACCURACY CHECK

		RANGE
ION	0.984	(.96 TO 1.04)
TDS	1.033	(.90 TO 1.10)
EC	0.993	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.007	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.05
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	0.007	URANIUM(U)	0.008		

```
             %CATIONS         %ANIONS
   80   60   40   20    0    20   40   60   80
  !-!----!----!----!----!----!----!----!----!-!
CA!                     *         *          !HCO3
  !                     .        .           !
 .!                     .       .            !
1                       *      *             !SO4
  !              .             .             !
  !      .                      .            !
A+K!                              *          !CL
  !-!----!----!----!----!----!----!----!----!-!
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4081

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-51 6-16-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	14	0.70	36.40	4.38
MAGNESIUM(MG)	00925	4.1	0.34	15.84	2.13
SODIUM(NA)	00929	338	14.70	718.83	92.05
POTASSIUM(K)	00937	9.0	0.23	16.56	1.44
		TOTAL CATION	15.97		
CARBONATE(CO3)	00445	17	0.57	48.22	3.51
BICARBONATE(HCO3)	00440	298	4.88	212.77	30.01
SULFATE(SO4)	00945	217	4.52	334.03	27.80
CHLORIDE(CL)	00940	223	6.29	477.41	38.68
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.65	TOTAL	1860.06	
SILICA(SIO2)	00955	20			
		TOTAL ANION	16.26		

TOTAL ION 1141

TDS(180 C)	70300	1040	
TOT ION-0.5 HCO3=		992	
EC(25 C)	00095	1640 UMHOS	
EC(DIL)=110.2	X 16.7 =	1840 UMHOS	
ALK. AS CACO3	00410	272	
PH		8.78	

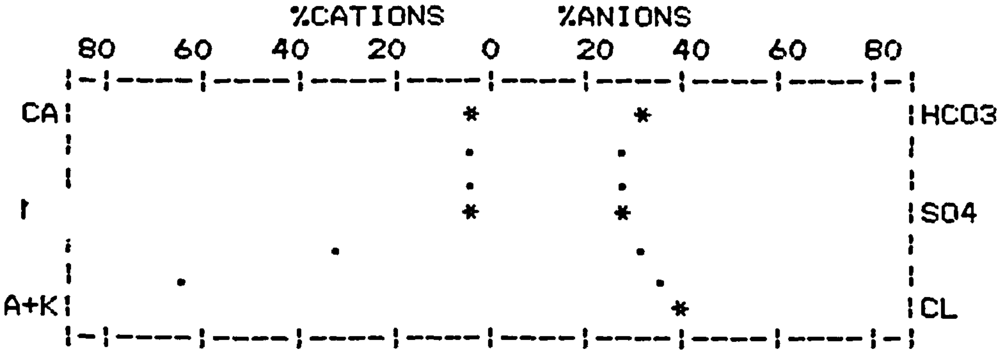
ACCURACY CHECK

		RANGE
ION	0.982	(.96 TO 1.04)
TDS	1.049	(.90 TO 1.10)
EC	0.989	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.009	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0001	MOLY.(MO)	0.013	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.025		



ANALYST:

NIXON AND ALLEN

CHECKED BY:
Carl Robinson

LAB.NO:M27-4082

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-71 6-17-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	12	0.60	31.20	4.07
MAGNESIUM(MG)	00925	4.3	0.35	16.31	2.37
SODIUM(NA)	00929	313	13.61	665.53	92.21
POTASSIUM(K)	00937	7.7	0.20	14.40	1.36
		TOTAL CATION	14.76		
CARBONATE(CO3)	00445	10	0.33	27.92	2.19
BICARBONATE(HCO3)	00440	273	4.47	194.89	29.70
SULFATE(SO4)	00945	190	3.96	292.64	26.31
CHLORIDE(CL)	00940	223	6.29	477.41	41.79
NITRATE(NO3-N)	71851	1.2			
FLUORIDE(F)	00951	0.55	TOTAL	1720.30	
SILICA(SIO2)	00955	28			
		TOTAL ANION	15.05		
	TOTAL ION	1063			

TDS(180 C)	70300	957
TOT ION-0.5 HCO3=		926
EC(25 C)	00095	1570 UMHOS
EC(DIL)=102.4 X 16.7 =		1710 UMHOS
ALK. AS CACO3	00410	240
PH		8.66

ACCURACY CHECK

		RANGE
ION	0.981	(.96 TO 1.04)
TDS	1.033	(.90 TO 1.10)
EC	0.994	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER
GROSS ALPHA +/-
GROSS BETA +/-
RADIUM 226 +/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	0.010	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.04	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.01
COPPER(CU)		SELENIUM(SE)	0.003		
IRON(FE)	0.03	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.017		

```
               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
CA |                    *       *              |HCO3
   |                    .       .              |
   |                    .       .              |
M  |                    *       *              |SO4
   |             .               .             |
   |     .                        .            |
A+K|                               *           |CL
   |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4102

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY:  URI, INC.                                  REPORT DATE:  JUNE 20,, 1989
IDENTIFICATION:  KVD PAA-2
                 MW-31      6-2-89
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM                STORET      MG/L          EPM        CONDUCTANCE      %EPM

CALCIUM(CA)         00915        16           0.80           41.60         5.33
MAGNESIUM(MG)       00925         4.8         0.39           18.17         2.60
SODIUM(NA)          00929       314          13.66          667.97        91.01
POTASSIUM(K)        00937         6.3         0.16           11.52         1.07

                          TOTAL CATION       15.01

CARBONATE(CO3)      00445         0           0.00            0.00         0.00
BICARBONATE(HCO3)00440          293           4.80          209.28        32.19
SULFATE(SO4)        00945       193           4.02          297.08        26.96
CHLORIDE(CL)        00940       216           6.09          462.23        40.85
NITRATE(NO3-N)      71851         5.8
FLUORIDE(F)         00951         0.62           TOTAL     1707.86
SILICA(SIO2)        00955        22

                          TOTAL ANION       14.91
                 TOTAL ION     1072                        ACCURACY CHECK
                                                                      RANGE
✓TDS(180 C)         70300        982             ION      1.007   (.96 TO 1.04)
 TOT ION-0.5 HCO3=               925             TDS      1.062   (.90 TO 1.10)
✓EC(25 C)           00095       1610 UMHOS       EC       1.001   (.95 TO 1.05)
 EC(DIL)=102.4   X  16.7 =      1710 UMHOS
 ALK. AS CACO3      00410        240             RADIATION-PICOCURIES/LITER
 PH                                7.69          GROSS ALPHA         +/-
                                                 GROSS BETA          +/-
 MINOR AND TRACE CONSTITUENTS                    RADIUM 226     6.9  +/-    0.3

 ITEM              MG/L      ITEM              MG/L       ITEM              MG/L
 ARSENIC(AS)      <0.001     MANGANESE(MN)    0.01        VANADIUM(V)
 BARIUM(BA)                  MERCURY(HG)     <0.0001      ZINC(ZN)
 CADMIUM(CD)       0.0001    MOLY.(MO)        0.03        BORON(B)
 CHROM.(CR)                  NICKEL(NI)                   AMMONIA-N          0.09
 COPPER(CU)                  SELENIUM(SE)    <0.001
 IRON(FE)          0.01      SILVER(AG)
 LEAD(PB)          0.001     URANIUM(U)       0.012

               %CATIONS          %ANIONS
  80    60    40    20     0     20    40    60    80
 |-|----|----|----|----|----|----|----|----|-|
CA|                     *        *            |HCO3      ANALYST:
  .                     .        .            |
  .                     .       .             |           NIXON AND ALLEN
MG|                     *       *             |SO4        ---------------
  |             .                .            |
  |      .                        .           |           CHECKED BY:
NA+K|                              *          |CL
 |-|----|----|----|----|----|----|----|----|-|                ---------------
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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JUNE 20,, 1989
IDENTIFICATION: KVD PAA-2
MW-32 6-2-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	17	0.85	44.20	5.51
MAGNESIUM(MG)	00925	5.0	0.41	19.11	2.66
SODIUM(NA)	00929	322	14.01	685.09	90.86
POTASSIUM(K)	00937	5.8	0.15	10.80	0.97
		TOTAL CATION	15.42		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	317	5.20	226.72	33.64
SULFATE(SO4)	00945	199	4.14	305.95	26.78
CHLORIDE(CL)	00940	217	6.12	464.51	39.59
NITRATE(NO3-N)	71851	2.4			
FLUORIDE(F)	00951	0.65	TOTAL	1756.37	
SILICA(SIO2)	00955	20			
		TOTAL ANION	15.46		
	TOTAL ION	1106			

TDS(180 C)	70300	995
TOT ION-0.5 HCO3=		947
EC(25 C)	00095	1620 UMHOS
EC(DIL)=103.6 X 16.7 =		1730 UMHOS
ALK. AS CACO3	00410	260
PH		8.05

ACCURACY CHECK

		RANGE
ION	0.997	(.96 TO 1.04)
TDS	1.050	(.90 TO 1.10)
EC	0.985	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	4.1	+/-	0.3

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.09
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	0.014	URANIUM(U)	0.008		

```
             %CATIONS        %ANIONS
  80   60   40   20    0    20   40   60   80
 !-!----!----!----!----!----!----!----!----!-!
CA!                  *      *                !HCO3
  !                  .      .                !
  !                  .     .                 !
MG!                  *     *                 !SO4
  !            .            .                !
  !     .                    .               !
A+K!                          *               !CL
 !-!----!----!----!----!----!----!----!----!-!
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB NO:M27-2457

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

OMPANY: URI, INC. REPORT DATE: JULY 6, 1989
IDENTIFICATION: KVD PAA-2
MW-33 6-17-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	12	0.60	31.20	3.93
MAGNESIUM(MG)	00925	3.7	0.30	13.98	1.97
SODIUM(NA)	00929	326	14.18	693.40	92.92
POTASSIUM(K)	00937	7.0	0.18	12.96	1.18
		TOTAL CATION	15.26		
CARBONATE(CO3)	00445	5	0.17	14.38	1.09
BICARBONATE(HCO3)	00440	312	5.11	222.80	32.88
SULFATE(SO4)	00945	196	4.08	301.51	26.25
CHLORIDE(CL)	00940	219	6.18	469.06	39.77
NITRATE(NO3-N)	71851	0.03			
FLUORIDE(F)	00951	0.70	TOTAL	1759.29	
SILICA(SIO2)	00955	23			
		TOTAL ANION	15.54		
	TOTAL ION	1104			

TDS(180 C)	70300	999
TOT ION-0.5 HCO3=		948
EC(25 C)	00095	1600 UMHOS
EC(DIL)=104.2 X 16.7 =		1740 UMHOS
ALK. AS CACO3	00410	264
PH		8.47

ACCURACY CHECK

		RANGE
ION	0.982	(.96 TO 1.04)
TDS	1.053	(.90 TO 1.10)
EC	0.989	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA	+/-
GROSS BETA	+/-
RADIUM 226	+/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	<0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.01
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	0.011	URANIUM(U)	0.007		

```
                %CATIONS      %ANIONS
     80   60   40   20    0    20   40   60   80
    |-|----|----|----|----|----|----|----|----|-|
  CA|                    *        *             |HCO3
    |                    .        .             |
    |                    .       .              |
                          *      *              |SO4
    |             .               .             |
    |     .                        .            |
 A+K|                               *           |CL
    |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-4077

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JUNE 21, 1989
IDENTIFICATION: KVD PAA-2
MW-34 6-5-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	41	2.05	106.60	13.20
MAGNESIUM(MG)	00925	4.1	0.34	15.84	2.19
SODIUM(NA)	00929	298	12.96	633.74	83.45
POTASSIUM(K)	00937	7.1	0.18	12.96	1.16
		TOTAL CATION	15.53		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	329	5.39	235.00	33.96
SULFATE(SO4)	00945	190	3.96	292.64	24.95
CHLORIDE(CL)	00940	231	6.52	494.87	41.08
NITRATE(NO3-N)	71851	0.05			
FLUORIDE(F)	00951	0.82	TOTAL	1791.66	
SILICA(SIO2)	00955	23			
		TOTAL ANION	15.87		
	TOTAL ION	1124			

TDS(180 C)	70300	1020
TOT ION-0.5 HCO3=		960
EC(25 C)	00095	1620 UMHOS
EC(DIL)=106.6 X 16.7 =		1780 UMHOS
ALK. AS CACO3	00410	270
PH		7.86

ACCURACY CHECK

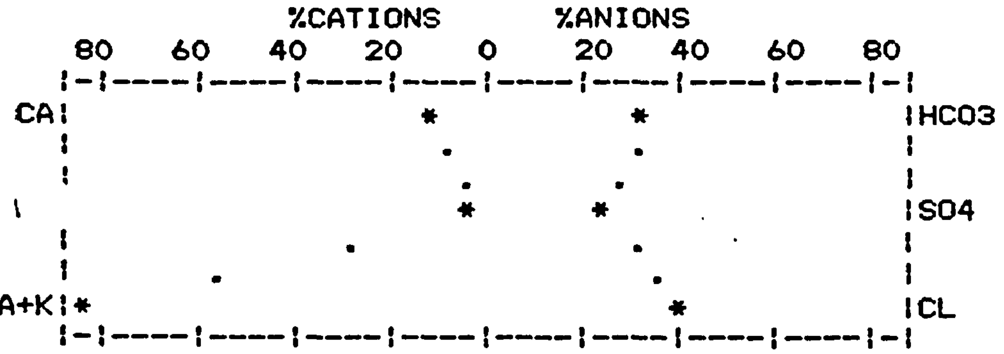
		RANGE
ION	0.979	(.96 TO 1.04)
TDS	1.063	(.90 TO 1.10)
EC	0.994	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	3.2	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.03	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.06	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.11
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.05	SILVER(AG)			
LEAD(PB)	0.001	URANIUM(U)	0.015		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3678

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC. REPORT DATE: JUNE 21 1989
IDENTIFICATION: KVD PAA-2
MW-35 4-10-89
LABORATORY: JORDAN LABORATORIES, INC.

JUN 2 6 1989
URI, INC.
URI, DALLAS

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	57	2.84	147.68	16.20
MAGNESIUM(MG)	00925	7.8	0.64	29.82	3.65
SODIUM(NA)	00929	319	13.88	678.73	79.18
POTASSIUM(K)	00937	6.7	0.17	12.24	0.97
		TOTAL CATION	17.53		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	355	5.82	253.75	32.73
SULFATE(SO4)	00945	187	3.89	287.47	21.88
CHLORIDE(CL)	00940	286	8.07	612.51	45.39
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.65	TOTAL	2022.21	
SILICA(SIO2)	00955	22			
		TOTAL ANION	17.78		

TOTAL ION 1241

TDS(180 C)	70300	1120	
TOT ION-0.5 HCO3=		1064	
EC(25 C)	00095	1830	UMHOS
EC(DIL)=100.5 X 20.0 =		2010	UMHOS
ALK. AS CACO3	00410	291	
PH		7.69	

ACCURACY CHECK

		RANGE
ION	0.986	(.96 TO 1.04)
TDS	1.053	(.90 TO 1.10)
EC	0.994	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	2.3	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.08	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.02	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.10
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.07	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.003		

```
            %CATIONS        %ANIONS
   80   60   40   20    0   20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                 *          *               |HCO3
   |                  .        .                |
   |                   .      .                 |
                        *    *                  |SO4
   |               .           .                |
   |         .                   .              |
A+K| *                             *            |CL
   |-|----|----|----|----|----|----|----|----|-|
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ANALYST:

NIXON AND ALLEN

CHECKED BY:

Carl Newman

LAB.NO:M27-3727

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JUNE 21, 1989
IDENTIFICATION: KVD PAA-2
MW-36 6-6-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	18	0.90	46.80	5.91
MAGNESIUM(MG)	00925	5.2	0.43	20.04	2.82
SODIUM(NA)	00929	316	13.75	672.38	90.22
POTASSIUM(K)	00937	6.1	0.16	11.52	1.05
		TOTAL CATION	15.24		
CARBONATE(CO3)	00445	5	0.17	14.38	1.12
BICARBONATE(HCO3)	00440	329	5.39	235.00	35.48
SULFATE(SO4)	00945	190	3.96	292.64	26.07
CHLORIDE(CL)	00940	201	5.67	430.35	37.33
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.70	TOTAL	1723.12	
SILICA(SIO2)	00955	22			
		TOTAL ANION	15.19		
	TOTAL ION	1093			

TDS(180 C)	70300	971
TOT ION-0.5 HCO3=		929
EC(25 C)	00095	1580 UMHOS
EC(DIL)=102.4	X 16.7 =	1710 UMHOS
ALK. AS CACO3	00410	278
PH		8.45

ACCURACY CHECK

		RANGE
ION	1.003	(.96 TO 1.04)
TDS	1.046	(.90 TO 1.10)
EC	0.992	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	1.1	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.08
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.007		

```
               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                    *         *            |HCO3
   |                    .        .             |
   |                    .       .              |
MG.|                    *       *              |SO4
   |             .              .              |
   |      .                      .             |
A+K|                              *            |CL
   |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3728

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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM


COMPANY:  URI, INC.                           REPORT DATE:  JUNE 28, 1989
IDENTIFICATION:  KVD PAA-2
                 MW-37     6-8-89
LABORATORY:  JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM             STORET      MG/L         EPM       CONDUCTANCE      %EPM

CALCIUM(CA)      00915        20          1.00         52.00         6.48
MAGNESIUM(MG)    00925         5.7        0.47         21.90         3.05
SODIUM(NA)       00929       317         13.79        674.33        89.37
POTASSIUM(K)     00937         6.6        0.17         12.24         1.10

                         TOTAL CATION    15.43

CARBONATE(CO3)   00445         0          0.00          0.00         0.00
BICARBONATE(HCO3)00440       345          5.65        246.34        36.19
SULFATE(SO4)     00945       191          3.98        294.12        25.50
CHLORIDE(CL)     00940       212          5.98        453.88        38.31
NITRATE(NO3-N)   71851        <0.01
FLUORIDE(F)      00951         0.67          TOTAL    1754.82
SILICA(SIO2)     00955        22

                         TOTAL ANION    15.61
                 TOTAL ION     1120                  ACCURACY CHECK
                                                           RANGE
TDS(180 C)       70300       1000            ION     0.988  (.96 TO 1.04)
TOT ION-0.5 HCO3=             947            TDS     1.055  (.90 TO 1.10)
EC(25 C)         00095       1610 UMHOS      EC      0.992  (.95 TO 1.05)
EC(DIL)=104.2  X  16.7 =     1740 UMHOS
ALK. AS CACO3    00410        283            RADIATION-PICOCURIES/LITER
PH                              8.14         GROSS ALPHA        +/-
                                             GROSS BETA         +/-
MINOR AND TRACE CONSTITUENTS                 RADIUM 226    0.4  +/-   0.1

ITEM            MG/L       ITEM            MG/L       ITEM             MG/L
ARSENIC(AS)     <0.001     MANGANESE(MN)    0.01      VANADIUM(V)
BARIUM(BA)                 MERCURY(HG)     <0.0001    ZINC(ZN)
CADMIUM(CD)     <0.0001    MOLY.(MO)       <0.01      BORON(B)
CHROM.(CR)                 NICKEL(NI)                 AMMONIA-N        0.16
COPPER(CU)                 SELENIUM(SE)    <0.001
IRON(FE)         0.04      SILVER(AG)
LEAD(PB)        <0.001     URANIUM(U)       0.002

               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   !-!----!----!----!----!----!----!----!----!-!
 CA!                   *          *            !HCO3      ANALYST:
                        .        .             !
   !                    .       .              !            NIXON AND ALLEN
 MG!                    *      *               !SO4         ------------------
   !             .              .              !
   !      .                      .             !          CHECKED BY:
A+K!                               *           !CL
   !-!----!----!----!----!----!----!----!----!-!            -----------------
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GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JUNE 28, 1989
IDENTIFICATION: KVD PAA-2
MW-38 6-8-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	21	1.05	54.60	6.62
MAGNESIUM(MG)	00925	5.6	0.46	21.44	2.90
SODIUM(NA)	00929	326	14.18	693.40	89.46
POTASSIUM(K)	00937	6.3	0.16	11.52	1.01
		TOTAL CATION	15.85		
CARBONATE(CO3)	00445	4	0.13	11.00	0.83
BICARBONATE(HCO3)	00440	323	5.29	230.64	33.80
SULFATE(SO4)	00945	196	4.08	301.51	26.07
CHLORIDE(CL)	00940	218	6.15	466.79	39.30
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.65	TOTAL	1790.90	
SILICA(SIO2)	00955	23			
		TOTAL ANION	15.65		

TOTAL ION 1124

TDS(180 C)	70300	1010
TOT ION-0.5 HCO3=		962
EC(25 C)	00095	1620 UMHOS
EC(DIL)=107.2 X 16.7 =		1790 UMHOS
ALK. AS CACO3	00410	271
PH		8.42

ACCURACY CHECK

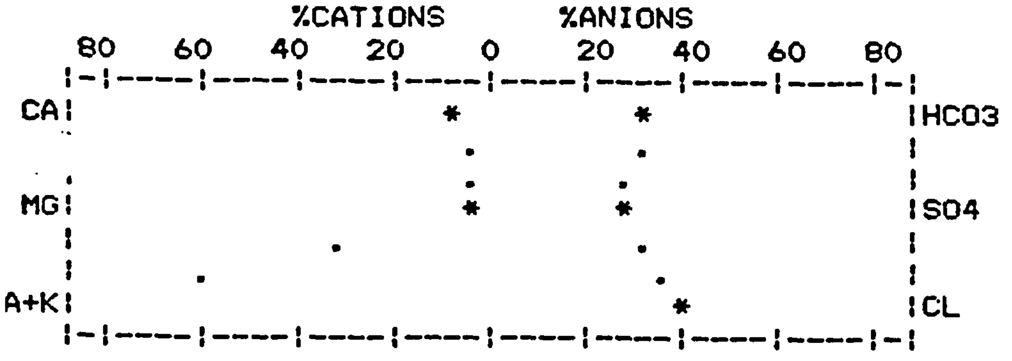
		RANGE
ION	1.013	(.96 TO 1.04)
TDS	1.050	(.90 TO 1.10)
EC	1.000	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.9	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.02	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.04	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.12
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.037		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JUNE 23, 1989
IDENTIFICATION: KVD PAA-2
MW-39 6-9-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	53	2.64	137.28	15.57
MAGNESIUM(MG)	00925	8.4	0.69	32.15	4.07
SODIUM(NA)	00929	309	13.44	657.22	79.25
POTASSIUM(K)	00937	7.6	0.19	13.68	1.12
		TOTAL CATION	16.96		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	345	5.65	246.34	32.79
SULFATE(SO4)	00945	193	4.02	297.08	23.33
CHLORIDE(CL)	00940	268	7.56	573.80	43.88
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.60	TOTAL	1957.55	
SILICA(SIO2)	00955	23			
		TOTAL ANION	17.23		

TOTAL ION 1208

TDS(180 C)	70300	1090
TOT ION-0.5 HCO3=		1035
EC(25 C)	00095	1770 UMHOS
EC(DIL)= 98.0 X 20.0 =		1960 UMHOS
ALK. AS CACO3	00410	283
PH		7.69

ACCURACY CHECK

		RANGE
ION	0.984	(.96 TO 1.04)
TDS	1.053	(.90 TO 1.10)
EC	1.001	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	2.6	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.06	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.09	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.06
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.06	SILVER(AG)			
LEAD(PB)	0.001	URANIUM(U)	0.005		

```
               %CATIONS      %ANIONS
    80   60   40   20    0    20   40   60   80
   |-|----|----|----|----|----|----|----|----|-|
 CA|                 *           *             |HCO3
   |                  .         .              |
                       .        .              |
 MG|                    *      *               |SO4
   |              .              .             |
   |       .            .         .            |
A+K| *                              *          |CL
   |-|----|----|----|----|----|----|----|----|-|
```

ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB NO:M27-2024

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JUNE 23, 1989
IDENTIFICATION: KVD PAA-2
MW-40 6-12-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	50	2.50	130.00	14.93
MAGNESIUM(MG)	00925	7.0	0.58	27.03	3.46
SODIUM(NA)	00929	310	13.48	659.17	80.53
POTASSIUM(K)	00937	7.2	0.18	12.96	1.08
		TOTAL CATION	16.74		
CARBONATE(CO3)	00445	1	0.03	2.54	0.18
BICARBONATE(HCO3)	00440	339	5.56	242.42	33.04
SULFATE(SO4)	00945	188	3.91	288.95	23.23
CHLORIDE(CL)	00940	260	7.33	556.35	43.55
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.65	TOTAL	1919.41	
SILICA(SIO2)	00955	24			
		TOTAL ANION	16.83		

TOTAL ION 1187

TDS(180 C)	70300	1060
TOT ION-0.5 HCO3=		1017
EC(25 C)	00095	1740 UMHOS
EC(DIL)= 95.0 X 20.0 =		1900 UMHOS
ALK. AS CACO3	00410	280
PH		8.31

ACCURACY CHECK

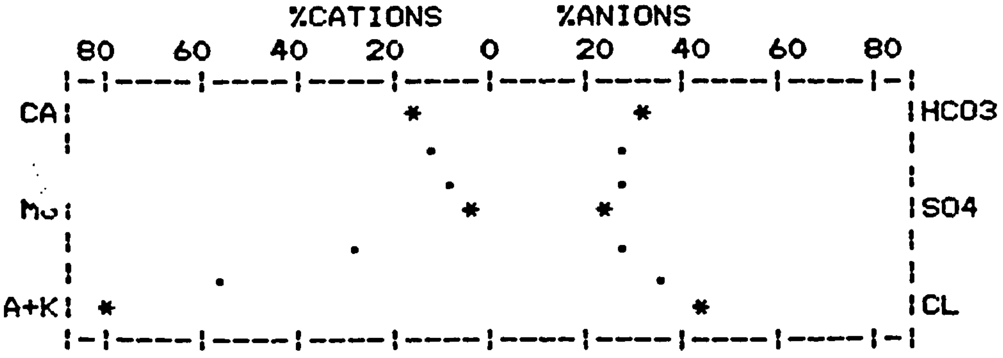
		RANGE
ION	0.995	(.96 TO 1.04)
TDS	1.042	(.90 TO 1.10)
EC	0.990	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	2.3	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.05	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	0.11	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.08
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.01	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.012		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3827

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
IDENTIFICATION: KVD PAA-2
MW-41 6-12-89
LABORATORY: JORDAN LABORATORIES, INC.

REPORT DATE: JUNE 23, 1989

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	48	2.40	124.80	13.77
MAGNESIUM(MG)	00925	7.5	0.62	28.89	3.56
SODIUM(NA)	00929	327	14.22	695.36	81.58
POTASSIUM(K)	00937	7.3	0.19	13.68	1.09
		TOTAL CATION	17.43		
CARBONATE(CO3)	00445	2	0.07	5.92	0.41
BICARBONATE(HCO3)	00440	504	8.26	360.14	47.80
SULFATE(SO4)	00945	64	1.33	98.29	7.70
CHLORIDE(CL)	00940	270	7.62	578.36	44.10
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.55	TOTAL	1905.43	
SILICA(SIO2)	00955	25			
		TOTAL ANION	17.28		

TOTAL ION 1255

TDS(180 C)	70300	1060
TOT ION-0.5 HCO3=		1003
EC(25 C)	00095	1730 UMHOS
EC(DIL)= 95.0 X 20.0 =		1900 UMHOS
ALK. AS CACO3	00410	417
PH		8.33

ACCURACY CHECK

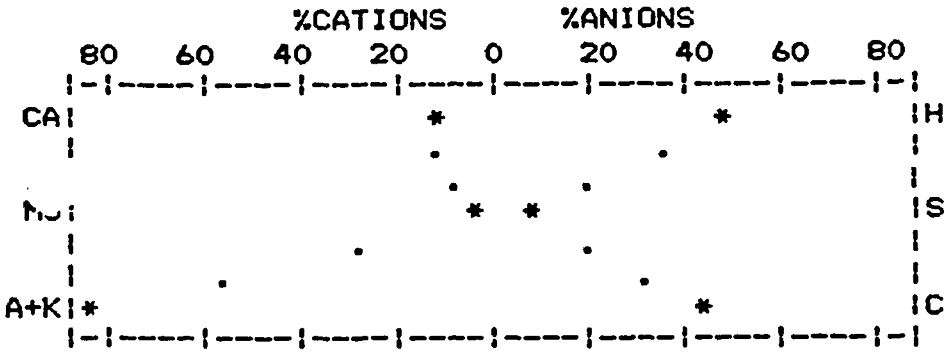
		RANGE
ION	1.009	(.96 TO 1.04)
TDS	1.056	(.90 TO 1.10)
EC	0.997	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	2.8	+/-	0.2

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.03	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.13
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.04	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.002		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

LAB.NO:M27-3828

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY: URI, INC.
REPORT DATE: JUNE 23, 1989
IDENTIFICATION: KVD PAA-2
MW-42 6-12-89
LABORATORY: JORDAN LABORATORIES, INC.

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	18	0.90	46.80	5.82
MAGNESIUM(MG)	00925	3.7	0.30	13.98	4.00
SODIUM(NA)	00929	324	14.09	689.00	91.14
POTASSIUM(K)	00937	6.6	0.17	12.24	1.10
		TOTAL CATION	15.46		
CARBONATE(CO3)	00445	18	0.60	50.76	3.91
BICARBONATE(HCO3)	00440	505	8.28	361.01	53.91
SULFATE(SO4)	00945	13	0.27	19.95	1.76
CHLORIDE(CL)	00940	220	6.21	471.34	40.43
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.73	TOTAL	1665.08	
SILICA(SIO2)	00955	24			
		TOTAL ANION	15.36		
	TOTAL ION	1133			

TDS(180 C)	70300	939
TOT ION-0.5 HCO3=		881
EC(25 C)	00095	1570 UMHOS
EC(DIL)=100.6 X 16.7 =		1680 UMHOS
ALK. AS CACO3	00410	444
PH		8.52

ACCURACY CHECK

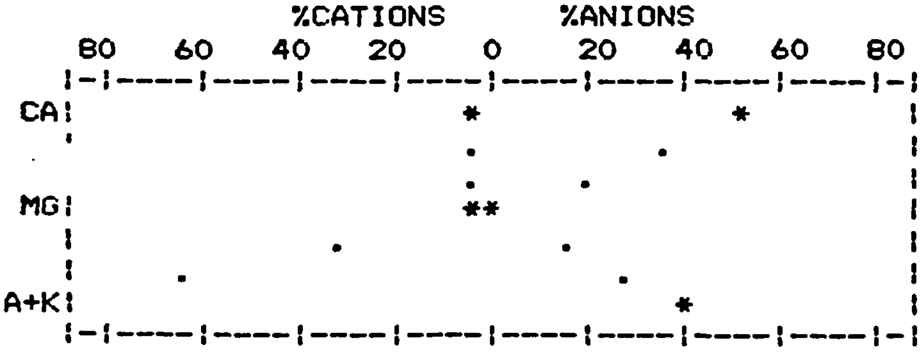
		RANGE
ION	1.007	(.96 TO 1.04)
TDS	1.066	(.90 TO 1.10)
EC	1.009	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA		+/-	
GROSS BETA		+/-	
RADIUM 226	0.9	+/-	0.1

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.01	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	<0.0001	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.14
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.02	SILVER(AG)			
LEAD(PB)	<0.001	URANIUM(U)	0.003		



ANALYST:

NIXON AND ALLEN

CHECKED BY: Cal Steurmer

LAB NO:M27-

GROUND WATER ANALYSIS REPORT-IN SITU MINING-URANIUM

COMPANY:	URI, INC.	REPORT DATE:	JULY 6, 1989
IDENTIFICATION:	KVD PAA-2 MW-43 6-17-89		
LABORATORY:	JORDAN LABORATORIES, INC.		

MAJOR AND SECONDARY CONSTITUENTS

ITEM	STORET	MG/L	EPM	CONDUCTANCE	%EPM
CALCIUM(CA)	00915	53	2.64	137.28	15.56
MAGNESIUM(MG)	00925	8.4	0.69	32.15	4.07
SODIUM(NA)	00929	310	13.48	659.17	79.43
POTASSIUM(K)	00937	6.4	0.16	11.52	0.94
		TOTAL CATION	16.97		
CARBONATE(CO3)	00445	0	0.00	0.00	0.00
BICARBONATE(HCO3)	00440	372	6.10	265.96	34.92
SULFATE(SO4)	00945	183	3.81	281.56	21.81
CHLORIDE(CL)	00940	268	7.56	573.80	43.27
NITRATE(NO3-N)	71851	<0.01			
FLUORIDE(F)	00951	0.57	TOTAL	1961.45	
SILICA(SIO2)	00955	21			
		TOTAL ANION	17.47		
	TOTAL ION	1222			

TDS(180 C)	70300	1070
TOT ION-0.5 HCO3=		1036
EC(25 C)	00095	1760 UMHOS
EC(DIL)= 96.5 X 20.0 =		1930 UMHOS
ALK. AS CACO3	00410	305
PH		7.68

ACCURACY CHECK

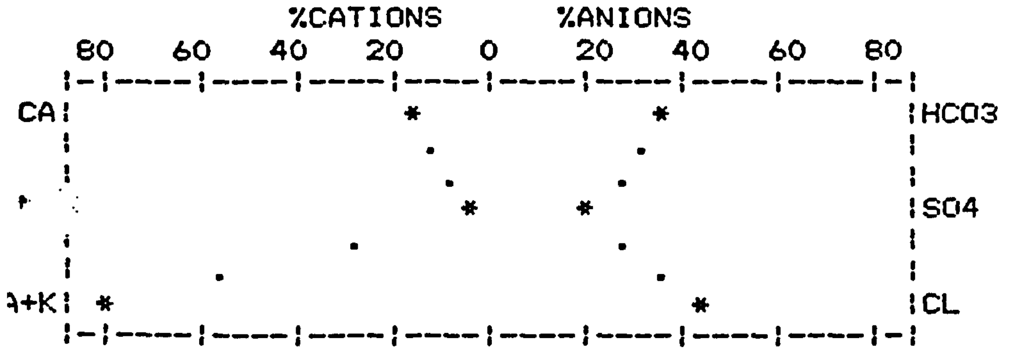
		RANGE
ION	0.971	(.96 TO 1.04)
TDS	1.032	(.90 TO 1.10)
EC	0.984	(.95 TO 1.05)

RADIATION-PICOCURIES/LITER

GROSS ALPHA	+/-
GROSS BETA	+/-
RADIUM 226	+/-

MINOR AND TRACE CONSTITUENTS

ITEM	MG/L	ITEM	MG/L	ITEM	MG/L
ARSENIC(AS)	<0.001	MANGANESE(MN)	0.04	VANADIUM(V)	
BARIUM(BA)		MERCURY(HG)	<0.0001	ZINC(ZN)	
CADMIUM(CD)	0.0002	MOLY.(MO)	<0.01	BORON(B)	
CHROM.(CR)		NICKEL(NI)		AMMONIA-N	0.04
COPPER(CU)		SELENIUM(SE)	<0.001		
IRON(FE)	0.08	SILVER(AG)			
LEAD(PB)	0.007	URANIUM(U)	0.002		



ANALYST:

NIXON AND ALLEN

CHECKED BY:

ALRooney

LAB.NO:M27-4078

Production Wells

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
NOVEMBER 22, 1996

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

LAB. NO.	IDENTIFICATION (KVD PA II)	(NATURAL) URANIUM MG/L	RADIUM 226 PCI/L
M34-8749	PRODUCTION WELL #5534 INJ. 10-30-96	0.237	23 +/- 1
M34-8750	PRODUCTION WELL #5705 10-28-96	0.407	178 +/- 2
M34-8751	PRODUCTION WELL #5354-EXT. 10-30-96	2.20	114 +/- 1
M34-8752	PRODUCTION WELL #5552-EXT. 10-25-96	0.016	132 +/- 2
M34-8753	PRODUCTION WELL #5350-EXT. 10-25-96	0.195	9.3 +/- 0.4
M34-8754	PRODUCTION WELL #5356-EXT. 10-29-96	0.078	52 +/- 1

ANALYSIS DATE	11-21-96	11-14-96
ANALYST	KUME	STRAUSS
METHOD	ASTM D2907-83	SM 7500-RA C.

RESPECTFULLY SUBMITTED,

Carl F Crownover

CARL F. CROWNOVER, PRES.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
JANUARY 2, 1997

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

LAB. NO.	IDENTIFICATION (KVD PA II)	(NATURAL) URANIUM MG/L	RADIUM 226 PCI/L
M34-9294	PRODUCTION WELL #5567 11-6-96	0.178	82 +/- 1
M34-9295	PRODUCTION WELL #5566 11-6-96	0.153	5.0 +/- 0.3
M34-9296	PRODUCTION WELL #5556 10-31-96	0.037	27 +/- 1
M34-9297	PRODUCTION WELL #5132 10-31-96	1.19	22 +/- 1
M34-9298	PRODUCTION WELL #5557 11-1-96	0.085	44 +/- 1

ANALYSIS DATE	11-21-96	12-27-96
ANALYST	KUME	CHAPA
METHOD	ASTM D2907-83	SM 7500-RA C.

URI, INC.
URI. DALLAS
JAN - 6 1997
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RESPECTFULLY SUBMITTED,

CARL F. CROWNOVER, PRES.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
JANUARY 2, 1997

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

LAB. NO.	IDENTIFICATION (KVD PA II)	(NATURAL) URANIUM MG/L	RADIUM 226 PCI/L
M34-9399	PRODUCTION WELL #5562 11-6-96	0.153	150 +/- 2
M34-9400	PRODUCTION WELL #5525 11-6-96	102	577 +/- 3
M34-9401	PRODUCTION WELL #5560 11-6-96	0.577	94 +/- 1
ANALYSIS DATE		11-21-96	12-27-96
ANALYST		KUME	STRAUSS
METHOD		ASTM D2907-83	SM 7500-RA C.

RESPECTFULLY SUBMITTED,

CARL F. CROWNOVER, PRES.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
JANUARY 3, 1997

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

LAB. NO.	IDENTIFICATION (KVD PA II)	(NATURAL) URANIUM MG/L	RADIUM 226 PCI/L
M34-9536	PRODUCTION WELL #5707 11-7-96	1.53	33 +/- 1
M34-9537	PRODUCTION WELL #5119 11-8-96	0.763	403 +/- 3
M34-9538	PRODUCTION WELL #5120 11-8-96	0.058	137 +/- 2
ANALYSIS DATE		12-11-96	12-27-96
ANALYST		KUME	STRAUSS
METHOD		ASTM D2907-83	SM 7500-RA C.

RESPECTFULLY SUBMITTED,

CARL F. CROWNOVER, PRES.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

JANUARY 6, 1997

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

LAB. NO.	IDENTIFICATION (KVD PA II)	(NATURAL) URANIUM MG/L	RADIUM 226 PCI/L
M34-9613	PRODUCTION WELL #5570 10:15 AM 11-12-96	0.136	4.3 +/- 0.3
M34-9614	PRODUCTION WELL #5559 4:00 PM 11-13-96	0.407	2.9 +/- 0.3
M34-9615	PRODUCTION WELL #5710 1:40 PM 11-13-96	0.288	106 +/- 1
M34-9616	PRODUCTION WELL #5558 2:45 PM 11-13-96	1.19	14 +/- 1
M34-9617	PRODUCTION WELL #5711 10:45 AM 11-13-96	26.3	49 +/- 1

ANALYSIS DATE	12-11/12-96	12-27-96
ANALYST	KUME	STRAUSS
METHOD	ASTM D2907-83	SM 7500-RA C.

RESPECTFULLY SUBMITTED,

CARL F. CROWNOVER, PRES.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

JANUARY 30, 1997

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

LAB. NO.	IDENTIFICATION (KVD PA II)	(NATURAL) URANIUM MG/L	RADIUM 226 PCI/L
M34-10575	PRODUCTION WELL #5135 9:00 AM 12-2-96	0.547	32 +/- 1
M34-10576	PRODUCTION WELL #5425 10:15 AM 12-2-96	66.2	233 +/- 2
M34-10577	PRODUCTION WELL #5553 10:50 AM 12-2-96	0.042	0.9 +/- 0.1
M34-10578	PRODUCTION WELL #5577 9:00 AM 11-25-96	0.152	81 +/- 1
ANALYSIS DATE		1-2-97	1-23-97
ANALYST		KUME	STRAUSS
METHOD		ASTM D2907-83	SM 7500-RA C.

RESPECTFULLY SUBMITTED,

CARL F. CROWNOVER, PRES.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

JANUARY 30, 1997

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

LAB. NO.	IDENTIFICATION (KVD PA II)	(NATURAL) URANIUM MG/L	RADIUM 226 PCI/L
M34-10765	PRODUCTION WELL #5133 2:15 PM 12-9-96	1.34	207 +/- 2
M34-10766	PRODUCTION WELL #5134 3:35 PM 12-9-96	1.28	12 +/- 1
M34-10767	PRODUCTION WELL #5370 10:30 AM 12-6-96	0.170	16 +/- 1
M34-10768	PRODUCTION WELL #5372 12:50 PM 12-6-96	0.056	5.7 +/- 0.3
M34-10769	PRODUCTION WELL #5430 12:10 PM 12-9-96	1.03	360 +/- 2

ANALYSIS DATE	12-30-96/1-2-97	1-23-97
ANALYST	GEARY / KUME	STRAUSS
METHOD	ASTM D2907-83	SM 7500-RA C.

RESPECTFULLY SUBMITTED,

CARL F. CROWNOVER, PRES.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

FEBRUARY 4, 1997

URI, INC.
12750 MERIT DRIVE, SUITE 1020, LB12
DALLAS, TEXAS 75251

REPORT OF ANALYSIS

IDENTIFICATION: KVD PA II PRODUCTION WELL #5137
9:10 AM 12-10-96

METHOD NUMBER			ANALYST	ANALYSIS DATE
ASTM D2907-83	URANIUM (NATURAL), MG/L ------	0.137	KUME	01-02-97
SM 7500-RA C.	RADIUM 226, PCI/L ------------	45	STRAUSS	01-23-97
	COUNTING ERROR, PCI/L -- +/-	1		

LAB. NO. M34-11616

RESPECTFULLY SUBMITTED,

Carl Crownover by mle

CARL F. CROWNOVER, PRES.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

September 12, 1997

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URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6141
11:30 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.80	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.219	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	247	Strauss	08-28-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	507000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 11:30 AM 8-20-97.

Lab. No. M35-9845

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6136
11:30 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	2.6	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	1.13	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	240	Strauss	08-28-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	31400	Strauss	08-21-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 11:30 AM 8-20-97.

Lab. No. M35-9846

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6147
10:40 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.72	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.102	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	39	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	112000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:40 AM 8-20-97.

Lab. No. M35-9847

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

September 12, 1997

URI, INC.
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Dallas, Texas 75251

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Report of Analysis

Identification: KVD PA II Extraction Well #6150
10:35 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	3.4	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.029	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	40	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	34100	Strauss	08-21-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 10:35 AM 8-20-97.

Lab. No. M35-9848

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6314
10:20 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	3.8	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.015	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	378	Strauss	08-28-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	226000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:20 AM 8-20-97.

Lab. No. M35-9849

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

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URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6460
10:25 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.28	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.028	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	88	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	249000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:25 AM 8-20-97.

Lab. No. M35-9850

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6466
10:30 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.29	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.046	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	206	Strauss	08-28-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	314000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:30 AM 8-20-97.

Lab. No. M35-9851

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6468
10:40 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.07	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.049	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	40	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	93000	Strauss	08-21-97
	Counting Error, pci/L +/-	200		

* Value reflects Radon 222 content as of 10:40 AM 8-20-97.

Lab. No. M35-9852

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

September 12, 1997

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URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6470
10:55 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.06	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.037	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	13	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	88200	Strauss	08-21-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 10:55 AM 8-20-97.

Lab. No. M35-9853

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6472
10:55 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	1.1	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.491	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	106	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	174000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:55 AM 8-20-97.

Lab. No. M35-9854

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6474
11:10 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.14	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.071	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	92	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	270000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 11:10 AM 8-20-97.

Lab. No. M35-9855

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6141
11:30 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.80	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.219	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	247	Strauss	08-28-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	507000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 11:30 AM 8-20-97.

Lab. No. M35-9845

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6136
11:30 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	2.6	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	1.13	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	240	Strauss	08-28-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	31400	Strauss	08-21-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 11:30 AM 8-20-97.

Lab. No. M35-9846

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6147
10:40 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.72	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.102	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L --------- Counting Error, pci/L +/-	39 1	Strauss	08-28-97
Radon Emanation	*Radon 222, pci/L ---------- Counting Error, pci/L +/-	112000 1000	Strauss	08-21-97

* Value reflects Radon 222 content as of 10:40 AM 8-20-97.

Lab. No. M35-9847

Respectfully Submitted,

Carl F. Crownover, Pres.

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CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6150
10:35 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	3.4	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.029	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	40	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	34100	Strauss	08-21-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 10:35 AM 8-20-97.

Lab. No. M35-9848

Respectfully Submitted,

Carl F. Crownover, Pres.

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6314
10:20 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	3.8	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.015	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	378	Strauss	08-28-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	226000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:20 AM 8-20-97.

Lab. No. M35-9849

Respectfully Submitted,

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CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6460
10:25 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.28	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.028	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	88	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	249000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:25 AM 8-20-97.

Lab. No. M35-9850

Respectfully Submitted,

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CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6466
10:30 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.29	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.046	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	206	Strauss	08-28-97
	Counting Error, pci/L +/-	2		
Radon Emanation	*Radon 222, pci/L ----------	314000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:30 AM 8-20-97.

Lab. No. M35-9851

Respectfully Submitted,

Carl F. Crownover, Pres.

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CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6468
10:40 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.07	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.049	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	40	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	93000	Strauss	08-21-97
	Counting Error, pci/L +/-	200		

* Value reflects Radon 222 content as of 10:40 AM 8-20-97.

Lab. No. M35-9852

Respectfully Submitted,

Carl F. Crownover, Pres.

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September 12, 1997

URI, INC.
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Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6470
10:55 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.06	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.037	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	13	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	88200	Strauss	08-21-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 10:55 AM 8-20-97.

Lab. No. M35-9853

Respectfully Submitted,

Carl F. Crownover, Pres.

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September 12, 1997

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Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6472
10:55 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	1.1	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.491	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	106	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	174000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 10:55 AM 8-20-97.

Lab. No. M35-9854

Respectfully Submitted,

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CORPUS CHRISTI, TEXAS
September 12, 1997

URI, INC.
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Dallas, Texas 75251

Report of Analysis

Identification: KVD PA II Extraction Well #6474
11:10 AM 8-20-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.14	Nixon	09-10-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.071	Strauss	09-10-97
SM 7500-Ra C.	Radium 226, pci/L ---------	92	Strauss	08-28-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	270000	Strauss	08-21-97
	Counting Error, pci/L +/-	1000		

* Value reflects Radon 222 content as of 11:10 AM 8-20-97.

Lab. No. M35-9855

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
November 26, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Wellfield No. 6 #6210
3:10 PM 11-3-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.07	Nixon	11-26-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.047	Owen	11-20-97
SM 7500-Ra C.	Radium 226, pci/L ---------	35	Strauss	11-20-97
	Counting Error, pci/L +/-	1		
Radon Emanation	*Radon 222, pci/L ----------	49300	Strauss	11-05-97
	Counting Error, pci/L +/-	100		

* Value reflects Radon 222 content as of 3:10 PM 11-3-97.

Lab. No. M3S-12634

Respectfully Submitted,

Carl Crownover

Carl F. Crownover, Pres.

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

December 30, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Well #6362
12-1-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.47	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.127	Owen	12-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	205	Strauss	12-15-97
	Counting Error, pci/L +/-	2		

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Lab. No. M35-13593

Respectfully Submitted,

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CORPUS CHRISTI, TEXAS
December 30, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD Well #6364
12-1-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.26	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ---	1.42	Owen	12-09-97
SM 7500-Ra C.	Radium 226, pci/L ---------	458	Strauss	12-15-97
	Counting Error, pci/L +/-	3		

Lab. No. M35-13594

Respectfully Submitted,

Carl F. Crownover, Pres.

TEL. 512-884-0371 PO BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
December 31, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 752S1

Report of Analysis

Identification: KVD No. 6212
Baseline
12-3-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	1.8	Nixon	12-31-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.012	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L ---------	250	Chapa	12-22-97
	Counting Error, pci/L +/-	2		

Lab. No. M3S-13784

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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CORPUS CHRISTI, TEXAS
December 31, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD No. 6350
Baseline
12-3-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L -----------	9.5	Nixon	12-31-97
ASTM D2907-83	Uranium (Natural), mg/L ---	5.10	Owen	12-23-97
SM 7500-Ra C.	Radium 226, pci/L ----------	23	Chapa	12-22-97
	Counting Error, pci/L +/-	1		

Lab. No. M35-13785

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
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CORPUS CHRISTI, TEXAS
December 31, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD No. 6179
Baseline
12-3-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.03	Nixon	12-31-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.060	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L ---------	6.3	Chapa	12-22-97
	Counting Error, pci/L +/-	0.2		

Lab. No. M35-13786

Respectfully Submitted,

Carl F. Crownover, Pres.

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CORPUS CHRISTI, TEXAS
December 31, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD No. 6174
Baseline
12-3-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	0.03	Nixon	12-31-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.092	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L ---------	26	Chapa	12-22-97
	Counting Error, pci/L +/-	1		

Lab. No. M35-13787

Respectfully Submitted,

Carl F. Crownover, Pres.

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CORPUS CHRISTI, TEXAS

December 31, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD No. 6172
Baseline
12-4-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L -----------	0.15	Nixon	12-31-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.192	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L ----------	189	Chapa	12-22-97
	Counting Error, pci/L +/-	1		

Lab. No. M35-13788

Respectfully Submitted,

Carl F. Crownover, Pres.

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CORPUS CHRISTI, TEXAS
December 31, 1997

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD No. 6178
Baseline
12-4-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ----------	6.1	Nixon	12-31-97
ASTM D2907-83	Uranium (Natural), mg/L ---	0.728	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L ---------	67	Chapa	12-22-97
	Counting Error, pci/L +/-	1		

Lab. No. M35-13789

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
January 15, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #6445
12-5-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L	0.22	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L	0.099	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L	132	Strauss	01-12-98
	Counting Error, pci/L - +/-	1		

Lab. No. M35-14173

Respectfully Submitted,

Carl F. Crownover, Pres.

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CORPUS CHRISTI, TEXAS

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Report of Analysis

Identification: KVD
Well #6171
12-6-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.83	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ------	2.16	Owen	12-23-97
SM 7500-Ra C.	Radium 226, pci/L ------------	61	Strauss	01-12-98
	Counting Error, pci/L - +/-	1		

Lab. No. M35-14172

Respectfully Submitted,

Carl F. Crownover, Pres.

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CORPUS CHRISTI, TEXAS

January 15, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8509
12-8-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L -------------	0.05	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ------	0.171	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L ------------	27	Strauss	01-12-98
	Counting Error, pci/L - +/-	1		

Lab. No. M35-14174

Respectfully Submitted,

Carl F. Crownover, Pres.

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CORPUS CHRISTI, TEXAS

January 15, 1998

URI, INC.
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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8510
12-8-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.69	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ------	0.187	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L -----------	4.8	Strauss	01-12-98
	Counting Error, pci/L - +/-	0.3		

Lab. No. M35-14175

Respectfully Submitted,

Carl F. Crounover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
January 23, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8303
12-10-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.29	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ------	0.791	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L -----------	1.3	Strauss	01-12-98
	Counting Error, pci/L - +/-	0.2		

Lab. No. M35-14243

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
January 23, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8305
12-15-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.96	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L -----	0.365	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L -----------	4.0	Strauss	01-12-98
	Counting Error, pci/L - +/-	0.3		

Lab. No. M35-14244

Respectfully Submitted,

Carl F. Crownover, Pres.

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
January 23, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8509
12-17-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.90	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ------	0.423	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L -----------	70	Strauss	01-12-98
	Counting Error, pci/L - +/-	1		

Lab. No. M35-14247

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
January 23, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8306
12-17-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	1.6	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ------	1.03	Owen	01-21-98
SM 7500-Ra C.	Radium 226, pci/L -----------	110	Strauss	01-12-98
	Counting Error, pci/L - +/-	1		

Lab. No. M35-14245

Respectfully Submitted,

Carl F. Crownover, Pres.

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8508
12-17-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.19	Nixon	12-22-97
ASTM D2907-83	Uranium (Natural), mg/L ------	0.476	Owen	12-22-97
SM 7500-Ra C.	Radium 226, pci/L ------------	43	Strauss	01-12-98
	Counting Error, pci/L - +/-	1		

Lab. No. M35-14246

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Report of Analysis

Identification: KVD
Well #8507
12-19-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.04	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L ------	0.066	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L ------------	135	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-089

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8511
12-22-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.05	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L -----	0.071	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L -----------	30	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-090

Respectfully Submitted,

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8512
12-22-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L	0.24	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L	0.101	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L	20	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-091

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8518
12-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.06	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L ------	0.083	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L -----------	21	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-092

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8519
12-23-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.06	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L ------	0.027	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L -----------	17	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-093

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January 23, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8516
12-24-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.37	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L ------	0.269	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L -----------	13	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-096

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8515
12-29-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.26	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L -----	0.176	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L -----------	2.1	Strauss	01-19-98
	Counting Error, pci/L - +/-	0.2		

Lab. No. M36-095

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January 23, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8702
12-31-97

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.28	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L ------	0.107	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L ------------	13	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-099

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8703
1-5-98

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	2.3	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L -----	0.041	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L -----------	5.5	Strauss	01-19-98
	Counting Error, pci/L - +/-	0.3		

Lab. No. M36-100

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8517
1-5-98

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.11	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L -----	1.69	Owen	01-14-98
SM 7500-Ra C.	Radium 226, pci/L ------------	22	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-097

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January 23, 1998

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Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8701
1-5-98

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.03	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L ------	0.032	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L ------------	8.7	Strauss	01-19-98
	Counting Error, pci/L - +/-	0.4		

Lab. No. M36-098

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URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Well #8514
1-5-98

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.37	Nixon	01-15-98
ASTM D2907-83	Uranium (Natural), mg/L -----	0.081	Owen	01-08-98
SM 7500-Ra C.	Radium 226, pci/L -----------	65	Strauss	01-19-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-094

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ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

February 4, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Production Well #8522
1-14-98

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L ------------	0.08	Nixon	02-03-98
ASTM D2907-83	Uranium (Natural), mg/L ------	2.01	Owen	02-04-98
SM 7500-Ra C.	Radium 226, pci/L -----------	105	Strauss	01-29-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-581

Respectfully Submitted,

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
February 4, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Production Well #8523
1-14-98

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L -------------	0.03	Nixon	02-03-98
ASTM D2907-83	Uranium (Natural), mg/L ------	0.031	Owen	02-04-98
SM 7500-Ra C.	Radium 226, pci/L ------------	145	Strauss	01-29-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-582

Respectfully Submitted,

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JORDAN LABORATORIES, INCORPORATED
ANALYTICAL & ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS
February 4, 1998

URI, INC.
12750 Merit Drive, Suite 1020, LB12
Dallas, Texas 75251

Report of Analysis

Identification: KVD
Production Well #8708
1-6-98

Method Number			Analyst	Analysis Date
EPA 600 246.1	Molybdenum, mg/L -------------	0.28	Nixon	02-03-98
ASTM D2907-83	Uranium (Natural), mg/L ------	0.890	Owen	02-04-98
SM 7500-Ra C.	Radium 226, pci/L ------------	117	Strauss	01-29-98
	Counting Error, pci/L - +/-	1		

Lab. No. M36-583

Respectfully Submitted,

Carl F. Crownover, Pres.

form: S1-20

ATTACHMENT L

TBRC EA-14

ENVIRONMENTAL ASSESSMENT, SAFETY EVALUATION REPORT, AND PROPOSED LICENSE CONDITIONS RELATED TO THE URANIUM RESOURCES INC. KINGSVILLE DOME PROJECT, KLEBERG COUNTY, TEXAS

BUREAU OF RADIATION CONTROL
TEXAS DEPARTMENT OF HEALTH
JULY 16, 1985

Appendix D

Texas Geologic History and Uranium Deposition

South Texas uranium deposits can best be understood when related to the geologic past of Texas. The following discussion is based in part on Oetking (1963). The geologic time scale is presented in Figure 1.

Precambrian rocks over 600 million years old, such as those exposed in Llano County, form the geologic basement of Texas. More than 30,000 ft of sediments were deposited on top of basement rocks in South Texas. During most of the first 300 million years of the Paleozoic Era, shallow seas covered what is now Texas (Figure 2-a). The region that now constitutes North, Central, and West Texas slowly subsided, and skeletal remains of marine organisms accumulated to form limestone deposits. While this region was slowly sinking, a belt along a line extending through the present-day cities of Marathon, Del Rio, San Antonio, Dallas, and Hot Springs, Arkansas, was sinking much faster (Figure 2-b). Marginal land areas to the south supplied sand and mud to this subsiding area. During the following 100 million years (Pennsylvanian and Permian periods), geologic forces compressed sediments in this linear depression into a long, narrow mountain range, now called the Ouachita Folded Belt (Figure 2-c). Remnants of this Late Paleozoic mountain chain are exposed today in the Marathon region of West Texas and the Ouachita Mountains of Oklahoma and Arkansas. The shallow sea covering what is now Central, North, and West Texas was progressively filled with sand and mud derived from these rising mountains.

The coastline shifted back and forth as subsidence and sediment supply varied. By Permian time only a restricted sea existed over West Texas. Around the margin of the Permian sea, marine organisms built a vast barrier reef complex now exposed in the Guadalupe, Delaware, and Glass mountains. Reef growth further restricted the inland sea until it became an evaporite basin, and over time hundreds of feet of salts were deposited, filling the basin. At the end of the Paleozoic Era, Texas was again a land area undergoing erosion.

During the 45-50 million years of the Triassic and early Jurassic periods, erosion reduced the mountains of the Ouachita Folded Belt to lowlands. Streams flowing westward deposited sediments as red beds. As the mountains were eroded to low relief, the area to the south started to sink, and the sea advanced northward. By early Jurassic time it had advanced to the south edge of the Ouachita Folded Belt covering the southern part of what is now Texas. Like the Late Permian sea, it was restricted so that hundreds of feet of salt were deposited. Late Jurassic sedimentation varied from open marine to restricted marine, resulting in the deposition of both limestone and anhydrite. During the 70 million years of the Cretaceous Period, the marginal lowland progressively subsided, and by Late Cretaceous time a shallow sea covered most of Texas. Thick deposits of limestone, dolomite, shale, and sandstone were laid down. At the close of the Mesozoic Era, uplift to the north and west began to form the Rocky Mountains. The southern end of the mountain range extends into the Big Bend area of Texas. As the mountains rose, the bordering lands were also uplifted (Figure 2-d,-e).

Uplift of the Rocky Mountains combined with erosion and deposition of the transported sediment along the coast caused relatively rapid retreat of the sea, shifting the Gulf of Mexico shoreline to the south and southeast. These sediments were coastal barrier sands, lagoonal deposits, tidal inlet fill, deltaic sands, and fluvial channel deposits (Figure 3). During this time, the area along the present coast subsided rapidly, allowing thick sequences of Cenozoic sediments to accumulate (Figure 2-f,-e).

Cenozoic sediments in the Texas Gulf Coastal Region are of shallow-water, non-marine origin. The formation outcrop map (Figure 4) depicts surface exposures of sediments deposited during specific time intervals. The lithology of a formation may vary from place to place and may be sandy, silty, or clayey because of the variety of depositional modes and of source materials available from erosion of different source rocks. The outcrop of each formation trends north or northeast across Texas from the Mexican border to the Louisiana border (Figure 5). Regional faulting, which also trends northeast, is illustrated in Figure 6. The uranium deposits of South Texas are located within this northeast-trending belt of Cenozoic sedimentary rocks.

CATAHOULA Fm.

During the time sediments were accumulating in what would later be called the Catahoula Formation, the Southern Rockies in Mexico were undergoing massive volcanic eruptions. Thick clouds of volcanic ash were swept into Texas by northeasterly directed winds (Figure 7). Volcanic ash accumulations in the Catahoula sediments were covered by later sedimentary deposits. The most permeable parts of the Catahoula Formation are channel sands and silts deposited by river systems which flowed down slope approximately perpendicular to the present formation outcrop trend toward the ancestral Gulf of Mexico (Figure 3). These ancient channel deposits later enabled groundwater to migrate rapidly through the surficial volcanic ash. Uranium was leached from the ash and transported down gradient in the groundwater.

The groundwater of the Catahoula Formation continued to percolate through highly reactive, siliceous ash. At the same time, diagenesis of ash in both permeable and confining layers continued to reduce permeability and increase aquitard efficiency. With continued burial (perhaps to several hundred feet), ash-rich units that had escaped argillation and retained some permeability were flushed by chemically evolving meteoric waters (Galloway and Kaiser, 1980).

OAKVILLE SAND

Uplift along the Balcones Fault Zone marked the beginning of the Miocene about 25-30 million years ago. This major uplift caused the sea to regress rapidly (Galloway et al, 1979). The Oakville Sandstone was deposited in this period. Sediments including uranitic tuffs, sand, and reworked Cretaceous shells were deposited in great quantities (Sellards, Adkins, and Plummers, 1932). Following deposition of the Oakville sands, the Lagarto Clay was deposited during a transgressive sequence later in the Miocene, confining the Oakville sandstone.

GOLIAD

The Goliad Formation was deposited during the Pliocene, about 15 million years ago. The Goliad is typically a coarse, clastic fluvial unit that was deposited by a series of moderately low-gradient, intermittently torrential streams that crossed a broad, flat coastal plain in a southeastward direction. Principal drainages in South Texas were the ancestral Rio Grande, Nueces, Atascosa, San Antonio, and Colorado rivers. The source of Goliad quartz, chert, feldspar, and calcium carbonate would have been from the rocks of the Edwards Plateau and the Llano Uplift in Central Texas, as well as the Diablo Plateau in West Texas. The volcanic constitutents contained in the Goliad were likely derived from the still-active volcanic fields in West Texas and Northern Mexico. Since the Goliad overlaps older Tertiary units, it is apparent that hundreds of feet of Miocene and Oligocene sediments were scoured by Goliad streams, contributing to the massive buildup downdip of Goliad sands, which reach a thickness of 450 ft (Adams and Smith, 1981).

Uranium in South Texas occurs as roll-type deposits that formed at the margin of tongues of altered sandstone by the encroachment of oxidizing, uraniferous solutions into reduced aquifers containing pyrite (Adams and Smith, 1981). Studies by Goldhaber and co-workers have supported the idea that the abundance of pyrite within the sands reflects the introduction of hydrogen sulfide (H_2S) up and along faults from hydrocarbon accumulations at depth (Goldhaber et al, 1979). The introduction of H_2S before ore formation prepared the sands for roll-front development, whereas post-ore introduction produced re-reduction of portions of the altered tongue, leaving the deposit suspended in reduced sandstone.

Figures 8 and 9 show schematic cross sections through a uranium roll front deposit. Meteoric waters enter the aquifer by infiltration in the recharge area and then move downdip. Uranium, which is relatively immobile in its reduced valence state (U^{+4}), is oxidized and solubilized by the oxygenated groundwater. Once in solution the uranium moves with the groundwater until it encounters reducing conditions. In South Texas reduced zones commonly contain disseminated pyrite. At the generally arcuate interface between reducing and oxidizing zones, uranium minerals precipitate out to form a "roll front" deposit.

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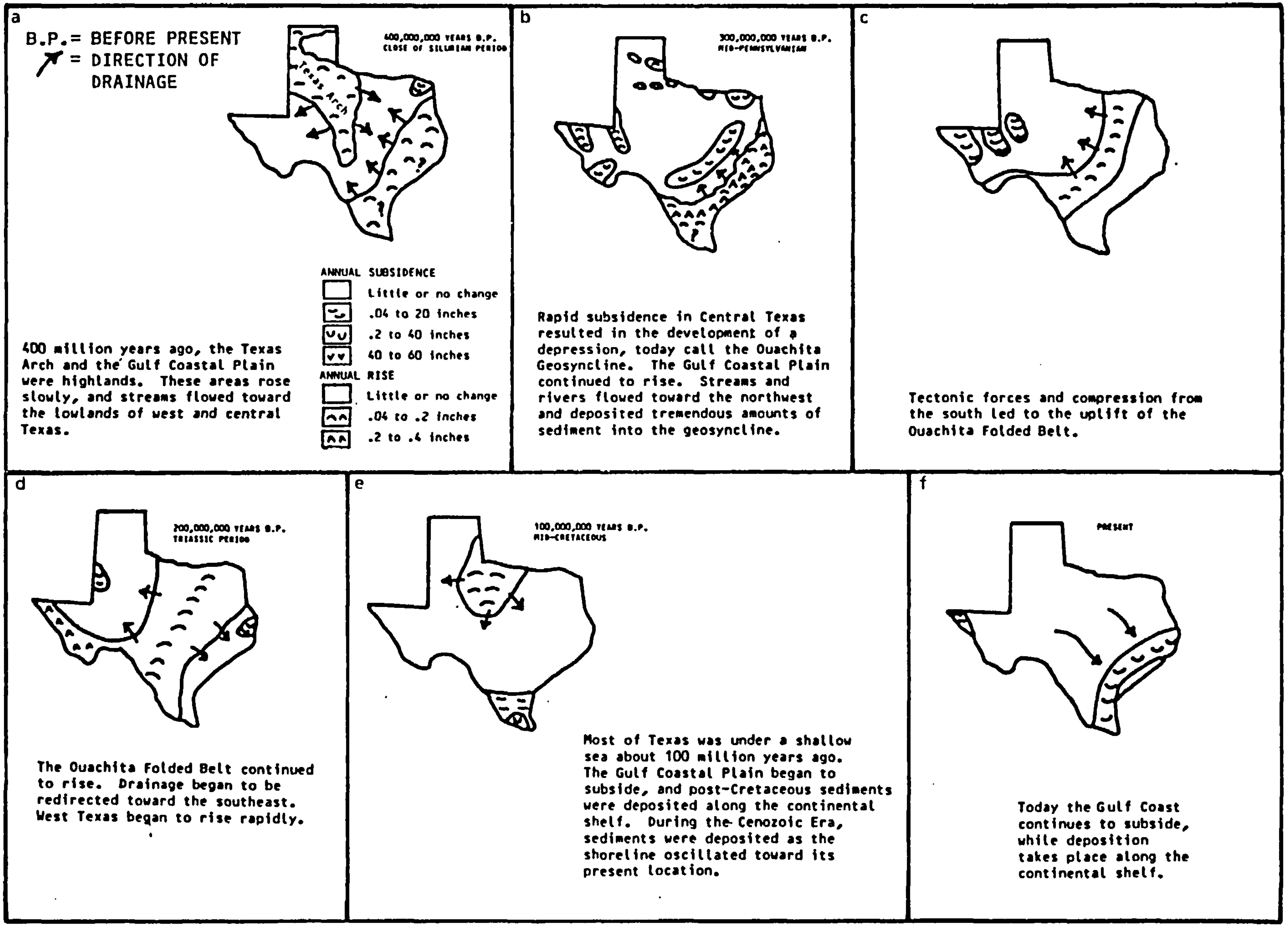
ERA	PERIOD	EPOCH	MILLIONS OF YEARS AGO (approx.)	DURATION IN MILLIONS OF YEARS (approx.)	IMPORTANT BIOLOGICAL EVENTS
		Recent began 10 000 years ago			
CENOZOIC	Quaternary	Recent			
		Pleistocene	2.5-3	2.5-3	
	Tertiary	Pliocene		12-13	First men
		Miocene		12	First manlike primates
		Oligocene		11	First apes
		Eocene		22	Grass spreads widely First elephants
		Paleocene	63	5-7	First horses
MESOZOIC	Cretaceous		140	72	Extinction of dinosaurs, giant marine reptiles, flying reptiles, and ammonites First primates Angiosperms spread widely First snakes
	Jurassic		200	65	First sequoias First birds
	Triassic		230	35	First turtles and lizards First dinosaurs and mammals Last giant amphibians
PALEOZOIC	Permian		285	55	Extinction of trilobites, fusulinids, many corals, crinoids, and other invertebrates First mammal-like reptiles
	Pennsylvanian		325	40	First conifers, ferns, and ginkgoes; first reptiles First flying insects
	Mississippian		350	25	First fusulinids Extinction of graptolites First seed plants
	Devonian		410	60	First land-living vertebrates First sharks First forests and insects First ammonites
	Silurian		430	20	First land vegetation and air-breathing animals
	Ordovician		500	70	First bone-bearing animals First corals and bryozoans
	Cambrian		600	100	First cephalopods First pelecypods First conodonts First graptolites First gastropods Appearance of many invertebrate phyla: arthropods, mollusks, sponges, and echinoderms
PRECAMBRIAN	Upper Middle Lower	Although many local subdivisions are recognized no worldwide system of naming has been evolved. The Precambrian lasted for at least 3.5 billion years. Until more is learned this lengthy interval may be divided into Lower, Middle and Upper without formal names.			

Figure 1 Geologic Time Scale (from Stokes, 1973)



400 million years ago, the Texas Arch and the Gulf Coastal Plain were highlands. These areas rose slowly, and streams flowed toward the lowlands of west and central Texas.

Rapid subsidence in Central Texas resulted in the development of a depression, today call the Ouachita Geosyncline. The Gulf Coastal Plain continued to rise. Streams and rivers flowed toward the northwest and deposited tremendous amounts of sediment into the geosyncline.

Tectonic forces and compression from the south led to the uplift of the Ouachita Folded Belt.

The Ouachita Folded Belt continued to rise. Drainage began to be redirected toward the southeast. West Texas began to rise rapidly.

Most of Texas was under a shallow sea about 100 million years ago. The Gulf Coastal Plain began to subside, and post-Cretaceous sediments were deposited along the continental shelf. During the Cenozoic Era, sediments were deposited as the shoreline oscillated toward its present location.

Today the Gulf Coast continues to subside, while deposition takes place along the continental shelf.

Figure 2 General Geologic Evolution of Texas (Illustrations Modified from Renfro and Feray, 1973)

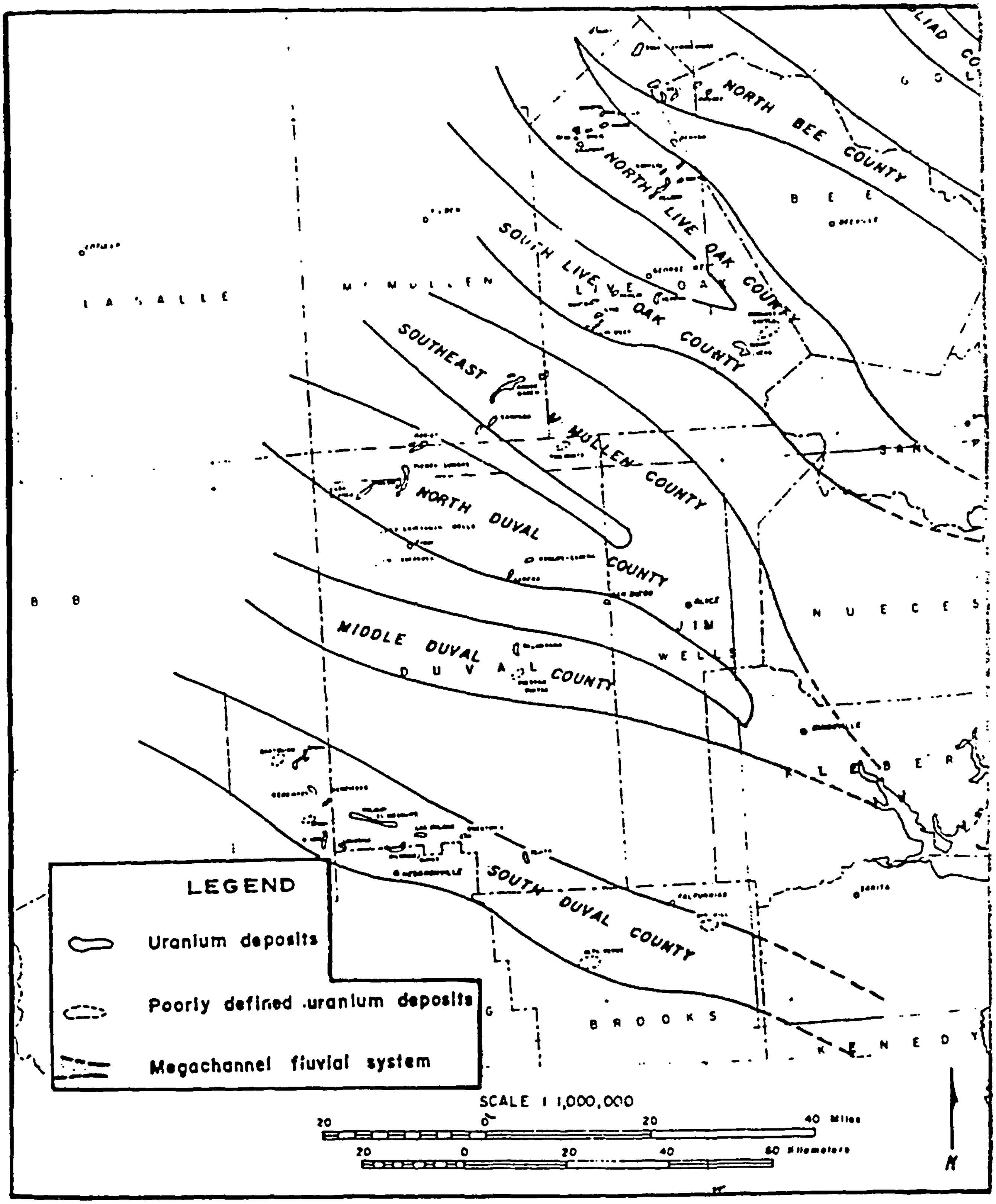


Figure 3 Mega-channel Sand System in South Texas Showing Fluvial Deposition During Tertiary Period (from Adams and Smith, 1981)

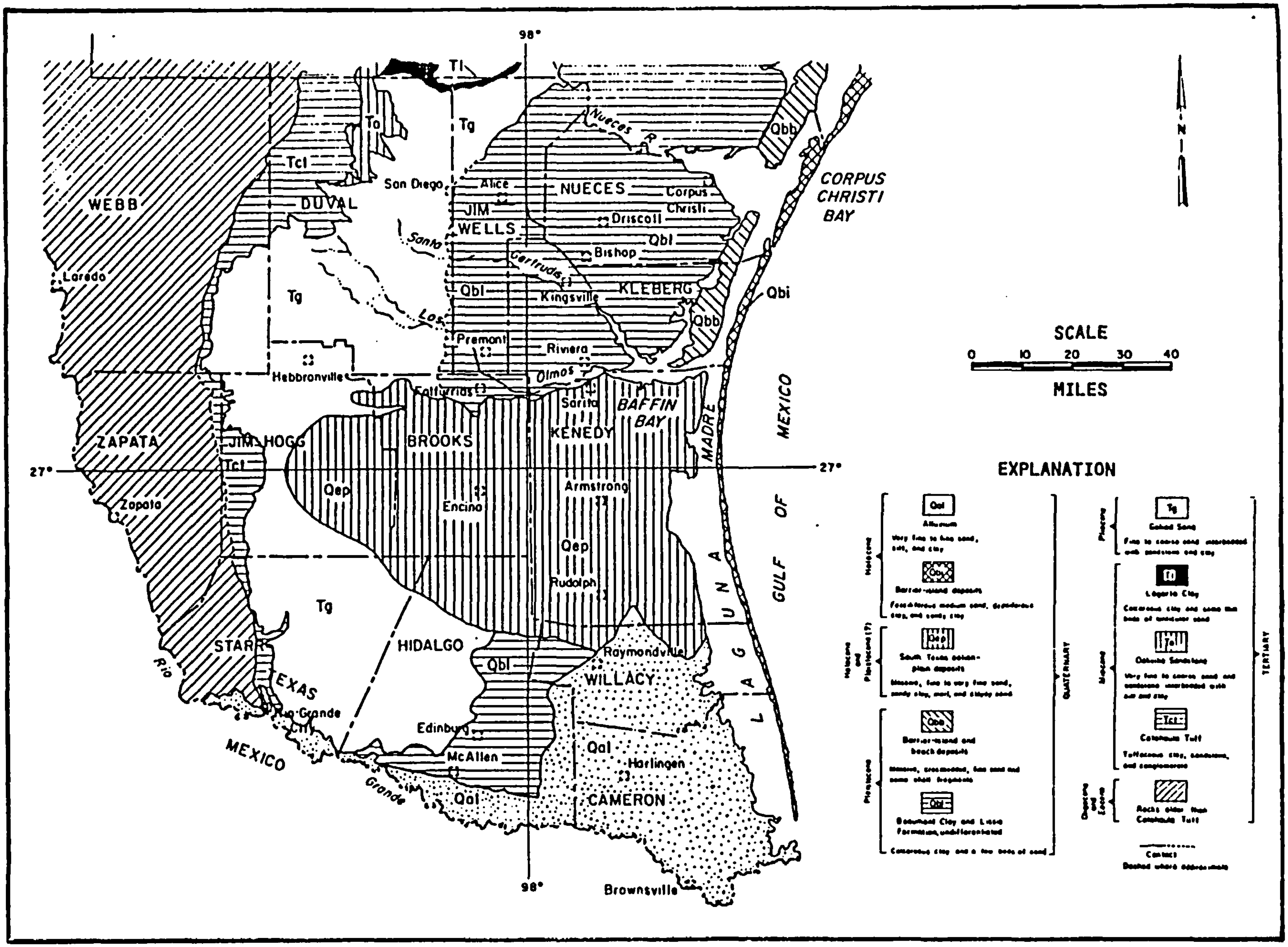


Figure 4 General South Texas Geology (from Shafer and Baker, 1973)

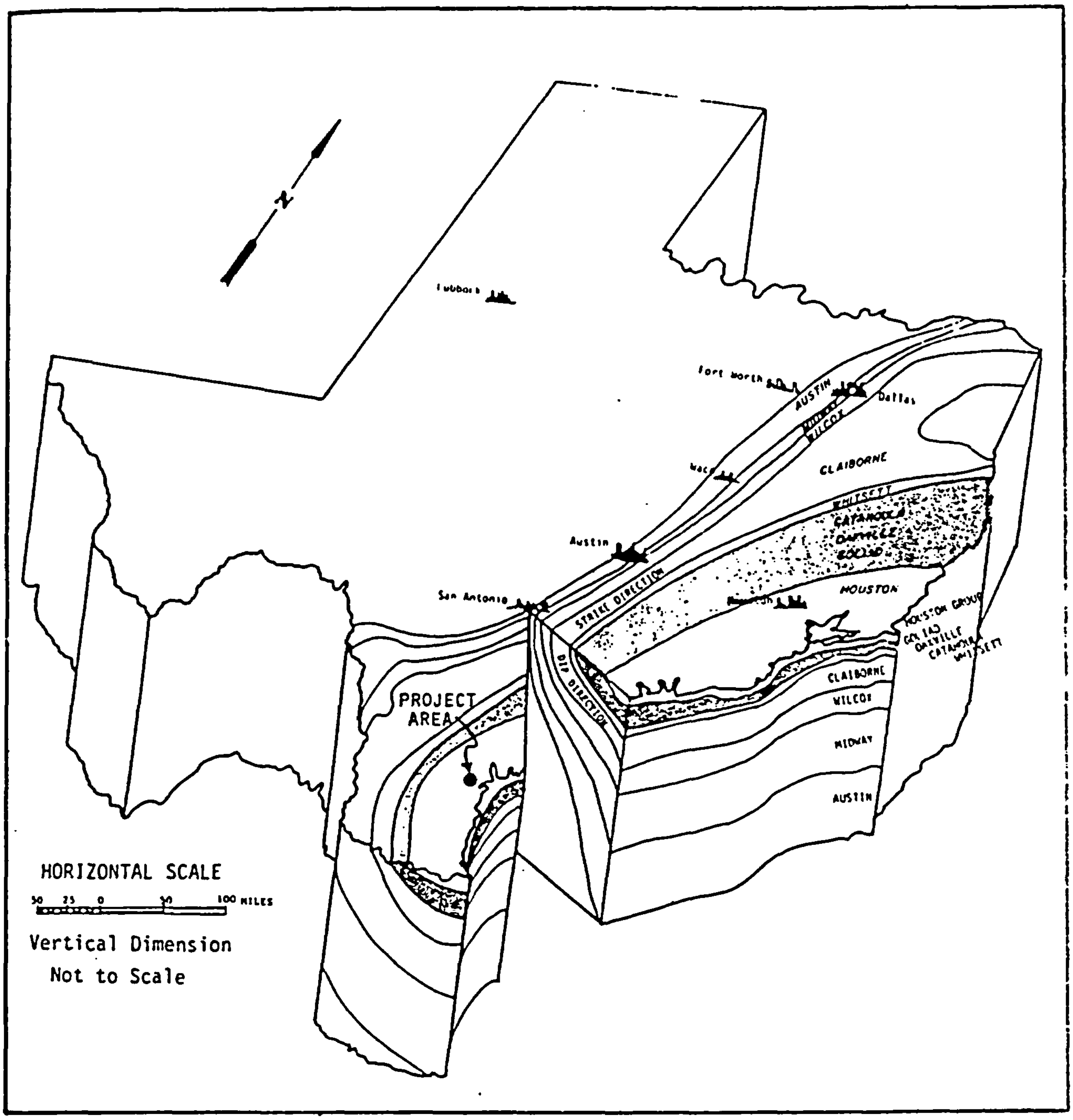


Figure 5 Stratigraphic Section Through Cenozoic Era Sediments in South Texas Showing Strike and Dip of Primary Uranium-bearing Formations

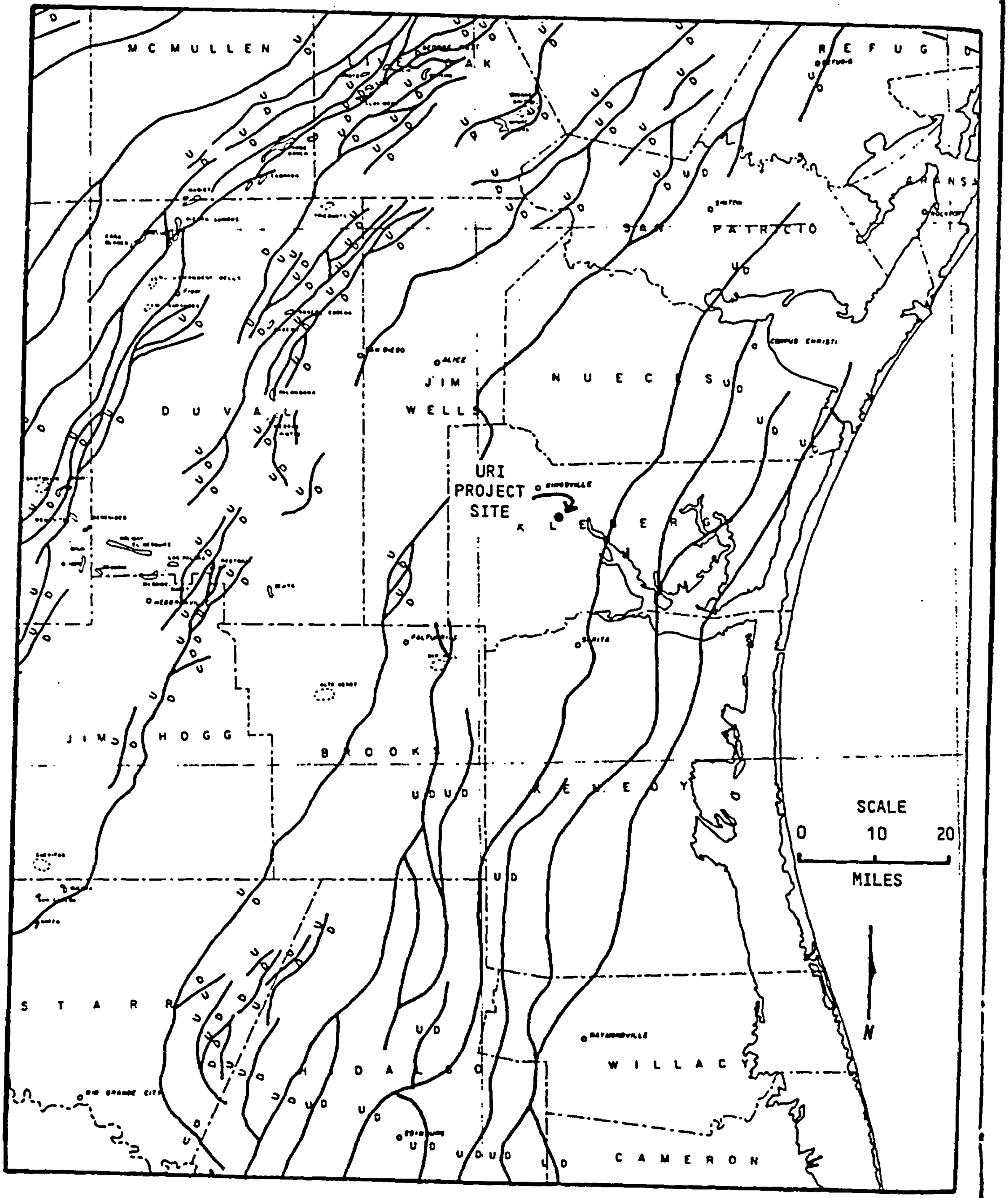
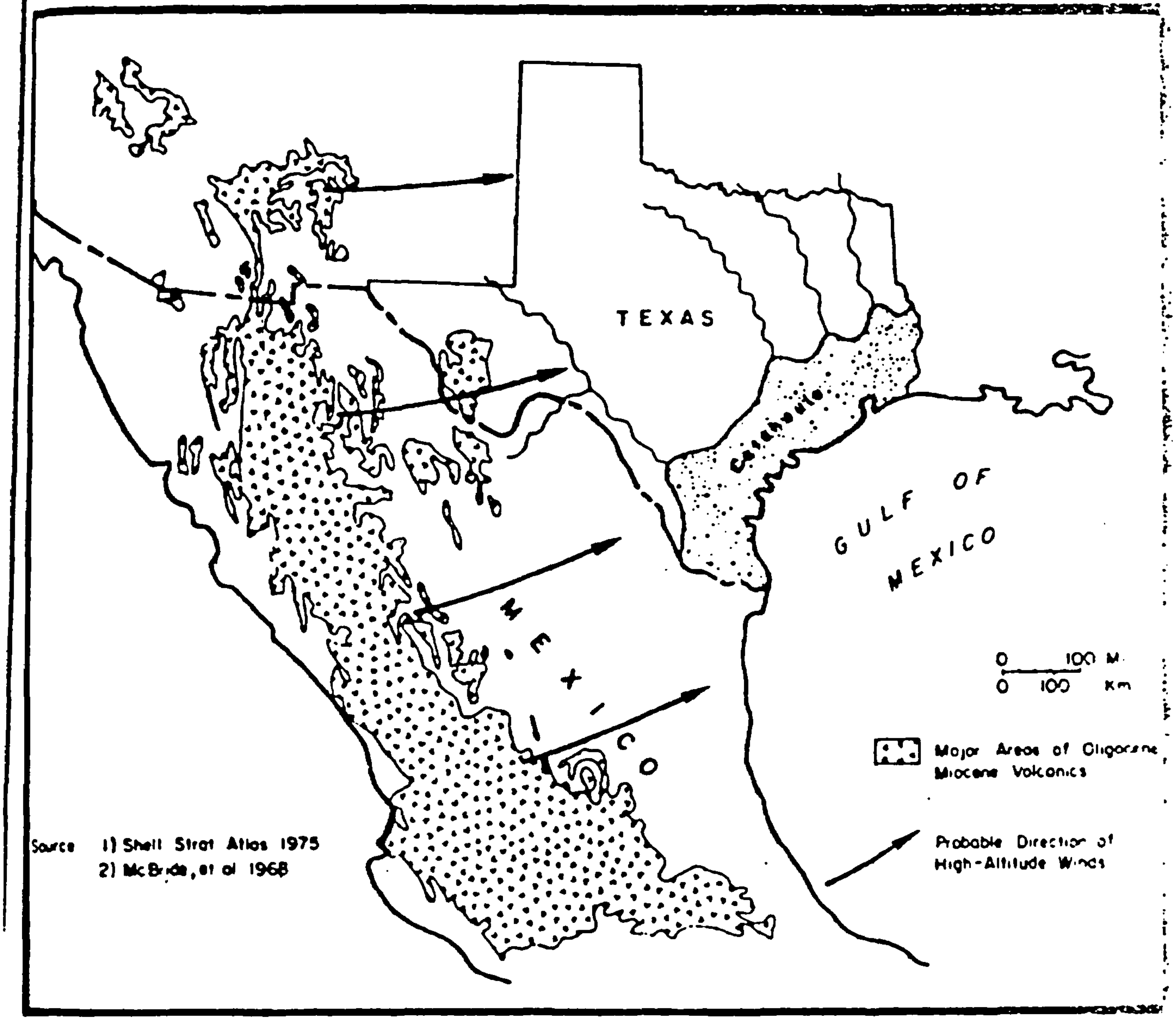


Figure 6 Structural Map of South Texas (from Adams and Smith, 1981)



Source 1) Shell Strat Atlas 1975
2) McBride, et al 1968

Areas of Oligocene volcanism and probable high-altitude wind patterns. Airborne material deposited in the Catahoula was derived from northwest Mexico and deposited in the coastal plain or along lower reaches of the major extant drainage basins.

Figure 7 Areas of Oligocene Volcanism (from Galloway, 1977)

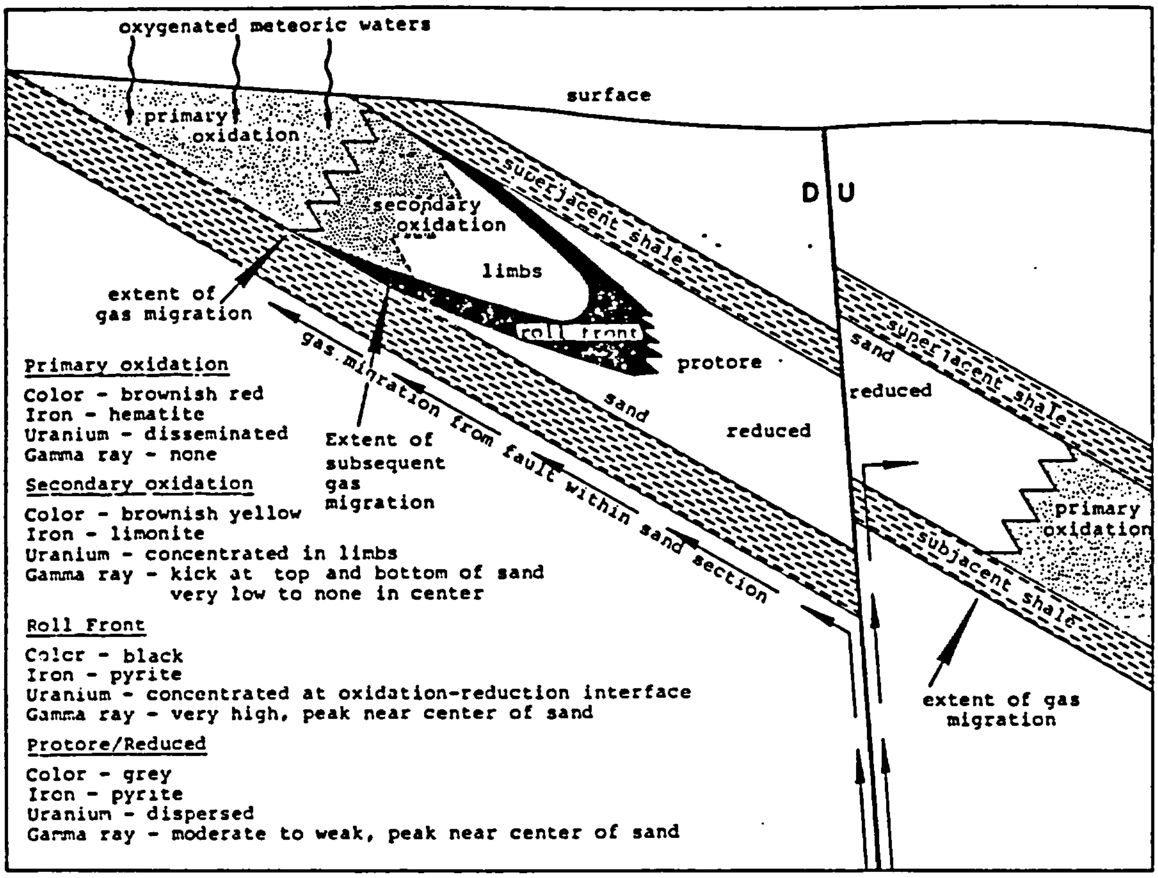


Figure 8 Schematic Cross Section Across a Roll Front (from Adams and Smith, 1981). The figure shows relations for secondary reduction and subsequent partial re-oxidation of the altered tongue for a fault-derived sulfide-bearing sandstone. Pathways of earlier hydrogen sulfide introduction are indicated.

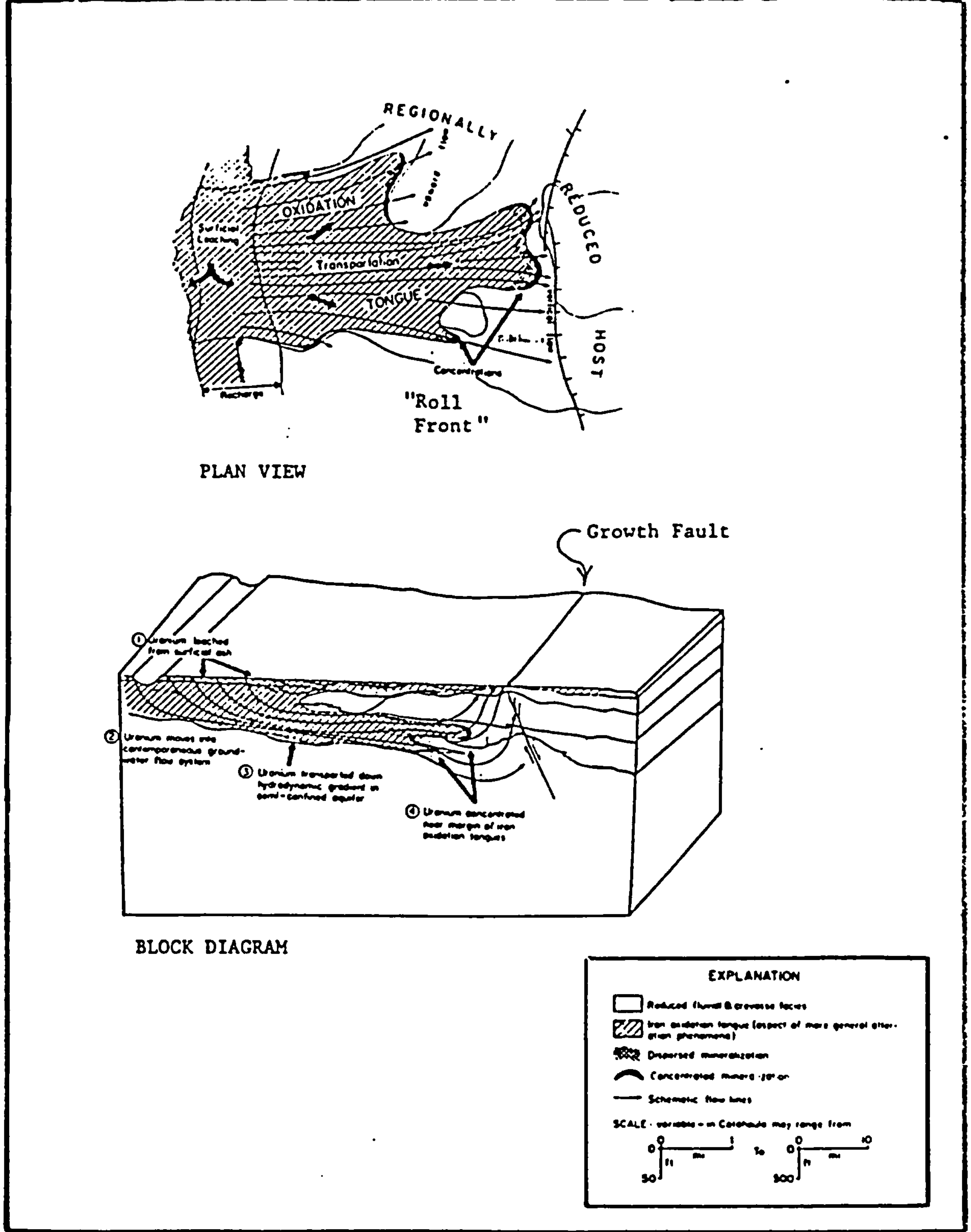


Figure 9 Gulf Coast Uranium Deposition
(Modified from Galloway, 1977)

ATTACHMENT M

TITLE 30 ENVIRONMENTAL QUALITY
PART 1 TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CHAPTER 331 UNDERGROUND INJECTION CONTROL
SUBCHAPTER F STANDARDS FOR CLASS III WELL PRODUCTION AREA DEVELOPMENT
RULE §331.107 Restoration

(a) Restoration table. Upon issuance and renewal, Class III permits and production area authorizations shall contain a restoration table listing restoration goals as provided by §331.104 of this title (relating to Establishment of Baseline and Restoration Values).

(b) Mining completion. When the mining of a permit or production area is completed, the permittee shall notify the appropriate commission regional office and the executive director and shall proceed to reestablish groundwater quality in the affected permit or mine area aquifers to levels consistent with the values listed in the restoration table for that permit or mine area. Restoration efforts shall begin as soon as practicable but no later than 30 days after mining is completed in a particular production area. The executive director, subject to commission approval, may grant a variance from the 30-day period for good cause shown.

(c) Timetable. Aquifer restoration, where appropriate for each permit or mine area, shall be accomplished in accordance with the timetable specified in the currently approved mine plan, unless otherwise authorized by the commission. Authorization for expansion of mining into new production areas may be contingent upon achieving restoration progress in previously mined production areas within the schedule set forth in the mine plan. The commission may amend the permit to allow an extension of the time to complete restoration after considering the following factors:

(1) efforts made to achieve restoration by the original date in the mine plan;

(2) technology available to restore groundwater for particular parameters;

(3) the ability of existing technology to restore groundwater to baseline quality in the area;

(4) the cost of achieving restoration by a particular method;

(5) the amount of water which would be used or has been used to achieve restoration;

(6) the need to make use of the affected aquifer; and

(7) complaints from persons affected by the permitted activity.

(d) Reports. Beginning six months after the date of initiation of restoration of a permit or production area, as defined in the mine plan, the operator shall provide to the executive director semi-annual restoration progress reports until restoration is accomplished for the permit or mine area.

(e) Stability sampling. The permittee shall obtain stability samples and complete an analysis for certain parameters listed in the restoration table from all production area baseline wells. Stability samples shall be conducted at a minimum of 30-day intervals for a minimum of three sample sets and reported to the executive director. The permittee shall notify the executive director at least two weeks in advance of sample dates to provide the opportunity for splitting samples and for selecting additional wells for sampling, if desired. To insure water quality has stabilized, a period of 180 days must elapse between cessation of restoration operations and the final set of stability samples. The executive director shall determine within 45 days of the receipt of all sample analysis results whether or not restoration has been achieved. Upon acknowledgment in writing by the executive director confirming achievement of final restoration, the permittee shall accomplish closure of the area in accordance with §331.86 of this title (relating to Closure).

(f) Restoration table values not achieved. After an appropriate effort has been made to achieve restoration to levels consistent with values listed in the restoration table for a production area, the permittee may cease restoration operations, reduce bleed and request that the restoration table be amended. With the request for amendment, the permittee shall submit the results of three consecutive sample sets taken at a minimum of 30-day intervals from all production area baseline wells used in determining the restoration table to verify current water quality. Stabilization sampling may commence 60 days after cessation of restoration operations.

(1) In determining whether the restoration table should be amended, the commission will consider the following items addressed in the request:

(A) uses for which the groundwater was suitable at baseline water quality levels;

(B) actual existing use of groundwater in the area prior to and during mining;

(C) potential future use of groundwater of baseline quality and of proposed restoration quality;

(D) the effort made by the permittee to restore the groundwater to baseline;

(E) technology available to restore groundwater for particular parameters;

(F) the ability of existing technology to restore groundwater to baseline quality in the area under consideration;

(G) the cost of further restoration efforts;

(H) the consumption of groundwater resources during further restoration; and

(I) the harmful effects of levels of particular parameter.

(2) The commission may amend the restoration table if it finds that:

(A) reasonable restoration efforts have been undertaken, giving consideration to the factors listed in paragraph (1) of this subsection;

(B) the values for the parameters describing water quality have stabilized for a period of 180 days;

(C) the formation water present in the aquifer would be suitable for any use to which it was reasonably suited prior to mining; and

(D) further restoration efforts would consume energy, water, or other natural resources of the state without providing a corresponding benefit to the state.

(3) If the restoration table is amended, restoration sampling shall commence and proceed as described in subsection (e) of this section.

ATTACHMENT N

NUREG-0925

Draft Environmental Statement
related to the operation of the
Teton Project

Docket No. 40-8781

Teton Exploration Drilling, Inc.

U.S. Nuclear Regulatory
Commission

Office of Nuclear Material Safety and Safeguards

June 1982

Table 3.20 are average values calculated from at least three separate samplings, except for well 308 where the value from only one sample is shown. The table also shows the composite mean of each parameter from all the wells. The composite mean baseline value for each parameter is compared to Wyoming drinking water and livestock standards in Table 4.1 (p. 4-6). The R&D data for the N ore zone indicates that the groundwater quality is similar to that found in the M ore zone.

As proposed by the applicant, additional premining water quality sampling will be performed in Mining Unit I and in all subsequenty mining units by sampling a specified set of injection and recovery wells spaced evenly throughout the mining unit(s) at a minimum density of one well per two acres. This new data will be used to establish more representative baseline values for each mining unit (See Sect. 4.4.1.1). The same wells will be sampled as part of the postmining and postrestoration sampling programs (See Sect. 4.4.2.5).

Groundwater in the M and N ore zone sand of mining unit I does not meet drinking water standards because of its high radium-226 levels, which exceed the drinking water standard of 5 pCi/L. However, baseline averages for the other indicator parameters are within or very close to meeting drinking water standards (see Sect. 4.3, Tables 4.1 and 4.3). Therefore, the position of the NRC is that the quality of the water in the ore zone(s) be restored after mining to baseline. For this project, some improvement in a number of groundwater constituents may be expected. A detailed discussion of restoration criteria, restoration targets, and the applicant's R&D restoration tests are presented in Sect. 4.3.

The groundwater quality of the O aquifer is similar to that of the ore zone aquifers except that radium-226 is below the 5 pCi/L standard. The O aquifer is the source of drinking water for residents living in the site vicinity. The basal aquifer contains potable water and will serve as the mining facility's source of fresh water (ER, p. 38).

3.6.2.6 Water use

The list of groundwater rights within 2 km (3 miles) of the project site supplied by the applicant indicates that there are 41 wells supplying water for stock and 20 supplying water for domestic use. The wells range in yield from 136 to 16 m^3/d (25 to 3 gpm). Some of these wells are not listed in the office of the Wyoming State Engineer and are therefore listed as unpermitted (ER, pp. D-6.1 to D-6.10).

3.7 GEOLOGY, MINERAL RESOURCES, AND SEISMICITY

3.7.1 Geology

3.7.1.1 Regional geology

The project site is located in east central Wyoming in the southern portion of the Powder River Basin (Fig. 3.8). The Powder River Basin occupies approximately 19,000 km^2 (12,000 sq miles) and is bounded on the south by the Laramie Range, on the east by the Black Hills, and on the west by the Bighorn Mountains (ER, p. 16).

The Powder River Basin is an asymmetric syncline incorporating a sedimentary rock sequence ranging in age from Cambrian to Recent and having a maximum thickness of approximately 4573 m (15,000 ft) along its synclinal axis (Fig. 3.9). The sediments overlie a Precambian igneous and metamorphic basement rock complex (ER, p. 18). The structural axis projected to the surface from the Precambian basement is approximately parallel to the front of the Bighorn Mountains (Fig. 3.8). Pre-Tertiary strata along the east side of the Bighorn Mountains dip from 30° east to locally overturned. Toward the Powder River Basin, dip of Tertiary strata are generally less than 5° toward the structural axis; locally dips may be steeper along the limbs of small scale folds.[24] Readers interested in the geologic history of the Southern Powder River Basin are referred to Sharp and Gibbons, 1964 (ref. 25).

Solution mining of uranium at Teton Project will be confined to the Fort Union formation of Paleocene age. The formation consists of dark gray siltstones and claystone; buff to gray, fine- to coarse-grained channel sandstones; abundant fossils; and coal beds up to 37 m (120 ft) thick. These deposits suggest that the Fort Union formation was deposited in a swampy, forested lowland threaded by sluggish rivers. The source area for the Fort Union formation has not been clearly determined. The Laramie Range to the south, the Sweetwater Arch in Central Wyoming, and a site near the Bighorn Mountains have all been postulated as its source.[24]

3.7.1.2 Site geology

The stratigraphic unit outcropping at the site surface and containing the economic uranium mineralization for the Leuenberger site is the Lebo member of the Paleocene Fort Union formation. The Lebo is the formation's uppermost member and is composed of interbedded fine- to coarse-grained sandstone, siltstone, claystone, subbituminous coal and lignite (ER, p. 28). A description of the typical lithology of the Lebo member is shown in Table 3.21. Unit designations O, N, M, and basal sands are by the applicant.

Two separate mineralized zones, one in each of the N and M sands, exist at the project site (see Table 3.21). The upper N sand is approximately 15 m (50 ft) thick and lies at a depth of 61 m (200 ft) or more beneath the surface of the Leuenberger site. Approximately 30 m (100 ft) of claystone lies between the N sand and the uppermost O sand unit (ER, p. 35).

Separating the N sand from the lower ore-bearing M sand is approximately 15 to 23 m (50 to 75 ft) of interbedded claystone and siltstone. The M sand is approximately 15 to 20 m (50 to 65 ft) thick and lies at a depth of 98 m (320 ft) from the surface. This unit differs from the N sand in that there is generally less clay in the matrix and very few interbeds of claystone and coaly material present. The M sand is separated from the next lower basal sand unit by 18 to 21 m (60 to 70 ft) of claystone (ER, p. 36). The applicant's geologic cross sections constructed for the project area indicate that the N and M sand units are not continuous within the project boundaries (Figs. 3.10, 3.11, and 3.12).

Table 3.21. (Continued)

Unit	Description[a]
M sand, thickness 0 ft to 70 ft	Fine- to coarse-grained sand with frequent intervals of shale pebble conglomerate in coarse-grained sand matrix. Fine grained intervals occasionally interlaminated with silt and carbonaceous material; with trace amounts of pyrite present in some areas. Coarse grained units typically contain small amount of muscovite, biotite, chert fragments, plagioclase feldspar, kaolinite and sporadic concentrated lignite laminae. Color light gray to medium dark gray in unaltered areas and yellowish gray to dark yellow-orange in altered areas.
Clay below M sand, thickness 50 ft to 60 ft	Clay with occasional sand breaks. Color medium gray to medium dark gray.
Basal sand, thickness 50 ft to 70 ft	Fine- to medium-grained sand and silt, very argillaceous in part with rare carbonaceous laminae. Sand typically quartzose with minor amounts of feldspar, chert, and muscovite. Middle of unit typically clay from 1 to 20 ft. Color medium light gray to medium dark gray.

[a] Color names taken from system described in National Bureau of Standards Research Paper RP 1239.

No faulting at the Leuenberger site has been reported nor is any evident from geophysical log interpretations (ER, p. 63).

An independent staff evaluation of a representative set of geophysical logs indicated that the layers of interbedded clays and silts separating the O, M, N, and basal aquifers are uniform and continuous throughout the project area. Several representative geophysical logs are shown in Fig. 3.3.

3.7.2 Mineral resources

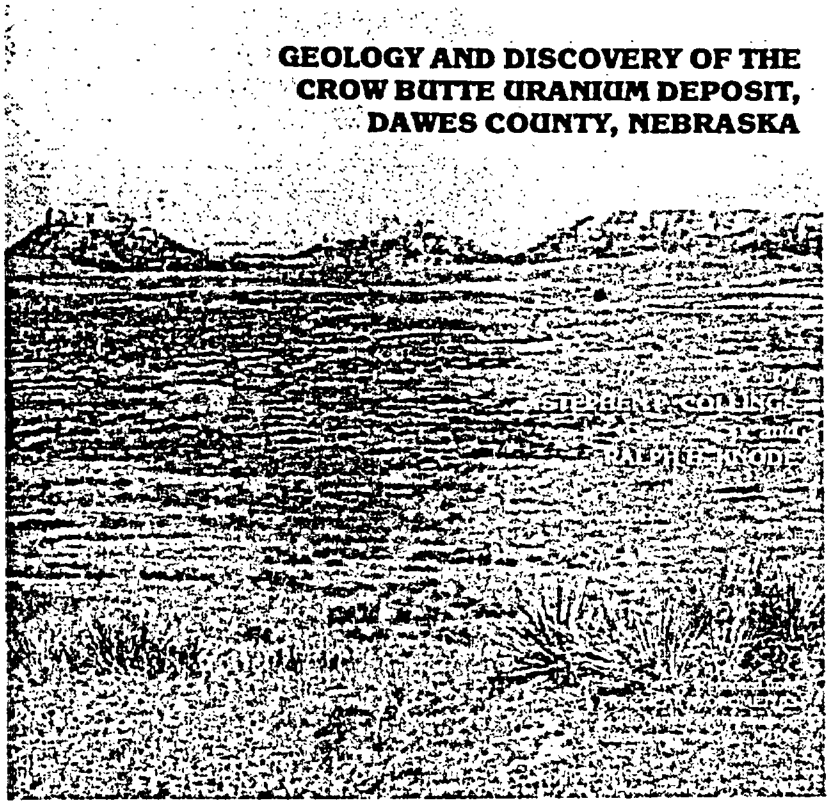
3.7.2.1 Uranium

Uranium occurrences for the Powder River Basin were first reported in the Pumpkin Buttes area about 80.5 km (50 miles) north of the Leuenberger

ATTACHMENT O

Home | Uranium | Back

WFC
WYOMING FUEL COMPANY
Lakewood, Colorado
Crawford, Nebraska



GEOLOGY AND DISCOVERY OF THE CROW BUTTE URANIUM DEPOSIT, DAWES COUNTY, NEBRASKA

STEPHEN F. COLLINGS AND RALPH H. KNODE

Wyoming Fuel Company, Lakewood, Colorado and Crawford, Nebraska

INTRODUCTION

The Crow Butte uranium deposit is located in northwest Nebraska near the Town of Crawford (Figure 1). The deposit was discovered during the fall of 1980 by Wyoming Fuel Company, operator of the Crow Butte Joint Venture. The Crow Butte Joint Venture is owned 50 percent by Wyoming Fuel Company, a subsidiary of KN Energy, Inc.; formerly Kansas-Nebraska Natural Gas Company, Inc., 40 percent by Ferret Exploration Company, Inc., and 10 percent by First Exploration Company. A preliminary announcement made in January 1981 indicated a "probable potential" reserve in excess of 25,000, 000 pounds U308. Drilling during 1981 and 1982 confirmed these reserves and indicated the presence of more than 30,000,000 pounds U308 having an average grade in excess of 0.25 percent U308.

Wyoming Fuel Company was initially attracted to the area in 1978 by favorable regional geology for sandstone uranium deposits and weak radioactivity noted in regional oil and gas holes. Exploration drilling began in 1979 following the formation of the Crow Butte Joint Venture. Drilling has continued up to the present, at which time the Joint Venture is ready to proceed with a pilot scale solution mine. Environmental baseline data have been acquired and the permit applications for the pilot scale mine have been submitted to the Nuclear Regulatory Commission and to the applicable state agencies in Nebraska.

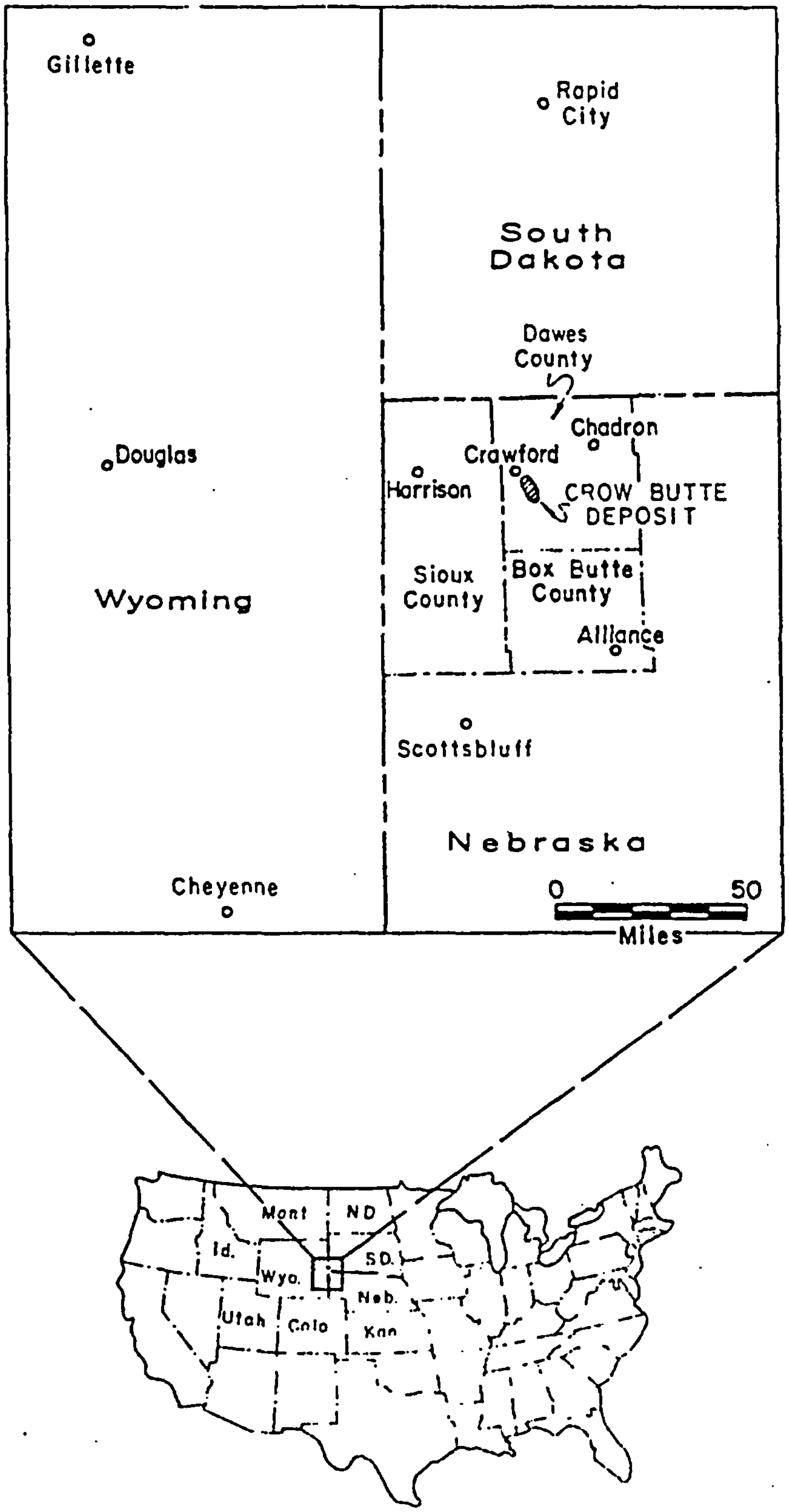


FIGURE 1. Location Map: Crow Butte Deposit

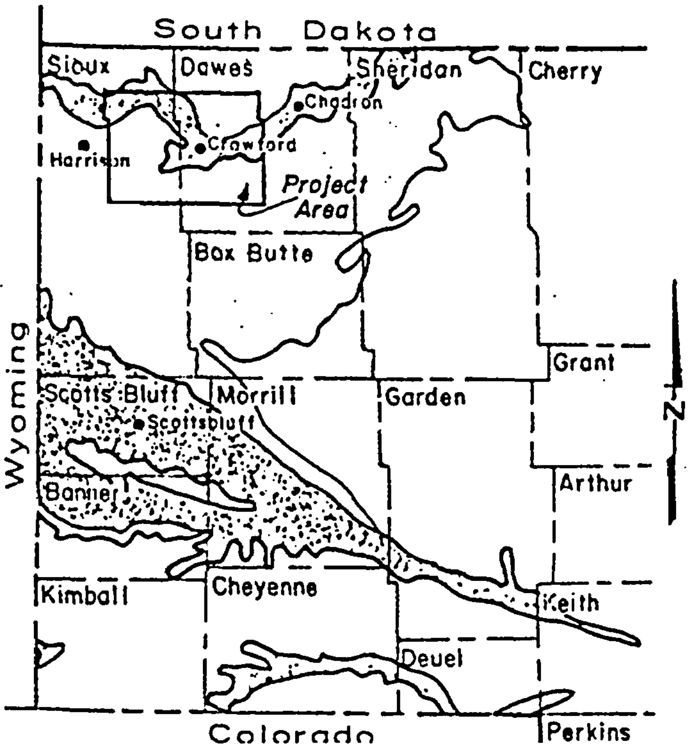
GEOLOGICAL SETTING

The Crow Butte deposit is in the Pine Ridge country of northwest Nebraska. The main portion of the deposit lies north of the Pine Ridge escarpment on gradual sloping terrain with local relief of less than 100 feet. The Pine Ridge escarpment surrounds the main deposit on three sides and is about 500 feet higher in elevation than the northward sloping plain (Figure 2). The Pine Ridge is covered with ponderosa pine and is formed by a major sandstone unit.

Figure 2. Pine Ridge - Crow Butte on left. View looking northeast. Crow Butte Deposit is in the middle distance. Gering and Monroe Creek Formations form the Pine Ridge.

The climate, typical of a semi-arid continental climate is characterized by warm summers, cold winters, light precipitation and frequent changes in the weather. The average precipitation is 15.5 inches distributed mostly during the spring and summer. Average temperature ranges from 23 degrees F in January to 74 degrees F in July, with extremes ranging from -29 degrees F to 110 degrees F

The land in the area of the deposit is largely privately owned and used for agriculture with a population density of about 12 persons per square mile. Winter wheat and hay are the principal crops and cattle are the principal livestock.



Nearby Crawford is a town of 1320 people whose economy is based on agriculture and tourism. Fort Robinson State Park is located immediately west of the town; other nearby points of interest are the Nebraska National Forest to the southeast and the Black Hills, 90 miles to the north. Chadron, with a population of 5933, the largest community in the immediate area, is 25 miles to the east. Scottsbluff, located 75 miles to the south, is the largest community and the principal trade center for northwest Nebraska and east-central Wyoming.

GENERAL STRATIGRAPHY

Sedimentary strata ranging from late Cretaceous through Tertiary age exposed throughout the project area (Figure 3). Pleistocene alluvial and colluvial material are abundant along the north slope of the Pine Ridge. Figure 4 is a generalized stratigraphic column for the area.

Pierre Shale

The Pierre Shale of Late Cretaceous age is the oldest formation encountered in WFC's test holes. The Pierre is a widespread dark gray to black marine shale, with relatively uniform composition throughout. The Pierre outcrops extensively in Dawes County north of the project area, (Figure 3). The Pierre is essentially impermeable to the degree that in areas of outcropping Pierre, water for domestic and agricultural needs is piped in from wells from other formations.

Although the Pierre is up to 5,000 feet thick in other areas, in Dawes County deep oil tests have indicated thicknesses of 1,200 to 1,500 feet. Aerial exposure and subsequent erosion greatly reduced the vertical thickness of the Pierre prior to Oligocene sedimentation. Consequently, the top of the present day Pierre contact marks a major unconformity and exhibits a paleotopography with considerable relief (DeGraw, 1969).

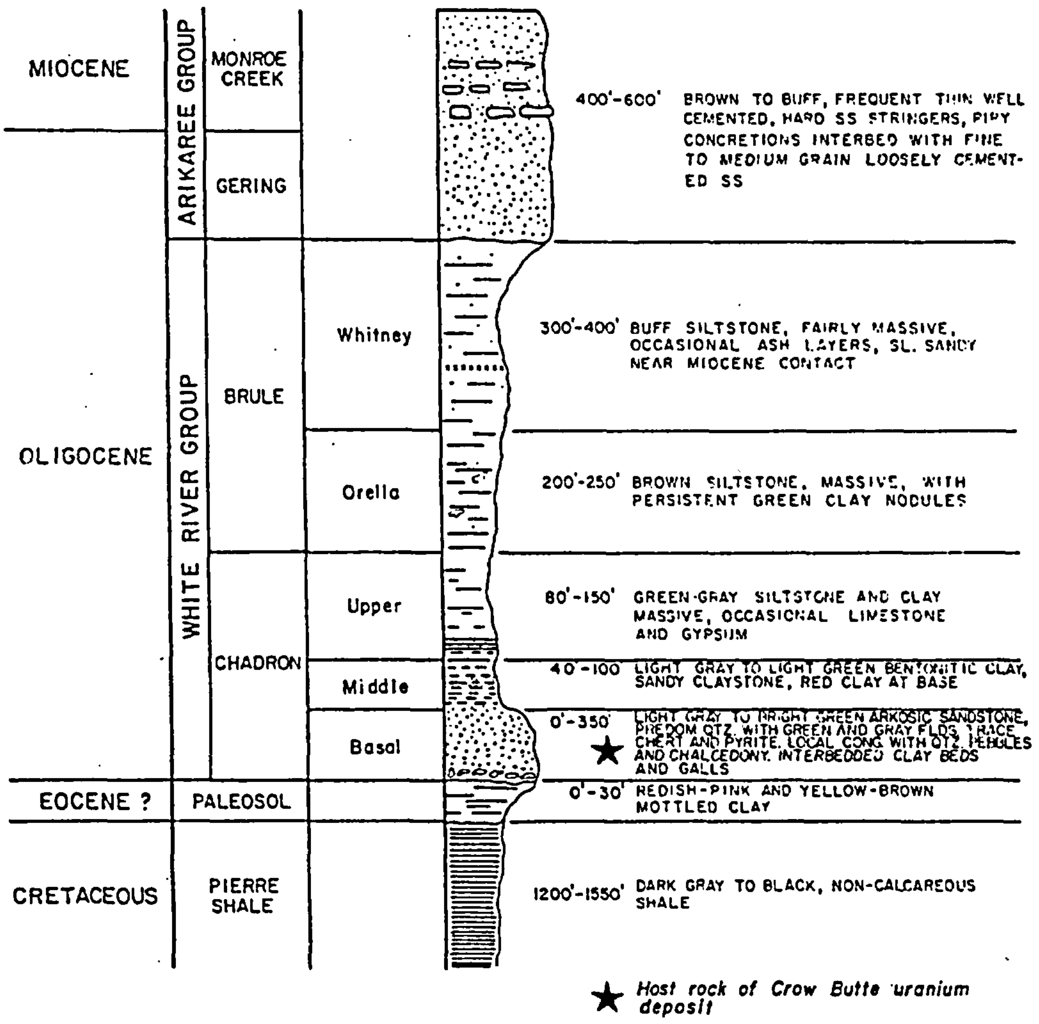


FIGURE 4. Stratigraphic Column: Crow Butte Project Area

As a result of the extended exposure to atmospheric weathering, an ancient soil horizon or Paleosol was formed on the surface of the Pierre Shale. It is known as the "Interior Paleosol Complex" of the Pierre Shale (Shultz and Stout, 1955, p.24) and is readily observed in certain outcrop exposures. The Paleosol is generally absent in areas of Chadron Sandstone channels.

The Pierre Shale is the confining bed below the Basal Chadron Sandstone member which is the host for uranium mineralization (Figure 5). The black marine shale is an ideal confining bed with measured permeabilities of less than 0.0001 millidarcies. The log characteristics of the Pierre Shale are shown on Figure 6 and illustrate its impermeable nature.

White River Group

The White River Group is Oligocene in age and consists of the Chadron and Brule Formations. The Chadron is the oldest Tertiary Formation of record in northwest Nebraska. It lies with marked unconformity on top of the Pierre Shale (Figure 5). Regionally, the vertical thickness of the Chadron Formation varies greatly. This is attributed to the extreme variability of the Basal Sand unit of this formation. The

Chadron Formation is comprised of three distinct members.

Basal Sandstone Member: The Basal Sandstone is the depositional product of a large, vigorous braided stream system which occurred during early Oligocene (approximately 36 to 36 million years before present). Regionally, the Basal Sandstone ranges in thickness from 0 to 350 feet.

Uranium mineralization occurs exclusively within the Basal Chadron Sandstone Member, a coarse grained arkosic sandstone with frequent interbedded thin clay beds and clay galls (Figures 5 and 6). Occasionally the lower portion of the Basal Member is a very coarse, poorly sorted conglomerate (Figure 7). Thickness of the Basal Chadron within the ore trend is about 40 feet.

Figure 5. Pierre Shale - Basal Chadron Sandstone Contact, Whitehead Creek, Section 36, T34N, R54W, Sioux County

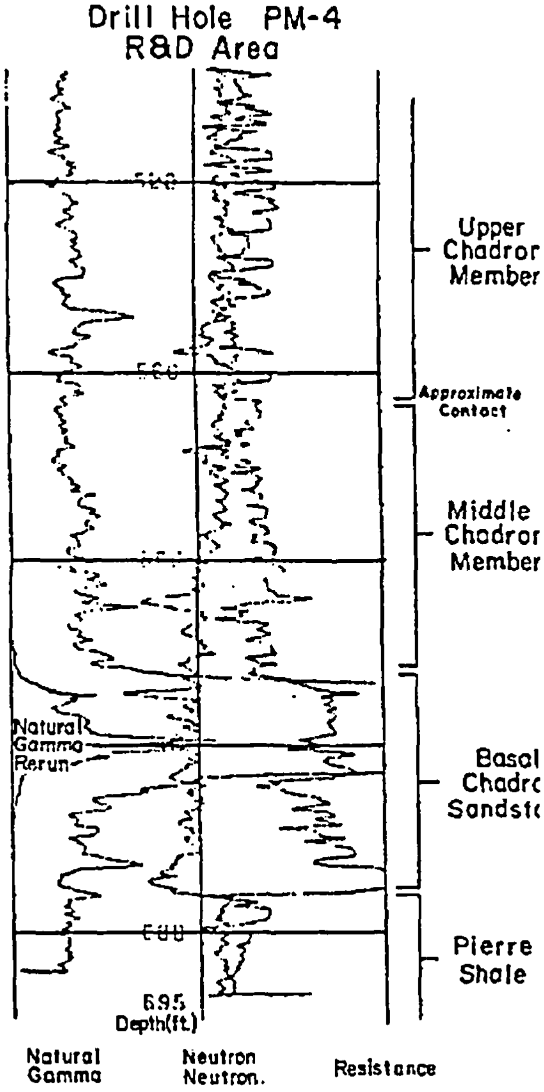


FIGURE 6. Log Characteristics: Crow B
Project Area.

remainder includes polycrystalline quartz, chert, chalcedonic quartz, various heavy minerals and pyrite.

Core samples of the Basal Chadron exhibit numerous clay galls up to a few inches in diameter. In addition, the Basal Member contains frequent thin silt and clay lenses of varying thickness and continuity. These represent flood plain, or low velocity, deposits which normally occur during fluvial sedimentation. These lenses vary in thickness from several inches to one or two feet. Within the ore trend, clay beds one to two feet thick separate the Chadron Sandstone into two or more subunits. X-ray diffraction of the Basal Sandstone has identified the following clay minerals: illite, smectite, expandable mixed layer illite-smectite, and minor amounts of Kaolinite.

Figure 7: Close-up Pierre Shale - Basal Chadron Sandstone Contact. Note pebbles and heterogenity of Chadron Sandstone, Whitehead Creek, Sec. 36, T34N, R54W, Sioux County.

Middle Chadron Member: The Middle Chadron Member represents a distinct and rapid facies change from the underlying Basal Sandstone. The lower portion of the Middle Chadron is characterized by brick red clay (Figure 8). The brick red clay can be observed on outcrop in northern Dawes and Sioux Counties and serves as an excellent marker bed in drill hole cuttings. The Middle Chadron Member has been observed in virtually all drill holes along the mineral trend. Thickness of the Middle Chadron Member ranges from 40 to 100 feet throughout the project area.

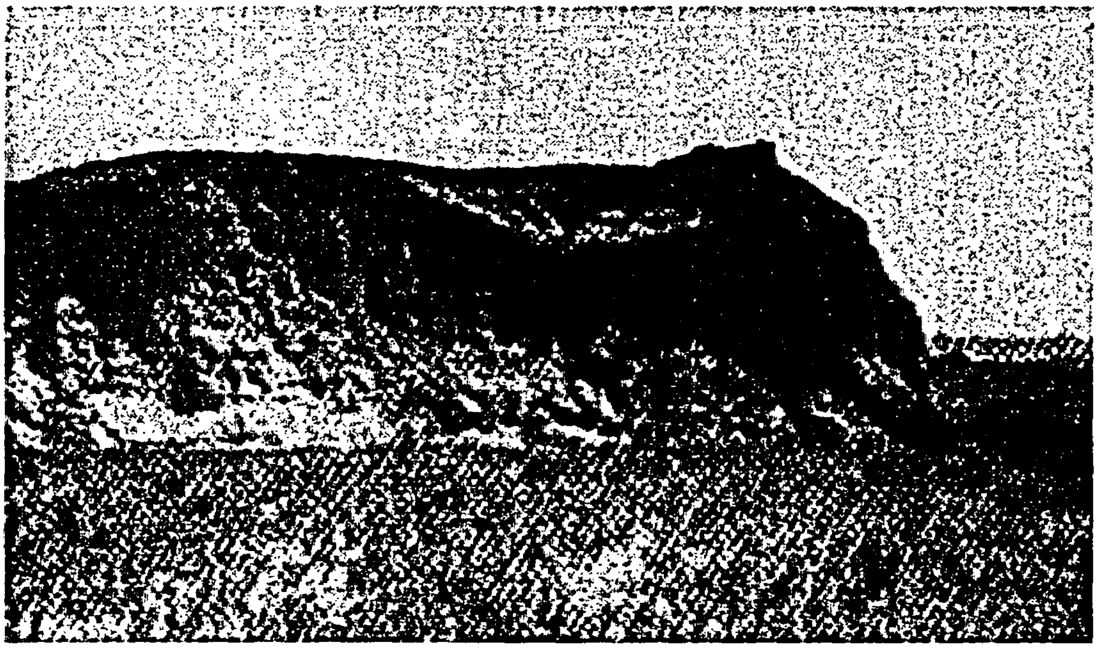


Figure 8. Basal Chadron Sandstone - Middle Chadron Member. Red clay at base of Middle Chadron is dark band overlying light colored sandstone. Whitehead Creek, Sec. 36, T34N, R54W, Sioux County

The Middle Chadron Member is the upper confining bed overlying the Basal Sandstone Member. This can be observed by the epigenetic occurrence of the uranium mineralization, which is strictly confined to the Basal Chadron Sandstone Member. The lower part of the Middle Member is a brick red clay with occasional interbedded gray-green clay. The brick red clay grades upward to a light green-gray sandy claystone. The upper part of the Middle Member is a light gray bentonitic clay. Upper Chadron Member: The Upper Chadron consists of massive claystones and siltstones (Figure 9). These range in color from a dark bluegreen to greenish-brown. The sequence of green siltstones and mudstones are generally considered fluvial channel and flood plain deposits, with limited lacustrine and eolian material present (Vondra, 1958, p.41). Well developed sand channels in the Upper Chadron are rarely encountered in test holes, and of very limited lateral extent when observed. The Upper Chadron Member averages 100 feet thick throughout the project area.

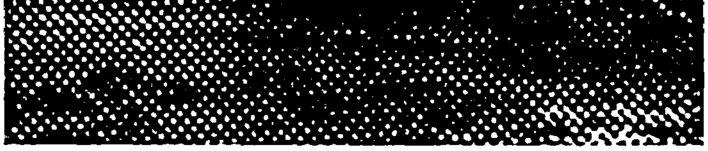


Figure 9. Upper Chadron Member. Claystones and Siltstones. Sugar Loaf Butte Sec. 27, T34N, R53W, Sioux County.

Brule Formation

The Brule Formation lies conformably on top of the Chadron Formation and combined with the Chadron comprises the White River Group. The Brule outcrops throughout the main ore trend. It is made up almost entirely of siltstones with minor sand channels (Figure 10). The contact between the Upper Chadron Member and the overlying Brule Formation is a gradational one. In drill cuttings and geophysical logs the formation boundary can only be approximated. The Brule Formation can generally be identified by its buff to medium brown color in contrast to the greens of the underlying Chadron.

The Brule has been subdivided into two separate members (Shultz and stout, 1938) the Orella and the Whitney. Differentiation of the two members in drill hole cuttings or with geophysical logs is very difficult.

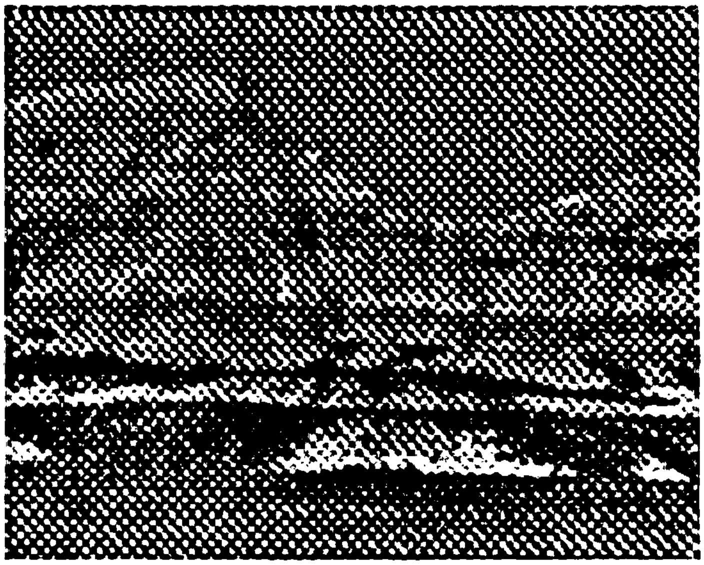


Figure 10. Brule Formation, Siltstones, Toadstool Park, Sec. 5, T33N, R53W, Sioux County.

The Orella lies directly on the Chadron Formation and an approximate Brule-Chadron contact can generally be estimated with drill cuttings but usually not on geophysical logs. The Orella is composed of buff to brown siltstones, with persistent spotty green nodules as it grades into the green clays of the Chadron.

The Whitney Member of the Brule is comprised of fairly massive buff to brown siltstones, in part probably eolian in origin (Vondra, 1958, p.19). Several volcanic ash horizons have been reported in outcrops. They are rarely distinguishable in drill hole cuttings, but are occasionally identified on geophysical logs. The Whitney Member frequently becomes coarser grained upward near

the Gering Formation contact. This is marked by an increase in grain size which is difficult to detect in drill hole cuttings but usually can be observed on geophysical logs. Some moderate to well defined channel sands can be observed in both drill holes and on outcrops. These upper Brule channels are limited in lateral extent and continuity but may occasionally be water saturated in the otherwise generally impermeable Brule.
Within the pilot mine area occasional sand units are encountered in the upper 250 feet of the drill hole. These represent small Brule channel sands known to occur intermittently in the Whitney Member. The small sand units have very limited lateral continuity and although water bearing, little water can be produced. Thus, these units do not meet a strict definition of an aquifer. This has been demonstrated in WFC drill holes and can be observed in cross sections throughout the R and D permit area.

Arikaree Group

The Arikaree Group includes three sandstone Formations which are present locally and regionally but in the main ore trend are absent due to erosion. The Gering Formation (Figure 2) is the oldest formation of the Arikaree Group. The Gering Formation is Oligocene in age (Souders, 1981) and lies unconformably on the Brule Formation. The Gering is predominantly buff to brown, fine grained sandstones and siltstones. These repre sent channel and flood plain deposits of higher velocity than the underlying Brule. The Gering Formation also includes some eolian material. Thickness of the Gering Formation ranges from 100 to 200 feet (Witzel, 1974, p.50).

The Monroe Creek Formation is Miocene in age and overlies the Gering Formation (Figure 2). The Monroe Creek is lithologically similar to the Gering with buff to brown, fine grained sandstone. The unique characteristics of the Monroe Creek is the presence of large "pipy" concretions. These concretions consist of fine grained sand similar to the rest of the formation with calcium carbonate cement and are extremely hard and resistent to weathering.

The reported thickness of the Monroe Creek Formation is 280 to 360 feet (Lugan, 1938 from Witzel, 1974, p.53).
The Harrison Formation is the youngest member of the Arikaree Group. To date, this formation has rarely been penetrated in WFC drill holes, thus little first hand information is available. It is described as lithologically similar to the Gering and Monroe Creek Formations, with fine grained unconsolidated buff to light gray sands. The Harrison Formation is also noted for its abundance of fossil remains (Witzel, 1974, p.55)

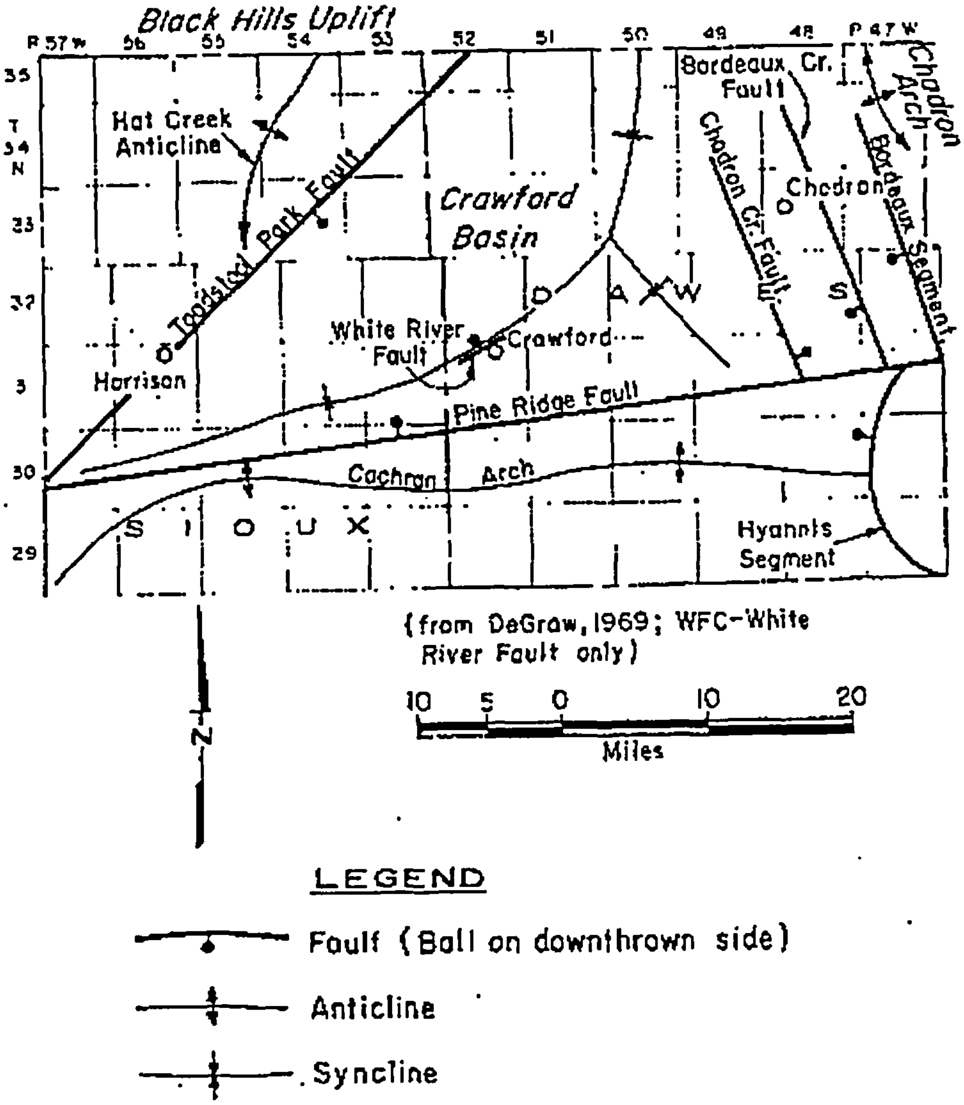
Quarternary Alluvium

Quarternary alluvial and colluvial material are present in the permit area ranging in depth from 0 to 40 feet. The material consists of OligoceneMiocene rock fragments, silt, sand and gravel.

REGIONAL STRUCTURE

The most prominent structural expression in northwest Nebraska is the Chadron Arch (Figure 11). This anticlinal feature strikes roughly northwestsoutheast along the northeastern boundary of Dawes County. The only surficial expression of the Chadron Arch is in the northeastern corner of Dawes County, as well as small portions of Sheridan County and Shannon County, South Dakota.

The Black Hills lie north of Sioux and Dawes Counties in southwestern South Dakota (Figure 11). Together with the Chadron Arch, the Black Hills Uplift has produced many of the prominent structural features presently observed in the area. As a result of the uplift, formations underlying the project area dip gently to the south. The Tertiary deposits dip slightly less than the older Mesozoic and Paleozoic Formation (Witzel, 1974, p.18).



(from DeGraw, 1969; WFC-White River Fault only)

FIGURE 11. Regional Structure: Northwest Nebraska

The Crow Butte ore body lies in what has been named the Crawford Basin (DeGraw, 1969). DeGraw made detailed studies of the preTertiary subsurface in western Nebraska using primarily deep oil well test information. DeGraw substantiated known structural features and proposed several structures not earlier recognized. The Crawford Basin was defined by DeGraw as being a triangular, asymmetrical basin bounded by the Toadstool Park Fault on the northwest, the Chadron Arch and Bordeaux Fault to the west, the Cochran Arch and Pine Ridge Fault to the south (Figure 11).

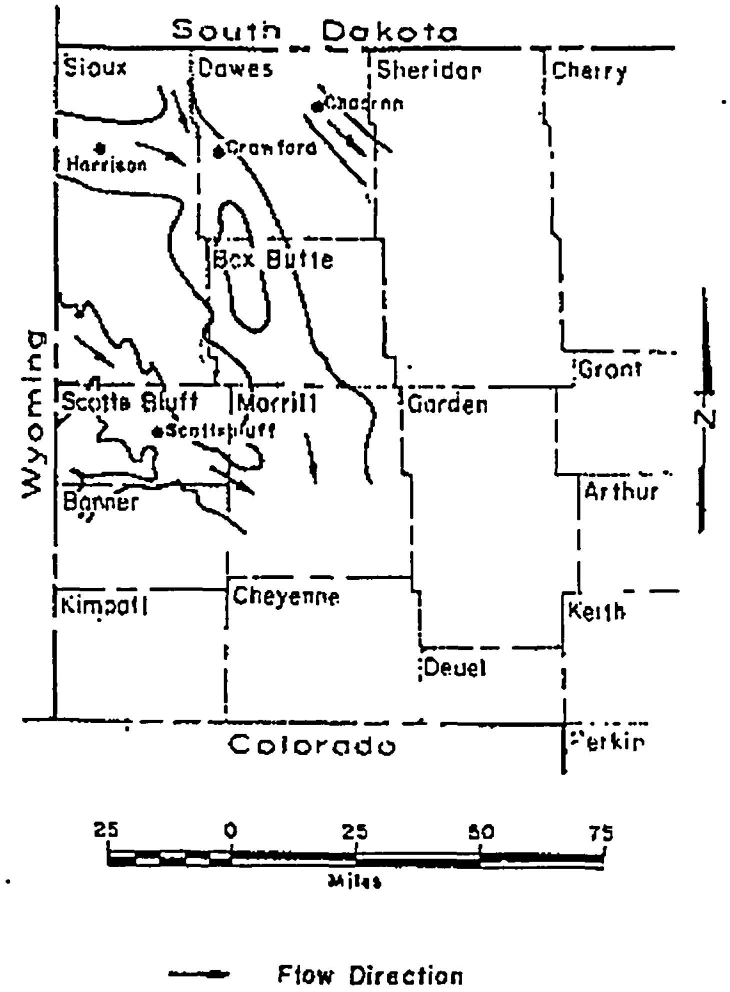
The Toadstool Park Fault, the Bordeaux Fault and other faults occur outside WFC's project area and are assumed to exist as described by DeGraw and others. The Pine Ridge Fault has also been inferred from subsurface data and proposed by DeGraw (1969, p.36). This fault trends east-west across Sioux and Dawes Counties. This fault is subparallel to the Cochran Arch and has a reported displacement of about 300 feet with the south side upthrown.

The Cochran Arch was also proposed by DeGraw (1969, p.36) on the basis of subsurface data. The Cochran Arch trends east-west through Sioux and Dawes Counties, parallel to the aforementioned Pine Ridge Fault. Structural features subparallel to the Cochran Arch have also been observed in drill hole data. The existence of the Cochran Arch alone is probably enough to explain the structural high south of Crawford.
The synclinal axis of the Crawford Basin trends roughly eastwest and plunges west into what is informally referred to as the Inner Crawford Basin by WFC. The Inner Basin is characterized by a rather sharp paleotopographic change in the Pierre Shale with dramatic increase in the thickness of the Basal Chadron Sandstone.

The single most prominent structural feature within the Crawford Basin is the previously unnamed White River Fault (Figure 11). It is located directly north of Crawford, and strikes northeastsouthwest with the upthrown side to the south. The total vertical displacement is 200 to 400 feet; no strike-slip movement has been detected. The disturbance of the Chadron and Brule Formations date the fault as post-Oligocene.

HISTORY OF DISCOVERY

A review of the regional geology indicated that northwest Nebraska was favorable for the occurrence of sandstone uranium mineralization. H.M. DeGraw of the Nebraska Geological Survey reviewed several thousand oil and gas logs in the Nebraska Panhandle and outlined several major fluvial systems within the basal Tertiary, the Oligocene Chadron Formation (DeGraw, 1969). A major fluvial system from Wyoming and South Dakota trends through northern Sioux County and southeastward across Dawes and Box Butte Counties (Figure 12). Another major system trends southeastward along the present day course of the North Platte River near Scottsbluff (Figure 12).



(from DeGraw, 1969)

FIGURE 12. Regional Chadron Sandstone Channels: Western Nebraska

Wyoming Fuel Company reviewed the DeGraw study and reinterpreted the logs and developed a Chadron sandstone isopach (Figure 13) based on the widely spaced oil and gas exploration holes, 0 to 5 holes per township. The logs indicate an extensive fluvial sandstone system at the base of the Tertiary overlying the Cretaceous Pierre Shale. This fluvial sandstone is the Basal Sandstone Member of the Chadron Formation of Oligocene age. In the Crawford area it was noted that five oil and gas holes had gamma spikes in the sandstone indicating approximately .005 to .025 percent eU308. (In this context, eU308 refers to estimation by means of radiometric measurement.) In addition, methane gas shows had been reported from several oil and gas holes and water wells in the Crawford area. There was also some evidence of oxidation-reduction interfaces based on a lithologic log of one of the oil and gas holes.

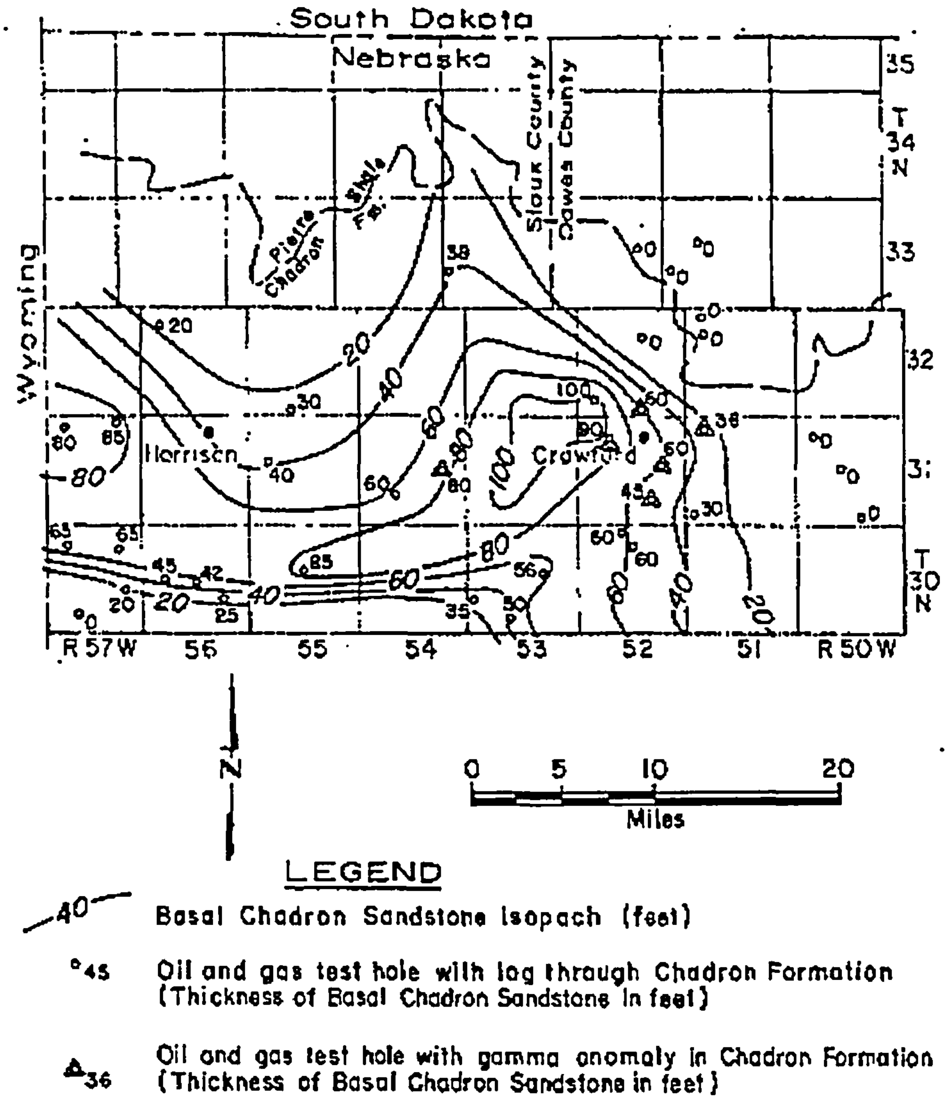


FIGURE 13. Chadron Sandstone Isopach:
Northwest Nebraska

Based on this information Wyoming Fuel Company acquired a regional lease position from Sioux Minerals, Ltd. and Wulf Oil Corporation of about 64,000 acres along the Chadron Formation outcrop (Figure 3) of northwest Nebraska in the spring of 1978. The lease position extended from north of Harrison to southeast of Crawford, a distance of about 30 miles.

Wyoming Fuel Company and Ferret Exploration Company formed a joint venture during the late summer of 1979. Wyoming Fuel Company, designated as project operator, undertook a regional exploration drilling program. Property evaluation began during 1979 and 95 exploration drill holes totaling approximately 50,000 feet were completed (Figure 14). The holes were widely spaced on one or two mile centers. In areas of encouragement, a few holes were drilled on a one-fourth to one-half mile spacing. Two areas of encouragement were encountered during this drilling (Figure 14). An area north of Crawford was identified as having considerable weak uranium mineralization associated with vague oxidation-reduction boundaries adjacent to the

White River Fault. This was in the same general area of weakly radioactive oil and gas holes and methane gas shows.

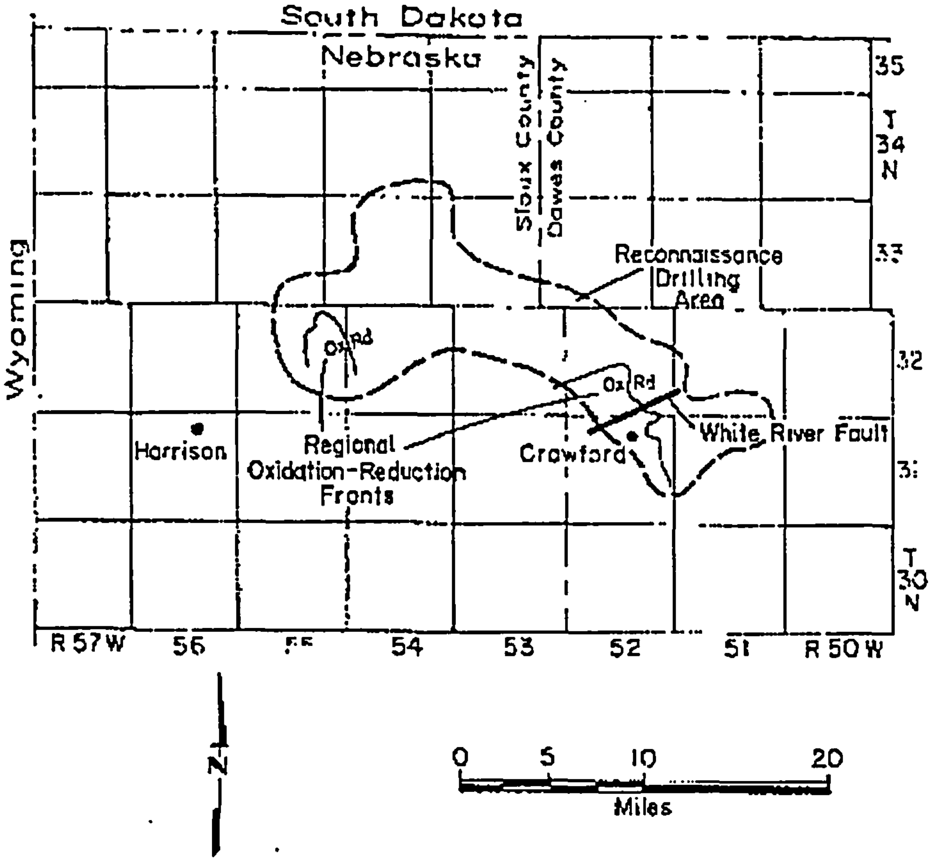


FIGURE 14. Reconnaissance Drill Results: Crow Butte Project

Following the 1979 drilling, the lease position was consolidated and additional acreage was leased in the areas of encouragement. Amore extensive drill program was planned for the next phase of project evaluation.

During 1980, reconnaissance drilling continued within the lease block and follow-up drilling continued in areas with encouraging results. The 100th hole of the 1980 drill program intersected the first ore grade mineralization (0.1% eU308). After an additional 65 holes, a mineralized trend based on three additional holes was indicated to extend about six miles southeast of Crawford.

Following additional lease acquisition, Wyoming Fuel increased the pace of close-spaced drilling. An additional 148 holes were drilled during 1980 to define the mineralized trend (Figure 15) which was named Crow Butte for a prominent butte of the Pine Ridge southeast of Crawford (Figure 2). A total of 408 drill holes had been drilled to date.

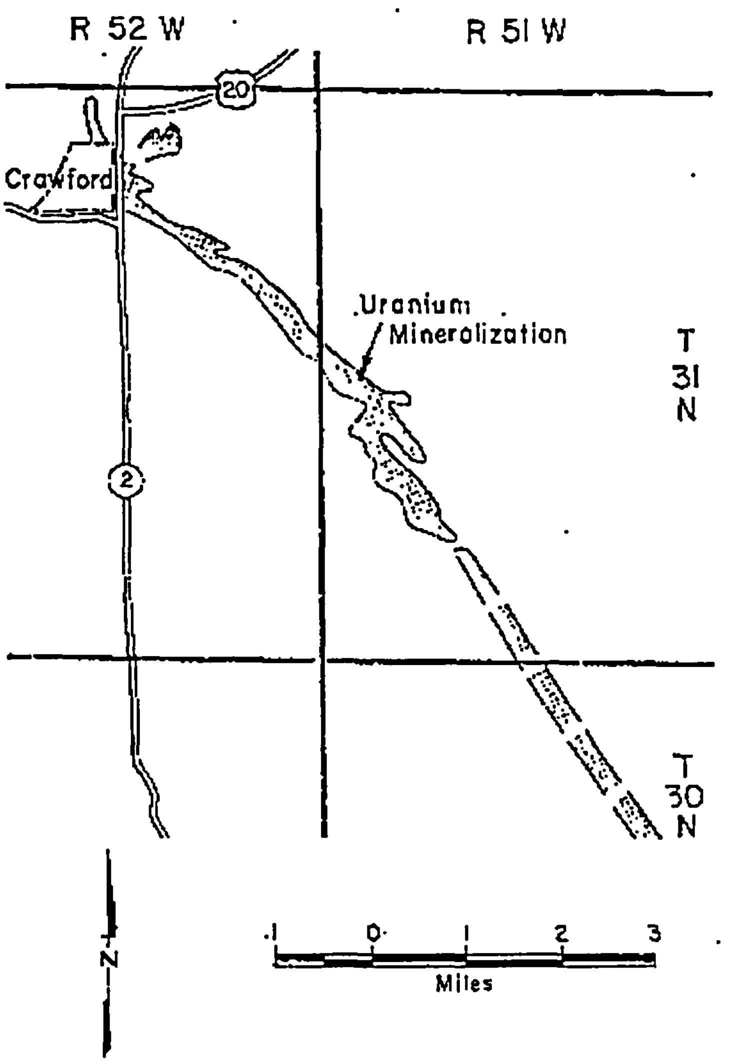


FIGURE 15. Crow Butte Mineralized.Trend

At this point, the Crow Butte mineralized trend was determined to be about six miles long and up to 3000 feet wide as defined by a drill hole spacing of 400 feet by 1000 feet in the shallower northern part and 400 feet by 2500 feet along the deeper southern part. Depths to mineralization varied from 275 to 820 feet. Based on 127 holes drilled within the Crow Butte mineralized trend, a news release of January 12, 1981 stated that "probable potential" reserves at the Crow Butte prospect exceeded 25 million pounds U308.

An additional 850 holes drilled during 1981 further defined the grade, thickness and extent of the Crow Butte mineralized trend. The trend was drilled on a 200 foot by 200 foot grid. Ore reserves of the Crow Butte Deposit (Figure 15) calculated following the 1981 drilling indicated over 30 million pounds eU308 in place with an average grade in excess of 0.25% eU308. In addition, chemical analyses of a large number of samples from core holes throughout the deposit indicated that the ratio of chemical uranium to equivalent uranium exceeds 1.20. The only uranium mineral that has been identified to date is coffinite, a uranium silicate.

Reconnaissance drilling during 1982 doubled the known length of the Crow Butte trend; however, drill hole spacing is too wide to calculate additional reserves. Detailed drilling on a 50 to 100 foot spacing confirmed that the 200 foot grid was adequate for reserve calculations and defined an area for a pilot solution mining operation. Baseline environmental data were also gathered during 1982 for research and development permits to operate the pilot solution mine. Permit applications were submitted during February and April of 1983 to the Nuclear Regulatory Commission and the Nebraska Department of Environmental Control respectively.

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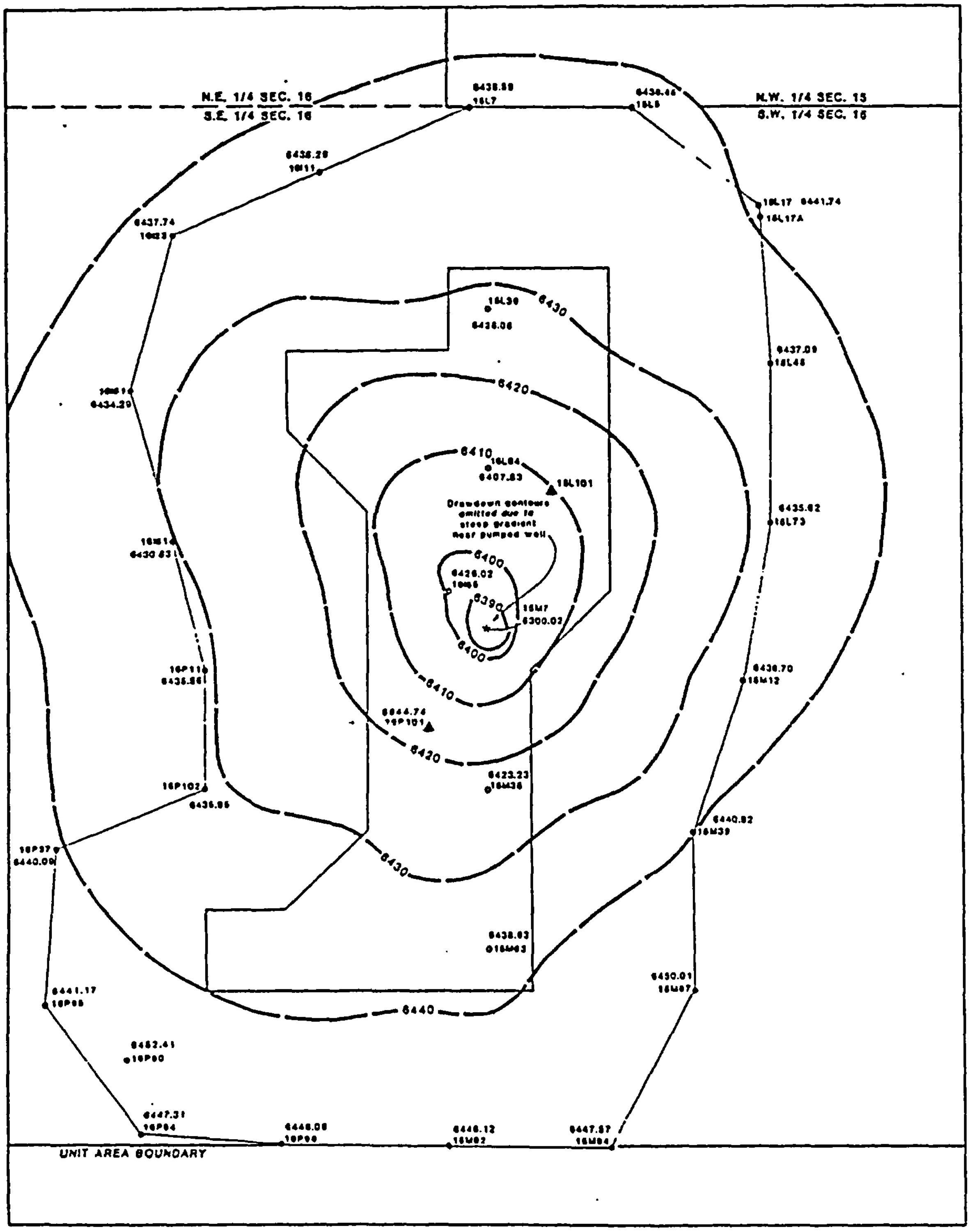
ATTACHMENT P



Map based on corrected water level elevations taken 17 August 1982.

Contour Interval = 10 ft

N

SCALE
0 100 200
FEET

15M7 ★ PUMPING WELL
15M35 ● INTERIOR MONITORING WELL
15M12 ● EXTERIOR MONITORING WELL
16L101 ▲ DAKOTA AQUIFER MONITORING WELL

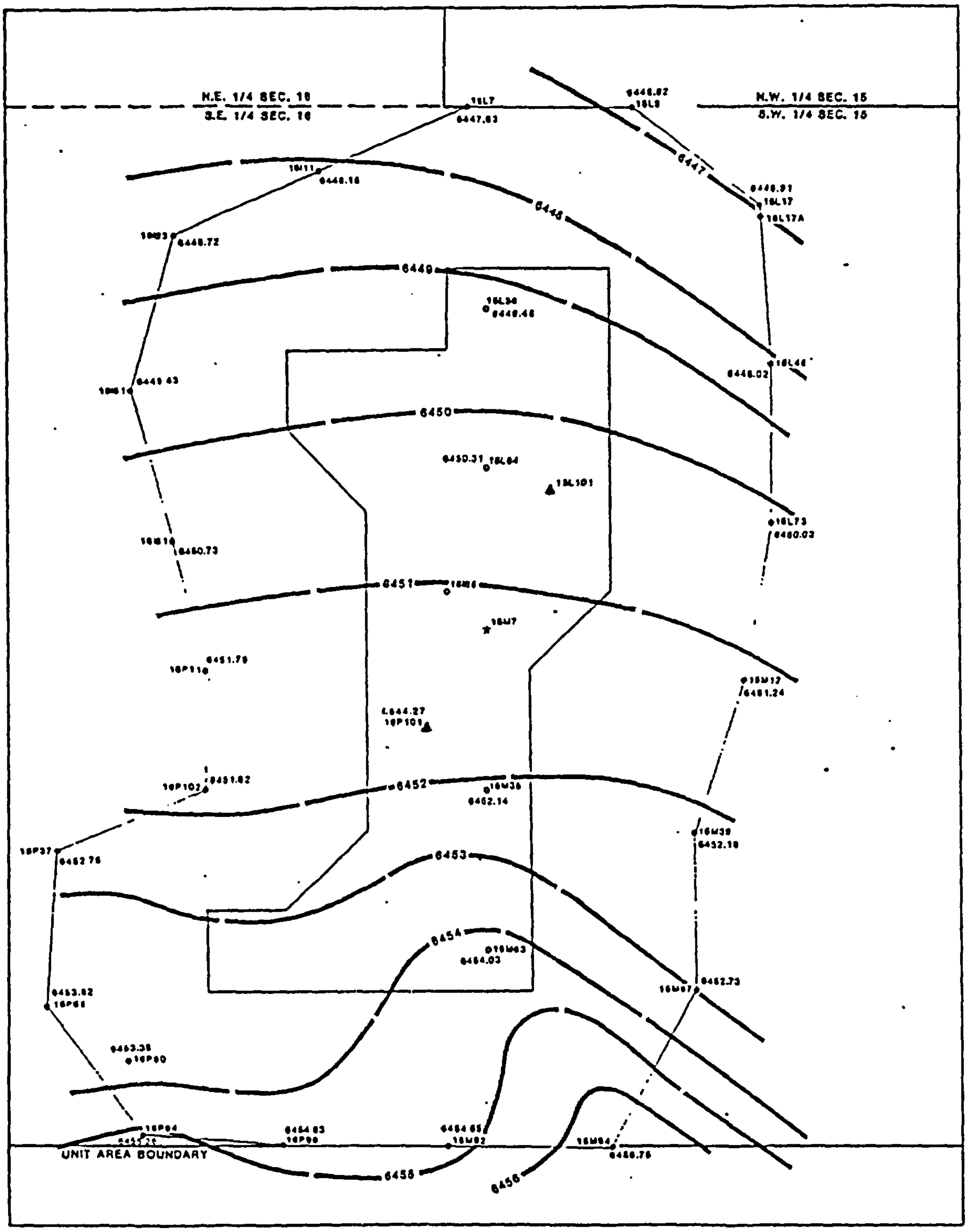
Figure A-2

Mobil Oil Corporation

POTENTIOMETRIC MAP
OF MAXIMUM DRAWDOWN

CROWNPOINT - SOUTH TREND
PUMPING TEST

CDM



Map based on water level elevations (above MSL) taken 15 August 1982.

Contour Interval =1 ft

N

SCALE
0 100 200
FEET

15M7 ★ PUMPING WELL
15M39 ● INTERIOR MONITORING WELL
15M12 ● EXTERIOR MONITORING WELL
15L101 ▲ DAKOTA AQUIFER MONITORING WELL

Figure A-1

Mobil Oil Corporation

PRE-TEST
POTENTIOMETRIC MAP

CROWNPOINT - SOUTH TREND
WELL FIELD

CDM

RECEIVED
Division of Fuels
AUG 04 1983
Uranium Operations
Branch
Casper

ANALYSIS OF SOUTH TREND DEVELOPMENT AREA

PUMPING TEST, AUGUST 16-18, 1982

CROWNPOINT, McKINLEY COUNTY, NEW MEXICO

Submitted to:

Mobil Oil Corporation
Uranium/Minerals Division
P.O. Box 5444
Denver, Colorado 80217

Prepared by:

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Water Resources Engineers
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May 1983

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ABSTRACT

A detailed analysis has been made of the drawdown and recovery water level data in 29 monitor wells collected during the August 16-18, 1982, pumping test of well 15M7 in the South Trend Development Area near Crownpoint, McKinley County, New Mexico. Analysis of these data indicates rather consistent values of transmissivity and storage coefficients even though individual monitor wells penetrate various sands of the Westwater Canyon Member of the Morrison Formation. Average aquifer transmissivity and storage coefficients of the sands tested were 1,230 gallons per day per foot and 6.7×10^{-5} respectively. Pumping test data were not sufficiently definitive to differentiate hydraulic conductivities of individual sands.

Based upon a detailed examination of pumping test and related geohydrologic data (excepting well 16P80 information), we conclude that the hydraulic communication between the sands penetrated by the pumped well and all of the monitor wells penetrating A through D zones is good. The hydraulic connection vertically between the D and E zone sands remains unknown resulting from well completion problems suggested by the available test data from well 16P80. There is a strong indication that monitor wells 15M67 and 15L17 are partially clogged or also affected by completion problems.

Leakage through or from the Brushy Basin Shale was not measurable during the pumping test. Based upon a thorough study of water level information, no drawdown impacts were detected in the Dakota Sandstone during the period of this test.

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INTRODUCTION

General Background

Mobil Oil Corporation is pursuing development of an in situ solution uranium mine in the vicinity of Crownpoint, New Mexico. As part of this development, Mobil has been required to submit selected hydrogeologic data for the proposed site to various State and Federal regulatory agencies. The information required relates primarily to the hydrogeologic characteristics of the uranium producing formation (the Westwater Canyon Member of the Morrison Formation), the potential for drawdown impacts and vertical leakage from other formations (Dakota Sandstone drawdowns and leakage downward through the Brushy Basin Shale to the Westwater), and documentation of hydraulic communication between the production well field and adjacent monitoring wells.

To the above extent and in partial fulfillment of the regulatory agencies requirements, Mobil Oil Corporation agreed to conduct a 24-hour pumping test at the South Trend site. The services of Camp Dresser and McKee Inc. (CDM) were retained by Mobil to supervise the testing activities and to provide complete reduction and compilation of water level monitoring data and other information obtained from the pumping test.

Pumping Test Design

The pumping test at the South Trend site was designed by Mobil Oil

Corporation, was jointly carried out with CDM, and included the following elements:

1.) A pumped well (15M7) completed in four potentially producing sands of the Westwater Canyon Member of the Morrison Formation.
2.) Two monitor wells completed in the overlying Dakota Sandstone.
3.) 27 monitor wells completed in selected sections of the Westwater Canyon Member.
4.) A preliminary "practice run" test conducted on August 10, 1982, in preparation for the actual pumping test beginning on August 16, 1982.
5.) Continuous rate pumping and monitoring for 24 hours at a design rate of 75 gallons per minute(gpm).
6.) Recovery and monitoring period of 24 hours (till August 18, 1982) after pumpage was stopped on August 17, 1982.

The distribution of monitoring wells at the South Trend site included the following:

1.) A centrally located pumping well (15M7) within the proposed uranium production field.
2.) Five (5) "interior" monitoring wells, also completed in the Westwater Canyon Member and located in a rough north-south line across the production well field.

3.) Twenty One (21) "exterior" wells completed in the Westwater Canyon Member and located peripheral to the proposed production well field.

4.) Two (2) "interior" monitoring wells completed in the Dakota Sandstone and located near the center of the production well field.

5.) One (1) "exterior" monitor well completed in a so-called E sand of the Westwater Canyon Member and located near the southwestern portion of the outer monitoring well ring.

The remaining data collected by Mobil and CDM included information on barometric pressure and precipitation at the South Trend site and regional water level trends at a U S G S. Westwater Canyon monitor well (514P) located approximately two miles northwest of the South Trend site.

CDM, in cooperation with Mobil Oil Corporation, set up, pretested, and conducted the above pumping test during the period August 10-18, 1982. The collected water level data were tabulated, corrected for barometric pressure changes and regional water level trends, and plotted on arithmetic, log-log, and semilog graph paper by CDM as further described below.

CDM Data Presentation

CDM produced a report entitled "Data summary report, Crownpoint-South Trend pumping test, McKinley County, New Mexico," dated as

30 September, 1982 (see references for complete citation). This CDM report must be made a companion of this one since the CDM data, pumping test information, drawdown and recovery plots, problems, and explanations of testing and data reduction procedures are not repeated herein. The CDM report is voluminous and contains the following information:

1.) All data in tabulated form.
2.) Time versus water level elevation hydrographs on arithmetic paper for period of record.
3.) Time versus drawdown plots on log-log graph paper.
4.) Time versus drawdown on semilog paper.
5.) The ratio of time since pumping started and time since pumping stopped versus residual drawdown on semilog graph paper.

Subsequent to a preliminary analysis of the CDM data report, an additional appendix was added covering:

6.) Time versus recovery plots on log-log graph paper.

The analysis that follows in this report is based upon these CDM materials. It should be re-emphasized that one should have a copy of the CDM (1982) report (including the log-log recovery graph appendix) at hand when reading this report.

General Analysis of Data and Report Organization

Thomas A. Prickett and Associates (TAP) were hired by Mobil Oil Corporation to provide technical support for analyzing the information generated by the pumping test reported by CDM (1982). In particular, TAP was to complete a type-curve analysis of the CDM test data to illustrate the presence or nonpresence of formation communication and to analyze and report all aquifer and confining layer properties possible with the CDM data base. To this extent, TAP worked with Mobil and CDM in preparing for the pumping test, specifying the form and type of data to be plotted, and obtaining additional information such as electric resistivity logs and perforation records of monitor wells.

TAP proceeded to analyze the drawdown and recovery data as presented by CDM. It should be mentioned that CDM provided original graphs to TAP such that photocopy distortion would not be present. In our opinion, this is an important item in analyzing the data set since distortion can significantly change the analysis.

The remainder of this report consists of the data analysis and results sections. Discussions are given concerning the typical methods used for analysis, tables are presented with the values of aquifer transmissivities and storage coefficients, and numerous discussions are given concerning possibilities of leakage and Dakota Sandstone impacts. A discussion is given concerning the wells which we believe to be partially clogged.

Finally, numerous discussions are presented concerning the overall inter sand and well hydraulic communication in the South Trend Development Area.

DISCUSSION OF ANALYSIS AND RESULTS

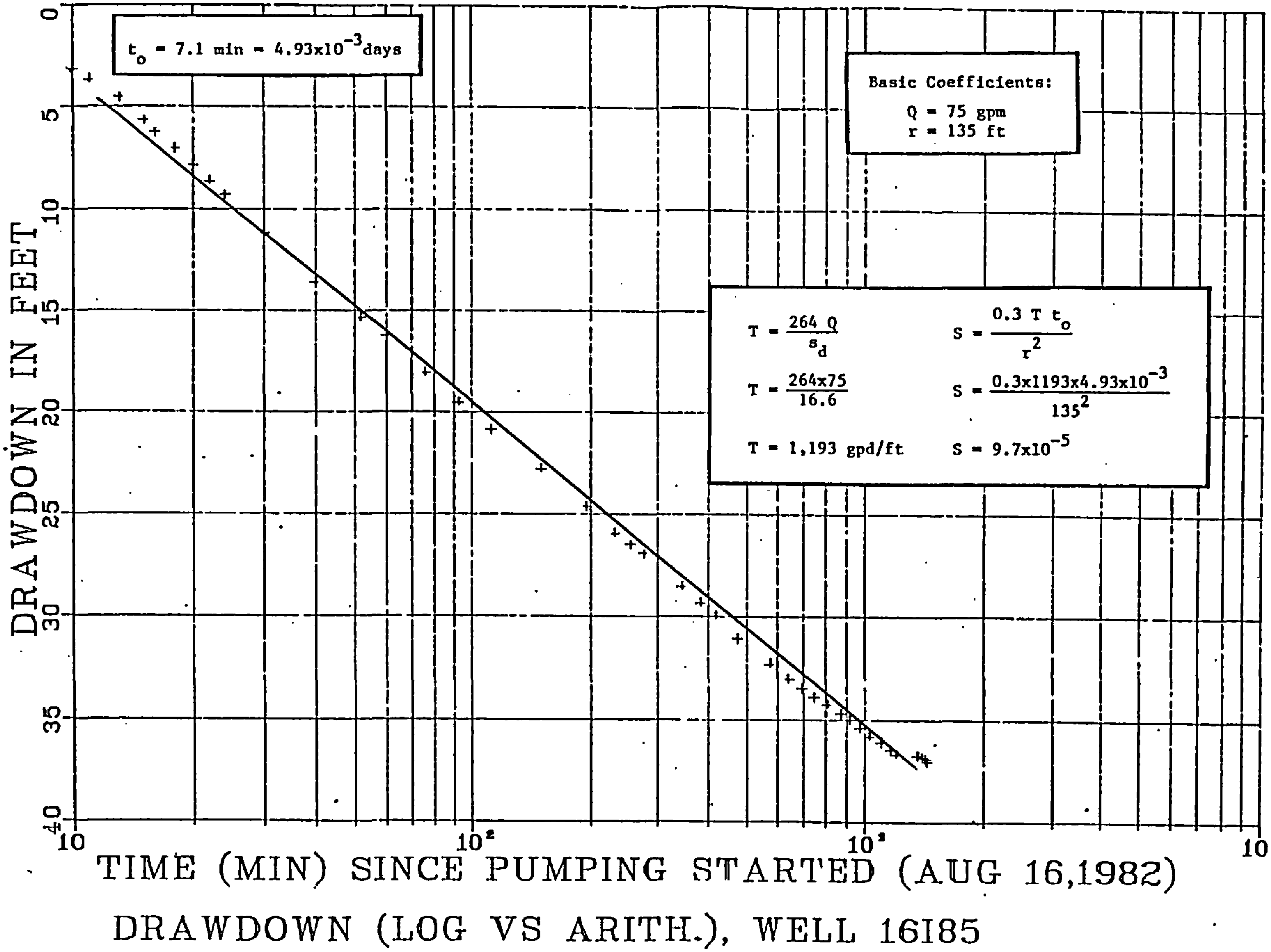
Methods of Analysis

Log-log time-drawdown and time-recovery graphs for all but the pumped well (15M7) were analyzed by the Theis type-curve method. An example analysis for well 15L7 is given in Figure 1. With the exception of data from the closest observation well (16I85), see Figure 2, the time-drawdown or recovery data could not be analyzed by the modified Jacob (semilog time versus arithmetic drawdown/recovery) method because the straight line criteria were not met (not enough time had elapsed for the semilog graph to fall on a straight line). Attempts at Jacob straight line analysis here will lead to transmissivity values which are generally too high. Time-drawdown and recovery data from the pumped well were analyzed by the Papadopulos-Cooper (1967) method to deal with problems of well casing storage. As problems developed with the column pipe check valve (see CDM, 1982), the pumped well data are questionable for highly detailed analysis.

Distance-drawdown data from two approximately right angle located lines of wells - 16I11, 16I85, and 15M92 and then 16P102, 16P37, and 16P65 were also analyzed by the Theis type-curve method. The positions of the type curves and match points are shown on Figure 3.

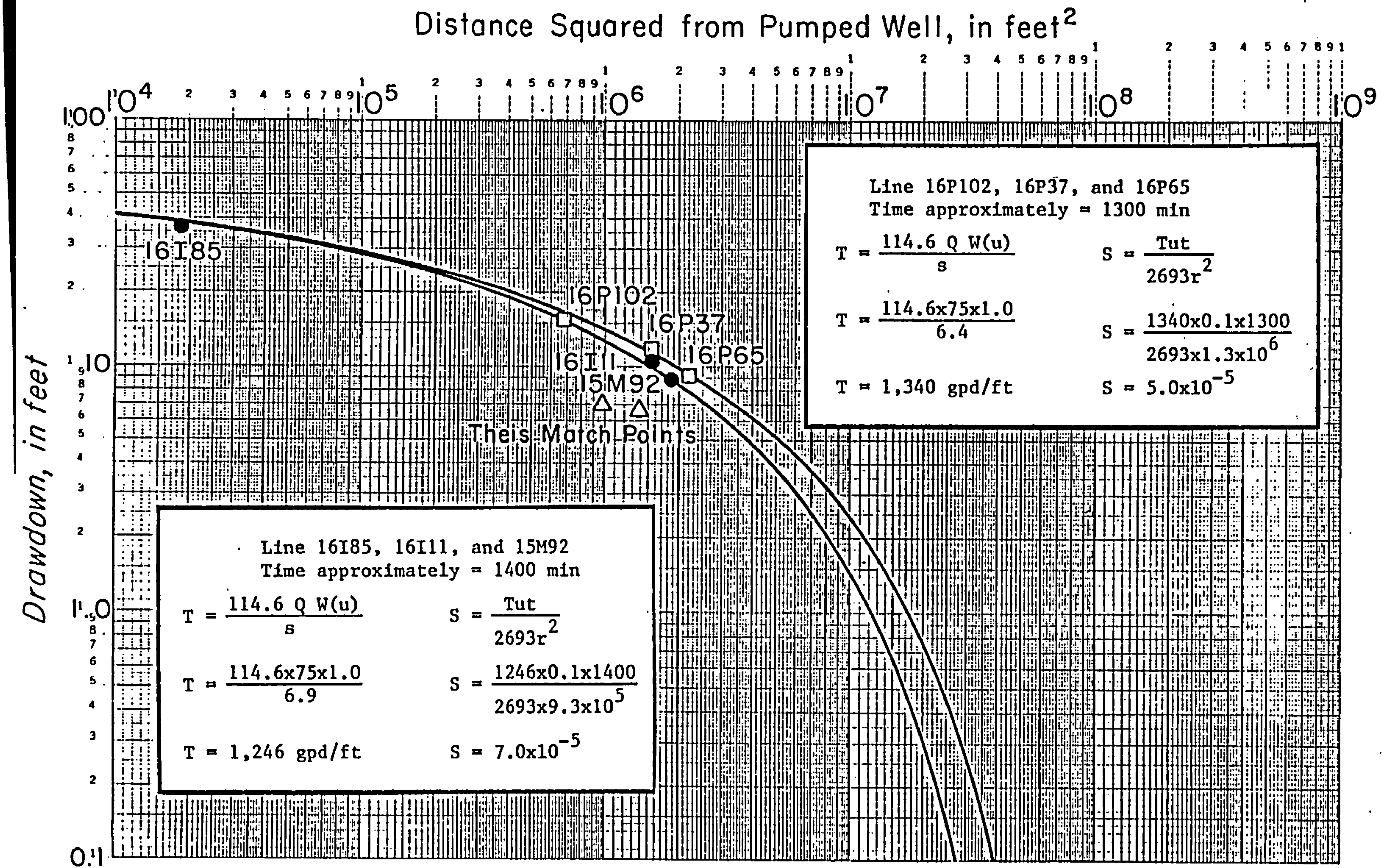
Coefficients of Transmissivity and Storage

Table 1 shows the results of the calculations for aquifer transmissivity and storage coefficient for the above-mentioned analyses. An



CDM

FIGURE 2. Semilog Plot of Time-Drawdown Data for Well 16I85 for Jacob Analysis



Line 16P102, 16P37, and 16P65
Time approximately = 1300 min

$T = \frac{114.6\ Q\ W(u)}{s}$ $S = \frac{Tut}{2693r^2}$

$T = \frac{114.6 \times 75 \times 1.0}{6.4}$ $S = \frac{1340 \times 0.1 \times 1300}{2693 \times 1.3 \times 10^6}$

$T = 1{,}340$ gpd/ft $S = 5.0 \times 10^{-5}$

Line 16I85, 16I11, and 15M92
Time approximately = 1400 min

$T = \frac{114.6\ Q\ W(u)}{s}$ $S = \frac{Tut}{2693r^2}$

$T = \frac{114.6 \times 75 \times 1.0}{6.9}$ $S = \frac{1246 \times 0.1 \times 1400}{2693 \times 9.3 \times 10^5}$

$T = 1{,}246$ gpd/ft $S = 7.0 \times 10^{-5}$

FIGURE 3. Example Logarithmic Plots of Distance-Drawdown Data For Two Lines of Wells Analyzed by Theis Method.

TABLE 1. Summary of Aquifer Transmissivity and Storage Coefficients for South Trend Area Pumping Test, August 16-18, 1982

		DRAWDOWN		RECOVERY	
Well Number	Perforated Section	Transmissivity (gpd/ft)	Storage Coefficient	Transmissivity (gpd/ft)	Storage Coefficient
15L5	A-D	1,102	8.9×10^{-5}	1,102	7.8×10^{-5}
15L7	A-D	1,228	7.0×10^{-5}	1,302	6.1×10^{-5}
15L17*	A-D	905	1.6×10^{-4}	886	1.7×10^{-4}
15L17A	A	1,432	5.4×10^{-5}	1,457	4.6×10^{-5}
15L36	A	914	4.6×10^{-5}	1,194	4.1×10^{-5}
15L45	A-D	1,177	9.4×10^{-5}	1,228	1.2×10^{-4}
15L64	B	1,228	4.6×10^{-5}	1,177	5.2×10^{-5}
15L73	B	1,194	9.1×10^{-5}	1,177	1.1×10^{-4}
15M12	A-D	1,432	8.5×10^{-5}	1,432	8.2×10^{-5}
15M35	B	977	6.2×10^{-5}	966	6.4×10^{-5}
15M39	C	1,074	1.1×10^{-4}	1,146	1.0×10^{-4}
15M63	B-C	1,177	6.0×10^{-5}	1,023	7.9×10^{-5}
15M67*	D	1,228	2.8×10^{-4}	*	*
15M92	A-D	1,432	6.7×10^{-5}	1,563	6.9×10^{-5}
15M94	A-D	1,409	7.9×10^{-5}	1,264	7.9×10^{-5}
16I11	A-D	1,228	6.6×10^{-5}	1,322	5.2×10^{-5}
16I23	A-D	1,283	5.0×10^{-5}	1,194	4.7×10^{-5}
16I51	A-D	1,283	4.9×10^{-5}	1,246	4.8×10^{-5}
16I81	A-D	1,228	3.7×10^{-5}	1,131	6.6×10^{-5}
16I85	B	1,194	9.7×10^{-5}	1,023	1.4×10^{-4}
16P11	A-D	1,211	6.4×10^{-5}	insufficient data	
16P37	A-D	1,146	5.4×10^{-5}	1,102	7.0×10^{-5}
16P65	A-D	1,264	5.5×10^{-5}	1,246	5.0×10^{-5}
16P80*	E	*	*	*	*
16P94	A-D	1,322	5.9×10^{-5}	1,482	5.0×10^{-5}
16P96	A-D	1,409	6.5×10^{-5}	1,432	5.8×10^{-5}
16P102	A-D	1,409	4.7×10^{-5}	1,177	9.5×10^{-5}
15M7	A-D	819	3.3×10^{-5}	1,074	8.0×10^{-6}
DD	-	1,293	6.0×10^{-5}	1,364	5.4×10^{-5}
Averages		1,226	6.5×10^{-5}	1,233	6.9×10^{-5}

*Values apparently distorted by suspected clogging. Not used in averages.

DD indicates distance drawdown average data.

examination of the hydraulic properties in Table 1 reveals a fairly consistent set of transmissivities and storage coefficients. The range of transmissivity in Table 1 is from a low of 819 gallons per day per foot (gpd/ft) to a high of 1563 gpd/ft. Storage coefficients in Table 1 range from a low of 3.3×10^{-5} to a high of 2.8×10^{-4}. If suspected clogged monitor wells are excluded (as discussed below), the average transmissivity is about 1,230 gpd/ft and the average storage coefficient is about 6.7×10^{-5}. No particular difference is noted when comparing time-drawdown and time-recovery data.

Hydraulic Communication Between Sand Zones

Several of the time-drawdown plots revealed early-time deviations from the Theis curve. Among the wells completed in single zones (A, B, C, or D), deviations from the Theis curve were observed in wells 15L17A and 15L36(zone A), 15M35(zone B), 15M39(zone C), 15M67(zone D), and 16I85(zone B), although the recovery plot for well 16I85 showed no such deviation. At first inspection, these apparent deviations resemble those described by Javandel and Witherspoon (1969) for multilayered aquifers. According to these authors, at early time away from the pumped well, significant differences in potential develop between layers in a two-layer aquifer, for example, because of the more rapid removal of water from the higher permeability layer. This contrast of potential at a fixed radius, which leads to so-called "cross-flow", diminishes with time, and the deviation from the Theis curve also diminishes. The smaller the contrast in permeability between adjacent layers, the less the degree of cross-flow and the more rapidly the results will converge on the Theis curve. In examining the plots from single-zone wells, therefore, there should appear a consistent deviation from the Theis curve in the early data, the direction and magnitude of which should depend upon the relative permeabilities of the adjacent layers. Since the individual zones are supposedly separated by layers of lower permeability, (as defined by Mobil study of electric logs), it would seem reasonable to expect that all deviations for single-zone wells would reflect the relatively higher permeability of the zone itself. The results, however, were inconsistent, in that some data deviated above the Theis curve, some deviated below the Theis curve, and still others showed little or no deviation at all (see 15L64 recovery data for example). Since several of the wells open through zones A-D also exhibited apparent deviations from the Theis curve, the inferences concerning multilayered aquifers of a noncommunicating nature are inconclusive. What appears to be more consistent, on the other hand, are the transmissivities determined from both single-zone and multi-zone wells. Mobil indicates that the single-zone wells will be recompleted to multi-zone wells prior to wellfield startup.

Figure 4 shows the statistical distribution of transmissivity values selected from Table 1 for single sand wells (A, B, B-C, and D) and for those wells which are open to zones A-D. In general, one can note from Figure 4 that the range of values for each category is not greatly different from one another and that the median value (50-percent value) span is between 1150 and 1250 gpd/ft. The single-zone transmissivity values have a slightly lower median value compared with the fully penetrating A-D zone transmissivities. In our opinion,

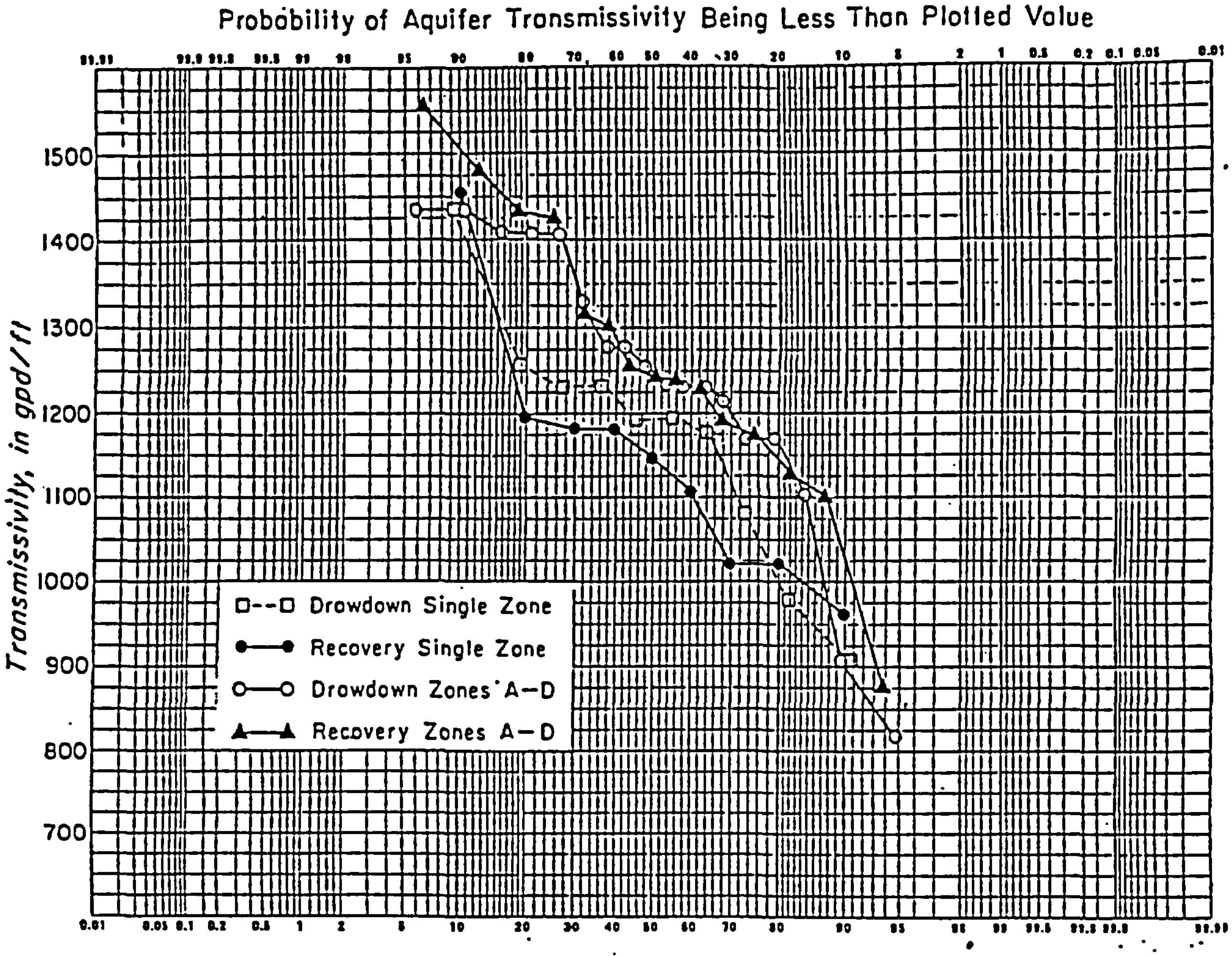


FIGURE 4. Statistical Distribution of Selected Recovery and Drawdown Values of transmissivity by Sand Zones

this difference is not significant. Finally, the values of transmissivity of Table 1 were plotted on a map of the South Trend Development Area. A study of that map showed an apparent random distribution in transmissivities. (See CDM Report)

A study was made of the available electric logs of the area and of the apparent separations and relative permeabilities of the A through E sands. While there appears to be a fairly well defined separation between the individual sand zones, the relative permeability of the separating layers compared to those of the A-E sands is not great. In addition, the thickness of the deposits separating the A-D sand zones varies significantly from place to place and in some areas disappears. Under these conditions it is not surprising that hydraulic communication is good and that the transmissivity variation between zone evaluations is not large. In our opinion, the pumping test data are not sufficiently definitive to differentiate hydraulic conductivities of individual sands. Since well 16P80 exhibited well completion problems, the vertical hydraulic connection between the D and E sand zones could not be determined.

In summary, the analysis of the test data suggest that the multizoned aquifer actually exhibited radial flow, especially in the latter stages of the test and that the multiple zones (A-D sands) behaved hydraulically nearly as a single layer. No evidence of aquifer boundaries appeared in the data, and it can reasonably be inferred, therefore, that the aquifer has generally consistent hydraulic properties of substantial areal extent and hydraulic connection.

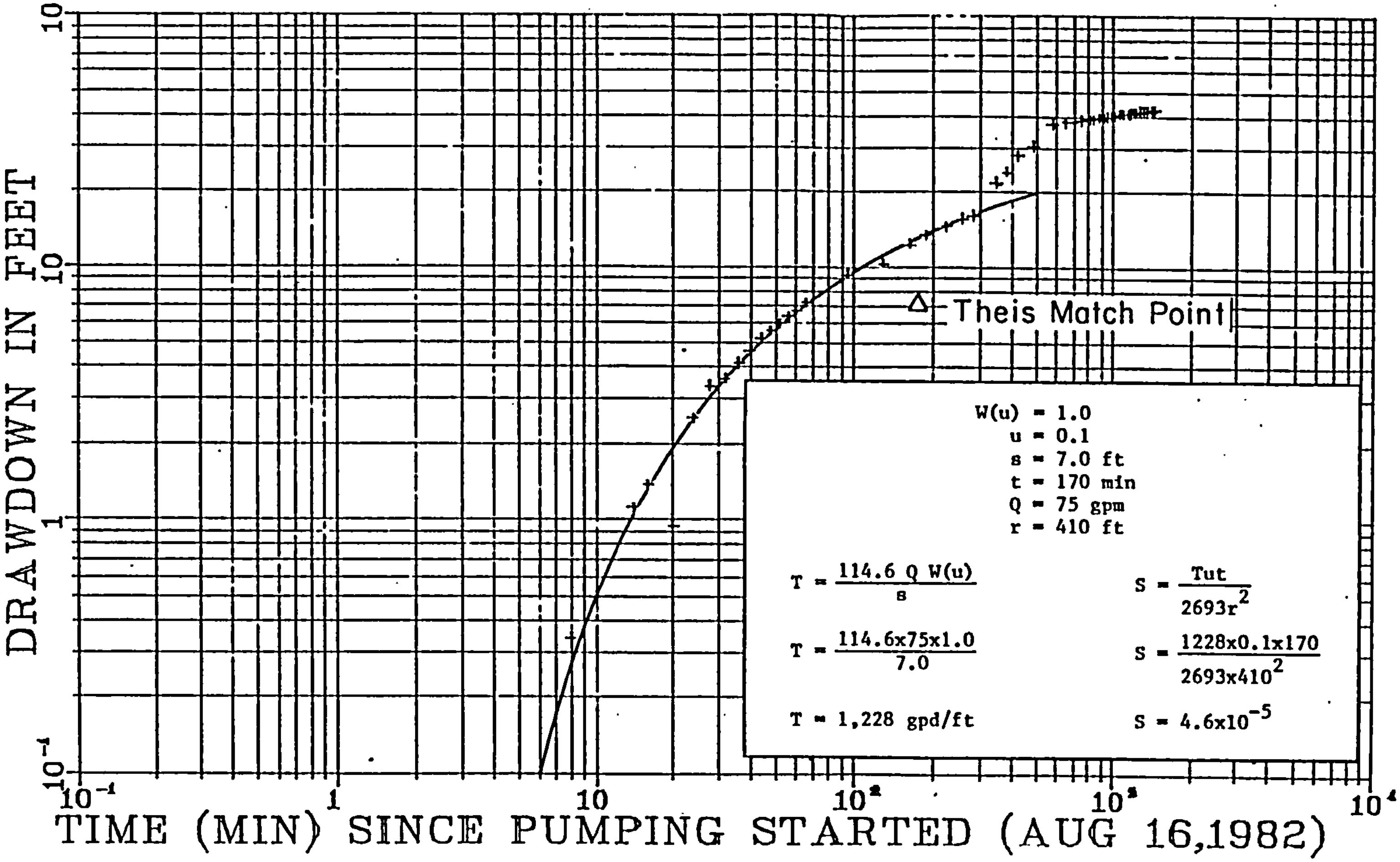
Problems Related to Mechanical Float Operation

Several of the type-curve "fits" were complicated by apparently vertical or horizontal offsets of the graphical plots. These offsets frequently could be traced to float sticking problems mentioned and described in the data report by CDM (1982). Float problems apparently plagued some of the recovery data just as they had during the drawdown test, although not necessarily in the same wells. A comparison of Figures 5 and 6 illustrates a typical float problem during drawdown that vanished during the recovery portion in well 15L64.

Furthermore, deviations in the early portions of the time-drawdown plots of single-zone wells 15L17A and 15L36 were not apparent during recovery, and in fact very good type-curve "fits" were possible in all of the single-zone wells except for 15M67 and 16P80 which will be discussed below. Therefore, the further speculation concerning the resemblance of deviations again from the Theis curve to those described by Javandel and Witherspoon (1969) for multilayered aquifers was not supported by analysis of the recovery data. Most of the deviations observed in the recovery plots were seen in wells open from zones "A" through "D" and can be explained by residual float problems for the most part.

Suspected Wells With Clogged Perforations or Completion Problems

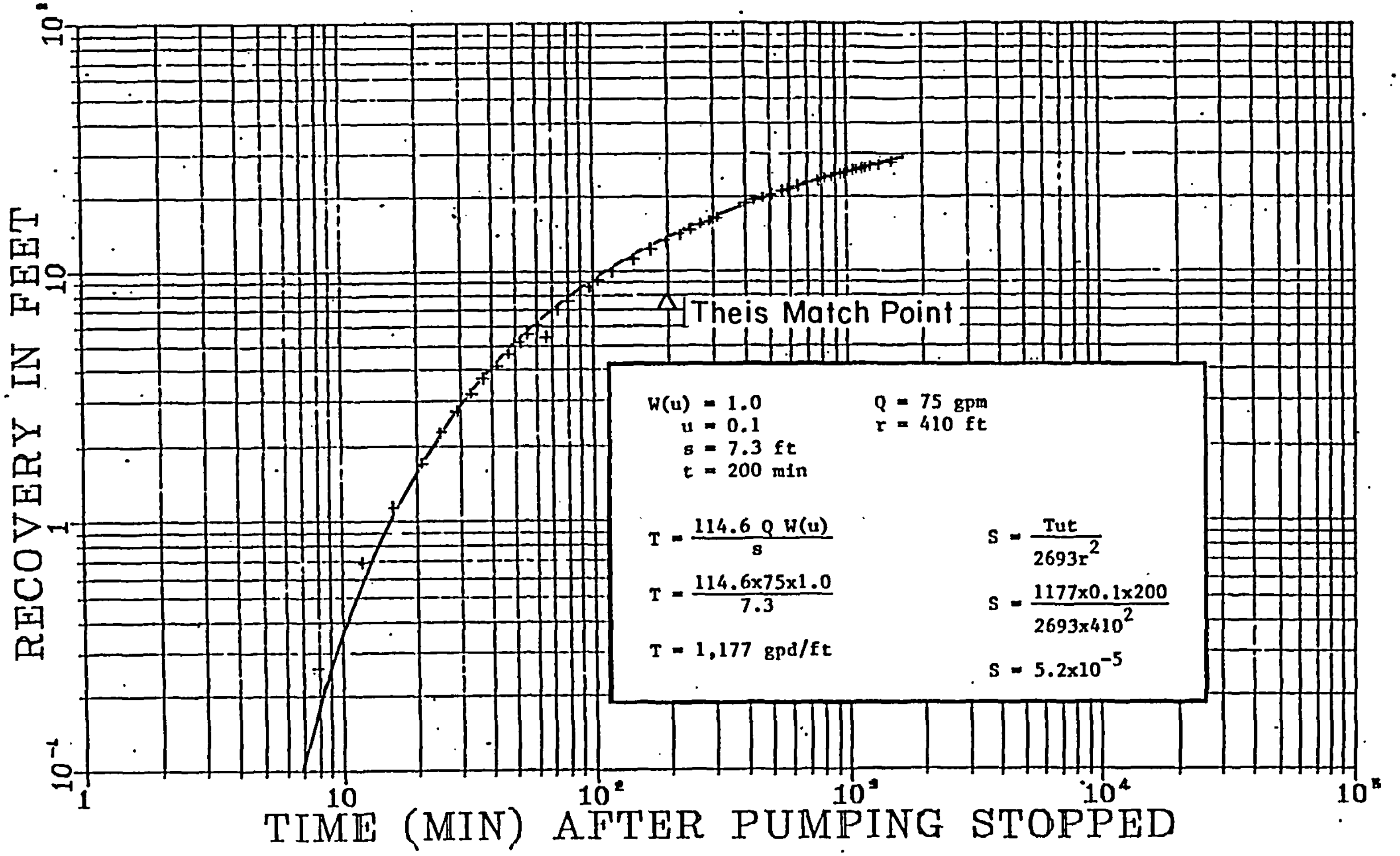
We believe data collected at wells 15L17, 15M67, and 16P80 indicate that these wells are partially clogged or have completion problems. In our opinion, the water level response in these wells does not represent a clean and free exchange of aquifer and well bore water.



DRAWDOWN (LOG VS LOG), WELL 15L64

CDM

FIGURE 5. Logarithmic Plot of Time-Drawdown Data for Well 15L64 Showing Example Float Related Problems.



$W(u) = 1.0$
$u = 0.1$
$s = 7.3$ ft
$t = 200$ min

$Q = 75$ gpm
$r = 410$ ft

$$T = \frac{114.6\ Q\ W(u)}{s}$$

$$T = \frac{114.6 \times 75 \times 1.0}{7.3}$$

$T = 1{,}177$ gpd/ft

$$S = \frac{Tut}{2693r^2}$$

$$S = \frac{1177 \times 0.1 \times 200}{2693 \times 410^2}$$

$S = 5.2 \times 10^{-5}$

TIME–RECOVERY PLOT(LOG VS LOG), WELL 15L64

CDM
environmental engineers, scient
planners, & management consult

FIGURE 6. Logarithmic Plot of Time-Recovery Data for Well 15L64 Showing Disappearance of Float Related Problems.

The analysis of aquifer coefficients from water level fluctuations at these wells is highly suspect. A discussion follows.

Data from Well 16P80 (open to the "E" horizon) were not amenable to analysis, since significant residual trends continued to decline for nearly 1200 minutes into the recovery. Initially it was hypothesized that the sluggish response of this well during the time-drawdown test could be due to leakage from the "E" horizon across the "D"-"E" aquitard to the "A"-"D" sections of the aquifer which were being directly pumped by Well 15M7. Upon closer inspection of the drawdown, recovery and pretest hydrograph data, it became apparent that Well 16P80 as well as 15L17 and 15M67 showed similar strong signs of poor perforation connection to the aquifer or that microannular completion problems existed.

It is our opinion that Wells 15L17 and 15M67 are at least partially clogged in their perforated sections. For instance, in 15L17 and 15M67, the pre-testing hydrograph shows little, if any, response to the preliminary pumping which took place on August 11, 1982. In addition, the log-log data traces show nearly linear response through most of the early portion of the recovery and, in Wells 15L17 and 16P80, little early response during the time-drawdown test. Finally, a comparison of drawdowns and recoveries in these wells with similar data from wells at comparable radial distances from the pumped well, identifies substantial discrepancies. Drawdowns and recoveries in all cases were noticeably smaller in these three wells than in comparably spaced wells.

For example, consider the substantial difference in the absolute value of both drawdown and recovery at wells 15L17 and 15L17A, 5.49 ft versus 10.71 ft and 4.27 ft versus 10.60 ft for drawdown and recovery respectively. Wells 15L17 (zones A-D) and 15L17A (zone A) are located 1275 ft and 1255 ft, respectively from the pumped well. The difference between these two wells in drawdown and recovery is too great, particularly when the common zone A (15L17A) has transmissivity values much greater than the apparently clogged A-D zone well (15L17).

In summary, we believe Wells 15L17, 15M67, and 16P80 need work to develop a free exchange of water between the well bore and the desired aquifer sand zone to be measured.

Considerations of Leakage Through or From the Brushy Basin Shale

Two monitoring wells were open in the Dakota Sandstone during the pumping test (15L101 and 16P101). Both of these wells showed a very gradual rise in water levels throughout the period of record before, during, and after the pumping test. Slight irregularities in water level movement were noted in these wells at times we believe to be unrelated to pumping. These irregularities were attributed to measuring equipment difficulties. Based upon a study of these water levels in relation to regional trends and the pumping test activities it is our opinion that drawdown was not measurable in the Dakota

Sandstone and that the effects of pumping in the Westwater Canyon aquifer had not reached the top of the Brushy Basin Shale.

Furthermore, a special pass was made through the drawdown and recovery plots looking for any indication of leakage via "bending over" of data beneath the Theis curve near the end of the test. Methods devised by Hantush (1964) for aquitard storage and leaky artesian conditions were used herein. No such indication of leakage from or through the Brushy Basin Shale was found. The main conclusions here were that there were no indications of water being released from storage or passing through the Brushy Basin shale during the period of the pumping test. This analysis reconfirms the conclusion above that the drawdown impacts on the Dakota Sandstone were nil, otherwise some sort of water level indications would have showed up in the Westwater monitor wells.

Final Comments on Overall Communications

CDM (1982) generated potentiometric surface maps for groundwater elevation data collected from all of the observation wells completed in the Westwater Canyon Member of the Morrison Formation. Two maps were completed to illustrate pretest conditions (August 15, 1982) and drawdown conditions (after about 24 hours of pumping on August 17, 1982). The pretest map (see CDM map A-1) depicts a northerly flow of water with some aquifer heterogeneities likely causing steeper gradients in the south than in the north. The drawdown condition (see CDM map A-2) shows groundwater flow everywhere toward the pumping well. All observation wells of map A-2 had significant drawdowns (even those that we believed to be partially clogged). The hydraulic communications is further illustrated by study of these maps. (See CDM Report)

As mentioned above, one may note slight indications of warping of piezometric contours from place to place and that heterogeneities no doubt play a role in local flow paths from place to place. However, one cannot escape notice of the fact that there are no indications of large scale heterogeneities present either vertically or horizontally in this system. Under conditions of pumping, there apparently will be communication between monitoring and pumping wells to the extent desired.

SUMMARY AND CONCLUSIONS

Based upon an evaluation of the pumping test data in the South Trend Development Area, we conclude that the average aquifer transmissivity and storage coefficients of the Westwater Canyon sands tested is 1,230 gpd/ft and 6.7×10^{-5}, that hydraulic communications between sand zones of the Westwater Canyon Member of the Morrison Formation is good, and the pumping test data are not sufficiently definitive to differentiate hydraulic conductivities of individual sands.

We have also concluded that wells 16P80, 15M67, and 15L17 are partially clogged or affected by completion problems and are in need of development. Leakage through or from the Brushy Basin Shale was not measurable during the pumping test. No drawdown impacts were measured in the Dakota Sandstone during the period of this test.

REFERENCES

Camp Dresser and McKee Inc., September 30, 1982. Data summary report Crownpoint-South Trend pumping test, McKinley County, New Mexico. Submitted to Mobil Oil Corporation, Uranium/Minerals Division, Denver, Colorado. (With time-recovery log-log graphs attached).

Hantush, M.S. 1964. Hydraulics of wells, in "Advances in Hydroscience", Academic Press, Inc., New York, New York.

Jacob, C.E. 1950. Flow of ground water. In "Engineering Hydraulics", (Edited by H. Rouse), John Willy and Sons, New York, pp. 321-386.

Javandel, Iraj and Paul A. Witherspoon, 1969. A method of analyzing transient flow in multilayered aquifers. Water Resources Research, Volume 5, Number 4, pp. 856-869.

Papadopulos, I.S. and H.H. Cooper, Jr., 1967. Drawdown in a well of large diameter. Water Resources Research, Volume 5, pp.241-244.

Theis, C.V., 1935. The relation between the lowering of piezometric surface and the rate and duration of discharge of a well using ground-water storage, Transactions of the American Geophysical Union, 16th Annual Meeting, Part 2.

ATTACHMENT Q

COPY

MAILED
DISTRICT COURT
MCKINLEY COUNTY
NM
Oct 19 11 27 AM '95

STATE OF NEW MEXICO
ELEVENTH JUDICIAL DISTRICT COURT
MC KINLEY COUNTY

UNITED NUCLEAR CORPORATION,
appellant,

-vs.-

ELUID L. MARTINEZ, NEW MEXICO
STATE ENGINEER,
appellee,

and

THE NAVAJO NATION,
appellee.

No. CV-92-72

RECEIVED
OCT 20 1995
CARPENTER, COMEAU et. al.

ORDER

THESE MATTERS came before the District Court on the State Engineer's Motion for Summary Judgment filed April 4, 1994 and Navajo Nation's Motion to Dismiss filed August 22, 1994. The Court, being fully advised of the premises, FINDS:

1. Sections 8 and 17, Township 16 North, Range 16 West, N.M.P.M., in question here as to jurisdiction, are not within the boundaries of the Navajo Nation nor are they Indian Country.

2. This appeal is the result of a State Engineer Office denial of UNC's application for transfer of declared water rights.

3. The application was denied because the State Engineer found, as a threshold matter, that UNC had insufficient rights to support the transfer application.

4. United Nuclear Corporation and State Engineer agree that this case is not aimed at adjudicating water rights and that the State Engineer is not empowered to make such a determination.

5. Applications under N.M. Stat. Ann. §72-12-7 (1985 Repl.

Pamp.) require that the applicant already be the "owner of a water right."

6. By its "Declaration of Ownership of Underground Water Right No. G-190" UNC has made a prima facie showing that it has a right to 650 g.p.m. (1048 acre feet per year).

7. Absent an adjudication to the contrary, and solely for the purpose of reviewing a transfer request, the amount of UNC's water right is presumed to be 650 g.p.m. (1048 acre feet per year).

8. The transfer application proposes to put 6,500 acre feet per year to beneficial use.

9. Comparison of UNC's declared right with the amount described in the transfer application shows, by simple subtraction, that UNC's presumed water right is insufficient to support its requested water right transfer.

Based on the above findings, the Court makes the following CONCLUSIONS OF LAW:

1. Because the sections of land at issue as to subject matter jurisdiction are not within the boundaries of the Navajo Nation, nor in Indian Country, water rights within them are subject to state law and this Court's jurisdiction.

2. N.M. Stat. Ann. §72-12-7(1985 Repl. Pamp.) does not describe what demonstration of ownership an applicant must make in order to proceed; but in the case of an unadjudicated, "pre-basin" claim [as in the case in the instant matter], a verified declaration under N.M. Stat. Ann. §72-12-5 (1985 Repl. Pamp.) is prima facie evidence of the truth of its contents.

3. While the State Engineer cannot adjudicate the amount of an owner's water right, he not only may, but he must determine whether the proposed change would result in a further appropriation. See N.M. Stat. Ann. §72-12-3 (1985 Repl. Pamp.).

4. UNC cannot, in the guise of applying for a change in use and diversion point, enlarge its water right.

5. The State Engineer, in all applications under N.M. Stat. Ann. §72-12-7(1985 Repl. Pamp.), before proceeding further, must determine as a threshold issue that the amount to be put to beneficial use is no greater than the actual water right. Otherwise the application must be denied.

6. Based on the undisputed facts, the application cannot be approved.

THEREFORE, the Navajo Nation's Motion to Dismiss for Lack of Subject Matter Jurisdiction is denied and the State Engineer's Motion for Summary Judgment is granted, dismissing UNC's de novo appeal.

Joseph L. Rich

The Honorable Joseph L. Rich
District Judge

Approved as to form:

____

Attorneys for Appellant UNC

____

Telephonically approved by Ann Finley Wright on 10/16/95

____

Attorneys for Appellee Martinez

Attorneys for Appellee Navajo Nation

ATTACHMENT R

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
Santa Fe

John R. D'Antonio Jr., P.E.
State Engineer

BATAAN MEMORIAL BUILDING, ROOM 102
SANTA FE, NEW MEXICO 87504-5102
(505) 827-6120
FAX: (505) 827-6682

May 19, 2004

Mr. Mark S. Pelizza
HRI, Inc.
650 S. Edmonds Lane, Ste. 108
Lewisville, Texas 75067

Certified – Return Receipt Requested

Re: Permit to Appropriate the Underground Waters of the State of New Mexico – OSE File No. SJ-125-T

Dear Mr. Pelizza:

Enclosed is your copy of the State Engineer Order, which overturns the previous denial of the subject application and approves the permit – subject to Conditions of Approval listed in the Order.

If you are aggrieved by this Order or by any of the Conditions of Approval, you must so advise this office *in writing* before the expiration of thirty (30) days after receipt of this letter and request that the previous action of the State Engineer be set aside and that a date for a hearing be set by the State Engineer.

Sincerely,

Jim L. Sizemore

Jim L. Sizemore, P.E.
Director, Water Rights Division

Cc: District V, Aztec (w/ encls)

Jay Stein (w/ encls)
Stein & Brockmann, P.A.
460 St. Michaels Dr., Suite 603
Santa Fe, NM 87505

STATE OF NEW MEXICO
OFFICE OF THE
STATE ENGINEER

IN THE MATTER OF THE APPLICATION)
BY HYDRO RESOURCES, INC. (ORIGINALLY)
FILED BY CONTINENTAL OIL CO.)
OSE FILE NO. SJ-125-T – SAN JUAN BASIN)

STATE ENGINEER ORDER

WHEREAS, on the 13th day of December 1976, the Continental Oil Co. filed the captioned application with the State Engineer for Permit to Appropriate the Underground Waters of the State of New Mexico and

WHEREAS, the Notice for Publication was published as required by Statute and the Affidavit of Publication was filed with the Office of the State Engineer on January 18, 1977; and

WHEREAS, no protests to the application were received; and

WHEREAS, on the 29th day of January 1980, the application was denied for the reason that the proposed appropriation of water would impair existing water rights; and

WHEREAS, on the 20th day of February 1980, aggrieval was filed with the decision taken by the Office of the State Engineer and request made that said decision be set aside; and

WHEREAS, on the 25th day of February 1980, the State Engineer set aside his denial of the captioned application; and

WHEREAS, by letter dated Jan. 23, 1981, Conoco amended SJ-125 by requesting a reduction in the amount of ground water to be appropriated to 15,000 AF/Y, of which 7,500 AF/Y would be appropriated in connection with the Crownpoint project and 7,500 AF/Y would be appropriated in connection with the Borrego Pass project; and

WHEREAS, by letter dated April 14, 1983, Conoco withdrew the Borrego Pass portion of the application and left the total request to be 7,500 AF/Y for the Crownpoint project; and

WHEREAS, on Feb.4, 1981 Conoco filed SJ-125-PR (Plan of Replacement). The Notice for Publication was issued February 26, 1981. The notice was published in the Gallup Independent on March 4, 11, & 18, 1981. The Affidavit of Publication was filed March 19, 1981. Several protests to the PR were filed but they were all eventually withdrawn; and

WHEREAS, over time, several changes of ownership for SJ-125 were filed whereby Hydro Resources, Inc. (HRI, Inc.) gained ownership of the captioned application; and

WHEREAS, HRI, Inc., by letter dated May 11, 2001, requested an amendment to the application and requested a reduction in the proposed appropriation to 650 AF/Y for "in situ" leach uranium recovery; and

WHEREAS, HRI, Inc., by letter dated May 11, 2001, stated that a maximum of 4000 gallons per minute would be re-circulated for in situ leach uranium recovery; and

WHEREAS, by letter dated May 23, 2003, HRI, Inc. withdrew SJ-125-PR (Plan of Replacement); and

WHEREAS, the state engineer did reconsider his denial of the captioned application and found that the original cause for denial, due to modifications of the application, are no longer valid, NOW THEREFORE, the State Engineer of the State of New Mexico hereby overturns the original denial of the application and approves the application subject to the following Conditions of Approval:

1. This application is approved as follows:

Permit No.:
SJ-125-T
Priority:
December 13, 1976
Source:
The Westwater Member of the Morrison Formation – San Juan Underground Water Basin

Point of Diversion: Deep Artesian Wells as listed in the original application to be located in McKinley County, NM on 40-acre tracts as follow:

Location – NMPM	Depth (ft.)	Casing Size (in.)
NE1/4 SE1/4 Section 24, T.17N., R.13W.	2200	24" – Max.
NE1/4 SE1/4 Section 24, T.17N., R.13W.	2200	20" – Max.
SE1/4 SE1/4 Section 24, T.17N., R.13W.	2200	20" – Max.

Purpose of Use: In-situ leach uranium recovery.

Place of Use: HRI's Crownpoint Section 24 Mine Site

2. **Amount of Water:** This permit authorizes the temporary appropriation for consumptive use of a maximum of 650 acre-feet of water per annum from the Westwater Member of the Morrison Formation – San Juan Underground Water Basin for in-situ leach uranium recovery. A maximum of 4000 gallons per minute may be re-circulated.

3. This permit is hereby renumbered from SJ-125 to SJ-125-T so as to indicate the right conveyed by this permit is temporary in nature. This permit does not establish a transferable water right.

4. Diversion for consumptive use shall not exceed 650 acre-feet per annum from all combined points of diversion under this permit. The state engineer must be notified by letter to; Office of the State Engineer, Aztec Sub-Office, 100 South Oliver Drive, Aztec, NM 87410-2432; of the date pumping will begin.

5. The permittee shall notify the state engineer prior to drilling and/or plugging of each well proposed to be drilled or plugged under this permit – whether it be a production well or an injection well or an observation well. The notification shall specify the diameter, the proposed location (by GPS location), the intended purpose, the anticipated depth and the schedule for construction. The permittee shall comply with state engineer rules and regulations regarding construction and/or plugging of artesian wells.

6. The permittee shall install the metering devices necessary to record total diversions from all points of diversion and the total amount of water injected into underground aquifers. The devices shall be of a type and shall be installed at locations and in configurations acceptable to the state engineer.

7. Meter readings for each meter shall be reported to the Aztec Sub-Office, Office of the State Engineer on a quarterly basis. Readings must be received in the Aztec Sub-Office by the 10th of the month for the preceding 3-month period - in January, in April, in July and in October. Zero meter readings must be reported if no water is diverted during any quarter. The calculated amount of consumptive use – diversions minus the amount of water injected – for each quarter will also be reported with the meter readings. The meter readings shall be sent to the address listed in Condition No. 3 above.

8. Each year, prior to diverting water from any point of diversion, an annual operating plan shall be submitted to the state engineer. The plan shall detail proposed quarterly pumping schedules and shall detail proposed diversion amounts, proposed consumptive use amounts and proposed injection amounts. The operating plan shall be updated on a quarterly basis if the plan changes significantly.

The plan shall be submitted by the 1st day of December for the next calendar year that diversions are planned. The plan shall be sent to the Aztec Sub-Office at the address listed in Condition No. 3 above.

9. The permittee shall abide by all federal and state permits, laws and regulations during the exercising of their rights under this permit.

10. The permittee shall not exercise this permit if it impairs existing rights, if it is contrary to the conservation of water or if it is detrimental to the public welfare of the state of New Mexico.

11. The permittee shall utilize the highest and best technology available to ensure conservation of water to the maximum extent practical.

12. The State Engineer retains jurisdiction over this permit due to the fact that the Nuclear Regulatory Commission (NRC) permits the mining activity for which this permit is issued. NRC regulatory requirements may change and may adversely affect groundwater as authorized by this permit. Any changes to mining methods, whether or not dictated by NRC, shall be individually evaluated by the State Engineer for compliance with the conditions of approval for this permit. The State Engineer retains jurisdiction over this permit for the purpose of modifying the frequency of meter reading submittals, if he deems appropriate.

13. This permit shall expire on June 1, 2044.

Witness my hand and official seal this 18th day of May 2004.

John R. D'Antonio, Jr. P.E.
State Engineer

Jim L. Sizemore

by: Jim L. Sizemore, P.E.
Director, Water Rights Division

ATTACHMENT S

COTTER

August 5, 2004

Mark Pelizza
Uranium Resources, Inc.
641 East FM 1118
Kingsville, Texas 78363

Subject: Cost Proposal for Byproduct Materials

Dear Mark:

Based upon our recent discussions relating to the disposal of Byproduct Material generated as a result of in-situ uranium recovery projects owned by Uranium Resources, Inc. ("URI"), located in the State of Texas and commonly know as the Kingsville Dome, Rosita and Vasquez Mines you (1) requested Cotter to provide URI with a proposal of basic cost and other terms; and (2) forwarded to Cotter an initial draft of a proposed form of Agreement, a copy of which is attached to this letter..

1. Draft Form of Agreement.

Subject to incorporation of the terms of the following proposal as well as other changes, modifications and additional terms to be mutually agreed upon the draft Agreement must be finalized prior to acceptance of materials at the Cotter milling facility.

2. Proposed Basic Cost and Other Terms.

The following are proposed:

a. URI shall be responsible for all costs and expenses associated with compliance by Cotter with the rules and regulation of CDHPE and DOE, public meetings, county costs and costs associated with HB 1358 or future proposed regulations having regulatory costs related to the disposal of this Byproduct Material as defined in the attached draft proposed Agreement.

Cotter Corporation
7800 E. Dorado Place, Suite 210, Englewood, CO 80111

Telephone (720) 554-6200
Fax (720) 554-6201

b. For Byproduct Material consisting of soils, sand, gravel, rock, concrete rubble within size specification, masonry-type demolition material, unpackaged pond sediments, PVC, fiberglass, and process equipment: $50.00/cu yd.

c. For Byproduct Material consisting of ion exchange resin, and packaged or drummed demolition and process waste, including PVC, fiberglass, process equipment, and other miscellaneous items not included as bulk material in (ii): $10.00/cu. ft.

d. A charge of $35.00 per hour shall be made for unloading time at the Canon City Mill.

e. A decontamination charge of $130.00 per hour, or any part thereof, will be made in the event Cotter determines that any truck or container has been contaminated to the extent that additional decontamination efforts are required due to surface contamination not caused by Cotter actions.

f. Any truckload consisting of any combination of materials specified in (b), and (c) will be charged at the rates provided in (c). The determination of "cubic yard" or "cubic feet" shall be based on the shipping container or package volume.

g. All above dollar figures in final Agreement will be subject to increases based upon a yet to be determined and negotiated price index.

This proposal shall remain in effect for a period of one year from the date of this letter, unless expressly extended in writing by Cotter.

If you have any questions, comments or concerns regarding this proposal please do not hesitate to contact me.

Sincerely,

Rich Ziegler
Executive Vice President

Enclosure:

ATTACHMENT T

TRC Form 12-1
08/04

Department of State Health Services

RADIOACTIVE MATERIAL LICENSE

Pursuant to the Texas Radiation Control Act and Texas Department of State Health Services (Agency) regulations on radiation, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess and transfer radioactive material listed below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations and orders of the Agency now or hereafter in effect and to any conditions specified below.

LICENSEE

1. Name	WASTE CONTROL SPECIALISTS LLC ATTN TERENCE MOORE
2. Address	P O BOX 1129 ANDREWS TX 79714

This license is issued in response to a 2-year fee payment

Remitted: November 29, 2004

3. License Number	Amendment Number
L04971	33

PREVIOUS AMENDMENTS ARE VOID

4a. License Expiration Date
November 30, 2006

4b. Technical Renewal Application Due Date
November 30, 2004

RADIOACTIVE MATERIAL AUTHORIZED

5. Radioisotope	6. Form of Material	7. Maximum Activity*	8. Authorized Use
A. Any radioactive material (includes radioactive waste, byproduct material as defined at Texas Health and Safety Code §401.003(3)(B), uranium ore received as waste, NORM waste, and/or oil and gas NORM waste)	A. Solid or liquid	A. Activities per category group as specified under 25 TAC° §289.254(d)(1), not to exceed the following: Category I: 2,000 Ci Category II: 20,000 Ci Category III: 200,000 Ci Category IV: 2,000,000 Ci	A. Receipt, processing of radioactive material received as waste, in-house decontamination, interim storage, and transfer to licensed radioactive waste disposal sites, the licensed generator, or return to an authorized federal agency.
B. Any radioactive material	B. Sealed sources	B. Total activity not to exceed 150,000 Ci	B. Receipt, interim storage, and transfer to licensed radioactive waste disposal sites, other licensed recipients, or return to an authorized federal agency.
C. Any radioactive material	C. Solid	C. Activity for Category I as specified under 25 TAC° §289.254(d)(1), not to exceed 33,000 Ci	C. Receipt, interim storage of pre-packaged, stabilized dry-active waste from an authorized federal agency, and transfer to licensed radioactive waste disposal sites, or return to an authorized federal agency.

* Ci-Curies mCi-Millicuries µCi-Microcuries

° Texas Administrative Code (TAC)

Department of State Health Services

RADIOACTIVE MATERIAL LICENSE

LICENSE NUMBER	AMENDMENT NUMBER
L04971	33

5. Radioisotope (continued)	6. Form of Material (continued)	7. Maximum Activity* (continued)	8. Authorized Use (continued)
D. Sr-90	D. Sealed sources	D. No single source to exceed 1 uCi, Total: 5 μCi	D. Calibration reference sources.
E. Any radioactive material	E. Solid or liquid	E. No single isotope to exceed 100 μCi, no combination of isotopes to exceed 500 μCi, Total: 2 mCi	E. Calibration reference sources.
F. Any radioactive material	F. Plated or sealed sources	F. No single isotope to exceed 15 μCi, no combination of isotopes to exceed 50 μCi, Total: 1 mCi	F. Calibration reference sources.
G. Cs-137	G. Sealed source (JL Shepherd model 6810; IPL model 193)	G. Two sources, one not to exceed 330 Ci, and the other not to exceed 300 mCi	G. Calibration of survey instruments using a JL Shepherd calibrator device, model 78 (-2M) Series with an attached, shielded JL Shepherd calibration range device, model 89 Series.

9. Radioactive material shall be used only at:

Site Number	Location
000	Andrews - One mile North of State Highway 176, 250 feet East of TX/NM State Line (30 miles West of Andrews, TX)

10. Copies of all active documents and records required by this license shall be maintained for Agency review at Site 000.

11. The licensee shall comply with the provisions (as amended) of Title 25 TAC §289.201, §289.202, §289.203, §289.204, §289.205, §289.251, §289.252, §289.254, and §289.257.

12. The individual designated to perform the functions of Radiation Safety Officer (RSO) for activities covered by this license is Terence Moore.

13. Radioactive material shall be used by individuals designated by the RSO only after each worker has successfully completed the training specified in the Radiological Training Program. Documentation verifying the successful completion of the training for each user shall be maintained by the licensee for inspection by the Agency. All training shall be supervised by Terence Moore.

14. The licensee shall submit a current resume listing all pertinent education, training and experience for any individual who replaces the following positions: Management Oversight representative, Radiation Safety Supervisor, Facility Manager, Operations Manager, Laboratory Manager, and/or Environmental Health & Safety Manager.

15. For the purposes of this license, the following definitions apply:

    A. Appropriately authorized: the activity has been formally authorized by the State or Federal agency, which has jurisdiction over the issue.

    B. Authorized federal agency: the United States Department of Energy (DOE) or the United States Department of Defense (DOD) without limited purpose, or the United States Environmental Protection Agency (EPA) for the limited purpose of the material derived from the decommissioning of the Gulf Nuclear of Louisiana, Inc. facilities at 202 Medical Center Boulevard in Webster, Texas and 9320 Tavenor Street in Houston, Texas, upon written, executed agreement with the licensee that specifies that the authorized federal agency will take back and assume responsibility for all of its waste currently maintained at the licensee's facility within 30 days of written notification by the Agency that the waste is ready for removal, and that all associated expenses for such will be borne by the authorized federal agency to the extent that they are not covered by the licensee's financial assurance. These provisions will only apply if the licensee has failed to properly decontaminate and decommission the facility or otherwise failed to comply with an Agency order.

    C. Interim storage: Waste packaged in accordance with Title 49 Code of Federal Register (CFR), (as amended), and that meets current or stated acceptance requirements for an authorized disposal facility or an authorized federal agency.

    D. Waste: Radioactive waste, byproduct material as defined in Section 401.003(3)(B) of the Health and Safety Code (as amended), uranium ore, NORM waste, and/or oil and gas NORM waste.

    E. Permacon: refers to the east end of the stabilization building modified in accordance with the references specified in Condition 33.A of this license.

16. Copies of authorized federal agency agreements specified in License Conditions 15.B, 19.C, and 23.D, shall be mailed within seven (7) days of execution and prior written approval of the agreement must be granted by the Agency prior to receipt of the waste. The written agreement shall be mailed to:

    ATTN: Radiation Safety Licensing Branch Manager
    Regulatory Services
    Department of State Health Services
    1100 W. 49th Street
    Austin TX 78756-3189

17. The licensee is hereby authorized to perform in-house pocket dosimeter calibration. The calibrations shall be performed under the supervision of the RSO.

18. The licensee is hereby authorized to perform in-house leak test analysis. The analysis shall be performed under the supervision of the RSO.

19. A. In accordance with the Order (Docket No. 70-7005), dated November 5, 2004, issued by the United States Nuclear Regulatory Commission (NRC), the Licensee may possess special nuclear material (SNM) within the restricted area of the Licensee's facility provided that:

(1) Concentrations of SNM in individual waste containers and/or during processing must not exceed the following values:

SNM Radionuclide	Operational Limit (gram SNM/gram waste)	Measurement Uncertainty (gram SNM/gram waste)
U-233	4.7 E - 4	7.1 E - 5
U-235 (10 percent enriched)	9.9 E - 4	1.5 E - 4
U-235 (100 percent enriched)	6.2 E - 4	9.3 E - 5
Pu-239	2.8 E - 4	4.2 E - 5
Pu-241	2.2 E - 4	3.2 E - 5

When mixtures of these SNM radionuclides are present in the waste, the sum-of-the-fractions rule, as illustrated below, should be used.

$$\frac{U-233conc}{U-233\lim}+\frac{100wt\%U-235conc}{100wt\%U-235\lim}+\frac{10wt\%U-235conc}{10wt\%U-235\lim}+\frac{Pu-239conc}{Pu-239\lim}+$$

$$\frac{Pu-241conc}{Pu-241\lim}\leq 1$$

The measurement uncertainty values in column 3 above represent the maximum one-sigma uncertainty associated with the measurement of the concentration of the particular radionuclide.

The SNM must be homogeneously distributed throughout the waste. If the SNM is not homogeneously distributed, then the limiting concentrations must not be exceeded on average in any contiguous mass of 600 kilograms.

(2) Waste must not contain "pure forms" of chemicals containing carbon, fluorine, magnesium, or bismuth in bulk quantities (e.g., a pallet of drums, a B-25 box). By "pure forms," it is meant that mixtures of the above elements such as magnesium oxide, magnesium carbonate, magnesium fluoride, bismuth oxide, etc. do not contain other elements. The presence of the above materials will be determined and documented by the generator, based on process knowledge or testing.

19. A. (continued)

(3) Waste accepted must not contain total quantities of beryllium, hydrogenous material enriched in deuterium, or graphite above one tenth of one percent of the total weight of the waste. The presence of the above materials will be determined and documented by the generator, based on process knowledge, or testing.

(4) Waste packages must not contain highly water-soluble forms of SNM greater than 350 grams of U-235 or 200 grams of U-233 or 200 grams of Pu. The sum of the fractions rule will apply for mixtures of U-233, U-235 and Pu. When multiple containers are processed in a larger container, the total quantity of soluble SNM shall not exceed these mass limits. Highly soluble forms of SNM include, but are not limited to: uranium sulfate, uranyl acetate, uranyl chloride, uranyl formate, uranyl fluoride, uranyl nitrate, uranyl potassium carbonate, uranyl sulfate, plutonium chloride, plutonium fluoride, and plutonium nitrate. The presence of the above materials will be determined and documented by the generator, based on process knowledge or testing.

(5) Processing of mixed waste containing SNM will be limited to chemical stabilization (i.e., mixing waste with reagents). For batches with more than 600 kilograms of waste, the total mass of SNM shall not exceed the concentration limits in Condition 19.A.1., times 600 kilograms of waste.

(6) Prior to shipment of waste the Licensee shall require generators to provide a written certification containing the following information for each waste stream:

a. Waste Description. The description must detail how the waste was generated, list the physical forms in the waste, and identify uranium chemical composition.

b. Waste Characterization Summary. The data must include a general description of how the waste was characterized (including the volumetric extent of the waste, and the number, location, type, and results of any analytical testing), the range of SNM concentrations, and the analytical results with error values used to develop the concentration ranges.

c. Uniformity Description. A description of the process by which the waste was generated showing that the spatial distribution of SNM must be uniform, or other information supporting spatial distribution.

d. Manifest Concentration. The generator must describe the methods to be used to determine the concentrations on the manifests. These methods could include direct measurement and the use of scaling factors. The generator must describe the uncertainty associated with sampling and testing used to obtain the manifest concentrations.

19. A. (6) (continued)

The Licensee shall review the above information and, if adequate, approve in writing this pre-shipment waste characterization and assurance plan before permitting the shipment of a waste stream. This will include statements that the Licensee has a written copy of all the information required above, that the characterization information is adequate and consistent with the waste description, and that the information is sufficient to demonstrate compliance with Subparts (1) through (4) of this condition. Where generator process knowledge is used to demonstrate compliance with Subparts (1), (2), (3), or (4), the Licensee shall review this information and determine when testing is required to provide additional information in assuring compliance with the Subparts. The Licensee shall retain this information as required by the State of Texas to permit independent review.

At the time the waste is received, the Licensee shall require generators of SNM waste to provide a written certification with each waste manifest that states that the SNM concentrations reported on the manifest do not exceed the limits in Subpart (1) of this condition, that the measurement uncertainty does not exceed the uncertainty value in Subpart (1) of this condition, and that the waste meets Subparts (2) through (4) of this condition.

The Licensee shall require generators to sample and determine the SNM concentration for each waste stream at the following frequency: (a) if the concentrations are above one-tenth the SNM limits as specified in Subpart (1) of this condition, once per 600 kg, (b) if the concentrations are below one-tenth and greater than one-hundredth of the SNM limits, once per 6,000 kg, and (c) if the concentrations are below one-hundredth of the SNM limits, once per 60,000 kg.

If the waste is determined to be not homogeneous (i.e., maximum, which cannot exceed the limits in Subpart (1) of this condition, and minimum testing values performed by the generator are greater than five times the average value), the generator shall sample and determine the SNM concentration once per 600 kg thereafter, regardless of the SNM concentration. In this case, samples shall be a composite consisting of four uniformly sampled aliquots.

The certifications required under this condition shall be made in writing and include the statement that the signer of the certification understands that this information is required to meet the requirements of the NRC and must be complete and accurate in all material respects.

(7) The Licensee shall sample and determine the SNM concentration for each waste stream at the following frequency:

a. if the concentrations are above one-tenth the SNM limits as specified in Subpart (1) of this condition, once per 1,500 kg for the first shipment and every 6,000 kg thereafter;

19. A. (7) (continued)

b. if the concentrations are below one-tenth and greater than one-hundredth of the SNM limits, once per 20,000 kg for the first shipment and every 60,000 kg thereafter; and

c. if the concentrations are below one-hundredth of the SNM limits, once per 600,000 kg.

This confirmatory testing is not required for waste to be disposed of at the United States Department of Energy's Waste Isolation Pilot Project facility located near Carlsbad, New Mexico.

If the waste is determined to be not homogeneous (i.e., maximum and minimum testing values performed by the generator are greater than five times the average value), the Licensee shall sample and determine the SNM concentration once per 1,500 kg for the first shipment and every 6,000 kg thereafter, regardless of SNM concentration. In this case, samples shall be a composite consisting of four uniformly sampled aliquots.

(8) The Licensee shall notify the NRC, Region IV office and the Department of State Health Services/Radiation Safety Licensing Branch within 24 hours if any of the above Subparts of this condition are violated. A written notification of the event must be provided within 7 days to both agencies.

(9) The Licensee shall obtain NRC approval and secure an amendment to this license prior to changing any activities associated with the Subparts of this condition.

B. The licensee shall manage waste containing SNM in accordance with the order from the NRC, as specified in Condition 19.A of this license, and the licensee's operational procedures titled "Special Nuclear Material Exemption Certification" designated OP-1.2.22, Revision 0.

C. Not withstanding the licensee's procedures, the licensee is authorized to possess transuranics (nuclides with an atomic number greater than 92) in concentrations greater than 100 nanocuries per gram (nCi/g). Prior to receipt of transuranics with concentrations exceeding 100 nCi/g, the licensee shall obtain an executed, written agreement from an authorized federal agency. The agreement shall meet the terms of the agreement specified in Condition 15.B of this license. Furthermore, in no respect shall this authorization be construed as to allow the limitations specified in Part A of this condition to be exceeded or violated.

20. The licensee is authorized to perform in-house decontamination of surface contaminated objects, contaminated through the course of the licensee's authorized activities or as a consequence of shipment of radioactive waste to the licensee's facility (e.g., containers, coverings, bracing, etc.), and/or surface contaminated objects removed from bulk waste, in the confines of the "Permacon" portion of the Stabilization Building, in accordance with the following:

20. (continued)
    A. utilizing the PlasBlast Model 5050, or equivalent, in accordance with procedures submitted in the application dated January 24, 1997; or

    B. utilizing the methods and procedures identified in "Decontamination of Material", OP-1.4.8, issue date 4/25/99.

21. Radioactive material described in Parts A and B of Conditions 5, 6, 7 and 8 shall only be transferred to the initial generator, to an appropriately authorized waste disposal facility, or to an appropriately authorized waste processor. Documentation of recipient's authorization shall be maintained for inspection for a minimum of five (5) years.

22. The licensee is authorized to process waste. Such processing shall be performed in accordance with the procedures and commitments submitted in the application dated January 24, 1997, or new or modified procedures specified in Condition 36 of this license, and are limited to the following:

    A. Receipt and survey;

    B. Repackaging;

    C. Compaction and consolidation utilizing a Model 55R RAMFLAT, or equivalent, compactor. This use is restricted to the Stabilization Building;

    D. Processing and/or treatment of waste in the following methods:

        (1) Solidification/stabilization, chemical fixation, oxidation, reduction, and/or pH adjustment of liquid or solid radioactive waste using media acceptable to low-level waste disposal sites utilizing the following:

            a. a 55-gallon Enrico Barrel Mixer, or equivalent;

            b. a Prentice Arm, or equivalent, in accordance with OP-1.4.10, Revision 0, Issue Date 8/16/00, titled "Bulk Solidification/Stabilization Operations" and OP-1.4.11, Revision 0, Issue Date 8/18/00, titled "Prentice Arm Operations"; and/or

            c. a 450-gallon paddle blender in accordance with OP-1.4.16, Revision 0, Issue Date 5/7/04, titled "Operation of the Marion Paddle Mixer, Model #3061."

        The use of these methods is restricted to the "Permacon".

22. D. (continued)

(2) Treatment of cesium-137-contaminated electric arc furnace dust (United States Environmental Protection Agency designation KO61) and incident related material utilizing the procedure described in module OP-1.4.7, issue date of 9/18/98, revision 1, titled "KO61 And Incident Related Material Stabilization Process." In addition to the procedures described in OP-1.4.7, all doors to the stabilization building shall be closed and remain closed during the processing of the waste.

(3) Solvated Electron Technology (SET) of mixed-waste using the Commodore D/2 unit for pilot testing in accordance with the commitments made in the letters dated September 9, 1999 (with attachments), October 6, 1999 (with attachments, including the procedures identified as wCs Work Instruction for the Commodore D/2 Unit, WI99-1.16), and October 7, 1999 (with attachments). This treatment method is restricted to the following waste matrices and radionuclides:

Waste Matrix	Radionuclides
Soil (degreaser sludge)	U-234, U-235, U-238, Cs-137, K-40
Moist solids, water on top	U-234, U-235, U-238, Cs-137
Oil/Freon	U-234, U-235, U-238, K-40, Co-57, Co-60, Cs-134, Cs-137, Ce-144, Eu-152, Eu-156, Rb-106, Sb-125, Zn-65, Pb-212
Freon soaked soil	U-234, U-235, U-238, Cs-137, K-40
Sodium contaminated metals	Co-60
Floor removal wastes	Ag-116, Co-58, Co-60, Cs-137
Thinners and solvents	Co-60, Cs-137, Ce-144, H-3, C-14, Tc-99, I-129
Spill Cleanup Material	Co-60, Sb-125, Cs-134, Cs-137
Sludge	K-40, Co-60, Sb-125, Cs-134, Ra-226, Cs-137
Waste grease	Co-60, Cs-134, Cs-137
Compactor Sludge	Ag-110, C-14, Co-58, Cs-134, Cs-137, Fe-55, Sb-125, H-3, Mn-54, Ni-63, Sr-90, Tc-99, U-234, U-238, Zn-65
Sludge	Co-60, Cs-134, Cs-137, Eu-154, Eu-155, Mn-54, Sb-125, Zn-65

(4) Solvated Electron Technology (SET) using the Commodore SL2 unit for pilot testing in accordance with the commitments made in the letter dated December 22, 2000 (with attachments), (with attachment titled "SL2 Description and Information" consisting of seven (7) pages).

E. Interim storage of radioactive waste in the Bin Storage Unit 1, Container Storage Area, LSA Storage Area, Container Storage Building and the Stabilization Building.

22. (continued)

F. Research and development in the treatment of radioactive waste using the Commodore Mobile Demonstration Unit as described in and in accordance with the limitations and specifications contained in the letters dated February 3, 1999 and April 23, 1999, and attachments and enclosures, including wCs Work Instructions for CMDU2, dated April 9, 1999, WI99-1.2 and Attachment A to WI99-1.2.

G. Shredding, in accordance with OP-1.4.12, Revision 0, Issue Dated 8/18/00, titled "Shredder Operations".

H. Demonstration of the In Container Vitrification Process in accordance with document titled "In-Container Vitrification Treatability Demonstration of Mixed TSCA Low Level Radioactive Waste" dated April 2004 (revision 6); drawing titled "Wall Penetration at Permacon for AMEC/Geomelt Melt Cables" date issued 03-25-2003; drawing titled "Wall Penetration at Permacon for AMEC/Geomelt Vent Pipe" date issued 03-25-2003; document titled "Intermediate Scale Geomelt System; Safe Operating Procedure (SOP)" dated May 7, 2003; and responses made in the letter dated May 23, 2003, signed by Stephen L. Cook, P.E.

In spite of the procedures titled "Intermediate Scale Standard Operating Procedures (SOP)" Revision 2, dated 5/7/2003, all components of the In Container Vitrification Process shall meet the criteria for release of equipment to unrestricted use as specified at 25 TAC § 289.202(ggg)(6) when the equipment is released from the licensee's facility for unrestricted use. The licensee shall make a record of the surveys made to demonstrate that the release criteria has been met and retain the record of those surveys for inspection by the agency, or if transferred as radioactive material, the licensee shall retain a copy of the recipient's radioactive material license for inspection by the agency.

23. In addition to the limits specified by Conditions 5, 6, 7 and 8, the licensee shall restrict possession of waste to the following conditions.

A. The total volume physically present shall not exceed 1,802,865 cubic feet and shall be further limited to the following building limitations:

1. Bin Storage Unit 1: 87,480 cubic feet
2. *Container Storage Building: 36,750 cubic feet*
3. Stabilization Building: 8,000 cubic feet
4. LSA Storage Area: 1,500,000 cubic feet
5. Container Storage Area: 174,960 cubic feet

23. (continued)

B. Any waste container shall be counted as a full container in the volume inventory unless it can be readily verified as empty.

C. Waste stored in the Bin Storage Unit 1, Container Storage Area, or LSA Storage Area that is not contained within a High Integrity Container will be restricted to Low Specific Activity or Surface Contaminated Object, as defined by Title 10 of the Code of Federal Regulations (CFR) Part 71 (as amended), or depleted uranium.

D. The volume authorized in License Condition No. 23.A shall be further limited in accordance with the amount of Financial Assurance in place with the Agency:

1. Financial Assurance = $18,467,478. No more than 1,039 cubic feet of waste that has a current commercial disposal option, 58,320 cubic feet of cesium-137-contaminated electric arc furnace dust (U. S. Environmental Protection Agency designation KO61) or waste from authorized federal agencies, and 1,743,506 cubic feet of waste from authorized federal agencies; or

2. Financial Assurance = $32,881,617. No more than 19,211 cubic feet of waste that has a current commercial disposal option, 58,320 cubic feet of cesium-137-contaminated electric arc furnace dust (U. S. Environmental Protection Agency designation KO61) or waste from authorized federal agencies, and 1,725,334 cubic feet of waste from authorized federal agencies.

3. The volume of waste that has a current commercial disposal option authorized in License Condition Nos. 23.D.1 and 23.D.2 may include up to 2,700 cubic feet of commercial mixed waste that cannot be processed into a form that has a current disposal option.

24. All waste not in storage shall be physically restricted in the following ways:

A. (1) waste meeting the requirements of low specific activity group I radioactive material, as specified in Title 49 of the CFR (as amended), shall be processed within the confines of the Stabilization Building; and

(2) all other waste shall be processed within the confines of a PERMACON, or equivalent, structure; or

B. waste shall be packaged in accordance with Title 49 of the CFR (as amended) requirements while in transit between the Bin Storage Unit 1, Container Storage Area, LSA Storage Area, Container Storage Building, Stabilization Building, or offsite.

25. All waste holding times shall be limited to the following:

A. All waste received for purposes of processing, shall be initially processed within 30 days of placement within the Stabilization Building. All waste shall be transferred out of the Stabilization Building within 90 days of placement within the Stabilization Building;

25. (continued)

B. All waste shall be placed into interim storage or transferred to an authorized recipient within 365 days of the initial date of receipt; and

C. All waste authorized under License Condition No. 23.D.3 shall be returned to the generator or an appropriately authorized waste processor within 180 days of determining the waste is subject to License Condition No. 23.D.3.

D. Regardless of the holding time limits, waste with hazardous constituents requiring a permit issued by the Texas Commission on Environmental Quality (TCEQ) to possess, treat, and store, that is mixed waste, shall meet the conditions for treatability studies in 40 CFR 261.4(f)(5) or the conditions for accumulation of adequate quantities in 40 CFR 268.50. Holding times will be consistent with that permitted under the provisions of the licensee's permit issued by the TCEQ.

(1) Containers of such waste shall be clearly identifiable and each container shall bear legible and unique identification.

(2) Records shall be maintained that identify the containers and their contents in terms of radionuclides, activity and volume for inspection by the agency.

(3) Written notifications of intent submitted to TCEQ for each treatability study and/or any requested extensions for holding times for specific containers or batches of mixed waste shall be maintained for inspection by the agency to document that the waste in question is subject and in compliance with the holding time provisions.

(4) Quarterly reports documenting compliance with this condition shall be made available during inspections.

E. The Licensee is authorized interim storage of waste materials as defined by Texas Health and Safety Code Section 401.003(3)(B) from Silos 1 and 2 located at the DOE Fernald Closure Project, Fernald Ohio, ("Fernald waste") as set forth in Items A, B and C of Conditions 5, 6, 7, and 8, for a period ending October 31, 2007, and shall then transfer the Fernald waste to an authorized facility as described in Condition 25F. No later than 30 days prior to the receipt of the Fernald waste, the Licensee shall obtain a written commitment from the DOE that it: 1) retains title to the Fernald waste, and 2) that it will store or dispose of the Fernald waste at another authorized facility within six months of a request to do so by the Agency. The Licensee shall obtain the written approval of the Agency for the DOE commitment prior to receipt of the Fernald waste. Financial assurance held by the Agency under Condition 23 may be used by the Agency to transfer the Fernald waste for storage or disposal at an authorized facility should the licensee or DOE fail to do so by the prescribed dates. The Licensee shall be required to comply with any standards, taxes, and fees applicable to the activities authorized by this license that may be imposed by law after the amendment date.

F. In the event licensee has received into interim storage byproduct material as defined by Texas Health and Safety Code Section 401.003(3)(B) from Silos 1 and 2 located at the Department of Energy Fernald site in Ohio, the licensee shall, no later than October 31, 2007, transfer the byproduct material to:

25. F. (continued)

1. a site licensed by the Texas Commission on Environmental Quality for the disposal of byproduct material;

2. a site licensed for the disposal of byproduct material by the Texas Department of State Health Services in coordination with and with input from the Texas Commission on Environmental Quality on binding license conditions for the technical requirements for the disposal of byproduct material;

3. another facility licensed to receive or dispose of byproduct material outside the State of Texas; or

4. an authorized federal agency outside the State of Texas.

In accordance with Health and Safety Code §401.381 and §401.384, the Agency shall assess the licensee an administrative penalty of up to $10,000 a day or the licensee shall be liable for a civil penalty of up to $25,000 a day if the Fernald Silos 1 and 2 byproduct material is stored by licensee under this license in violation of this Condition. Condition 25.F. shall not apply and licensee shall have no liability under this Condition contingent upon the passage of legislation during the Regular Session of the 79th Texas Legislature that:

a. transfers jurisdiction over this license and any new or pending radioactive waste and byproduct material as defined by Texas Health and Safety Code Section 401.003(3)(B) storage, processing, and disposal licenses by licensee to the Texas Commission on Environmental Quality;

b. creates state revenue measures for the disposal of byproduct material as defined by Texas Health and Safety Code Section 401.003(3)(B); and

c. is made effective by September 1, 2005.

26. A. No waste shall be commingled with material requiring a separate disposal methodology.

B. In spite of the licensee's procedures, no waste from an authorized Federal agency shall be commingled with waste from another generator.

27. The licensee shall maintain for inspection by the Agency an inventory of all waste possessed under this license. The inventory shall show the radionuclide, date received, from whom received, amount of activity, physical form, date processed, original and reassigned drum or container number, and the date transferred for disposal. In addition, the licensee shall at least monthly generate a cumulative inventory that demonstrates compliance with License Condition Nos. 19, 23, and 25 (including waste form requirements for interim storage), and the appropriate processing category limits of 25 TAC §289.254(d). The licensee shall maintain a copy of the inventories, for a minimum of five (5) years from the date of generation, for inspection by the Agency.

28. A summary of all waste processing activities for the preceding calendar year shall be generated no later than March 1 of each year and maintained for inspection until disposition is authorized by the Agency. This report shall include total throughput for each individual process; all material received; all material transferred; all spills outside of primary containment; and a current inventory at the end of the report. Material transferred and received shall also be listed by licensee. All categories shall include activity by isotope and total volume.

29. A. Waste containers containing radioactive waste meeting the requirements of low specific activity material, group I (LSA-I), as specified in Title 49 of the Code of Federal Regulations, Section 173.403, may be opened for sampling of the contents or container maintenance or repair in an approved, enclosed structure.

    B. All other waste containers shall only be opened in PERMACON or equivalent structures.

30. A. If air sample results indicate that an airborne release in excess of ten times the limits of 25 TAC §289.202(ggg)(2), Table I, Column 3 occurred to the restricted area or to any portion of the restricted area, the licensee shall, within 72 hours of the exposure, perform bioassays on all individuals who were present.

    B. The licensee is relieved of complying with the frequency for the fecal analysis as specified under article 521(5) of the licensee's Radcon Manual. Fecal analysis may be performed at the discretion of and as directed by the RSO.

    C. The licensee's Radcon Manual at both articles 521(4) and 521(5) shall both specify an annual frequency for performing whole body counting.

31. A. The licensee shall notify the Agency in writing or via facsimile at least three (3) working days in advance of shipping its low-level radioactive waste to a commercial treatment, storage, or disposal site.

    B. The licensee shall notify the Agency in writing or via facsimile at least three (3) working days in advance of initial receipt of waste pursuant to this license.

    C. Notification required by this Condition shall be made to:

    LLRW Notification
    ATTN: Radiation Branch Manager
    Regulatory Services
    Department of State Health Services
    1100 W. 49th Street
    Austin, Texas 78756-3189 or
    by facsimile to: (512) 834-6654.

32. A. In accordance with the application dated January 24, 1997, the licensee may only modify the following procedures: Operations Procedures; Occupational Health and Safety Procedures; Quality Assurance Procedures; Emergency Procedures; Laboratory Procedures and/or Radiation Safety Procedures. All modifications shall provide at least equivalent levels of radiation safety and administrative control. Documentation of all modifications, and the corresponding internal review, shall be maintained for inspection for a minimum of five (5) years.

B. In the radiation safety procedure RS-3.3.62, wherever Form RS 3.3.61-1 is referenced, it shall be understood that Form RS 3.3.62-1 is meant.

33. Modification of the facility or the processes described in the documents listed in License Condition No. 40 is prohibited except as authorized pursuant to amendment of this license.

A. The licensee may modify the facility as requested in the licensee's letter dated August 21, 2000 regarding the Permacon and shall construct the loading bay and employee center attached to or abutting the Permacon in accordance with the following:

(1) Drawing titled "Loading Bay & Employee Center Addition", Sheet A1, dated 7-10-00, Rev. 1 dated 7-20-00, depicting Floor Plan, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(2) Drawing titled "Loading Bay & Employee Center Addition", Sheet A2, 4 of 9, dated 7-10-00, Rev 1 dated 7-20-00, depicting Enlarged Partial Floor Plan, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(3) Drawing titled "Loading Bay & Employee Center Addition", Sheet A3, 5 of 9, dated 7-10-00, Rev 1 dated 7-20-00, depicting (1) North, (2) East, (3) South and (4) West Exterior Elevations, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(4) Drawing titled "Loading Bay & Employee Center Addition", Sheet A4, 6 of 9, dated 7-10-00, Rev 1 dated 7-20-00, depicting (1) Enlarged Partial Building Section and (2) Building Section, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(5) Drawing titled "Loading Bay & Employee Center Addition", Sheet A5, 7 of 9, dated 7-10-00, Rev 1 dated 7-20-00, depicting (1) Enlarged Partial Building Section, (2) Enlarged Partial Building Section, and (3) wall section, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

33. A. (continued)

(6) Drawing titled "Loading Bay & Employee Center Addition", Sheet S1, 1 of 2, dated 7-10-00, Rev 1 dated 7-20-00, identified as Foundation Plan depicting (1) Bollard Detail and (2) Column Tie Footing, (3) Grade Beam Footing @ Door, (4) Grade Beam Footing, and (5) Main Frame Footing, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(7) Drawing titled "Loading Bay & Employee Center Addition", Sheet S2, 2 of 2, dated 7-10-00, Rev 1 dated 7-20-00, identified as Foundation Plan and Framing Plan, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(8) Drawing titled "Loading Bay & Employee Center Addition", Sheet M101, dated 7/19/00, identified as Plumbing Plan, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(9) Drawing titled "Loading Bay & Employee Center Addition", Sheet M201, dated 7/19/00, depicting (1) HVAC Plan and (2) Enlarged Mechanical Plan, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(10) Drawing titled "Loading Bay & Employee Center Addition", Sheet M401, dated 7/19/00, depicting (1) Filtered Exhaust System Control Diagram, (2) Breathing Air Alarm System, and (3) Air Handling Unit Detail, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(11) Drawing titled "Loading Bay & Employee Center Addition", Sheet M501, dated 7/19/00, depicting (1) Gooseneck Detail, (2) Holding Tank Detail, (3) Exhaust Fan EF-3 Support, (4) Valve Box Detail, (5) Vent Thru Roof Detail, (6) Water Heater Detail, (7) Flue Thru Roof Detail, and (8) Clean Out Detail, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(12) Drawing titled "Loading Bay & Employee Center Addition", Sheet M602, dated 7/19/00, depicting the Equipment Schedule, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

(13) Attachment B titled "Submittals of Ventilation Equipment Specifications", to the August 21, 2000 letter;

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33. A. (continued)

(14) Attachment C titled "Map of Equipment Locations", to the August 21, 2000 letter;

(15) Letter dated October 19, 2000 pertaining to the operation of the Permacon ventilation system and the oversight of the Permacon modification and addition of the loading bay and employee center;

(16) The responses to items 6, 7, 8, 9, 10, 12, 13, and 14 in the licensee's letter dated October 6, 2000 pertaining to the facility modifications (i.e., Permacon) and additions (i.e., loading bay and employee center);

(17) The air effluent monitoring system for the Permacon shall conform to the description provided in the letter dated October 10, 2000, including the attachments titled "Waste Control Specialists Stack Sampling Configuration" and "Generic Stack Schematic"; and

(18) The term "air lock" used in the licensee's submissions describing this facility modification shall be understood to refer to the feature identified as "loading bay" on the submitted drawings.

B. All waste (liquid and solids) in the holding tank receiving waste from the decontamination area of the Employee Center shall be disposed of as radioactive waste.

C. The licensee may modify the bin storage area as described in the letters dated January 14, 1998 and May 3, 1999.

D. The licensee may modify the Stabilization Building as described in the letter dated January 14, 1998 and May 3, 1999.

E. The licensee may construct and utilize for storage Container Storage Area and LSA Storage Area pads for interim waste storage, inspection frequency, and design criteria in accordance with letters dated May 19, 2004, August 12, 2004, and October 28, 2004.

34. The licensee must secure all applicable licenses, permits, and/or authorizations from the appropriate regulatory authorities before engaging in the authorizations granted by this license.

35. The licensee is relieved of the requirements of Conditions 15.C and 24.B of this license, for no more than 23,590 cubic feet of waste that requires additional packaging/overpacks to meet US DOT, that is, 49 CFR, requirements. Such waste may be packaged in metal or polyethylene containers that meet the requirements for a strong, tight container in 49 CFR regulations when in storage or in transport between the Bin Storage Unit 1, Container Storage Area, LSA Storage Area, Container Storage Building, and Stabilization Building at the licensee's facility. All other waste shall be packaged to meet US DOT transportation requirements when in storage or in transit between the Bin Storage Unit 1, Container Storage Area, LSA Storage Area, Container Storage Building, and Stabilization Building at the licensee's facility.

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36. The licensee is authorized to dispose of certain radioactive material authorized in Conditions 5, 6, 7 and 8 and listed in 25 TAC §289.202(ggg)(7), whose half lives do not exceed 300 days, in accordance with the provisions of §289.202(fff)(4) - (8) and procedures dated November 13, 2003, May 17, 2004 and July 26, 2004.

    A. The waste authorized for disposal is limited to that generated by customers under specific radioactive material licenses issued in accordance with §289.252.

    B. Changes in the Licensee's contractor who analyzes radiochemical samples from this waste stream must be addressed through a license amendment.

    C. Disposal is authorized in a Type I municipal solid waste facility permitted by the Texas Commission on Environmental Quality (TCEQ), unless the generator's waste also contained hazardous waste when presented that would allow for burial in a hazardous waste site, also permitted by TCEQ.

    D. The records for annual activity and container concentration limits shall reflect the ratios for radionuclide mixtures and these limits shall apply only once, regardless of the number of original generators.

37. The licensee shall implement an emergency plan to comply with the provisions of 25 TAC §289.252(hh), and the Emergency Plan enclosed with correspondence dated March 11, 2004, and additional correspondences dated July 27, 2004 and August 31, 2004. Execution of the plan shall include records of any required training, quarterly communication checks at intervals not to exceed three months and biennial onsite exercises. Critiques of exercises shall evaluate the appropriateness of the plan, emergency procedures, facilities, equipment, training of personnel, and overall effectiveness of the response. Deficiencies found by the critiques shall be corrected, and copies of those changes retained for Agency inspection.

38. In accordance with correspondence and procedures dated November 11, 2004, the licensee is hereby authorized to perform calibrations of in-house radiation survey instruments. The calibrations shall be performed by, or under the supervision of, Terence Moore, C.H.P.

39. The next two-year fee payment is due by November 30, 2006. If fee payment is not received by this date the license expires and the licensee must comply with Title 25 Texas Administrative Code Section (TAC) §289.252(y) by (1) terminating the use of radioactive material; (2) properly disposing of radioactive material; (3) submitting a record of disposal of radioactive material and radiation survey(s) of the locations of use and/or storage to show that the locations are releasable for unrestricted use; (4) paying any outstanding fees in accordance with 25 TAC §289.204; and (5) resolving any outstanding notices of violation. The next technical renewal application for this license, in accordance with 25 TAC 289.252(z), is due by November 30, 2004.

40. Except as specifically provided otherwise by this license, the licensee shall possess and use the radioactive material authorized by this license in accordance with statements, representations, and procedures contained in the following:

application dated January 24, 1997 and amendment dated May 2, 1997, including Appendices Volume I-V, Site and Facility Drawings, and Drawing Specification;

letters dated January 14, 1998 (signed by Allen Messenger); March 5, 1998 (with Andrews Site Organizational Chart and vice president operations/facility manager, radiation safety officer, and operations manager position descriptions attachments) and October 6, 1998 (with attachments); February 3, 1999; and April 23, 1999 (with attachments and enclosures, including wCs Work Instructions for CMDU2, dated April 9, 1999, WI99-1.2 and Attachment A to WI99-1.2); May 3, 1999 (signed by Allen Messenger); September 9, 1999 (with attachments), October 6, 1999 (with attachments, including wCs Work Instruction for the Commodore D/2 Unit, WI99-1.16) and October 7, 1999 (with attachments); August 21, 2000 (with attachments); October 6, 2000 (with attachments); October 10, 2000 (with enclosures titled "Waste Control Specialists Stack Sampling Configuration" and "Generic Stack Schematic"); December 22, 2000 (with enclosure titled "SL2 Description and Information" consisting of 7 pages); May 23, 2003 (signed by Stephen L. Cook, P.E.); October 28, 2004;

Drawing titled "Loading Bay & Employee Center Addition", Sheet A1, dated 7-10-00, Rev. 1 dated 7-20-00, depicting Floor Plan, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet A2, 4 of 9, dated 7-10-00, Rev 1 dated 7-20-00, depicting Enlarged Partial Floor Plan, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet A3, 5 of 9, dated 7-10-00, Rev 1 dated 7-20-00, depicting (1) North, (2) East, (3) South and (4) West Exterior Elevations, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet A4, 6 of 9, dated 7-10-00, Rev 1 dated 7-20-00, depicting (1) Enlarged Partial Building Section and (2) Building Section, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet A5, 7 of 9, dated 7-10-00, Rev 1 dated 7-20-00, depicting (1) Enlarged Partial Building Section, (2) Enlarged Partial Building Section, and (3) wall section, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

40. (continued)
Drawing titled "Loading Bay & Employee Center Addition", Sheet S1, 1 of 2, dated 7-10-00, Rev 1 dated 7-20-00, identified as Foundation Plan depicting (1) Bollard Detail and (2) Column Tie Footing, (3) Grade Beam Footing @ Door, (4) Grade Beam Footing, and (5) Main Frame Footing, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet S2, 2 of 2, dated 7-10-00, Rev 1 dated 7-20-00, identified as Foundation Plan and Framing Plan, from the firm of Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet M101, dated 7/19/00, identified as plumbing Plan, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet M201, dated 7/19/00, depicting (1) HVAC Plan and (2) Enlarged Mechanical Plan, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet M401, dated 7/19/00, depicting (1) Filtered Exhaust System Control Diagram, (2) Breathing Air Alarm System, and (3) Air Handling Unit Detail, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet M501, dated 7/19/00, depicting (1) Gooseneck Detail, (2) Holding Tank Detail, (3) Exhaust Fan EF-3 Support, (4) Valve Box Detail, (5) Vent Thru Roof Detail, (6) Water Heater Detail, (7) Flue Thru Roof Detail, and (8) Clean Out Detail, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Loading Bay & Employee Center Addition", Sheet M602, dated 7/19/00, depicting the Equipment Schedule, from the firms of Smith Engineering Company of Albuquerque, NM, James O. Coupland, and Nesser, Prestidge, Smith, Razloznik Architects, Inc. of Carlsbad, NM, received in the Bureau of Radiation Control on October 10, 2000;

Drawing titled "Wall Penetration at Permacon for AMEC/Geomelt Melt Cables" date issued 03-25-2003;

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40. (continued)
Drawing titled "Wall Penetration at Permacon for AMEC/Geomelt Vent Pipe" date issued 03-25-2003;

Procedure titled "Processing Mixed Waste," Issue Date: 9/18/98, Rev. 1 (replaces Rev. 0);

Procedure titled "Receipt and Storage of Radioactive and Mixed Waste," Issue Date: 9/18/98, Rev. 1 (replaces Rev. 0);

Procedure titled"KO61 and Incident Related Material Stabilization Process," reference no.: OP-1.4.7, Issue Date: 9/18/98, Rev. 1 (replaces Rev. 0); and

Procedure titled "Survey Sample Analysis and Activity Calculation," reference no.: RS-3.3.62, Issue Date: 6/23/98, Rev. 0.

Procedure titled "Bulk Solidification/Stabilization Operations", reference no.: OP-1.4.10, Revision 0, Issue Date 8/16/00;

Procedure titled "Prentice Arm Operations", reference no.: OP-1.4.11, Revision 0, Issue Date 8/18/00;

Procedure titled "Shredder Operations", reference no.: OP-1.4.12, Revision 0, Issue Dated 8/18/00;

Procedure titled "Decontamination of Material", reference no.: OP-1.4.8, Revision 0, Issue Date 4/25/99;

Procedure titled "Release of Items from Controlled Areas and the Facility", reference no.: RS-4.4.1, Revision 1, Issue Date 1/16/01 (excluding Section 3.7), new section 4.6 (see letter dated May 17, 2004), and Sampling Protocol reference no.: AL-2.0.1, Revision 0;

Responses for TDH dated January 16, 2001 (enclosure of letter dated January 16, 2001);

Procedure titled "Special Nuclear Material Exemption Certification", reference no.: OP-1.2.22, Revision 0 (With respect to special nuclear material, the provisions of this procedure will supercede any other procedures in which there is conflict, the word "should" in these procedures shall be interpreted as meaning "shall", and the title of the referenced procedure RS-1.4.2 is understood to actually be "Chain of Custody Record".);

Procedure titled "Chain of Custody Record", reference no.: RS-1.4.2, Revision 5, Effective Date 08/11/00;

Document titled "In-Container Vitrification Treatability Demonstration of Mixed TSCA Low Level Radioactive Waste" dated April 2004 (revision 6);

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40. (continued)
Document titled "Intermediate Scale Geomelt System; Safe Operating Procedure (SOP)" dated May 7, 2003; and responses made in the letter dated May 23, 2003, signed by Stephen L. Cook, P.E; and

Procedure titled "Operation of the Marion Paddle Mixer, Model #3061", reference no.: OP-1.4.16 Revision 0, Issue Date 5/7/04.

Title 25 of the TAC Chapter 289 shall prevail over statements contained in the above documents, unless such statements are more restrictive than the regulations.

DMW

FOR THE DEPARTMENT OF STATE HEALTH SERVICES

Date February 25, 2005

Ruth E. McBurney

Ruth E. McBurney, CHP, Manager
Radiation Safety Licensing Branch

ATTACHMENT U

NRC FORM 374

U.S. NUCLEAR REGULATORY COMMISSION

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and the applicable parts of Title 10, Code of Federal Regulations, Chapter I, Parts 19, 20, 30, 31, 32, 33, 34, 35, 36, 39, 40, 51, 70, and 71, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee

1. Hydro Resources, Inc.

2. 650 S. Edmonds Lane, Suite 108
Lewisville, TX 75067
[Applicable Amendment No. 2]

3. License Number SUA-1580
Amendment No. 2

4. Expiration Date January 5, 2003

5. Docket No. 40-8968
Reference No.

6. Byproduct Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum amount that Licensee May Possess at Any One Time Under This License
Uranium	Any	Unlimited

SECTION 9: ADMINISTRATIVE CONDITIONS

9.1 The authorized place of use shall be the licensee's Crownpoint Uranium Project which includes the Crownpoint, Unit 1, and Church Rock uranium recovery and processing facilities in McKinley County, New Mexico.

9.2 All written notices and reports to NRC required under this license (with the exception of effluent monitoring reports required under License Condition (LC) 12.3 and 10 CFR Part 40.65, which shall also be submitted to Region IV) shall be addressed to the Chief, Fuel Cycle Facilities Branch, Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Mail Stop T-8F42, 11545 Rockville Pike, Two White Flint North, Rockville, MD 20852-2738.

Incidents and events that require telephone notification shall be made to the NRC Operations Center at (301) 816-5100.

[Applicable Amendment: 2]

9.3 The licensee shall conduct operations in accordance with all commitments, representations, and statements made in its license application submitted by cover letter dated April 25, 1988 (as supplemented by the licensee submittals listed in Attachment A), and in the Crownpoint Uranium Project Consolidated Operations Plan (COP), Rev. 2.0, dated August 15, 1997 - except where superseded by license conditions contained in this license. Whenever the licensee uses the words "will" or "shall" in the aforementioned licensee documents, it denotes an enforceable license requirement.

9.4 A) The licensee may, without prior NRC review or approval: (i) make changes in the Crownpoint Project's facilities or processes as described in the COP (Rev. 2.0); (ii) make changes in its standard operating procedures; and (iii) conduct tests or experiments, if the licensee ensures that the following conditions are met:

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(1) the change, test, or experiment does not conflict with any requirement specifically stated in this license, or impair the licensee's ability to meet all applicable NRC regulations;

(2) there is no degradation in the safety or environmental commitments made in the Crownpoint Uranium Project Consolidated Operations Plan (COP), Revision 2.0, or in the approved reclamation plan for the Crownpoint Project; and

(3) the change, test, or experiment is consistent with NRC's findings in NUREG-1508, the Final Environmental Impact Statement (FEIS, dated February 1997) and the Safety Evaluation Report (SER, dated December 1997) for the Crownpoint Project.

If any of these conditions are not met for the change, test, or experiment under consideration, the licensee is required to submit a license amendment application for NRC review and approval. The licensee's determinations as to whether the above conditions are met will be made by a Safety and Environmental Review Panel (SERP). All such determinations shall be documented, and the records kept until license termination. All such determinations shall be reported annually to the NRC, pursuant to LC 12.8. The retained records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining whether or not the conditions are met.

B) The SERP shall consist of a minimum of three individuals employed by the licensee, and one of these shall be designated the SERP chairman. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have responsibility for implementing any operational changes; and, one member shall be the Environmental Manager, with the responsibility of ensuring that changes conform to radiation safety and environmental requirements. Additional members may be included in the SERP, as appropriate, to address technical aspects such as health physics, groundwater hydrology, surface-water hydrology, specific earth sciences, and other technical disciplines. Temporary members or permanent members, other than the three above-specified individuals, may be consultants.

9.5 As a prerequisite to operating under this license, the licensee shall submit an NRC-approved surety arrangement to cover the estimated costs of decommissioning, reclamation, and groundwater restoration. Generally, these surety amounts shall be determined by the NRC based on cost estimates for a third party completing the work in case the licensee defaults. Surety for groundwater restoration of the initial well fields shall be based on 9 pore-volumes. Surety shall be maintained at this level until the number of pore volumes required to restore the groundwater quality of a production-scale well field has been established by the restoration demonstration described in LC 10.28. If at any time it is found that well field restoration requires greater pore-volumes or higher restoration costs, the value of the surety will be adjusted upwards. Upon NRC approval, the licensee shall maintain the NRC-approved financial surety arrangement consistent with 10 CFR Part 40, Appendix A, Criterion 9.

Annual updates to the surety amount, required by 10 CFR Part 40, Appendix A, Criterion 9, shall be provided to the NRC at least 3 months prior to the anniversary date of the license issuance. If the NRC has not approved a proposed revision 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing arrangement, prior to expiration, for 1 year. Along with each proposed revision or annual update of the surety the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation (i.e., using the approved Urban Consumer Price Index), maintenance of a minimum 15 percent contingency, changes in engineering plans, activities performed, and any other conditions affecting estimated costs for site closure.

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The licensee shall provide an NRC-approved updated surety before undertaking any planned expansion or operational change which has not been included in the annual surety update. This surety update shall be provided to the NRC at least 90 days prior to the commencement of the planned expansion or operational change.

The licensee shall also provide the NRC with copies of surety-related correspondence submitted to the State of New Mexico, a copy of the State's surety review, and the final approved surety arrangement. The licensee must also ensure that the surety, where authorized to be held by the State, identifies the NRC-related portion of the surety and covers the above-ground decommissioning and decontamination, the cost of off-site disposal, soil and water sample analyses, and groundwater restoration activities associated with the site. The basis for the cost estimate is the NRC-approved site closure plan or the NRC-approved revisions to the plan.

9.6 The licensee shall dispose of 11e.(2) byproduct material from the Crownpoint Project at a waste disposal site licensed by the NRC or an Agreement State to receive 11e.(2) byproduct material. At each project site, the licensee shall maintain an area within the restricted area boundary for storing contaminated materials prior to their disposal. The licensee's approved waste disposal agreement must be maintained on-site. Should this agreement expire or be terminated, the licensee shall notify the NRC pursuant to LC 12.6. A new agreement shall be ratified within 90 days of expiration or termination of the previous agreement, or the licensee will be prohibited from further lixiviant injection.

9.7 The licensee shall implement and maintain a training program for all site employees as described in Regulatory Guide 8.31, and as detailed in the COP of the approved license application. All training materials shall incorporate the information from current versions of 10 CFR Part 19 and 10 CFR Part 20. Additionally, classroom training shall include the subjects described in Section 2.5 of Regulatory Guide 8.31. All personnel shall attend annual refresher training, and the licensee shall conduct regular safety meetings on at least a bi-monthly basis, as described in Section 2.5 of Regulatory Guide 8.31.

The Radiation Safety Officer (RSO), or his designee, shall have the education, training and experience as specified in Regulatory Guide 8.31. A Radiation Safety Technician (RST) shall have the qualifications specified in Regulatory Guide 8.31. Any person newly hired as an RST shall have all work reviewed and approved by the RSO as part of a comprehensive training program until appropriate course training is completed, and at least for 6 months from the date of appointment.

9.8 Written standard operating procedures (SOPs) shall be established and followed for: (1) all operational activities involving radioactive materials that are handled, processed, stored, or transported by employees; (2) all non-operational activities involving radioactive materials including in-plant radiation protection and environmental monitoring; and (3) emergency procedures for potential accident/unusual occurrences including significant equipment or facility damage, pipe breaks and spills, loss or theft of yellowcake or sealed sources, and significant fires. The SOPs shall include appropriate radiation safety practices to be followed in accordance with 10 CFR Part 20. SOOPs for operational activities shall enumerate pertinent radiation safety practices to be followed. A copy of the current written procedures shall be kept in the area(s) of the production facility where they are utilized. All SOPs for activities described in the COP shall be reviewed and approved as presently described in the COP.

9.9 Release of equipment, materials, or packages from the restricted area shall be in accordance with NRC staff position, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials," dated May 1987, or suitable alternative procedures approved by the NRC prior to any such release.

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9.10 Any corporate organization changes affecting the assignments or reporting responsibilities of the radiation safety staff as described in the COP of the approved license application shall conform to Regulatory Guide 8.31.

9.11 The licensee is hereby exempted from the requirements of 10 CFR Section 20.1902(e) for areas within the process facility, provided that all entrances to the facility are conspicuously posted in accordance with Section 20.1902(e), and with the words, "ANY AREA WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

9.12 Before engaging in any construction activity not previously assessed by the NRC, the licensee shall conduct a cultural resource inventory. All disturbances associated with the proposed development will be completed in compliance with the National Historic Preservation Act of 1966, as amended, and its implementing regulations (36 CFR Part 800), and the Archaeological Resources Protection Act of 1979, as amended, and its implementing regulations (43 CFR Part 7).

In order to ensure that no unapproved disturbance of cultural resources occurs, any work resulting in the discovery of previously unknown cultural artifacts shall cease. The artifacts shall be inventoried and evaluated in accordance with 36 CFR Part 800, and no disturbance shall occur until the licensee has received written authorization to proceed from the State and Navajo Nation Historic Preservation Offices.

9.13 Prior to injection of lixiviant, the licensee shall have all applicable Memoranda of Agreements (MOAs) between the licensee and local authorities, the fire department, medical facilities, and other emergency services, ratified and in effect. At a minimum, the MOAs shall identify individual party responsibilities, coordination requirements, and reporting procedures for all emergency incident responses.

9.14 Prior to injection of lixiviant, the licensee shall obtain all necessary permits and licenses from the appropriate regulatory authorities.

SECTION 10: OPERATIONS, CONTROLS, LIMITS, AND RESTRICTIONS

10.1 The licensee shall use a lixiviant composed of native ground water, carbon dioxide gas or sodium bicarbonate, and dissolved oxygen or air, as specified in the COP of the approved license application.

10.2 The processing plant flow rate at each site (Church Rock, Unit 1, or Crownpoint) shall not exceed 4000 gal/min (15,140 L/min), exclusive of restoration flow. Total yellowcake production from all three sites shall not exceed 3 million lbs (1.36 million kg) annually.

10.3 Injection well operating pressures shall be maintained at less than formation fracture pressures, and shall not exceed the well's mechanical integrity test pressure.

10.4 Only steel or fiber glass well casing shall be used at the Unit 1 and Crownpoint sites for all wells completed into the Dakota Sandstone, Westwater Canyon, and Cow Springs aquifers.

10.5 A leak detection monitoring system shall be installed for all retention ponds. The licensee shall measure and document pond freeboard and fluid levels in the leak detection system daily, including weekends and holidays. If fluid levels greater than 6 in (15.2 cm) are detected in the leak detection sumps, the fluid in the sumps shall be sampled and analyzed for specific conductance and chloride. Elevated levels of these parameters shall confirm a retention pond liner leak, at which time the licensee shall take the following corrective actions: (a) analyze standpipe water quality samples for leak parameters once every 7 days during the leak period, and once every 7 days for at least 14 days following repairs; and (b) locate and repair the area of liner damage. After a confirmed leak, the licensee shall also file a report pursuant to LC 12.2. At all times, sufficient reserve capacity shall be maintained in the retention pond system to enable transferring the contents of one pond to the other ponds. In the event of a leak and subsequent transfer of liquid, the freeboard requirements may be suspended during the repair period.

10.6 At the Crownpoint site, from initial lixiviant injection through the completion of groundwater restoration activities, the licensee shall at all times maintain sufficient emergency generator capacity to provide a 50 gal/min (189 L/min) bleed from the Westwater Canyon aquifer. The licensee shall document all required uses of the emergency generator, pursuant to LC 11.1.

10.7 Liquid oxygen tanks shall be located within the well fields. Other chemical storage tanks shall be located on the concrete pad near a waste retention pond. All yellowcake shall be stored inside the designated restricted area.

10.8 For all required types of surveys, the licensee shall, at a minimum, use the survey locations, frequencies, and lower limits of detection established in Table 2 of Regulatory Guide 8.30. Additionally, all radiation survey instruments shall be operationally checked in conformance with Regulatory Guide 8.30.

10.9 The licensee shall ensure that the manufacturer-recommended vacuum pressure is maintained in the drying chamber during all periods of yellowcake drying operations. This shall be accomplished by continuously monitoring differential pressure and installing instrumentation which will signal an audible alarm if the air pressure differential falls below the manufacturer's recommended levels. The alarm's operability shall be checked and documented daily. Additionally, yellowcake drying operations shall be immediately suspended if any emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance.

10.10 All liquid effluents from process buildings and other process waste streams, with the exception of sanitary wastes, shall be disposed of in accordance with the requirements of 10 CFR Part 20, Subpart K.

10.11 Within restricted areas, eating shall be allowed only in designated eating areas.

10.12 An excursion shall have occurred if, in any monitor well: (a) any two upper control limit parameters exceed their respective upper control limits; or (b) a single upper control limit parameter exceeds its upper control limit by 20 percent. A verification sample shall be taken within 24 hours after results of the first analyses are received. If the second sample shows that either of the excursion criteria in (a) or (b) are present, an excursion shall be confirmed. If the second sample does not show that the excursion criteria in (a) or (b) are present, a third sample shall be taken within 48 hours after the second set of sampling data was acquired. If the third sample shows that either of the excursion criteria in (a) or (b) are present, an excursion shall be confirmed. If the third sample does not show that the excursion criteria in (a) or (b) are present, the first sample shall be considered to be an error.

10.13 If an excursion is not corrected within 60 days of confirmation, the licensee shall either: (a) terminate injection of lixiviant within the well field until aquifer cleanup is complete; or (b) increase the surety in an amount to cover the full third-party cost of correcting and cleaning up the excursion. The surety increase for horizontal and vertical excursions shall be calculated using the method described on page

4-22, Section 4.3.1 of the FEIS. The surety increase shall remain in force until the NRC has verified that the excursion has been corrected and cleaned up. The written 60-day excursion report, filed pursuant to LC 12.1, shall identify which course of action [(a) or (b) listed above] the licensee is taking.

10.14 At the Unit 1 or Crownpoint sites, if a vertical excursion is confirmed in the Dakota Sandstone aquifer, the licensee shall complete and sample monitor wells to determine if the vertical excursion has impacted any other overlying aquifers that could sustain yields greater than 150 gal/day (568 L/day). The specific aquifers to be monitored shall be identified in the licensee's 60-day excursion report, filed pursuant to LC 12.1.

10.15 At the Crownpoint site, from initial lixiviant injection through the completion of groundwater restoration activities, the licensee shall maintain a continuous bleed (pumping) until the groundwater quality in the well fields has been determined by the NRC to be fully restored to the required limits established pursuant to LC 10.21.

10.16 During groundwater restoration activities at production-scale well fields within either the Unit 1 or Crownpoint sites, the licensee shall reimburse the operators of the Crownpoint water supply wells for any increased pumping and well work-over costs associated with a drop in water levels due to groundwater restoration activities. This reimbursement requirement does not apply to restoration demonstrations of small-scale well fields.

10.17 Prior to injection of lixiviant in a well field, monitor wells shall be completed in the Westwater Canyon aquifer and shall encircle the well field at a distance of 400 ft (122 m) from the edge of the production or injection wells and 400 ft (122 m) between each monitor well. The angle formed by lines drawn from any production well to the two nearest monitor wells shall not exceed 75 degrees. At the Church Rock site, Westwater Canyon aquifer monitor wells shall be located by treating production mine workings as if they were injection or production wells. Sampling frequencies for all monitor wells completed in the Westwater Canyon aquifer shall be as stated in LC 11.3.

10.18 Prior to injection of lixiviant in a well field at the Unit 1 or Crownpoint sites, monitor wells shall be completed in the Dakota Sandstone aquifer. Such wells shall be placed at a minimum density of one well per 4 acres (1.62 ha) of well field. Sampling frequencies for these wells shall be as stated in LC 11.3.

10.19 Prior to injection of lixiviant at the Unit 1 site, the licensee shall complete a minimum of three monitor wells in the overlying Dakota Sandstone aquifer between the well fields and the town of Crownpoint water supply wells, in addition to the wells required by LC 10.18. Groundwater restoration goals and upper control limits for these wells will be established pursuant to LCs 10.21 and 10.22, except that upper control limits shall be established for these wells on a well-by-well basis. Sampling frequencies for these wells shall be as stated in LC 11.3.

10.20 Prior to injection of lixiviant in a well field at the Church Rock site, monitor wells shall be completed in: (a) the Brushy Basin "B" sand aquifer; and (b) the Dakota Sandstone aquifer. Monitor wells completed in the Brushy Basin "B" sand aquifer shall be placed at a minimum density of one well per 4 acres (1.62 ha) of well field. Monitor wells completed in the Dakota sandstone aquifer shall be placed at a minimum density of one well per 8 acres (3.24 ha) of well field. Any openings of the existing mine workings into the Brushy Basin "B" sand, or Dakota Sandstone aquifers, shall be monitored by Brushy

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Basin "B" sand or Dakota Sandstone monitor wells placed within 40 ft (12 m) of the openings. These wells shall be placed down-gradient from the openings. Sampling frequencies for all monitor wells completed in the Brushy Basin and Dakota Sandstone aquifers shall be as stated in LC 11.3.

10.21 Lixiviant shall not be injected into a well field before groundwater quality data is collected and analyzed to establish groundwater restoration goals for each monitored aquifer of the well field, as follows:

A) The licensee shall establish groundwater restoration goals by analyzing three independently-collected groundwater samples of formation water from: (1) each monitor well in the well field; and (2) a minimum of one production/injection well per acre of well field. Samples shall be collected a minimum of 14 days apart from each other. Groundwater restoration goals shall be established on a parameter-by- parameter basis, with the primary restoration goal to return all parameters to average pre-lixiviant injection conditions. If groundwater quality parameters cannot be returned to average pre-lixiviant injection levels, the secondary goal shall be to return groundwater quality to the maximum concentration limits as specified in the U.S. Environmental Protection Agency (EPA) secondary and primary drinking water regulations. The secondary restoration goal for barium and fluoride shall be set to the State of New Mexico primary drinking water standard. The secondary restoration goal for uranium shall be 0.44 mg/L (300 pCi/L).

B) In establishing restoration goals, the following parameters shall be measured: alkalinity, ammonium, arsenic, barium, bicarbonate, boron, cadmium, calcium, carbonate, chloride, chromium, copper, fluoride, electrical conductivity, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, nitrate, pH, potassium, combined radium-226 and radium-228, selenium, sodium, silver, sulfate, total dissolved solids, uranium, vanadium, zinc, gross Beta, and gross Alpha (excluding radon, uranium, and radium). The restoration goal for each of these parameters shall be established by calculating the baseline mean of the data collected. Prior to calculating a groundwater restoration goal for a parameter, outliers shall be eliminated using methods consistent with those specified in EPA's 1989, "Statistical Analysis of Ground-Water Monitoring Data at RCRA [Resource Conservation and Recovery Act] Facilities, Interim Guidance." Parameter concentrations determined to be high or low outliers will not be used in establishing groundwater restoration goals.

10.22 Lixiviant shall not be injected into a well field before groundwater quality data is collected and analyzed to establish upper control limits for each monitored aquifer of the well field, as follows:

A) The licensee shall analyze three independently-collected groundwater samples of formation water from each monitor well in the well field. Samples shall be collected a minimum of 14 days apart from each other.

B) The upper control limit parameters shall be chloride, bicarbonate, and electrical conductivity [corrected to a temperature of 25°C (77°F)]. The concentrations of these upper control limit parameters shall be established for each well field by calculating the baseline mean of the upper control limit parameter concentration, and adding 5 standard deviations. Prior to calculating upper control limits, outliers shall be eliminated using methods consistent with those specified in EPA's 1989, "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance." Values determined to be high and low outliers will not be used in the calculation of upper control limits.

10.23 Prior to injection of lixiviant in a well field, groundwater pump tests shall be performed to determine if overlying aquitards are adequate confining layers, and to confirm that horizontal monitor wells for that well field are completed in the Westwater Canyon aquifer.

10.24 The licensee shall perform mechanical well integrity tests on each injection and production well: (a) before the well is first used for *in situ* leach uranium extraction; (b) after each time the well has been serviced with equipment or otherwise subjected to procedures that could damage well casing; and (c) at least once every 5 years the well is in use. After a well has been completed and opened into the aquifer, a packer shall be set above the well screen and each well casing shall be filled with water. The well shall be pressurized with either air or water to 125 psi (862 kPa) at the land surface, or 25 percent above the expected operating pressure, whichever is greater. A well shall have passed the test if a pressure drop of no more than 10 percent occurred over 30 minutes.

10.25 If it is determined that a vertical connection exists in a well field between the Westwater Canyon aquifer and the Cow Springs aquifer, monitor wells will be completed in the Cow Springs aquifer within that well field at a minimum density of one well per 4 acres (1.62 ha) of well field. Groundwater restoration goals and upper control limits will be established for these wells, pursuant to LCs 10.21 and 10.22. Sampling frequencies for all monitor wells completed in the Cow Springs aquifer shall be as stated in LC 11.3.

10.26 Prior to injecting lixiviant at a site, or processing licensed material at the Crownpoint site, HRI shall provide and receive NRC acceptance - for that site - information, calculations, and analyses to document the adequacy of the design of waste retention ponds and their associated embankments (if applicable), liners, and hydrologic site characteristics. HRI shall demonstrate that the criteria described in the following documents have been met: 10 CFR Part 40, Appendix A, Criterion 5A regarding surface impoundment design; Regulatory Guide 3.11, "Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills"; WM-8201, "Hydrologic Design Criteria for Tailings Retention Systems,"; and Final Staff Technical Position, "Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites." As applicable, based on the designs selected, HRI shall provide information in the following areas:

A) maps and detailed drawings outlining drainage areas of principal water courses and drainage features at the site;

B) drainage basin characteristics, including soil types and characteristics, vegetative cover, local topography, flood plains, geomorphic characteristics, and surficial and bedrock geology;

C) maps and detailed drawings showing the location of site features, particularly the location of the retention ponds and diversion channels;

E) analyses and calculations for water surface profiles and velocities associated with the ability of the retention ponds or diversion channels to resist or limit erosion and flooding;

F) analyses and computations of riprap or erosion protection needed to protect the retention ponds;

G) specific details on the design, construction, maintenance, and operation of the waste retention ponds and embankments (where applicable);

H) specific details on the design, construction, maintenance, and operation of the liners and leak detection system.

I) any other analyses and computations which demonstrate that applicable design criteria have been met.

10.27 Prior to the injection of lixiviant at the Crownpoint site, the licensee shall:

A) Replace the town of Crownpoint's water supply wells NTUA-1, NTUA-2, BIA-3, BIA-5, and BIA-6, construct the necessary water pipeline, and provide funds so the existing water supply systems of the Navajo Tribal Utility Authority (NTUA) and the Bureau of Indian Affairs (BIA) can be connected to the new wells. Any new wells, pumps, pipelines, and other changes to the existing water supply systems, made necessary by the replacement of the wells specified above, shall be made such that the systems can continue to provide at least the same quantity of water as the existing systems. The new wells shall be located so that the water quality at each individual well head does not exceed the EPA's primary and secondary drinking water standards, and does not exceed a concentration of 0.44 mg/L (300 pCi/L) uranium, as a result of *in situ* leach uranium extraction activities at the Unit 1 and Crownpoint sites. To determine the appropriate placement of the new wells, the licensee shall coordinate with the appropriate agencies and regulatory authorities, including BIA, NTUA, the Navajo Nation Department of Water Development and Water Resources, and the Navajo Nation EPA.

B) Abandon and seal wells NTUA-1, NTUA-2, BIA-3, BIA-5, and BIA-6 in accordance with applicable requirements so these wells cannot become future pathways for the vertical movement of contaminants.

10.28 Prior to the injection of lixiviant at the Church Rock Section 17 site, Unit 1 site, or the Crownpoint site, the licensee shall submit to the NRC for approval the results of a groundwater restoration demonstration conducted at the Church Rock Section 8 site. The demonstration shall be conducted on a scale, acceptable to the NRC, that is large enough to determine the number of pore volumes that shall be required to restore a production-scale wellfield.

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10.29 Before starting uranium extraction operations beyond the first well field at the Church Rock site, the licensee shall submit an NRC-approved groundwater restoration plan for the entire project. At a minimum, this plan shall include: (a) a proposed restoration schedule; (b) a general description of the restoration methodology; and (c) a description of post-restoration groundwater monitoring.

10.30 Prior to injecting lixiviant at any of the sites, the licensee shall submit an NRC-approved procedure-level, detailed effluent and environmental monitoring program. In addition, the licensee shall develop and administer its radiological effluent and environmental monitoring program consistent with Regulatory Guide 4.14. The licensee shall maintain, at a minimum, three airborne effluent monitoring stations at each site, at the locations described in COP (Rev.2.0) Table 9.5-1.

10.31 Prior to the injection of lixiviant at the Church Rock site, the licensee shall conduct a Westwater Canyon aquifer step-rate injection (fracture) test within the Church Rock site boundaries, but outside future well field areas. One such test at the Unit 1 or Crownpoint site shall also be performed before lixiviant injection begins at either of these sites.

10.32 Prior to the injection of lixiviant at any of the sites, the licensee shall: (a) collect sufficient water quality data to generally characterize the water quality of the Cow Springs aquifer beneath each of the project sites, by completing and sampling wells for the following water quality parameters: alkalinity, ammonium, arsenic, barium, bicarbonate, boron, cadmium, calcium, carbonate, chloride, chromium, copper, fluoride, electrical conductivity, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, nitrate, pH, potassium, combined radium-226 and radium-228, selenium, sodium, silver, sulfate, total dissolved solids, uranium, vanadium, zinc, gross Beta and gross Alpha (excluding radon, uranium, and radium); and (b) conduct sufficient pumping tests to determine if the Cow Springs aquifer beneath each of the sites is hydraulically confined from the Westwater Canyon aquifer.

SECTION 11: MONITORING, RECORDING AND BOOKING REQUIREMENTS

11.1 The results of the following activities, operations, or actions shall be documented: sampling; analyses; surveys or monitoring; survey/ monitoring equipment calibrations; reports on audits and inspections; emergency generator use and maintenance records; all meetings and training courses required by this license; and any subsequent reviews, investigations, or corrective actions. Unless otherwise specified in a license condition or applicable NRC regulation, all documentation required by this license shall be maintained for a period of at least five (5) years by the licensee at its facility, and is subject to NRC review and inspection.

11.2 Flow rates on each injection and production well, and injection manifold pressures on the entire system, shall be measured and recorded daily.

11.3 Formation water, from monitoring wells at well fields undergoing uranium extraction or groundwater restoration activities, shall be sampled for upper control limit parameters at least once every 14 days, and the results documented pursuant to LC 11.1. During corrective action for a confirmed excursion, sample frequency shall be increased to once every seven days for the upper control limit parameters until the excursion is concluded. An excursion shall be considered corrected when all upper control limit parameters are reduced to their upper control limits.

11.4 Radiation Work Permits shall include, at a minimum, the information described in Section 2.2 of Regulatory Guide 8.31.

11.5 Site inspections and reviews shall be completed and documented by the licensee as described in Section 2.3.1 and 2.3.2 of Regulatory Guide 8.31.

11.6 The licensee shall implement a comprehensive bioassay sampling program that conforms to Regulatory Guide 8.22.

11.7 Until license termination, the licensee shall maintain documentation on all spills of source or 11e.(2) byproduct materials, and all spills of process chemicals. Documented information shall include date, volume of spill, total activity, survey results, corrective actions, results of remediation surveys, and a map showing spill location and impacted area. After any spill the licensee shall also determine whether the NRC must be notified, pursuant to LC 12.4.

11.8 Prior to land application of waste water, the licensee shall submit and receive NRC acceptance of a plan outlining how the licensee will monitor constituent buildup in soils resulting from the land application. The plan should identify the constituents resulting from land application that will be monitored, constituent threshold values for discontinuing land application and justification for the values selected.

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SECTION 12: REPORTING REQUIREMENTS

12.1 The licensee shall notify the NRC by telephone within 24 hrs of confirming a lixiviant excursion, and by letter within 7 days from the time the excursion is confirmed, pursuant to LC 10.12. A written report describing the excursion event, corrective actions taken, and the corrective action results shall be submitted to the NRC within 60 days of the excursion confirmation. If wells are still on excursion when the report is submitted, the report shall also contain a schedule for submitting additional reports to the NRC describing the excursion event, corrective actions taken, and results obtained. In the case of a confirmed vertical excursion, the report shall also contain a projected completion date for characterization of the extent of the vertical excursion.

12.2 The licensee shall notify the NRC by telephone within 48 hours of confirming a retention pond liner leak, pursuant to LC 10.5. A written report shall be submitted to the NRC within 30 days of the leak confirmation. This report shall include analytical data, describe the corrective action taken, and discuss the results of that action.

12.3 The licensee shall submit the required effluent reports in accordance with 10 CFR Part 40.65. The licensee shall submit the information specified in Section 7 of Regulatory Guide 4.14, in addition to the reports required by 10 CFR Part 40.65.

12.4 The licensee shall notify the NRC by telephone within 48 hours of any spill of source or 11e.(2) byproduct materials, and all spills of process chemicals, that might have a radiological impact on the environment. The notification shall be followed, within 7 days, by submittal of a written report detailing the conditions leading to the spill, corrective actions taken, and results achieved. This shall be done in addition to meeting the requirements of 10 CFR Parts 20 and 40.

12.5 In addition to reporting exposures of individuals to radioactive material in accordance with 10 CFR Part 20.2202, the licensee shall submit to the NRC a written report within 30 days of such reportable incidents, detailing the conditions leading to the incident, corrective actions taken, and results achieved.

12.6 In the event the licensee's approved waste disposal agreement expires or is terminated, the licensee shall notify the NRC in writing within 7 working days after the expiration date.

12.7 As part of the licensee's decommissioning activities for a site, the licensee shall submit to the NRC for review and approval a detailed site reclamation plan. The plan shall be submitted at least 12 months prior to the planned final shutdown of uranium extraction operations at the site. If depressions appear at the land surface due to subsurface collapse from *in situ* leach uranium extraction activities, the licensee shall return the land surface to its general contour as part of the surface reclamation activities. Before release of any site to unrestricted use, the licensee shall provide information to the NRC verifying that radionuclide concentrations, due to licensed materials, meet radiation standards for unrestricted release.

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12.8 The licensee shall provide in an annual report to the NRC, a description of all changes, tests, and experiments made or conducted pursuant to LC 9.4, including a summary of the safety and environmental evaluation of each such action. As part of this annual report, the licensee shall include any COP pages revised pursuant to LC 9.4.

FOR THE NUCLEAR REGULATORY COMMISSION

Dated: 8/16/04

Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

ATTACHMENT A

The licensee shall conduct its operations in accordance with all commitments, representations, and statements made in the following submittals, which are hereby incorporated by reference, except where superseded by license conditions in this license:

- May 8, 1989 (Crownpoint Facility Supplemental Environmental Report)
- July 13, 1989 (Crownpoint Cultural Resources Survey)
- January 6, 1992 (Unit 1 Allotted Lease Program Environmental Assessment (EA))
- July 31, 1992 (Unit 1 and Crownpoint Project Environmental Reports)
- October 9, 1992 (Unit 1 Underground Injection Control (UIC) Application)
- October 30, 1992 (Cultural Resources-Environmental Assessment and Management Plan for Crownpoint, NM)
- March 16, 1993 (Churchrock Project Revised Environmental Report)
- March 16, 1993 (Section 9 Pilot Summary Report)
- April 5, 1993 (page changes)
- April 6, 1993 (page changes)
- July 26, 1993 (page changes)
- October 11, 1993 (page changes)
- October 18, 1993 (Analysis of Hydrodynamic Control at Crownpoint and Churchrock)
- October 19, 1993 (Churchrock Surface Hydrology Analysis)
- October 19, 1993 (Churchrock and Crownpoint Aquifer Modeling Supplement)
- November 11, 1993 (page changes)
- January 24, 1994 (page changes)
- November 20, 1993 (Response to NRC Request for Additional Information)
- February 23, 1994 (Description of Radon Emission Controls)
- January 6, 1995 (EA Allotted Lease Program Unit 1)
- October 9, 1995 (Unit 1 UIC Application)
- February 20, 1996 (Response to NRC Comments)
- April 10, 1996 (Response to NRC Comments)
- May 3, 1996 (Response to NRC Comments)
- June 18, 1996 (Unit 1 Water Quality Information)
- August 15, 1996 (Response to NRC Comments)
- August 16, 1996 (Response to NRC Comments)
- August 21, 1996 (page changes)
- August 30, 1996 (Response to NRC Comments)
- September 5, 1996 (Surface Water Drainage Analysis at Churchrock)
- September 6, 1996 (page changes)
- September 13, 1996 (Response to NRC Comments)
- September 27, 1996 (Response to NRC Comments)
- September 30, 1996 (Crownpoint Uranium Project COP, Rev. 0.0)
- October 15, 1996 (Response to NRC Comments)
- October 18, 1996 (Restoration Standards Commitment)
- October 20, 1996 (Response to NRC Comments)
- October 29, 1996 (Response to NRC Comments)
- November 18, 1996 (Response to NRC Comments)
- November 26, 1996 (Response to NRC Comments)
- December 20, 1996 (NRC Proposed Requirements and Recommendations)
- December 26, 1996 (HRI Acceptance Letter to NRC Proposed Requirements and Recommendations)
- April 1, 1997 (NRC Proposed Requirements)
- April 25, 1997 (HRI Acceptance Letter to NRC Proposed Requirements)
- May 15, 1997 (Crownpoint Uranium Project COP, Rev 1.0)
- June 16, 1997 (Churchrock Design Specifications for Surface Water Diversion Channel)
- July 9, 1997 (HRI Electric Power Supply Commitment)
- August 18, 1997 (Response to NRC Comments)
- October 24, 1997 (HRI Commitment on Groundwater Baseline Sampling)

ATTACHMENT V

HRI, INC.

CHURCHROCK PROJECT

REVISED ENVIRONMENTAL REPORT

MARCH, 1993

2.6.2 MINE ZONE GEOLOGY

Numerous exploration holes have been drilled which delineate the geology within the project area. Figures 2.6-5 through 2.6-10 are detailed cross sections and index maps which illustrate the geologic features in the area. In addition, Appendix A contains cutting and geophysical logs of the recently drilled test wells.

The Churchrock project contains mineralization in the Westwater Canyon member of the Jurassic Morrison formation. This section of the Westwater has been arbitrarily designated the "A" sand in the project area. As described previously, the Westwater was deposited as a broad alluvial fan sequence with a preponderance of thick arkosic sandstone on the west side of the San Juan Basin shaling out to the east and northeast at the distal edge of the fan. At Churchrock, the "A" sand consists of a medium to coarse- grained, moderately sorted conglomeratic sandstone with numerous clay clasts intermixed throughout the section. Sieve analysis of well CR-3 is shown on Figure 2.6-11. Laboratory air permeability studies indicate permeability of 8.048 to 1.450 darcies, however, pump test results indicate lower permeability in the 850 millidarcy range. The "A" sand is approximately 200 feet thick in the area.

Uranium mineralization within the "A" sand occurs in individual roll fronts. The "A" sand contains 9 roll fronts in separate horizons. These nine horizons are shown on cross section C-C' (Figure 2.6-8) with their designations.

The roll fronts form elongate tabular deposits along the iron-redox interfaces. Mineralization varies in thickness, but averages nine feet in each zone, for a combined thickness of 80 feet for the Churchrock ore body. Fronts contain ore grade mineralization (mineralization above .05% U_3O_8) along a 5300 foot length. Each front has an average width between 80 and 200 feet. Due to the stacked nature of the rolls, the overall dimension of the ore body is 5300 feet long by 800 to 1000 feet wide.

The uranium ore occurs as coffinite and uraninite concentrated in interstitial matrix and occurs on grain margins and at grain contacts. Below the "A" sand is a sandstone unit which is designated the "AA" sand for the purpose of this project. The "AA" sand, which contains uranium mineralization, is the lower-most unit of the Westwater Member and lies on top at the Recapture shale. There is 150 feet of Recapture shale overlying the Cow Springs sandstone.

Above the "A" sand is the Brushy Basin Member of the Morrison Formation. It consists of upper and lower bentonitic shales sandwiching a sand horizon. These have been designated the "A" shale, for the lower shale horizon, "B" shale for the upper shale horizons and "B" sand for the sand unit.

Overlying the Brushy Basin member is the Dakota Formation composed of sandstone with interbedded shales and coal seams. The Dakota sands are the overlying monitor zone.

Exploration drilling has indicated the presence of uranium mineralization in the Dakota sand. If future drilling indicates a minable resource, this will be addressed by a future application. All necessary monitoring safeguards will be proposed.

From the top of the Dakota to the surface is the Cretaceous Mancos Shale.

Old Churchrock mine workings extensively cover the ore area in the NE 1/4 Section 17, T16N, R16W. Unmined ore extensions surround the old workings, as shown by Figure 2.6-12 and 2.6-13. HRI will solution-mine these extensions from the surface with injection and extraction wells being completed in these zones, as well as virgin ore in deeper horizons. HRI will approach the mining of this ore to gain maximum recovery with minimal dilution of uranium-bearing flow streams by placing extraction wells adjacent to the workings and injection wells in the ore further away from the workings. It is anticipated that lixiviant will enter the workings during the operation. Any affected water in the adits will be restored concurrently with the normal restoration of surrounding ore horizons to level consistent to baseline.

2.7.2 Hydrologic Testing

A hydrological test was conducted in September and October, 1988 at Hydro Resources, Inc. (HRI) Churchrock in-situ uranium project in Section 8, McKinley County, New Mexico. This test was designed to provide the hydrologic parameters which when coupled with core and other geological information, would allow a characterization of our proposed production horizon in terms of continuity and leakage potential.

This was the second regional pump test which HRI ran for this project area. The first test was run in January, 1988. However, the observation well (CR-4) completed in the first zone (AA sand) underlying our proposed production horizon responded to the pumping from well CR-3 in that test. A re-examination of the well completion for CR-4 indicated that the well was partially open into our production zone, the Westwater Canyon. As a result, remedial work and other changes, as described below, were completed prior to the second test.

2.7.2.1 Geology

A stratigraphic column for the Churchrock area is presented as Figure 2.7.-14. HRI's proposed production horizon is noted as the "A" and "AA" sands, and is in the Westwater Canyon Member of the Morrison Formation. The first underlying sandstone to this is known as Cow Springs. The AA clay is the aquiclude separating the A and AA sands. The Brushy Basin Member of the Morrison Formation immediately overlies the Westwater. Typically, the Brushy Basin is a continuous clay, however, in this area, the clay is bifurcated by a sand which is identified as the "B" sand. Overlying the Brushy Basin is another sandstone, the Dakota Formation.

Table 2.7-1 lists the various zones and their approximate thicknesses in the Churchrock area. Also listed are the wells completed in each of the sands.

2.7.2.2 Pre-Test Preparation

A plan view of the regional test wells is shown in Figure 2.7-15. The locations of the wells completed into the Westwater Canyon aquifer were chosen for two reason: (1) to allow characterization of the aquifer over a large region; (2) to provide additional geologic data on the ore and individual roll fronts. The monitor wells in the over and underlying sands were located 50-100 feet from the pumped well in order to maximize the stress (induced by pumping) to the aquicludes confining the Westwater Canyon aquifer.

All wells are completed with Centrol fiberglass (FRP) casing. However, in order to allow direct comparisons of different well completions, a variety of techniques were used. In the "cement basket and screen" completion, the well was drilled to final TD, the casing with the cement basket and screen run to the bottom, and the well cemented through the cement basket. Later the plug in the cement basket was drilled and the well developed through the screen. For the "open hole" completion, the well was drilled to the tope of the target zone, cased, cemented, and then drilled through the bottom of the casing and into the zone. Later, a screen assembly may have been placed across the open hole interval. The "perforated" wells were drilled to final TD, cased, cemented, and subsequently jet perforated with shaped charges across a specific interval. After completion, all wells were produced until clean using a submersible pump, air jetting or both. Table 2.7-2 provides well completion information (depths, open intervals, etc.) for the different regional test wells.

As noted above, CR-4 was suspected of allowing hydraulic communication between the "A" and "AA" sands during the original pump test. In August, 1988, well CR-4 was plugged by underreaming and then cementing through the clay ("AA Clay") separating the Westwater from the underlying zone. Another well (CR-7) was drilled as a replacement to CR-4. CR-7 was cased and

CHURCHROCK PROJECT -TYPE STRATIGRAPHIC COLUMN

Figure 2.7-14

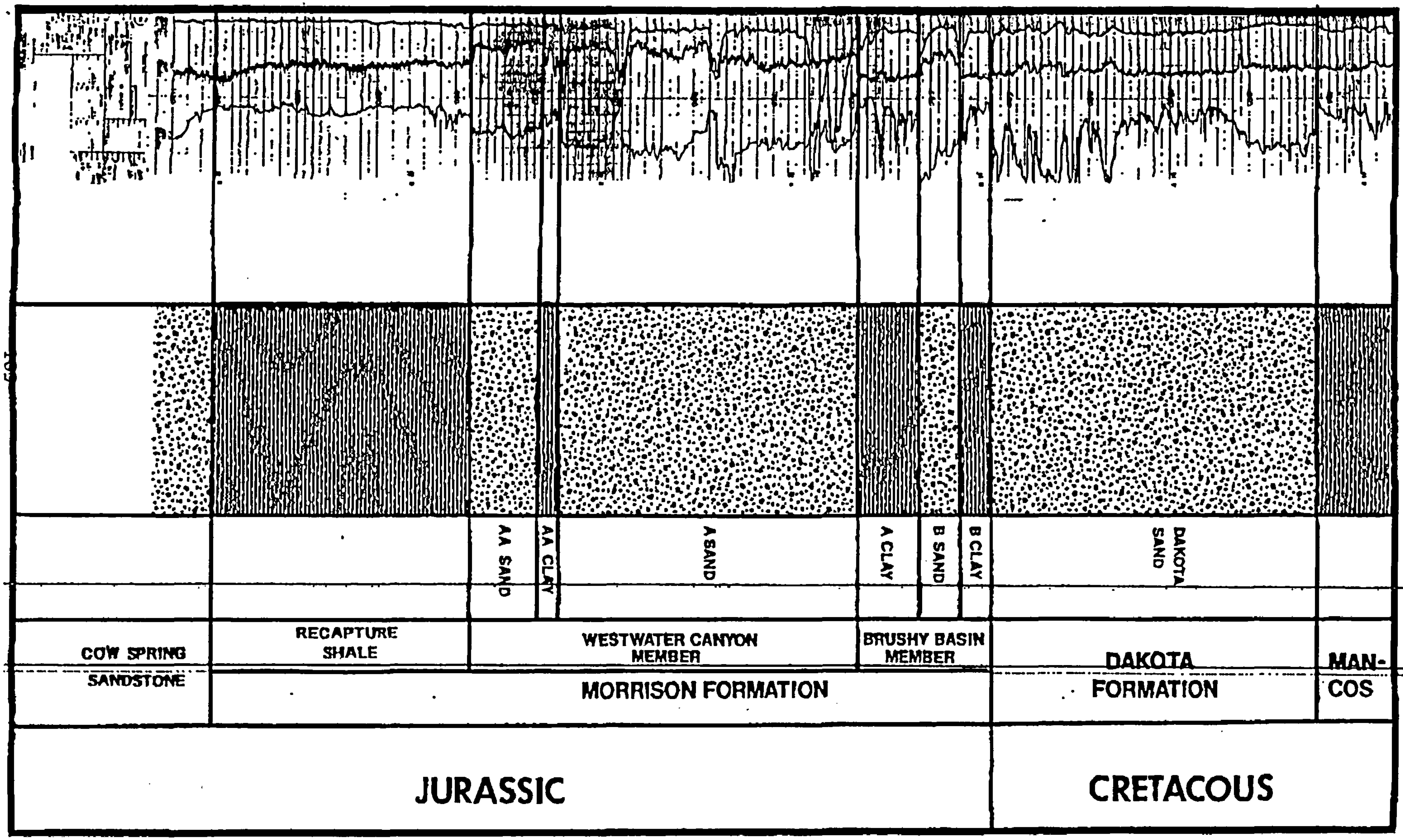


Table 2.7-1

Typical Thickness of Zones

HRI, Inc.
Churchrock Project
Section 8, McKinley County, New Mexico

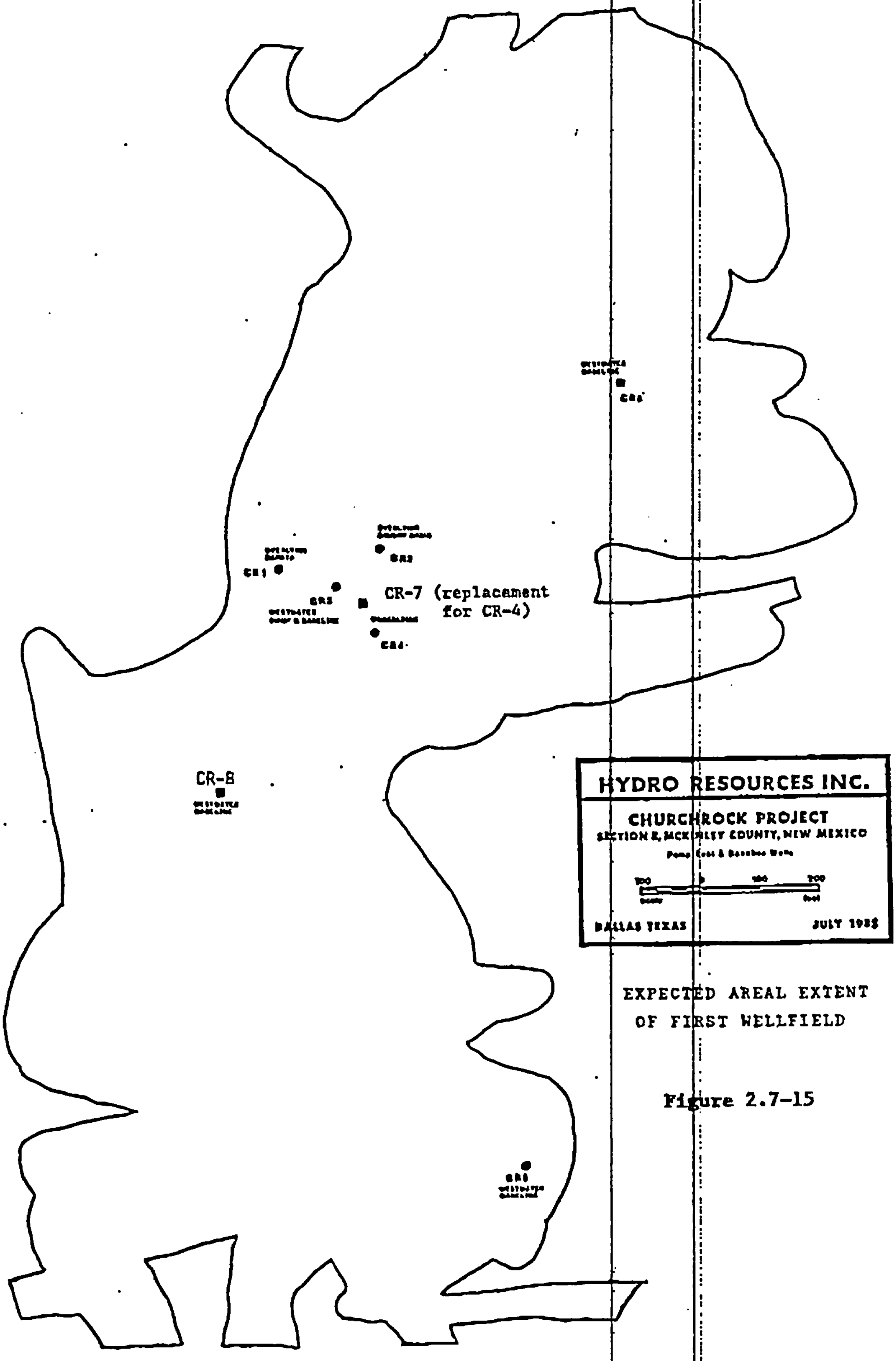
Dakota Sandstone	2nd Overlying	200	CR-1
Upper Clay, Brushy Basin	B Clay	20	-
Brushy Basin Sand	B Sand, 1st Overlying	25	CR-2
Lower Clay, Brushy Basin	A Clay	35	-
Westwater Sand	A Sand	200	CR-3, CR-5 CR-6, CR-8
Lower Clay, Westwater	AA Clay	12	-
Lower Westwater Sand	AA Sand, 1st Underlying	40	CR-7

Table 2.7-2

Well Description

Hydro Resources, Inc.
Churchrock Project
Section 8, McKinley County
New Mexico

	CR-1	CR-2	CR-3	CR-5	CR-6	CR-7	CR-8
Formation	Dakota	Brushy Basin	Westwater	Westwater	Westwater	Westwater "AA Sand"	Westwater
Total Depth (ft)	650	690	914	910	797	960	900
Casing Type	Fiberglass	Fiberglass	Fiberglass	Fiberglass	Fiberglass	Fiberglass	Fiberglass
Casing I.D. (in)	4.33	4.33	6.25	4.33	4.33	4.33	4.33
Casing Depth (ft)	568	650	690	679	539	960	900
Cement Basket Depth (ft)	569	650	None	None	561	None	None
Open Interval (ft)	570-650	650-681	690-914	691-910	590-797	927-937	706-716 804-814 877-887
Type Completion	Screen 0.008" W/ Bottom Cap Knocked Off	Screen 0.008" W/ Bottom Cap Knocked Off	Open Hole W/ Screen, Sawed Slot	Open Hole	Screen, 0.008"	Perf, Shaped Charge, 2 sh/ft	Perf, Shaped Charge, 2 sh/ft
Distance From Pumping Well (ft)	98.3	86.1	0	536	1021	59.2	398
Figure & Table Numbers	B.1	B.2	B.3	B.4	B.5	B.6	B.7



EXPECTED AREAL EXTENT OF FIRST WELLFIELD

Figure 2.7-15

cemented into the underlying zone (the AA sand) and then perforated. In addition, well CR-8 was drilled, cased and perforated into the Westwater Canyon sand to provide an intermediate analysis point between the pumped well CR-3 and well CR-6 to the south.

A 15 horsepower Grundfos SP16-16 pump, equipped with a check valve, was set on 2 7/8" tubing to a depth of 690 feet in well CR-3. A double meter system (two meters, 4 pressure valves) plus an upstream pressure gauge were placed near CR-3 to allow measurement of flowrates and surface flowing pressures during the test. In addition, a stopwatch along with a calibrated 5 gallon container were placed at well CR-3 to be used as the final check of flowrates.

During the January, 1988 pump test, the water level measurements were taken manually using the conductance of electric line placed into the wells as indicator of the fluid level. While this method is commonly used for hydrologic tests and is satisfactory, it is subject to more random error at the deep water levels encountered at Churchrock (about 450 feet) than are down hole electronic piezometers or pressure transducers. Because of this and to ensure confidence in the overall test, pressure transducers were used in all of the observation wells during the Fall, 1988 regional hydrologic test.

The pressure transducers were connected to a single multi-channel data logger at the surface which surveyed the piezometers at preset times, storing those readings in computer memory. In addition, a transducer was placed in a thirty inch PVC tube, vertically set into the ground and open to the air, to record barometric pressure. This was also connected to the data logger. The data logger and transducers were leased from Resource Technologies Group, Inc. ("RTG"). RTG also supervised the installation and setup of the system and gave instruction as to its operation during the test.

Manual water level measurements were used only in the pumping well CR-3. The pumping fluid level is very sensitive to flowrate changes, thus, a continual check of this level helps in maintaining a constant flowrate during a pump test. One inch I.D., plastic tubing had been attached to the drop pipe holding the pump in CR-3. An electric line was then dropped through this continuous length tubing until water was reached and the level measured.

2.7.2.3 Antecedent Conditions

The aquifers in the Churchrock area had been depressurized somewhat due to dewatering for the underground mining taking place nearby. The mining was stopped in the early Eighties, but the pumping continued for some time. The last facility to stop dewatering was the Kerr-McGee plant to the north of Churchrock in January, 1986. Since that time, water levels have been rising in the Churchrock area. The Potentiometric Surface Map is shown in Figure 2.7-16.

Recording of antecedent conditions with the downhole pressure transducers began at 12:30 p.. on 9-27-88, three days prior to starting of the pump in CR-3. The average rise in fluid level in the Westwater Canyon during those three days was calculated to be 0.27 feet per day.

2.7.2.4 Hydrologic Testing

Pumping of CR-3 started at 9:20 a.m. on 9-30-88. The pumping continued for just over 72 hours until 9:24 a.m., 10-3-88 at an average flowrate of 61.1 gpm. Recovery measurements continued until 9:03 a.m. on 10-6-88. During drawdown and buildup, manual water level measurements were made on the pumped well CR-3, while computer controlled readings were collected on all observation wells.

Twenty-four hour surveillance was maintained throughout the test on the computer equipment, flowrates, and fluid levels with one man per shift during the antecedent period and a

2.7.5 Differential Pressures Between Zones

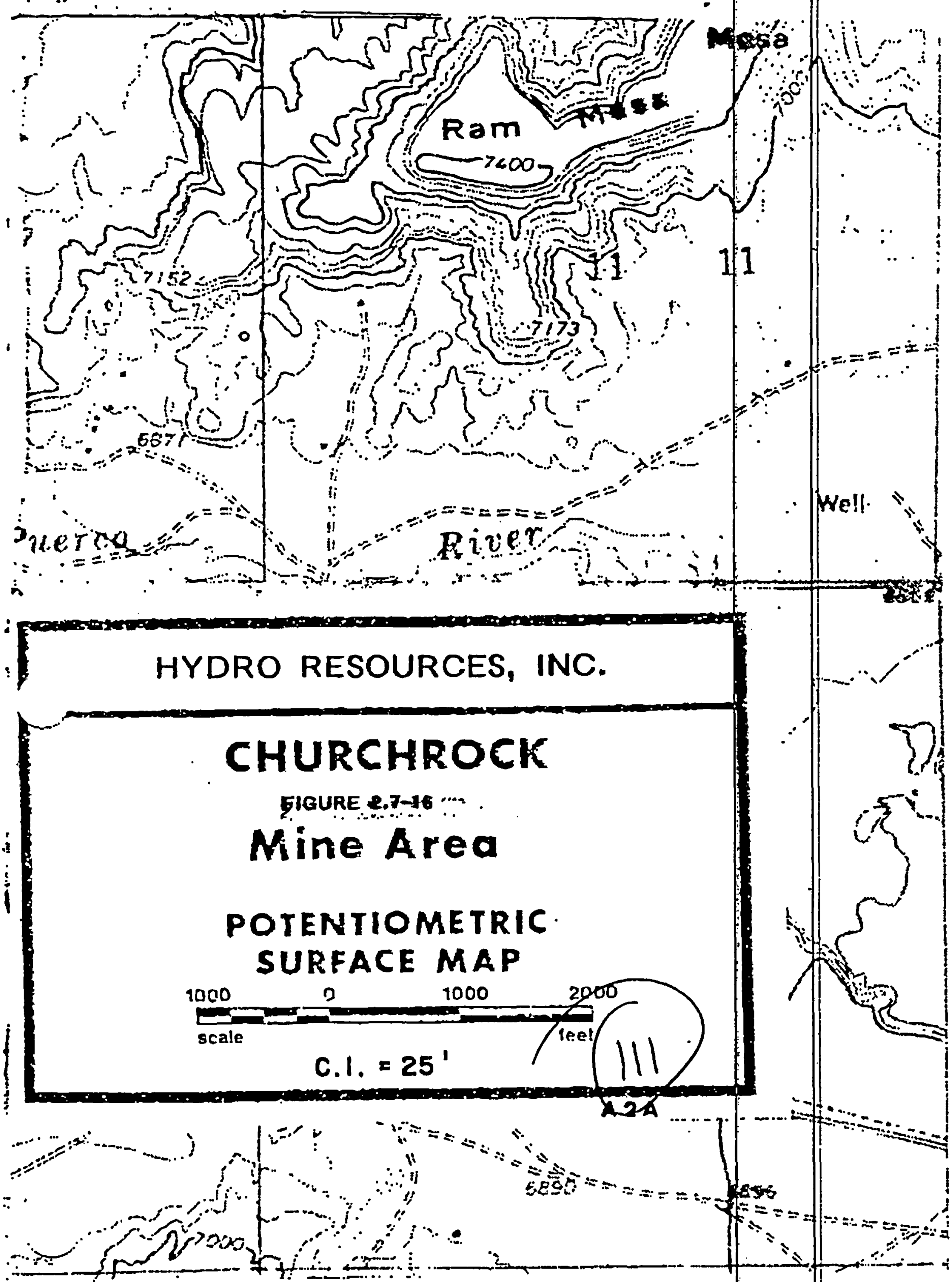
The fluid pressure within the Westwater Canyon Sandstone in the Old Churchrock area is considerably lower than that in either the first overlying sand (The Poison Canyon) or the second overlying sand (the Dakota) as evidenced by fluid levels measured in observation wells in Section 8, just to the north of the Old Churchrock mine workings. This will cause water movement out of these overlying sands and into the Westwater Canyon, if a hydraulic connection exists between the zones. The fluid levels in the Section 8 observation wells have been recorded periodically since early 1988, and show that presently (January,1993) the pressure in the Poison Canyon sand is 30.7 feet (of water) higher than that in the Westwater Canyon, while that in the Dakota sand is 58.9 feet greater than in the Westwater. These piezometric pressures have been adjusted for elevation.

The differences in pressure potential between these three zones was probably caused by dewatering of the aquifers at differing flowrates for underground mining. The dewatering in the area stopped about January, 1986. Although the water levels have been recovering since then, this pressure recovery has slowed considerably with time, which is normal. The difference in piezometric levels between the Poison Canyon and the Westwater Canyon sands had an average change, month-to-month, from January, 1992 through January, 1993 of 0.046 feet or 0.55 feet calculated on a yearly basis. Thus, the differential pressure with the Dakota and the Poison Canyon greater than the Westwater would extend decades into the future (30.7 feet/0.55 feet/year) before equilibrium is accomplished, even discounted that the changes would naturally become smaller with time, increasing the time to equivalence significantly.

Presently, these differential pressures would cause a substantial recharge of the Westwater Canyon with water from the overlying aquifers, if any of the mine workings at the Old Churchrock site extend up and into the Poison Canyon, and then into the Dakota sand. This natural migration of water into the Westwater would take considerably pressure to reverse at the Old Churchrock site, and such a reversal would not be expected during the normal ISL operations surrounding the site.

2.7.6 Water Level Rebound

Since HRI began measuring water levels in the Churchrock area in 1988, the water levels have increased significantly (Figure 2.7-17). This rebound is the result of the cessation of mine watering as discussed in 2.7-5.



HYDRO RESOURCES, INC.

CHURCHROCK

FIGURE 2.7-16

Mine Area

POTENTIOMETRIC SURFACE MAP

1000 0 1000 2000
scale feet

C.I. = 25'

two man crew during drawdown and recovery.

2.7.2.5 Analysis and Results

After the recovery portion of the test, the data logger and other equipment were collected and expressed to RTG for data reduction. The raw computer data, both barometric and monitor well, were dumped from the data logger by RTG and put in a form compatible with HRI's computer programs. This was then sent to HRI for analysis.

The data was tabulated, corrected for barometric and antecedent conditions, and plotted. Table 2 Appendix E lists the various tables and figures corresponding to the individual wells. Figure 3 Appendix E is a composite graph of over/underlying monitor wells CR-1, CR-2, CR-7 and Westwater well CR-6 showing the fluid level change from antecedent through recovery time on a cartesian plot. Figure 4 Appendix E is the same except plotted for the overlying well CR-1 and Westwater wells CR-5, CR-6, and CR-8. From Figures 3 and 4 Appendix E it can be seen that while there was substantial drawdown during pumping in all Westwater observation wells, there was actually buildup in over and underlying monitor wells at the same time. This was due to the Noordbergum effect and verifies the integrity of the clays which confine the Westwater Canyon aquifer.

During the time of the test, the aquifers were static in that no injection or withdrawal was taking place in our project area, other than from our pumping well, CR-3. As a result, the only corrections to the data are due to barometric fluctuations, antecedent conditions (regional discharge/recharge), and diurnal effects. The barometric information was provided as part of the basic data gathering facility. ALL PLOTS have been corrected for this, although the tabulations do include the raw data without that modification. The diurnal effects (for example, see Figure B.4b Appendix E) were considered negligible and disregarded in the analysis.

As noted above, only the Westwater Canyon observation wells drewdown during the pumping phase of the test and as a result, only those wells were corrected for the antecedent recharge effect. The change in water levels for the full test, antecedent through recovery times are shown in Figure B.4a Appendix E for well CR-5. Only barometric fluctuations were corrected for in this figure. This same information is presented in tabular form as Table B.4. The fluid rise during the 68.8 hours prior to pumping was plotted on an expanded scale as Figure B.4b Appendix E. The straight line drawn through the points was done by regression and indicates a recharge of .297 ft/day. The water levels, adjusted by this amount, were re-plotted as Figure B.4c Appendix E. Figure B.4d Appendix E is the Theis curve fit of the data from Figure B.4c Appendix E in log-log format. A computer was used to facilitate the analysis of this data. However, the Theis curve was MANUALLY matched to the data on the computer. After this, a computer program was used to calculate the transmissivities and storage coefficients.

Water levels from the Westwater Canyon monitor wells CR-6 and CR-8 were examined in the manner of CR-5 and are shown in the Figure groupings of B.5a-B.5d Appendix E and B.7a-B.7d Appendix E, respectively. The calculated transmissivities and storage coefficients for the three Westwater Canyon observation wells are presented below. The permeabilities were calculated using an aquifer thickness of 200 feet and a water viscosity of 1.06 cp.

Well	Transmissivity (gpd/ft)	Storage Coefficient (dimensionless)	Permeability (md)
CR-5	926	8.90e-5	239
CR-6	1208	4.13e-4	312
CR-8	1326	3.00e-4	342

Revised: October 11, 1993

2.7.2.6 Confining Clays and Leakage Potential

Test analysis of the regional pump test shows excellent confining shales for the Westwater Canyon aquifer. This was evidenced by the lack of drawdown in the over and underlying observation wells while pumping of CR-3 and by the excellent match of the data from the Westwater monitor wells using the non-leaky Theis curve.

In addition, core analysis was performed on cores retrieved from the "AA Clay" separating the Westwater Canyon Member from the underlying AA in well CR-7. Three samples were examined by Core Laboratories, resulting in an average permeability of 4.1 x 10^{-6} millidarcies (5.5 x 10^{-6} md, 5.6 x 10^{-6} md, and 1.3 x 10^{-6}). This is 72 million times less than the 298 md average calculated using the Theis curve fit.

Both the hydrologic test and the core information make it apparent that the potential of our leachate migrating to zones outside our production horizon is very low.

2.7.3 Exploration Boreholes

In Churchrock, many exploration holes were drilled during the 1950's, (see listing in Appendix G) before plugging regulations were in place and the natural drill mud must be relied upon as an adequate plugging medium, additional actions will be undertaken before beginning wellfield construction to verify the adequacy of the natural mud. To state the case, natural drill mud plugging of the drill holes has been demonstrated to be sufficient to prevent hydraulic connectivity in pump tests conducted by HRI. Also, prior to operations and after completion of injection, extraction and monitor wells, additional pump tests will be undertaken. In Churchrock, since hole locations are documented, an additional extra step of coring the abandonment mud in selected holes to evaluate the gel strength of the drill hole across the confining clays will be undertaken. The gel strength is a measure of the shearing stress required to overcome the tendency of the wellbore fluid to remain static. This stress can be converted to pressure, in psi, estimated for a certain depth from the following equation:

Pressure, psi = .003 X GS X H/D

Where GS = gel strength (lb/100 sq. ft.)

F = depth (ft.)

D = wellbore diameter (in.)

This equation is taken from the paper "Factors Affecting the Area of Review for Hazardous Waste Disposal Wells", presented by Ken E. Davis & Associates. The presentation was made at the March, 1986 proceedings of the International Symposium on Subsurface Injection of Liquefied Wastes.

Once the above mentioned coring is completed, computer simulation runs will calculate the pressures exerted by the mining operations at these unplugged locations. This information will be used to evaluate the advisability of drilling out and plugging these abandoned locations before mining.

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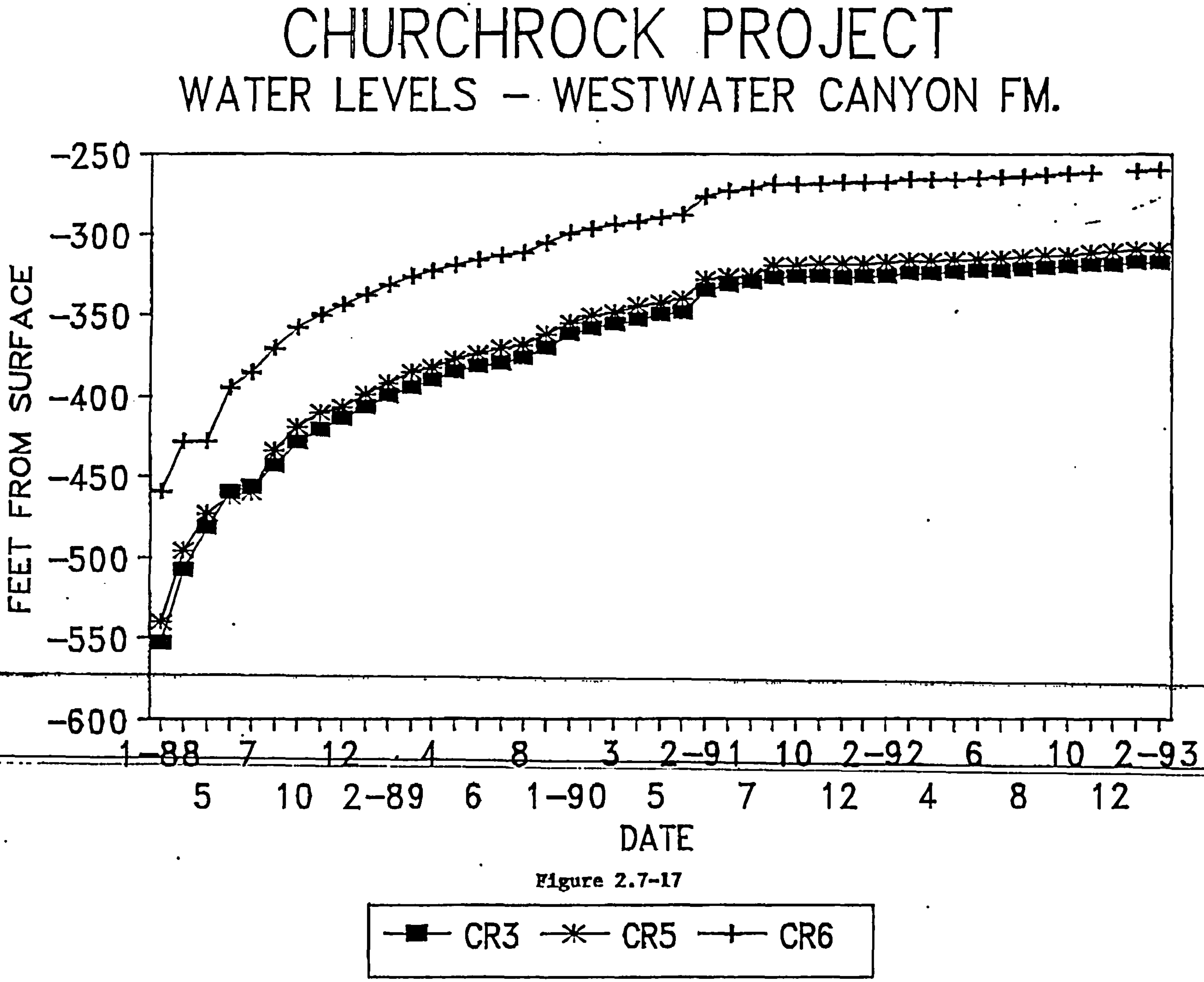
CHURCHROCK PROJECT
WATER LEVELS - WESTWATER CANYON FM.
FEET FROM SURFACE
-250
-300
-350
-400
-450
-500
-550
-600
1-88
5
7
10
12
2-89
4
6
8
1-90
3
5
2-91
7
10
12
2-92
4
6
8
10
12
2-93
DATE
CR3
CR5
CR6

Figure 2.7-17

CROWNPOINT PROJECT

IN-SITU MINING

TECHNICAL REPORT

SUBMITTED BY

HRI, INC.

JUNE 12, 1992

2.2.1.1 Stratigraphy

The San Juan Basin is composed of approximately 0 - 10,000 feet of Paleozoic, Mesozoic, and some Tertiary sedimentary rock sequences which dip gently from the margins toward the center. The margins of the basin are characterized by relatively small elongate domes, uplifts, and synclinal depressions.

The stratigraphic descriptions presented will be limited to formations to be encountered during the in-situ leach operation or formations which may have environmental significance, such as major aquifers. A generalized stratigraphic column is shown in Figure 2.2-2.

Morrison Formation - The Morrison Formation, of Late Jurassic Age, is composed of the Recapture, Westwater Canyon, and Brushy Basin Members and is the host formation for the major uranium deposits in the area. In addition, the Westwater Canyon Member is an aquifer of major importance.

Recapture Member - The Recapture Member is the lowest part of the Morrison Formation and ranges in thickness from 50-300 feet in the region and averages approximately 150 feet. It consists of alternating thin beds of reddish brown, grayish red, and light gray sandstone and siltstone. The Recapture interfingers with the Cow Springs Sandstone west of the project area. No uranium deposits of any significance occur locally in the Recapture.

Westwater Canyon Member - The Westwater Canyon Member consists of interbedded fluvial red, tan, and light gray arkosic sandstone, claystone, and mudstone. It is the major water-bearing member of the Morrison. Regionally, the Westwater Canyon ranges in thickness from 50 to more than 260 feet, and exhibits a relatively uniform thickness of approximately 235 feet in the vicinity of the project area. This member is host for the major uranium deposits in the Morrison Formation. The uranium occurs in coarse-grained poorly sorted sandstone units within the Westwater Canyon and is closely associated with carbonaceous material which coats the sand grains.

Brushy Basin Member - The Brushy Basin Member consists dominantly of greenish gray mudstones, contains thin lenses of sandstone, and a few thin beds of limestone. The Brushy Basin ranges from 20 to 300 feet thick in the region and is approximately 190 feet thick at the project area. It is distinguished from the Westwater Canyon Member, with which it intertongues, by an increase in thickness of mudstone faces and a decrease in thickness of sandstone faces. There are two distinct sandstone units within the Brushy Basin, known informally as the Jackpile Sandstone and Poison Canyon Sandstone, which are known to host uranium deposits. These units are described as alluvial fans and vary in thickness and areal extent. Only the Poison Canyon Sandstone, which represents tongues of the Westwater Canyon within the Brushy Basin, occurs at the project area. (Figure 2.2-2 Stratigraphic Column).

Dakota Sandstone - The Dakota Sandstone is the basal formation of the Cretaceous System and unconformably overlies the Morrison Formation. The Dakota is a gray-brown quartz sandstone with some interbedded conglomerate, shale, carbonaceous shale and coal. It is a marine sandstone and is considered to represent the earliest transgression of Late Cretaceous seas. The Dakota crops out around the margins of the San Juan Basin and thickens towards the center of the basin to about 200 feet - the thickness in the project area is approximately 130 feet.

Mancos Shale - The Mancos is a gray marine Upper Cretaceous shale containing thin lenses of fine grained sandstone. The Mancos varies in thickness up to 2000 feet regionally. The Mancos has two upper sandy tongues, the Mulatto and Satan, which intertongue with the Mesa Verde Group. The Mancos shale is approximately 840 feet thick at the project area.

Mesa Verde Group - The Mesa Verde Group overlies the Mancos Shale and outcrops at the project area (Figure 2.2-2). It is composed of several formations which are described below in ascending order.

2.3.2 Hydrologic Test

2.3.2.1 Introduction

A hydrologic test was conducted in April, 1991 at Hydro Resources, Inc. (HRI) Crownpoint *in situ* uranium project in McKinley County, New Mexico. This test was designed to provide the hydrologic parameters which, coupled with core and other geologic information, will allow a characterization of our proposed production horizon in terms of continuity and leakage potential. Continuity is demonstrated to ensure that future wells drilled at the perimeter of the *in situ* leach (ISL) project and completed into the Mine Zone will actually monitor the ISL mining. Although regional pump tests are of limited value to an operator for wellfield design purposes, flow tests on individual wells can be devised to provide such design information.

2.3.2.2 Geology

The various tables and figures for this report are organized in the following fashion. Tables which provide general information about the test and the wells are immediately after the test, in Appendix A. Following the general tables, and also in Appendix A, are the figures general to the overall test. Data specific to the individual wells are contained in tables in Appendix B and the figures and plots for those same wells are in Appendix C. The well number provides the location of the data and figures within Appendices B and C. For instance, data for well CP-2 is designated as B.2 and C.2 in the respective appendices, and for well CP-8, as B.8 and C.8.

The geology in this area has been described in detail in other reports (HRI, 1988; HRI, 1989) and will be summarized here only briefly. A stratigraphic column for the Crownpoint area is presented in Appendix A as Figure 1 (USGS, 1977). HRI's proposed production horizon is the Westwater Canyon Sandstone, which is the middle Member of the Morrison Formation (Jurassic age). Note that the term "Westwater Canyon Sandstone Member" is used interchangeably in this report with "Westwater" and "Mine Zone". The Westwater Sandstone is a poorly sorted sandstone of about 320 feet thick in the area, which hosts considerable quantities of commercially producible uranium.

The Brushy Basin Shale is the upper Member of the Morrison Formation and immediately overlies the Westwater. This shale is continuous across the area and acts as the upper aquiclude (preventing vertical fluid movement) for the Westwater. It is noted as 115 feet thick in the region (see Figure 1), but the dense clay, as determined from geophysical logs, averages about 80 feet locally. Demonstrating its suitability as a barrier to vertical migration of *in situ* leach fluids was a primary goal of this pump test.

The Dakota Formation is directly above the Brushy Basin Shale and is predominantly sandstone with some interbedded shale and siltstone. It is the first zone above the proposed production horizon with any significant permeability. Regionally, it is 160 feet thick (Figure 1), but averages about 170 feet locally. The Dakota was monitored during the pump test to ensure that it is hydraulically disconnected from the Westwater and may be designated during ISL mining as the "First Overlying Zone".

Continuing upward, the Mancos Shale Formation is immediately above the Dakota Formation and, except for the Two Wells Sandstone Member, a 700+ feet of massive shale and siltstone. The Mancos is of such thickness and extent that wells were not completed above it for monitoring during this pump test.

The aquiclude below the Westwater is the Recapture Shale, the lower Member of the Morrison Formation, and composed of about 255 feet of silt and mudstone. Like the Mancos Shale above the Westwater, the Recapture is of such thickness that wells were not drilled and completed below it. In addition, this protects the integrity of the Recapture as a barrier to downward flow of fluid in that multiple penetrations through the aquiclude are not made arbitrarily.

2.3.2.3 Monitor Well Preparation

A plan view of the area with locations of the pump test wells is shown in Appendix A as Figure 2. The locations of the wells completed into the Westwater Canyon aquifer were chosen for three reasons: (1) to allow characterization of the aquifer over a large region, (2) to confirm the thicknesses estimated for the upper aquiclude, especially to the north, and (3) to provide additional geologic data on the ore and individual roll fronts. Multiple observation wells, at various distances and directions from the pumped well, are required to determine the homogeneity of an aquifer through the symmetry of the pressure response and the variability of the calculated formation parameters. Figure 2 shows the locations of the older observation wells (CP-2, CP-3) and the newer monitor wells (CP-6 through CP-10) in relation to the primary pumping well, CP-5.

Various completion data are shown in Appendix A, Table 1. The older wells, CP-1 through CP-5, were drilled in 1980 and the steel casing cemented with cement baskets placed near the top of the Westwater and uncemented, slotted casing extending into the Westwater below. Wells CP-1 through CP-4 were completed with the larger diameter 10-3/4" casing since they were intended as dewatering wells for the proposed underground mine at Crownpoint (Conoco, 1982). Well CP-5 (also known as the 'Construction Water Well') was completed with smaller 6-5/8" casing and equipped with a 30 horsepower submersible pump. This well has provided water for the existing plant facility since its installation.

The newer monitor wells (CP-6 through CP-9) were drilled in 1990 and completed with 5-1/2", 14 lb/foot steel casing which was cemented from the bottom to the surface and then perforated with oil field-shaped charges, as shown in Appendix A, Table 1. Wells CP-6, CP-7 and CP-8 were opened with ten feet of perforation in each of the top, middle and bottom (but above the AA Clay) portions of the Westwater, for a total of thirty feet. Well CP-9 was completed as an individual zone well for another purpose and was not used for this test.

An attempt was made to re-complete well CP-4, and then CP-1 as a Dakota monitor well. This was done for two reasons:

1. These wells were reasonably close to the proposed pump test well, CP-5. Pumping just this one well (CP-5) then would serve two purposes of the pump test, namely, to test the continuity of the Westwater and the integrity of the overlying aquiclude in the local mine area.

2. The costs could be minimized, since the re-completion costs were considerably less than the full drilling and completion costs of a new well.

The recompletion consisted of cementing off the lower section (the Westwater) of the well and then perforating and developing the overlying Dakota. The risks associated with the recompletion of these wells were readily understood since HRI personnel are experienced in drilling and re-completing of wells in both ISL and the oil field industries. Problems did develop as anticipated. Drill pipe was lost in well CP-4 causing it to be abandoned, and the response of the Dakota in CP-1 to the usual fluctuations caused by barometric and diurnal influences was considered too poor for its use as a monitor well. As a result, well CP-10 was drilled as a twin (a nearby well) to the Westwater monitor well, CP-8, and completed into the Dakota with a thirty foot open hole section, (Appendix A, Table 1). Field representatives from the New Mexico State engineer's Office were on site during the cementing of casing for the five new wells, CP-6 through CP-10.

Each monitor well to be used in the pump test (CP-2, CP-3, CP-6, CP-7, CP-8 and CP-10) was developed using a combination of air compressors (for air jetting) and submersible pumps. Fluid levels in the wells were then monitored with Electric Handlines (also called "E-lines", "Well Sounders" and "M Scopes") and/or Steven's Chart Recorders to ensure that they responded to the ordinary barometric and diurnal fluctuations.

2.3.2.4 Town of Crownpoint Water Supply Wells

The town of Crownpoint has six water supply wells, any of which may be on or off at a particular time. These water supply wells are close enough to HRI's Crownpoint Project that this on/off operation might interfere with the detailed fluid level measurements in a pump test (see Appendix A, Table 4). As a result, and in preparation for our Area Pump Test, Mr. Salvador Chavez, Environmental Coordinator at HRI's Crownpoint Project, contacted the Navajo Tribal Utility Authority (NTUA) and the U.S. Department of Interior's Bureau of Indian Affairs (BIA) in September 1990, to ask if they would share the details of the completions and production histories for the town water supply wells. They graciously provided us with the information they had at hand. Although they did not include geophysical logs, it was enough to allow a general determination of the open zones (see Appendix A, Table 2). In addition, they allowed HRI continuous access to their metering facilities so that we could compile detailed flowrate data, and judge the interference to our Area Pump Test. HRI gratefully acknowledges their cooperation.

HRI began reading the flow meters from the individual Crownpoint town water wells in late October, 1990. Initially these meters were read twice daily, in the early morning and late afternoon, except weekends. These readings were rescheduled in mid-January, 1991 (partly because of weather) to just morning. The flowrates (in gallons per minute or 'gpm') from November, 1990, through April, 1991, are shown for the NTUA wells in Appendix A, Figure 3, and for the BIA wells in Appendix A, Figure 4. Note that during this time each well produced over 80 gpm intermittently and four of the wells produced over 110 gpm. These flowrates were calculated as an average over the period between a particular meter's totalizer readings.

Transmissivity and Storage Coefficient are two aquifer parameters normally calculated from a pump test. This is usually done most easily and accurately with a single well pumping at a constant flowrate. However, several pump tests (USGS, 1977; Mobil, 1980) have already been conducted in the area of our proposed Crownpoint ISL site and the transmissivity and storage coefficient of the Westwater evaluated. As a result, HRI felt it was not reasonable to interfere with the normal operation of the Town of Crownpoint water wells during our pump test, but to concentrate instead on demonstrating the integrity of the Brushy Basin Shale, and on showing the continuity between our monitor wells.

2.3.2.5 Pump Test Design

This Area Pump Test was to be conducted in either one or two phases. Phase One would be the primary investigation and would involve producing from Well CP-5 at 100+ gpm for 72 hours, followed by a build-up of the same duration, unless interference from the Crownpoint Town water wells indicated that the build-up (recovery) could be shortened. This would test the continuity between the Mine Zone monitor wells an, through the degree of pressure response, determine the quality of the overlying confining clay.

Wells CP-8 and CP-10 are twinned wells (see Appendix A, Figure 2) completed in the Westwater and Dakota, respectively. If the overlying aquiclude (Brushy Basin) was not adequately stressed in Phase One, as determined by the differences and the character of the drawdowns in CP-8 and CP-10, then Phase Two would involve producing well CP-8 while monitoring the Dakota well, CP-10.

A number of factors can substantially influence the results from a pump test. Among these are:

- Interference from other producing wells (mentioned above);
- antecedent conditions (i.e., significant trends noted before and continuing through the test);
- barometric and diurnal (tidal) effects;
- quality of the data recorded.

Fluid level measurements in the monitor wells typically begin two to three days prior to the pumping phase in order to determine antecedent conditions. If considerable and predictable, these trends are then "corrected" out of the subsequent test results. Because of possible and significant interference from the Town of Crownpoint water wells, HRI planned to begin monitoring for antecedent conditions at least six days prior to pumping.

The strength of barometric and diurnal effects can also be noted from the antecedent measurements. If these effects are large in relation to the resultant drawdowns, they too should be corrected out.

2.3.2.6 Pump Test Details

Steven's Chart Recorders had been installed on a number of the monitor wells weeks prior to the actual pumping in preparation for the test. During that time, Mr. Chavez had excellent results in operating the Steven's Recorders at the 400+ feet water levels typical for the monitor wells in the area. Therefore, recorders were installed on the Mine Zone wells (CP-6, CP-7 and CP-8) and the Dakota well (CP-10). All of the recorders were converted from 8-day clocks to 24 hour. In addition, the recorders on the Mine Zone wells were geared at 1:5 (i.e., one revolution of the drum to five feet of fluid level movement) and on the Dakota well at the more sensitive 1:1 ratio.

Mine Zone monitor wells CP-2 and CP-3 were expected to have considerable drawdown while producing CP-5, so the fluid levels in those wells were measured manually during Phase One. Manual fluid level measurements were taken from specific points marked at the top of the well casing. The same E-line was used for all readings on a particular well in order to remain consistent and minimize error. manual readings were also taken prior to installing a recorder on a well and at other times during the test when a check of the recorder seemed appropriate.

Antecedent data collection began on Thursday, April 4, 1991. Barometric pressures were measured on a recording barometer which was maintained throughout the test at the existing Crownpoint facility. The weather was poor (snow, wind) during much of the test, which was not unexpected, and various precautions had been taken, such as the construction of small sheds over some of the Steven's Recorders which were in locations unprotected from the wind.

The pump in Well CP-5 and Phase One were started at 1100 hours, April 17, 1991. The existing 30 horsepower, 18 stage, REDA submersible pump in Well CP-5 draws power from the local electric utility, providing a reliable power source and making interruption of pumping much less likely than with a portable electrical generator. Twenty-four hour coverage was provided to continuously monitor and maintain a constant pumping flowrate, to ensure that the Steven's Recorders were tracking properly in the wells and on the charts, and to take the various manual fluid levels required.

A single, three-inch McCrometer flow meter (Model MW 503), with a totalizer and gpm indicator (0 to 250 gpm), was used to measure the flowrates on well CP-5. Typically, HRI uses a double meter system which allows the test to continue if meter problems develop. However, this meter was newly purchased a few months earlier and the existing meter run was left intact rather than modifying it for a backup meter. The initial target flowrate for CP-5 was 110 gallons per minute (gpm), but the pump was not able to maintain that rate and it was lowered to 105 gpm, and finally to 101.1 gpm over the entire 72 hour drawdown period and 100.7 gpm over the last 24 hours. These rates are tabulated in Table B.5-A and shown graphically in Figure C.5-1.

Phase One proceeded as scheduled until an instantaneous power outage (or "power bump", as it is called locally) occurred at 0545 hours, 4-18-92, and caused the pump to stop. It was off for less than two minutes before being restarted at the 100-101 gpm flowrate. This was the only interruption during the 72 hour pumping period. The pump was shut off manually at 1100 hours, 4-20-91 (after 4320 minutes of drawdown), and the recovery portion of Phase One begun. Two representatives from the New Mexico Environmental Department (ED) visited the site during the drawdown of CP-5 to observe the monitor wells, equipment, personnel, and test procedures. In addition, two representatives of the NTUA (Crownpoint office) visited and observed the test.

The drop in fluid level at the Westwater monitor well CP-8, due to pumping of CP-5, was -14.21 feet (as measured, see Appendix A, Table 5). This compares to a rise in fluid level over the same period of +0.053 feet (Table 5) in Well CP-10, which monitors the overlying Dakota Sandstone. The large drawdown in CP-8 coupled with the actual rise in water level in CP-10 caused HRI to end the test at this point (as discussed above) and not proceed into Phase Two.

2.3.2.7 Analysis and Results

All Steven's Recorders had twenty-four hour clocks installed for this pump test, which means that twenty-four hours is required to completely track across the time scale of the chart. All charts were manually digitized into two-hour increments and input into computer files. Files were also built for the manual fluid level and flowrate readings. This data was then plotted versus time and scrutinized for obvious errors and those errors corrected or that information deleted.

Well locations were corrected for drill hole elevation to the mid-point of the Westwater Canyon Sandstone and are shown for wells CP-1 through CP-8 in Appendix A, Table 3. Since well CP-10 is shallower than the Westwater and extends to just above the top of the Brushy Basin, the correction for deviation was made to the bottom (TD) of the well. The elevations to the top of the casings for those same wells are also shown in Appendix A, Table 3. Surface locations and elevations for the Crownpoint town wells were estimated from USGS Topographic maps and are also noted in that Table. Distances between various wells, using the locations of the wells at the mid-point of the Westwater Canyon (Appendix A, Table 3), were calculated and are tabulated in Appendix A, Table 4.

The following are some abbreviations used in the various tables and plots for this report:

antec = antecedent;
baro = barometric;
corr = correction;
feet H_2O = feet of water;
F.L. = fluid levels
gpm = Flowrate in gallons per minute;
MSL = feet above Mean Sea Level Elevation;
regress = linear regression;
S = storage coefficient (dimensionless);
T = transmissivity (gpd/ft).

A note on the precision of the various estimates of transmissivity and storage coefficient in this analysis. The transmissivity is typically carried to four digits and the storage coefficient to three digits here. This was not intended to imply that all of those digits are significant. Although an error analysis was not undertaken, the range of the numbers themselves indicates that, at most, two digits would be significant, and in some cases, possibly just one digit. In general, the numbers were reported in this form as a matter of convenience in transferring them from the various computer programs to this report.

As discussed earlier, the primary objectives of this test were to show the degree of communication between the Westwater and the First Overlying Zone, the Dakota Sandstone; and to show continuity in the Westwater Canyon Sandstone in that monitor wells will communicate easily across our initial proposed project area. A secondary objective was to estimate the various formation flow parameters (transmissivity and storage coefficient).

Fluid levels, calculated to Mean Seal Level elevation and just prior to starting the pump in CP-5 on 4-17-91, are shown in Appendix A, Table 5. Typically, when static fluid levels and chemical water quality differ markedly for different sands or zones, the degree of hydraulic connection between them is negligible or nonexistent. As can be seen from Table 5, the beginning fluid levels in the twin wells CP-8 (Westwater) and CP-10 (Dakota) are very dissimilar, a 98.87 feet difference. In addition, the ground water chemistry (Appendix A, Table 9) from individual well water samples reveals a marked contrast in water quality (compare sodium, sulfate, TDS, conductivity) for the Westwater and Dakota aquifers. The fluid levels and water quality strongly indicate that the Dakota and the Westwater Canyon are indeed hydraulically isolated from each other. The results shown in Figures C.10-A and C.8-A and in the composite Figure 8, Appendix A, bears this out and is discussed in more detail below.

Barometric readings taken at the project site during the pump test were converted from "inches of mercury" to "feet of water" and plotted in Figure 7, Appendix A. As atmospheric pressure changes and is charted by the barograph, the water level in a well typically goes up or down by some fraction of the change in barometer. This fraction is known as "barometric efficiency". The wellbore fluid level moves in reverse to the atmospheric pressure. As the atmospheric pressure goes up (an increasing barometer), the wellbore fluid level will go down and vice versa. Note the large changes in the barometer reading in Figure 7 during the pumping of CP-5.

Figure C.10-A shows that the fluid levels in well CP-10 (Dakota) are affected considerably by the barometric, diurnal, and antecedent conditions. The measured fluid levels were adjusted and re-plotted with various fractions (barometric efficiency) times the inverse of the barometric readings and a barometric efficiency of 0.35 settled upon. This is plotted in Figure C.10-A as the curve "Corrected for Baro". The importance of accounting for changes in barometric pressure is especially evident when considering the trend of the measured fluid levels while pumping well CP-5, as compared to the corrected levels (see Figure C.10-A).

The recurring daily fluctuations in CP-10 demonstrate the diurnal or tidal influences on the water levels. As can be seen from Figure C.10-A, these cyclic changes do not take away from the overall, upward trend of the fluid levels corrected for barometric pressure and as a result no diurnal corrections were made.

The general upward trending slope in Figure C.10-A is indicative of antecedent conditions, in other words, the continuing and outside influence on the pressure response of a well. A "best" line fit was developed using linear regression through the curve corrected for barometric changes. This "best" line fit to the antecedent rise in fluid level gave a slope of +0.022 feet/day and is plotted in figure C.10-A as "Antec. by Regress.".

The wells CP-10 (First Overlying Zone monitor) and CP-8 (completed in the Westwater) were drilled as twins and are 72 feet apart. The drawdown in well CP-8 while pumping CP-5 was substantial, at 14.21 feet (see Tables 5 & B-8, Appendix A, and Figures C.8-A and C.8-B). A composite plot of CP-8 and CP-10 on the left side and those for CP-8 on the right side of the graph. Thus, the scale for CP-10 covers 1.0 feet, while that for CP-8 covers 20.0 feet. The large drawdown in CP-8 coupled with the attendant, overall rise in fluid level and lack of response in CP-10, and the disparity in beginning fluid levels and the water qualities of the two wells show that the Dakota Sandstone and the Westwater Canyon are, for all practical expectations, separated hydrologically.

As an additional comment to the composite graph, Figure 8, note the general rise in fluid levels in CP-10 beginning about 4-8-91, and the corresponding decrease in levels in CP-8. The drop in level in CP-8 most reasonably could be attributed o pumping of the Crownpoint Town water wells, which would affect a very large region. The coincident and opposite rise in levels in CP-10 is typical of zones hydraulically disconnected from, but vertically close to, the pumping aquifer and is called the Moordbergum or Mandel-Cryer effect.

Typically, a well not affected by pumping and which reacts strongly to barometric and diurnal fluctuations is used to develop corrections for other wells which do not respond to the pumping. In this case, with no response in CP-10 from pumping of CP-5, corrections for the various cyclic and random changes in fluid levels could be made to other wells from CP-10. This was done in the first part of the analysis for this Area Pump Test.

The pump test analysis proceeded in two parts. The first portion involved an examination of the data and calculation of the various formation flow parameters (transmissivity and storage coefficient) using data corrected for barometric, diurnal and antecedent conditions, but not modified for the interference caused by other flowing wells. Except for well CP-10, the barometric and diurnal corrections turned out to be negligible as compared to the larger corrections made for the production from the Town of Crownpoint water wells. As a result, only the second portion of the analysis is presented here and "uncorrected" in the various tables and figures of this report refers to the fluid levels "as measured", while "corrected" refers to those corrections for the Town water wells determined from computer simulation.

As noted above, the various flow characteristics for the Westwater has been estimated in other studies and was not a primary objective here. However, by investigating the influence of the producing Town water wells on the HRI observation wells, the degree of scale of those effects could be determined. Obviously, this would involve computer simulation, and selection of the best computer model for this effort had to be considered. Models were available and on hand utilizing either the Theis solution or numerical techniques (specifically finite difference) to solve the radial diffusivity equation. The single, most important difference between the solution methods for these models is that the Theis model assumes homogeneity in the system, whereas the numerical models allow the formation characteristics (transmissivity, thickness, etc.) to vary.

The Theis solution model was ultimately selected for use for the following reasons. In order to take advantage of the non-homogeneity aspect of the finite difference model, data as to the variability of the system must already be available, and then the model set up and calibrated. Over the relatively small region that this Area Pump Test was to encompass, even when including the area of Crownpoint Town water wells, the detail is simply not available and the finite difference model would run as a homogeneous system, just as the Theis solution model.

The changing flowrates of the Town water wells have to be included in any analysis. As it happened, any change in rate lingers for some time and is usually accounted for mathematically using a special technique called superposition. Thus, any model chosen would have to handle the many changes in flowrates represented by the Town water wells. The available Theis model does so and provides an immediate graphic comparison of measured versus estimated drawdowns for any combination of the producing wells. The finite difference model accounts for changing flowrates, but in a manner more unwieldy for the user.

Two other considerations let to choosing the Theis model for this study. Generally, the Theis models re much easier to set up and very fast to run and re-run. Secondly, most analyses of pump tests involve using the Theis solution and various semi-log techniques, which were developed as extensions of that theory, to solve for the formation flow parameters, and are all based on the same limiting assumptions. Even with these restrictions, these analytical methods have proven to give excellent results as to general formation flow characteristics and are used extensively even to providing the input data for finite difference/finite element models.

All analyses for the Westwater observation wells were made in the same general manner. Consequently, that method will be described in detail for one well, arbitrarily CP-7, with the similarities to other wells understood. The fluid levels for Well CP-7 from early to late April, 1991 are tabulated in Table B.7-A and plotted in Figure C.7-A.

All flowrates for the Town of Crownpoint water wells from November, 1990 through April 1991 (see Appendix A, Tables 3 & 4 and Figures 5 & 6) and varying on a daily basis were included in the computer simulation using superposition. Also included in this model were the flowrates from Well CP-5 (Table B.5-A) and well CP-6 (Table B.6-B). In addition, for the sake of completeness, the following were included: the 124 minute flow of well CP-5 for 103.3 gpm on 2-19-91, and again for 79 minutes at 107.6 gpm on 4-1-91, as well as the 60 minute flow of CP-6 at 18.7 gpm on 4-23-91. The individual start and stop times for flowrates in the model can be set to the second.

The most prominent feature of Figure C.7-A, as well as the region of most interest, is the drawdown and recovery caused by producing well CP-5. As a result, this was the feature chosen to be history-matched and the area most closely observed during the ensuing trial and error pressure matches with the simulator. All production wells were included from November, 1990, and transmissivity and storage coefficient were varied until the best match, of the CP-5 drawdown and the other fluid level changes, occurred. A transmissivity of 2556 gpd/ft and a storage coefficient of 1.39e-4 (dimensionless) achieved the best results here and was plotted as the "simulation" curve in Figures C.7-A and C.7-G. The simulation was then run with only the Town of Crownpoint water wells and the resulting estimated drawdown noted as "Town Wells" on the various figures (again, Figures C.7-A and C.7-B). The estimated effect of the Town wells was then subtracted from the measured fluid levels and the "corrected" curve plotted (Figure C.7-B). Table 6, (Appendix A) contains a summary of the transmissivities and storage coefficients used to history-match fluid levels for the various Westwater monitor wells.

Figure C.7-D is the log-log Theis-type curve match for the uncorrected drawdowns in well CP-7 during the water production from CP-5. Also shown in that plot is the match of the pressure derivatives, that is, the first derivatives of both the Theis curve and the uncorrected, measured fluid levels. As can be seen from Fighre C.7-D, the first derivative has a more pronounced curvature than its parent (the Theis solution) and actually reverses slope on the log-log plot. When both the Theis and its derivative curve are moved at the same time, a more firm match will usually result than with the Theis curve alone, since there is normally a much smaller area in which a fit is good for both curves, especially if the match depends on data at the later times. This technique has gained considerable popularity since 1979 and is used extensively in the petroleum industry since it provides a more certain diagnostic tool for many of the complex geologic systems normally encountered, such as double porosity, fracture, leakage dominated, and bounded (Tiab and Kumar, 1980; Bourdet *et al.*, 1983; Bourdet *et al.*, 1989; Ehlig-Economides *et al.*, 1990). There are many additional publications, and some describe extending the technique to using the pressure integral and the second derivative.

The transmissivity calculated from the curve match in Figure C.7-D is 1734 gpd/ft and the storage coefficient is 1.37e-4 (dimensionless). It should be noted that, although a computer was used to facilitate the curve matches presented in this report, the selection of each match was done manually. Figure C.7-E presents the log-log match to the "corrected" drawdown data for the Theis curve and its derivative over the same time period as Figure C.7-D. The transmissivity in this case is 2198 gpd/ft and the storage coefficient, 1.54e-r.

A straight line at the later times in a semi-log plot of drawdown versus log of time determines the transmissivity and storage coefficient. This provides estimates of those parameters which are preferable as compared to the log-log plots discussed earlier. This is so because the number of reasonable straight liens through the later times is usually much smaller than the possible curve matches in a log-log plot and this results in a smaller range of possible transmissivities and storage coefficients from semi-log plots.

However, the proper straight line forms in a semi-log plot only after a specific, minimum time has passed, which itself is dependent on the flow characteristics of the formation. In ground water terms, the time must be such that $u <= .025$ and in petroleum terms, dimensionless time $(tD) >= 10$. This minimum time was estimated from the log-log Theis curve matches and then shown on the semi-log plots. Linear regression was used to determine the "best" straight line fit for points with times greater than the calculated minimum time. The transmissivity was then calculated from the slope of that straight line and the storage coefficient from the X-intercept. Figure C.7-F shows that results for the uncorrected fluid levels and Figure C.7-G for the "corrected" data (corrected for the concurrent water production from the Town of Crownpoint water wells).

Semi-log analysis of the recovery or buildup data (after drawdown has ended) is favored over that of the drawdown analysis because the recovery data is less affected by changes in flowrate of the pumping well, which might have occurred earlier, than is the drawdown data. The time on the abscissa or X-axis is replaced by a ratio of the production time to shut-in time, t/t'. Proceeding to an even more important buildup plotting technique, the Residual Drawdown curve simply takes the difference between the initial and the shut-in fluid levels and plots this on the ordinate or Y-axis. The transmissivities are then calculated from the slopes of the "best" straight lines beyond a certain minimum time, as explained earlier. This is shown for both the uncorrected and corrected fluid levels in Figure C.7-H and the resulting transmissivities noted.

The analysis as described above wa identical for all of the Westwater observation wells (CP-2, CP-3, CP-6, CP-7 and CP-8). The transmissivities calculated from the various plots for those wells are summarized tin Table 7 (Appendix A) and the storage coefficients in Table 8. (Appendix A)

The semi-log Residual Drawdown curve was chosen for the pressure buildup plot because it has the significant advantage of resulting in straight lines which pass through the X-axis at the origin (zero) if there are no unusual effects, either within the zone being tested or from outside influences. A number of influences might cause displacement from the zero point, but in particular, the continued depressurization from other production wells will cause a shift to the left. This provides one means of validating the corrections made earlier for the Town of Crownpoint water wells: the lines through the corrected points should fall closer to the zero point than those for the uncorrected points.

This does happen for wells CP-2, CP-6 and CP-7 (Figures C.2-H, C.6-H and C.7-H, respectively). Figure C.3-H shows the lines to be about equidistance on either side of the zero point, but both are fairly close to zero. The difference is considered to be negligible when considered the proximal location of CP-3 and CP-2 and that CP-2 showed an X-intercept of the corrected data very close to zero.

Well CP-8 (Figure C.8-H), on the other hand, also has straight lines on both sides of the zero point, but both are further from zero than for CP-3. As can be seen from Table 8, the wells with the lowest storage coefficients are wells CP-3 and CP-8, with well CP-8 about half of CP-3 and about 2-1/2 times less than the average of CP-2, CP-6 and CP-7. Considering that a line drawn from CP-5 to CP-6 (Appendix A, Figure 2) is between wells CP-3 and CP-8 and that well CP-6 has an estimated storage coefficient close to 1.0e-4, it appears that the lower storage coefficient at CP-8 is a local phenomenon. Whether it extends further to the west from CP-8 is unknown.

This lower storage coefficient at CP-8 was also reflected in the computer simulations described earlier (Appendix A, Table 6). The simulations matched the most dominant feature of the fluid level curves, the drawdown caused by CP-5, and by their very nature, would most closely reflect the conditions between CP-5 and the individual observation well. If the storage coefficient used in the simulation was lower than the regional average, then the drawdown attributed to the Town wells would be too large, a as would be the resulting correction, and the line in the plots, such as Figure C.8-H, would be shifted to the right. If the formation parameters (transmissivity and storage coefficient) local to the monitor wells were near the regional average, then the correction determined by the simulation would place the X-intercept on the semi-log residual drawdown plots very near to zero, as for CP-2, CP-6 and CP-7. This indicates that regionally, between wells CP-2, CP-6, and CP-7 and the Town water wells, the storage coefficient is about 1.0e-4.

As a note, another simulation was run for well CP-8 with the storage coefficient doubled to 9e-5. In that case, the effects of the Town wells were decreased by just over 40%, which would shift the "corrected" line in Figure C.8-H to the left and closer to the zero point.

One final set of figures was constructed for the drawdowns associated with the production from well CP-5 and are called semi-log distance drawdown plots. The drawdown for a particular time and monitor well is plotted against the inverse of the distance squared from the pumping well. The greater the homogeneity (the less the anisotropy) of a formation, the closer the points will fall to a straight line. The lines determined from linear regression on the semi-log drawdown plots were used to compute the drawdowns at 2880 and 4200 minutes into the pumping of CP-5. This"uncorrected" and "corrected" data were then plotted af Figures 10 and 11, Appendix A.

Two times (2880 and 4200 minutes) were used to ensure that time would not drastically affect the pressure relationship of the Mine Zone monitor wells one to another, which in turn would cause Figures 10 and 11 to differ markedly from each other in overall appearance. Both figures area reasonably the same. Note that the points for CP-2, CP-3, CP-6 and CP-7 lie, generally in a straight line, indicating homogeneity between those wells. Linear regression was used to determine the "best" line fit using the points from those four wells (excluding CP-8) and the resulting transmissivities and storage coefficients are shown in Figures 10 and 11 and in Tables 7 and 8. Not surprisingly, CP-8 lies off the line represented by the other wells.

If it is assumed that the points in Figure 10 and 11 (Appendix A) are not adequately represented by straight lines, then the system is non-homogeneous. One common method of depicting such a system is with variable transmissivities that can be separated by direction to obtain maximum and minimum values which are mutually perpendicular (an anisotrophic system). Such an analysis was conducted here to allow comparison of the various estimated parameters for the different systems. This method assumes a constant storage coefficient with a variable transmissivity and, as noted above, there is evidence of just the opposite at well CP-8. As a result, the values shown below are averages with and without well CP-8 included. The angle (in degrees) of the average major transmissivity is measured such that zero is to the east and increases counter-clockwise (e.g., an angel of -45 degrees would be to the southeast and +45 degrees, to the northeast).

Using the uncorrected data:

	Excluding Well CP-8	Including Well CP-8
Storage Coefficient	9.10e-5	7.93e-5
Major Transmissivity	2,453	4,039
Minor Transmissivity	1,749	1,184
Angle of Major Transmissivity	-27	-27

Using the data corrected for the Town water wells:

	Excluding Well CP-8	Including Well CP-8
Storage Coefficient	8.48e-5	7.42e-5
Major Transmissivity	4,303	5,772
Minor Transmissivity	1,959	1,526
Angle of Major Transmissivity	-9	-17

2.3.2.8 Conclusions

1. The Dakota Sandstone Formation is hydrologically separate from the Westwater Canyon Sandstone. This is borne out by the water quality and fluid levels of the two sands, as well as, by the negative response of the Dakota during this Area Pump Test.
2. The continuity of the Westwater is excellent across the area of the projected ISL mine. Production Zone Monitor wells will respond readily to changes within the Mine Area.
3. Transmissivity for the Westwater Canyon Sandstone, corrected for the coincident production from the Town of Crownpoint water wells, averages about 2600 gpd/ft through the area and the storage coefficient, about 9e-5 (dimensionless).

2.3.2.9 Acknowledgements

Mr. Pelizza, Environmental Manager for HRI, coordinated all aspects of this test with the various regulatory agencies and the Navajo Tribe.

Mr. Frank Lichnovsky, Senior Geologist with HRI, provided the log correlations and geological interpretations. In addition, he coordinated the drilling and recompletion work at the Crownpoint site.

Mr. Salvador Chavez, Environmental Coordinator at HRI's Crownpoint Project, had responsibility for most onsite operations:

- developing and preparing Crownpoint monitor wells;
- compiling flowrate data from the Town of Crownpoint's water wells;
- day to day data collection and data quality control.

Mr. Craig Bartels, Reservoir Engineer, prepared the pump test analysis.

2.3.2.10 References

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UNIT I PROJECT

U.I.C. APPLICATION AND TECHNICAL REPORT

BY

HRI, INC.

SUBMITTED TO U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 9
SAN FRANCISCO, CALIFORNIA

OCTOBER 16, 1992

DATA SUMMARY REPORT
CROWNPOINT - SOUTH TREND
PUMPING TEST
McKINLEY COUNTY, NEW MEXICO

Submitted to:

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27 October 1982

Mr. William B. Trippett II
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P.O. Box 5444
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Subject: Transmittal - Final Data Summary Report,
Crownpoint South Trend Pumping Test Project
0.53.05 Term Contract Number UMD 4205
CDM Project No. 0779-117-CG

Dear Bill:

Camp Dresser and McKee Inc. (CDM) is pleased to submit the accompanying final Data Summary Report for Mobil Oil Corporation's Crownpoint South Trend Pumping Test Project. As you requested, this report incorporates the modifications and suggested changes resulting from Mobil's review of CDM's draft report. As was indicated for our draft report, please do not attempt to perform scaled measurements or graphic analysis of the figures contained in the report as they have been xerox reproduced and contain some degree of distortion.

CDM would like to express its sincere appreciation for the opportunity to assist Mobil Oil Corporation on this project. It was a pleasure working with you and I hope that we have the opportunity to do so again in the near future.

Please feel free to contact us if you have any questions regarding this final report or if we can be of further assistance.

Sincerely,

William G. McMullan

William G. McMullan
Associate

WGM/jm

Enclosure

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CDM

1.0 INTRODUCTION

Mobil Oil Corporation is currently pursuing development of an in situ solution uranium mine in the vicinity of Crownpoint, New Mexico. As part of this development, Mobil will be required to submit selected hydrogeologic data for the proposed site to the New Mexico Environmental Improvement Division, State Engineer and the Minerals Management Service. The information required relates primarily to the hydrogeologic characteristics of the uranium producing formation (the Westwater Canyon Member of the Morrison Formation), the potential for drawdown impacts and vertical leakance from other formations, and documentation of hydraulic communication between the production well field and the adjacent monitoring wells.

In response to the aforementioned data requirements, Mobil has agreed with the regulatory agencies to conduct a 24-hr pumping test at the Crownpoint-South Trend site. The services of Camp Dresser and McKee Inc. (CDM) were retained by Mobil to supervise the testing activities, and to provide reduction and compilation of water level monitoring data and other information obtained from the pumping test. In addition, Mobil has retained Thomas A. Prickett and Associates to analyze the pumping test data relative to the aforementioned hydrologic information requirements.

This Data Summary Report presents the results of the pumping test, including tabulated field monitoring information, data plots, a narrative description of the pumping test activities, and preliminary analysis of selected test data.

1.1 OBJECTIVES

As part of its permit application to conduct solution mining activities at the South Trend site, Mobil has agreed to provide information adequate to address the following:

- Hydraulic properties (e.g. transmissivity and storativity) of the uranium-producing Westwater Canyon Member of the Morrison Formation

- Hydraulic communication between the production well field and the surrounding monitor wells
- Potential for downward leakance through the Brushy Basin shale from the overlying Dakota sandstone
- Potentiometric impacts that could occur to the Dakota sandstone as a result of this leakance

To address these requirements, Mobil agreed to conduct a 24-hr pumping test at the South Trend site. Data collected from the test will be analyzed by Thomas A. Prickett and Associates to provide the hydrologic data.

1.2 SCOPE OF WORK

CDM's primary involvement with the aforementioned pumping test included the following:

- Provide two hydrogeologists to supervise and assist Mobil in the pumping test activities
- Reduce and compile water level data obtained during the test
- Develop tabular information and data plots for analysis by T.A. Prickett and Associates
- Conduct preliminary data analysis of transmissivity for selected wells

Under the Contract Scope of Work, Mobil provided all equipment required for the pumping test, with the exception of selected monitoring equipment which was provided by CDM. Specifically, Mobil was responsible for providing the following test-related equipment and support functions:

- All pumping, discharge monitoring, water level recording/monitoring equipment
- Pre-test water level (and other) monitoring equipment, set-up and tear-down of all testing-related equipment
- Field technicians and support staff (9) to assist in test operation and data acquisition

CDM provided two hydrogeologists to supervise the testing and monitoring activities. In addition, CDM provided two Johnson-Keck SD62B water level recorders, selected Stevens Type-F recorder gears, a portable discharge measurement flume, and a digital pressure transducer monitoring/recording system with electric sounder backup for the pumped well.

CDM's initial efforts focused on review of available hydrogeologic data for the site and surrounding area, and discussions with Mobil staff to coordinate the pumping test activities and related logistics. Following mobilization to the project site, a preliminary test was conducted on 10 August 1982 as a "shake-down" for the actual pumping test performed 16-18 August 1982. Subsequent to completion of the final pumping test, all data were transported to CDM's offices in Wheat Ridge, Colorado for reduction, compilation, and preliminary analyses.

1.3 PUMPING TEST DESIGN

The pumping test at the South Trend site was designed by Mobil and included the following elements:

- A pumped well completed in four potentially producing sands of the Westwater Canyon Member
- Two monitor wells completed in the Dakota sandstone
- 27 monitor wells completed in the Westwater Canyon Member
- Continuous rate pumping and monitoring for 24 hr at a design rate of 75 gpm
- Recovery period of 24 hr

The distribution of monitoring and production wells at the South Trend site is presented in Figure A-1 of this report (Appendix A). As indicated, the array of wells utilized for the pumping test includes the following:

- A centrally located pumping well (15M7) completed in the Westwater Canyon Member of the Morrison Formation, within the proposed production well field

- Five "interior" monitoring wells, also completed in the Westwater Canyon Member and located in a rough, north-south line across the production well field
- 21 "exterior" monitoring wells completed in the Westwater Canyon Member and located peripheral to the proposed production well field (4 wells were completed in individual sands)
- Two "interior" monitoring wells completed in the Dakota sandstone and located within the production well field
- One "exterior" monitor well completed in the "e" sand of the Westwater Canyon Member and located near the southwestern portion of the outer monitoring well ring

Equipment used to monitor drawdown and recovery in the pumped and monitor wells is described in Section 3.0 of this report (Field Program).

2.0 PRE-TEST PREPARATION

A project initiation meeting was held at Mobil's Denver offices on 28 July 1982 to begin planning and coordination activities for the pumping test. In this meeting, a preliminary work plan was submitted by CDM, identifying the anticipated schedule and activities leading up to the test. Preparatory action items and logistics were discussed and delegation of responsibilities were finalized between Mobil and CDM.

Following this meeting, CDM proceeded with acquisition of equipment and materials necessary for fulfilling its responsibilities on the pumping test program. As part of these efforts, CDM acquired various components of a Hewlett-Packard (HP) 41CV calculator/multimeter interface system to be used in recording drawdown data from a pressure transducer probe in the pumped well. During the period 2-8 August, CDM developed the necessary software for this system so that frequent data could be recorded from a pressure transducer probe in the pumped well during the early portions of the drawdown and recovery period. Additionally, CDM performed a pre-test calibration of its SINCO pressure transducer unit by conducting a short-term pumping test in a local shallow well. This pre-test calibration test was intended to evaluate the transducer performance over the partial range of pressure anticipated during the actual test.

All materials and equipment were shipped to Albuquerque, New Mexico on 6 August 1982 and transported to the project site by Mobil personnel. CDM staff traveled to the project site on 9 August 1982 to assist Mobil personnel in set-up and inspection of the equipment for the preliminary pumping test.

3.0 FIELD PROGRAM

3.1 PRELIMINARY TEST

3.1.1 Preparation

Equipment set-up for the preliminary pumping test was initiated the morning of 9 August 1982. Two field crews were utilized during the set-up process; one crew at the pumped well, and one at the array of monitor wells.

Two personnel, one each from Mobil and CDM, were stationed at the pumping well to supervise installation of the pump, transducer system, wire-line monitoring tube, and associated cables. The submersible pump (furnished by Mobil) was a three stage, 25-hp Grundfos Type SP 16 set at a depth of approximately 950 ft in well 15M7. A Sinco 56442-250 Model pressure transducer was installed slightly above the pump and connected by 1000 ft of cable to a Sinco Model 56499 LCD digital readout unit. A nominal 1-1/2 in. ID plastic monitoring tube was also installed in the well to allow backup water level measurements with an electric (wire-line) well sounder. The monitoring tube was securely attached to the discharge pipe. The transducer and pump power cables were also secured to the discharge pipe at appropriate intervals with fiber tape. Mobil's staff engineer (W.R. Bowman) supervised the installation of the pump and cable, discharge pipe, and monitoring tube. The CDM staff hydrogeologist (D.C. Chamberlin) verified the proper installation of the transducer. CDM also installed a 1000-ft M-scope wire line device through the monitoring tube as a back-up to the pressure transducer.

The second crew, composed of Mobil staff and the on-site Mobil supervisor (W.A. Trippet), installed Stevens Type F Recorders on 24 wells completed in the Westwater Canyon Member of the Morrison Formation. Three additional recorders were installed on Westwater monitoring wells the following morning (10 August) after the preliminary pumping test had been completed. Johnson-Keck SD62B Water Level Sensors furnished by CDM were installed on each of two wells completed in the Dakota sandstone. Proper installation of all recording devices was verified by CDM's principal investigator (T.L. Johnson). M-scope readings were taken during the installation of each recorder to allow calibration of the respective charts.

The set-up of monitoring equipment included establishment of the electrical circuitry for the HP system, as discussed in Section 3.2. This equipment was set up in a mobile trailer 50 ft from the pumping well.

Discharge monitoring devices were installed adjacent to the pumping well. This equipment included an in-line Halliburton flow meter, with LED rate and totalizer displays, and a portable Parshall flume at the end of the discharge line. The Halliburton meter was installed by the Mobil site technician (W. Robinson), and the flume by the CDM staff hydrogeologist (D.C. Chamberlin). The flume was installed and levelled on a 20-ft-long by 4-ft-wide rubber mat to channelize the flow and eliminate infiltration loss.

3.1.2 Operation

Pumping was initiated at approximately 1300 hours on 10 August. No discharge or drawdown was observed after running the pump for 10 to 15 minutes. As a result, the pump was shut down and the pump-setting rig brought in to remove the discharge pipe. A mud plug encountered in the discharge pipe at the 500-ft level was removed. The drop pipe was then reinserted back in the pumped well and the pump turned on at each connection to ensure that no additional plugs were present. Upon completion of this process, the pump was turned on for 10 minutes, and the gate valve set to the desired 75 gpm.

All recorder charts were changed the morning of 11 August. At 1000 hr the pump was turned on and run for 3 hr at a constant discharge rate of 75 gpm. Pumping was stopped at 1300 hr. Recovery was monitored for an additional 2 hr until 1500 hr. During the 5-hr drawdown/recovery period, all monitoring equipment was checked, including the HP calculator system. No significant problems were identified. At the pumped well, standing water was observed in the discharge line, indicating that the check valve installed by Mobil had held properly.

3.1.3 Results

Preliminary semi-logrithmic plots of drawdown and recovery versus time from the pumped well were prepared in the field to examine aquifer response on a cursory level. Equilibrium, whereby a constant pump level is achieved, occurred within 20 minutes of pumping. Response was noted in all interior Westwater wells, and in nearly all wells in the outside monitoring ring. All monitoring equipment appeared to function adequately. Considerable "sticking" of floats occurred in most wells, but this situation was rectified by periodically shaking the float wires and noting the corresponding time marks on each recorder chart.

3.2 INTERIM MONITORING

3.2.1 Preparation

Following termination of the preliminary test, a meeting was held in Mobil's field office to discuss operation of the monitoring equipment during the interim period. The Mobil field personnel responsible for this monitoring (S. Dellinger and R. Pierce) were instructed on the timing and method of data collection during this period. Each recorder was to be checked three times daily, with time marks as early in the day as possible, near mid-day and as late in the day as possible. Scheduling was completed with the designation of additional Mobil personnel (W.A. Trippet and W.A. Steingraber) to be on site to complete the interim monitoring on 15 August 1982.

Mobil personnel were also instructed to perform two additional tasks during the interim period:

1. Install a second Halliburton flow meter in parallel with the first as a back-up, with necessary gate valves.
2. Complete the on-site power system to ensure adequate and stable voltage to both the pump and the trailer, where a variety of electrical monitoring and recording equipment would be used.

Upon conclusion of the meeting, responsibility for the operation of the interim monitoring period was transferred to Mobil.

3.2.2 Operation

Monitoring during the interim period was accomplished with less success than desired. Scheduling problems and access constraints resulting from adverse weather conditions precluded taking readings as frequently as originally planned. At most wells, at least one reading per day was made. Readings per well averaged three on the 12th, two on the 13th, one on the 14th, and two on the 15th of August. All recorder charts were changed by Mobil personnel on 15 August. M-scope readings were recorded by Mobil personnel at each well to calibrate the Stevens recorder charts. No M-scope readings were taken in wells 16185 (closest Westwater well) and 15M7 (pumping well). Because the Stevens recorder float problems were not conducive to an accurate record of the response anticipated in well 16185, the Stevens Type F recorder at this well was replaced with a third Johnson-Keck 62B sensor furnished by Mobil.

During the interim period, Mobil staff installed the second Halliburton meter and wired an auxilliary generator to supply electricity to the equipment trailer.

3.2.3 Results

As previously noted, water level monitoring data for the interim, pre-test period were limited. No regular, consistent, or significant trends for all wells were observed. Hydrographs for all wells are presented in Appendix B. As shown on these graphs, background water level conditions during the interim period ranged from a gradual increase to gradual decrease, with several wells displaying significant fluctuations. As a result of these fluctuations and lack of meaningful trend, pre-test water level data from USGS monitoring wells in the area were subsequently used to define pre-test trends in the Westwater Canyon aquifer.

The barometric conditions during this period are presented in Appendix C.

3.3 FINAL TEST

3.3.1 Preparation

All Mobil and CDM personnel assembled at the pumping site during the morning of 16 August. Final checks of the Stevens and Johnson-Keck recorders were made. A meeting with all personnel was held at 1100 hr to distribute instructions prepared by CDM delineating specific (individual) responsibilities and schedules, as well as projected data recording intervals and frequencies. Questions were answered, and potential problems discussed. The field crew was then instructed as to the appropriate remedial action(s) should problems (e.g. pump failure) arise. Lines of responsibility for CDM and Mobil personnel were delineated.

Final pretest time demarcations were made on all recorders at approximately 1130 hr.

3.3.2 Operation

The pumping test commenced at precisely 1200 hr on 16 August 1982, as scheduled. The pumping rate began at 74 gpm, and was corrected to 75 gpm plus or minus 1.7 percent within the first minute of the test.

At approximately 1215 hr, the discharge rate displayed on the Halliburton meter showed a 1 gpm decrease. The gate valve was adjusted to increase the displayed discharge back up to 75 gpm. Additional similar adjustments were made at 1219, 1225, and 1230. At 1235 hr, a discharge increase of 3 gpm was indicated as necessary. At 1238 hr, the decision was made to route the pumped well discharge entirely through the second Halliburton meter, and to shut the first meter off. Once appropriate valves were opened, the second meter displayed a discharge of 82 gpm. Flow was immediately reduced to 75 gpm, where it was stabilized to within 1.7 percent for the remainder of the test. Subsequent inspection of the first Halliburton meter showed that two brass fragments had become partially wedged in the impeller, resulting in spurious discharge meter readings. The brass fragments were eventually determined to be from the check valve installed above the pump, indicating that considerable damage to the valve occurred at some time prior to or during initial portions of the test.

The test progressed smoothly until 1350 hr. High wind, rain, and hail during this period impaired data collection (demarcation of time intervals on Stevens charts) for approximately 1 hr. The adverse weather at the site impeded monitor well access, delaying water level measurement times. No inflow of surface water to the monitoring wells was observed. Total rainfall on-site during the storm was 0.50 in.

Other problems occurring during the course of the drawdown period were as follows:

1. The auxiliary generator failed, reducing power to the trailer. As a result, the HP system began drawing too much power and was shut down at 2100 hr. Collection of accurate pumping well data continued with transducer and M-scope readings.
2. The Johnson-Keck unit on well 15L101 did not function well after the first 12 hr of pumping. A replacement unit gave no improvement.
3. Access along the outside monitoring well ring continued to be a problem, resulting in longer intervals between time marks on the Stevens charts.
4. Considerable float-sticking and chart-wraps were encountered on many wells monitored by a Stevens F-type recorder, reducing the overall quality and continuity of the water level data.

The recovery period commenced with pump shut-off at 1200 hr on 17 August 1982. At 1221 hr, an M-scope was inserted in the discharge pipe at the well head. No water was encountered to a depth of 80 ft, indicating that the check valve had indeed failed and all water in the discharge column had drained into the pumped well.

Sticking of floats became more pronounced during the recovery period in many of the wells, but adequate data were collected by systematically jarring the float wires at each time interval.

The decision was made by Mobil at 1130 hr on 18 August to terminate the recovery period as scheduled at 1200 hr. Residual drawdown in the pumping well was only 2.78 ft or 1.8 percent (of 154.1 ft). Residual in the nearest Westwater well was 3.5 ft or 10.1 percent (of 34.5 ft).

The Mobil pump rig began pulling the pump at 1210 hr. Simultaneously, recorder charts were removed from all wells, and final M-scope readings were taken for chart calibration. All equipment was disassembled and packed for shipment or storage. The test site was shut down at 1530 hr.

3.3.3 Results

Data collected during the pumping test are presented in Appendix B. The following data and data plots are presented in Appendix B by well number:

- Tabulated data on data forms
- Time versus water level hydrographs
- Time versus drawdown, log-log, and semi-log plots
- The ratio of time since pumping started/time since pumping stopped versus residual drawdown, semi-log plots (recovery)

A discussion of preliminary analyses from this graphical and tabulated data is presented in Section 4.0.

4.0 DATA REDUCTION

4.1 METHODOLOGY

Two primary field methods of water level data collection were utilized during the test.

- Mechanical water-level recorders, Johnson/Keck (2 Dakota wells), and Stevens F-type water level recorders (27 wells)
- Pressure transducer readings recorded by a HP-41CV/multimeter system with verification reading

Stevens recorders were used for the 29 observation wells. The 41CV system was used only for the pumping well, with manual transducer readings collected from the transducer readout for back-up. The discussion of data reduction methodology is divided into two sections to explain the techniques used to reduce data collected by the aforementioned field methods. These sections are followed by a discussion of the methodologies used to correct water levels for regional trends, barometric fluctuation, and to present the data in graphical form.

4.1.1 Stevens Recorder Data

Data collected by the mechanical water-level recorders was very difficult to tabulate due to the following factors:

- Many recorder floats stuck during the test, and in most instances, would move only after field personnel manually freed the float lines. These difficulties were due primarily to the considerable depth to water in each well, and snagging on well casing joints.
- Recorder charts could not be checked regularly with water level measuring devices (m-scope, steel tape, etc.) without removing the recorder floats. Therefore, little data exists to correlate actual water levels to the chart record when data was discontinuous due to float stick or other difficulties.

CDM staff tabulated data collected by the mechanical recorders compiled from August 9 (when recorders were installed) until 18 August (end of recovery), where possible. This tabulated data is presented, by well number, in Appendix B. Each data set includes time of measurement and water level depth from the reference point.

The time of measurement was recorded on 4- or 24-hr recorder clocks. Each data point was corrected for possible recorder clock error. The correction was made utilizing the following formula:

$$TLU = [(CED - CSD) \times 1440 + (CET - CST) \times 60] \div LS$$

where:

TLU = Time length unit
CED = Chart end day (day of month)
CSD = Chart start day (day of month)
CET = Chart end time (0-2400 hr)
CST = Chart start time (0-2400 hr)
LS = Length of chart span (length from CST to CET using engineering rule, 50 scale)

The Time Length Unit (TLU) is the actual increment of time per unit length of the engineering rule, 50 scale.

Water level data was then tabulated from each chart by following the record from each manual measurement of water level by field personnel. Water levels collected by M-scope on 9, 10, 15, and 18 August were utilized to correct chart records to actual water level. For wells that were not field measured on one or more of the aforementioned dates, chart records were correlated from existing water level data. This resulted in entire chart records being based on one water level measurement at the beginning or end of the data record. Generally, the lack of water level data did not affect the drawdown and recovery records, but did result in incomplete hydrograph records. It was not possible to obtain meaningful data from water level records for well 15L101 (Dakota Sandstone).

4.1.2 Pressure Transducer Data

Pressure transducer data for the pumping well was collected and recorded on magnetic tape by a HP-41CV/multimeter system. This system was designed and programmed by CDM staff hydrogeologists to collect data rapidly during the first hours of drawdown and recovery.

After returning from the field, the magnetic tape record was printed to hard copy for data tabulation. The multimeter recorded voltage output from the Sinco transducer. The voltage is converted to the standard transducer readout using the following formula:

multimeter data x 100 = transducer readout

The converted readout data was used to calculate head and drawdown data using TRANPRO (CDM HP-41CV program). Data from TRANPRO is tabulated for well 15M7 (the pumped well) in Appendix B. The following equations are used in TRANPRO to calculate drawdown from Sinco transducer data:

$$\text{Pressure} = P = \frac{(\text{Transducer Reading} - \text{Offset}) \times \text{Range}}{100 \times \text{Sensitivity}}$$

$$\text{Barometric Compensation} = Bc = \frac{\text{Barometric Pressure (in Hg)}}{2.036} - 14.7$$

$$\text{Head (feet of water above the transducer probe)} = 2.308 \times (P) \times (Bc)$$

$$\text{Drawdown} = \text{Head at static} - \text{Head at time "t"}$$

4.1.3 Data Correction

Mechanical recorder and transducer data was corrected for changes in ground water elevation due to regional (local) trend and ground water elevation changes due to fluctuation in barometric pressure.

Regional trend corrections were based on data collected at U.S. Geological Survey observation well 514P. This well is approximately 2 miles north-northwest of the South Trend well field and provides the most detailed data available for water level trend. Hydrographs for well 514P are presented in Appendix D. Regional trend is represented by a decline in water level of approximately 0.005 ft per day. The correction values were made by using the water level in USGS Well 514P at 1200 hr on 16 August (beginning of pumping) as a reference point. Increases and decreases in water level relative to the reference point were corrected hourly until the end of recovery monitoring (18 August). The hourly correction allowed for both regional trend and apparent earth tides.

Barometric pressure data collected at the pumping well was also used to correct water level data for the various monitoring wells. Tabulated barometric pressure data is presented in Appendix C. The barometric pressure at the beginning of pumping was used as the reference point for data correction. Corrections were made hourly for increased or decreased water level due to barometric change relative to the reference pressure.

Figure A-3 (Appendix A) presents a hydrograph illustrating the corrections (in feet) used during pumping and recovery. Data was corrected using a DEC-20 computer program. This program corrected each data file by reading the time in the well data file, finding the corresponding time interval in the correction data file, and restituting drawdown in the well data file based on the factor in the correction data file.

4.1.4 Data Presentation

Due to the large volume of data for this test, data were reduced by computer or handheld programmable calculator where possible. The following information and graphs (where data permit) are presented in Appendix B by well number.

- Tabulated data on data forms
- Time versus water level hydrograph

- Time versus drawdown, logarithmic versus logarithmic plot
- Time versus drawdown, logarithmic versus arithmetic plot
- The ratio time since pumping started/time since pumping stopped versus residual drawdown, logarithmic versus arithmetic plot

Calculated recovery versus time since pumping stopped was presented for wells 15M7 (pumping well), 15M35, and 16185. Calculated recovery for the pumping well was calculated using the equilibrium drawdown (152.25 ft) as the measuring point. Calculated recovery for wells 15M35 and 16185 were determined by extending drawdown as the measuring point (Johnson 1975). Hydrographs used to project extended drawdown for well 15M35 and 16185 are presented in Appendix B by well number. The following plots are presented for each of these three wells in the appendix:

- Extended drawdown, hydrographs
- Time since pumping stopped versus calculated recovery, logarithmic versus logarithmic
- Time since pumping stopped versus calculated recovery, logarithmic versus arithmetic

The data plots of recovery and drawdown were made using a Tektronix 4662 plotter directed by the CDM DEC-20 computer system. Logarithmic versus logarithmic (5 x 3 cycle) original plots are equal in scale to K & E paper number 46 7522. Semi-logarithmic (3 and 5 cycle) are equal in scale to K & E paper numbers 46 5492 and 46 6213. Log-log (6 x 4 cycle) plots used for well 15M7 are equivalent in scale to K & E paper number 47 7522 (5 x 3 cycle). It is important to note that photostatic copies of original graphics are distorted and will not correspond to standard scale graph paper.

4.2 PRELIMINARY ANALYSES

4.2.1 Potentiometric Surface

Potentiometric surface maps were generated for ground water elevation data collected from observation wells completed in the Westwater Canyon Me the Morrison Formation. Two maps were completed to illustrate pre-test (15 August) and maximum drawdown potentiometric surfaces for the South Trend well field.

The pre-test map (Figure A-1) depicts a northerly flow of ground water beneath the site. The maximum drawdown potentiometric surface map (data collected 1120 to 1159 hr, 17 August) illustrates the change in ground water flow direction due to approximately 24 hr of pumping at well 15M7 (Figure A-2). At maximum drawdown, ground water flow is toward the pumping well resulting in lower water level elevation for all Westwater Canyon Member observation wells.

The maximum drawdown potentiometric surface data indicates that the outside observation wells are in communication with the interior pumping well (15M7). Data collected during the test for the Dakota sandstone completions (Wells 15L101 and 16P101) did not respond to pumping in the Westwater Canyon Member (see hydrograph in Appendix B).

4.2.2 Preliminary Data Analyses

CDM's analysis of the pumping test was limited to two Westwater wells proximal to the pumping well:

- Well 16I85
- Well 15M35

Analyses of the pumping well data was not conducted due to the complex nature of the data. Detailed analyses of all pumping test data will be conducted by Thomas A. Prickett and Associates.

Preliminary analysis of drawdown data was performed by Theis non-equilibrium (log versus log) and Jacob non-equilibrium, straight-line methods (log versus arithmetic plots). The recovery data (log versus arithmetic) was analyzed by a modified Jacobs straight-line method. The methodology and formulas used for these preliminary analyses are presented for each well in Appendix B.

Preliminary values for transmissivity and storage coefficient (Wells 16I85, 15M35) are presented in Table 4-1. The calculated transmissivity ranges from 905 gpd/ft to 1,230 gpd/ft. The storage coefficient ranges from 0.00013 to 0.00002, which is consistent with typical artesian aquifers (Freeze and Cherry 1979).

Table 4-1 PRELIMINARY TRANSMISSIVITY AND STORATIVITY VALUES FOR WELLS 16I85 and 15M35

Well Number	Theis Curve Matching (Drawdown) T gpd/ft	S^a	Jacob Straight-Line (Drawdown) T gpd/ft	S^a	Straight-Line Recovery (Recovery) T gpd/ft
16I85	934	.00013	1151	.00008	1222
15M35	905	.00012	1172	.00002	1230

[a] Storage coefficient is dimensionless.

CDM

REFERENCES

Freeze, A.R.; Cherry, J.A. 1979. Groundwater. New Jersey: Prentice-Hall Inc.

Johnson, (UOP Inc.) 1975. Ground water and wells. Fourth ed. St. Paul, Minnesota.

Hydro Resources, Inc.

CROWNPOINT
RESTORATION ACTION PLAN

License No: SUA-1580

November 19, 2001

2. Groundwater Restoration

2.1. Introduction

In addition to the regulatory guidance provided by NRC, HRI used historic and ongoing company experience with similar groundwater restoration operations in developing its budget model. Groundwater restoration costs are presented as a monthly restoration budget with cumulative total costs. This is an appropriate budget interval because ongoing operational cost such as labor, electricity, reagents, replacement equipment etc. are paid out of cash on a monthly basis. The duration of the restoration cost expenditure was based on the processing and circulation of 9 pore volumes of groundwater as required by license condition 9.5 surety requirement. Surety will be maintained at this level until the number of pore volumes required to restore the ground water quality of a production scale wellfield has been demonstrated as stated in COP Section 10.4.4.

The COP that was submitted in support of the HRI's License contemplated a number of methods for liquid waste treatment and disposal during ground water restoration. The costs that are presented in this budget assume the most conservative liquid waste treatment and disposal option; reverse osmosis treatment ("RO") and brine concentration ("BC"). It is conservative because it is authorized by the current license (other options would require additional licensing steps) and it is the most costly option. If HRI is to pursue one of the other treatment/disposal options described in the COP Revision 2.0 and it is approved in a future licensing action, then HRI will adjust the surety budget accordingly during the annual update review.

RO and BC will be used to treat water during production operations and be used for groundwater restoration conducted in the pilot demonstration and during concurrent restoration that will be ongoing with production activities. Because the cost of restoration equipment such as wellfield pumps, ponds, the RO unit, the BC unit, laboratory equipment, trucks, and field equipment must be incurred for production process operations, they are assumed to be operational capital and are not included as capital requirements in any of the RAP budget lines. NRC will be able to verify the availability of the restoration equipment during routine inspections.

The budget model described in this RAP used 2,102,609,094 gallons of water to size duration of the restoration program against the projected nominal equipment capacity. Rows 21-42 of the restoration budget is a monthly calculation of water treatment capacity that has been cumulated over the term of restoration and compared with the required nine pore volumes of treated water. It is nominal equipment design capacity that is needed to process the requisite gallonage that justifies the length (and cost) of groundwater restoration operations.

2.2. Reverse Osmosis Equipment Description

Reverse osmosis is a water treatment process whereby the majority of dissolved "ions" are filtered from the wastewater, and concentrated into a smaller concentrated brine volume. The resulting product water typically meets, or exceeds drinking water standards, and during restoration activities, is reinjected back into the wellfield further diluting the underground mining solutions toward baseline quality. For the purpose of this budget model, the concentrated brine stream, representing 20% of the feed volume will be disposed by brine concentration (a form of distillation).

Osmosis is a natural process that occurs in all living cells. With an appropriate semi-permeable membrane as a barrier to solutions of differing concentrations, naturally occurring osmotic pressure forces pure water from the dilute solution to pass through the membrane, and dilute the more concentrated solution. This process will continue until equilibrium exists between the two solutions.

Reverse osmosis (R.O.) is a reversal of the natural osmotic process. By confining a concentrated solution against a semi permeable membrane, and applying a reverse pressure on the concentrate greater than the naturally occurring osmotic pressure, water will move across the membrane ("product water"), and out of the original concentrate, resulting in an even more concentrated solution ("brine"). The membrane rejects the passage of the majority of the dissolved solids while permitting the passage of water.

Post-mining solutions from a depleted mine area will be treated with an anti-scalent which is the only chemical pretreatment budgeted. The solution may next be bulk-filtered across sand filters to remove all solids greater than 30 microns. Cartridge filters will then filter out the remaining solids greater than 1 micron. The solution at this point is ready for the reverse osmosis process. To achieve reverse osmotic purification, the pretreated and filtered solution is pressurized and directed to the first step of a two-stage reverse osmosis process. Approximately 60 percent of the total feed volume will be converted to product or purified water in the first stage. The brine water of the first stage will then act as the feed for the second stage, which yields an overall product or purified to brine ratio of 4:1. The brine generated will be further treated and reduced by brine concentration.

The RO unit was sized to operate at a nominal[5] capacity of 580 gallons per minute. This design rate has been utilized by URI at similar ISL facilities with excellent results. Additionally, the sizing is optimal because it will allow concurrent restoration to proceed at approximately the same rate production wellfields are depleted. (I.e. with mining and restoration going on concurrently restoration and mining will proceed at similar rates).

RO treatment operating and maintenance costs are included within the O & M budget in Attachment E-2-1.

2.3. Brine Concentrator Equipment Description

A brine concentrator will be used for final reduction of liquid waste. The RO reject stream will be treated with a vertical tube, falling film vapor compressor evaporator followed by a

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[5] RAP-U1's nominal capacity is an estimate. HRI will deal with capacity variances that result from equipment efficiency or downtime by increasing or decreasing the equipment size and possibly adjusting surge capacity. For example, if actual operating results indicate that R.O. equipment downtime is 5% then increasing the equipment design capacity from 580 gpm to 610 gpm would allow the average throughput to remain the same. At this stage it is impossible for HRI to anticipate and adjust for every operational variable that may arise in the future.

steam driven rotary drum dryer to achieve zero liquid discharge (dry solids). The solids will be bulk stored and shipped to an 11.e.2-byproduct facility for disposal.

Brine concentration is a process that can process a waste stream into deionized water and solid slurry. Electrical utilities in the Four Corners area, and paper, and pulp companies have employed this technology for decades to handle their waste streams. The principle behind the process is based on the ideal Carnot cycle where an initial fixed volume of concentrated brine is heated to boiling temperature. The steam vapor created is mechanically compressed; resulting in a secondary steam vapor whose temperature is elevated (15-20 degrees) by the work energy used during compression. Distilled water is condensed from the secondary steam vapor onto internal heat exchangers. The heat loss during condensation is transferred to the circulating brine on the opposite side of the heat exchanger. The brine's temperature is raised, maintaining the internal boiling environment. This source of heat sustains the creation of primary steam used to feed the compressor. The cycle is continuous so long as energy is added at the compressor stage. The electrical power used in compressing, and elevating the temperature of the primary steam vapor produces distilled product water. The resultant hyper-concentrated brine allows solid precipitate in the form of common salts as determined by the solution's limits for solubility. Typically, for each 100 gallons of waste brine treated, 98 gallons of distilled water and 2 gallon of slurry solids are formed.

The BC was sized to accommodate the anticipated brine that the RO will produce.

BC costs are included within the O & M budget in Attachment E-2-1.

2.4. Pore Volumes and Flair

Restoration equipment capacity design coupled with timing of the restoration operations budgeted herein is a function of the quantity of water that will be processed during restoration that is calculated in this RAP by using the pore volume unit of measure. The term "pore volume" (PV) is a term of convenience that has been conceived by the ISL industry to describe the quantity of free water in the pores of a given volume of rock. The units are provided in gallons. PV's provides a unit of reference that a miner can use to describe the amount of circulation that is needed to leach an ore body, or describe the times water must be flowed through a quantity of depleted ore to achieve restoration. PV's provide a way that a miner can take small-scale studies, such as studies in the laboratory, and scale these studies up to field level or to compare pilot scale studies[6] to commercial scale. Hence they provide a miner with an important technique for calculating ISL project economics and restoration costs.

PV's are calculated by determining the three dimensional volume of the rock (that is also the ore zone) and multiplying this number by the percent porosity. HRI used the "ore area" method to determine pore volumes[7], where the extent of ore of given grade within a mine unit is

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[6] I.e. such as the Section 9 Pilot. See FEIS p. 4-37.

[7] Different operators have used different methods to determine the volume of the ore zone. For example, some use the "pattern method" where pattern dimensions are used to determine the area of the ore and then the area is multiplied by screen thickness to determine the volume of rock in the five spot. The pore volume of the five spot is

outlined and digitized to provide the ore area[8]. This area is then multiplied by the average ore thickness to provide the three dimensional volume of the ore that is to be leached. This volume is converted to a PV by multiplying the ore volume by the percent porosity and then converting to the units of measurement (i.e. gallons). Table 1 below shows the PV calculation for the Crownpoint location that was used as the assumption in the budget model.

Table 1 – Crownpoint Pore Volume Calculation

ZONE	Area (ft2)	Tk (ft)	Vol (ft3)	Por	gal/ft3	PV (gal)	H-PIF	V-PIF	CPV (gal)	9 X CPV
SE/4										
UA	168,000	12	2,016,000	0.25	7.48	3,769,920	1.5	1.3	7,351,344	66,162,096
ULA	630,000	9.6	6,048,000	0.25	7.48	11,309,760	1.5	1.3	22,054,032	198,486,288
MLA	260,000	8.6	2,236,000	0.25	7.48	4,181,320	1.5	1.3	8,153,574	73,382,166
ULB	350,000	11.9	4,165,000	0.25	7.48	7,788,550	1.5	1.3	15,187,673	136,689,053
LB	182,000	9.8	1,783,600	0.25	7.48	3,335,332	1.5	1.3	6,503,897	58,535,077
UUC	675,000	7.6	5,130,000	0.25	7.48	9,593,100	1.5	1.3	18,706,545	168,358,905
MC	840,000	12.2	10,248,000	0.25	7.48	19,163,760	1.5	1.3	37,369,332	336,323,988
ULC	992,000	11.8	11,705,600	0.25	7.48	21,889,472	1.5	1.3	42,684,470	384,160,234
LLC	754,000	7.3	5,504,200	0.25	7.48	10,292,854	1.5	1.3	20,071,065	180,639,588
TOTALS	4,851,000		48,836,400			91,324,068			178,081,933	1,602,737,393
SW/4										
LA	308,000	8.8	2,710,400	0.25	7.48	5,068,448	1.5	1.3	9,883,474	88,951,262
ULB	270,000	6.2	1,674,000	0.25	7.48	3,130,380	1.5	1.3	6,104,241	54,938,169
LB	437,000	7.5	3,277,500	0.25	7.48	6,128,925	1.5	1.3	11,951,404	107,562,634
UUC	256,000	6.5	1,664,000	0.25	7.48	3,111,680	1.5	1.3	6,067,776	54,609,984
MC	465,000	12.7	5,905,500	0.25	7.48	11,043,285	1.5	1.3	21,534,406	193,809,652
TOTALS	1,736,000		15,231,400			28,482,718			55,541,300	499,871,701
G. Totals	6,587,000		64,067,800			119,806,786			233,623,233	2,102,609,094

Explanation of Headings:

Area - Area of cut off grade mineralization.
Tk - Thickness of cut off grade mineralization.
Por - Estimated porosity of the rock.
PV - Straight pore volume without any correction.
H-PIF - Horizontal pore volume increase factor.
V-PIF - Vertical pore volume increase factor.
CPV - Corrected pore Volume.

"Flare" factors or pore volume increase factors are multipliers that are commonly used by the ISL industry to account for leach solution outside of the specific boundaries of the calculated ore PV and are generally accepted increases[9] that should be recognized in cost estimates. HRI

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calculated by multiplying the volume of rock by the percent porosity and then converting to the units of measurement (i.e. gallons). The total PV of a mine unit is calculated by adding all the five spot patterns in the mine unit. This method works well for existing ISL operations where the ore had been fully delineated and wellfield installed such as the existing projects in Wyoming.

[8] Future wellfield patterns will be constructed within the ore that is economic at the time. Patterns will be a subset of the overall "ore area".

[9] Flare outside of the ore zone is the norm. In the subsurface water moves in a radial pattern from injector to extractor in its path across the target ore. By choosing patterns carefully flair is minimized. However, as an expected component of ISL mining the flair factors are included in the bonding calculation as a deliberate cost contingency. There is a limit on acceptable flair; the horizontal monitor wells. If fluid is detected in the horizontal monitor wells it is no longer simply flair but then becomes an excursion. An excursion requires immediate corrective action to draw it back to the mine zone or the bonding must be increased above the amount contemplated

uses pore volume increase factors of 1.5 for horizontal and 1.3 for vertical[10]. Horizontal increase is calculated by multiplying the measured or mapped area of the ore, in plan, and multiplying the actual area by 1.5. This yields the affected horizontal area. Likewise, vertical increase is calculated by multiplying the measures average thickness of the ore by 1.3. This yields the affected vertical area. Multiplying the affected horizontal times the affected vertical by porosity provides the affected pore volume for the surety cost estimation. This number is in turn multiplied by 9 to determine water treatment and disposal volumes that are entered into the model to calculate costs. The 1.5 for horizontal and 1.3 for vertical pore volume increase factors have been calculated by URI engineers based on operating experience at other restoration demonstrations and commercial operations and have been adequate for monitoring and reporting restoration progress at other operations. During the Churchrock restoration demonstration that is described in LC 10.28, HRI will use these factors to measure the number of pore volumes that are processed during the restoration demonstration.

The methods utilized in this RAP and all three previous RAP's to calculate pore volume and adjusted pore volumes are consistent with the methods used for the Mobil Section 9 Pilot that was conducted approximately three miles northwest of the Crownpoint site, which in turn were the basis for the NRC evaluation in the FEIS, and are consistent with the methods used by HRI throughout the CUP licensing process, and for HRI's submittals during the Subpart L hearing. HRI methods to calculate pore volume and adjusted pore volumes, and the factors that were used were not generic or arbitrary, but rather were consistently proposed, evaluated, litigated and applied throughout the NRC licensing process and this Subpart L proceeding.

HRI presented the NRC with the Summary Report for the Mobil Section 9 In Situ Leach Pilot[11] as a part of the License Application support materials because the Pilot was a substantial field demonstration, and provided empirical results[12], for the ISL development that is proposed for the CUP. This Report was a compilation of the information from Mobil Oil Company's files and records that were developed when the Pilot was conducted. HRI utilized actual pattern dimensions and the actual number of gallons processed during the restoration to compile the summary report.

The cumulative restoration analyses in Attachment C of the Summary Report show that 59,173,469 gallons were circulated during restoration of the Section 9 Pilot, which equated to 16.7 adjusted pore volumes. It is from this data that NRC determined that after 8 – 10 pore

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in this RAP to compensate for the increase in restoration cost. (See L.C. 10.13 which requires a bond increase if corrective action is not completed in 60 days)

[10] Combined pore volume increase factor is 1.95.

[11] See Pelizza Affidavit January 19, 2001, Attachment 1.

[12] The Section 9 Pilot data provide actual ore zone dimensions and gallons processed so that actual pore volume can be processed. ENDAUM witness Lafferty Testimony May, 23 2001 ¶ 14 specifically recognizes the importance of knowing the quantity of water removed from the formation in calculating pore volumes ".... if the flair factor were increased, the number of pore volumes required should be decreased. This scenario may be true only if the total gallons of impacted groundwater where known." The value of the Section 9 Pilot, or any demonstration, is that it provides *known* variables to the equation that allows pore volume increase factors to be assigned. Given similar mining technology and geology, the pore volume increase factors from a demonstration, such as the Section 9 Pilot, can be applied to an analogous site such as the Crownpoint location.

volumes that TDS concentrations and specific conductance had reached a point where little improvement was realized with additional effort[13] and that the initial surety should be based on 9 pore volumes. Table 2 shows how the adjusted pore volume was calculated using the pattern area, screen thickness, porosity, a horizontal pore volume increase factor of 1.5, and a vertical pore volume increase factor of 1.3. The methods of pore volume analysis utilized in the Summary Report form the foundation of the NRC impact evaluation in Section 4.3.1 of the FEIS which ultimately resulted in the staff determination that 9 pore volumes would be required for surety calculations[14]. It is important that HRI continue to use the previously evaluated pore volume increase factors in the RAP, and in future restoration analyses for the NRC, so that can projected and actual performance and costs can be measured consistently.

Table 2 – Section 9 Pore Volume Calculation

ZONE	Pattern Area (ft2)	Tk (ft)	Vol (ft3)	Por	gal/ft3	PV (gal)	H-PIF	V-PIF	CPV (gal)	Gallons Processed	CPV Processed
Single	40,488	24	971,712	0.25	7.48	1,817,101	1.5	1.3	3,543,347	59,173,469	16.69

Explanation of Headings:

Area - Area of cut off grade mineralization.
Tk - Thickness of cut off grade mineralization.
Por - Estimated porosity of the rock.
PV - Straight pore volume without any correction.
H-PIF - Horizontal pore volume increase factor.
V-PIF - Vertical pore volume increase factor.
CPV - Corrected pore Volume.

HRI has presented similar pore volume estimates during the license application review process. Specifically, in response to NRC Request for Further Information, Question 59, August 15, 1996, pertaining to Ground water Consumption, HRI supplied NRC with a pore volume calculation for the Crownpoint site that was similar to the one presented in the RAP Section 2.a[15][16]. Consistent with the methodology used throughout the Crownpoint Project Licensing process, HRI utilized the ore body outline, not pattern dimensions, to determine the affected surface area and used a horizontal increase factor of 1.5. These were the same values utilized by NRC to conduct the evaluation of water consumption in the FEIS[17]. HRI's proposed pore volume increase factors are consistent with those, which had been systematically evaluated in the FEIS[18]. The FEIS has been found to be adequate for the purpose of licensing the Crownpoint Uranium Project.[19]

In summary, HRI correctly used the same methods to calculate adjusted pore volumes in the RAP cost estimate because they were the same as those that NRC reviewed in HRI submittals,

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[13] See FEIS p. 4-40

[14] See FEIS p. 4-40

[15] Based on professional judgment, HRI increased the estimated porosity from .21 in Q/59 to .25 in the RAP. This resulted in a more conservative estimate in the RAP. All other factors are the same.

[16] See RAI Q1/59.

[17] See FEIS pp. 4-57 through 4-60.

[18] FEIS p. 4-122 used a combined horizontal and vertical pore volume increase factor of 1.95. I.e 1.3 (HDF) x 1.5 (VDF) = 1.95.

[19] See COMMISSION CLI-01-04.

that NRC used in the FEIS impact evaluation, and that was placed into evidence by the HRI in the course of the Subpart L hearing process.

As an additional test for reasonableness of HRI's cost estimate, Table 3 below compares important project variables for PRI's Highland Uranium Project in Wyoming[20] against similar project variables for HRI's Crownpoint project[21]. Table 3 brings into context the comparative size, and corresponding scope of reclamation, of the two projects. In this table the actual surety amount for PRI are shown against the proposed surety amount from this RAP-CP. Reviewing the data in Table 3 in the context of number of wells, throughput, and number of satellite locations, the PRI Highland project exceeds the size of the HRI Crownpoint project. The PRI Highland and HRI Crownpoint wellfield pattern size and duration of operation are comparable. The PRI Highland adjusted pore volume is 20% greater than that estimated by HRI for the Crownpoint site[22]. In the comparative measures of $/acre wellfield, or $/pound produced, PRI proposed surety amount exceeds that of HRI. In the comparative measures of water process cost in $/ m gal., HRI's an PRI's[23] proposed surety amount are essentially the same. The Table 3 information provides strong evidence that the costs estimates for the HRI Crownpoint location are consistent the PRI Highland costs that the Intervenor's experts argue should serve as a reasonable example.

Table 3 – Comparison of Key Project Variables and Reclamation Costs

Project Variables	PRI[24]	HRI Crownpoint
Number of wells (all)	~4141	~1014
Acres of wellfield patterns	~189	~181[25]
Years of operation	13	15
Cumulative production (mm lbs. U_3O_8)	~13	~15
Nominal throughput (gallon per minute)	9000	4000
Number of satellites	3[26]	1
Number of pore volume's used in surety estimate	6	9
Size of adjusted restoration volume (billion gallons)	~2.71	~2.10
Comparative PV size (mm gal.) /acre wellfield	14.3	11.6
Restoration estimate (~mm $)	$21.12	$16.39
Comparative $/acre wellfield	$111,751	$93,370
Comparative $/pound produced	$1.63	$1.09
Comparative process cost $/ m gal.	$7.79	$7.81

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[20] See Testimony of April Lafferty, May 23, 2001 ¶ 11.

[21] Mr. Ingle Testimony of December 19, 2000, p. 31 states "there is considerable relevant and analogous uranium ISL restoration experience in Wyoming to draw from to develop credible cost estimates".

[22] As stated in 5 above, it is anticipated that if HRI was to use wellfield patterns rather that ore boundary areas then the pore volume and adjusted pore volumes would be smaller and more proportional to PRI when compared to well field pattern acreage.

[23] Dr. Abitz Testimony dated May 23, 2001 continues to describe reasons to use unit groundwater costs from the Fernald site. It is more appropriate to use a similar NRC licensed ISL facility.

[24] Actual from information provided by PRI staff.

[25] Estimated from COP 2.0, Figure 1.4-3.

[26] PRI costs include the D & D of the also include the mother plant. HRI mother plant D & D costs are included in the Churchrock Section 8 RAP.

2.6. Ground Water Quality

Once the economic recovery limit of a mine area is reached, lixiviant injection is stopped, and the affected ground water is treated (restored) to return the quality of water to regulatory standards. Water quality will be reclaimed to the criteria of L.C. 10.21. The limited water quality data from the Crownpoint site suggests that the water good and meets drinking water quality standards for all parameters except uranium related radionuclides.[27]. The Unit 1 site monitor well data[28] from the same ore zone aquifer 2 to 3 miles to the west of the Crownpoint location is more extensive, and provides a good picture of radionuclide concentrations in water that is interstitial to roll front uranium mineralization. A thorough characterization of the premine groundwater will be conducted at the Crownpoint location as required by L.C.'s 10.21 & 10.22 and it will be this characterization that provides the baseline against which restoration will be measured.

LC 9.14 States: "Prior to injection of lixiviant, the licensee shall obtain all necessary permits and licenses from the appropriate regulatory authorities". At the Crownpoint location this provision requires that HRI acquire an Underground Injection Control Permit and an Aquifer Exemption[29] through the USEPA. Aquifer Exemption is a regulatory devise of the USEPA that is used to designate aquifers or portions of aquifers as "exempt" because they are mineralized and producible of minerals in commercial quantities and are not currently or likely to be in the future sources of drinking water. HRI has not acquired either of these authorizations for the Crownpoint location at this time but will be required to do so by NRC before operations begin.

2.7. Groundwater Restoration Budget Line Item Assumptions

HRI used historic and ongoing company experience with similar ISL uranium recovery and groundwater restoration operations in developing its budget model. For example because URI, HRI's sister company is currently reclaiming two other commercial ISL mines, HRI drew on this experience to aid in sizing labor requirements, maintenance needs and other cost categories that may not be apparent to someone without similar "hands on" experience. Unit labor costs are

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[27] FEIS p. 3-31.

[28] RAP-U1 § 2.6

[29] 40 CFR 146.4 states: "An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in § 146.3 may be determined under 40 CFR 144.8 to be an "exempted aquifer" if it meets the following criteria:

(a) It does not currently serve as a source of drinking water; and

(b) It cannot now and will not in the future serve as a source of drinking water because:

(1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.

(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;

(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or

(4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse;..."

the same as what was provided to NRC as part of the license review of the overall project.[30] In addition HRI used actual costs estimates from the region for utilities, and other materials that will be used in reclamation.

The assumptions that were used in the groundwater restoration budget (See Attachment E-2-1) are as follows:

Salaries

For the purpose of the Financial Assurance Plan, HRI assumed employment of technical professionals whose expertise is needed on a limited basis during the restoration mode. Anticipated positions are listed in the Restoration Budget rows 1-15. However, to justify their full time status and utilize their time on the job, it is assumed that they are required to provide a multitude of services, i.e., every employee will be wearing multiple hats. As such, individual job descriptions are difficult. For example, in the restoration mode, a qualified geologist will be required to verify the configuration of restoration patterns to assure efficient results. While this task requires unique geological expertise, the time commitment by the geologist to this task may only be several hours per week. Therefore, to maximize the use of the geologist time, he or she will be assigned to many other tasks for which he or she will be qualified such as lab analyst, well sampler, and plant operator. HRI also plans to maintain several other technical disciplines on staff such as radiation safety specialist, and engineers. In the restoration mode they will also perform their primary function and a number of secondary roles.

Reflecting the very broad nature of each full time employee's job at the CUP during the restoration mode, the following is a summary of each position that is budgeted in the Financial Assurance Plan. Anticipated salaries that were used in the budget are within Attachment E-2-4.

Operations Manager. In Charge of all aspects of day-to-day activities and planning for Crownpoint Uranium Project D & D. Responsible for interface with accounting services including coding and approval of all invoices, monthly cost analysis, restoration report generation, and employee relation responsibilities.

Environmental Manager. Responsible for the radiation health and safety, environmental compliance and quality assurance program at the Crownpoint Uranium Project. Supervise the Radiation Safety Officers to ensure that all radiation safety; environmental compliance and permitting/licensing programs will be conducted in a responsible manner and in compliance with all applicable regulations and permit/license conditions. Serve as Company liaison with regulatory agencies over the term of the restoration activity.

Radiation Safety Officer. Responsible for compliance with all USNRC, and MSHA rules and regulations at the CUP. Also responsible for assistance with laboratory analysis, vehicle safety, reporting and public information.

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[30] See RAI Q1/8 - Feb. 19, 1996.

Chemist. Responsible for maintaining day to day analytical services including operational and environmental. In this capacity the chemist will assure that proper chemical parameters are reported to operations for the water treatment processes. He will be responsible for performing analysis of all routine environmental samples such as monitor wells.

Senior Geologist. Responsible for evaluation of logs and other well data and its interpretation as it pertains to restoration activities. Performs all monitor well sampling duties and when possible, helps with wellfield construction as well as Smeal pump hoist operation. Duties include drafting and ACAD operator for mapping needs. Provides weekend call-out and rotating operator duties as needed.

Wellfield Foreman. Responsible for Wellfield operation and construction as it pertains to restoration. Helps with monitor well sampling and backup pump hoist operator.

Wages-Direct

Electrician. Responsible for performing day to day electrical maintenance and repair services. Performs restoration operator duties on a rotating basis.

Plant Operator. Performs restoration operator duties on a regular basis. This would include the operations of all water treatment equipment including the reverse osmosis unit and brine concentrator.

Truck driver. Provides CDL driver duties. Will serve as backhoe operator and have operator duties on a rotating basis.

Wellfield Operator. Perform wellfield restoration operator duties on a regular basis and rotations with the Plant Operator.

Pump Hoist Operator. Responsible for the running of pumps in and out of the hole as required by restoration activities. Other duties include the operation of the backhoe and labor necessary for field construction.

Insurance-Workman's Compensation

Estimate based on projected compensation expenses and prevailing rates.

Payroll Taxes

Estimate based on projected compensation expenses and prevailing rates.

Medical Insurance

Estimate based on headcount and historic premium rates.

401K Contributions

The 401(k) Contribution cost codes represent HRI-funded contributions under the 401(k) – the retirement savings plan for HRI employees. The 401 (k) Contribution portion is made concurrent with each bi-weekly payroll period as a component of each eligible employee's total compensation.

Telephone/Telegraph

Estimated average costs of regular telephone service, cellular telephone service, and fax line service and internet line service at all CUP locations.

Postage/Freight

Estimated average cost of all types of mail service.

Copy Equipment

Estimate average cost for operation of all types of copy and fax equipment at all CUP locations.

Other Equipment & Rental

This covers the rental of equipment and miscellaneous equipment average costs. As applied in these estimates, it would include office machine rental, water machines for potable water, etc.

Office Supplies

Estimated average costs of office supplies such as paper, pens, etc.

Office Equipment Maintenance

Estimate average cost for maintenance for all types of office equipment at all CUP locations.

Data Processing

Estimated average cost for outside data processing.

Maps

Estimated average cost of plotting and reproducing maps for routine operations and reports.

Drafting & Printing

Estimated average for outside computer automated drawing services for report preparation.

Transportation - Air & Car

Estimated average for airplane tickets and auto rental.

Meals

Estimated average for travel related meals.

Misc. Travel Expense

Estimated average for travel related expenses such as hotels.

Env-Depreciable Equipment

Replacement equipment and calibration costs. This would include survey and sample equipment and routine calibration and service.

Env-Operational Analyses

This cost code is reserved for outside analysis

Environmental – Miscellaneous

As the name suggests, any environmental related item not specifically addressed in the other codes 090 through 098. Miscellaneous items may include sample bottles, filters, reagents, calibration, etc.

Safety

This is for costs associated with safety supplies for the employees. Items charged to this cost code would include safety boots, safety glasses, potable water, protective gloves, safety goggles etc.

Backhoe

All backhoe rental and maintenance such as oil changes, and repairs would be charged to this account

Misc. Chemicals

The major charge to this cost code during restoration is anti-scalent for the RO.

Utilities - Electric, Wellfield

Calculated electrical cost for operating the pumps and other equipment in the wellfield. The basis for these costs is shown in Attachment E-2-2.

Utilities - Electric, Brine Concentrator

Calculated electrical cost for operating the brine concentrator. The basis for these costs is shown in Attachment E-2-2.

Utilities - Electric, Plant and RO

Calculated electrical cost for operating the plant, reverse osmosis unit, and other office lighting and electrical needs. The basis for these costs is shown in Attachment E-2-2.

Submersible Pumps

Estimated average maintenance and replacement costs for submersible pumps that are used in extraction wells.

Submersible Motors

Estimated average maintenance and replacement costs for submersible pump electric motors that are used in extraction wells.

Field Piping & Valves

Estimated average maintenance and replacement costs for the various fittings, valves, glues etc. that is used in wellfield operations.

Meters

Estimated average maintenance and replacement costs for wellfield meters.

Misc. Field

The major charge to this cost code during restoration is PPE, rags, solvents and other miscellaneous field needs.

Handtools

Estimated average handtool replacement costs

Plant Piping & Valves

Estimated average maintenance and replacement costs for the various fittings, valves, glues etc. that is used in plant operations.

Plant Brine Concentrator Inst.

A cost code to charge anticipated brine concentrator instrument replacement.

Pumps

Estimated average maintenance and replacement costs for pumps that are used in the water treatment plant.

Plant Electrical

Estimated average electrical maintenance and replacement costs for water treatment plant operations.

Filters

Estimated average filter and filter media replacement costs and maintenance costs for filtration equipment for water treatment plant operations.

Evaporation Ponds

A cost code to charge anticipated maintenance costs for pond liner repairs and maintenance.

Roads

A cost code to charge anticipated maintenance costs for road maintenance.

Gas, Oil, and Grease

Equipment fuel costs and lubrication.

Disposal - BC Solids

Ongoing operational cost of disposing salt residue from brine concentrator. The basis for these costs is shown in Attachment E-2-2.

RO Unit

A cost code to charge anticipated reverse osmosis unit repair, maintenance and instrument replacement.

Lab Supplies

Estimated average costs of analytical laboratory supplies such as reagents, filters, glassware, etc.

RO Membrane

Average replacement costs of reverse osmosis unit membranes.

Field Equip. Repairs & Maint.

A cost code to charge anticipated maintenance costs for large field equipment such as the pump host equipment, generators, and trucks.

Vehicle Repairs & Maint.

A cost code to charge anticipated maintenance costs for road vehicles such as pick up trucks and company autos.

Vehicles – Pickups

The estimated average cost for the major repair of a company pickup truck.

Vehicles - Tractors & Trucks

The estimated average cost for the major repair of a large trucks or trailers.

Vehicles - Automobiles

The estimated average cost for the major repair of a company car.

Minus contingency/profit, the total cost for groundwater restoration and post restoration management is projected to be $10,890,592.

November 19, 2001

ATTACHMENT E-2-1
GROUNDWATER RESTORATION BUDGET

CROWNPOINT SEC, 24 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

November 19, 2001

	Period	1/1	2/1	3/1	4/1	5/1	6/1	7/1	8/1	9/1	10/1	11/1	12/1
1	*Management and Accounting*												
2	Operations Manager	1	1	1	1	1	1	1	1	1	1	1	1
3	Environmental Manager	1	1	1	1	1	1	1	1	1	1	1	1
4	*Plant Personnel*												
	Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
	Chemist	1	1	1	1	1	1	1	1	1	1	1	1
	Electrician	1	1	1	1	1	1	1	1	1	1	1	1
8	Plant Operator	1	1	1	1	1	1	1	1	1	1	1	1
9	*Wellfield Personnel*												
10	Foremen	1	1	1	1	1	1	1	1	1	1	1	1
11	Truck Driver	1	1	1	1	1	1	1	1	1	1	1	1
12	Wellfield Operators	1	1	1	1	1	1	1	1	1	1	1	1
13	Pump Hoist Operators	1	1	1	1	1	1	1	1	1	1	1	1
14	*Engineering & Geologic Personnel*												
15	Senior Geologist	1	1	1	1	1	1	1	1	1	1	1	1
16													
17	*Total Employees*	11	11	11	11	11	11	11	11	11	11	11	11
18													
19	*Operations Statistics*												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,891,200	24,220,800	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200
25	MM Gals, RO Permeate - Month	20,712,960	19,376,640	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960
26	MM Gals, RO Reject - Month	5,178,240	4,844,160	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,580,000	5,220,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000
32	MM Gals, Distillate - Month	5,066,640	4,739,760	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640
33	MM Gals, Brine - Month	111,600	104,400	111,600	108,000	111,600	108,000	111,600	111,600	108,000	111,600	108,000	111,600
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	2,102,609,094	2,076,829,494	2,052,713,094	2,026,933,494	2,001,985,494	1,976,205,894	1,951,257,894	1,925,478,294	1,899,698,694	1,874,750,694	1,848,971,094	1,824,023,094
36	Beginning PV	9	8.89	8.79	8.68	8.57	8.46	8.35	8.24	8.13	8.02	7.91	7.81
37	Gallons Processes Month	25,779,600	24,116,400	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600
38	PV Processed Month	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
39	Cumulative Gallons Processed	25,779,600	49,896,000	75,675,600	100,623,600	126,403,200	151,351,200	177,130,800	202,910,400	227,858,400	253,638,000	278,586,000	304,365,600
40	Cumulative PV Processed	0.11	0.21	0.32	0.43	0.54	0.65	0.76	0.87	0.98	1.09	1.19	1.30
41	Remaining Gallons to Process	2,076,829,494	2,052,713,094	2,026,933,494	2,001,985,494	1,976,205,894	1,951,257,894	1,925,478,294	1,899,698,694	1,874,750,694	1,848,971,094	1,824,023,094	1,798,243,494
42	Remaining PV to Process	8.89	8.79	8.68	8.57	8.46	8.35	8.24	8.13	8.02	7.91	7.81	7.70
43	*ESTIMATED COST DETAIL*												
44													
45	Description	GW Restoration Operations										GW Restoration Operations	
46													
47	Salaries-Direct	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250
48	Wages-Direct	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487
49	Insurance-Workmans Compensation	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368
50	Payroll Taxes	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992
51	Medical Insurance	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274
52	401K Contributions	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
56	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
57	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
62	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Solids	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287
99	Cumulative Total	$136,287	$272,574	$408,861	$545,148	$681,435	$817,722	$954,008	$1,090,295	$1,226,582	$1,362,869	$1,499,156	$1,635,443
100	Period Days	31	29	31	30	31	30	31	31	30	31	30	31

CROWNPOINT SEC, 24 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

November 19, 2001

	Period	1/2	2/2	3/2	4/2	5/2	6/2	7/2	8/2	9/2	10/2	11/2	12/2
1	*Management and Accounting*												
2	Operations Manager	1	1	1	1	1	1	1	1	1	1	1	1
3	Environmental Manager	1	1	1	1	1	1	1	1	1	1	1	1
4	*Plant Personnel*												
	Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
	Chemist	1	1	1	1	1	1	1	1	1	1	1	1
7	Electrician	1	1	1	1	1	1	1	1	1	1	1	1
8	Plant Operator	1	1	1	1	1	1	1	1	1	1	1	1
9	*Wellfield Personnel*												
10	Foremen	1	1	1	1	1	1	1	1	1	1	1	1
11	Truck Driver	1	1	1	1	1	1	1	1	1	1	1	1
12	Wellfield Operators	1	1	1	1	1	1	1	1	1	1	1	1
13	Pump Hoist Operators	1	1	1	1	1	1	1	1	1	1	1	1
14	*Engineering & Geologic Personnel*												
15	Senior Geologist	1	1	1	1	1	1	1	1	1	1	1	1
16													
17	*Total Employees*	11	11	11	11	11	11	11	11	11	11	11	11
18													
19	*Operations Statistics*												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,891,200	24,220,800	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200
25	MM Gals, RO Permeate - Month	20,712,960	19,376,640	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960
26	MM Gals, RO Reject - Month	5,178,240	4,844,160	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,580,000	5,220,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000
32	MM Gals, Distillate - Month	5,066,640	4,739,760	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640
33	MM Gals, Brine - Month	111,600	104,400	111,600	108,000	111,600	108,000	111,600	111,600	108,000	111,600	108,000	111,600
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	1,798,243,494	1,772,463,894	1,748,347,494	1,722,567,894	1,697,619,894	1,671,840,294	1,646,892,294	1,621,112,694	1,595,333,094	1,570,385,094	1,544,605,494	1,519,657,494
36	Beginning PV	7.70	7.59	7.48	7.37	7.27	7.16	7.05	6.94	6.83	6.72	6.61	6.50
37	Gallons Processes Month	25,779,600	24,116,400	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600
38	PV Processed Month	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
39	Cumulative Gallons Processed	330,145,200	354,261,600	380,041,200	404,989,200	430,768,800	455,716,800	481,496,400	507,276,000	532,224,000	558,003,600	582,951,600	608,731,200
40	Cumulative PV Processed	1.41	1.52	1.63	1.73	1.84	1.95	2.06	2.17	2.28	2.39	2.50	2.61
41	Remaining Gallons to Process	1,772,463,894	1,748,347,494	1,722,567,894	1,697,619,894	1,671,840,294	1,646,892,294	1,621,112,694	1,595,333,094	1,570,385,094	1,544,605,494	1,519,657,494	1,493,877,894
42	Remaining PV to Process	7.59	7.48	7.37	7.27	7.16	7.05	6.94	6.83	6.72	6.61	6.50	6.39
43	*ESTIMATED COST DETAIL*												
44													
45	Description	GW Restoration Operations											
46													
47	Salaries-Direct	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250
48	Wages-Direct	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487
49	Insurance-Workmens Compensation	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368
50	Payroll Taxes	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992
51	Medical Insurance	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274
52	401K Contributions	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
56	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
57	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
61	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
62	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Solids	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287
99	Cumulative Total	$1,771,730	$1,908,017	$2,044,304	$2,180,591	$2,316,878	$2,453,165	$2,589,452	$2,725,738	$2,862,025	$2,998,312	$3,134,599	$3,270,886
100	*Period Days*	31	29	31	30	31	30	31	31	30	31	30	31

CROWNPOINT SEC, 24 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

November 18, 2001

	Period	1/3	2/3	3/3	4/3	5/3	6/3	7/3	8/3	9/3	10/3	11/3	12/3
1	*Management and Accounting*												
2	Operations Manager	1	1	1	1	1	1	1	1	1	1	1	1
3	Environmental Manager	1	1	1	1	1	1	1	1	1	1	1	1
4	*Plant Personnel*												
	Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
	Chemist	1	1	1	1	1	1	1	1	1	1	1	1
	Electrician	1	1	1	1	1	1	1	1	1	1	1	1
8	Plant Operator	1	1	1	1	1	1	1	1	1	1	1	1
9	*Wellfield Personnel*												
10	Foreman	1	1	1	1	1	1	1	1	1	1	1	1
11	Truck Driver	1	1	1	1	1	1	1	1	1	1	1	1
12	Wellfield Operators	1	1	1	1	1	1	1	1	1	1	1	1
13	Pump Hoist Operators	1	1	1	1	1	1	1	1	1	1	1	1
14	*Engineering & Geologic Personnel*												
15	Senior Geologist	1	1	1	1	1	1	1	1	1	1	1	1
16													
17	*Total Employees*	11	11	11	11	11	11	11	11	11	11	11	11
18													
19	*Operations Statistics*												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,891,200	24,220,800	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200
25	MM Gals, RO Permiate - Month	20,712,960	19,376,640	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960
26	MM Gals, RO Reject - Month	5,178,240	4,844,160	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,580,000	5,220,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000
32	MM Gals, Distillate - Month	5,066,640	4,739,760	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640
33	MM Gals, Brine - Month	111,600	104,400	111,600	108,000	111,600	108,000	111,600	111,600	108,000	111,600	108,000	111,600
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	1,493,877,894	1,468,098,294	1,443,981,894	1,418,202,294	1,393,254,294	1,367,474,694	1,342,526,694	1,316,747,094	1,290,967,494	1,266,019,494	1,240,239,894	1,215,291,894
36	Beginning PV	6.39	6.28	6.18	6.07	5.96	5.85	5.75	5.64	5.53	5.42	5.31	5.20
37	Gallons Processes Month	25,779,600	24,116,400	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600
38	PV Processed Month	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
39	Cumulative Gallons Processed	634,510,800	658,627,200	684,406,800	709,354,800	735,134,400	760,082,400	785,862,000	811,641,600	836,589,600	862,369,200	887,317,200	913,096,800
40	Cumulative PV Processed	2.72	2.82	2.93	3.04	3.15	3.25	3.36	3.47	3.58	3.69	3.80	3.91
41	Remaining Gallons to Process	1,468,098,294	1,443,981,894	1,418,202,294	1,393,254,294	1,367,474,694	1,342,526,694	1,316,747,094	1,290,967,494	1,266,019,494	1,240,239,894	1,215,291,894	1,189,512,294
42	Remaining PV to Process	6.28	6.18	6.07	5.96	5.85	5.75	5.64	5.53	5.42	5.31	5.20	5.09
43	*ESTIMATED COST DETAIL*												
44													
45	Description	GW Restoration Operations											
46													
47	Salaries-Direct	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250
48	Wages-Direct	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487
49	Insurance-Workmens Compensation	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368
50	Payroll Taxes	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992
51	Medical Insurance	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274
52	401K Contributions	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
56	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
57	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Solids	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287
99	Cumulative Total	$3,407,173	$3,543,460	$3,679,747	$3,816,034	$3,952,321	$4,088,608	$4,224,895	$4,361,182	$4,497,468	$4,633,755	$4,770,042	$4,906,329
100	Period Days	31	29	31	30	31	30	31	31	30	31	30	31
		25	26	27	28	29	30	31	32	33	34	35	36
		1/3	2/3	3/3	4/3	5/3	6/3	7/3	8/3	9/3	10/3	11/3	12/3

CROWNPOINT SEC, 24 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

November 19, 2001

	Period	1/4	2/4	3/4	4/4	5/4	6/4	7/4	8/4	9/4	10/4	11/4	12/4
1	*Management and Accounting*												
2	Operations Manager	1	1	1	1	1	1	1	1	1	1	1	1
3	Environmental Manager	1	1	1	1	1	1	1	1	1	1	1	1
4	*Plant Personnel*												
5	Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
	Chemist	1	1	1	1	1	1	1	1	1	1	1	1
	Electrician	1	1	1	1	1	1	1	1	1	1	1	1
8	Plant Operator	1	1	1	1	1	1	1	1	1	1	1	1
9	*Wellfield Personnel*												
10	Foreman	1	1	1	1	1	1	1	1	1	1	1	1
11	Truck Driver	1	1	1	1	1	1	1	1	1	1	1	1
12	Wellfield Operators	1	1	1	1	1	1	1	1	1	1	1	1
13	Pump Hoist Operators	1	1	1	1	1	1	1	1	1	1	1	1
14	*Engineering & Geologic Personnel*												
15	Senior Geologist	1	1	1	1	1	1	1	1	1	1	1	1
16													
17	*Total Employees*	11	11	11	11	11	11	11	11	11	11	11	11
18													
19	*Operations Statistics*												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,891,200	24,220,800	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200
25	MM Gals, RO Permiate - Month	20,712,960	19,376,640	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960
26	MM Gals, RO Reject - Month	5,178,240	4,844,160	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,580,000	5,220,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000
32	MM Gals, Distillate - Month	5,066,640	4,739,760	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640
33	MM Gals, Brine - Month	111,600	104,400	111,600	108,000	111,600	108,000	111,600	111,600	108,000	111,600	108,000	111,600
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	1,189,512,294	1,163,732,694	1,139,616,294	1,113,836,694	1,088,888,694	1,063,109,094	1,038,161,094	1,012,381,494	986,601,894	961,653,894	935,874,294	910,926,294
36	Beginning PV	5.09	4.98	4.88	4.77	4.66	4.55	4.44	4.33	4.22	4.12	4.01	3.90
37	Gallons Processes Month	25,779,600	24,116,400	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600
38	PV Processed Month	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
39	Cumulative Gallons Processed	938,876,400	962,992,800	988,772,400	1,013,720,400	1,039,500,000	1,064,448,000	1,090,227,600	1,116,007,200	1,140,955,200	1,166,734,800	1,191,682,800	1,217,462,400
40	Cumulative PV Processed	4.02	4.12	4.23	4.34	4.45	4.56	4.67	4.78	4.88	4.99	5.10	5.21
41	Remaining Gallons to Process	1,163,732,694	1,139,616,294	1,113,836,694	1,088,888,694	1,063,109,094	1,038,161,094	1,012,381,494	986,601,894	961,653,894	935,874,294	910,926,294	885,146,694
42	Remaining PV to Process	4.98	4.88	4.77	4.66	4.55	4.44	4.33	4.22	4.12	4.01	3.90	3.79
43	*ESTIMATED COST DETAIL*												
44													
45	Description	—GW Restoration Operations—							—GW Restoration Operations—				
46													
47	Salaries-Direct	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250
48	Wages-Direct	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487
49	Insurance-Workmans Compensation	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368
50	Payroll Taxes	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992
51	Medical Insurance	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274
52	401K Contributions	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
56	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
57	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
58	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Solids	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287
99	Cumulative Total	$5,042,616	$5,178,903	$5,315,190	$5,451,477	$5,587,764	$5,724,051	$5,860,338	$5,996,625	$6,132,912	$6,269,198	$6,405,485	$6,541,772
100	Period Days	31	29	31	30	31	30	31	31	30	31	30	31

CROWNPOINT SEC, 24 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

November 16, 2001

	Period	1/5	2/5	3/5	4/5	5/5	6/5	7/5	8/5	9/5	10/5	11/5	12/5
1	*Management and Accounting*												
2	Operations Manager	1	1	1	1	1	1	1	1	1	1	1	1
3	Environmental Manager	1	1	1	1	1	1	1	1	1	1	1	1
4	*Plant Personnel*												
	Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
	Chemist	1	1	1	1	1	1	1	1	1	1	1	1
	Electrician	1	1	1	1	1	1	1	1	1	1	1	1
8	Plant Operator	1	1	1	1	1	1	1	1	1	1	1	1
9	*Wellfield Personnel*												
10	Foremen	1	1	1	1	1	1	1	1	1	1	1	1
11	Truck Driver	1	1	1	1	1	1	1	1	1	1	1	1
12	Wellfield Operators	1	1	1	1	1	1	1	1	1	1	1	1
13	Pump Hoist Operators	1	1	1	1	1	1	1	1	1	1	1	1
14	*Engineering & Geologic Personnel*												
15	Senior Geologist	1	1	1	1	1	1	1	1	1	1	1	1
16													
17	*Total Employees*	11	11	11	11	11	11	11	11	11	11	11	11
18													
19	*Operations Statistics*												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,891,200	24,220,800	25,891,200	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000
25	MM Gals, RO Permiate - Month	20,712,960	19,376,640	20,712,960	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800
26	MM Gals, RO Reject - Month	5,178,240	4,844,160	5,178,240	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,580,000	5,220,000	5,580,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000
32	MM Gals, Distillate - Month	5,066,640	4,739,760	5,066,640	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200
33	MM Gals, Brine - Month	111,600	104,400	111,600	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	885,146,694	859,367,094	835,250,694	809,471,094	784,523,094	759,575,094	734,627,094	709,679,094	684,731,094	659,783,094	634,835,094	609,887,094
36	Beginning PV	3.79	3.68	3.58	3.46	3.36	3.25	3.14	3.04	2.93	2.82	2.72	2.61
37	Gallons Processes Month	25,779,600	24,116,400	25,779,600	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000
38	PV Processed Month	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
39	Cumulative Gallons Processed	1,243,242,000	1,267,358,400	1,293,138,000	1,318,086,000	1,343,034,000	1,367,982,000	1,392,930,000	1,417,878,000	1,442,826,000	1,467,774,000	1,492,722,000	1,517,670,000
40	Cumulative PV Processed	5.32	5.42	5.54	5.64	5.75	5.86	5.96	6.07	6.18	6.28	6.39	6.50
41	Remaining Gallons to Process	859,367,094	835,250,694	809,471,094	784,523,094	759,575,094	734,627,094	709,679,094	684,731,094	659,783,094	634,835,094	609,887,094	584,939,094
42	Remaining PV to Process	3.68	3.58	3.46	3.36	3.25	3.14	3.04	2.93	2.82	2.72	2.61	2.50
43	*ESTIMATED COST DETAIL*												
44													
45	Description					GW Restoration Operations							
46													
47	Salaries-Direct	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250
48	Wages-Direct	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487
49	Insurance-Workmens Compensation	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368
50	Payroll Taxes	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992
51	Medical Insurance	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274
52	401K Contributions	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
56	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
57	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
62	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Solids	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287	$136,287
99	Cumulative Total	$6,678,059	$6,814,346	$6,950,633	$7,086,920	$7,223,207	$7,359,494	$7,495,781	$7,632,068	$7,768,355	$7,904,642	$8,040,928	$8,177,215
100	Period Days	31	28	31	30	30	30	30	30	30	30	30	30

November 19, 2001

CROWNPOINT SEC, 24 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

	Period	1/6	2/6	3/6	4/6	5/6	6/6	7/6	8/6	9/6	10/6	11/6	12/6
1	*Management and Accounting*												
2	Operations Manager	1	1										
3	Environmental Manager	1	1										
4	*Plant Personnel*												
	Radiation Officer	1	1										
	Chemist	1	1										
	Electrician	1	1										
8	Plant Operator	1	1										
9	*Wellfield Personnel*												
10	Foremen	1	1										
11	Truck Driver	1	1										
12	Wellfield Operators	1	1										
13	Pump Hoist Operators	1	1										
14	*Engineering & Geologic Personnel*												
15	Senior Geologist	1	1										
16													
17	*Total Employees*	11	11										
18													
19	*Operations Statistics*												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000
25	MM Gals, RO Permiate - Month	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800
26	MM Gals, RO Reject - Month	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000
32	MM Gals, Distillate - Month	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200
33	MM Gals, Brine - Month	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000
34	Process Results												
35	Beginning Gallons (8 PV Eq.)	584,839,094	559,891,094	535,043,094	510,095,094	485,147,094	460,199,094	435,251,094	410,303,094	385,355,094	360,407,094	335,459,094	310,511,094
36	Beginning PV	2.50	2.40	2.29	2.18	2.08	1.97	1.86	1.76	1.65	1.54	1.44	1.33
37	Gallons Processes Month	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000
38	PV Processed Month	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
39	Cumulative Gallons Processed	1,542,618,000	1,567,566,000	1,592,514,000	1,617,462,000	1,642,410,000	1,667,358,000	1,692,306,000	1,717,254,000	1,742,202,000	1,767,150,000	1,792,098,000	1,817,046,000
40	Cumulative PV Processed	6.60	6.71	6.82	6.92	7.03	7.14	7.24	7.35	7.46	7.56	7.67	7.78
41	Remaining Gallons to Process	559,891,094	535,043,094	510,095,094	485,147,094	460,199,094	435,251,094	410,303,094	385,355,094	360,407,094	335,459,094	310,511,094	285,563,094
42	Remaining PV to Process	2.40	2.29	2.18	2.08	1.97	1.86	1.76	1.65	1.54	1.44	1.33	1.22
43	*ESTIMATED COST DETAIL*												
44													
45	Description			GW Restoration Operations									GW Restoration Oper
46													
47	Salaries-Direct	$32,250	$32,250	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750
48	Wages-Direct	$10,487	$10,487	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
49	Insurance-Workmens Compensation	$1,368	$1,368	$280	$280	$280	$280	$280	$280	$280	$280	$280	$280
50	Payroll Taxes	$2,982	$2,982	$613	$613	$613	$613	$613	$613	$613	$613	$613	$613
51	Medical Insurance	$4,274	$4,274	$875	$875	$875	$875	$875	$875	$875	$875	$875	$875
52	401K Contributions	$1,068	$1,068	$219	$219	$219	$219	$219	$219	$219	$219	$219	$219
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
56	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
57	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
62	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,898	$5,898	$5,898	$5,898	$5,898	$5,898	$5,898	$5,898	$5,898	$5,898	$5,898	$5,898
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Solids	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$136,287	$136,287	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585
99	Cumulative Total	$8,313,502	$8,449,789	$8,544,374	$8,638,959	$8,733,544	$8,828,129	$8,922,714	$9,017,298	$9,111,883	$9,206,468	$9,301,053	$9,395,638
100	Period Days	30	30	30	30	30	30	30	30	30	30	30	30

CROWNPOINT SEC, 24 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

November 19, 2001

	Period	1/7	2/7	3/7	4/7	5/7	6/7	7/7	8/7	9/7	10/7	11/7	12/7
1	*Management and Accounting*												
2	Operations Manager												
3	Environmental Manager												
4	*Plant Personnel*												
	Radiation Officer												
	Chemist												
	Electrician												
8	Plant Operator												
9	*Wellfield Personnel*												
10	Foreman												
11	Truck Driver												
12	Wellfield Operators												
13	Pump Hoist Operators												
14	*Engineering & Geologic Personnel*												
15	Senior Geologist												
16													
17	*Total Employees*												
18													
19	*Operations Statistics*												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000	25,056,000
25	MM Gals, RO Permiate - Month	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800	20,044,800
26	MM Gals, RO Reject - Month	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200	5,011,200
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000
32	MM Gals, Distillate - Month	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200	4,903,200
33	MM Gals, Brine - Month	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	285,563,094	260,615,094	235,667,094	210,719,094	185,771,094	160,823,094	135,875,094	110,927,094	85,979,094	61,031,094	36,083,094	11,135,094
36	Beginning PV	1.22	1.12	1.01	0.90	0.80	0.69	0.58	0.47	0.37	0.26	0.15	0.05
37	Gallons Processes Month	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000	24,948,000
38	PV Processed Month	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
39	Cumulative Gallons Processed	1,841,994,000	1,866,942,000	1,891,890,000	1,916,838,000	1,941,786,000	1,966,734,000	1,991,682,000	2,016,630,000	2,041,578,000	2,066,526,000	2,091,474,000	2,116,422,000
40	Cumulative PV Processed	7.88	7.99	8.10	8.20	8.31	8.42	8.53	8.63	8.74	8.85	8.95	9.06
41	Remaining Gallons to Process	260,615,094	235,667,094	210,719,094	185,771,094	160,823,094	135,875,094	110,927,094	85,979,094	61,031,094	36,083,094	11,135,094	-13,812,906
42	Remaining PV to Process	1.12	1.01	0.90	0.80	0.69	0.58	0.47	0.37	0.26	0.15	0.05	-0.06
43	*ESTIMATED COST DETAIL*												
44													
45	Description	tions							—GW Restoration Operations—				
46													
47	Salaries-Direct	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750	$8,750
48	Wages-Direct	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
49	Insurance-Workmans Compensation	$280	$280	$280	$280	$280	$280	$280	$280	$280	$280	$280	$280
50	Payroll Taxes	$613	$613	$613	$613	$613	$613	$613	$613	$613	$613	$613	$613
51	Medical Insurance	$875	$875	$875	$875	$875	$875	$875	$875	$875	$875	$875	$875
52	401K Contributions	$219	$219	$219	$219	$219	$219	$219	$219	$219	$219	$219	$219
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
56	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
57	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
62	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362	$16,362
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Solids	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291	$8,291
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585	$94,585
99	Cumulative Total	$9,490,223	$9,584,808	$9,679,393	$9,773,977	$9,868,562	$9,963,147	$10,057,732	$10,152,317	$10,246,902	$10,341,487	$10,436,072	$10,530,656
100	Period Days	30	30	30	30	30	30	30	30	30	30	30	30

November 19, 2001

CROWNPOINT SEC, 24 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

	Period	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8
1	***Management and Accounting***								
2	Operations Manager	1	1	1	1	1	1	1	1
3	Environmental Manager	1	1	1	1	1	1	1	1
4	***Plant Personnel***								
	Radiation Officer	1	1	1	1	1	1	1	1
	Chemist	1	1	1	1	1	1	1	1
	Electrician								
8	Plant Operator								
9	***Wellfield Personnel***								
10	Foremen	1	1	1	1	1	1	1	1
11	Truck Driver								
12	Wellfield Operators								
13	Pump Hoist Operators								
14	***Engineering & Geologic Personnel***								
15	Senior Geologist								
16									
17	***Total Employees***	5	5	5	5	5	5	5	5
18									
19	***Operations Statistics***								
20	Reverse Osmosis Treatment								
21	GPM RO Capacity								
22	GPM RO Product								
23	GPM RO Reject								
24	MM Gals, RO Processed - Month								
25	MM Gals, RO Permiate - Month								
26	MM Gals, RO Reject - Month								
27	Brine Concentration								
28	GPM BC Capacity								
29	GPM Distillate								
30	GPM Brine								
31	MM Gals, BC Capacity - Month								
32	MM Gals, Distillate - Month								
33	MM Gals, Brine - Month								
34	Process Results								
35	Beginning Gallons (9 PV Eq.)								
36	Beginning PV								
37	Gallons Processes Month								
38	PV Processed Month								
39	Cumulative Gallons Processed								
40	Cumulative PV Processed								
41	Remaining Gallons to Process								
42	Remaining PV to Process								
43	***ESTIMATED COST DETAIL***								
44									
45	Description	Final Decontamination, Decomissioning and Reclamation							
46									
47	Salaries-Direct	$27,417	$27,417	$27,417	$27,417	$27,417	$27,417	$27,417	$27,417
48	Wages-Direct	$0	$0	$0	$0	$0	$0	$0	$0
49	Insurance-Workmens Compensation	900	900	900	900	900	900	900	900
50	Payroll Taxes	4200	4200	4200	4200	4200	4200	4200	4200
51	Medical Insurance	4000	4000	4000	4000	4000	4000	4000	4000
52	401K Contributions	4000	4000	4000	4000	4000	4000	4000	4000
53	Telephone/Telegraph	$950	$950	$950	$950	$950	$950	$950	$950
54	Postage/Freight	$175	$175	$175	$175	$175	$175	$175	$175
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300
56	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200
57	Office Supplies	$150	$150	$150	$150	$150	$150	$150	$150
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing								
	Maps					$1,000	$1,000	$1,000	$1,000
	Drafting & Printing					$2,500	$2,500	$2,500	$2,500
62	Transportation - Air & Car	$300	$300	$300	$300	$300	$300	$300	$300
63	Meals & Entertainment	$300	$300	$300	$300	$300	$300	$300	$300
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment								
66	Env-Operational Analyses								
67	Environmental - Miscellaneous								
68	Safety								
69	Backhoe Maintenance								
70	Misc. Chemicals								
71	Utilities - Electric, Wellfield								
72	Utilities - Electric, Brine Concentrator								
73	Utilities - Electric, Plant and RO								
74	Submersible Pumps								
75	Submersible Motors								
76	Field Piping & Valves								
77	Meters								
78	Misc. Field								
79	Handtools								
80	Plant Piping & Valves								
81	Plant Brine Conc Inst.								
82	Pumps								
83	Plant Electrical								
84	Filters								
85	Evaporation Ponds								
86	Roads								
87	Gas, Oil, Grease								
88	Disposal - B.C. Solids								
89	RO Unit								
90	Lab Supplies								
91	RO Membrane								
92	Field Equip. Repairs & Maint.								
93	Vehicle Repairs & Maint.								
94	Vehicles - Pickups								
95	Vehicles - Tractors & Trucks								
96	Vehicles - Automobiles								
97									
98	Monthly Total	$43,242	$43,242	$43,242	$43,242	$46,742	$46,742	$46,742	$46,742
99	Cumulative Total	$10,573,898	$10,617,140	$10,660,382	$10,703,624	$10,750,366	$10,797,108	$10,843,850	$10,890,592
100	Period Days	31	30	31	31	30	31	30	31

D & D COSTS ARE ITEMIZED ON A TASK BASIS

November 19, 2001

ATTACHMENT E-2-2
BUDGET CALCUALTION AND BACKUP

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Labor Rates
Electrical Usage
Solid Production

November 19, 2001

LABOR SUMMARIES

			Number	Hourly Rate	Yearly Salary	Annual	Monthly
8		*Management and Accounting*					
9	Salaried	Operations Manager	1	-	$120,000	$120,000	$10,000
10	Salaried	Environmental Manager	1	-	$105,000	$105,000	$8,750
11	Salaried	Accounting Manager			$105,000	$105,000	$8,750
12	Salaried	Accountant		-	$65,000	$65,000	$5,417
13		*Plant Personnel*					
14	Salaried	Plant Superintendent		-	$85,000	$85,000	$7,083
15	Salaried	Plant Engineer		-	$45,000	$45,000	$3,750
16	Salaried	Radiation Officer	1	-	$30,000	$30,000	$2,500
17	Salaried	Chemist	1	-	$46,000	$46,000	$3,833
18	Salaried	Plant Foreman		-	$28,000	$28,000	$2,333
19	Salaried	Maintenance Foreman		-	$28,000	$28,000	$2,333
20	Wage	Lab Technicans		$9.62	-	$20,010	$1,667
21	Wage	Secretary		$9.62	-	$20,010	$1,667
22	Wage	Electrician	1	$14.43	-	$30,014	$2,501
23	Wage	Apprentice Electrican		$12.01	-	$24,981	$2,082
24	Wage	Plant Operator	1	$11.54	-	$24,003	$2,000
25	Wage	Assistance Plant Operator		$11.54	-	$24,003	$2,000
26	Wage	Dryer Operator		$11.54	-	$24,003	$2,000
27	Wage	Maintenance		$11.54	-	$24,003	$2,000
28		*Wellfield Personnel*					
29	Salaried	Wellfield Superintendent		-	$41,200	$41,200	$3,433
	Salaried	Drilling Engineer		-	$40,500	$40,500	$3,375
	Salaried	Foreman	1	-	$28,000	$28,000	$2,333
32	Wage	Truck Driver	1	$11.54	-	$24,003	$2,000
33	Wage	Electrician		$14.43	-	$30,014	$2,501
34	Salaried	Data Entry Clerk		-	$20,000	$20,000	$1,667
35	Wage	Secretary			$20,000	$20,000	$1,667
36	Wage	Logger		$12.01	-	$24,981	$2,082
37	Wage	Wellfield Operators	1	$11.50	-	$23,920	$1,993
38	Wage	Assistant Wellfield Operator		$11.50	-	$23,920	$1,993
39	Wage	Balancer		$11.50	-	$23,920	$1,993
40	Wage	Environmental Sampler		$11.50	-	$23,920	$1,993
41	Wage	Pump Hoist Operators	1	$11.50	-	$23,920	$1,993
42	Wage	Backhoe Operator		$10.49	-	$21,819	$1,818
43	Wage	Maintenance		$11.50	-	$23,920	$1,993
44	Wage	Casing Crew		$11.50	-	$23,920	$1,993
45		*Engineering & Geologic Personnel*					
46	Salaried	Chief Engineer		-	$66,000	$66,000	$5,500
47	Salaried	RESERVOIR ENGINEER		-	$60,000	$60,000	$5,000
48	Salaried	Senior Geologist	1	-	$58,000	$58,000	$4,833
49	Salaried	Geologist		-	$48,800	$48,800	$4,067
50	Salaried	Logging Supervisor		-	$35,000	$35,000	$2,917
51	Wage	Secretary			$20,000	$20,000	$1,667
52	Wage	Surveyor		$12.02	-	$25,002	$2,083
53	Wage	Assistant Surveyor		$12.02	-	$25,002	$2,083
	Wage	Logger		$10.49	-	$21,819	$1,818
56		Total #	11				

ATTACHMENT W

'99 OCT 22 AM 7 34
STATE ENGINEER OFFICE
SANTA FE NEW MEXICO

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
SANTA FE

THOMAS C. TURNEY
State Engineer

BATAAN MEMORIAL BUILDING, ROOM 101
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BEFORE THE NEW MEXICO
STATE ENGINEER

IN THE MATTER OF THE)
APPLICATION OF HRI, INC.)
TO CHANGE PLACE OR)
PURPOSE OF USE AND POINTS)
OF DIVERSION OF)
UNDERGROUND WATERS)

G-11-A

FINDINGS AND ORDER

This matter came before the State Engineer upon the Application of HRI, Inc. The hearing was held on the application in Gallup, New Mexico commencing 9:00 a.m. March 24, 1998. Having considered the evidence, the Hearing Examiner FINDS:

1. The State Engineer has personal and subject matter jurisdiction.
2. The Applicant requested a Permit to Change Place and Purpose of Use and Points of Diversion of 650 acre feet per annum of underground water in the Gallup Basin from a well located in the NE¼, NW¼, SE¼ of Section 35, T17N, R16W, M. to 750 wells to be drilled in the SE¼, NW¼ and NE¼ of Section 17, and the SE¼ of Section 8, all of T16N, R16W, N.M.P.M. for <u>in situ</u> uranium mining and related purposes.
3. The proposed mining operation would not exceed 30 years.
4. A maximum of 4000 gallons per minute would be recirculated at the move to location for the purposes stated on the application.
5. Four thousand gallons per minute translates approximately to 6,450 acre feet per annum.
6. Application G-11-A does not indicate a maximum of 4000 gallons per minute, 6,450 acre feet per annum, will be recirculated.

7. The applicant purchased the water right set forth in G-11 from United Nuclear Corporation on December 11, 1992.

8. Six hundred fifty acre feet per annum of water right is assigned from G-11 as G-11-A.

9. United Nuclear Corporation put to beneficial use a sufficient amount of consumptive use water right for the applicant to transfer 650 acre feet per annum to the move to location.

10. In situ mining of uranium at the move to location is feasible.

11. The diversion and consumptive use of 650 acre feet per annum at the move to location for the purposes stated on the application would not impair valid existing water rights and would not be contrary to the conservation of water or detrimental to the public welfare of the state.

THEREFORE it is hereby ORDERED that application G-11-A is approved subject to the following conditions:

1. Diversion and consumptive use shall not exceed 650 acre feet per annum from the well locations described under this permit.

2. The permittee shall comply with State Engineer artesian well construction regulations.

3. The State Engineer shall be notified prior to the construction of each well.

4. The permittee shall install metering devices at locations and in a manner acceptable to the State Engineer.

5. The permittee shall report metered diversions to the State Engineer monthly.

6. Permit shall expire October 31, 2029.

R. Q. Rogers
Hearing Examiner

Witness my hand and official seal this 19th day of October, 1999.

Thomas C. Turney
State Engineer

THOMAS C. TURNEY
6332