

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

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\_\_\_\_\_  
In the Matter of: )  
)  
)  
HYDRO RESOURCES, INC. )  
P.O. Box 15910 )  
Rio Rancho, New Mexico 87174 )  
\_\_\_\_\_ )

Docket No. 40-8968-ML  
ASLBP No. 95-706-01-ML

**RESPONSE OF HYDRO RESOURCES, INC.  
TO COMMISSION'S ORDER IN CLI-00-08 REQUIRING SUBMITTAL OF A  
FINANCIAL ASSURANCE PLAN**

By Memorandum and Order, CLI-00-08, dated May 25, 2000 (the "Order"), the Commission requested that licensee, Hydro Resources, Inc. ("HRI) submit, within 180 days after service of the Order, "a decontamination, decommissioning and reclamation plan with cost estimates on which a surety will be based."<sup>1</sup> The Commission further stated, "[T]he plan in the first instance need only address the Section 8 site where HRI plans to begin operations first."<sup>2</sup> Attached hereto is HRI's decontamination, decommissioning and reclamation plan for the Section 8 site of the proposed Crownpoint Uranium Project ("CUP"). As the Commission is aware, the CUP will consist of an *in situ leach* uranium extraction and processing operation. The extraction process will consist of injecting lixiviant into the ore body to solubilize the uranium present and pumping the uranium-bearing groundwater to a nearby processing facility, where the uranium will be separated from the groundwater by a process of ion exchange.

<sup>1</sup> CLI-00-08 at 16.  
<sup>2</sup> *Id.* (footnote omitted).

Template = SECY-049

SECY-02

After the in situ leach uranium recovery is conducted at Churchrock Section 8, resin will be processed and yellowcake packaged at the Crownpoint Central Plant. Thus, the attached decontamination, decommissioning and reclamation plan focuses on groundwater restoration of the Section 8 ore body aquifer, Section 8 well plugging, and associated satellite and central plant decommissioning. Included are detailed calculations for restoring the Section 8 ore body aquifer as close as is reasonably achievable to its pre-mining condition. These calculations are based upon the LC 9.5 assumption that nine pore volumes will be required to restore the Section 8 ore body aquifer and incorporate the institutional experience gained by HRI's sister company, URI, in its successful reclamation of *in situ leach* mined ore body aquifers in Texas. HRI proposes to obtain surety and performance bonds (see forms in the attached plan) in amounts based upon the estimates presented with the attached plan.

HRI submits that the attached plan and cost estimates are consistent with the NRC's "Technical Position on Financial Assurances for Reclamation, Decommissioning, and Long-Term Surveillance and Control of Uranium Recovery Facilities"<sup>3</sup> and Criterion 9 of Appendix A, Part 40.<sup>4</sup> Moreover, HRI's license, at LC 9.5, which provides for the annual reassessment of the adequacy of HRI's surety,<sup>5</sup> ensures that HRI, under supervision of NRC Staff, will annually

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<sup>3</sup> Division of Low-Level Waste Management and Decommissioning, U.S. Nuclear Regulatory Commission, October 1988.

<sup>4</sup> The requirement establishes the need for a surety which covers specific decommissioning and reclamation activities committed to by the operator in his license. The surety mechanism is not intended to be a floating liability which guarantees the performance of whatever standards are in place fifteen or twenty years in the future. NUREG-0706, Vol. II, p. A-107 (September 1980).

<sup>5</sup> 10 C.F.R. Part 40, Appendix A, Criterion 9. *See also:* [An] Adjustment provision that requires a periodic review of surety adequacy. The amount of the surety should be adjusted to recognize any increases or decreases resulting from inflation, changes in engineering plans, activities performed and any other conditions affecting costs. This will yield a surety that is at least sufficient at all times to cover the costs of decommissioning and

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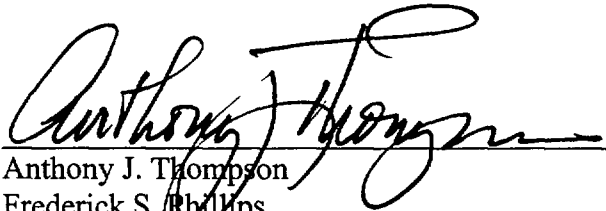
review HRI's financial assurance instruments and adjust them up or down as conditions and experience warrant.

### CONCLUSION

The attached decontamination, decommissioning and reclamation plan and accompanying cost estimates based thereon are consistent with NRC Staff estimates for restoration of the CUP Section 8 ore body aquifer and are compliant with Appendix A, Criterion 9 requirements. In addition, HRI's license requires HRI to review and update its financial assurance annually in response to changed conditions and experience gained with actual field operations.

For all of the foregoing reasons, HRI respectfully requests that the Commission approve HRI's attached plan.

Respectfully submitted this 21<sup>st</sup> day of November, 2000.



Anthony J. Thompson  
Frederick S. Phillips  
SHAW PITTMAN  
2300 N. Street, N.W.  
Washington, D.C. 20037  
202.663.8000

COUNSEL TO HYDRO RESOURCES, INC.

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reclamation of the areas that are expected to be disturbed, before the next license renewal. This provision will provide an incentive to design systems involving staged reclamation, whereby costs for the surety mechanism are reduced. *Id.* at Vol. I, p.14-10.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

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HYDRO RESOURCES, INC. )	Docket No. 40-8968-ML
P.O. Box 15910 )	ASLBP No. 95-706-01-ML
Rio Rancho, New Mexico 87174 )	
_____ )	

CERTIFICATE OF SERVICE

I hereby certify that copies of the Response of HYDRO Resources, Inc. to Commission's Order in CLI-00-08 Requiring Submittal of a Financial Assurance Plan in the above-captioned proceeding has been served on the following by electronic mail (as indicated) and on all parties by first class mail, postage pre-paid, on this 21st day of November, 2000.

Administrative Judge  
Thomas S. Moore, Presiding Officer  
Atomic Safety and Licensing Board  
Two White Flint North  
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U.S. Nuclear Regulatory Commission  
Rockville, Maryland 20852  
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Rockville, Maryland 20852  
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Attn: Rulemakings and Adjudications Staff  
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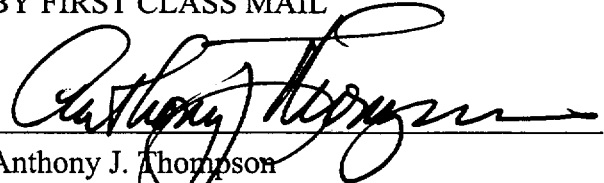
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Frederick S. Phillips  
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2300 N Street, N.W.  
Washington, DC 20037

Counsel for Hydro Resources, Inc.

**Hydro Resources, Inc.**

**CHURCH ROCK SECTION 8/CROWNPOINT PROCESS PLANT  
RESTORATION ACTION PLAN**

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**License No.: SUA-1580**

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**November 17, 2000**

**Hydro Resources, Inc.**

**CHURCH ROCK SECTION 8/CROWNPOINT PROCESS PLANT  
RESTORATION ACTION PLAN**

**November 17, 2000**

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## CHURCH ROCK SECTION 8/CROWNPOINT PROCESS PLANT - RESTORATION ACTION PLAN

### A. INTRODUCTION

The following summarizes the Restoration Action Plan ("RAP") for the Churchrock Section 8 and Crownpoint Process site locations. Shown in Attachment A-1, the estimate puts the costs of restoration by an independent contractor at \$9,485,812 over a five year period which is based on the conservative assumption that all reclamation activities are postponed until the end of the mine life with the resulting liabilities accumulated until the end. In practice, within the wellfield, individual wells will be shut down when they cease to be economically productive and when an entire segment of a wellfield has been depleted of uranium, restoration will be initiated simultaneous with production in new segments of the mine. As a result, at the end of the mine life at the Churchrock Section 8 location, a substantial proportion of the groundwater restoration cost that had been contemplated in this plan will also have been complete. This progressive restoration is the reason that annual surety reviews are completed pursuant to LC 9.5.

The RAP encompasses the full cycle activities necessary to:

- ◆ Restore the groundwater at the Churchrock Section 8 site to levels consistent with those described in License<sup>1</sup> Condition 9.3 and the COP<sup>2</sup>.
- ◆ Complete a six-month stabilization period during which the chemistry of the groundwater remains constant.
- ◆ Complete the plugging and abandonment ("P&A") of all wells.
- ◆ Radiological decontamination buildings, process vessels, and other structures, or affected areas.
- ◆ Removal as necessary and reclamation of the Crownpoint Central Plant ("CCP"), satellites, and auxiliary structures.
- ◆ Surface reclamation, decommission and obtain release for unrestricted use of the surface and revegetation of restored well fields. When accomplished, the land is returned to its original premining use of sheep, and cattle grazing, and associated wildlife habitat.

It should be emphasized that this RAP has been compiled with the absence of actual development in the field that would normally be used as justification for the basic assumptions. The greatest potential for inaccuracy that may result from the absence of real information is in the mine area, where actual drilling will reveal details in the nature of the ore and mine zone. Additionally, there may be other differences in the reclamation costs that will result once "as built" conditions are realized. The buildings may be larger or smaller. HRI may not bury laterals. Because of new deregulation initiatives, electrical costs may be more or less.

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<sup>1</sup> The "License" that is referenced throughout this RAP means the U.S. Nuclear Regulatory Commission Materials License SUA-1580.

<sup>2</sup> The "COP" referenced throughout this RAP means the Crownpoint Uranium Project Consolidated Operations Plan, Revision 2.0, August 15, 1997.

The sequence of mining activity and the resulting schedule for production and restoration may also differ from what the RAP budget reflects. Based on HRI's ability to obtain economic uranium sales contracts, production rates may be more or less than what is expected. Any change in the development rate would be reflected in the overall groundwater restoration schedule and possibly the sizing of the desired equipment.

The results of the requisite restoration demonstration described in LC 10.28 and COP 10.4.4 may have a significant effect on groundwater restoration costs. An increase or decrease in demonstrated pore volume requirements will have a proportional effect on groundwater restoration costs.

HRI's submittal presented herein employs assumptions that are based on best professional judgment given the data that is currently available. It is a fact that the detail of the RAP budget model exceeds our ability to predict precise field conditions accurately. Necessarily, the accuracy of the budget assumptions will improve as operations proceed. The annual review required by LC 9.5 would provide the iterative format by which NRC can continually update the surety amount that results from the newly available information.

**ATTACHMENT A-1  
SUMMARY**

**HRI CROWNPOINT URANIUM PROJECT**  
**Financial Assurance Plan for Churchrock Section 8 and the Crownpoint Central Plant**  
**Summary**

<u>Category</u>	<u>Project Total</u>	<u>Initial Surety</u>
Groundwater Restoration	\$7,204,799	\$2,401,600
Groundwater Stability Analysis	\$80,000	\$80,000
Well Plugging	\$401,345	\$133,782
Equipment Removal	\$67,626	\$67,626
Wellfield Decommissioning and Decontamination	\$105,228	\$105,228
Building Decommissioning and Decontamination	\$249,874	\$249,874
Surface Reclamation	\$139,660	\$139,660
<b>Totals</b>	<b>\$8,248,533</b>	<b>\$3,177,770</b>
<b>Contingency/Profit 15%</b>	<b>\$1,237,280</b>	<b>\$476,665</b>
<b>Total Surety</b>	<b>\$9,485,812</b>	<b>\$3,654,435</b>

## **B. SURITY BOND FORMAT**

Examples of the planned performance or performance guarantee bonds are contained in Attachment B-1. This format has been found to be generally acceptable to St. Paul Fire and Marine Insurance, the carrier that has provided performance/performance guarantee bonds for the Company's licensed operations in Texas. The performance or performance guarantee bonds in the Attachment are intended to serve as examples of format only and penal sum amounts have not been included. Once the NRC staffs approves HRI's restoration and reclamation costs estimates the penal sum figure will be included in the final bonds which will be tendered as a prerequisite to operation under the license.

HRI has formatted the wording in these bond instruments by referring to guidance from the State of New Mexico and the NRC "Technical Position on Financial Assurance for Reclamation, Decommission, and Long-Term Surveillance and Control of Uranium Recovery Facilities," dated October 1988. Where differences exist between State and the NRC guidance, HRI has used the most restrictive requirement in the examples presented in Attachment B-1.

**ATTACHMENT B-1**  
**BOND FORMAT**

## PERFORMANCE BOND

Date bond executed: \_\_\_\_\_

Effective date: \_\_\_\_\_

Principal: HRI, Inc., 12751 Merit Drive, Dallas, Texas 75251

Type of organization: Corporation

State of incorporation: Delaware

Surety: St. Paul Fire and Marine Insurance, 5801 Centennial Way, Baltimore, MD 21209

NMED Discharge Permit No. 558

Surety's bond number: \_\_\_\_\_

Know All Persons By These Presents.

That We, the Principal and Surety(ies) hereto are firmly bound to the New Mexico Environment Department [hereinafter called "NMED"], in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally; provided that, where the Surety(ies) are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

Whereas said Principal is required, under the Water Quality Act and New Mexico Water Quality Control Commission Regulations, as amended, to have an approved discharge permit in order to operate each injection well identified above, and

WHEREAS, the U.S. Nuclear Regulatory Commission "NRC", an agency of the U.S. Government, pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, has promulgated regulations in Title 10, Chapter I of the Code of Federal Regulations, Part [30, 40, 70, or 72] and has approved a license in order to operate each injection well identified above, and,

Whereas said Principal is required to provide financial assurance for plugging and abandonment as a condition of the discharge permit and license, and

Whereas, said Principal desires to avoid unnecessary duplication and expense, and therefor posts surety in favor of the State of New Mexico, with the implicit understanding that this surety will meet the 10 CFR Part 40, Appendix A Criterion 9 requirements regarding decommissioning and reclamation costs of the NRC.

Whereas said Principal shall establish a standby trust fund where both NMED and NRC serve as Beneficiaries as required when a surety bond is used to provide such financial assurance;

Now, Therefore, the conditions of this obligation are such that if the Principal shall faithfully perform plugging and abandonment, whenever required to do so, of each injection well for which this bond guarantees plugging and abandonment, in accordance with the plugging and abandonment plan and other requirements of the discharge permit as may be amended, pursuant to all applicable laws, statutes, rules and regulations, as such laws, statutes, rules, and regulations may be amended,

Or, if the Principal shall provide alternate financial assurance as specified in Discharge Permit DP-558 and the New Mexico Water Quality Control Commission Regulations and obtain the NMED Secretary's written approval of such assurance, within 90 days after the date of notice of cancellation is received by both the Principal and the NMED Secretary from the Surety(ies), then this obligation shall be null and void, otherwise it is to remain in full force and effect.

The Surety(ies) shall become liable on this bond obligation only when the Principal has failed to fulfill the conditions described above.

Upon notification by the NMED Secretary that the Principal has been found in violation of the plugging and abandonment requirements of Discharge Permit DP-558 and the New Mexico Water Quality Control Commission Regulations for an injection well which this bond guarantees performances of plugging and abandonment, the Surety(ies) shall either perform plugging and abandonment in accordance with the plugging and abandonment plan and other discharge permit requirements or other requirements or place the amount for plugging and abandonment into a standby trust fund as directed by the NMED Secretary.

Upon notification by the NMED Secretary that the Principal has failed to provide alternate financial assurance as specified in Discharge Permit DP-558 and the New Mexico Water Quality Control Commission Regulations and obtain written approval of such assurance from the NMED Secretary during the 60 days following receipt by both the Principal and the NMED Secretary of a notice of cancellation of the bond, the Surety(ies) shall place funds in the amount guaranteed for the injection well(s) into the standby trust fund as directed by the NMED Secretary.

The surety(ies) hereby waive(s) notification of amendments to plugging and abandonment plans, discharge permits, applicable laws, statutes, rules, and regulations and agrees that no such amendment shall in any way alleviate its (their) obligation on this bond.

The liability of the Surety(ies) shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the Surety(ies) hereunder exceed the amount of said penal sum.

The Surety(ies) may cancel the bond by sending notice by certified mail to the Principal and to the NMED Secretary provided, however, that cancellation shall not occur during the 90 days beginning on the date of receipt of the notice of cancellation by both the Principal and the NMED Secretary, as evidenced by the return receipts.



The Principal may terminate this bond by sending written notice to the Surety(ies), provided, however, that no such notice shall become effective until the Surety(ies) receive(s) written authorization for termination of the bond by the NMED Secretary.

Principal and Surety(ies) hereby agree to adjust the penal sum of the bond yearly in accordance with Discharge Permit DP-558 so that it guarantees a new amount(s) for the activities required in the approved discharge plan and pursuant to the Water Quality Control Commission Regulations, provided that no decrease in the penal sum takes place without the written permission of the NMED Secretary.

In Witness Whereof, The Principal and Surety(ies) have executed this Performance Bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the Principal and Surety(ies).

Principal

\_\_\_\_\_  
MARK S. PELIZZA, PRESIDENT

[Corporate seal]

Corporate Surety(ies)

St. Paul Fire and Marine Insurance  
5801 Centennial Way  
Baltimore, MD 21209  
State of incorporation: Maryland

Liability limit: \_\_\_\_\_

\_\_\_\_\_  
XXXXX, ATTORNEY-IN-FACT

[Corporate seal]

Bond premium: \$ \_\_\_\_\_

## PERFORMANCE GUARANTEE BOND

Date bond executed: \_\_\_\_\_

Effective date: \_\_\_\_\_

Principal: HRI, Inc., 12377 Merit Drive, Dallas, Texas 75251

Type of organization: Corporation

State of incorporation: Delaware

Surety(ies): St. Paul Fire and Marine Insurance, 5801 Centennial Way, Baltimore, MD 21209

NMED Discharge Permit No. 558

Total penal sum bond: \$ \_\_\_\_\_

Surety's bond number: \_\_\_\_\_

Know All Person By These Presents, That we, the Principal and Surety(ies) hereto are firmly bound to the New Mexico Environment Department (hereinafter called "NMED"), in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally; provided that, where the Surety(ies) are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

WHEREAS, the NMED, an agency of the State of New Mexico, has promulgated regulations in the New Mexico Water Quality Control Commission Regulations. These regulations applicable to the Principal require that a discharge permit for a facility shall provide assurance that funds will be available when needed in accordance with the approved Closure Plan.

WHEREAS, the U.S. Nuclear Regulatory Commission "NRC", an agency of the U.S. Government, pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, has promulgated regulations in Title 10, Chapter I of the Code of Federal Regulations, Part [30, 40, 70, or 72]. These regulations, applicable to the Principal, require that a holder of, or an applicant for, a Part 30, 40, 70, or 72 license provide assurance that funds will be available when needed for required decommissioning activities in accordance with the approved Closure Plan.

Whereas, said Principal is required under these regulations, to have a discharge permit and license in order to own or operate the Churchrock In Situ mine identified above, and

Whereas, said Principal is required to provide financial assurance for closure activities as a condition of the discharge permit and license, and

Whereas, said Principal desires to avoid unnecessary duplication and expense, and therefor posts surety in favor of the State of New Mexico, with the implicit understanding that this surety

will meet the 10 CFR Part 40, Appendix A Criterion 9 requirements regarding decommissioning and reclamation costs of the NRC.

Whereas said Principal shall establish a standby trust fund where both NMED and NRC serve as Beneficiaries as required when a surety bond is used to provide such financial assurance;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall faithfully perform the activities for which financial assurance is given pursuant to the Water Quality Control Commission Regulations, whenever required to do so, of the Churchrock In Situ Mine for which this bond guarantees those activities, in accordance with the discharge plan conditions, pursuant to all applicable laws, statutes, rules, and regulations, as such laws, statutes, rules, and regulations may be amended,

Or, if the Principal shall provide alternate financial assurance as specified in DP-558 & the New Mexico Water Quality Control Commission Regulations and obtain the NMED Secretary's written approval of such assurance, within 60 days after the date of notice of cancellation is received by both the Principal and the NMED Secretary from the Surety(ies), then this obligation shall be null and void, otherwise it is to remain in full force and effect.

The Surety(ies) shall become liable on this bond obligation only when the Principal has failed to fulfill the conditions described above.

Upon notification by the NMED Secretary that the Principal has been found in violation of the discharge permit conditions and requirements of the New Mexico Water Quality Control Commission Regulations for a facility for which this bond guarantees performance of closure activities the Surety(ies) shall either perform in accordance with discharge permit requirements and the regulations, or place the amount guaranteed for the Churchrock In Situ mine into the standby trust fund as directed by the NMED Secretary.

Upon notification by the NMED Secretary that Principal has failed to provide alternate financial assurance as specified in Discharge Permit DP-558 or New Mexico Water Quality Control Commission Regulations and obtain written approval of such assurance from the NMED Secretary during the 60 days following receipt by both the Principal and the NMED Secretary of a notice of cancellation of the bond, the Surety(ies) shall place funds in the amount guaranteed for the Churchrock In Situ mine into the standby trust fund as directed by the NMED Secretary.

The Surety(ies) hereby waive(s) notification of amendments to closure plans, discharge permits, applicable laws, statutes, rules, and regulations and agrees that no such amendment shall in any way alleviate its (their) obligation on this bond.

The liability of the Surety(ies) shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the Surety(ies) hereunder exceed the amount of said penal sum.

The Surety(ies) may cancel the bond by sending notice of cancellation by certified mail to the principal and to the NMED Secretary, provided, however, that cancellation shall not occur during the 90 days beginning on the date of receipt of the notice of cancellation by both the Principal and the NMED Secretary, as evidenced by the return receipts.

The Principal may terminate this bond by sending written notice to the Surety(ies), provided, however, that no such notice shall become effective until the Surety(ies) receive(s) written authorization for termination of the bond by the NMED Secretary.

Principal and Surety(ies) hereby agree to adjust the penal sum of the bond yearly in accordance with Discharge Permit DP-558 so that it guarantees a new amount(s) for the activities required in the approved discharge plan and pursuant to the Water Quality Control Commission Regulations, provided that no decrease in the penal sum takes place without the written permission of the NMED Secretary.

In Witness Whereof, the Principal and Surety(ies) have executed this Performance Guarantee Bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the Principal and Surety(ies).

Principal

\_\_\_\_\_  
MARK S. PELIZZA, PRESIDENT

[Corporate seal]

Corporate Surety(ies)

St. Paul Fire and Marine Insurance  
5801 Centennial Way

Baltimore, MD 21209  
State of incorporation: Maryland

Liability limit: \_\_\_\_\_

\_\_\_\_\_  
XXXXXX, ATTORNEY-IN-FACT

[Corporate seal]

Bond premium: \$ \_\_\_\_\_

### **C. STANDBY TRUST AGREEMENT**

As presented in Attachment C-1, HRI's proposed standby trust instrument is consistent with the recommended wording for standby trust agreements in the NRC's "Technical Position on Financial Assurance for Reclamation, Decommission, and Long-Term Surveillance and Control of Uranium Recovery Facilities," dated October 1988. Some adjustments have been necessary to meet the wording requirements of New Mexico. Where differences exist between State and the NRC guidance, HRI has used the most restrictive requirement in the examples presented in Attachment C-1. The information contained in example Schedules A, B, and C of the NRC's standby trust will be provided as recommended in the above-mentioned technical position.

**Attachment C-1**  
**STANDBY TRUST FORMAT**

## STANDBY TRUST AGREEMENT

TRUST AGREEMENT, the Agreement entered into as of [date] by and between HRI, Inc., a Delaware corporation, the "Grantor", and XXXX Bank of New Mexico the "Trustee".

WHEREAS, the New Mexico Water Quality Control Commission "WQCC", an agency of the state of New Mexico has established certain regulations applicable to the Grantor, requiring that a discharger shall provide assurance that funds will be available when needed for certain activities as required in Discharge Permit DP-558 and WQCC Regulations.

WHEREAS, the U.S. Nuclear Regulatory Commission "NRC", an agency of the U.S. Government, pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, has promulgated regulations in Title 10, Chapter I of the Code of Federal Regulations, Part [30, 40, 70, or 72]. These regulations, applicable to the Grantor, require that a holder of, or an applicant for, a Part 30, 40, 70, or 72 license provide assurance that funds will be available when needed for required decommissioning activities.

WHEREAS, the Grantor has elected to use a surety bond to provide all of such financial assurance for the facilities identified herein; and

WHEREAS, when payment is made under a surety bond this standby trust shall be used for the receipt of such payment; and

WHEREAS, the Grantor, acting through its duly authorized officers, has selected the Trustee to be the trustee under this Agreement, and the Trustee is willing to act as trustee,

WHEREAS, the Grantor agrees to guarantee its financial assurance obligation and to indemnify, defend and hold harmless the New Mexico Environment Department "NMED" and the NRC from any and all losses and expenses which NMED or NRC may sustain as a result of the Grantor's failure to comply with the conditions of its financial assurance obligation.

NOW, THEREFORE, the Grantor and the Trustee agree as follows:

### Section 1. Definitions. As used in this Agreement:

- (a) The term "Grantor" means the means the NMED discharge permit holder and NRC licensee who enters into this Agreement and any successors or assigns of the Grantor.
- (b) The term "Trustee" means the trustee who enters into this Agreement and any successor Trustee.
- (c) The term "Beneficiaries" means the NMED and NRC.

Section 2. Identification of Facilities and Cost Estimates. This Agreement pertains to the facilities and/or sites and NMED approved cost estimates identified in Discharge Permit 558 and costs of

decommissioning the materials and activities identified in License Number SUA-1580 issued pursuant to 10 CFR Part [30, 40, 70, or 72] as shown in Schedule A.

Section 3. Establishment of Fund. The Grantor and the Trustee hereby establish a trust fund, the "Fund", for the benefit of the State of New Mexico C/O Secretary, New Mexico Environment Department (NMED) and the NRC C/O Chairman of the Commission, to be utilized for the sole purpose of guaranteeing completion of the closure, post closure and abatement activities required by Discharge Permit DP-558 and 20 NMAC 6.2 and 10 CFR Part [30, 40, 70, or 72]. The Grantor and the Trustee intend that no third party have access to the Fund except as herein provided. The Fund is established initially as consisting of the property, which is acceptable to the Trustee, to NMED and NRC, described in Schedule B attached hereto. Such property and any other property subsequently transferred to the Trustee is referred to as the "Fund", together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible, nor shall it undertake any responsibility for the amount or adequacy of, nor any duty to collect from the Grantor, any payments necessary to discharge any liabilities of the Grantor established by NMED or NRC.

Section 4. Payments Comprising the Fund. Payments made to the Trustee for the Fund shall consist of cash, bank checks, bank wire transfers or other negotiable instruments or liquid assets acceptable to the Trustee and the Beneficiaries. The Grantor warrants to, and agrees with the Trustee and Beneficiaries that, unless otherwise expressly set forth in this agreement, there is no security interest in the Fund or any part thereof, no financing statement under the Uniform Commercial Code is on file in any jurisdiction claiming a security interest in or describing (whether specifically or generally) the Fund or any part thereof, and the Trustee and Beneficiaries shall have no responsibility at any time to ascertain whether or not any security interest exists in the Fund or any part thereof or to file any financing statement under the Uniform Commercial Code with respect to the Fund or any part of the Fund.

Section 5. Payment for Required Activities Specified in the Plan. The Trustee shall make payments from the Fund to the Grantor upon presentation to the Trustee of the following:

- a. A certificate duly executed by the Secretary of the Depositor attesting to the occurrence of the events, and in the form set forth in the attached Specimen Certificate, and
- b. A certificate attesting to the following conditions;
  - (1) that decommissioning is proceeding pursuant to an NMED and NRC-approved plan.
  - (2) that the funds withdrawn will be expended for activities undertaken pursuant to the NMED and NRC approved plan, and
  - (3) that the NMED and NRC has been given 30 days' prior notice of HRI's intent to withdraw funds from the escrow fund.



No withdrawal from the fund can exceed \_\_\_ percent of the outstanding balance of the Fund or \_\_\_\_\_ dollars, whichever is greater, unless NMED and NRC approval is attached.

In the event of the Grantor's default or inability to direct decommissioning activities, the Trustee shall make payments from the Fund as the NMED and NRC shall direct, in writing, to provide for the payment of the costs of required activities covered by this Agreement. The Trustee shall reimburse the Grantor or other persons as specified by the NMED and NRC from the Fund for expenditures for required activities in such amounts as the NMED and NRC direct in writing. In addition, the Trustee shall refund to the Grantor such amounts as the NMED and NRC specifies in writing. Upon refund, such funds shall no longer constitute part of the Fund as defined herein.

Section 6. Trust Management. The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge its duties with respect to the Fund solely in the interest of the Beneficiaries and with the care, skill, prudence, and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; except that:

- (a) Securities or other obligations of the Grantor, or any other owner or operator of the facilities, or any of their affiliates as defined in the Investment Company Act of 1940, as amended (15 U.S.C. 80a-2(a)), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government;
- (b) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal Government, and in obligations of the Federal Government such as GNMA, FNMA, and FHLM bonds and certificates or State and Municipal bonds rated BBB or higher by Standard and Poors or Baa or higher by Moody's Investment Services; and
- (c) For a reasonable time, not to exceed 60 days, the Trustee is authorized to hold uninvested cash, awaiting investment or distribution, without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The Trustee is expressly authorized in its discretion:

- (a) To transfer from time to time any or all of the assets of the fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and

- (b) To purchase shares in any investment company registered under the Investment Company Act of 1940 (15 U.S.C. 80a-1 et seq.), including one that may be created, managed, underwritten, or to which investment advice is rendered, or the shares of which are sold by the Trustee. The Trustee may vote such shares in its discretion.

Section 8. Express Powers of Trustee. Without in any way limiting the powers and discretion conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered:

- (a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale, as necessary to allow duly authorized withdrawals at the joint request of the Grantor and the NMED and NRC or to reinvest in securities at the direction of the Grantor;
- (b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;
- (c) To register any securities held in the Fund in its own name, or in the name of a nominee, and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, to reinvest interest payments and funds from matured and redeemed instruments, to file proper forms concerning securities held in the Fund in a timely fashion with appropriate government agencies, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee or such depository with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the U.S. Government, or any agency or instrumentality thereof, with a Federal Reserve bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund;
- (d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal government; and
- (e) To compromise or otherwise adjust all claims in favor of or against the Fund.

Section 9. Taxes and Expenses. Until such time as the Fund is fully funded by the payment of the principal amount of [\$], compensation of the Trustee and all other reasonable and customary expenses incurred by the Trustee in connection with the administration of this Fund, including fees for legal services rendered to the Trustee, and all taxes of any kind that are assessed or levied against or in respect of the Fund, shall be paid directly by the Grantor and shall not be taken from the Fund. Upon full funding of the Fund, all compensation, expenses and taxes as theretofore

stated shall be paid from the Fund provided that the principal amount of the Fund never falls below the amount required for financial assurance.

Section 10. Quarterly Valuation. After payment has been made into this standby trust fund, the Trustee shall annually, at least 30 days before the date of each calendar quarter of receipt of payment into the standby trust fund, furnish to the Grantor, to the NMED Secretary, and to the NRC Chairman, a statement confirming the value of the Trust. Any securities in the Fund shall be valued at market value as of no more than 30 days before the anniversary date of the establishment of the Fund. The failure of the Grantor to object in writing to the Trustee within 60 days after the statement has been furnished to the Grantor, the NMED Secretary, and the NRC Chairman shall constitute a conclusively binding assent by the Grantor, barring the grantor from asserting any claim or liability against the Trustee with respect to the matters disclosed in the statement.

Section 11. Advice of Counsel. The Trustee may from time to time consult with counsel, who may be counsel to the Grantor, with respect to any question arising as to the construction of this Agreement or any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting upon the advice of counsel, subject to the following conditions:

a. The Trustee shall give prompt written notice to the Beneficiaries of each claim in favor or against the Fund, specifying the amount and nature of such claim. The Trustee shall also give prompt written notice to the Beneficiaries of any controversies, demands, actions, losses, damages, costs, expenses or any other matter that is likely to give rise to a claim; and

b. The Beneficiaries will have the right, but not the duty, to participate in the prosecution of or defense against, any claim in favor of or against the Fund with counsel of the Beneficiaries choosing. Upon notice to the Trustee that the Beneficiaries will assume protection or defense, neither the Fund nor the Beneficiaries will be liable to the Trustee for any subsequent costs of prosecution or defense which the Trustee may incur. No claim in favor of or against the Fund may be settled without written consent of the Beneficiaries, provided that such consent shall not be unreasonably withheld.

Section 12. Trustee Compensation. Upon full funding of the trust, the Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing from time to time with the Beneficiaries. (See Schedule C.)

Section 13. Successor Trustee. Until the Fund is fully funded, the Trustee may resign only after giving 120 days written notice to the Grantor and Beneficiaries. Upon full funding of the Trust, the Trustee may resign only after giving 120 days written notice to the Beneficiaries. The Trustee's resignation shall not be effective until a successor Trustee has been appointed by the Grantor and approved in writing by the Beneficiaries, and the successor trustee accepts the appointment. The successor trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. Upon the successor trustee's acceptance of the appointment, the Trustee shall assign, transfer, and pay over to the successor trustee the funds and property then constituting the Fund. If for any reason the Grantor cannot or does not act in the event of the

resignation the Trustee, the Trustee may apply to a court of competent jurisdiction for the appointment of a successor trustee for instructions. The successor trustee shall specify the date on which it assumes administration of the trust in a writing sent to the Grantor, the NMED Secretary, and the present Trustee by certified mail 10 days before such change becomes effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this Section shall be paid as provided in Section 9.

Section 14. Instructions to the Trustee. All orders, requests, and instructions by the NMED Secretary or NRC to the Trustee shall be in writing, signed by the NMED Secretary, or his designee(s), or NRC Chairman, or his designee(e) and the Trustee shall act and shall be fully protected in acting in accordance with such orders, requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the NMED or NRC hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the NMED or NRC except as provided for herein.

Section 15. Notice of Nonpayment. The Trustee shall notify in writing the Grantor and the NMED Secretary and the NRC Chairman, by certified mail within 10 days following the expiration of the 30-day period after the anniversary of the establishment of the Trust, if no payment is received from the Grantor during that period. After the pay-in period is completed, the Trustee shall not be required to send a notice of nonpayment.

Section 16. Amendment of Agreement. Until the Fund is fully funded this agreement may be amended in writing by the Grantor and the Trustee, with written consent of the Beneficiaries, or by the Trustee and Beneficiaries if the Grantor ceases to exist, becomes insolvent or enters into liquidation, receivership or bankruptcy, or is legally incompetent. Upon the full funding of the Fund, this Agreement may be amended in writing only by the Beneficiaries and the Trustee.

Section 17. Irrevocability and Termination. Subject to the right of the parties to amend this Agreement as provided in Section 16, this Trust Agreement shall be irrevocable and shall continue until terminated in writing by the NMED Secretary and NRC Chairman upon the NMED's and NRC's written determination that the Grantor has met all of its obligations under the applicable regulations established by the New Mexico Water Quality Control Commission (WQCC) and the NRC. Upon termination of the Trust, all remaining property of the trust, less final Trust administration expenses shall be delivered to the Grantor by the Trustee.

If the Grantor fails, refuses or otherwise becomes unable to fulfill its obligations under the WQCC or NRC regulations, or if the Grantor ceases to exist, becomes insolvent or enters into liquidation, receivership or bankruptcy, dissolves or becomes legally incompetent, the trustee shall not release the Fund to the Grantor. Upon notice by the Beneficiaries of any of the above circumstances of insolvency or failures by the discharger, the Trustee shall vest all rights, title and interest of the Fund in the Beneficiaries and shall pay to the Beneficiaries all monies remaining in the Fund, together with any property of the Fund, less final Trust administration expenses of the Trustee.

In the event the Trustee shall for any reason fail, refuse or neglect to pay the monies and other property of the Fund to the Beneficiaries within ten calendar days after receipt of the Beneficiaries notice and demand for payment, the Grantor agrees in such an event or events to, 1) hold the Beneficiaries free, harmless and indemnified of and from any cost, expense, or loss, actually incurred by reason of such refusal, including but not limited to court costs and attorney's fees, and 2) to pay the Beneficiaries interest on the amount of the Fund required to be surrendered at the highest rate authorized by United States law computed from the date on which Beneficiaries demanded surrender of the Fund to the date on which the Fund monies and property are actually received by Beneficiaries.

Section 18. Immunity and Indemnification. The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this Trust, or in carrying out any directions by the Grantor or the NMED issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor or from the Trust Fund, or both, from and against any personal liability to which the Trustee may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its defense in the event that Grantor fails to provide such defense.

Section 19. Choice of Law. This Agreement shall be administered, construed, and enforced according to the laws of the State of New Mexico.

Section 20. Interpretation. As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each Section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed by their respective officers duly authorized and their corporate seals to be hereunto affixed and attested as of the date first above written.

GRANTOR

BY: \_\_\_\_\_  
Name \_\_\_\_\_  
Title \_\_\_\_\_

ATTEST:

(seal)

\_\_\_\_\_  
Name \_\_\_\_\_  
Title \_\_\_\_\_

State of \_\_\_\_\_  
County of \_\_\_\_\_

On this \_\_\_\_\_, 19\_\_, before me personally came Thomas H. Erlich to me known, who, being by me duly sworn, did depose and say that he is Vice President, Chief Financial Officer of HRI, Inc., the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to such instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

\_\_\_\_\_  
Notary Public  
My Commission Expires  
\_\_\_\_\_

TRUSTEE

By: \_\_\_\_\_  
Name \_\_\_\_\_  
Title \_\_\_\_\_

ATTEST

(seal)

\_\_\_\_\_  
Name \_\_\_\_\_

Title \_\_\_\_\_

State of \_\_\_\_\_

County of \_\_\_\_\_

On this \_\_\_\_\_, 19\_\_ before me personally came [name of licensee] to me known, who, being by me duly sworn, did depose and say that she/he resides at [address], that she/he is [title] of [Corporation], the corporation described in and which executed the above instrument; that she/he knows the seal of said corporation; that the seal affixed to such instrument is such corporate seal; that is was so affixed by order of the Board of Directors of said corporation, and that she/he signed her/his name thereto by like order.

\_\_\_\_\_  
Notary Public

My Commission Expires

\_\_\_\_\_

**D. Consolidation of State, EPA and NRC Surety Instruments**

In addition to being crafted to comply with the NRC criteria, HRI's proposed Performance Guarantee Bond is designed to address the New Mexico Environmental Department's (NMED's) restoration and reclamation requirements, and U.S. Environmental Protection Agency (USEPA) Underground Injection Control Criteria. These multi-compliant sureties will require multi-agency concurrence. The Bond examples shown in Appendix A are designed to be consistent with 10 CFR Part 40, Appendix A, Criterion 9 (Financial Criteria) which clearly allows for consolidation of State and Federal financial or surety arrangements established to meet restoration, reclamation, and decommissioning costs provided that "the portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas is clearly identified and committed for use in accomplishing these activities." Absent a mill or tailings, essentially all of the process facility, wellfield, and ancillary components of the operations would be subject to the decommissioning requirements of both the State of New Mexico and the NRC.



## **E. COST DETAILS FOR RESTORATION AND RECLAMATION ACTIVITIES**

### **1. Introduction**

HRI's proposed RAP contains details concerning cost basis figures and assumptions, calculations and/or methodologies used in deriving cost estimates, references, for the full cycle groundwater restoration, well plugging and abandonment, surface decommissioning and reclamation, closure and ultimate license termination. This information is designed to be descriptive enough for the NRC staff to determine the acceptability of HRI's proposed cost figures, and is based on an independent contractor performing the decommissioning and reclamation work<sup>3</sup> in accordance with 10 CFR Part 40, Appendix A, Criterion 9. HRI reviewed Appendix E of the NRC's draft "Standard Review Plan for In Situ Leach Uranium Extraction License Applications" (NUREG-1 569, dated October 1997), and Section 4 of the NRC's "Technical Position on Financial Assurances for Reclamation, Decommissioning, and Long-Term Surveillance and Control of Uranium Recovery Facilities" (dated October 1988) for examples of acceptable "levels of detail" for cost estimates pertaining to this surety plan.

HRI used two different budget formats to present the closure costs estimates in this RAP. Costs for groundwater restoration (2) were estimated over time as an operational budget. Final decommissioning costs including analytical stability, plugging and abandonment, equipment removal, wellfield decommissioning, building decommissioning, and surface reclamation (3-8) were budgeted on a lump sum basis

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<sup>3</sup> Costs have been estimated using standard budgetary techniques as would be done by a independent contractor. In addition, HRI has included a subtotal category entitled "contractor profit" that included 15% of the total cost.

## 2. Groundwater Restoration Budget

### a. Assumptions Used in Sizing Equipment and Estimating the Length of Restoration Operations

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.

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 and brine concentration. 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.

The central assumption in this RAP is that groundwater restoration is conducted using reverse osmosis ("RO") and brine concentration ("BC") water treatment methods. 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.

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 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 pore space. HRI used the "ore area" method to determine pore volumes, where the extent of economic ore within a mine unit is outlined and digitized to provide the area. 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 Churchrock Section 8 location that was used as the assumption in the budget model.

Table 1 – Churchrock Section 8 Pore Volume Calculation

ZONE	Area (ft <sup>2</sup> )	Tk (ft)	Vol (ft <sup>3</sup> )	Por	gal/ft <sup>3</sup>	PV (gal)	H-PIF	V-PIF	CPV (gal)	9 X CPV
UA	318,700	8.6	2,740,820	0.25	7.48	5,125,333	1.5	1.3	9,994,400	89,949,601
LA	404,500	12.2	4,934,900	0.25	7.48	9,228,263	1.5	1.3	17,995,113	161,956,016
UB	329,500	10.5	3,459,750	0.25	7.48	6,469,733	1.5	1.3	12,615,978	113,543,805
LB	555,300	11.6	6,441,480	0.25	7.48	12,045,568	1.5	1.3	23,488,857	211,399,711
UC	658,700	14.9	9,814,630	0.25	7.48	18,353,358	1.5	1.3	35,789,048	322,101,435
ULC	378,200	10.5	3,971,100	0.25	7.48	7,425,957	1.5	1.3	14,480,616	130,325,545
LLC	321,900	12.3	3,959,370	0.25	7.48	7,404,022	1.5	1.3	14,437,843	129,940,584
UD	124,600	10.4	1,295,840	0.25	7.48	2,423,221	1.5	1.3	4,725,281	42,527,525
MD+LD	326,500	12	3,918,000	0.25	7.48	7,326,660	1.5	1.3	14,286,987	128,582,883
TOTALS	3,417,900		40,535,890			75,802,114			147,814,123	1,330,327,106

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.

Attachment E-2-2 contains a map and cross section that will enable the reader to visualize the individual zones from which pore volumes were calculated. Within Attachment E-2-2 Cross Section C-C' is presented. This is the same cross section that has been provided in the Application<sup>4</sup>. Additionally within Attachment E-2-2, HRI has superimposed the C-C' cross section location on a composite GT contour map which provide a plan view of the various zones at the Churchrock Section 8 site. Each zone volume is derived from the average zone thickness shown in cross section and the digitized areas are taken from within a selected GT contour; zone by zone.

<sup>4</sup> See Churchrock Project Environmental Report, April 1988, Figure 2.6-8.

"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<sup>5</sup> that should be recognized in cost estimates. HRI uses pore volume increase factors of 1.5 for horizontal and 1.3 for vertical. 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 measured average thickness of the ore by 1.3. This yields the affected vertical area. Multiplying the affected horizontal times the affected vertical times porosity provides the affected pore volume for bonding purposes. This number is in turn multiplied by 9 pore volumes to determine water treatment and disposal volumes and costs. During the Churchrock restoration demonstration that is described in LC 10.28, HRI will use these factors to determine the number of pore volumes that are processed during restoration.

The budget model described in this RAP used 1,330,327,106 gallons of water to size duration of the restoration program against the chosen 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 the equipment design capacity that is needed to process the requisite gallonage that justifies the length (and cost) of groundwater restoration operations.

b. Reverse Osmosis Equipment Description

Reverse osmosis is a water treatment process whereby the majority of dissolved "ions" are filtered 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. 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 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

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<sup>5</sup> 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 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)

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 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 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 4:1. The brine generated will be further treated and reduced by brine concentration.

The RO unit was sized to operate at a nominal 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 costs are included within the O & M budget in Attachment E-2-1.

c. 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 steam driven rotary drum dryer to achieve zero liquid discharge (dry solids). The solids will be bulk stored and shipped to an I.I.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 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. Typically, for each 100 gallons of waste brine treated, 99 gallons of distilled water and 1 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.

d. Groundwater Restoration Budget Assumptions

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.

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-scalant 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-2-3.

### *Utilities - Electric, Brine Concentrator*

Calculated electrical cost for operating the brine concentrator. The basis for these costs is shown in Attachment E-2-3.

### *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-2-3.

### *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-2-3.

### *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. The basis for these costs is shown in Attachment E-2-3.

### *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.

The total cost for groundwater restoration and post restoration management is projected to be \$7,255,621.

**ATTACHMENT E-2-1**  
**GROUNDWATER RESTORATION BUDGET**





**CHURCHROCK SECTION RES  
COSTS ASSOCIATED WITH RO AND**

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
<b>1 Management and Accounting</b>												
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
<b>4 Personnel</b>												
5 Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
6 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
<b>9 Wellfield Personnel</b>												
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
<b>14 Engineering &amp; Geologic Personnel</b>												
15 Senior Geologist	1	1	1	1	1	1	1	1	1	1	1	1
16												
17 <b>Total Employees</b>	11	11	11	11	11	11	11	11	11	11	11	11
<b>18</b>												
<b>19 Operations Statistics</b>												
<b>20 Reverse Osmosis Treatment</b>												
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	25,891,200	25,891,200	25,891,200	25,891,200	25,891,200	25,891,200	25,891,200	25,891,200	25,891,200	25,891,200	25,891,200
25 MM Gals, RO Permeate - Month	20,712,960	20,712,960	20,712,960	20,712,960	20,712,960	20,712,960	20,712,960	20,712,960	20,712,960	20,712,960	20,712,960	20,712,960
26 MM Gals, RO Reject - Month	5,178,240	5,178,240	5,178,240	5,178,240	5,178,240	5,178,240	5,178,240	5,178,240	5,178,240	5,178,240	5,178,240	5,178,240
<b>27 Brine Concentration</b>												
28 GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29 GPM Distillate	115	115	115	115	115	115	115	115	115	115	115	115
30 GPM Brine	1	1	1	1	1	1	1	1	1	1	1	1
31 MM Gals, BC Capacity - Month	5,580,000	5,580,000	5,580,000	5,580,000	5,580,000	5,580,000	5,580,000	5,580,000	5,580,000	5,580,000	5,580,000	5,580,000
32 MM Gals, Distillate - Month	5,133,600	5,133,600	5,133,600	5,133,600	5,133,600	5,133,600	5,133,600	5,133,600	5,133,600	5,133,600	5,133,600	5,133,600
33 MM Gals, Brine - Month	44,840	44,840	44,840	44,840	44,840	44,840	44,840	44,840	44,840	44,840	44,840	44,840
<b>34 Process Results</b>												
35 Beginning Gallons (0 PV Eq.)	710,009,866	684,183,106	658,316,546	632,469,986	606,623,426	580,776,866	554,930,306	529,083,746	503,237,186	477,390,626	451,544,066	425,697,506
36 Beginning PV	4.80	4.63	4.45	4.28	4.10	3.93	3.75	3.58	3.40	3.23	3.05	2.88
37 Gallons Processes Month	25,846,560	25,846,560	25,846,560	25,846,560	25,846,560	25,846,560	25,846,560	25,846,560	25,846,560	25,846,560	25,846,560	25,846,560
38 PV Processed Month	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
39 Cumulative Gallons Processed	846,164,000	872,010,560	897,857,120	923,703,680	949,550,240	975,396,800	1,001,243,360	1,027,089,920	1,052,936,480	1,078,783,040	1,104,629,600	1,130,476,160
40 Cumulative PV Processed	4.37	4.55	4.72	4.89	5.07	5.25	5.42	5.60	5.77	5.95	6.12	6.29
41 Remaining Gallons to Process	684,163,106	658,316,546	632,469,986	606,623,426	580,776,866	554,930,306	529,083,746	503,237,186	477,390,626	451,544,066	425,697,506	399,850,946
42 Remaining PV to Process	4.63	4.45	4.28	4.10	3.93	3.75	3.58	3.40	3.23	3.05	2.88	2.71
43 <b>ESTIMATED COST DETAIL</b>												
<b>44</b>												
<b>45 Description</b>												
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**ATTACHMENT E-2-2**  
**MAP AND CROSS SECTION**

**THIS PAGE IS AN  
OVERSIZED DRAWING  
OR FIGURE,  
THAT CAN BE VIEWED AT  
THE RECORD TITLE:**

**:**

**SECTION 8, T16, R16W MCKINLEY  
COUNTY, NEW MEXICO**

**WITHIN THIS PACKAGE...OR,  
BY SEARCHING USING THE  
DRAWING NUMBER:**

**None**

**NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.**

**D-1**

**THIS PAGE IS AN  
OVERSIZED DRAWING  
OR FIGURE,  
THAT CAN BE VIEWED AT  
THE RECORD TITLE:  
FIGURE 2.6-8:  
CHURCHROCK PROJECT MCKINLEY  
COUNTY, NEW MEXICO SECTION 8  
CROSS-SECTION C-C'**

**WITHIN THIS PACKAGE...OR,  
BY SEARCHING USING THE  
DRAWING NUMBER:  
FIGURE 2.6-8**

**NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.**

**ATTACHMENT E-2-3  
BUDGET CALCULATIONS AND BACKUP**

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**Labor rates  
Electrical usage  
Solid production**

	A	B	C	D	E	F	G	H	I	J
1										
2	<b>LABOR SUMMARIES</b>									
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Number	Hourly Rate	Yearly Salary	Annual	Monthly
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**Management and Accounting**

Salaried	Operations Manager	1	-	\$120,000	\$120,000	\$10,000
Salaried	Environmental Manager	1	-	\$105,000	\$105,000	\$8,750
Salaried	Accounting Manager	1	-	\$105,000	\$105,000	\$8,750
Salaried	Accountant	1	-	\$65,000	\$65,000	\$5,417

**Plant Personnel**

Salaried	Plant Superintendent		-	\$85,000	\$85,000	\$7,083
Salaried	Plant Engineer		-	\$45,000	\$45,000	\$3,750
Salaried	Radiation Officer	1	-	\$30,000	\$30,000	\$2,500
Salaried	Chemist	1	-	\$46,000	\$46,000	\$3,833
Salaried	Plant Foreman	1	-	\$28,000	\$28,000	\$2,333
Salaried	Maintenance Foreman		-	\$28,000	\$28,000	\$2,333
Wage	Lab Technicians		\$9.62	-	\$20,010	\$1,667
Wage	Secretary		\$9.62	-	\$20,010	\$1,667
Wage	Electrician		\$14.43	-	\$30,014	\$2,501
Wage	Apprentice Electrician		\$12.01	-	\$24,981	\$2,082
Wage	Plant Operator	1	\$11.54	-	\$24,003	\$2,000
Wage	Assistance Plant Operator		\$11.54	-	\$24,003	\$2,000
Wage	Dryer Operator		\$11.54	-	\$24,003	\$2,000
Wage	Maintenance		\$11.54	-	\$24,003	\$2,000

**Wellfield Personnel**

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
Wage	Truck Driver	1	\$11.54	-	\$24,003	\$2,000
Wage	Electrician	1	\$14.43	-	\$30,014	\$2,501
Salaried	Data Entry Clerk		-	\$20,000	\$20,000	\$1,667
Wage	Secretary			\$20,000	\$20,000	\$1,667
Wage	Logger		\$12.01	-	\$24,981	\$2,082
Wage	Wellfield Operators	1	\$11.50	-	\$23,920	\$1,993
Wage	Assistant Wellfield Operator		\$11.50	-	\$23,920	\$1,993
Wage	Balancer		\$11.50	-	\$23,920	\$1,993
Wage	Environmental Sampler	1	\$11.50	-	\$23,920	\$1,993
Wage	Pump Hoist Operators	1	\$11.50	-	\$23,920	\$1,993
Wage	Backhoe Operator		\$10.49	-	\$21,819	\$1,818
Wage	Maintenance		\$11.50	-	\$23,920	\$1,993
Wage	Casing Crew		\$11.50	-	\$23,920	\$1,993

**Engineering & Geologic Personnel**

Salaried	Chief Engineer	1	-	\$66,000	\$66,000	\$5,500
Salaried	RESERVOIR ENGINEER		-	\$60,000	\$60,000	\$5,000
Salaried	Senior Geologist	1	-	\$58,000	\$58,000	\$4,833
Salaried	Geologist		-	\$48,800	\$48,800	\$4,067
Salaried	Logging Supervisor		-	\$35,000	\$35,000	\$2,917
Wage	Secretary			\$20,000	\$20,000	\$1,667
Wage	Surveyor		\$12.02	-	\$25,002	\$2,083
Wage	Assistant Surveyor		\$12.02	-	\$25,002	\$2,083
Wage	Logger		\$10.49	-	\$21,819	\$1,818

Total # 16

COST SUMMARY TABLE					
	KW	Hrs/month	\$/KW	Cost/month	Cost/year
<b>WELL FIELD</b>					
Submersible pumps	7.44				
30 extractors	223.2	720	0.075	\$ 12,053	\$ 144,633.60
<b>PLANT</b>					
Sand Filter Pump	17	720	0.075	\$ 918	
RO Feed Pump	51	720	0.075	\$ 2,754	
Injection Pump	33	720	0.075	\$ 1,782	
RO Heater Pump	3.5	72	0.075	\$ 19	
RO Wash pump	10	24	0.075	\$ 18	
RO Heater	75	72	0.075	\$ 405	
				\$ 5,896	\$ 70,750.80
		<b>TOTAL</b>		\$ 17,949	\$ 215,384.40



CHURCHROCK  
WF/RO ELECTRIC  
REQUIREMENTS/COST

ASSUMPTIONS

1 Well depth	660 ft
2 Pump depth	500 ft
3 Static water level	250 ft.
4 Pipe line length	3600 ft.
5 Number of extraction wells	20
6 number of injection wells	30
7 Flow rate per extraction well	30 gpm
8 Flow rate per injection well.	30 gpm
9 Electrical cost.	\$.075/KWH
10 Tank elevation	20 ft.

WELL FIELD

A. Total head requirements

Friction loss

	psi	feet
1 Pipe line friction loss. 600 gpm in 6" SDR 17 polyethylene pipe.	40	92.4
2 Elevation change between plant and WF	0	0
3 Tank elevation	8.7	20
4 Well lift to surface	173	400
5 Well tubing loss	5	11.6
Total submersible head requirements.	226.7	524

B. Submersible pump requirements

Grundfos model 25S75-39DS

7.5 hp

(see attachment)

Amps

Run amps for this pump @ 31.8 gpm @ 562 ft. of head is:

8.58

Full load current:

10.9

Amperage used for electrical useage:

11

Total Wellfield amperage is 30 @ 11 amps.

330

KW =

$$1.73 * I * E * PF$$

1000

KW =

$$(1.73 * 11 * 460 * .85) / 1000$$

KW =

7.44

Cost per well per year =

$$7.44 \text{ kw} * 8760 \text{ hrs} * \$ .0875 / \text{kw}$$

Cost per well per year =

\$4,888.00

Total cost(30 ext) per year

\$ 146,642.00

PLANT

A.

Injection Pump

1 Injection rate 435 gpm  
 2 Injection pressure 100 psi

$$\text{WHP} = \frac{Q * \text{TDH} * \text{SG}}{3960}$$

$$\text{WHP} = \frac{435 * 100 * 2.31 * 1}{3960}$$

$$\text{WHP} = 25$$

$$\text{BHP} = \text{WHP} / \text{Eff}$$

$$\text{BHP} = 25 / .75$$

$$\text{BHP} = 33$$

$$\text{Amps} = \frac{\text{BHP} * 746}{1.73 * \text{E} * \text{Eff} * \text{PF}}$$

$$\text{Amps} = \frac{33 * 746}{1.73 * 460 * .75 * .85}$$

$$\text{Amps} = 48$$

$$\text{KW} = \frac{\text{I} * \text{E}}{1000}$$

$$\text{KW} = \frac{48 * 460}{1000}$$

$$\text{KW} = 22$$

B.

Sandfilter Feed Pump

$$\text{BHP} = 25$$

$$\text{Amps} = \frac{\text{BHP} * 746}{1.73 * \text{E} * \text{Eff} * \text{PF}}$$

$$\text{Amps} = \frac{25 * 746}{1.73 * 460 * .75 * .85}$$

$$\text{Amps} = 36$$

$$\text{KW} = \frac{\text{I} * \text{E}}{1000}$$

$$\text{KW} = \frac{36 * 460}{1000}$$

$$\text{KW} = 17$$

C.

RO Feed Pump

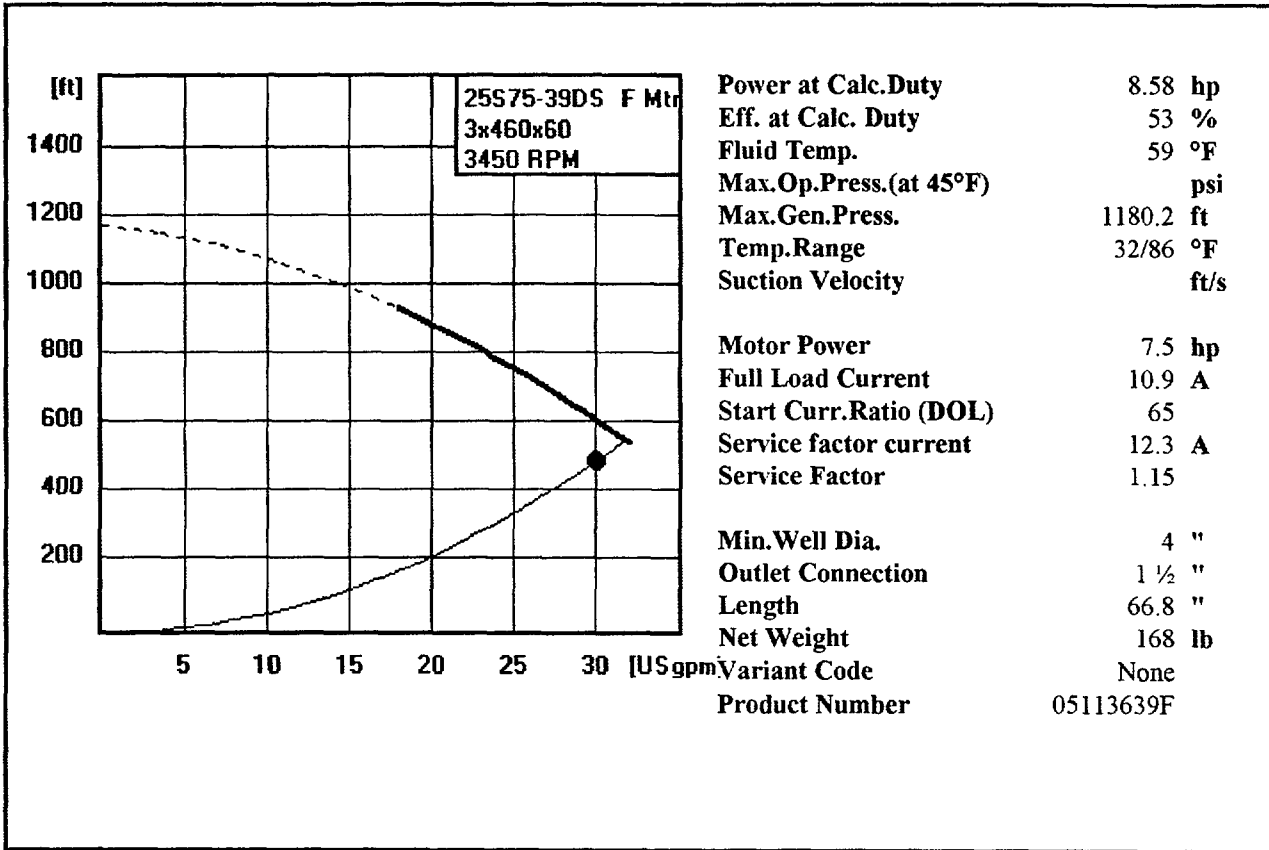
BHP	75
Amps =	$\frac{\text{BHP} * 746}{1.73 * \text{E} * \text{Eff} * \text{PF}}$
Amps =	$\frac{75 * 746}{1.73 * 460 * .75 * .85}$
Amps =	110
KW =	$\frac{\text{I} * \text{E}}{1000}$
KW =	$\frac{110 * 460}{1000}$
KW =	51

D. RO Heater Feed pump

BHP	5
Amps =	$\frac{\text{BHP} * 746}{1.73 * \text{E} * \text{Eff} * \text{PF}}$
Amps=	$\frac{5 * 746}{1.73 * 460 * .75 * .85}$
Amps=	7.5
KW =	$\frac{\text{I} * \text{E}}{1000}$
KW =	$\frac{7.5 * 460}{1000}$
KW =	3.5

E. RO Wash Pump

BHP	15
Amps =	$\frac{\text{BHP} * 746}{1.73 * \text{E} * \text{Eff} * \text{PF}}$
Amps=	$\frac{15 * 746}{1.73 * 460 * .75 * .85}$
Amps=	22
KW =	$\frac{\text{I} * \text{E}}{1000}$
KW =	$\frac{22 * 460}{1000}$
KW =	10



<b>Power at Calc. Duty</b>	8.58 hp
<b>Eff. at Calc. Duty</b>	53 %
<b>Fluid Temp.</b>	59 °F
<b>Max. Op. Press. (at 45°F)</b>	psi
<b>Max. Gen. Press.</b>	1180.2 ft
<b>Temp. Range</b>	32/86 °F
<b>Suction Velocity</b>	ft/s
<b>Motor Power</b>	7.5 hp
<b>Full Load Current</b>	10.9 A
<b>Start Curr. Ratio (DOL)</b>	65
<b>Service factor current</b>	12.3 A
<b>Service Factor</b>	1.15
<b>Min. Well Dia.</b>	4 "
<b>Outlet Connection</b>	1 ½ "
<b>Length</b>	66.8 "
<b>Net Weight</b>	168 lb
<b>Variant Code</b>	None
<b>Product Number</b>	05113639F

**Required Duty** 30.0 USgpm at 500.0 ft  
**Calc. Duty** 31.8 USgpm at 562.1 ft

Pos.1.1 - 25S75-39DS F Mtr

\$ 3106.00 x 1

**Total** \$ 3106.00

25S75-39DS F Mtr/7.5hp/31.8gpm@562.1 ft. of head/8.58 amps/ 53% eff.  
 25S75-39DS G Mtr/7.5hp/31.8 gpm@562.1 ft. of head/8.58 amps/53% eff  
 40S75-21 F Mtr/7.5hp/30.8 gpm@508.7 ft. of head/? amps/? eff

**Calculation of BC Solids Produced**

Flow (g/min)	580
Flow (l/min)	2,195
Flow (l/d)	3,161,232
Solids (g/l)	4
Solids (g/d)	12,644,928
Solids (g/mo)	384,616,560
Solids (kg/mo)	384,617
Solids (lb/mo)	174,429
Solids (yd <sup>3</sup> /mo)*	87
Solids (ft <sup>3</sup> /mo)	2,355
Unit disposal cost (\$/ft <sup>3</sup> )	\$2.78
Monthly disposal cost (\$)	<b>\$6,541</b>

\*1 yd<sup>3</sup> ~ 1 ton

**ATTACHMENT E-2-4  
QUOTES AND PRICES**

---

**BC vendor specs  
Electrical rates**



3006 Northrup Way  
Bellevue, WA 98004-1407

Phone: 425 828-2400 x 1306  
Fax: 425 828-0526

September 13, 2000  
RCC No. 00-3218

Mark S. Pelizza  
HRI, Inc.  
12750 Merit Drive  
Suite 720, LB 12  
Dallas TX 75251  
VIA FAX 972-387-7779

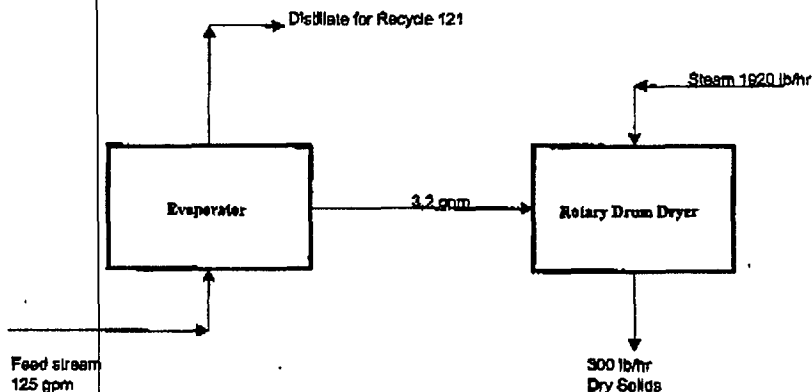
Subject: Brine Concentrator for Uranium Recovery Project, McKinley County, NM

Dear Mr. Pelizza,

RCC has reviewed your request for a Brine Concentrator System for the above project and as discussed with RCC's Process Director, Bob Solomon. RCC would recommend a vertical tube, falling film vapor compression (MVR) evaporator (BC) followed by a steam driven rotary drum dryer to achieve zero liquid discharge (dry solids).

A chemistry of approximately 4800 mg/l TDS was provided as feed to the evaporator/drum dryer system. RCC has assumed a concentration factor of 40 can be achieved in the evaporator thereby reducing the feed stream of 125 gpm to 3.2 gpm. The 3.2 gpm concentrated evaporator blowdown will be sent to a rotary drum dryer for solids generation and zero liquid discharge.

**Ionic RCC Zero Liquid Discharge System**





Mark Pelizza  
HRI, Inc.  
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The offer includes all necessary vessels, pumps, ducts, valves, controls, instrumentation and motors. It is designed to process 100 gpm of the specified wastewater and recovers about 97 percent of that volume as high purity distillate for recycle/reuse. The recovered distillate would contain less than 10 mg/l of total solids, excluding volatile species. The remaining 3.2 gpm concentrate will be sent to the drum dryer.

The proposed evaporator is a vertical tube, falling film, vapor compression unit similar in design to about 80 other RCC systems operating in this country and around the world. The first installations were put on-line in 1974 and continue today to perform as originally required and designed. Many of those units are treating wastewater, which are essentially identical to your requirement.

The composition of the wastewater to be processed is such that sparingly soluble species (e.g., calcium sulfate and silica) will precipitate as it is concentrated. This situation is typical in almost all cases where RCC units are employed and necessitates employing RCC's proprietary seed slurry process to avoid scaling and fouling of heat transfer surfaces. This design feature is incorporated into the proposed system

The feed is pumped to the agitated feed tank where the pH is adjusted to 5-6 using sulfuric acid. The feed tank provides sufficient residence time for complete mixing before the feed is pumped through the heat exchanger. The feed is heated in the heat exchanger to near boiling by recovering the distillate's sensible heat. The hot feed then passes through the deaerator where carbon dioxide (CO<sub>2</sub>) and other non-condensibles are stripped before the feed enters the evaporator sump.

The brine from the sump is continuously recirculated to the top of the vertical heat-transfer tubes where it flows through an RCC patented distributor inserted into the top of each heat transfer tube and falls as a thin film inside the tubes. A portion of the thin film is vaporized. In a vapor compression thermodynamic cycle the vapor is compressed and introduced into the shell side of the vertical tube bundle. The temperature difference between the vapor and the brine film causes the vapor to release its heat of condensation to the falling brine and to condense on the outside of the tubes as distilled water. This distillate is collected at the bottom of the condenser and flows to the distillate tank through a pipe handling both liquid and steam. The steam phase is vented to the deaerator and to the atmosphere to remove non-condensibles and maintain proper system operating pressure. The hot distillate is pumped through the heat exchanger where it gives up its sensible heat to the feed. From this point, the distillate is available for use.

A portion of the concentrated brine is continuously withdrawn from the sump for discharge to the dryer feed tank. The rate of discharge is controlled to maintain proper solids composition in the sump brine.

The concentrated waste blowdown is collected in the dryer feed tank (by others) and is transferred to the rotary drum dryer. A Bufflovak atmospheric double drum dryer is used to crystallize the slurry being discharged from the Brine Concentrator. This drum dryer crystallizer is most versatile and widely applied to dry many food, chemical and pharmaceutical materials of widely varying densities and viscosity's: dilute solutions, heavy liquids, or pasty

Mark Pelizza  
HRI, Inc.  
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materials. They are also effective for heavy sludge's which become saturated and deposit salts. The movable drum permits complete control of film thickness producing the crystals. In operation, the slurry is fed to the crystallizer through the pendulum feed system and over/across steam heated rotating drums. The feed is evenly distributed upon the drums and dries before being scraped by a double doctor blade. Solids fall from the blades directly into a dumpster for disposal. Steam pressure and temperature control capacity. The device has been in use for many years and is featured in Perry's Chemical Engineers Handbook.

Process vapor from the dryer is vented to atmosphere; supply steam is condensed and returned to the condensate system. The "dry" solids are discharged from the system and hauled away.

The following is preliminary performance data for the evaporator/crystallizer system.

Feed TDS, mg/l	4,769
Evaporator Feed Flow, gpm	125
Distillate Flow, gpm	121
Distillate Quality, mg/l (excluding volatiles)	<10
Evaporator Blowdown, gpm	3.2
Evaporator Electrical Energy, kw	600
Startup Steam (for 24 hours), lb/hr	1200
Rotary Dryer Feed Flow, gpm	3.2
Dryer Prime Steam req'd., lb/h	1900
Dryer Electrical Energy, kw	20
Dryer Solids Produced, lb/hr. (dry basis)	300
Plot Plan Required, ft.	60 x 60 x 70 h

A suggested scope of work by RCC and by others for the proposed system is as follows:

#### RCC Scope of Work:

- Perform process design and prepare Process Flow Diagram (PFD),
- Perform system design and prepare P&ID, General Arrangement, and Electrical One-Line drawings,
- Specify and supply the Brine Concentrator/Crystallizer equipment including:

<u>Equipment</u>	<u>Quantity</u>	<u>Material (or Similar)</u>
Evaporator Vessel	1	Titanium/316L SS
Recirculation Ducts	1 set	316L SS
Steam Ducts	1 set	316L SS
Vapor Compressor & Motor	1	CI/SS
Plate & Frame Heat Exchanger	1	Titanium Plates
Deaerator w/Packing	1	317L SS
Recirculation Pump & Motor	1	Cd4MCu
Feed Pump & Motor	1	316 SS
Feed Tank	1	FRP
Feed Tank Mixer & Motor	1	316L SS
Seed/Waste Tank	1	316L SS

Mark Pelizza  
HRI, Inc.  
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Seed/Waste Tank Mixer	1	6% Mo SS
Seed/Waste Tank Pump & Motor	1	Cd4MCu
Distillate Pump & Motor	1	316 SS
Distillate Tank	1	316L SS
Acid Pump & Motor	2	Alloy 20
<b>AND</b>		
Rotary Drum Dryer	1	Cr. Plated CI
Feed Pump & Motor	1	Cd4MCu
Condensate Tank	1	316 SS
Condensate Pump & Motor	1	316 SS
Control System (PLC type)	1	AB
Field Instruments	1 lot	Various
Control Valves	1 lot	Various

- Provide Operations & Maintenance Manuals.

#### Scope of Work by Others:

- Design and provide foundations, process and utility interfaces, waste disposal system, electrical equipment (including MCC and medium voltage switchgear), and insulation,
- Erect the system and provide interconnecting piping, manual valves and pipe supports,
- Perform checkout, startup and operation,

A price for equipment design and supply of the proposed system is as follows, FOB site. Delivery can be made in 48 weeks following notification to proceed.

125 gpm Brine Concentrator System with a 3.2 gpm rotary drum dryer to achieve zero liquid discharge: \$1,700,000

Installation is estimated to be \$800,000 including foundations and building Installation based on components installed on site although some components can be skid mounted at additional costs.

The operation of the proposed system will require approximately four (4) hours per shift. General duties will involve routine monitoring with plant walk-through and simple bench chemical (e.g., pH) tests.

RCC estimates approximately one man-month of supervision, construction support, training, startup and acceptance is required to support this project. RCC offers this on a time and material basis for \$85.00 per hour plus travel and per diem expenses.

Mark Pelizza

HRI, Inc.

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RCC appreciates your inquiry and would be pleased to provide additional information and answer any questions you may have. Please feel free to contact me at (425) 828-2400, x1306 or by fax at (425) 828-0526 or by email at [joeb@ionicsrcc.com](mailto:joeb@ionicsrcc.com).

Very truly yours,  
RESOURCES CONSERVATION COMPANY

Joe Bostjancic  
Sales Manager

**PUBLIC SERVICE COMPANY OF NEW MEXICO  
ELECTRIC SERVICES**

**EFFECTIVE ON ALL BILLS  
RENDERED ON OR AFTER  
DECEMBER 30, 1999**

**SCHEDULE 5B: INDUSTRIAL POWER SERVICE--TIME-OF-USE  
LARGE SERVICE FOR MINING CUSTOMERS  
≥ 10,000 KW MINIMUM AT 115 KV AND 69KV**

**APPLICABILITY:** The rates on this schedule are available to a retail mining customer who contracts for a definite capacity commensurate with the customer's normal requirements but in no case less than 10,000 kW of capacity and who takes service directly from PNM's transmission system at 115 kV and the Company's primary distribution voltage of 69kV.

Service shall be furnished at the Company's available transmission voltage of 115 kV and at the Company's distribution voltage of 69kV. Service will be furnished subject to the Company's Rules and Regulations and any subsequent revisions. These Rules and Regulations are available at the Company's office and are on file with the New Mexico Public Regulation Commission. These Rules and Regulations are a part of this Schedule as if fully written herein.

**TERRITORY:** All territory served by the Company in New Mexico.

**TYPE OF SERVICE:** The service available under this schedule shall be three-phase service delivered at the Company's available transmission voltage of 115 kV and distribution voltage of 69kV.

**SERVICE WITH A CONTRACT DEMAND OF 10,000 KW OR MORE:**

1. The Company will provide service under this rate schedule to retail customers who contract for a demand of 10,000 kW or more and who take service from PNM's transmission system at 115 kV and distribution system at 69kV only if the customer agrees to a specified period of service under this rate schedule of not less than one year but in no event to extend past the initiation of customer choice for generation service as provided for in the Electric Utility Industry Restructuring Act of 1999. The customer must sign a facilities contract or appropriate line extension agreement for any transmission or distribution cost incurred by the Company for the customer not covered through rates on this tariff. Liquidated damages provisions will be included in the contract or line extension agreement unless otherwise agreed to by the Company.
2. All contract modifications must be in writing and executed as a supplement to the Contract.

**SUBSTATION EQUIPMENT:** All substation and distribution transformers, the necessary structures, voltage regulating devices, lightning arrestors, and accessory equipment required by the customer in order to utilize the Company's service at 115 kV and 69kV shall be installed, paid for, owned, operated, and maintained by the customer.

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ELECTRIC SERVICES**

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LARGE SERVICE FOR MINING CUSTOMERS  
≥ 10,000 KW MINIMUM AT 115 KV AND 69KV**

*ENIK*

The customer shall also provide at customer's expense suitable protective equipment and devices so as to protect Company's system and service, and other electric users, from disturbances or faults that may occur on the customer's system or equipment.

The customer shall at all times keep each of the three phases balanced as far as practicable so as not to affect service and voltage to other customers served by the Company. The customer shall not operate any equipment in a manner which will cause voltage disturbances elsewhere on the Company's system.

**NET RATE PER MONTH OR PART THEREOF FOR EACH SERVICE LOCATION:** The rate for electric service provided shall be the sum of A, B, C, D, and E below. On-Peak period is from 8:00am to 8:00pm Monday through Friday (60 hours per week). Off Peak period is all times other than On-Peak period (108 hours per week).

(A) **CUSTOMER CHARGE:** \$75,100.00/Bill  
(Per Metered Account)  
(Includes 1st 10,000 kW of Billed Demand)

(B) **ON-PEAK DEMAND CHARGE:** \$7.51/kW  
(For Billing Demand Above 10,000 kW During On-Peak Period)

(C) **ENERGY CHARGE:**  
For Energy Consumed During On-Peak Period: 4.4905¢/kWh  
For Energy Consumed During Off-Peak Periods: 3.1000¢/kWh

**PUBLIC SERVICE COMPANY OF NEW MEXICO  
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≥ 10,000 KW MINIMUM AT 115 KV AND 69KV**

- (D) **POWER FACTOR ADJUSTMENT:** The above rates are based on a power factor of 90 percent or higher and the Company will supply, without additional charge, a maximum of 0.48 kvar (Reactive Kilovolt Amperes) per kW of billable demand. The monthly bill will be increased \$.25 for each kvar in excess of the allowed 0.48 KVAR per kW of billable demand.
- (E) **SPECIAL TAX AND ASSESSMENT ADJUSTMENT:** Billings under this Schedule may be increased by an amount equal to the sum of the taxes payable under the Gross Receipts and Compensating Tax Act and of all other taxes, fees, or charges (exclusive of ad valorem, state and federal income taxes) payable by the Company and levied or assessed by any governmental authority on the public utility service rendered, or on the right or privilege of rendering the service, or on any object or event incidental to the rendition of the service.

**MONTHLY MINIMUM CHARGE:** The monthly minimum charge under this Schedule is the On-Peak period demand charge applied to the 10,000 kW minimum demand.

**DETERMINATION OF ON-PEAK PERIOD DEMAND CHARGE:** The On-Peak period demand charge for any month shall be as determined by appropriate measurement as defined by the Company, but in no event shall it be less than the highest of the following: (a) the actual metered kW demand minus minimum demand; or (b) 50 percent of the highest kW demand during the preceding 11 months minus minimum demand, or (c) zero.

Metering shall normally be at customer's substation secondary voltage. The Company reserves the right to meter at the substation primary voltage level, in which event the metered kWh, kW demand, and kVAR shall be multiplied by .98 to allow for losses.

Where highly fluctuating or intermittent loads which are impractical to determine properly (such as welding machine, electric furnaces, hoists, elevators, X-rays, and the like) are in operation by the customer, the Company reserves the right to determine the billing demand by increasing the 15-minute measured maximum demand and kvar by an amount equal to 65 percent of the nameplate rated kVA capacity of the fluctuating equipment in operation by the customer.

**INTERRUPTION OF SERVICE:** The Company will use reasonable diligence to furnish a regular and uninterrupted supply of energy. However, interruptions or partial interruptions may occur or service may be curtailed, become irregular, or fail as a result of circumstances beyond the control of the Company, or are the results of acts of public enemies, accidents, strikes, legal processes, governmental restrictions, fuel shortages, breakdown or damages to generation,

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≥ 10,000 KW MINIMUM AT 115 KV AND 69KV**

transmission, or distribution facilities of the Company, repairs or changes in the Company's generation, transmission, or distribution facilities, and in any such case the Company will not be liable for damages. Customers whose reliability requirements exceed these normally provided should advise the Company and contract for additional facilities and increased reliability as may be required. The Company will not, under any circumstances, contract to provide 100 percent reliability.

**ACCESSIBILITY:** Equipment used to provide electric service must be physically accessible. The metering must be installed on each service location at a point accessible to Company personnel at any time.

**TERMS OF PAYMENT:** All bills are net and payable within twenty (20) days, and are delinquent thirty (30) days, from the date the bill is rendered. If payment for any or all electric service rendered is not made within thirty (30) days from the date the bill is rendered, the Company shall apply an additional charge of 1.5 percent per month to the total balance in arrears, excluding gross receipts tax. Partial payment of amount due by Customer is applied first to oldest bill, including any other fees or charges assessed, if any, before any amount is applied to current bill.

**LIMITATION OF RATE:** Electric service under this Schedule is not available for standby service, is not available to customers served in the downtown area of Albuquerque when served by the underground network system, and shall not be resold or shared with others.

AN-274  
PC Document #25409



### 3. Analytical Stability

#### a. Introduction and Description

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. These ongoing sample and analysis costs are covered within the groundwater restoration budget.

When sample data indicates that restoration is at, or near completion, each original baseline well will be sampled for the parameters listed in Table 10.4-1 of the COP and analyzed by HRI on location. If the wellfield average value for each chemical parameter is consistent with baseline quality, restoration is considered to be complete and stability sampling will begin.

Stability will be determined by three sample sets taken at two-month intervals from the original baseline wells, and analyzed for the parameters in COP Table 8.6-1. Stability analysis will be performed off location by an independent commercial laboratory.

#### b. Budget Assumptions

The stability analysis budget was developed with the assumption that sample labor is provided from the on site staff and that staff will be available six months after restoration is complete as shown in the Groundwater Restoration Budget. As stated in LC 10.21 there will be one baseline well per acre of wellfield. It is estimated that the Churchrock Section 8 wellfield will be 40 acres when fully developed.

It is estimated that a sample analysis by a commercial laboratory for the parameters shown in Table 10.4-1 of the COP will cost \$150 and a sample analysis by a commercial laboratory for the parameters shown in Table 8.6-1 of the COP will cost \$350.

One sample will be taken from each baseline well and analyzed for all the constituents in Table 8.6-1 of the COP before restoration begins at a cost of \$14,000.

Baseline wells will be sampled once per year and analyzed for all the constituents in Table 10.4-1 of the COP during restoration at a cost of \$24,000.

Following restoration, stability samples will be taken every 2 months for six months and analyzed for all the constituents in Table 8.6-1 of the COP at a cost of \$42,000.

As shown in Attachment E-3-1, the total cost for restoration analytical sampling is projected to be \$80,000.

**ATTACHMENT E-3-1**  
**ANALYTICAL STABILITY BUDGET**

**GROUND WATER RESTORATION Sampling**

Units    Sub Total    Total

**Assumptions:**

- Labor from staff.
- Routine monitoring is covered in the restoration budget.
- One baseline well sampled per acre of wellfield (40).
- One sample taken before restoration starts.
- Baseline wells sampled once per year during restoration.
- Stability samples taken every 2 months for six months

**I    Monitoring and Sampling Costs**

A.	Restoration Well Sampling			
	Estimated Restoration Period (Years)	4.4		
1	Well Sampling prior to restoration start			
	# of Wells	40		
	\$/sample	\$350	\$14,000	
2	Restoration Progress Sampling			
	# of Wells	40		
	\$/sample	\$150		
	Samples/Year	1	\$24,000	
B.	Stability			
	Estimated Stabilization Period (Months)	6		
	# of Wells	40		
	Sample Freq. Mos.	2		
	\$/sample	\$350		
	Total		\$42,000	
	<b>Total Monitoring and Sampling Costs</b>			<b>\$80,000</b>

**ATTACHMENT E-3-2**  
**COMMERCIAL LABORATORY RATES**

**JORDAN LABORATORIES, INCORPORATED  
ANALYTICAL AND ENVIRONMENTAL CHEMISTS  
CORPUS CHRISTI, TEXAS**

**2000  
SCHEDULE OF SERVICES**

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## URANIUM AND RADIOMETRICS

Parameter/Method	Water	Soil/ Filters	Vegetation	Raw Wastes, Sludges, Etc.
Uranium - Fluorometric (ASTM D2907-83)	\$12.00	\$27.00	\$32.00	\$57.00
Radium - Total Alpha Emitting Isotopes (Std. Met. No. 7500-Ra B.)	70.00	85.00	90.00	115.00
Radium 226 (Std. Met. No. 7500-Ra C.)	53.00	68.00	73.00	98.00
Radium 228 (SW846 9320)	80.00	95.00	100.00	125.00
Gross Alpha and Beta - Combined (SW846 9310)	30.00	45.00	50.00	75.00
Lead 210 (HSL Si 76a)	73.00	88.00	93.00	118.00
Thorium 230 (Anal. Chem. 46, 12 (1974))	63.00	78.00	83.00	108.00
<b>Other:</b>				
Uranium in Urine - Fluorometric (ASTM D2907-83)				\$14.00
Uranium in Slurries and Concentrates for Settlement				80.00
Radon in Water, Gas or Air (100 cc Sample Size)				25.00
Cesium 134, 137 & Iodine 131 in Grain or Nuts (by Gamma Spec)				32.00
Naturally Occuring Radioactive Material (NORM)				
Includes Ra 226 & Ra 228				
In Water (StM 7500 RaC, SW846 9320)				133.00
In Soil or Solids (by Gamma Spectroscopy)				70.00
Alpha Spectroscopy				Ask for Quote
Gamma Spectroscopy				\$60 plus \$10 per Isotope

## SPECIAL GROUPINGS

<b>Mineral Analysis of Fresh Water</b> - Includes Sodium, Potassium, Calcium, Magnesium, Chloride, Carbonate, Bicarbonate, Sulfate, Silica, Iron, Alkalinity, Hardness, Dissolved Solids, and pH	<u>\$90.00</u>
<b>Oil Field Brine</b> - Same as above but including Barium, Resistivity, CaCO <sub>3</sub> Stability Calculations and Stiff Diagrams	<u>\$100.00</u>
<b>TDWR Report</b> - Texas Dept. of Water Resources Uranium In-Situ Mining Report with Accuracy Checks and Ion Diagram - TDWR 0177 (Includes Radium 226)	<u>\$380.00</u>
<b>TDWR Report 0678</b> - Same as above with abbreviated Metals list	<u>\$306.00</u>
<b>TDWR Common Ion Report</b> - Same as above excluding Metals, Radium 226 and Ammonium	<u>\$120.00</u>
<b>Naturally Occuring Radioactive Material (NORM)</b> Includes Radium 226 and Radium 228	
In Water (StM 7500 RaC, SW846 9320)	<u>\$133.00</u>
In Soil or Solids (by Gamma Spectroscopy)	<u>\$70.00</u>
<b>Used Fuel Oil Specification</b> - Includes Arsenic, Cadmium, Chromium, Lead, TOX, and Flash Point	<u>\$164.00</u>

## GLYCOL ANALYSES

Benzene, Toluene, Ethyl Benzene & Xylenes (EPA 5030 & 8021)	\$45.00
Chloride (StM 4500 - Cl-B)	10.00
pH (EPA 150.1)	5.00
Water by Karl Fischer (ASTM D1744)	18.00

## AMINE ANALYSES

Amine Concentration, Wt. % (by titration)	\$15.00
Total Acid Gas Loading	15.00

#### **4. Plugging and Abandonment**

##### **a. Introduction and Description**

All production, and injection wells will be permanently plugged, and abandoned upon completion of ground water restoration and, stabilized in a manner that prevents interformational transfer of fluids. The casing will be cut off three feet from the surface and, the site disked and seeded as outlined below.

##### **b. Budget Assumptions**

The plugging budget was developed with the assumption that all labor is contracted. HRI will use a direct placement method of well plugging as described in the procedure shown in Attachment E-4-2.

Cement shrinkage is estimated at 120% of the initial volume. Shown in E-4-1 cement cost per yard is \$100.00. For the purposes of determining labor and equipment requirements, it is estimated that 10 holes will be filled per day. Engineer/geologist supervision will be budgeted at \$50,000 per year and the cement contractor will receive \$100 per well. Finally a backhoe and operator rate of \$37.75 per hour as described in Attachment E-6-2 was assumed.

As shown within Attachment E-4-1, the total cost for plugging is projected to be \$401,435.



**ATTACHMENT E-4-1  
PLUGGING AND ABANDONMENT BUDGET**

**WELL PLUGGING AND ABANDONMENT**

**Assumptions**

- 1. Cement shrinkage 120%
- 2. Cement cost per yard \$100.00
- 3. Holes filled per day 10
- 4. Engineer/geologist - per year \$50,000.00
- 5. Backhoe & operator - per hour \$37.75
- 6. Contractor - per well \$100.00
- 7. Wellfield acreage fully developed 40 ac.

Unit of Measure	IN		FT	CU YD	CU YD	DOLLARS EACH WELL					DOLLARS
ITEM	WELL DIAMETER	QTY	AVERAGE DEPTH	HOLE VOLUME	CEMENT REQ'D	CEMENT COST	BACKHOE	ENG/GEOL	CONTRACTOR	TOTAL PER HOLE	TOTAL SECTION 8
Injectors	6	215	800	5.8	7.0	\$697.78	\$30.20	\$20.00	\$100.00	\$847.98	\$182,315.22
Extractors	6	226	800	5.8	7.0	\$697.78	\$30.20	\$20.00	\$100.00	\$847.98	\$191,642.98
Deep Monitor	5	22	900	4.5	5.5	\$545.14	\$30.20	\$20.00	\$100.00	\$695.34	\$15,297.46
Brushy Monitor	5	10	700	3.5	4.2	\$424.00	\$30.20	\$20.00	\$100.00	\$574.20	\$5,741.97
Dakota Monitor	5	5	600	3.0	3.6	\$363.43	\$30.20	\$20.00	\$100.00	\$513.63	\$2,568.13
Recapture Monitor	5	5	1000	5.0	6.1	\$605.71	\$30.20	\$20.00	\$100.00	\$755.91	\$3,779.55
<b>Section 8 Total</b>											<b>\$401,345.30</b>

**ATTACHMENT E-4-2  
BACKUP INFORMATION**

---

**PLUGGING PROCEEDURE  
CEMENT PRICE QUOTE  
CEMENT VOLUME CALCULATION**

# URANIUM RESOURCES, INC

## South Texas Operations

### STANDARD OPERATING PROCEDURES & JOB DESCRIPTIONS

SUBJECT  <b>PLUGGING &amp; ABANDONMENT  OF CASED WELLS</b>	SECTION SOP 87	
	DATE 7/10/2000	PAGE 1 of 4
	STATUS Revision 0.0	

#### A. Introduction

Following the restoration of groundwater to restoration table values and the demonstration of stabilization, the production wells in a wellfield need to be plugged and abandoned ("P&A'd"). The method detailed here utilizes a simple but effective approach that does not require the services of a drilling rig to completely plug cased production wells from top to bottom with cement. Other benefits include efficiency and minimum commitment of technical and mechanical resources,

It is assumed that URI has received all necessary groundwater releases from the governing state agencies prior to the initiation of these procedures. The wells are plugged with a 13-lb/gallon neat cement slurry which is delivered to the well in a commercial redi-mix truck. The cement is metered down the well using a simple funnel device constructed out of a 55-gallon plastic drum and the well is filled to about 2/3 full with the cement slurry. The cement is allowed to cure for several days and is then tagged with a simple weight on a chain to ensure a competent plug. When the plug has been verified, the well casing is broken off at least three feet below surface and the balance of the hole is filled with cement slurry. The pit is then back filled and the plugging is complete.

#### B. Resources

The labor and material resources necessary to complete the work include the following:

1. **Engineer.** The term "Engineer" is used herein to describe any competent URI employee or contractor whose task it is to plan, oversee and execute in the field the plugging and abandonment of cased wells.
2. **Backhoe Operator.** To operate the backhoe and provide general labor support.
3. **Backhoe.** Necessary to break off the casing of the well 4 feet below surface and the back filing of the resulting trench.

# URANIUM RESOURCES, INC

## South Texas Operations

### STANDARD OPERATING PROCEDURES & JOB DESCRIPTIONS

SUBJECT  <b>PLUGGING &amp; ABANDONMENT  OF CASED WELLS</b>	SECTION SOP 87	
	DATE 7/10/2000	PAGE 2 of 4
	STATUS Revision 0.0	

- Measuring funnel.** Constructed by cutting off a 55 gallon plastic drum so as to allow at least 35 gallons of capacity (approximately 1/6 of a cubic yard) plus some freeboard. The bottom of the funnel is fitted with a 3 inch pipe which is long enough to keep the funnel in the casing during the filling process. (See Figure No. 1).
- Plug for the funnel.** The funnel plug consists of a cement or rubber plug sufficient to restrict flow through the 3 inch pipe at the bottom of the funnel which is attached to a handle long enough to allow its removal when the funnel is full of cement slurry. (See figure No. 2).
- Down-hole surveying equipment.** Such equipment as necessary to allow the verification of the location and competency of the plug down hole. In its simplest form, this could be a weight attached to a surveyors tape that would allow direct reading of the distance from top of casing to top of the cement plug
- Cement Slurry.** Adequate quantities of 13 lb/gal neat cement slurry delivered in a commercial redi mix truck with driver to fill the holes scheduled for the day. This is provided under a separate contract with a local cement company such as Alamo Cement

#### C. Office Preparation:

- Identify the holes that are scheduled to be plugged.
- Determine casing volumes from logs or other data.
- Determine the number of 1/6-yd<sup>3</sup> loads, or "metered drops", necessary to fill at least 2/3 of each hole's individual casing volume. This shall be calculated by taking the casing volume, multiplying it by 0.667 and rounding up to the nearest 1/2 cubic yard. The number of cubic yards are then multiplied by 6 to get the number of metered drops.
- Order the required quantity of concrete for the next day's work.

#### D. Bottom Plugging in the Field:

- Locate hole in the field.

# URANIUM RESOURCES, INC

## South Texas Operations

### STANDARD OPERATING PROCEDURES & JOB DESCRIPTIONS

<b>SUBJECT</b>  <b>PLUGGING &amp; ABANDONMENT</b>  <b>OF CASED WELLS</b>	<b>SECTION</b> SOP 87	
	<b>DATE</b> 7/10/2000	<b>PAGE</b> 3 of 4
	<b>STATUS</b> Revision 0.0	

2. Engineer places the metering funnel on the hole and inserts the plug into the funnel
3. The redi-mix driver backs his cement truck up to the hole. (Figure 3).
4. Cement truck driver and the Engineer fill the funnel to the 35 gallon (1/6 yd<sup>3</sup>) marks with 13 lb. neat slurry. (Figure 4)
5. Engineer lifts the plug, releasing the cement slurry down the hole. (Figure 5)
6. The preceding two steps are repeated until the desired quantity of cement slurry has been discharged to the hole.
7. Funnel and truck are washed down as needed with water from the truck. (Figure No. 6).
8. The engineer and cement truck move to the next hole to be plugged and repeat the process. (Figure 7).

#### **E. Verification of Bottom Plug**

1. Hole is allowed to cure for at least three days to allow cement to set up.
2. Engineer tags the top of the cement plug to verify its existence and location. Engineer records the level of the plug found in the hole.
3. Where a solid plug is found, the hole is determined to be properly bottom plugged and scheduled for final surface plugging.

#### **F. Surface Plugging in the Field:**

1. Holes that have successfully undergone the tagging exercise above have their casings broken off at least 4 feet below the surface of the ground with a backhoe. The resulting trench is about one bucket wide and about ten feet long with the hole exposed in the bottom. Figures 8 & 9).
2. The cement truck backs up to the trench and discharges the cement slurry down the exposed bore hole until the hole is filled to the bottom of the trench. When full, the truck moves to the next hole to be plugged.

# URANIUM RESOURCES, INC

## South Texas Operations

### STANDARD OPERATING PROCEDURES & JOB DESCRIPTIONS

<b>SUBJECT</b>  <b>PLUGGING &amp; ABANDONMENT</b>  <b>OF CASED WELLS</b>	<b>SECTION</b> SOP 87	
	<b>DATE</b> 7/10/2000	<b>PAGE</b> 4 of 4
	<b>STATUS</b> Revision 0.0	

3. The engineer records that the hole has been successfully surface plugged and marks it for back-filling.
4. The backhoe returns to the hole and back fills the trench, returning the ground to its original contours.
5. The hole is now completely P&A'd.

FIGURE NO. 1

METERING FUNNEL

MADE FROM CUT OFF  
55-GALLON PLASTIC  
DRUM

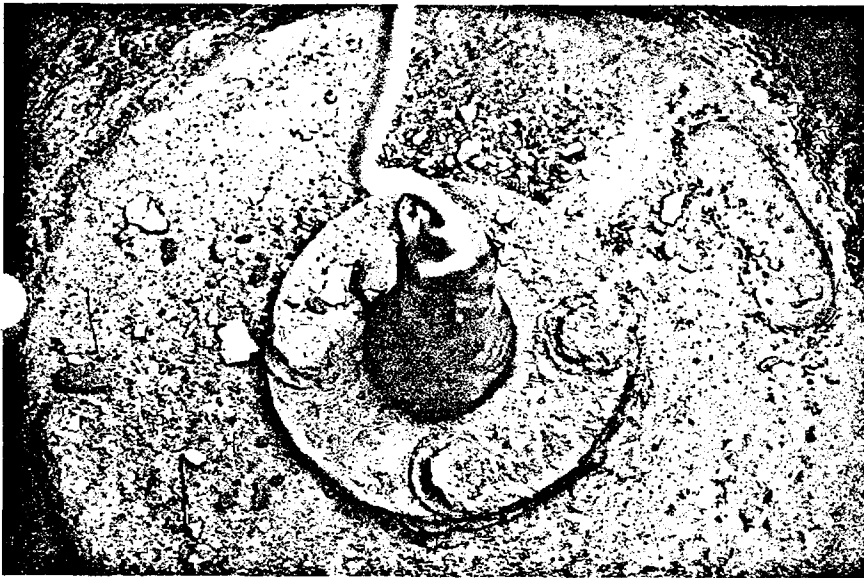


FIGURE NO. 2

MANUAL PLUG  
FOR METERING FUNNEL

FIGURE NO. 3  
CEMENT TRUCK  
READY TO  
FILL FUNNEL

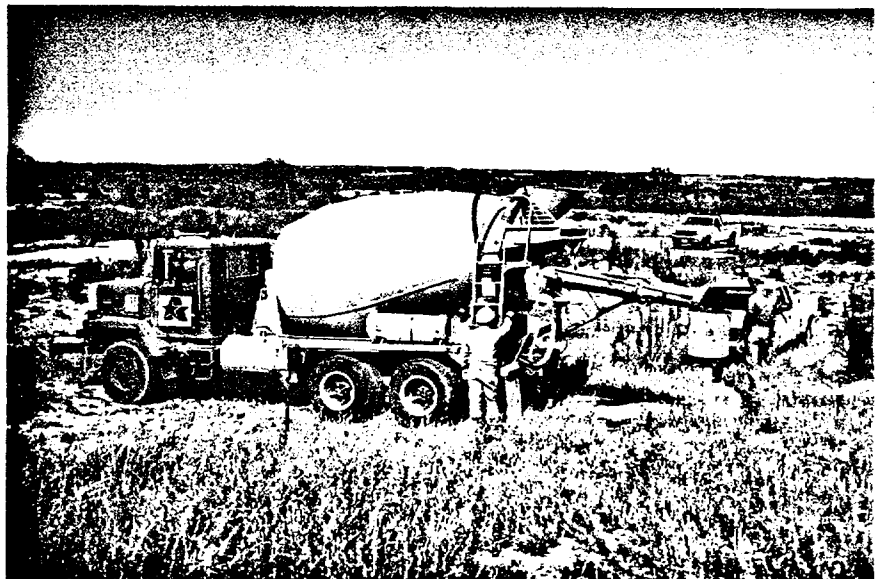




FIGURE NO. 4  
FILLING FUNNEL

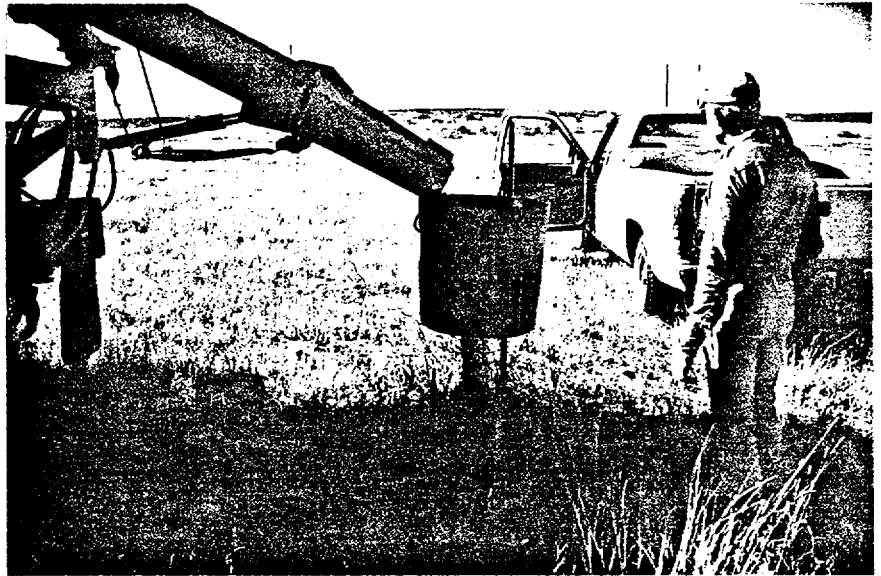


FIGURE NO. 5  
FILLING STEP FINISHED  
PLUG BEING PULLED  
TO RELEASE CEMENT  
INTO BORE HOLE

FIGURE NO. 6  
WASHING FUNNEL  
AFTER DONE FILLING

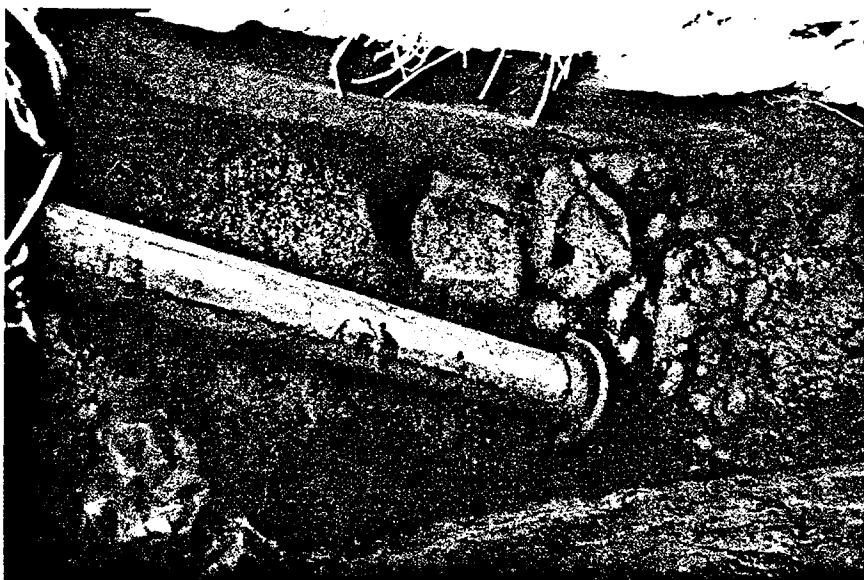


FIGURE NO. 7  
CARRYING FUNNEL  
BACK TO TRUCK  
FOR MOVE TO NEXT HOLE



FIGURE NO. 8  
PIT RESULTING  
FROM BACKHOE  
BREAKING CASING  
OFF 4 FEET BELOW  
GROUND LEVEL

FIGURE NO. 9  
BOOTOM OF PIT  
SHOWING BROKEN  
CASING AND  
DRILL HOLE



**HRI Churchrock Project  
Section 8 Wellfield Equipment Tabulation**

<b># H. Houses</b>	<b># Injectors</b>	<b># Extractors</b>	<b># Feet 2"</b>	<b># Feet 10"</b>	<b># Feet 14"</b>	<b>Gravel Road</b>
1	21	18	6690	540		
2	21	18	6950	440		
3	19	21	7010	460		
4	23	26	6370	360		
5	16	30	6770	500		
6	13	18	4070	260		
7	9	11	4500	1400		
8	30	28	9030	460		
9	27	28	8460	400		
10	15	13	4690	380		
11	21	15	6580	500		
<b>Totals</b>	<b>215</b>	<b>226</b>	<b>71120</b>	<b>5700</b>	<b>7200</b>	<b>3600</b>



# AMERICAN

CEMENT CORPORATION

P.O. BOX 38  
ESPAÑOLA, NEW MEXICO 87532  
(505) 753-8260 FAX (505) 753-8402

Via FAX

505 386-6555

October 6, 2000

HRI, Inc.  
P.O. Box 777  
Crownpoint, New Mexico 87313

RE: Quotation for Type I/II Portland Cement

Dear Salvador,

We are delighted to quote your cement needs as follows:

Type I/II Cement	f.o.b. Albuquerque	\$83.00 less \$1.00 Pd by 10 <sup>th</sup> .
Truck freight	to Churchrock, NM	16.70
Total delivered price		<u>\$99.70 less \$1.00 Pd by 10<sup>th</sup></u>
Per short ton (2000 lbs)		

Price should be good for all of 2001, however American Cement reserves the right to amend price on July 1, 2001 should it become necessary due to price increases. These generally do not exceed \$2 or \$3 per ton.

Thank you for the opportunity to quote this job. Please let me know if I can be of any further assistance.

Very truly,  
*Peter H. Cantrup*  
Peter H. Cantrup  
American Cement Corp.

**MARK**

$$\frac{2000}{95} = 21 \quad \frac{99.70}{21} = 4.75/\text{SACK}$$

*Salvador 10/6/00*

REQUIRE SILO FOR UNLOADING.

# Cement Cost Worksheet

## Cement Volumes (per bag)

Specific Gravity	3.15
Absolute Volume Factor (lb/ft <sup>3</sup> )	62.4
Absolute volume (lb/ft <sup>3</sup> )	196.56
Lbs per bag	94
Lbs per ton	2000
Cement volume per bag (ft <sup>3</sup> )	0.478

## Water Volumes (per bag)

Specific Gravity	1.00
Pounds per gallon (lbs/gal)	8.33
Water per bag cement (gal)	6
Water weight w/ 1 bag cement (lb)	49.98
Absolute Volume Factor (lb/ft <sup>3</sup> )	62.4
Water volume (ft <sup>3</sup> )	0.80

**Total volume per bag (ft<sup>3</sup>)** 1.279

## Cement costs

Cement cost per ton (delivered) (\$)	\$98.70
Cement cost per 94 lbs	\$4.64
Cement/water yield per bag (ft <sup>3</sup> )	1.279
Mixed cement cost per ft <sup>3</sup> (\$)	\$3.63
Mixed cement cost per yd <sup>3</sup> (\$)	\$97.91

## 5. Equipment Removal

### a. Introduction and Description

This budget includes the cost estimates for removing all of the production and restoration process equipment. All process vessels and other equipment are assumed to be contaminated for the purpose of developing the RAP budget and would be disposed in an U.S. NRC licensed waste disposal facility.

The surety would cover removing all process and restoration equipment at both the Churchrock satellite and at the Crownpoint process facility site. The budget contemplates costs for disassembly, or demolition, loading, transportation and disposal at a NRC licensed facility<sup>6</sup>. There is no decommissioning considered or disposal at an unrestricted site.

### b. Budget Assumptions

The Process Equipment Removal and Disposal Budget is formatted with the underlying assumptions integrated into the tabulation. The budget figures distinguish individually costs associated with the Churchrock and Crownpoint locations, and further break down removal and loading costs and transportation and disposal costs. Costs for tanks, pipe, pumps, the dryer, reverse osmosis and brine concentration equipment are estimated.

The Process Equipment Removal and Disposal Budget was developed with the assumption that all labor is contracted at a rate of \$120 per day or \$15 per hour. These are reasonable contract labor rates. Estimate labor time requirements are based on best professional judgment. Management of this activity will be provided by site staff who will be available six months after restoration.

All tankage and piping will be reduced in volume as indicated in the budget. Tanks will be reduced by hydraulic shear and pipe will be crushed. There is no provision for reduction in the size of pumps, the dryer, the reverse osmosis equipment or the brine concentrator. No credit is given for salvage value.

For demolished tankage and pipe, a 30% void factor was included in all volume calculations for the purpose of determining transportation and disposal costs. All disposal was priced at the bulk rate as shown in Attachment E-5-2.

A contingency was included for health and safety supplies such as disposable uniforms and respirators.

As shown in Attachment E-5-1, the total cost for equipment removal is projected to be \$67,626.

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<sup>6</sup> For the purpose of this budget cycle, HRI assumed that the NRC licensed site would be the IUC White Mesa Mill near Blanding Utah. Projected unit disposal costs are described in Attachment E-5-2.

**ATTACHMENT E-5-1  
EQUIPMENT REMOVAL BUDGET**

**PROCESS EQUIPMENT REMOVAL AND DISPOSAL**

		<u>CR Satellite</u>	<u>Central Plant</u>	<u>Combined</u>	<u>Totals</u>
<b>I.</b>	<b>Removal and Loading Costs</b>				
A.	Tankage				
	Number of tanks	29	9		
	Volume of tank construction material (ft <sup>3</sup> )	1300	405		
	1 Labor				
	Number of persons	3	3		
	Ft <sup>3</sup> /day	50	50		
	Number of days	26	8.1		
	\$/day/person	\$120	\$120		
	Subtotal labor costs	\$9,360	\$2,916	\$12,276	
	2 Equipment (hydraulic shear)				
	Number of days	26	8.1		
	\$/Day - \$300	\$300	\$300		
	Subtotal equipment costs	\$7,800	\$2,430	\$10,230	
	Subtotal tankage removal and loading costs	\$17,160	\$5,346		
B.	PVC pipe				
	PVC pipe footage	3000	3000		
	Average PVC pipe diameter (inches)	3	3		
	PVC pipe material volume (ft <sup>3</sup> /ft)	0.018	0.018		
	Volume of compacted PVC pipe w/100 % void (ft <sup>3</sup> )	108	108		
	1 Labor				
	Number of persons	2	2		
	Ft/day	200	200		
	Number of days	15	15		
	\$/day/person	\$120	\$120		
	Subtotal labor costs	\$3,600	\$3,600	\$7,200	
	2 Pipe crushing				
	Number of persons	2	2		
	\$/hr./person	\$15	\$15		
	Feet pipe per hour	300	300		
	Subtotal pipe crushing	\$300	\$300		
	Subtotal PVC pipe removal and loading costs	\$3,900	\$3,900	\$7,800	
C.	Pumps				
	Number of pumps	29	9		
	Average volume (ft <sup>3</sup> /pump)	5	5		
	Volume of pumps (ft <sup>3</sup> )	145	45		
	1 Labor				
	Number of persons	1	1		
	Pumps/day	2	2		
	Number of days	14.5	4.5		
	\$/day/person	\$120	\$120		
	Subtotal pump removal and loading costs	\$1,740	\$540	\$2,280	
D.	Dryer				
	Dryer volume (ft <sup>3</sup> )		2000		
	1 Labor				
	Number of persons		3		
	Ft <sup>3</sup> /day		200		
	Number of days		10		
	\$/day/person		\$120		
	Total dryer dismantling and loading cost		\$3,600	\$3,600	
E.	Reverse osmosis equipment				
	RO (ft <sup>3</sup> )	1000			



1	Labor				
	Number of persons	3			
	Ft <sup>3</sup> /day	200			
	Number of days	5			
	\$/day/person	\$120			
	Total RO dismantling and loading cost	\$1,800		\$1,800	
F	Brine concentration equipment				
	BC (ft <sup>3</sup> )	4000			
1	Labor				
	Number of persons	3			
	Ft <sup>3</sup> /day	200			
	Number of days	20			
	\$/day/person	\$120			
	Total BC dismantling and loading cost	\$7,200		\$7,200	\$52,386
	Total process equipment removal and loading costs				
<b>II. Transportation and Disposal Costs (NRC-Licensed Facility)</b>					
A.	Tankage (plastic and fiberglass)				
	Volume of tank construction material (ft <sup>3</sup> )	1300	405		
	Volume of disposal assuming 30% void space (ft <sup>3</sup> )	1690	526.5		
	Transportation and disposal unit cost (\$/ft <sup>3</sup> )	\$2.78	\$2.78		
	Subtotal tankage transportation and disposal costs	\$4,694	\$1,463	\$6,157	
B.	PVC pipe				
	Volume of crushed PVC pipe (ft <sup>3</sup> )	108	108		
	Volume of disposal assuming 30% void space (ft <sup>3</sup> )	140.4	140.4		
	Transportation and disposal unit cost (\$/ft <sup>3</sup> )	\$2.78	\$2.78		
	Subtotal PVC pipe transportation and disposal costs	\$390	\$390	\$780	
C.	Pumps				
	Volume of pumps (ft <sup>3</sup> )	145	45		
	Volume of disposal assuming 30% void space (ft <sup>3</sup> )	188.5	80.6		
	Transportation and disposal unit cost (\$/ft <sup>3</sup> )	\$2.78	\$2.78		
	Total dryer transportation and disposal costs per facility	\$524	\$224	\$748	
D.	Dryer				
	Dryer volume (ft <sup>3</sup> )		2000		
	Volume for disposal assuming dryer remains intact (ft <sup>3</sup> )		2000		
	Transportation and disposal unit cost (\$/ft <sup>3</sup> )		\$2.78		
	Total dryer transportation and disposal costs per facility		\$5,556	\$5,556	
E.	Reverse osmosis unit				
	RO volume (ft <sup>3</sup> )	1000			
	Volume for disposal assuming RO remains intact (ft <sup>3</sup> )	1000			
	Transportation and disposal unit cost (\$/ft <sup>3</sup> )	\$2.78			
	Total dryer transportation and disposal costs	\$2,778		\$2,778	
F.	Brine concentrator				
	BC volume (ft <sup>3</sup> )	4000			
	Volume for disposal assuming BC remains intact (ft <sup>3</sup> )	4000			
	Transportation and disposal unit cost (\$/ft <sup>3</sup> )	\$2.78			
		\$11,111		\$11,111	
	Total equipment transportation and disposal costs				\$13,240
<b>III. Health and Safety Costs</b>					
	Radiation safety equipment	1000	1000	\$2,000	
	Total health and safety costs				\$2,000
<b>TOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS</b>					<b>\$67,626</b>

**ATTACHMENT E-5-2  
BUDGET CALCULATIONS  
DISPOSAL COSTS**

---

**PIPE VOLUME  
TRANSPORTATION AND DISPOSAL**

## Pipe Wall Volume Data

<u>Outside Diameter (in)</u>	<u>Area Inside OD (ft2)</u>	<u>Wall Volume SDR17 (ft3/ft)</u>
2	0.022	0.012
2.5	0.034	
3	0.049	0.018
3.5	0.067	
4	0.087	
4.5	0.110	
5	0.136	
5.5	0.165	
6	0.196	
6.5	0.230	
7	0.267	
7.5	0.307	
8	0.349	
8.5	0.394	
9	0.442	
9.486	0.491	
9.5	0.492	
10	0.545	0.140
10.5	0.601	
10.75	0.630	
11	0.660	
11.5	0.721	
12	0.785	
12.353	0.832	
12.5	0.852	
13	0.922	
13.5	0.994	
14	1.069	0.237
14.5	1.147	
15	1.227	
15.5	1.310	

Wall Tk

14 " SDR 17	0.824
10 " SDR 17	0.632

## TRANSPORTATION AND DISPOSAL

### By-Product Material Transportation Disposal Costs per Ft3

**Assumptions:**

1. Based on URI contract costs for transportation to and disposal at the IUC White Mesa Mill near Blanding Utah.
2. Transportation assumed a 200 mile trip at \$2.00 per mile. Bulk truck capacity 20 yds<sup>3</sup>. Drum truck capacity 48.

Type of Waste:	Sludge, resin, and other by-product type wastes shipped in drums.			
	<u>Unit Cost</u>	<u>Units/Drum</u>	<u>Drums/Truck</u>	<u>Total \$/ft<sup>3</sup></u>
Disposal Fee	\$10.00			\$10.00
Shipping	\$400.00	7.35	48	\$1.13
Total Shipping and Disposal				\$11.13

Type of Waste:	Soil, sand, demolished concrete and other bulk wastes.		
	<u>Unit Cost</u>	<u>Ft<sup>3</sup>/Truck</u>	<u>Total \$/ft<sup>3</sup></u>
Disposal Fee	\$2.04		\$2.04
Shipping	\$400.00	540	\$0.74
Total Shipping and Disposal			\$2.78

### Unrestricted Material Transportation Disposal Costs per ton

**Assumptions:**

1. Based on public costs disposal at the Waste Management Red Rocks Landfill. 24 \$/ton.
2. 1 ton is equal to 1 yd<sup>3</sup>.
2. Transportation assumed a 30 mile trip at \$2.00 per mile. Bulk truck capacity 20 yds<sup>3</sup>.

	<u>Unit Cost</u>	<u>Total \$/yds<sup>3</sup></u>
Disposal Fee (ton)	\$24.00	\$24.00
Shipping (truck trip)	\$60.00	\$3.00
Total Shipping and Disposal (yd <sup>3</sup> )		\$27.00

**ATTACHMENT E-5-3  
QUOTES AND PRICES**

-----

**LANDFILL FEES  
LANDFILL DISTANCE  
WHITE MESA FEES**

HRI, INC.

Crownpoint Office

P. O. Box 777

Physical Address: 1/2 mile W of Crownpoint  
Crownpoint, New Mexico 87313

Voice: 505-786-5845 Fax: 505-786-5555

~~~~~

MARK: WASTE MANAGEMENT  
RED ROCKS LANDFILL  
505-862-8402

24<sup>00</sup>/TON REG WASTE

46<sup>00</sup>/TON SPECIAL WASTE  
(CONTAMINATED WITH OIL/GAS (GRAVE))

25 MILES FROM CP site

Salmody  
9-12-00

HRI, INC.

Crownpoint Office

P. O. Box 777

Physical Address: 1/2 mile W of Crownpoint  
Crownpoint, New Mexico 87313

Voice: 505-786-5845 Fax: 505-786-5555



MARK:

MILES TO LANDFILL

TO CP SITE 25 MILES

TO SEC 8-CR - 35 MILES (VIA I-40)

TO SE 8-CR - 35 MILES (VIA SMITH LAKE  
AND PALE)

Salvador 9-13-00

CROWNPOINT/GALLUP HAVE TRANSFER  
STATIONS ONLY. - LANDFILL CLOSE TO  
THOREAU N.M.

# BYPRODUCT DISPOSAL AGREEMENT

This BYPRODUCT DISPOSAL AGREEMENT ("Agreement") is made on APRIL 23 1999, by and between Uranium Resources, Inc. ("Shipper") with its principal offices at ~~12377~~ Merit Drive, Suite 1210, Dallas, Texas 75251 and INTERNATIONAL URANIUM (USA) CORPORATION ("IUSA"), with its principal corporate offices at 1050 Seventeenth Street, Independence Plaza, Suite 950, Denver, Colorado 80265.

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## RECITALS:

A. Shipper is the operator and owner of an in-situ uranium recovery project located in the State of Texas and commonly known as the Vasquez Mine (the "Mine"), and such operations are conducted in accordance with a permit issued by the State of Texas ("Shipper's State License").

B. Shipper desires an agreement with the operator and/or owner of a duly licensed facility authorized to permanently dispose of all of the ByProduct Material as defined under Section 11(e)(2) of the Atomic Energy Act of 1954, as amended, 42 U.S.C. § 2014(e)(2) and 10 C.F.R. § 40.4(a-1) (the "ByProduct Material"), associated with the Mine or arising from activities at the Mine.

C. IUSA is the operator of the White Mesa Mill located near Blanding, Utah (the "White Mesa Mill"). The White Mesa Mill is owned by IUC White Mesa, LLC., an affiliate of IUSA. The NRC has duly licensed (the "IUSA NRC License") the White Mesa Mill and its component facilities to permit the disposal of ByProduct Material generated as a result of uranium mining and processing by placement of the ByProduct Material in the White Mesa Mill's tailings impoundment (the "Tailings Facility").

D. IUSA and IUC White Mesa, LLC have the necessary expertise, equipment, facilities, permits and licenses to safely and lawfully dispose of the Material and to perform all work required in accordance with the terms and conditions set forth in this Agreement.

E. IUSA is willing to accept ByProduct Material from Shipper for permanent disposal in the Tailings Facility at the White Mesa Mill upon the terms and conditions set forth in this Agreement.

NOW, THEREFORE, in consideration of the mutual promises, covenants and agreements set forth in this Agreement, Shipper and IUSA agree as follows:

### 1. AGREEMENT TO ACCEPT BYPRODUCT MATERIAL.

A. During the Term of this Agreement, Shipper shall ship all but not less than all of the ByProduct Material of Shipper associated with or now located at the Mine or arising from activities at the Mine site to IUSA for final disposal at the White Mesa Mill pursuant to the terms and conditions of this Agreement. All such ByProduct Material shall be delivered to IUSA at the White Mesa Mill.



- B. IUSA agrees to accept for final disposal the ByProduct Material of Shipper, as described herein, which is delivered to the White Mesa Mill pursuant to the terms and conditions of this Agreement during the period extending from the date of this Agreement through December 31, 2002, unless this Agreement is terminated sooner under Paragraph 14 hereof.

## 2. ANALYSIS, TRANSPORTATION, SCHEDULING, AND DELIVERY OF BYPRODUCT MATERIAL.

A. Shipper shall provide and arrange for the transportation of Shipper's ByProduct Material through a transportation contractor. Any and all ByProduct Material shipped for disposal shall be transported in trucks or in 55 gallon drums. All trucks shall be self dumping/end dump trucks, and all such drums shall be full of ByProduct Material and shall be so labeled. Shipper shall require that the transportation contractor comply with all applicable federal and state transportation regulations. Shipper shall make a copy of its contract with the transportation contractor available to IUSA upon request. By releasing a shipment from the Mine, Shipper shall be deemed to have represented and warranted that all information set forth in the forms, reports and logs completed by Shipper is in accordance with this Agreement, and all applicable laws, rules and regulations. All deliveries of ByProduct Material to the White Mesa Mill shall be between the hours of 8:00 a.m. and 4:00 p.m., Monday through Friday. Shipper shall schedule loading at the Mine accordingly. Shipper shall be responsible for any demurrage charges resulting from failure to load trucks to ensure that this delivery requirement can be met. As used herein, "shipment" is defined as any number of drums loaded on one truck or a partial or one full truckload of ByProduct Material, transported at one time. Scheduling of the shipments shall be coordinated with IUSA. Shipper shall segregate types of ByProduct Material based on the categories set forth in Paragraph 10(B) hereof to facilitate determination of quantities being shipped for disposal and all shipments shall be in compliance with the requirements of Paragraph 5(D) hereof.

B. Shipper shall notify IUSA, in writing, thirty days prior to an intended shipment of the ByProduct Material. Such notice shall include (1) a detailed description of the content of the proposed shipment, setting forth with specificity a list of categories or types of ByProduct Material that it intends to ship to the White Mesa Mill and; (2) a date when sampling (as described in paragraph (C)) of the material proposed for shipment will occur.

C. At its sole expense, Shipper shall provide sample analyses (RCRA characterization, radionuclides, and other characterizations requested by IUSA) in sufficient detail to enable IUSA to confirm the content of the intended delivery of ByProduct Material. Shipper shall collect and analyze representative samples for each category or type of ByProduct Material that will be delivered to IUSA for disposal. IUSA reserves the right to have its representative present when Shipper collects the samples. The samples shall be sent to a commercial analytical laboratory which is acceptable to both IUSA and Shipper. An original report of the results of the commercial analytical laboratory analyses will be provided to IUSA thirty (30) days prior to scheduling the actual delivery of the ByProduct Material.

D. Shipper shall provide IUSA with advance notice of the actual date of delivery of the ByProduct Material two (2) business days prior to such delivery.

E. Unloading at the White Mesa Mill shall occur only in areas designated for unloading by IUSA, and in strict accordance with the procedures established by IUSA.

3. **REJECTION OF MATERIAL.** IUSA shall be entitled to reject delivery of any ByProduct Material or other material of Shipper which, (1) IUSA is not authorized to permanently dispose of at the White Mesa Mill by any term or condition of the IUSA NRC License, or by the terms or conditions of any other applicable permit or license, as by any applicable laws or regulations, or (2) IUSA, in good faith, determines it is not the material from which a sample analysis has been provided to IUSA. Upon receipt of notice from IUSA of any such rejection, Shipper will promptly remove any such nonconforming material from the White Mesa Mill. IUSA may also direct the transportation contractor to return the entire load to the Mine. The removal cost, including any demurrage or delay costs incurred by the trucker, and all of IUSA's costs associated with identifying and handling any rejected material shall be paid for by Shipper. To the extent that IUSA has the legal obligation to identify, and to notify governmental agencies of any shipment of material (or portion thereof) which IUSA believes not to be in compliance with applicable regulations, shall not be liable to Shipper for any loss or damage incurred by Shipper because of such identification and notification. IUSA shall make every effort to notify Shipper of such identification and notification in a timely manner. IUSA's right to reject material of Shipper shall continue up to the time that IUSA has accepted the material for permanent disposal at the Tailings Facility. "Permanent disposal" means the actual placement of the material in a tailings impoundment at the White Mesa Mill. After permanent disposal, Shipper's ByProduct Material will not be segregated from any other material received from any other third party or from any of IUSA's material. Title to the material shall pass to IUSA upon acceptance of the material by IUSA for permanent disposal at the Tailings Facility.

4. **REPRESENTATIONS AND WARRANTIES OF IUSA.** As material inducements to Shipper to enter into this Agreement, IUSA represents and warrants to Shipper as follows:

A. IUSA is a corporation duly organized, validly existing, in good standing under the laws of the State of Delaware, and is duly qualified and authorized to do business in the State of Utah.

B. IUSA has full corporate power and authority to own its property, carry on its business as being conducted on the date of this Agreement, and has full authority to enter into and perform its obligations under this Agreement.

C. The obligations of IUSA, which are set forth in this Agreement, are enforceable in accordance with their terms except as such terms may be limited by bankruptcy, insolvency, or similar laws affecting the enforcement of creditors' rights generally.

D. The White Mesa Mill facility (i) is not or has not been the subject of response costs as defined by the Comprehensive Environmental Response, Compensatory, and Liability Act, as amended, 42 U.S.C. § 9601-9657 ("CERCLA"), or (ii) is not listed, or is not proposed to be listed, on the National Priority List as defined in CERCLA.

5. REPRESENTATIONS AND WARRANTIES OF SHIPPER. As material inducements to IUSA to enter into this Agreement, Shipper represents and warrants to IUSA as follows:

A. Shipper is a corporation duly organized, validly existing, in good standing under the laws of the state of its incorporation. Shipper has been duly licensed under the Shipper's State License to operate the Mine and to generate the ByProduct Material.

B. Shipper has full corporate power and authority to own its property; to carry on its business as being conducted on the date of this Agreement, and has full authority to enter into and perform its obligations under this Agreement.

C. The obligations of Shipper, which are set forth in this Agreement, are enforceable in accordance with their terms except as such terms may be limited by bankruptcy, insolvency, or similar laws affecting the enforcement of creditors' rights generally.

D. Each shipment of ByProduct Material to be delivered to the White Mesa Mill for final disposal in the Tailings Facility will comply with all applicable provisions of Titles 10 and 49 of the U.S. Code of Federal Regulations, Shipper's State License, the IUSA NRC License, and all other applicable regulations, permits and licenses.

E. The ByProduct Material is not hazardous waste as defined in the Resource Conservation and Recovery Act, as amended, 42 U.S.C. § 6901-6991, or comparable state laws or regulations. The ByProduct Material has not been transported from any site or facility which (i) is or has been the subject of response costs or demands for the payment of response costs as defined in CERCLA, or (ii) is listed, or is proposed to be listed, on the National Priority List as defined in CERCLA.

6. COVENANTS OF IUSA. IUSA covenants are as follows:

A. IUSA shall remain in compliance with its representations and warranties as set forth in this Agreement during the term of this Agreement.

B. IUSA shall maintain, at its expense, during the continuance of the effectiveness of this Agreement, policies of insurance which provide at least the following types of coverage in at least the following amounts:

COVERAGE

LIMITS

|                                                           |                                   |
|-----------------------------------------------------------|-----------------------------------|
| Worker's Compensation                                     | Statutory                         |
| Employer's Liability                                      | \$1,000,000 each occurrence       |
| General Liability                                         | \$2,000,000 combined single limit |
| Automotive Liability<br>(bodily injury & property damage) | \$1,000,000 each accident         |

C. Worker's Compensation insurance shall contain a waiver of subrogation clause.

D. IUSA shall, throughout the continuance of the effectiveness of this Agreement, remain in compliance with the requirements of any federal or state agency for the deposit of surety bonds, cash funds, or other surety arrangements as required by any such agency, to assure it of performance and completion of requirements for reclamation of the White Mesa Mill in accordance with applicable law and regulations.

7. COVENANTS OF SHIPPER. Shipper covenants as follows:

A. Shipper shall remain in compliance with its representations and warranties as set forth in Paragraph 5 of this Agreement during the continuance of the effectiveness of this Agreement.

B. Shipper shall maintain or cause the transportation contractor to maintain, at its expense, during the continuance of the effectiveness of this Agreement, policies of insurance which name each of IUSA and IUC White Mesa LLC as an additional insured, and which provide at least the following types of coverage in at least the following amounts. Prior to delivering any ByProduct Material to the White Mesa Mill and, as a condition to doing so, then, and from time to time during the continuance of this Agreement, Shipper shall furnish to IUSA duly executed certificates of insurance establishing that the required insurance coverage has been obtained and is being maintained in full force and effect.

COVERAGE

LIMITS

|                                                                            |                                   |
|----------------------------------------------------------------------------|-----------------------------------|
| Worker's Compensation                                                      | Statutory                         |
| Employer's Liability                                                       | \$1,000,000 each occurrence       |
| General Liability                                                          | \$2,000,000 combined single limit |
| Automotive Liability<br>(bodily injury & property damage)                  | \$1,000,000 each accident         |
| Automotive Liability<br>(LSA - Highway Route Controlled Quantity Coverage) | \$5,000,000                       |

C. Worker's Compensation insurance shall contain a waiver of subrogation clause.

D. The ByProduct Material to be delivered to the White Mesa Mill for disposal in the Tailings Facility will consist of contaminated soil, sand, rocks, demolition masonry, concrete rubble, filter material, pond liners, pond sediments, processing equipment, piping, and other miscellaneous material and equipment. No separate pieces of any material shall exceed 30 cubic feet in volume, with no single dimension greater than six feet. Any and all material containing void space of one cubic foot or greater, except open-ended steel piping, shall be opened by Shipper such that the void space can be filled during disposal, or the material shall be crushed by Shipper such that the remaining void space is less than one cubic foot. No partially filled drums shall be shipped, and any empty drums which are shipped for disposal shall be crushed by Shipper. Materials of a friable nature, such as PVC or fiberglass, shall be crushed or chipped by Shipper to reduce void space. ByProduct Materials saturated with liquid will not be shipped. No rebar or other sharp objects shall be protruding from concrete or cement type of rubble. Any deviation from these requirements must be approved in writing by IUSA prior to transporting such materials. The ByProduct Material is expected to include the radionuclides Radium-226, Thorium-230, and natural uranium. The Radium-226 levels will not exceed 6,000 pci/gram, and total radioactivity will not exceed 6,000 pci gross alpha activity per gram, and sample reports showing radioactivity levels shall be included with the Bill of Lading delivered to IUSA.

E. With each shipment of the ByProduct Material to the White Mesa Mill, Shipper shall execute and deliver to IUSA (or the transporter, as appropriate) the Bill of Lading and Material Release Authorization in the Forms attached hereto as Exhibits A and B, respectively, and the information provided on such shall be true and accurate in all respects. A copy of Shipper's State License shall also be attached to the Bill of Lading.

8. **INDEMNIFICATION BY IUSA.** IUSA shall indemnify, defend, and save harmless Shipper and their representative officers, employees, and agents against all liability whatsoever, including all costs and expenses each of Shipper and their representative officers, agents, and employees may incur, including without limitation by reason of enumeration, claims asserted against either Shipper by any employee of IUSA, environmental response costs, clean up costs, governmental fines, costs of settlement, and reasonable attorney's fees which in any way results from a breach by IUSA of its representations, warranties or covenants made in this Agreement or failure of IUSA to comply with the terms and provisions of the IUC NRC license and/or any state issued permits, or other applicable federal and state statutes or regulations.

9. **INDEMNIFICATION BY SHIPPER.** Shipper shall indemnify, defend, and save harmless IUSA, IUC White Mesa, LLC and their representative officers, employees, and agents against all liability whatsoever, including all costs and expenses that IUSA, IUC White Mesa, LLC and their representative officers, agents, and employees may incur, including without limitation, loss of profits or revenues, claims asserted against IUSA or IUC White Mesa, LLC by any employee of Shipper, environmental response costs, clean up costs, governmental fines, costs of settlement, and reasonable attorney's fees which in any way relate to or arise out of or are incurred in connection with the disposal of any ByProduct Material delivered to IUSA, the White Mesa Mill, from Shipper, if such loss or liability, in any way whatsoever, results from the failure of the ByProduct Material to conform to the terms of this Agreement or the data supplied on any of the reports, logs or forms

provided by Shipper, or said shipment fails to meet applicable standards prescribed by the Department of Transportation, or any other federal or state governmental agency, having jurisdiction over such matters, or which are related to breaches by Shipper of its representations, warranties or covenants made in this Agreement, or the failure of Shipper to comply with the terms and provisions of the Shipper's State License, and/or any other permits or other applicable federal and state statutes or regulations, regardless of whether title to the ByProduct Material has passed to IUSA under the terms of this Agreement.

10. **PAYMENTS AND FEES.** For all the ByProduct Material delivered to and disposed of by IUSA, Shipper shall pay IUSA as follows:

A. Shipper shall pay IUSA within 21 days of receipt of an invoice, therefore the following disposal fees for quantities of ByProduct Material delivered for disposal, as indicated below:

- (i) 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: \$55.00/cu. yd.
- (ii) 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 A(i): \$10.00/cu. ft.
- (iii) A charge of \$35.00 per hour shall be made for unloading time at the White Mesa Mill.
- (iv) A decontamination charge of \$30.00 per hour, or any part thereof, will be made in the event IUSA 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 IUSA actions.
- (v) Package quantities specified in A(i), and A(ii) shall not be mixed within a single shipment. The determination of "cubic yard" or "cubic feet" shall be based on the shipping container or package volume.

IUSA will provide Shipper with a copy of IUSA's scale ticket to support IUSA's weight measurement and subsequent invoice.

B. All sales and use taxes, that are applicable to the services covered herein, shall be paid by Shipper.

11. **FEE REVIEW.** Any increase of IUSA's costs of operation, due to regulatory requirements, shall be charged to the Shipper, in a fair and reasonable proportion, from the date a particular requirement becomes effective.

12. **INSPECTIONS.** Shipper's representatives, as designated to IUSA in writing, shall have the right to inspect IUSA's White Mesa Mill facilities which are related to receipt, handling, and disposal of the ByProduct Material, at reasonable times and frequency designated by IUSA, and upon at least seven days written notice from Shipper. Shipper shall also have the right to inspect, upon reasonable notice, IUSA's licenses and permits to receive, handle and dispose of ByProduct Material at the White Mesa Mill facility. Such inspections shall be at the sole cost and risk of Shipper's participating representatives, and shall not interfere with IUSA's operations at the White Mesa Mill.

13. **SAFETY.** Shipper, its employees, all its contractors and subcontractors ("Shipper's Personnel"), shall abide by all health, safety, and security rules and regulations in force at the White Mesa Mill, or on any property controlled by IUSA or IUC White Mesa, LLC, while they are present on the premises. Shipper shall indemnify and hold harmless IUSA and IUC White Mesa LLC, for any loss or damages, including reasonable attorney's fees, suffered by IUSA or IUC White Mesa LLC resulting from the failure of Shipper's employees, contractors or subcontractors to comply with the terms of this paragraph 13.

14. **TERMINATION.**

A. This Agreement may be terminated by notice from either party in the event of substantial failure by the other party to fulfill its obligations through no fault of the terminating party, provided that no such termination may be effected unless the other party is given not less than 15 business days written notice (delivered in person or by certified mail, return receipt requested) of intent to terminate, during which time the default may be cured and the Agreement reinstated.

B. If termination is caused by default of Shipper, Shipper shall pay IUSA all sums due hereunder, through the date of termination.


C. In the event termination is caused by default of IUSA, IUSA will reimburse Shipper for all sampling and characterization costs incurred for any pending shipments; any transportation costs incurred for pending shipments.

D. In the event any one party shall have declared force majeure, as cited in Paragraph 24 herein, for any event or events cumulating over 60 days, the other party may terminate this Agreement by five days written notice.

15. **CONFIDENTIALITY.** IUSA and Shipper shall endeavor to keep this Agreement and the terms and conditions contained herein confidential and shall not disclose same to third parties without the other party's prior written consent, which will not be unreasonable withheld, unless such disclosure is required pursuant to applicable law or regulation, including tax and securities laws and regulations, or for the purposes of the financing of IUSA or any of its affiliates. Either party may make such disclosures as it deems appropriate to affiliates, employees, agents, contractors or prospective purchasers, lessees or assigns, provided that any such persons are advised of this confidentiality clause and agree to be bound by it.

16. **NOTICES.** Except as specifically provided to the contrary in this Agreement, any notices or communications permitted or required hereunder shall be deemed properly transmitted when delivered in person or sent by mail, telecopy, or any other form of written communication, addressed to the respective party at the addresses listed below or at such other address as either party may notify that other in writing in accordance with the provisions of this paragraph. Notices shall be deemed to have been given on the date of receipt.

IF TO IUSA:                    International Uranium (USA) Corporation  
                                  Independence Plaza, Suite 950  
                                  1050 Seventeenth Street  
                                  Denver, Colorado 80265  
                                  Phone: (303) 628-7798  
                                  Fax: (303) 389-4125

IF TO SHIPPER:              Uranium Resources, Inc.  
                                  <sup>12750</sup> ~~42377~~ Merit Drive, Suite 1210  
                                   Dallas, Texas 75251  
                                  Phone: (972) 387-7777  
                                  Fax: (972) 387-7779

17. **SURVIVAL OF OBLIGATIONS.** As provided in this Agreement, the obligations, representations and warranties of each party to the other, which are to be performed after termination, shall survive the termination of this Agreement regardless of the cause of termination.

18. **GOVERNING LAW AND VENUE.** This Agreement shall be governed by and construed in accordance with the laws of the State of Colorado.

19. **INUREMENT.** The terms and provisions of this Agreement shall be binding upon and inure to the benefit of the parties hereto, their successors, and assigns. Provided, however, Shipper shall not assign or transfer any of its rights or obligations under this Agreement except with the prior written consent of IUSA, and the written assumption by the transferee of all of the obligations of Shipper in a form satisfactory to IUSA. IUSA's consent to one transfer shall not operate as a waiver of IUSA's rights as to any subsequent transfer by Shipper or any subsequent transferee.

20. **COMPLETE AGREEMENT AND AMENDMENT.** This Agreement constitutes the full and complete understanding of the parties with respect to the subject matter hereof and supersedes any prior agreement, oral or written, relating thereto. This Agreement shall not be amended except in writing, signed by both parties, unless otherwise provided for within this Agreement. The parties hereto agree that any amendments that may be necessary to achieve or maintain compliance with any regulatory program that may apply to the subject of this Agreement shall be made as soon as practicable, provided, however, either party may elect to terminate this Agreement rather than agree to any amendment unless such amendment applies to ByProduct Material already disposed of at the White Mesa Mill, in which case the necessary amendment shall be made.



21. **HEADINGS.** The paragraph headings used in this Agreement are for convenience only, and shall not be deemed part of this Agreement nor used in its interpretation or construction.

22. **ARBITRATION.** Any controversy or claim arising out of or relating to this Agreement or the breach thereof shall be resolved in accordance with the Commercial Arbitration Rules of the American Arbitration Association by one arbitrator. The selection of the Arbitrator shall be in accordance with such rules. The Arbitrator's decision shall be final and binding upon the parties hereto; and judgment upon the award may be entered in any court having jurisdiction. The parties shall each pay one-half of the fees and expenses of the Arbitrator except for all fees and expenses of its own witnesses and counsel. Disputes shall not interrupt operations or other actions contemplated herein.

23. **COSTS AND ATTORNEY FEES.** Except to the extent that such will be considered liquidated damages payable to Shipper under Paragraph 24 and/or to the extent a matter is submitted to arbitration under Paragraph 22, if it is necessary for either party to obtain legal representation to enforce any provision of this Agreement, the non-prevailing party agrees to bear the court costs and reasonable attorney fees of the prevailing party.

24. **LIMITATIONS OF REMEDY.** The parties agree that IUSA shall not be liable for any incidental and/or consequential damages of any nature claimed by Shipper. If IUSA is unable for any reason, except a breach of this Agreement by the Shipper, and other than a breach of any of the provisions of this Agreement by IUSA, to accept delivery and dispose of ByProduct Material of Shipper, Shipper's sole remedy in such an instance shall be a refund of any advance payments or costs incurred by Shipper for pending shipments. Refund of such amount shall be considered as constituting liquidated damages, including any and all incidental and/or consequential damages that might be claimed by Shipper. The parties agree that such a refund is reasonable compensation, and not a penalty, for the reason that actual damages, if any, that might be sustained by the Shipper are uncertain and would be difficult to ascertain.

25. **FORCE MAJEURE.** Except for both parties' indemnification, the obligations of confidentiality and the Shipper's obligations to make payments, the obligations of either party shall be suspended to the extent, and for the period that performance is prevented by any cause, whether foreseeable or unforeseeable, beyond its reasonable control, including, without limitation, labor disputes (however arising and whether or not employee demands are reasonable or within the power of the party to grant), acts of God; laws, regulations, orders, proclamations, instructions or requests of any government or governmental entity whether federal, state or local; acts of war or conditions arising out of or attributable to war, whether declared or undeclared, riot, civil strife, disobedience, insurrection or rebellion, fire, explosion, earthquake, storm, flood, sink holes, drought or other adverse weather condition, or any other cause whether similar or dissimilar to the foregoing, but specifically excluding increasing in the costs of transportation or handling of ByProduct Materials. The affected party shall promptly give notice to the other party, as appropriate of the suspension of performance, stating therein the nature of the suspension, the reasons therefor, and the expected duration thereof. The affected party shall resume performance as soon as reasonably possible.

26. **BOOKS AND RECORDS.** Shipper shall keep complete and accurate books and records respecting all matters covered by this Agreement, including without limitation, records of the quantities and disposition of all ByProduct Materials, which shall be open for inspection by IUSA during business hours.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed by their duly authorized representatives as of the day and year first set forth above.

INTERNATIONAL URANIUM (USA) CORPORATION

By:  \_\_\_\_\_

URANIUM RESOURCES, INC.

By:  \_\_\_\_\_

## 6. Wellfield Decommissioning

### a. Introduction and Description

The Wellfield Decommissioning Budget includes the cost estimates for removing wellfield equipment from the Churchrock Section 8 site. All equipment that was used to circulate leach solution such as pumps and piping is assumed to be contaminated for the purpose of developing the RAP budget and would be disposed in an U.S. NRC licensed waste disposal facility. All structures are considered non-contaminated and would be disposed of in a landfill.

After ground water restoration is complete, all well houses, header houses, laterals, and pipelines will be removed. The budget contemplates costs for disassembly, or demolition, loading, transportation and disposal at a NRC licensed facility<sup>7</sup> or to the Red Rock landfill. Any vegetation, which has been disrupted, will be disked and re-seeded.

### b. Budget Assumptions

The Wellfield Decommissioning Budget is formatted with the underlying assumptions integrated into the tabulation. The budget figures distinguish individually costs associated with break down, excavation, removal, loading, transportation and disposal costs.

Lateral and piping lengths were estimated from the COP schematic Figure 1.4-8. Unit cost calculations are shown in Attachment E-6-2. Well tubing decommissioning costs assumed nominal tubing lengths of 600 feet and 40 existing wells. This quantity of wells is what is needed to supply adequate water to the restoration operations. Other wellfield O & M costs are covered in the groundwater restoration budget.

The Wellfield Decommissioning Budget was developed with the assumption that all labor is contracted at a rate of \$120 per day or \$15 per hour. These are reasonable contract labor rates. Estimate labor time requirements are based on best professional judgment. Management will be provided from the site staff who will be available six months after restoration.

After all of the wellfield equipment is removed the entire wellfield area will be surveyed to assure that no residual contamination remains on the soil. Surveys will be conducted according to the according to Regulatory Guide specified in Attachment E-6-2, and the hot spots are picked up and disposed of at a NRC licensed facility. The on site management described above would conduct these surveys.

Piping will be reduced in volume as indicated in the budget. Pipe volume calculations are shown in attachment E-6-2. The smaller diameter wellfield pipe and well tubing will be crushed. Larger diameter pipe will be cut into quarter strips for volume reduction. No credit is given for

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<sup>7</sup> For the purpose of this budget cycle, HRI assumed that the NRC licensed site would be the IUC White Mesa Mill near Blanding Utah. Projected unit disposal costs at the White Mesa Mill and the Red Rocks landfill are described in Attachment E-5-2.

reduction in the size of pumps, the dryer, the reverse osmosis equipment or the brine concentrator. No credit is given for salvage value.

For demolished tankage and pipe transportation and disposal costs, a 30% void factor was included in all volume calculations. All disposal was priced at the bulk rate as shown in Attachment E-5-2. A contingency was included for health and safety supplies such as disposable uniforms and respirators.

The total cost wellfield decommissioning is projected to be \$103,237.

**ATTACHMENT E-6-1**  
**WELLFIELD DECOMMISSIONING BUDGET**

## Section 8 Wellfield Buildings and Equipment Removal and Disposal

|     | <u>Description</u>                                                                        | <u>Unit</u> | <u>Total</u> |
|-----|-------------------------------------------------------------------------------------------|-------------|--------------|
| I.  | <b>Wellfield Piping</b>                                                                   |             |              |
|     | Assumptions:                                                                              |             |              |
|     | Total length of piping (ft)                                                               | 71120       |              |
|     | Labor included in per foot costs                                                          |             |              |
| A.  | Removal and loading                                                                       |             |              |
|     | Wellfield piping removal unit cost (\$/ft of pipe)                                        | 0.36        |              |
|     | Subtotal wellfield piping removal and loading costs                                       |             | \$25,603     |
| B.  | Pipe crushing                                                                             |             |              |
|     | Number of operators                                                                       | 2           |              |
|     | Operator hourly rate                                                                      | \$15        |              |
|     | Feet pipe per hour                                                                        | 300         |              |
|     | Subtotal crushing cost                                                                    |             | \$7,112      |
| C.  | Transport and disposal costs (NRC-licensed facility)                                      |             |              |
|     | Average diameter of piping (inches)                                                       | 2           |              |
|     | Crushed volume (ft <sup>3</sup> /ft)                                                      | 0.012       |              |
|     | Crushed volume total (ft <sup>3</sup> )                                                   | 873         |              |
|     | Volume for disposal assuming 100% void space (ft <sup>3</sup> )                           | 1746        |              |
|     | Transportation and disposal unit cost (\$/ft <sup>3</sup> )                               | \$2.78      |              |
|     | Subtotal wellfield piping transport and disposal costs                                    |             | \$4,853      |
|     | Wellfield piping costs per wellfield                                                      |             |              |
|     | Total wellfield piping costs                                                              |             | \$37,568     |
| II. | <b>Well Pumps and Tubing</b>                                                              |             |              |
|     | Assumptions:                                                                              |             |              |
|     | Ongoing pump and tubing removal costs included under ground water restoration labor costs |             |              |
|     | 40 production wells contain pumps and tubing                                              |             |              |
| A.  | Pump and tubing transportation and disposal                                               |             |              |
|     | Number of production wells                                                                | 226         |              |
|     | Number of injection wells                                                                 | 215         |              |
| 1   | Pump volume                                                                               |             |              |
|     | Number of production wells with pumps                                                     | 40          |              |
|     | Average pump volume (ft <sup>3</sup> )                                                    | 1           |              |
|     | Pump volume per wellfield (ft <sup>3</sup> )                                              | 40          |              |
| 2   | Tubing volume                                                                             |             |              |
|     | Assumptions:                                                                              |             |              |
|     | Average tubing length/wellfield based on average well depth minus 600 feet                |             |              |
|     | Number of production wells with tubing                                                    | 40          |              |
|     | Average tubing length per well (ft)                                                       | 600         |              |
|     | Tubing length per wellfield (ft)                                                          | 24000       |              |
|     | Diameter of production well fiberglass tubing (inches)                                    | 2           |              |
|     | Crushed volume reduction (ft <sup>3</sup> /ft)                                            | 0.012       |              |
|     | Wellfield pipe volume w 100% void                                                         | 589         |              |
|     | Volume of pump and tubing (ft <sup>3</sup> )                                              | 629         |              |
|     | Volume for disposal assuming 30% void space (ft <sup>3</sup> )                            | 818         |              |
|     | Transportation and disposal unit cost (\$/ft <sup>3</sup> )                               | \$2.78      |              |

|             |                                                                      |            |            |
|-------------|----------------------------------------------------------------------|------------|------------|
|             | Subtotal pump and tubing transport and disposal costs                | \$2,273.39 |            |
|             | Pump and tubing costs per wellfield                                  |            | \$2,273.39 |
| <b>III.</b> | <b>Buried Trunkline</b>                                              |            |            |
|             | Length of trunkline trench (ft)                                      | 25800      |            |
|             | A. Removal and Loading                                               |            |            |
|             | Main pipeline removal unit cost (\$/ft of trench)                    | \$0.42     |            |
|             | Subtotal trunkline removal and loading costs                         | \$10,870   |            |
|             | B. Pipe cutting                                                      |            |            |
|             | Number of operators                                                  | 2          |            |
|             | Operator hourly rate                                                 | \$15       |            |
|             | Feet pipe per hour                                                   | 100        |            |
|             | Subtotal cutting cost                                                | \$7,740    |            |
|             | C. Transport and disposal costs (NRC-licensed facility)              |            |            |
|             | 1 10" HDPE trunkline                                                 |            |            |
|             | Piping length (ft)                                                   | 5700       |            |
|             | Inj and ext length                                                   | 11400      |            |
|             | Cut volume (ft <sup>3</sup> /ft)                                     | 0.14       |            |
|             | Cut volume (ft <sup>3</sup> )                                        | 1596       |            |
|             | 2 14" HDPE trunkline                                                 |            |            |
|             | Piping length (ft)                                                   | 7200       |            |
|             | Inj and ext length                                                   | 14400      |            |
|             | Cut volume (ft <sup>3</sup> /ft)                                     | 0.24       |            |
|             | Cut volume (ft <sup>3</sup> )                                        | 3413       |            |
|             | Total trunkline chipped volume (ft <sup>3</sup> )                    | 5009       |            |
|             | Volume for disposal assuming 30% void space (ft <sup>3</sup> )       | 6511       |            |
|             | Transportation and disposal unit cost (\$/ft <sup>3</sup> )          | \$2.78     |            |
|             | Subtotal trunkline transport and disposal costs                      | \$18,102   |            |
|             | Trunkline decommissioning costs                                      |            | \$36,712   |
| <b>IV.</b>  | <b>Well Houses</b>                                                   |            |            |
|             | Total quantity                                                       | 40         |            |
|             | Average well house volume (ft <sup>3</sup> )                         | 12.5       |            |
|             | A. Removal                                                           |            |            |
|             | Total volume (ft <sup>3</sup> )                                      | 500        |            |
|             | Demolition unit cost per WDEQ Guideline No. 12 (\$/ft <sup>3</sup> ) | \$0.15     |            |
|             | Subtotal well house demolition costs                                 | \$76       |            |
|             | B. Survey and decontamination                                        |            |            |
|             | Assumptions:                                                         |            |            |
|             | Cost per well house                                                  | \$5        |            |
|             | Subtotal Survey and decontamination costs                            | \$200      |            |
|             | C. Disposal                                                          |            |            |
|             | Total volume (yd <sup>3</sup> )                                      | 19         |            |
|             | Volume for disposal assuming 10% void space (cy)                     | 20         |            |
|             | Unrestricted disposal cost of 26.7 \$/yd <sup>3</sup>                | \$27.00    |            |
|             | Subtotal unrestricted disposal costs                                 | \$530      |            |
|             | Well house removal and disposal per wellfield                        |            | \$806      |
| <b>VI.</b>  | <b>Header Houses</b>                                                 |            |            |
|             | Total quantity                                                       | 11         |            |

|    |                                                                               |          |                  |
|----|-------------------------------------------------------------------------------|----------|------------------|
|    | Average header house volume (ft <sup>3</sup> )                                | 1600     |                  |
| A. | Removal                                                                       |          |                  |
|    | Total volume (ft <sup>3</sup> )                                               | 17600    |                  |
|    | Demolition unit cost per WDEQ Guideline No. 12 (\$/ft <sup>3</sup> )          | \$0.15   |                  |
|    | Subtotal building demolition costs                                            | \$2,675  |                  |
| B. | Survey and decontamination                                                    |          |                  |
|    | Assumptions:                                                                  |          |                  |
|    | Cost per header house                                                         | \$200    |                  |
|    | Subtotal survey and decontamination costs                                     | \$2,200  |                  |
| C. | Disposal                                                                      |          |                  |
|    | Total volume (cy) assume 10% building volume                                  | 65       |                  |
|    | Volume for disposal assuming 10% void space (cy)                              | 72       |                  |
|    | Unrestricted disposal cost of 26.7 \$/yd <sup>3</sup>                         | \$27.00  |                  |
|    | Subtotal on-site disposal costs                                               | \$1,936  |                  |
|    | Header house removal and disposal costs per wellfield                         |          | \$6,811          |
| V. | Soil                                                                          |          |                  |
|    | Assumptions:                                                                  |          |                  |
|    | Acres of wellfield.                                                           | 40       |                  |
|    | Surveys by staff.                                                             |          |                  |
|    | Depth of contaminated soil (in)                                               | 2        |                  |
|    | Percent of wellfield contaminated                                             | 1        |                  |
|    | Soil analysis each                                                            | \$100    |                  |
| A. | Survey costs                                                                  |          |                  |
|    | 100 soil sample analysis                                                      | \$10,000 |                  |
|    | Flags, and supplies                                                           | \$1,000  |                  |
|    | Subtotal survey costs                                                         | \$11,000 |                  |
| B. | Disposal costs                                                                |          |                  |
|    | Backhoe one week                                                              | \$1,510  |                  |
|    | Volume to disposal                                                            | 2904     |                  |
|    | NRC disposal unit cost (ft <sup>3</sup> )                                     | \$2.78   |                  |
|    | Subtotal NRC-licensed facility disposal costs                                 | \$8,067  |                  |
|    | Wellfield soil D & D costs                                                    |          | \$19,067         |
|    | <b>TOTAL WELLFIELD BUILDINGS AND EQUIPMENT<br/>REMOVAL AND DISPOSAL COSTS</b> |          | <b>\$103,237</b> |



**ATTACHMENT E-6-2  
BUDGET BACKUP**

---

**WELLFIELD PIPING REMOVAL  
MAIN PIPELINE REMOVAL  
PIPE VOLUMES  
REGULATORY GUIDANCE**

## WELLFIELD PIPING REMOVAL

### Assumptions:

1. Trenching with backhoe at 1500 ft/day
2. Pipeline extraction and backfilling with backhoe at 1500 ft/day
3. Backhoe rental: \$750/week
4. Fuel cost: \$9/operating hour
5. Backhoe operation requires 1 worker at \$15/hour
6. Pipeline extraction requires 2 workers at \$15/hour (in addition to trackhoe operator)
7. Operating schedule: 8 hrs/day, 5 days/week

### Wellfield Pipeline Removal Costs per ft of Pipe

#### Equipment & Fuel

|         | <u>Weekly</u> | <u>Daily</u> | <u>Hourly</u> | <u>Per Foot</u> |
|---------|---------------|--------------|---------------|-----------------|
| Backhoe | \$550.00      | \$110.00     | \$13.75       | \$0.07          |
| Fuel    |               | \$72.00      | \$9.00        | \$0.05          |

#### Labor

|                         |  |          |         |        |
|-------------------------|--|----------|---------|--------|
| Backhoe operator        |  | \$120.00 | \$15.00 | \$0.08 |
| Pipeline Extractors (2) |  | \$240.00 | \$30.00 | \$0.16 |

Totals \$67.75

**Total Per Foot Cost** \$0.36

71120 feet of pipe removed. \$25,698.03

## MAIN PIPELINE REMOVAL

### Assumptions:

1. Trenching with trackhoe at 1,500 ft/day
2. Pipeline extraction and backfilling with trackhoe at 1500 ft/day
3. Trackhoe rental: \$1600/week
4. Fuel cost: \$9/operating hour
5. Trackhoe operation requires one worker at \$15/hour
6. Pipeline extraction requires 2 workers at \$15/hour (in addition to trackhoe ope
7. Pipelines removed simultaneously
8. Includes removal of manholes
9. Operating schedule: 8 hours/day, 5 days/week

### Main Pipeline Removal Costs per ft of Pipe

#### Equipment & Fuel

|          | <u>Weekly</u> | <u>Daily</u> | <u>Hourly</u> | <u>Per Foot</u> |
|----------|---------------|--------------|---------------|-----------------|
| Trackhoe | \$1,200.00    | \$240.00     | \$30.00       | \$0.16          |
| Fuel     |               | \$72.00      | \$9.00        | \$0.05          |

#### Labor

|                         |  |          |         |        |
|-------------------------|--|----------|---------|--------|
| Trackhoe operator       |  | \$120.00 | \$15.00 | \$0.08 |
| Pipeline extractors (2) |  | \$240.00 | \$30.00 | \$0.16 |

**Total Per Foot Cost** \$0.45

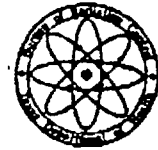
26800 feet of pipe removed. \$12,006

## Pipe Wall Volume Data

| <u>Outside Diameter (in)</u> | <u>Area Inside OD (ft2)</u> | <u>Wall Volume SDR17 (ft3/ft)</u> |
|------------------------------|-----------------------------|-----------------------------------|
| 2                            | 0.022                       | 0.012                             |
| 2.5                          | 0.034                       |                                   |
| 3                            | 0.049                       | 0.018                             |
| 3.5                          | 0.067                       |                                   |
| 4                            | 0.087                       |                                   |
| 4.5                          | 0.110                       |                                   |
| 5                            | 0.136                       |                                   |
| 5.5                          | 0.165                       |                                   |
| 6                            | 0.196                       |                                   |
| 6.5                          | 0.230                       |                                   |
| 7                            | 0.267                       |                                   |
| 7.5                          | 0.307                       |                                   |
| 8                            | 0.349                       |                                   |
| 8.5                          | 0.394                       |                                   |
| 9                            | 0.442                       |                                   |
| 9.486                        | 0.491                       |                                   |
| 9.5                          | 0.492                       |                                   |
| 10                           | 0.545                       | 0.140                             |
| 10.5                         | 0.601                       |                                   |
| 10.75                        | 0.630                       |                                   |
| 11                           | 0.660                       |                                   |
| 11.5                         | 0.721                       |                                   |
| 12                           | 0.785                       |                                   |
| 12.353                       | 0.832                       |                                   |
| 12.5                         | 0.852                       |                                   |
| 13                           | 0.922                       |                                   |
| 13.5                         | 0.994                       |                                   |
| 14                           | 1.069                       | 0.237                             |
| 14.5                         | 1.147                       |                                   |
| 15                           | 1.227                       |                                   |
| 15.5                         | 1.310                       |                                   |
|                              | Wall Tk                     |                                   |
| 14 " SDR 17                  |                             | 0.824                             |
| 10 " SDR 17                  |                             | 0.632                             |



BUREAU OF RADIATION CONTROL  
**REGULATORY GUIDE**  
TEXAS DEPARTMENT OF HEALTH



REGULATORY GUIDE 5.10

GUIDELINES FOR CONDUCTING CLOSE OUT SURVEYS OF OPEN LANDS  
AND REQUESTING RELEASE FOR UNRESTRICTED USE

I. Introduction

This document may be used as a guide for selecting sampling methods, performing surveys, and documenting the decontamination of open lands which have been restricted or potentially contaminated due to the use of radioactive material. Guidelines are also given for data which should be provided to the Agency when the licensee requests release of open lands for unrestricted use. This guide applies primarily to the release of lands which have been involved with in situ uranium recovery operations.

Before beginning surveying and sampling of the open lands to be released, the licensee should submit a surveying and sampling plan to the Agency, based upon the guidelines in this document.

II. Standards

The Agency adopted soil limits for radium-226 or radium-228 in the Texas Regulations for Control of Radiation (TRCR) 21.108 as follows:

1. 5 picocuries per gram (pCi/gm) above background in the first 15-centimeter (cm) layer of soil averaged over a 100 square-meter (m<sup>2</sup>) area, and
2. 15 pCi/gm above background averaged over a 100-m<sup>2</sup> area in any 15-cm layer thereafter.

The Agency took a conservative approach in establishing soil contamination limits for other radionuclides by converting the units in TRCR Appendix 21-A (Table II, Column 2) from microcuries per milliliter to microcuries per gram. With a water sample, it is assumed that the concentration of the contaminant is evenly distributed in the volume of water sampled. Soil tends to attenuate the movement of the contaminant and concentrates the contaminant in a smaller volume. If all of the

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TEXAS DEPARTMENT OF HEALTH, BUREAU OF RADIATION CONTROL, REGULATORY GUIDES

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Comments and suggestions for improvements in these Regulatory Guides are encouraged at all times and they will be revised, as appropriate, to accommodate comments and to reflect new information or experience. Comments should be sent to the Administrator, Standards Branch, Bureau of Radiation Control, Texas Department of Health, 1100 W. 49th Street, Austin, Texas 78756.

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radioactive material per gram of soil were released to water, the unrestricted water release limits would not be exceeded. Averaging over a soil volume of 100 m<sup>2</sup> by 15 cm in depth is considered adequate for radium-226. Therefore, it is practicable for the Agency to use the same averaging technique for natural uranium concentrations. The 100 m<sup>2</sup> by 15 cm in depth sampling method may be used for soils contaminated with natural uranium and the associated daughter products resulting from uranium recovery operations. For all other radionuclides, averaging should be over a soil volume of 1 meter by 1 meter by 15 cm in depth. Surveys must be conducted in accordance with TRCR 21.201. The licensee should realize that the standards used are decontamination limits. The licensee should adhere to the concept of "As Low As Reasonably Achievable" (ALARA).

### III. Instrumentation

The licensee should determine which type of instrumentation is most sensitive to the types and energies of radiation to be detected. When performing close out surveys, the Agency uses 1 inch by 1 inch sodium iodide probes in conjunction with an appropriate ratemeter for surveying open lands which have been involved in uranium recovery operations. However, the licensee may choose other appropriate instrumentation, such as microrentgen meters. The instrument used should be appropriately calibrated and a daily efficiency check should be performed to assure the instrument is working properly. The licensee should also consider the distance at which the instrument is able to detect a significantly elevated area (hot spot) and the appropriate height above the ground at which the probe should be held. A hot spot is considered to be an area with a reading equal to or greater than twice background or an area with a radionuclide concentration sufficiently high such that the average for the 100-m<sup>2</sup> area will exceed the soil contamination limits.

### IV. Survey and Sampling Procedures

#### A. Preliminary Survey Design

The licensee's preliminary survey area should be delineated with optimum grid spacing for the size of area to be released. In no case should any grid spacing be greater than 10 meters. Each grid line should be surveyed along the entire length of the line. Readings should be recorded at no more than 10-meter intervals. Although instrument readings may be documented every few meters, the response of the instrument should be monitored continuously while surveying along the grid lines.

Background radiation levels should be established by surveying areas adjacent to the survey area which are not affected by facility operations. The background level established by the licensee is subject to Agency approval. If readings taken in the survey area cannot be distinguished from the established background level, those readings should be recorded as being the same as background.

The licensee's survey should be on a grid spacing small enough to assure the Agency that a hot spot has not been missed. Hot spots should be physically marked and recorded.

Should the licensee decide to leave a hot spot(s), the area of contamination should be documented and an explanation submitted to the Agency justifying why the licensee has decided not to decontaminate the area.

If no hot spots are encountered during the preliminary survey, the licensee may use the preliminary survey as its final survey. If the preliminary survey is to be used as the final survey, random samples should be collected from the survey area, with a minimum of three samples per acre. Any hot spots found during the preliminary survey may be decontaminated after the preliminary survey. Also, a final survey need only document the decontamination of those areas found to be contaminated in the preliminary survey. The licensee should verify that soil contamination does not exceed the limits specified in TRCR 21.108.

#### B. Sampling Procedures

The licensee's sampling program should be comprehensive, covering the entire area to be released. If the licensee chooses not to decontaminate, the following areas should be sampled:

- (1) Any area with survey readings which are greater than twice background;
- (2) Any area which has an average reading of one and one-half times the background reading and encompasses an area of 50 m<sup>2</sup> or greater.

The remaining discussion of the sampling procedures will be directly related to uranium recovery operations. However, other licensees may use similar procedures over the sampling area of concern.

When sampling an area, the samples collected should be representative of the entire area. If the contaminated area covers 50 percent of the 100-m<sup>2</sup> area, then 50 percent of the samples collected should be from the contaminated area.

The licensee may average the concentrations of radium-226 and natural uranium over the first 15 cm of soil below the surface in a 100-m<sup>2</sup> area. In soil more than 15 cm below the surface, the concentrations may be averaged in 15-cm layers in a 100-m<sup>2</sup> area. The licensee should, at a minimum, sample the initial 15-cm layer (0-15 cm), and the second 15-cm layer (15-30 cm) if concentrations in the initial 15-cm layer indicate deeper sampling is necessary. A minimum of five samples from each layer should be collected within the 100-m<sup>2</sup> area.

When sampling a contaminated area which is less than 100 m<sup>2</sup>, the hot spot must be sampled as part of a single 100-m<sup>2</sup> area. The contaminated area may not be split into two sections which are located in two separate 100-m<sup>2</sup> areas. Figure 1 depicts an acceptable method of sampling and Figure 2 depicts an unacceptable method of sampling such a hot spot.

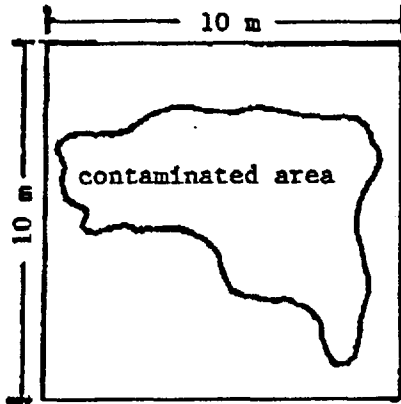


Figure 1

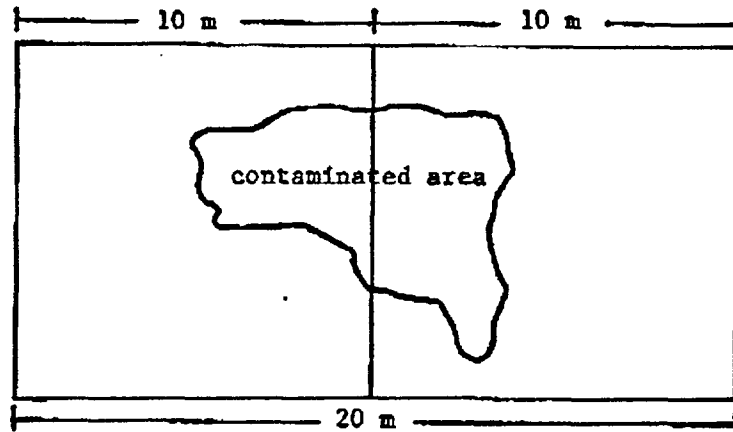


Figure 2

However, if the contamination occurs in narrow strips, 1 meter wide or less, the Agency may allow the licensee to divide the contaminated area into more than one sampling area as depicted in Figure 3. The dimensions of the sampling area should not be narrower than 5 meters on any boundary.

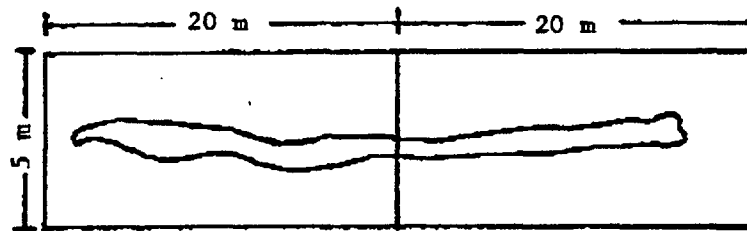
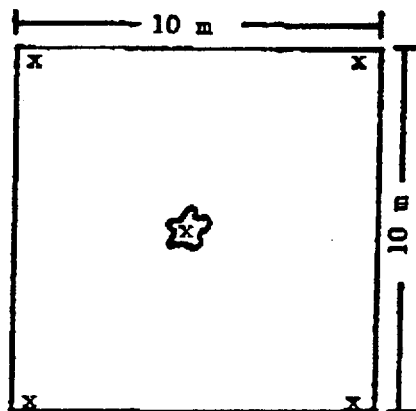


Figure 3



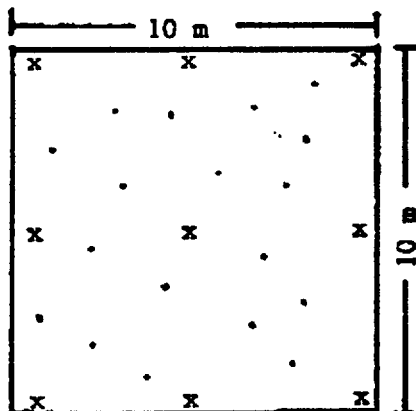
If a small hot spot is encountered (less than 1 meter in diameter), then that hot spot should be placed in the center of the 100-m<sup>2</sup> sampling area. One sample should be collected from the hot spot and four additional samples collected by sampling 1 meter toward the center from each corner of the 100-m<sup>2</sup> area. Again, the initial 15-cm layer (0-15 cm) should be sampled, and the second 15-cm layer (15-30 cm) if necessary. This sampling technique is depicted in Figure 4.



x denotes sample location

Figure 4

If numerous small hot spots occur in close proximity to one another, they should be sampled as one 100-m<sup>2</sup> area, and a more widely distributed array of samples should be collected from such an area. Figure 5 is an example of an acceptable method.



x denotes sample locations

••• denotes hot spots

Figure 5

Figure 5 indicates nine samples collected from the 100-m<sup>2</sup> area. The licensee may choose fewer or additional sampling locations within the 100-m<sup>2</sup> sampling area.

All areas which are sampled should be accurately identified on a scaled map. The samples should then be submitted to a qualified laboratory for analyses. The Agency recommends that each sample be analyzed separately. After the analyses of the samples are completed, the results can be averaged with results of other samples collected from the same sampling area and the same depth. The separate analysis of each sample allows a more precise determination as to the highest concentrations that will be released.

#### V. Request For Agency Confirmation Survey and Sampling

When the licensee is confident that the area of concern will be acceptable for release for unrestricted use, a written request asking for release for unrestricted use must be submitted to the Agency. The information discussed in this regulatory guide should be submitted in a comprehensive report accompanied by survey and sample results which show that contamination is less than the limits specified in TRCR 21.108.

If the area to be released has been involved in uranium mining or milling, the Agency will perform a survey before a release will be authorized. If the area involves a well field or part of a well field, the Agency will also perform a survey before a release will be authorized. In all cases, the well field or portion thereof must be considered restored by the Texas Water Commission (TWC) and the TWC requirements must be satisfied before the Agency will consider releasing the surface for unrestricted use.

The licensee should submit as much information as possible to aid the Agency in performing an efficient confirmatory survey and sampling program. Submitting pre-operational data will help the Agency determine the background for the area. Should pre-operational data not be available, background radiation levels should be established as indicated in Section IV.A. of this document.

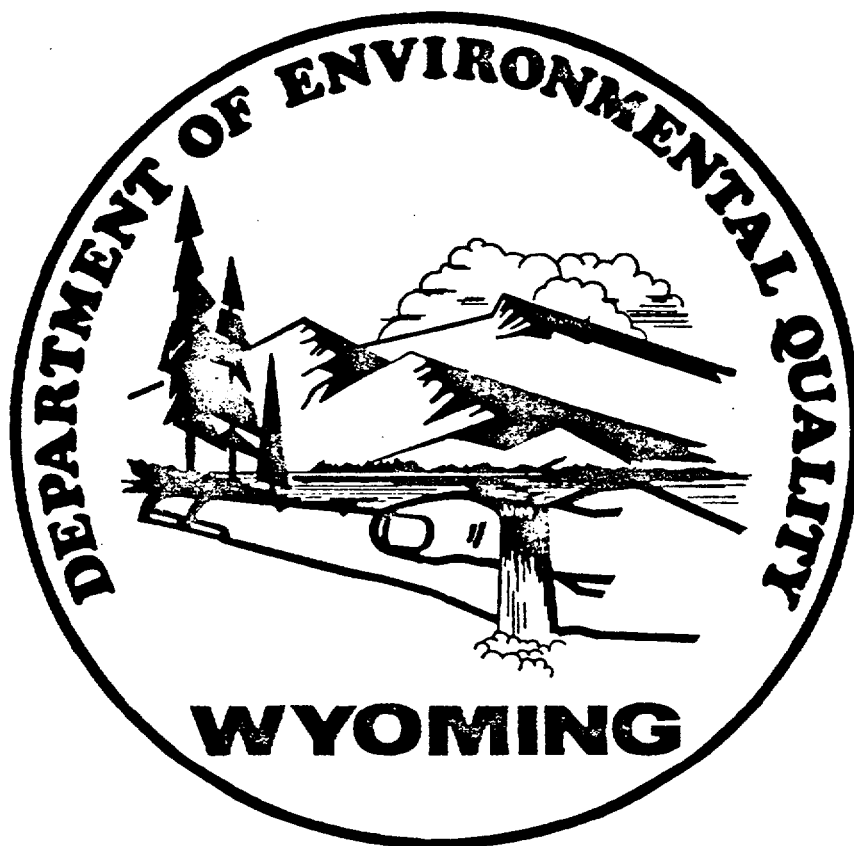
Operational data, such as maps of non-routine contamination, including spills and pipe leaks, will aid the Agency in determining areas that might need closer attention. Documentation of cleanup activities during operation, and sample results before and after cleanup should be submitted to the Agency.

Documentation of the survey results should be submitted to the Agency in the form of a scaled survey map which provides coordinates of the area surveyed. The map should also identify all structures in that area.

In order for an area to be released, soil contamination must not exceed the limits specified in TRCR 21.108. The licensee's release request should include surveys and sample results demonstrating that these limits have been met.

Because of limitations in Agency manpower and time, each licensee should prepare for the release of its equipment or facilities far enough in advance to provide sufficient time for appropriate surveys and sample analyses to be performed. The licensee should be aware that an Agency inspector may terminate a close out survey should a discrepancy exist between the Agency's survey and the information submitted by the licensee. Such discrepancies may include the inspector encountering higher survey readings than reported by the licensee, or misrepresentation of areas of contamination. Terminating a close out survey could cause delays in acquiring approval for release of the area. The licensee will be required to submit information to the Agency to explain the discrepancies, the actions taken to correct them, and the results of a complete follow-up survey. The Agency would then reschedule the close out survey.

**DEPARTMENT OF ENVIRONMENTAL QUALITY  
LAND QUALITY DIVISION**



**GUIDELINE NO. 12**

**STANDARDIZED RECLAMATION  
PERFORMANCE BOND FORMAT AND COST  
CALCULATION METHODS**

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## INTRODUCTION

This document is a Guideline only. Its contents are not to be interpreted by the applicant/permittee or Wyoming Department of Environmental Quality (WDEQ) staff as mandatory. This Guideline intends to assist applicants/permittees in understanding and attaining the requirements of the Wyoming Environmental Quality Act (WEQA) and Land Quality Division (LQD) Rules and Regulations addressing bonding topics.

This Guideline was developed as a joint project of the Wyoming Mining Association (WMA) Reclamation Subcommittee and the LQD. The LQD has and intends to selectively and periodically publish updated versions of the Cost Calculation Methods as contained in the various Appendices.

## APPLICABLE WEQA STATUTES AND LQD RULES AND REGULATIONS

This is a general summary of items from the WEQA.

W.S. §35-11-417:

Outlines some general provisions applying to initial bond and renewal bond values. This statute outlines the concept of Partial Bond Release.

W.S. §35-11-418:

Outlines acceptable bond vehicles.

W.S. §35-11-423:

Outlines procedures for bond release for coal and other mineral permittees.

W.S. §35-11-411(d):

Authorizes the WDEQ Director to establish the bond amount based upon information submitted in the annual report, an inspection and other materials.

These items in LQD Rules and Regulations have some applicability to bonding.

Coal Rules and Regulations, Chapter 1, Section 2.(k) and Noncoal Rules and Regulations, Chapter 1, Section 2.(i) defines bond.

Coal Rules and Regulations, Chapter 2, Section 3.(b)(xxi) requires that shared structures be cross-referenced in the bonds of applicable coal permittees.

- Coal Rules and Regulations, Chapter 4, Section 2.(d)(ix) establishes a minimum ten (10) year bond period for coal permittees.

Coal Rules and Regulations, Chapter 11 and Noncoal Rules and Regulations, Chapter 6 outlines definitions and procedures for the self-bond program.

Coal Rules and Regulations, Chapter 12 applies exclusively to coal permittees. Section 2.(a) defines the Area and Incremental Bonds. Section 2.(b) elaborates further bond data requirements. Section 2.(d) explains the liability areas and periods for the Area and Incremental Bonds. Section 2.(e) distinguishes among and establishes procedures for bond adjustments versus bond reductions versus partial bond releases. Sections 2.(f) through (h) address requirements for specific bond vehicles.

Coal Rules and Regulations, Chapter 14, Section 4. and Noncoal Rules and Regulations, Chapter 8, Section 3. require a bond for exploration by drilling.

Coal Rules and Regulations, Chapter 15 outlines procedures for partial or complete release of coal permittee bonds.

Noncoal Rules and Regulations, Chapter 9, Section 2. discusses bond requirements for conversion of a non-coal Small Mine Permit to a Regular Mine Permit.

Coal Rules and Regulations, Chapter 20 and Noncoal Rules and Regulations, Chapter 12 details information on Letters of Credit used as a bond vehicle.



## I. COST EXPLANATION FOR ITEMS USED IN STANDARDIZED RECLAMATION BOND COSTS

Equipment sizes (loaders, trucks, scrapers, motor graders, etc.) were selected and agreed upon by the WMA Committee and WDEQ/LQD based on the usual types of equipment contractors normally have available for use. Costs for other equipment may be calculated by using methodologies as shown in this package.

Owning and operating costs were determined, except where noted, by using the Dataquest Cost Reference Guide (DQCRG). The total owning and operating costs have been adjusted in this package to reflect wholesale prices rather than retail. To do this, a ten percent reduction has been made to DQCRG costs.

Costs for the electric shovel and the trucks associated with the shovel were determined from Western Mine Engineering, Inc. Surface Mine Estimator's Guide (Oct. 1997 Version). There was no adjustment factor used for these costs since they are based on actual costs at mining operations in the United States.

A standard efficiency factor of 0.83 is incorporated into all production calculations. The factor accounts for a fifty-minute work hour as recommended by many cost references.

Labor costs were obtained from the Wyoming Department of Transportation, Wage Determination Decision (1997) with an additional 25 percent for benefits, unemployment insurance, social security, etc.

Supervision costs were determined by adding \$5.00 per hour to labor costs and also include the 25 percent add-on for benefits, etc. In most cases, only a portion of a supervisor's costs is applied to each task. Theoretically, this allows one supervisor the flexibility to oversee many jobs or pieces of equipment at the same time.

The supervisor's transportation is also divided among tasks. For example, where one-half of a supervisor's time is allotted, the same amount of time is used in calculating his transportation costs.

Where only a portion of support equipment are used in a calculation (i.e., one-half water truck), it is assumed that the equipment in question services more than one area.

Table D-1. Operating Costs and Adjusted Costs (\$/Hour w/o Operator) For Equipment in This Standardized Bond Format

| Equipment Type     | Equipment Name         | DQCRG Book Cost (\$) | Multiplier (%) | Adj. Cost (\$) | Date |
|--------------------|------------------------|----------------------|----------------|----------------|------|
| Dozer              | Caterpillar D9R (SU)   | 113.60               | 90             | 102.24         | 3/98 |
| Blade              | Caterpillar 16H        | 72.79                | 90             | 65.51          | 3/98 |
| Scraper            | Caterpillar 657E P-P   | 221.51               | 90             | 199.36         | 3/98 |
| Truck (95 ton)     | Caterpillar 777D       | 170.45               | 90             | 153.41         | 3/98 |
| Loader (13½ yd³)   | Caterpillar 992D       | 192.26               | 90             | 173.03         | 3/98 |
| Loader (5¼ yd³)    | Caterpillar 980F       | 64.38                | 90             | 57.94          | 3/98 |
| Dozer              | Caterpillar D10R (SU)  | 148.97               | 90             | 134.07         | 3/98 |
| Dozer              | Caterpillar D11R (U)   | 223.85               | 90             | 201.47         | 3/98 |
| Dozer              | Caterpillar D9N (U)    | 105.11               | 90             | 94.60          | 3/98 |
| Backhoe Loader     | Caterpillar 428B (2WD) | 16.74                | 90             | 15.07          | 3/98 |
| Water Truck        | 14,000 Gallon          | 135.22               | 90             | 121.70         | 3/98 |
| Dump Truck         | 10-12 yd³              | 29.47                | 90             | 26.52          | 3/98 |
| Pickup Truck       | Crew 4x4 3/4T (Gas)    | 9.74                 | 90             | 8.77           | 3/98 |
| Pickup Truck       | Crew 4x4 3/4T (Diesel) | 7.85                 | 90             | 7.07           | 3/98 |
| Tractor            | MF 50EX 4WD 74 H.P.    | 9.11                 | 90             | 8.20           | 3/98 |
| Towed Mower        | Flail 7 ft             | 1.28                 | 90             | 1.15           | 3/98 |
| Rubber Tired Dozer | Caterpillar 834B       | 96.00                | 90             | 86.40          | 3/98 |
| Scraper            | Caterpillar 637E P-P   | 169.05               | 90             | 152.15         | 3/98 |

**Table D-1a. Purchase Price, Lease Cost, and Operating Costs for 56 CY Electric Shovel and 793C Trucks**

Operators that use the truck/shovel appendix must show a regrading plan that is suitable for a large shovel/truck operation. Many backfill operations are not suited for this type operation because the cuts are not thick enough to allow the shovel optimum digging depths, highwall reduction with dozers takes up a large percentage of the required backfill, and there is insufficient backfill to justify this large shovel/truck fleet.

Operators using the shovel/truck appendix should submit suitable cut and fill isopachs that support the choice of this backfill method.

This method is not to be used for topsoil movement from native areas or from stockpiles.

The \$7,988,916.00 purchase price of the 56 CY shovel must be added to the bond costs. There is no profit or other contingency items added to this cost so it can be added to the bond cost after all the line items and add-ons have been totaled. No salvage value is allowed at the end of the project.

56 CY Electric Shovel

Purchase Price \$7,988,916.00 (WME)  
 Productivity - 56 CY x 1 pass/35 sec. x 3,600 sec./hr. x 0.968 bucket fill factor = 5,576 CY/hr.  
 5,576 CY/hr. x 0.8696 BCY/LCY (15% swell of BCY) = 4,849 BCY/hr.  
 4,849 BCY/hr. x 0.8333 (operating efficiency) = 4,040 BCY/hr.

Hourly Costs (WME)

| <u>Parts</u> | <u>Maint. Labor</u> | <u>Elect.</u> | <u>Lube</u> | <u>Total</u> |
|--------------|---------------------|---------------|-------------|--------------|
| \$55.94      | \$46.23             | \$123.64      | \$22.83     | \$248.64     |

Caterpillar 793C Trucks (240 Ton)

Purchase Price \$2,539,800.00 (WME)  
 Monthly Lease (@600 hr./month) \$45,000.00  
 Hourly Lease Cost \$75.00

Hourly Costs (WME)

| <u>Parts</u> | <u>Maint. Labor</u> | <u>Fuel</u> | <u>Lube</u> | <u>Tires</u> | <u>Total</u> |
|--------------|---------------------|-------------|-------------|--------------|--------------|
| \$23.04      | \$16.32             | \$26.05     | \$16.80     | \$35.94      | \$118.15     |

Table D-2. Abbreviations Used in This Standardized Bond Format

|             |                                                                                   |
|-------------|-----------------------------------------------------------------------------------|
| CPH -       | Caterpillar Performance Handbook (Edition No. specified where appropriate)        |
| DQCRG -     | Dataquest Cost Reference Guide (date of data indicated)                           |
| WYDOT-WDD - | Wyoming Department of Transportation - Wage Determination Decision (1997 Version) |
| WME -       | Western Mine Engineering, Inc. (Oct. 1997 Estimating Guide)                       |
| BCY -       | Bank Cubic Yard                                                                   |
| LCY -       | Loose Cubic Yard                                                                  |
| MPH -       | Miles Per Hour                                                                    |
| BHB -       | Black Hills Bentonite Corporation                                                 |
| AML -       | DEQ Abandoned Mine Land Reclamation Program                                       |

## II. STANDARDIZED RECLAMATION BOND FORMAT

Individual items may be expanded as necessary or noted as not applicable based upon the specific reclamation practices approved in each permit.

### A. Area Bond

The Area Bond covers the costs of backfilling and rough grading (and special reconstruction techniques when specifically approved) according to procedures and postmining topography approved in the current term permit.

#### 1. Introduction

Present a general discussion of assumptions, calculations, procedures, methods, etc. for summarizing or documenting calculations.

#### 2. Backfill

Describe equipment, procedures, volumes, and costs for bringing all pits to an interim/bond topography with reference to a quality, current map of the project site. The interim/bond topography must come as close as possible to the approved final topography, acknowledging that the current mine site differs from the final configuration.

Appendices A through F detail equipment fleets and costs for this reclamation activity.

Operators should clearly show cut and fill areas and the associated haul distances and grades on a map.

This section should clearly list overburden Drilling and Blasting cost at \$0.10/BCY when applicable.

### 3. Rough Grade Backfill

Describe procedures and costs for shaping interim/bond topography with reference to a quality map. NOTE: Depending upon permit approved backfill practices, rough grading may not be a necessary line item bond cost.

Appendices G and M detail equipment and costs for this reclamation activity.

### 4. Final Grade Backfill

Describe equipment, procedures, and costs for specific site tasks (e.g., drainage reconstruction or permit-specific postmining features).

Appendix G details equipment and costs for this reclamation activity.

## B. Incremental Bond

### 1. Introduction

The Incremental Bond covers all other costs beyond those detailed in the Area Bond.

Present a general discussion of assumptions, calculation procedures, methods for summarizing or documenting calculations, etc.

### 2. Native Topsoil Removal From Borrow and/or Backslope Areas

If applicable, describe equipment, volumes, haul routes, and costs with reference to a quality, current map of the project site.

Appendices A, B, C, E, F and G detail potential equipment and costs for this reclamation activity.

### 3. Native Overburden Removal From Borrow and/or Backslope Areas

If applicable, describe equipment, haul routes, volumes, and costs with reference to a quality, current map of the project site.

Appendices A through G detail potential equipment and costs for this reclamation activity.

### 4. Miscellaneous Overburden Redistribution

Describe equipment, haul routes, volumes, and costs (with reference to a quality map) for backfilling structures, such as:

- scoria or shale pit(s)
- diversion ditches
- access/haul road cut or fill
- railroad cuts/embankments
- sediment ponds
- sewage lagoons
- culverts
- other

Appendices A through G (excluding D) detail potential equipment and costs for this reclamation activity.

## 5. Demolition

Equipment, procedures, and costs for demolition and disposal of each individual structure should be described in terms of size, type of construction, etc. so that appropriate demolition costs can be estimated, such as:

- fences
- power lines, transformers
- hard-surfaced roads
- bridges
- abandoned equipment (i.e., draglines, shovels, drills and pieces of same)
- culverts
- railroads (rails, ties, ballast, scales, etc.)
- facility buildings (shops, warehouse, offices, etc.)
- mineral handling facilities (truck dumps, conveyors, silos, scales, etc.)
- support facilities (ready line, fuel tanks, water tanks, equipment yards, explosive storage sites, electrical substations)

Appendices H through K contain costs for these reclamation and demolition practices.

## 6. Removal of Monitoring Structures and Other Miscellaneous Items

Describe the procedures, equipment, and costs required to properly abandon or remove and disposal of items, such as:

- groundwater monitor wells
- all other operator-owned wells within the permit area
- surface water monitoring stations
- all other experimental study sites within the permit area
- meteorological/air quality monitoring sites

Appendices L through O detail equipment and costs for these reclamation practices.

## 7. Scarification or Ripping of All Compacted Surfaces

Describe equipment, procedures, and costs (preferably on a per acre basis) with reference to a quality, current map of the project site.

Appendices II and P detail costs for this reclamation practice.

8. Topsoil Redistribution on All Disturbed Areas

Describe equipment, procedures, and costs with reference to a quality, current map of the project site. The map should show haul distances and grades.

Appendices B and C detail equipment and costs for this reclamation activity.

9. Revegetation of All Disturbed Areas

Describe equipment, practices, and costs (preferably on a per acre basis), including:

- seedbed preparation
- mulch (purchase and application)
- seed (purchase and application)
- fertilizer (if required, purchase and application)
- post-seeding maintenance over the minimum bonding period (e.g., weed control, mowing, interseeding). Operators suggest that a ten percent line item should cover this issue for the entire bonding period.

Appendix Q outlines a cost calculation process for this reclamation activity. The costs must be calculated using the specific seed mixes and practices from the approved term permit.

10. Reclamation Status and Bond Liability Status of All Lands Within the Permit Area

a. Land Status Categories

The bond calculation should describe the status of all lands within the permit area. Each land status category should be clearly identified on a quality map and cross-referenced to specific reclamation cost for each category. The LQD also prefers a tabular summary of the acreage for each category.

**LANDS THAT HAVE BEEN TOPSOILED AND SEEDED BUT HAVE NO BOND RELEASE MUST BE BONDED FOR RETOPSOILING, SCARIFICATION, AND REVEGETATION.** [see Section 10.b.(2)(b)i)e) on page 10]

The following is a summary of generic land status categories. Section 10.(2) below details the information and calculations necessary for each of these categories.

- (1) Native lands undisturbed at the time of this specific bond calculation and which will remain undisturbed under this bond calculation (e.g., no borrow areas necessary).

- (2) Lands disturbed and requiring backfilling, regrading and revegetation at the time of this specific bond calculation.
  - (a) Lands requiring assessment of Area Bond costs
  - (b) Lands requiring assessment of full or Incremental Bond costs
  - (c) Lands requiring assessment of partial Incremental Bond costs
    - i) Lands permanently reclaimed prior to December 31, 1982
    - ii) Lands permanently reclaimed after December 31, 1982
      - a) Lands with no approved Partial or Full Bond Release
      - b) Lands with approved 60 percent Partial Release of the Incremental Bond
      - c) Lands with approved larger percent Partial Release of the Incremental Bond
      - d) Lands with approved Full Release of Area and Incremental Bonds

**b. Line Item Bond Costs**

- (1) The bond covers lands currently disturbed by mining and associated activities and those lands to be disturbed in the next 12-month period.
- (2) The bond should include costs for the Area Bond (through backfill, rough and final grading) for all open pits, impoundments, sediment ponds, diversions, etc.
  - (a) Section E.1 of this Guideline and its associated appendices detail procedures and costs for the Area Bond. The bond calculation should detail costs for the operations listed in Sections E.1.B.), C) and D).
  - (b) Section E.2 of this Guideline and its associated appendices detail general categories and procedures for the Incremental Bond. Overall, the bond calculation should detail costs for the operations listed in Sections E.2.B) through I).
    - i) The bond calculation should assess the full suite of Incremental Bond tasks and costs for all disturbed lands which have no formally approved partial or full release of the Incremental Bond.



Historic LQD Administrator policy, LQD Coal Rules and Regulations Chapter 15 and W.S. §35-11-417(e) establish three (3) distinct categories of Partial Bond Release for permanently reclaimed lands.

a) Lands Permanently Reclaimed Prior to December 31, 1982

Prior to this date and prior to approval of the Wyoming State Coal Program, the LQD Administrator granted de facto Partial Bond Release for permanently reclaimed lands.

The LQD did not specifically approve or otherwise record this Partial Bond Release category, so there is generally no written approval letter.

The bond should specifically identify this Partial Bond Release category if it exists.

The bond should include a carry-over cost assessment for interseeding an appropriate, permit-approved seed mixture on these lands. These carry-over costs should include seed purchase and seed implantation.

b) 60 Percent Partial Bond Release

LQD Coal Rules and Regulations Chapter 15, Section 5.(a)(i) allows for release of 60 percent of the Incremental Bond when the permittee has completed backfilling, regrading, topsoil replacement, and drainage control according to the approved term permit procedures.

This category of Partial Bond Release requires formal, written approval by the DEQ Director. If this release category exists for your specific permit, the bond calculation should include the date of the Director's approval letter.

The bond calculation should specifically identify this category and show the appropriate units on a quality map.

The bond calculation should specifically tabulate the residual 40 percent Incremental Bond costs (preferably on a per acre basis) as the appropriate carry-over cost assessment. As noted above, the Incremental Bond includes all term permit approved Reclamation Plan practices beyond rough grading of the backfill. The tabulation of the 40 percent Incremental Bond carry-over costs should detail all approved reclamation practices.

c) Larger Percentage of Partial Bond Release

LQD Coal Rules and Regulations Chapter 15, Section 5.(a)(ii)(A) allows more than 60 percent release of the Incremental Bond as determined by the LQD Administrator and DEQ Director.

W.S. §35-11-423(d) mandates development of specific rules and regulations for release of coal bonds. These rules are controlling notwithstanding other provisions of W.S. §35-11-417 and §35-11-423 to the contrary.

LQD Coal Rules and Regulations, Chapter 15 is that formulation.

Coal Chapter 15 governs partial and 100 percent release of the Incremental Bond. For partial release, the amount remaining cannot be less than the cost of reseeded.

This category of Partial Bond Release requires formal, written approval by the DEQ Director. If this release category exists for your specific permit, the bond calculation should identify the date of the Director's approval letter.

The bond calculation should specifically tabulate the residual percentage Incremental Bond costs (preferably on a per acre basis) as the appropriate carry-over cost assessment. As previously noted, the Incremental Bond includes all term permit approved Reclamation Plan practices beyond rough grading of the backfill. The tabulation of the percentage Incremental Bond carry-over costs should detail all approved reclamation practices.

NOTE: The percentages of partial release of the Incremental Bond vary for Noncoal Permittees. A Noncoal Permittee seeking partial release should consult with the LQD.

d) Full Bond Release of the Area and Incremental Bonds

This category includes all land permanently reclaimed and formally released under provisions of the 1973 Environmental Quality Act and LQD Coal Rules and Regulations Chapter 15.

Full Bond Release requires formal, written approval by the DEQ Director. If this category exists for your specific permit, the bond calculation should list the date of the DEQ Director's Full Bond Release decision.

e) Lands Permanently Reclaimed After December 31, 1982

This category includes all land permanently reclaimed that has no bond release.

These reclaimed lands must be bonded to scarify, retopsoil, and reseed. There are no provisions made for where the topsoil would come from. It is assumed that topsoil would be spread at the same average depth on these lands as it is on the rest of the areas requiring topsoil. Topsoil haul distance and grade used would be the weighted average used for the rest of the reclamation. Scarification and reseeded costs would be the same per acre as those used on other lands requiring reclamation.

NOTE: The DEQ/LQD continues development of a DRAFT Guideline on Full and Partial Bond Release Procedures. Please consult with the LQD concerning the status of that Guideline, should you consider bond release for permanently reclaimed lands.

## 11. Coal Drilling

Describe the approximate number, depth, diameter, and location (show on inclusive map, if possible) of all holes drilled into or through coal during the current and next annual report period. A tabular format with reference to map locations may be an efficient presentation. This description should distinguish between coal drill holes which will be or have been removed by the pit advance within the annual report period versus those coal drill holes which will not be mined out in a report cycle. The operator may distinguish between abandonment/plugging procedures for the coal drill holes mined out in the report cycle versus the longer term abandoned holes. Each category should have a total line item cost entry in the bond. The LQD prefers that all coal drill hole reclamation costs be estimated according to Appendices L and M.

## 12. Miscellaneous Items

Each individual operator should identify these items as a line item or include each in some specific bond category. Otherwise, the LQD will enter the item as an addition to total dollar value of the Area and Incremental Bonds.

- a. COSTS FOR AN INDEPENDENT FIRM TO DESIGN THE FINAL RECLAMATION PROJECT: All design and engineering work (including field and office time) through production of construction documents should be included under this heading. At the least, some surveying and redesign of the operator's reclamation plan to fit the current situation would be required. Reference sources place this category at 2 to 6½ percent of the total bond cost. LQD typically uses 3 percent.
- b. CONTRACTOR PROFIT, OVERHEAD, MOBILIZATION AND DEMOBILIZATION COSTS: The Dataquest Cost Reference Guides used to construct the appendices do not include these costs. If an operator uses these appendices in bond calculations, there is still a need for this distinct line item cost in the bond. Assorted references place these items from 8 to 15 percent of the total bond cost. Presently LQD is using 10 percent.
- c. PRECONSTRUCTION INVESTIGATION AND STABILIZATION: This item addresses all field work necessary to document and mitigate dangerous and/or quickly deteriorating conditions, such as slumping highwalls or drainage problems. Any assessment under this item will be based upon the LQD's knowledge of specific site conditions and the length of time between cessation/forfeiture and initiation of the final reclamation project. When necessary, reference sources place this cost at 1 to 2 percent. LQD is using 1 percent.

- d. **COSTS FOR AN INDEPENDENT FIRM TO MANAGE THE FINAL RECLAMATION PROJECT:** This category includes complete oversight of all demolition, construction, and reclamation activities. Probable tasks would include supervision of earthmoving and reclamation, construction surveying, and soil sampling. References place this cost at 3 to 4 percent. LQD uses 3 percent.
- e. **COSTS FOR ON SITE MONITORING PROGRAMS FOR TEN YEARS AFTER COMPLETION OF THE FINAL RECLAMATION PROJECT (INCLUDES SUCH ITEMS AS UTILITIES AND GROUNDWATER SAMPLING):** Costs of this item will vary depending upon specific permit commitments. The LQD uses a range of 1/2 to 2 percent. Usually LQD uses 0.5 percent.
- f. **COSTS FOR SITE SECURITY DURING THE FINAL RECLAMATION PROJECT AND LIABILITY INSURANCE COST DURING THE FINAL RECLAMATION PROJECT AND OVER THE FULL BONDING PERIOD:** References place this cost at about 1 percent of the total bond amount.
- g. **LONG-TERM ADMINISTRATION AND ACCOUNTING COSTS:** After completion of a major reclamation project, a minimum of five years (non-coal permits) or a minimum of ten years (coal permits) will expire before the LQD can move for final bond release. The LQD will incur additional administrative costs during this extended period. The scale of some coal reclamation projects may necessitate employment of an outside contractor.

The LQD uses a range of 1 to 2 percent for this category depending upon the scale and complexity of the reclamation and post-reclamation monitoring projects. Currently LQD uses 2 percent.

- h. **ANY OTHER SITE-SPECIFIC PERMIT COMMITMENTS SHOULD ALSO BE INCLUDED HERE:** Costs will vary according to specific permit commitments.

The LQD has historically used the following sources to establish the range of percentages list in the Miscellaneous Items.

- \* Means Heavy Construction Cost Data (current edition), published by R. S. Means Company, Inc., Kingston, MA
- \* Means Site Work Cost Data (current edition), published by R. S. Means Company, Inc., Kingston, MA
- \* Building Construction Cost Data (current edition), published by R. S. Means Company, Inc., Kingston, MA
- \* Handbook for Calculation of Reclamation Bond Costs, 1987, Department of Interior, Office of Surface Mining Reclamation and Enforcement, Washington, D.C.

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### 13. Unknown Costs

The items under L) represent the usual contingency items applied to bonds. If these items are included as line items in the bond, the only remaining category could be unknown as per W.S. §35-11-417(c)(ii). References place this cost at 2 to 5 percent of the total bond cost. Under normal circumstances LQD is using 4 percent.

### 14. References

List sources of information, procedures, costs, etc. which were used in the bond calculations.

### 15. Maps

This Guideline requests that the various tasks, operations, disturbed areas, reclamation areas, etc., be illustrated on or referenced to a QUALITY, CURRENT MAP. Several of the tasks may be illustrated on the same map. All maps presented in support of the bond calculations must be clear and legible contour maps or recent (with date) aerial photographs. The preferred scale is 1"=500', unless it is necessary to directly compare (e.g., overlay) a bond map to an existing permit map. In this case the scales should be identical. Each map should be of a reasonable size, generally no larger than 48" on a side.

Each map must have a complete title block, including:

- Map title
- Name and address of permittee
- Permit number and term designation
- Annual report period
- Scale, north arrow, contour interval, date of photography or date of preparation

All maps must show and clearly label:

- Legal subdivisions with section, township, and range lines
- Permit area boundary and term boundary

## III. APPENDICES

The following appendices are intended for use in this standardized bond calculation package. Any references to specific equipment should not be interpreted as a recommendation of any kind by any person, company or agency for the use of specific brand-name equipment.

Appendix A  
Calculations for Moving Materials With a Caterpillar 992D Loader and Caterpillar 777D Truck Fleet

**NOTE: THESE COSTS ARE FOR EXCAVATION ONLY. MATERIAL REQUIRING BLASTING SHOULD HAVE AN ADDITIONAL \$0.10/BCY ADDED FOR DRILLING AND BLASTING COSTS.**

Material Movement By Loader-Truck Combination

|                                                     |                        |                                       |
|-----------------------------------------------------|------------------------|---------------------------------------|
| 1) Caterpillar 992D Loader                          | 12.1 BCY               | CPH 25                                |
| 2) Caterpillar 777D Trucks (85 ton)                 | 58.8 BCY               | CPH 25                                |
| 3) Material Density                                 | 2,850.0 LB/BCY         | CPH 25                                |
| 4) Operating Efficiency Factor (50 Min/Hr)          | 0.83 %                 | CPH 25                                |
| 5) Rolling Resistance Factor                        | 4.00 %                 | CPH 25                                |
| 6) 777D Truck Operating Costs                       | \$153.41 Per Hour      | 90% of DataQuest Cost Reference Guide |
| 7) 992D Loader Operating Costs                      | \$173.03 Per Hour      | 90% DQCRG                             |
| 8) Labor Costs                                      | \$18.75 Per Hour       | WYDOT-WDD                             |
| 9) 1/2 of 1 - 14,000 Gal. Water Trucks + 1 Operator | \$70.23 Per Hour       | 1/2 of 90% DQCRG                      |
| 10) 1 - 16H Blade for Road Work + 1 Operator        | \$84.26 Per Hour       | 90% DQCRG + Operator                  |
| 11) 1 - D9R for Misc. Work + 1 Operator             | \$120.99 Per Hour      | 90% DQCRG + Operator                  |
| 12) Supervision Labor Costs                         | \$12.50 Per Hour       | 1/2 of WYDOT-WDD                      |
| 13) Supervisor Transportation                       | <u>\$4.39 Per Hour</u> | 1/2 of 90% DQCRG                      |
| <br>14) Total Fleet Hourly Costs (Except Trucks)    | <br>\$464.53           |                                       |

**TO USE TABLE:** Locate your approximate grade by reference to case number. Determine cost per BCY by using distance column that approximates your distance. No calculations are necessary.

| Case #1: Level Ground |                        |                            | Loaded (0% grade + 4% rolling = 4% total resistance) |                        |                                   |                                  |                      | Empty (0% grade + 4% total resistance) |                                               |                                                |                                 |                          |
|-----------------------|------------------------|----------------------------|------------------------------------------------------|------------------------|-----------------------------------|----------------------------------|----------------------|----------------------------------------|-----------------------------------------------|------------------------------------------------|---------------------------------|--------------------------|
| Way<br>ance<br>(Ft.)  | Load<br>Time<br>(Min.) | Maneuver<br>Time<br>(Min.) | Travel<br>Time<br>Loaded<br>(Min.)                   | Dump<br>Time<br>(Min.) | Travel<br>Time<br>Empty<br>(Min.) | Total<br>Cycle<br>Time<br>(Min.) | Trips<br>Per<br>Hour | Payload<br>(BCY)                       | Adjusted<br>Truck<br>Productivity<br>(BCY/Hr) | Adjusted<br>Loader<br>Productivity<br>(BCY/Hr) | Number<br>of Trucks<br>Required | Oper<br>Cos.<br>(\$/BCY) |
| 500                   | 3.50                   | 0.70                       | 0.47                                                 | 1.10                   | 0.36                              | 6.13                             | 9.8                  | 58.8                                   | 479.6                                         | 840.0                                          | 1.75                            | \$0.91                   |
| 1000                  | 3.50                   | 0.70                       | 0.78                                                 | 1.10                   | 0.56                              | 6.64                             | 9.0                  | 58.8                                   | 442.8                                         | 840.0                                          | 1.90                            | \$0.94                   |
| 1500                  | 3.50                   | 0.70                       | 1.06                                                 | 1.10                   | 0.74                              | 7.10                             | 8.5                  | 58.8                                   | 414.1                                         | 840.0                                          | 2.03                            | \$0.97                   |
| 2000                  | 3.50                   | 0.70                       | 1.34                                                 | 1.10                   | 0.90                              | 7.54                             | 8.0                  | 58.8                                   | 389.9                                         | 840.0                                          | 2.15                            | \$0.99                   |
| 2500                  | 3.50                   | 0.70                       | 1.60                                                 | 1.10                   | 1.06                              | 7.96                             | 7.5                  | 58.8                                   | 369.3                                         | 840.0                                          | 2.27                            | \$1.02                   |
| 3000                  | 3.50                   | 0.70                       | 1.86                                                 | 1.10                   | 1.22                              | 8.38                             | 7.2                  | 58.8                                   | 350.8                                         | 840.0                                          | 2.39                            | \$1.04                   |
| 3500                  | 3.50                   | 0.70                       | 2.11                                                 | 1.10                   | 1.39                              | 8.80                             | 6.8                  | 58.8                                   | 334.1                                         | 840.0                                          | 2.51                            | \$1.07                   |
| 4000                  | 3.50                   | 0.70                       | 2.37                                                 | 1.10                   | 1.55                              | 9.22                             | 6.5                  | 58.8                                   | 318.9                                         | 840.0                                          | 2.63                            | \$1.09                   |
| 4500                  | 3.50                   | 0.70                       | 2.63                                                 | 1.10                   | 1.71                              | 9.64                             | 6.2                  | 58.8                                   | 305.0                                         | 840.0                                          | 2.75                            | \$1.12                   |
| 5000                  | 3.50                   | 0.70                       | 2.89                                                 | 1.10                   | 1.88                              | 10.07                            | 6.0                  | 58.8                                   | 292.0                                         | 840.0                                          | 2.88                            | \$1.14                   |
| 5500                  | 3.50                   | 0.70                       | 3.15                                                 | 1.10                   | 2.04                              | 10.49                            | 5.7                  | 58.8                                   | 280.3                                         | 840.0                                          | 3.00                            | \$1.17                   |
| 6000                  | 3.50                   | 0.70                       | 3.41                                                 | 1.10                   | 2.21                              | 10.92                            | 5.5                  | 58.8                                   | 269.2                                         | 840.0                                          | 3.12                            | \$1.19                   |
| 6500                  | 3.50                   | 0.70                       | 3.66                                                 | 1.10                   | 2.37                              | 11.33                            | 5.3                  | 58.8                                   | 259.5                                         | 840.0                                          | 3.24                            | \$1.22                   |
| 7000                  | 3.50                   | 0.70                       | 3.92                                                 | 1.10                   | 2.53                              | 11.75                            | 5.1                  | 58.8                                   | 250.2                                         | 840.0                                          | 3.36                            | \$1.24                   |

Operating Costs = (((# Trucks x (Truck costs + Labor costs)) + Total Fleet costs)/Loader Productivity)

Appendix A (Continued)  
Calculations for Moving Materials With a Caterpillar 992D Loader and Caterpillar 777D Truck Fleet

Material Movement By Loader-Truck Combination

| 5% Assisting Grade     |                  |                      | Loaded (-5% grade + 4% rolling = -1% total) |                  |                          |                         | Empty (5% grade + 4% rolling = 9% total) |               |                                      |                                       |                           |                          |
|------------------------|------------------|----------------------|---------------------------------------------|------------------|--------------------------|-------------------------|------------------------------------------|---------------|--------------------------------------|---------------------------------------|---------------------------|--------------------------|
| One-Way Distance (Ft.) | Load Time (Min.) | Maneuver Time (Min.) | Travel Time Loaded (Min.)                   | Dump Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour                           | Payload (BCY) | Adjusted Truck Productivity (BCY/Hr) | Adjusted Loader Productivity (BCY/Hr) | Number of Trucks Required | Operating Costs (\$/BCY) |
| 500                    | 3.50             | 0.70                 | 0.38                                        | 1.10             | 0.41                     | 6.09                    | 9.9                                      | 58.8          | 482.8                                | 840.0                                 | 1.74                      | \$0.91                   |
| 1000                   | 3.50             | 0.70                 | 0.58                                        | 1.10             | 0.68                     | 6.56                    | 9.1                                      | 58.8          | 448.2                                | 840.0                                 | 1.87                      | \$0.94                   |
| 1500                   | 3.50             | 0.70                 | 0.74                                        | 1.10             | 0.94                     | 6.98                    | 8.6                                      | 58.8          | 421.2                                | 840.0                                 | 1.99                      | \$0.96                   |
| 2000                   | 3.50             | 0.70                 | 0.89                                        | 1.10             | 1.18                     | 7.37                    | 8.1                                      | 58.8          | 398.9                                | 840.0                                 | 2.11                      | \$0.99                   |
| 2500                   | 3.50             | 0.70                 | 1.05                                        | 1.10             | 1.43                     | 7.78                    | 7.7                                      | 58.8          | 377.9                                | 840.0                                 | 2.22                      | \$1.01                   |
| 3000                   | 3.50             | 0.70                 | 1.20                                        | 1.10             | 1.68                     | 8.18                    | 7.3                                      | 58.8          | 359.4                                | 840.0                                 | 2.34                      | \$1.03                   |
| 3500                   | 3.50             | 0.70                 | 1.35                                        | 1.10             | 1.92                     | 8.57                    | 7.0                                      | 58.8          | 343.1                                | 840.0                                 | 2.45                      | \$1.06                   |
| 4000                   | 3.50             | 0.70                 | 1.50                                        | 1.10             | 2.17                     | 8.97                    | 6.7                                      | 58.8          | 327.8                                | 840.0                                 | 2.56                      | \$1.08                   |
| 4500                   | 3.50             | 0.70                 | 1.66                                        | 1.10             | 2.42                     | 9.38                    | 6.4                                      | 58.8          | 313.4                                | 840.0                                 | 2.68                      | \$1.10                   |
| 5000                   | 3.50             | 0.70                 | 1.81                                        | 1.10             | 2.66                     | 9.77                    | 6.1                                      | 58.8          | 300.9                                | 840.0                                 | 2.79                      | \$1.12                   |
| 5500                   | 3.50             | 0.70                 | 1.96                                        | 1.10             | 2.91                     | 10.17                   | 5.9                                      | 58.8          | 289.1                                | 840.0                                 | 2.91                      | \$1.15                   |
| 6000                   | 3.50             | 0.70                 | 2.11                                        | 1.10             | 3.16                     | 10.57                   | 5.7                                      | 58.8          | 278.1                                | 840.0                                 | 3.02                      | \$1.17                   |
| 6500                   | 3.50             | 0.70                 | 2.27                                        | 1.10             | 3.40                     | 10.97                   | 5.5                                      | 58.8          | 268.0                                | 840.0                                 | 3.13                      | \$1.19                   |
| 7000                   | 3.50             | 0.70                 | 2.42                                        | 1.10             | 3.65                     | 11.37                   | 5.3                                      | 58.8          | 258.6                                | 840.0                                 | 3.25                      | \$1.22                   |

| 10% Assisting Grade    |                  |                      | Loaded (-10% grade + 4% rolling = -6% total) |                  |                          |                         | Empty (10% grade + 4% rolling = 14% total) |               |                                      |                                       |                           |                          |
|------------------------|------------------|----------------------|----------------------------------------------|------------------|--------------------------|-------------------------|--------------------------------------------|---------------|--------------------------------------|---------------------------------------|---------------------------|--------------------------|
| One-Way Distance (Ft.) | Load Time (Min.) | Maneuver Time (Min.) | Travel Time Loaded (Min.)                    | Dump Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour                             | Payload (BCY) | Adjusted Truck Productivity (BCY/Hr) | Adjusted Loader Productivity (BCY/Hr) | Number of Trucks Required | Operating Costs (\$/BCY) |
| 500                    | 3.50             | 0.70                 | 0.35                                         | 1.10             | 0.49                     | 6.14                    | 9.8                                        | 58.8          | 478.8                                | 840.0                                 | 1.75                      | \$0.91                   |
| 1000                   | 3.50             | 0.70                 | 0.52                                         | 1.10             | 0.90                     | 6.72                    | 8.9                                        | 58.8          | 437.5                                | 840.0                                 | 1.92                      | \$0.95                   |
| 1500                   | 3.50             | 0.70                 | 0.67                                         | 1.10             | 1.31                     | 7.28                    | 8.2                                        | 58.8          | 403.8                                | 840.0                                 | 2.08                      | \$0.98                   |
| 2000                   | 3.50             | 0.70                 | 0.82                                         | 1.10             | 1.72                     | 7.84                    | 7.7                                        | 58.8          | 375.0                                | 840.0                                 | 2.24                      | \$1.01                   |
| 2500                   | 3.50             | 0.70                 | 0.97                                         | 1.10             | 2.13                     | 8.40                    | 7.1                                        | 58.8          | 350.0                                | 840.0                                 | 2.40                      | \$1.04                   |
| 3000                   | 3.50             | 0.70                 | 1.13                                         | 1.10             | 2.54                     | 8.97                    | 6.7                                        | 58.8          | 327.8                                | 840.0                                 | 2.56                      | \$1.08                   |
| 3500                   | 3.50             | 0.70                 | 1.28                                         | 1.10             | 2.94                     | 9.52                    | 6.3                                        | 58.8          | 308.8                                | 840.0                                 | 2.72                      | \$1.11                   |
| 4000                   | 3.50             | 0.70                 | 1.43                                         | 1.10             | 3.35                     | 10.08                   | 6.0                                        | 58.8          | 291.7                                | 840.0                                 | 2.88                      | \$1.14                   |
| 4500                   | 3.50             | 0.70                 | 1.59                                         | 1.10             | 3.76                     | 10.65                   | 5.6                                        | 58.8          | 276.1                                | 840.0                                 | 3.04                      | \$1.18                   |
| 5000                   | 3.50             | 0.70                 | 1.74                                         | 1.10             | 4.17                     | 11.21                   | 5.4                                        | 58.8          | 262.3                                | 840.0                                 | 3.20                      | \$1.21                   |
| 5500                   | 3.50             | 0.70                 | 1.89                                         | 1.10             | 4.58                     | 11.77                   | 5.1                                        | 58.8          | 249.8                                | 840.0                                 | 3.36                      | \$1.24                   |
| 6000                   | 3.50             | 0.70                 | 2.04                                         | 1.10             | 4.99                     | 12.33                   | 4.9                                        | 58.8          | 238.4                                | 840.0                                 | 3.52                      | \$1.27                   |
| 6500                   | 3.50             | 0.70                 | 2.20                                         | 1.10             | 5.40                     | 12.90                   | 4.7                                        | 58.8          | 227.9                                | 840.0                                 | 3.69                      | \$1.31                   |
| 7000                   | 3.50             | 0.70                 | 2.35                                         | 1.10             | 5.80                     | 13.45                   | 4.5                                        | 58.8          | 218.6                                | 840.0                                 | 3.84                      | \$1.34                   |

Appendix A (Continued)  
Calculations for Moving Materials With a Caterpillar 992D Loader and Caterpillar 777D Truck Fleet

Material Movement by Loader-Truck Combination

| Case #4: 5% Resisting Grade |                  |                      | Loaded (5% grade + 4% rolling = 9% total) |                  |                          |                         |                | Empty (-5% grade + 4% rolling = -1% total) |                                      |                                       |                           |                          |
|-----------------------------|------------------|----------------------|-------------------------------------------|------------------|--------------------------|-------------------------|----------------|--------------------------------------------|--------------------------------------|---------------------------------------|---------------------------|--------------------------|
| One-Way Distance (Fl.)      | Load Time (Min.) | Maneuver Time (Min.) | Travel Time Loaded (Min.)                 | Dump Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                              | Adjusted Truck Productivity (BCY/Hr) | Adjusted Loader Productivity (BCY/Hr) | Number of Trucks Required | Operating Costs (\$/BCY) |
| 500                         | 3.50             | 0.70                 | 0.66                                      | 1.10             | 0.33                     | 6.29                    | 9.5            | 58.8                                       | 467.4                                | 840.0                                 | 1.80                      | \$0.92                   |
| 1000                        | 3.50             | 0.70                 | 1.23                                      | 1.10             | 0.50                     | 7.03                    | 8.5            | 58.8                                       | 418.2                                | 840.0                                 | 2.01                      | \$0.97                   |
| 1500                        | 3.50             | 0.70                 | 1.81                                      | 1.10             | 0.65                     | 7.76                    | 7.7            | 58.8                                       | 377.3                                | 840.0                                 | 2.23                      | \$1.01                   |
| 2000                        | 3.50             | 0.70                 | 2.38                                      | 1.10             | 0.81                     | 8.49                    | 7.1            | 58.8                                       | 347.9                                | 840.0                                 | 2.41                      | \$1.05                   |
| 2500                        | 3.50             | 0.70                 | 2.95                                      | 1.10             | 0.96                     | 9.21                    | 6.5            | 58.8                                       | 318.5                                | 840.0                                 | 2.64                      | \$1.09                   |
| 3000                        | 3.50             | 0.70                 | 3.53                                      | 1.10             | 1.11                     | 9.94                    | 6.0            | 58.8                                       | 294.0                                | 840.0                                 | 2.86                      | \$1.14                   |
| 3500                        | 3.50             | 0.70                 | 4.10                                      | 1.10             | 1.26                     | 10.66                   | 5.6            | 58.8                                       | 274.4                                | 840.0                                 | 3.06                      | \$1.18                   |
| 4000                        | 3.50             | 0.70                 | 4.68                                      | 1.10             | 1.42                     | 11.40                   | 5.3            | 58.8                                       | 259.7                                | 840.0                                 | 3.23                      | \$1.22                   |
| 4500                        | 3.50             | 0.70                 | 5.25                                      | 1.10             | 1.57                     | 12.12                   | 5.0            | 58.8                                       | 245.0                                | 840.0                                 | 3.43                      | \$1.26                   |
| 5000                        | 3.50             | 0.70                 | 5.82                                      | 1.10             | 1.72                     | 12.84                   | 4.7            | 58.8                                       | 230.3                                | 840.0                                 | 3.65                      | \$1.30                   |
| 5500                        | 3.50             | 0.70                 | 6.40                                      | 1.10             | 1.87                     | 13.57                   | 4.4            | 58.8                                       | 215.6                                | 840.0                                 | 3.90                      | \$1.35                   |
| 6000                        | 3.50             | 0.70                 | 6.97                                      | 1.10             | 2.03                     | 14.30                   | 4.2            | 58.8                                       | 205.8                                | 840.0                                 | 4.08                      | \$1.39                   |
| 6500                        | 3.50             | 0.70                 | 7.54                                      | 1.10             | 2.18                     | 15.02                   | 4.0            | 58.8                                       | 196.0                                | 840.0                                 | 4.29                      | \$1.43                   |
| 7000                        | 3.50             | 0.70                 | 8.12                                      | 1.10             | 2.33                     | 15.75                   | 3.8            | 58.8                                       | 186.2                                | 840.0                                 | 4.51                      | \$1.48                   |

| Case #5: 10% Resisting Grade |                  |                      | Loaded (10% grade + 4% rolling = 14% total) |                  |                          |                         |                | Empty (-10% grade + 4% rolling = -6% total) |                                      |                                       |                           |                          |
|------------------------------|------------------|----------------------|---------------------------------------------|------------------|--------------------------|-------------------------|----------------|---------------------------------------------|--------------------------------------|---------------------------------------|---------------------------|--------------------------|
| One-Way Distance (Fl.)       | Load Time (Min.) | Maneuver Time (Min.) | Travel Time Loaded (Min.)                   | Dump Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                               | Adjusted Truck Productivity (BCY/Hr) | Adjusted Loader Productivity (BCY/Hr) | Number of Trucks Required | Operating Costs (\$/BCY) |
| 500                          | 3.50             | 0.70                 | 0.94                                        | 1.10             | 0.33                     | 6.57                    | 9.1            | 58.8                                        | 445.9                                | 840.0                                 | 1.88                      | \$0.94                   |
| 1000                         | 3.50             | 0.70                 | 1.83                                        | 1.10             | 0.49                     | 7.62                    | 7.9            | 58.8                                        | 387.1                                | 840.0                                 | 2.18                      | \$1.00                   |
| 1500                         | 3.50             | 0.70                 | 2.72                                        | 1.10             | 0.64                     | 8.66                    | 6.9            | 58.8                                        | 338.1                                | 840.0                                 | 2.47                      | \$1.06                   |
| 2000                         | 3.50             | 0.70                 | 3.60                                        | 1.10             | 0.79                     | 9.69                    | 6.2            | 58.8                                        | 303.8                                | 840.0                                 | 2.77                      | \$1.12                   |
| 2500                         | 3.50             | 0.70                 | 4.49                                        | 1.10             | 0.94                     | 10.73                   | 5.6            | 58.8                                        | 274.4                                | 840.0                                 | 3.07                      | \$1.18                   |
| 3000                         | 3.50             | 0.70                 | 5.38                                        | 1.10             | 1.10                     | 11.78                   | 5.1            | 58.8                                        | 249.9                                | 840.0                                 | 3.37                      | \$1.24                   |
| 3500                         | 3.50             | 0.70                 | 6.26                                        | 1.10             | 1.25                     | 12.81                   | 4.7            | 58.8                                        | 230.3                                | 840.0                                 | 3.66                      | \$1.30                   |
| 4000                         | 3.50             | 0.70                 | 7.15                                        | 1.10             | 1.40                     | 13.85                   | 4.3            | 58.8                                        | 210.7                                | 840.0                                 | 3.96                      | \$1.36                   |
| 4500                         | 3.50             | 0.70                 | 8.04                                        | 1.10             | 1.55                     | 14.89                   | 4.0            | 58.8                                        | 196.0                                | 840.0                                 | 4.25                      | \$1.42                   |
| 5000                         | 3.50             | 0.70                 | 8.94                                        | 1.10             | 1.71                     | 15.94                   | 3.8            | 58.8                                        | 186.2                                | 840.0                                 | 4.55                      | \$1.49                   |
| 5500                         | 3.50             | 0.70                 | 9.81                                        | 1.10             | 1.86                     | 16.97                   | 3.5            | 58.8                                        | 171.5                                | 840.0                                 | 4.85                      | \$1.55                   |
| 6000                         | 3.50             | 0.70                 | 10.70                                       | 1.10             | 2.01                     | 18.01                   | 3.3            | 58.8                                        | 161.7                                | 840.0                                 | 5.15                      | \$1.61                   |
| 6500                         | 3.50             | 0.70                 | 11.59                                       | 1.10             | 2.16                     | 19.05                   | 3.1            | 58.8                                        | 151.9                                | 840.0                                 | 5.44                      | \$1.67                   |
| 7000                         | 3.50             | 0.70                 | 12.48                                       | 1.10             | 2.32                     | 20.10                   | 3.0            | 58.8                                        | 147.0                                | 840.0                                 | 5.74                      | \$1.73                   |



Appendix B  
Calculations for Moving Materials With a Caterpillar 657E Push-Pull Scraper Fleet

**NOTE: DRILLING AND BLASTING COSTS ARE NOT INCLUDED IN THESE CALCULATIONS. THE LQD DOES NOT CONSIDER DRILLING AND BLASTING COSTS NECESSARY WHEN USING APPENDIX C.**

**Material Movement By Scrapers**

|                                                            |                         |                  |
|------------------------------------------------------------|-------------------------|------------------|
| 1) Caterpillar 657E Push-Pull Scraper                      |                         |                  |
| 2) Material Density                                        | 2,850. LB/BCY           | CPH 25           |
| 3) Payload                                                 | 104,000. LB             | CPH 25           |
|                                                            | 35.0 BCY                |                  |
| 4) Maximum Vehicle Speed Loaded                            | 34.9 MPH                | CPH 25           |
| 5) Operating Efficiency Factor (50 Min./Hr.)               | 0.83 %                  | CPH 25           |
| 6) 657E PF Operating Costs                                 | \$199.36 Per Hour       | 90% DQCRG        |
| 7) Labor Costs                                             | \$18.75 Per Hour        | WYDOT-WDD        |
| 8) Supervision Labor Costs                                 | \$3.13 Per Hour         | 1/8 of WYDOT-WDD |
| 9) Supervisor Transportation                               | \$1.10 Per Hour         | 1/8 of 90% DQCRG |
| 10) 1/8 of 1 - 14,000 Gal. Water Trucks + 1 Operator       | \$17.56 Per Hour        | 1/8 of 90% DQCRG |
| 11) 1/8 of 1 - 16H Blade for Road Work + 1 Operator        | \$10.53 Per Hour        | 1/8 of 90% DQCRG |
| 12) 1/2 - D9R for Ripping Ovb. and Misc. Work + 1 Operator | <u>\$60.50 Per Hour</u> | 1/2 of 90% DQCRG |
| 13) Total Hourly Costs                                     | <u>\$310.93</u>         |                  |

**TO USE TABLE:** Locate your approximate grade by reference to case number. Determine cost per BCY by using distance column that approximates your distance. No calculations are necessary.

| Case #1: Level Ground  | Loaded (0% grade + 4% rolling = 4% total) |                           |                               |                          |                         | Empty (0% grade + 4% rolling = 4% total) |               |                               |                                |                          |
|------------------------|-------------------------------------------|---------------------------|-------------------------------|--------------------------|-------------------------|------------------------------------------|---------------|-------------------------------|--------------------------------|--------------------------|
| One-Way Distance (Fl.) | Load Time (Min.)                          | Travel Time Loaded (Min.) | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour                           | Payload (BCY) | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |
| 500                    | 1.10                                      | 0.42                      | 0.60                          | 0.36                     | 2.48                    | 24.2                                     | 35.0          | 0.83                          | 706                            | \$0.44                   |
| 1000                   | 1.10                                      | 0.68                      | 0.60                          | 0.57                     | 2.95                    | 20.3                                     | 35.0          | 0.83                          | 593                            | \$0.52                   |
| 1500                   | 1.10                                      | 0.92                      | 0.60                          | 0.75                     | 3.37                    | 17.8                                     | 35.0          | 0.83                          | 519                            | \$0.60                   |
| 2000                   | 1.10                                      | 1.15                      | 0.60                          | 0.92                     | 3.77                    | 15.9                                     | 35.0          | 0.83                          | 464                            | \$0.67                   |
| 2500                   | 1.10                                      | 1.37                      | 0.60                          | 1.09                     | 4.16                    | 14.4                                     | 35.0          | 0.83                          | 421                            | \$0.74                   |
| 3000                   | 1.10                                      | 1.59                      | 0.60                          | 1.26                     | 4.55                    | 13.2                                     | 35.0          | 0.83                          | 385                            | \$0.81                   |
| 3500                   | 1.10                                      | 1.81                      | 0.60                          | 1.44                     | 4.95                    | 12.1                                     | 35.0          | 0.83                          | 354                            | \$0.88                   |
| 4000                   | 1.10                                      | 2.02                      | 0.60                          | 1.61                     | 5.33                    | 11.3                                     | 35.0          | 0.83                          | 328                            | \$0.95                   |
| 4500                   | 1.10                                      | 2.22                      | 0.60                          | 1.78                     | 5.70                    | 10.5                                     | 35.0          | 0.83                          | 307                            | \$1.01                   |
| 5000                   | 1.10                                      | 2.43                      | 0.60                          | 1.95                     | 6.08                    | 9.9                                      | 35.0          | 0.83                          | 288                            | \$1.08                   |
| 5500                   | 1.10                                      | 2.64                      | 0.60                          | 2.13                     | 6.47                    | 9.3                                      | 35.0          | 0.83                          | 270                            | \$1.15                   |
| 6000                   | 1.10                                      | 2.85                      | 0.60                          | 2.30                     | 6.85                    | 8.8                                      | 35.0          | 0.83                          | 255                            | \$1.22                   |
| 6500                   | 1.10                                      | 3.05                      | 0.60                          | 2.47                     | 7.22                    | 8.3                                      | 35.0          | 0.83                          | 242                            | \$1.28                   |
| 7000                   | 1.10                                      | 3.26                      | 0.60                          | 2.64                     | 7.60                    | 7.9                                      | 35.0          | 0.83                          | 230                            | \$1.35                   |

Appendix B (Continued)  
Calculations for Moving Materials With a Caterpillar 657E Push-Pull Scraper Fleet

Material Movement By Scrapers

| Case #2: 5% Assisting Grade |                  | Loaded (-5% grade + 4% rolling = -1% total) |                               |                          |                         |                | Empty (5% grade + 4% rolling = 9% total) |                               |                                |                          |
|-----------------------------|------------------|---------------------------------------------|-------------------------------|--------------------------|-------------------------|----------------|------------------------------------------|-------------------------------|--------------------------------|--------------------------|
| One-Way Distance (Fl.)      | Load Time (Min.) | Travel Time Loaded (Min.)                   | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                            | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |
| 500                         | 1.10             | 0.36                                        | 0.60                          | 0.42                     | 2.48                    | 24.2           | 35.0                                     | 0.83                          | 706                            | \$0.44                   |
| 1000                        | 1.10             | 0.54                                        | 0.60                          | 0.71                     | 2.95                    | 20.3           | 35.0                                     | 0.83                          | 593                            | \$0.52                   |
| 1500                        | 1.10             | 0.71                                        | 0.60                          | 0.98                     | 3.39                    | 17.7           | 35.0                                     | 0.83                          | 516                            | \$0.60                   |
| 2000                        | 1.10             | 0.87                                        | 0.60                          | 1.25                     | 3.82                    | 15.7           | 35.0                                     | 0.83                          | 458                            | \$0.68                   |
| 2500                        | 1.10             | 1.03                                        | 0.60                          | 1.51                     | 4.24                    | 14.2           | 35.0                                     | 0.83                          | 413                            | \$0.75                   |
| 3000                        | 1.10             | 1.19                                        | 0.60                          | 1.78                     | 4.67                    | 12.8           | 35.0                                     | 0.83                          | 375                            | \$0.83                   |
| 3500                        | 1.10             | 1.36                                        | 0.60                          | 2.05                     | 5.11                    | 11.7           | 35.0                                     | 0.83                          | 342                            | \$0.91                   |
| 4000                        | 1.10             | 1.52                                        | 0.60                          | 2.32                     | 5.54                    | 10.8           | 35.0                                     | 0.83                          | 316                            | \$0.98                   |
| 4500                        | 1.10             | 1.68                                        | 0.60                          | 2.59                     | 5.97                    | 10.1           | 35.0                                     | 0.83                          | 293                            | \$1.06                   |
| 5000                        | 1.10             | 1.85                                        | 0.60                          | 2.86                     | 6.41                    | 9.4            | 35.0                                     | 0.83                          | 273                            | \$1.14                   |
| 5500                        | 1.10             | 2.01                                        | 0.60                          | 3.12                     | 6.83                    | 8.8            | 35.0                                     | 0.83                          | 256                            | \$1.21                   |
| 6000                        | 1.10             | 2.17                                        | 0.60                          | 3.39                     | 7.26                    | 8.3            | 35.0                                     | 0.83                          | 241                            | \$1.29                   |
| 6500                        | 1.10             | 2.33                                        | 0.60                          | 3.66                     | 7.69                    | 7.8            | 35.0                                     | 0.83                          | 228                            | \$1.36                   |
| 7000                        | 1.10             | 2.50                                        | 0.60                          | 3.93                     | 8.13                    | 7.4            | 35.0                                     | 0.83                          | 215                            | \$1.45                   |

| Case #3: 10% Assisting Grade |                  | Loaded (-10% grade + 4% rolling = -6% total) |                               |                          |                         |                | Empty (10% grade + 4% rolling = 14% total) |                               |                                |                          |
|------------------------------|------------------|----------------------------------------------|-------------------------------|--------------------------|-------------------------|----------------|--------------------------------------------|-------------------------------|--------------------------------|--------------------------|
| One-Way Distance (Fl.)       | Load Time (Min.) | Travel Time Loaded (Min.)                    | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                              | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |
| 500                          | 1.10             | 0.34                                         | 0.60                          | 0.51                     | 2.55                    | 23.5           | 35.0                                       | 0.83                          | 686                            | \$0.45                   |
| 1000                         | 1.10             | 0.51                                         | 0.60                          | 0.96                     | 3.17                    | 18.9           | 35.0                                       | 0.83                          | 552                            | \$0.56                   |
| 1500                         | 1.10             | 0.67                                         | 0.60                          | 1.41                     | 3.78                    | 15.9           | 35.0                                       | 0.83                          | 463                            | \$0.67                   |
| 2000                         | 1.10             | 0.83                                         | 0.60                          | 1.85                     | 4.38                    | 13.7           | 35.0                                       | 0.83                          | 400                            | \$0.78                   |
| 2500                         | 1.10             | 0.99                                         | 0.60                          | 2.30                     | 4.99                    | 12.0           | 35.0                                       | 0.83                          | 351                            | \$0.89                   |
| 3000                         | 1.10             | 1.16                                         | 0.60                          | 2.74                     | 5.60                    | 10.7           | 35.0                                       | 0.83                          | 313                            | \$0.99                   |
| 3500                         | 1.10             | 1.32                                         | 0.60                          | 3.19                     | 6.21                    | 9.7            | 35.0                                       | 0.83                          | 282                            | \$1.10                   |
| 4000                         | 1.10             | 1.48                                         | 0.60                          | 3.63                     | 6.81                    | 8.8            | 35.0                                       | 0.83                          | 257                            | \$1.21                   |
| 4500                         | 1.10             | 1.64                                         | 0.60                          | 4.08                     | 7.42                    | 8.1            | 35.0                                       | 0.83                          | 236                            | \$1.32                   |
| 5000                         | 1.10             | 1.81                                         | 0.60                          | 4.52                     | 8.03                    | 7.5            | 35.0                                       | 0.83                          | 218                            | \$1.43                   |
| 5500                         | 1.10             | 1.97                                         | 0.60                          | 4.97                     | 8.64                    | 6.9            | 35.0                                       | 0.83                          | 203                            | \$1.53                   |
| 6000                         | 1.10             | 2.13                                         | 0.60                          | 5.41                     | 9.24                    | 6.5            | 35.0                                       | 0.83                          | 189                            | \$1.65                   |
| 6500                         | 1.10             | 2.30                                         | 0.60                          | 5.86                     | 9.86                    | 6.1            | 35.0                                       | 0.83                          | 177                            | \$1.76                   |
| 7000                         | 1.10             | 2.46                                         | 0.60                          | 6.30                     | 10.46                   | 5.7            | 35.0                                       | 0.83                          | 167                            | \$1.86                   |

Appendix B (Continued)  
Calculations for Moving Materials With a Caterpillar 657E Push-Pull Scraper Fleet

Material Movement By Scrapers

| Case #4: 5% Resisting Grade |                  | Loaded (5% grade + 4% rolling = 9% total) |                               |                          |                         |                | Empty (-5% grade + 4% rolling = -1% total) |                               |                                |                          |  |
|-----------------------------|------------------|-------------------------------------------|-------------------------------|--------------------------|-------------------------|----------------|--------------------------------------------|-------------------------------|--------------------------------|--------------------------|--|
| One-Way Distance (Pt.)      | Load Time (Min.) | Travel Time Loaded (Min.)                 | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                              | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |  |
| 500                         | 1.10             | 0.55                                      | 0.60                          | 0.33                     | 2.58                    | 23.3           | 35.0                                       | 0.83                          | 678                            | \$0.46                   |  |
| 1000                        | 1.10             | 1.01                                      | 0.60                          | 0.50                     | 3.21                    | 18.7           | 35.0                                       | 0.83                          | 545                            | \$0.57                   |  |
| 1500                        | 1.10             | 1.46                                      | 0.60                          | 0.66                     | 3.82                    | 15.7           | 35.0                                       | 0.83                          | 458                            | \$0.68                   |  |
| 2000                        | 1.10             | 1.92                                      | 0.60                          | 0.83                     | 4.45                    | 13.5           | 35.0                                       | 0.83                          | 393                            | \$0.79                   |  |
| 2500                        | 1.10             | 2.38                                      | 0.60                          | 0.99                     | 5.07                    | 11.8           | 35.0                                       | 0.83                          | 345                            | \$0.90                   |  |
| 3000                        | 1.10             | 2.83                                      | 0.60                          | 1.15                     | 5.68                    | 10.6           | 35.0                                       | 0.83                          | 308                            | \$1.01                   |  |
| 3500                        | 1.10             | 3.29                                      | 0.60                          | 1.31                     | 6.30                    | 9.5            | 35.0                                       | 0.83                          | 278                            | \$1.12                   |  |
| 4000                        | 1.10             | 3.75                                      | 0.60                          | 1.48                     | 6.93                    | 8.7            | 35.0                                       | 0.83                          | 253                            | \$1.23                   |  |
| 4500                        | 1.10             | 4.21                                      | 0.60                          | 1.64                     | 7.55                    | 7.9            | 35.0                                       | 0.83                          | 232                            | \$1.34                   |  |
| 5000                        | 1.10             | 4.66                                      | 0.60                          | 1.80                     | 8.16                    | 7.4            | 35.0                                       | 0.83                          | 214                            | \$1.45                   |  |
| 5500                        | 1.10             | 5.12                                      | 0.60                          | 1.96                     | 8.78                    | 6.8            | 35.0                                       | 0.83                          | 199                            | \$1.56                   |  |
| 6000                        | 1.10             | 5.58                                      | 0.60                          | 2.13                     | 9.41                    | 6.4            | 35.0                                       | 0.83                          | 186                            | \$1.67                   |  |
| 6500                        | 1.10             | 6.04                                      | 0.60                          | 2.29                     | 10.03                   | 6.0            | 35.0                                       | 0.83                          | 174                            | \$1.79                   |  |
| 7000                        | 1.10             | 6.49                                      | 0.60                          | 2.45                     | 10.64                   | 5.6            | 35.0                                       | 0.83                          | 164                            | \$1.90                   |  |

| Case #5: 10% Resisting Grade |                  | Loaded (10% grade + 4% rolling = 14% total) |                               |                          |                         |                | Empty (-10% grade + 4% rolling = -6% total) |                               |                                |                          |  |
|------------------------------|------------------|---------------------------------------------|-------------------------------|--------------------------|-------------------------|----------------|---------------------------------------------|-------------------------------|--------------------------------|--------------------------|--|
| One-Way Distance (Pt.)       | Load Time (Min.) | Travel Time Loaded (Min.)                   | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                               | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |  |
| 500                          | 1.10             | 0.75                                        | 0.60                          | 0.32                     | 2.77                    | 21.7           | 35.0                                        | 0.83                          | 632                            | \$0.49                   |  |
| 1000                         | 1.10             | 1.43                                        | 0.60                          | 0.49                     | 3.62                    | 16.6           | 35.0                                        | 0.83                          | 483                            | \$0.64                   |  |
| 1500                         | 1.10             | 2.12                                        | 0.60                          | 0.65                     | 4.47                    | 13.4           | 35.0                                        | 0.83                          | 391                            | \$0.80                   |  |
| 2000                         | 1.10             | 2.81                                        | 0.60                          | 0.81                     | 5.32                    | 11.3           | 35.0                                        | 0.83                          | 329                            | \$0.95                   |  |
| 2500                         | 1.10             | 3.49                                        | 0.60                          | 0.98                     | 6.17                    | 9.7            | 35.0                                        | 0.83                          | 284                            | \$1.09                   |  |
| 3000                         | 1.10             | 4.18                                        | 0.60                          | 1.14                     | 7.02                    | 8.5            | 35.0                                        | 0.83                          | 249                            | \$1.25                   |  |
| 3500                         | 1.10             | 4.87                                        | 0.60                          | 1.30                     | 7.87                    | 7.6            | 35.0                                        | 0.83                          | 222                            | \$1.40                   |  |
| 4000                         | 1.10             | 5.56                                        | 0.60                          | 1.46                     | 8.72                    | 6.9            | 35.0                                        | 0.83                          | 201                            | \$1.55                   |  |
| 4500                         | 1.10             | 6.24                                        | 0.60                          | 1.63                     | 9.57                    | 6.3            | 35.0                                        | 0.83                          | 183                            | \$1.70                   |  |
| 5000                         | 1.10             | 6.93                                        | 0.60                          | 1.79                     | 10.42                   | 5.8            | 35.0                                        | 0.83                          | 168                            | \$1.85                   |  |
| 5500                         | 1.10             | 7.62                                        | 0.60                          | 1.95                     | 11.27                   | 5.3            | 35.0                                        | 0.83                          | 155                            | \$2.00                   |  |
| 6000                         | 1.10             | 8.31                                        | 0.60                          | 2.12                     | 12.13                   | 4.9            | 35.0                                        | 0.83                          | 144                            | \$2.16                   |  |
| 6500                         | 1.10             | 8.99                                        | 0.60                          | 2.28                     | 12.97                   | 4.6            | 35.0                                        | 0.83                          | 135                            | \$2.30                   |  |
| 7000                         | 1.10             | 9.68                                        | 0.60                          | 2.44                     | 13.82                   | 4.3            | 35.0                                        | 0.83                          | 127                            | \$2.45                   |  |

Appendix C  
Calculations for Moving Materials With a Caterpillar 637E Push-Pull Scraper Fleet

**NOTE: DRILLING AND BLASTING COSTS ARE NOT INCLUDED IN THESE CALCULATIONS. THE LQD DOES NOT CONSIDER DRILLING AND BLASTING COSTS NECESSARY WHEN USING APPENDIX C.**

Material Movement By Scrapers

|                                                            |                   |                  |
|------------------------------------------------------------|-------------------|------------------|
| 1) Caterpillar 637E Push-Pull Scraper                      |                   |                  |
| 2) Material Density                                        | 2,850. LB/BCY     | CPH 25           |
| 3) Payload                                                 | 75,000. LB        | CPH 25           |
|                                                            | 25.0 BCY          |                  |
| 4) Maximum Vehicle Speed Loaded                            | 33.0 MPH          | CPH 25           |
| 5) Operating Efficiency Factor (50 Min./Hr.)               | 0.83 %            | CPH 25           |
| 6) 637E PP Operating Costs                                 | \$152.15 Per Hour | 90% DQCRG        |
| 7) Labor Costs                                             | \$18.75 Per Hour  | WYDOT-WDD        |
| 8) Supervision Labor Costs                                 | \$3.13 Per Hour   | 1/8 of WYDOT-WDD |
| 9) Supervisor Transportation                               | \$1.10 Per Hour   | 1/8 of 90% DQCRG |
| 10) 1/8 of 1 - 14,000 Gal. Water Trucks + 1 Operator       | \$17.56 Per Hour  | 1/8 of 90% DQCRG |
| 11) 1/8 of 1 - 16H Blade for Road Work + 1 Operator        | \$10.53 Per Hour  | 1/8 of 90% DQCRG |
| 12) 1/2 - D9R for Ripping Ovb. and Misc. Work + 1 Operator | \$60.50 Per Hour  | 1/2 of 90% DQCRG |
| 13) Total Hourly Costs                                     | \$263.72          |                  |

**TO USE TABLE:** Locate your approximate grade by reference to case number. Determine cost per BCY by using distance column that approximates your distance. No calculations are necessary.

| C: Level Ground        |                  | Loaded (0% grade + 4% rolling = 4% total) |                               |                          |                         | Empty (0% grade + 4% rolling = 4% total) |               |                               |                                |                          |
|------------------------|------------------|-------------------------------------------|-------------------------------|--------------------------|-------------------------|------------------------------------------|---------------|-------------------------------|--------------------------------|--------------------------|
| One-Way Distance (Ft.) | Load Time (Min.) | Travel Time Loaded (Min.)                 | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour                           | Payload (BCY) | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |
| 500                    | 1.0              | 0.42                                      | 0.60                          | 0.36                     | 2.38                    | 25.2                                     | 25.0          | 0.83                          | 523                            | \$0.50                   |
| 1000                   | 1.0              | 0.68                                      | 0.60                          | 0.57                     | 2.85                    | 21.1                                     | 25.0          | 0.83                          | 438                            | \$0.60                   |
| 1500                   | 1.0              | 0.92                                      | 0.60                          | 0.75                     | 3.27                    | 18.4                                     | 25.0          | 0.83                          | 382                            | \$0.69                   |
| 2000                   | 1.0              | 1.15                                      | 0.60                          | 0.92                     | 3.67                    | 16.3                                     | 25.0          | 0.83                          | 338                            | \$0.78                   |
| 2500                   | 1.0              | 1.37                                      | 0.60                          | 1.09                     | 4.06                    | 14.8                                     | 25.0          | 0.83                          | 307                            | \$0.86                   |
| 3000                   | 1.0              | 1.59                                      | 0.60                          | 1.26                     | 4.45                    | 13.5                                     | 25.0          | 0.83                          | 280                            | \$0.94                   |
| 3500                   | 1.0              | 1.81                                      | 0.60                          | 1.44                     | 4.85                    | 12.4                                     | 25.0          | 0.83                          | 257                            | \$1.03                   |
| 4000                   | 1.0              | 2.02                                      | 0.60                          | 1.61                     | 5.23                    | 11.5                                     | 25.0          | 0.83                          | 239                            | \$1.11                   |
| 4500                   | 1.0              | 2.22                                      | 0.60                          | 1.78                     | 5.60                    | 10.7                                     | 25.0          | 0.83                          | 222                            | \$1.19                   |
| 5000                   | 1.0              | 2.43                                      | 0.60                          | 1.95                     | 5.98                    | 10.0                                     | 25.0          | 0.83                          | 208                            | \$1.27                   |
| 5500                   | 1.0              | 2.64                                      | 0.60                          | 2.13                     | 6.37                    | 9.4                                      | 25.0          | 0.83                          | 195                            | \$1.35                   |
| 6000                   | 1.0              | 2.85                                      | 0.60                          | 2.30                     | 6.75                    | 8.9                                      | 25.0          | 0.83                          | 185                            | \$1.43                   |
| 6500                   | 1.0              | 3.05                                      | 0.60                          | 2.47                     | 7.12                    | 8.4                                      | 25.0          | 0.83                          | 174                            | \$1.51                   |
| 7000                   | 1.0              | 3.26                                      | 0.60                          | 2.64                     | 7.50                    | 8.0                                      | 25.0          | 0.83                          | 166                            | \$1.59                   |

Appendix C (Continued)  
Calculations for Moving Materials With a Caterpillar 637E Push-Pull Scraper Fleet

Material Movement By Scrapers

| Case #2: 5% Assisting Grade |                  | Loaded (-5% grade + 4% rolling = -1% total) |                               |                          |                         |                | Empty (5% grade + 4% rolling = 9% total) |                               |                                |                          |
|-----------------------------|------------------|---------------------------------------------|-------------------------------|--------------------------|-------------------------|----------------|------------------------------------------|-------------------------------|--------------------------------|--------------------------|
| One-Way Distance (Ft.)      | Load Time (Min.) | Travel Time Loaded (Min.)                   | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                            | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |
| 500                         | 1.0              | 0.36                                        | 0.60                          | 0.42                     | 2.38                    | 25.2           | 25.0                                     | 0.83                          | 523                            | \$0.50                   |
| 1000                        | 1.0              | 0.54                                        | 0.60                          | 0.71                     | 2.85                    | 21.0           | 25.0                                     | 0.83                          | 436                            | \$0.61                   |
| 1500                        | 1.0              | 0.71                                        | 0.60                          | 0.98                     | 3.29                    | 18.2           | 25.0                                     | 0.83                          | 378                            | \$0.70                   |
| 2000                        | 1.0              | 0.87                                        | 0.60                          | 1.25                     | 3.72                    | 16.1           | 25.0                                     | 0.83                          | 334                            | \$0.79                   |
| 2500                        | 1.0              | 1.03                                        | 0.60                          | 1.51                     | 4.14                    | 14.5           | 25.0                                     | 0.83                          | 301                            | \$0.88                   |
| 3000                        | 1.0              | 1.19                                        | 0.60                          | 1.78                     | 4.57                    | 13.1           | 25.0                                     | 0.83                          | 272                            | \$0.97                   |
| 3500                        | 1.0              | 1.36                                        | 0.60                          | 2.05                     | 5.01                    | 12.0           | 25.0                                     | 0.83                          | 249                            | \$1.06                   |
| 4000                        | 1.0              | 1.52                                        | 0.60                          | 2.32                     | 5.44                    | 11.0           | 25.0                                     | 0.83                          | 228                            | \$1.16                   |
| 4500                        | 1.0              | 1.68                                        | 0.60                          | 2.59                     | 5.87                    | 10.2           | 25.0                                     | 0.83                          | 212                            | \$1.25                   |
| 5000                        | 1.0              | 1.85                                        | 0.60                          | 2.86                     | 6.31                    | 9.5            | 25.0                                     | 0.83                          | 197                            | \$1.34                   |
| 5500                        | 1.0              | 2.01                                        | 0.60                          | 3.12                     | 6.73                    | 8.9            | 25.0                                     | 0.83                          | 185                            | \$1.43                   |
| 6000                        | 1.0              | 2.17                                        | 0.60                          | 3.39                     | 7.16                    | 8.4            | 25.0                                     | 0.83                          | 174                            | \$1.51                   |
| 6500                        | 1.0              | 2.33                                        | 0.60                          | 3.66                     | 7.59                    | 7.9            | 25.0                                     | 0.83                          | 164                            | \$1.61                   |
| 7000                        | 1.0              | 2.50                                        | 0.60                          | 3.93                     | 8.03                    | 7.5            | 25.0                                     | 0.83                          | 156                            | \$1.69                   |

| Case #3: 10% Assisting Grade |                  | Loaded (-10% grade + 4% rolling = -6% total) |                               |                          |                         |                | Empty (10% grade + 4% rolling = 14% total) |                               |                                |                          |
|------------------------------|------------------|----------------------------------------------|-------------------------------|--------------------------|-------------------------|----------------|--------------------------------------------|-------------------------------|--------------------------------|--------------------------|
| One-Way Distance (Ft.)       | Load Time (Min.) | Travel Time Loaded (Min.)                    | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                              | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |
| 500                          | 1.0              | 0.34                                         | 0.60                          | 0.51                     | 2.45                    | 24.5           | 25.0                                       | 0.83                          | 508                            | \$0.52                   |
| 1000                         | 1.0              | 0.51                                         | 0.60                          | 0.96                     | 3.07                    | 19.5           | 25.0                                       | 0.83                          | 405                            | \$0.65                   |
| 1500                         | 1.0              | 0.67                                         | 0.60                          | 1.41                     | 3.68                    | 16.3           | 25.0                                       | 0.83                          | 338                            | \$0.78                   |
| 2000                         | 1.0              | 0.83                                         | 0.60                          | 1.85                     | 4.28                    | 14.0           | 25.0                                       | 0.83                          | 291                            | \$0.91                   |
| 2500                         | 1.0              | 0.99                                         | 0.60                          | 2.30                     | 4.89                    | 12.3           | 25.0                                       | 0.83                          | 255                            | \$1.03                   |
| 3000                         | 1.0              | 1.16                                         | 0.60                          | 2.74                     | 5.50                    | 10.9           | 25.0                                       | 0.83                          | 226                            | \$1.17                   |
| 3500                         | 1.0              | 1.32                                         | 0.60                          | 3.19                     | 6.11                    | 9.8            | 25.0                                       | 0.83                          | 203                            | \$1.30                   |
| 4000                         | 1.0              | 1.48                                         | 0.60                          | 3.63                     | 6.71                    | 8.9            | 25.0                                       | 0.83                          | 185                            | \$1.43                   |
| 4500                         | 1.0              | 1.64                                         | 0.60                          | 4.08                     | 7.32                    | 8.2            | 25.0                                       | 0.83                          | 170                            | \$1.55                   |
| 5000                         | 1.0              | 1.81                                         | 0.60                          | 4.52                     | 7.93                    | 7.6            | 25.0                                       | 0.83                          | 158                            | \$1.67                   |
| 5500                         | 1.0              | 1.97                                         | 0.60                          | 4.97                     | 8.54                    | 7.0            | 25.0                                       | 0.83                          | 145                            | \$1.82                   |
| 6000                         | 1.0              | 2.13                                         | 0.60                          | 5.41                     | 9.14                    | 6.5            | 25.0                                       | 0.83                          | 135                            | \$1.96                   |
| 6500                         | 1.0              | 2.30                                         | 0.60                          | 5.86                     | 9.76                    | 6.2            | 25.0                                       | 0.83                          | 129                            | \$2.05                   |
| 7000                         | 1.0              | 2.46                                         | 0.60                          | 6.30                     | 10.36                   | 5.8            | 25.0                                       | 0.83                          | 120                            | \$2.19                   |

Appendix C (Continued)  
Calculations for Moving Materials With a Caterpillar 637E Push-Pull Scraper Fleet

Material Movement By Scrapers

| Case #4: 5% Resisting Grade |                  | Loaded (5% grade + 4% rolling = 9% total) |                               |                          |                         |                | Empty (-5% grade + 4% rolling = -1% total) |                               |                                |                          |
|-----------------------------|------------------|-------------------------------------------|-------------------------------|--------------------------|-------------------------|----------------|--------------------------------------------|-------------------------------|--------------------------------|--------------------------|
| One-Way Distance (Fl.)      | Load Time (Min.) | Travel Time Loaded (Min.)                 | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                              | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |
| 500                         | 1.0              | 0.55                                      | 0.60                          | 0.33                     | 2.48                    | 24.2           | 25.0                                       | 0.83                          | 502                            | \$0.53                   |
| 1000                        | 1.0              | 1.01                                      | 0.60                          | 0.50                     | 3.11                    | 19.3           | 25.0                                       | 0.83                          | 400                            | \$0.66                   |
| 1500                        | 1.0              | 1.46                                      | 0.60                          | 0.66                     | 3.72                    | 16.1           | 25.0                                       | 0.83                          | 334                            | \$0.79                   |
| 2000                        | 1.0              | 1.92                                      | 0.60                          | 0.83                     | 4.35                    | 13.8           | 25.0                                       | 0.83                          | 286                            | \$0.92                   |
| 2500                        | 1.0              | 2.38                                      | 0.60                          | 0.99                     | 4.97                    | 12.1           | 25.0                                       | 0.83                          | 251                            | \$1.05                   |
| 3000                        | 1.0              | 2.83                                      | 0.60                          | 1.15                     | 5.58                    | 10.8           | 25.0                                       | 0.83                          | 224                            | \$1.18                   |
| 3500                        | 1.0              | 3.29                                      | 0.60                          | 1.31                     | 6.20                    | 9.7            | 25.0                                       | 0.83                          | 201                            | \$1.31                   |
| 4000                        | 1.0              | 3.75                                      | 0.60                          | 1.48                     | 6.83                    | 8.8            | 25.0                                       | 0.83                          | 183                            | \$1.44                   |
| 4500                        | 1.0              | 4.21                                      | 0.60                          | 1.64                     | 7.45                    | 8.1            | 25.0                                       | 0.83                          | 168                            | \$1.57                   |
| 5000                        | 1.0              | 4.66                                      | 0.60                          | 1.80                     | 8.06                    | 7.4            | 25.0                                       | 0.83                          | 154                            | \$1.72                   |
| 5500                        | 1.0              | 5.12                                      | 0.60                          | 1.96                     | 8.68                    | 6.9            | 25.0                                       | 0.83                          | 143                            | \$1.84                   |
| 6000                        | 1.0              | 5.58                                      | 0.60                          | 2.13                     | 9.31                    | 6.4            | 25.0                                       | 0.83                          | 133                            | \$1.99                   |
| 6500                        | 1.0              | 6.04                                      | 0.60                          | 2.29                     | 9.93                    | 6.0            | 25.0                                       | 0.83                          | 125                            | \$2.12                   |
| 7000                        | 1.0              | 6.49                                      | 0.60                          | 2.45                     | 10.54                   | 5.7            | 25.0                                       | 0.83                          | 118                            | \$2.23                   |

| Case #5: 10% Resisting Grade |                  | Loaded (10% grade + 4% rolling = 14% total) |                               |                          |                         |                | Empty (-10% grade + 4% rolling = -6% total) |                               |                                |                          |
|------------------------------|------------------|---------------------------------------------|-------------------------------|--------------------------|-------------------------|----------------|---------------------------------------------|-------------------------------|--------------------------------|--------------------------|
| One-Way Distance (Fl.)       | Load Time (Min.) | Travel Time Loaded (Min.)                   | Maneuver & Spread Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                               | Efficiency Factor (50 min/hr) | Adjusted Productivity (BCY/Hr) | Operating Costs (\$/BCY) |
| 500                          | 1.0              | 0.75                                        | 0.60                          | 0.32                     | 2.67                    | 22.5           | 25.0                                        | 0.83                          | 467                            | \$0.56                   |
| 1000                         | 1.0              | 1.43                                        | 0.60                          | 0.49                     | 3.52                    | 17.0           | 25.0                                        | 0.83                          | 353                            | \$0.75                   |
| 1500                         | 1.0              | 2.12                                        | 0.60                          | 0.65                     | 4.37                    | 13.7           | 25.0                                        | 0.83                          | 284                            | \$0.93                   |
| 2000                         | 1.0              | 2.81                                        | 0.60                          | 0.81                     | 5.22                    | 11.5           | 25.0                                        | 0.83                          | 238                            | \$1.11                   |
| 2500                         | 1.0              | 3.49                                        | 0.60                          | 0.98                     | 6.07                    | 9.9            | 25.0                                        | 0.83                          | 205                            | \$1.28                   |
| 3000                         | 1.0              | 4.18                                        | 0.60                          | 1.14                     | 6.92                    | 8.7            | 25.0                                        | 0.83                          | 181                            | \$1.46                   |
| 3500                         | 1.0              | 4.87                                        | 0.60                          | 1.30                     | 7.77                    | 7.7            | 25.0                                        | 0.83                          | 160                            | \$1.65                   |
| 4000                         | 1.0              | 5.56                                        | 0.60                          | 1.46                     | 8.62                    | 7.0            | 25.0                                        | 0.83                          | 145                            | \$1.82                   |
| 4500                         | 1.0              | 6.24                                        | 0.60                          | 1.63                     | 9.47                    | 6.3            | 25.0                                        | 0.83                          | 131                            | \$2.02                   |
| 5000                         | 1.0              | 6.93                                        | 0.60                          | 1.79                     | 10.32                   | 5.8            | 25.0                                        | 0.83                          | 120                            | \$2.19                   |
| 5500                         | 1.0              | 7.62                                        | 0.60                          | 1.95                     | 11.17                   | 5.4            | 25.0                                        | 0.83                          | 112                            | \$2.35                   |
| 6000                         | 1.0              | 8.31                                        | 0.60                          | 2.12                     | 12.03                   | 4.9            | 25.0                                        | 0.83                          | 102                            | \$2.59                   |
| 6500                         | 1.0              | 8.99                                        | 0.60                          | 2.28                     | 12.87                   | 4.7            | 25.0                                        | 0.83                          | 98                             | \$2.70                   |
| 7000                         | 1.0              | 9.68                                        | 0.60                          | 2.44                     | 13.72                   | 4.4            | 25.0                                        | 0.83                          | 91                             | \$2.89                   |

Appendix D  
Calculations for Moving Materials With a Caterpillar 56 CY Cable Shovel and Caterpillar 240T (793C) Trucks

NOTE: THESE COSTS ARE FOR EXCAVATION ONLY. MATERIAL REQUIRING BLASTING SHOULD HAVE AN ADDITIONAL \$0.10/BCY ADDED FOR DRILLING AND BLASTING COSTS.

Material Movement By Shovel-Truck Combination

|                                                     |                     |                             |
|-----------------------------------------------------|---------------------|-----------------------------|
| 1) 56 CY Shovel                                     | 56.0 LCY Heaped     |                             |
| 2) Caterpillar 793B - 240-Ton End Dumps             | 193.0 LCY/156.8 BCY |                             |
| 3) Material Density                                 | 2,850.0 LB/BCY      | CPH 25                      |
| 4) Operating Efficiency Factor                      | 0.83 %              | CPH 25                      |
| 5) Rolling Resistance Factor                        | 4.00 %              | CPH 25                      |
| 6) 56 CY Shovel Operating Costs (No Ownership Cost) | \$248.64            | WME                         |
| 7) 793C Lease + Operating Costs                     | \$193.15            | WME                         |
| 8) Labor Costs                                      | \$18.75 Per Hour    | WYDOT-WDD                   |
| 9) 1/2 of 1 - 14,000 Gal. Water Truck + 1 Operator  | \$70.23 Per Hour    | 1/2 of 90% DQCRG + Operator |
| 10) 1 - 16H Blade + 1 Operator                      | \$84.26 Per Hour    | 90% DQCRG + Operator        |
| 11) 1 - D9R + 1 Operator                            | \$120.99 Per Hour   | 90% DQCRG + Operator        |
| 12) 1 834B Rubber Tired Dozer + 1 Operator          | \$105.15 Per Hour   | 90% DQCRG + Operator        |
| 13) Supervision Labor Costs                         | \$12.50 Per Hour    | 1/2 of WYDOT-WDD            |
| 14) Supervisor Transportation                       | \$4.32 Per Hour     | 1/2 of 90% DQCRG            |
| 15) Total Fleet Hourly Costs (Except Trucks)        | \$664.91 Per Hour   |                             |

TO USE TABLE: Locate your approximate grade by reference to case number. Determine cost per BCY by using distance column that approximates your distance. No calculations are necessary.

| Case #1: Level Ground  |                  |                      | Loaded (0% grade + 4% rolling = 4% total resistance) |                  |                          |                         |                | Empty (0% grade + 4% = 4% total) |                                      |                                       |                           |                          |
|------------------------|------------------|----------------------|------------------------------------------------------|------------------|--------------------------|-------------------------|----------------|----------------------------------|--------------------------------------|---------------------------------------|---------------------------|--------------------------|
| One-Way Distance (Ft.) | Load Time (Min.) | Maneuver Time (Min.) | Travel Time Loaded (Min.)                            | Dump Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                    | Adjusted Truck Productivity (BCY/Hr) | Adjusted Shovel Productivity (BCY/Hr) | Number of Trucks Required | Operating Costs (\$/BCY) |
| 500                    | 1.70             | 0.60                 | 0.4                                                  | 1.20             | 0.2                      | 4.1                     | 14.6           | 156.8                            | 1912                                 | 4040                                  | 2.11                      | \$0.275                  |
| 1000                   | 1.70             | 0.60                 | 0.7                                                  | 1.20             | 0.4                      | 4.6                     | 13.0           | 156.8                            | 1704                                 | 4040                                  | 2.37                      | \$0.289                  |
| 1500                   | 1.70             | 0.60                 | 1.0                                                  | 1.20             | 0.6                      | 5.1                     | 11.8           | 156.8                            | 1537                                 | 4040                                  | 2.63                      | \$0.303                  |
| 2000                   | 1.70             | 0.60                 | 1.3                                                  | 1.20             | 0.7                      | 5.5                     | 10.9           | 156.8                            | 1425                                 | 4040                                  | 2.83                      | \$0.313                  |
| 2500                   | 1.70             | 0.60                 | 1.6                                                  | 1.20             | 0.9                      | 6.0                     | 10.0           | 156.8                            | 1307                                 | 4040                                  | 3.09                      | \$0.327                  |
| 3000                   | 1.70             | 0.60                 | 1.9                                                  | 1.20             | 1.1                      | 6.5                     | 9.2            | 156.8                            | 1206                                 | 4040                                  | 3.35                      | \$0.340                  |
| 3500                   | 1.70             | 0.60                 | 2.2                                                  | 1.20             | 1.3                      | 7.0                     | 8.6            | 156.8                            | 1120                                 | 4040                                  | 3.61                      | \$0.354                  |
| 4000                   | 1.70             | 0.60                 | 2.4                                                  | 1.20             | 1.5                      | 7.4                     | 8.1            | 156.8                            | 1059                                 | 4040                                  | 3.81                      | \$0.364                  |
| 4500                   | 1.70             | 0.60                 | 2.7                                                  | 1.20             | 1.7                      | 7.9                     | 7.6            | 156.8                            | 992                                  | 4040                                  | 4.07                      | \$0.378                  |
| 5000                   | 1.70             | 0.60                 | 3.0                                                  | 1.20             | 1.9                      | 8.4                     | 7.1            | 156.8                            | 933                                  | 4040                                  | 4.33                      | \$0.392                  |
| 5500                   | 1.70             | 0.60                 | 3.2                                                  | 1.20             | 2.1                      | 8.8                     | 6.8            | 156.8                            | 891                                  | 4040                                  | 4.53                      | \$0.402                  |
| 6000                   | 1.70             | 0.60                 | 3.5                                                  | 1.20             | 2.3                      | 9.3                     | 6.5            | 156.8                            | 843                                  | 4040                                  | 4.79                      | \$0.416                  |
| 6500                   | 1.70             | 0.60                 | 3.8                                                  | 1.20             | 2.5                      | 9.8                     | 6.1            | 156.8                            | 800                                  | 4040                                  | 5.05                      | \$0.430                  |
| 7000                   | 1.70             | 0.60                 | 4.1                                                  | 1.20             | 2.7                      | 10.3                    | 5.8            | 156.8                            | 761                                  | 4040                                  | 5.31                      | \$0.443                  |

Operating Costs = (((# Trucks x (Truck costs + Labor costs)) + Total Fleet costs)/Shovel Productivity)

Appendix D (Continued)  
Calculations for Moving Materials With a Caterpillar 56 CY Cable Shovel and Caterpillar 240T (793C) Trucks

Material Movement By Shovel-Truck Combination

| Case #2: 5% Resisting Grade |                  |                      | Loaded (5% grade + 4% rolling = 9% total resistance) |                  |                          |                         |                | Empty (-5% grade + 4% rolling = -1% total) |                                      |                                       |                           |                          |
|-----------------------------|------------------|----------------------|------------------------------------------------------|------------------|--------------------------|-------------------------|----------------|--------------------------------------------|--------------------------------------|---------------------------------------|---------------------------|--------------------------|
| One-Way Distance (Fl.)      | Load Time (Min.) | Maneuver Time (Min.) | Travel Time Loaded (Min.)                            | Dump Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                              | Adjusted Truck Productivity (BCY/Hr) | Adjusted Shovel Productivity (BCY/Hr) | Number of Trucks Required | Operating Costs (\$/BCY) |
| 500                         | 1.70             | 0.60                 | 0.8                                                  | 1.20             | 0.4                      | 4.7                     | 12.8           | 156.8                                      | 1668                                 | 4040                                  | 2.42                      | \$0.292                  |
| 1000                        | 1.70             | 0.60                 | 1.4                                                  | 1.20             | 0.7                      | 5.6                     | 10.7           | 156.8                                      | 1398                                 | 4040                                  | 2.89                      | \$0.316                  |
| 1500                        | 1.70             | 0.60                 | 2.2                                                  | 1.20             | 1.0                      | 6.7                     | 9.0            | 156.8                                      | 1170                                 | 4040                                  | 3.45                      | \$0.346                  |
| 2000                        | 1.70             | 0.60                 | 2.9                                                  | 1.20             | 1.3                      | 7.7                     | 7.8            | 156.8                                      | 1019                                 | 4040                                  | 3.96                      | \$0.372                  |
| 2500                        | 1.70             | 0.60                 | 3.6                                                  | 1.20             | 1.6                      | 8.7                     | 6.9            | 156.8                                      | 902                                  | 4040                                  | 4.48                      | \$0.400                  |
| 3000                        | 1.70             | 0.60                 | 4.3                                                  | 1.20             | 1.9                      | 9.7                     | 6.2            | 156.8                                      | 810                                  | 4040                                  | 4.99                      | \$0.426                  |
| 3500                        | 1.70             | 0.60                 | 5.0                                                  | 1.20             | 2.2                      | 10.7                    | 5.6            | 156.8                                      | 731                                  | 4040                                  | 5.52                      | \$0.454                  |
| 4000                        | 1.70             | 0.60                 | 5.7                                                  | 1.20             | 2.5                      | 11.7                    | 5.1            | 156.8                                      | 669                                  | 4040                                  | 6.04                      | \$0.481                  |
| 4500                        | 1.70             | 0.60                 | 6.4                                                  | 1.20             | 2.8                      | 12.7                    | 4.7            | 156.8                                      | 615                                  | 4040                                  | 6.57                      | \$0.509                  |
| 5000                        | 1.70             | 0.60                 | 7.1                                                  | 1.20             | 3.2                      | 13.8                    | 4.4            | 156.8                                      | 570                                  | 4040                                  | 7.09                      | \$0.537                  |
| 5500                        | 1.70             | 0.60                 | 7.8                                                  | 1.20             | 3.5                      | 14.8                    | 4.1            | 156.8                                      | 531                                  | 4040                                  | 7.61                      | \$0.564                  |
| 6000                        | 1.70             | 0.60                 | 8.5                                                  | 1.20             | 3.8                      | 15.8                    | 3.8            | 156.8                                      | 497                                  | 4040                                  | 8.14                      | \$0.592                  |
| 6500                        | 1.70             | 0.60                 | 9.2                                                  | 1.20             | 4.1                      | 16.8                    | 3.6            | 156.8                                      | 467                                  | 4040                                  | 8.66                      | \$0.619                  |
| 7000                        | 1.70             | 0.60                 | 9.9                                                  | 1.20             | 4.4                      | 17.8                    | 3.4            | 156.8                                      | 440                                  | 4040                                  | 9.17                      | \$0.646                  |

| Case #3: 5% Assisting Grade |                  |                      | Loaded (-5% grade + 4% rolling = -1% total resistance) |                  |                          |                         |                | Empty (5% grade + 4% = 9% total) |                                      |                                       |                           |                          |
|-----------------------------|------------------|----------------------|--------------------------------------------------------|------------------|--------------------------|-------------------------|----------------|----------------------------------|--------------------------------------|---------------------------------------|---------------------------|--------------------------|
| One-Way Distance (Fl.)      | Load Time (Min.) | Maneuver Time (Min.) | Travel Time Loaded (Min.)                              | Dump Time (Min.) | Travel Time Empty (Min.) | Total Cycle Time (Min.) | Trips Per Hour | Payload (BCY)                    | Adjusted Truck Productivity (BCY/Hr) | Adjusted Shovel Productivity (BCY/Hr) | Number of Trucks Required | Operating Costs (\$/BCY) |
| 500                         | 1.70             | 0.60                 | 0.4                                                    | 1.20             | 0.3                      | 4.2                     | 14.3           | 156.8                            | 1867                                 | 4040                                  | 2.16                      | \$0.278                  |
| 1000                        | 1.70             | 0.60                 | 0.7                                                    | 1.20             | 0.5                      | 4.7                     | 12.7           | 156.8                            | 1662                                 | 4040                                  | 2.43                      | \$0.292                  |
| 1500                        | 1.70             | 0.60                 | 1.0                                                    | 1.20             | 0.8                      | 5.3                     | 11.3           | 156.8                            | 1479                                 | 4040                                  | 2.73                      | \$0.308                  |
| 2000                        | 1.70             | 0.60                 | 1.3                                                    | 1.20             | 1.0                      | 5.8                     | 10.3           | 156.8                            | 1344                                 | 4040                                  | 3.00                      | \$0.322                  |
| 2500                        | 1.70             | 0.60                 | 1.6                                                    | 1.20             | 1.3                      | 6.4                     | 9.4            | 156.8                            | 1227                                 | 4040                                  | 3.29                      | \$0.337                  |
| 3000                        | 1.70             | 0.60                 | 1.9                                                    | 1.20             | 1.6                      | 7.0                     | 8.6            | 156.8                            | 1128                                 | 4040                                  | 3.58                      | \$0.352                  |
| 3500                        | 1.70             | 0.60                 | 2.2                                                    | 1.20             | 1.8                      | 7.5                     | 8.0            | 156.8                            | 1044                                 | 4040                                  | 3.87                      | \$0.368                  |
| 4000                        | 1.70             | 0.60                 | 2.5                                                    | 1.20             | 2.1                      | 8.1                     | 7.4            | 156.8                            | 972                                  | 4040                                  | 4.16                      | \$0.383                  |
| 4500                        | 1.70             | 0.60                 | 2.8                                                    | 1.20             | 2.3                      | 8.6                     | 7.0            | 156.8                            | 909                                  | 4040                                  | 4.44                      | \$0.398                  |
| 5000                        | 1.70             | 0.60                 | 3.2                                                    | 1.20             | 2.6                      | 9.3                     | 6.5            | 156.8                            | 845                                  | 4040                                  | 4.78                      | \$0.415                  |
| 5500                        | 1.70             | 0.60                 | 3.5                                                    | 1.20             | 2.8                      | 9.8                     | 6.1            | 156.8                            | 797                                  | 4040                                  | 5.07                      | \$0.431                  |
| 6000                        | 1.70             | 0.60                 | 3.8                                                    | 1.20             | 3.1                      | 10.4                    | 5.8            | 156.8                            | 754                                  | 4040                                  | 5.36                      | \$0.446                  |
| 6500                        | 1.70             | 0.60                 | 4.1                                                    | 1.20             | 3.4                      | 11.0                    | 5.5            | 156.8                            | 715                                  | 4040                                  | 5.65                      | \$0.461                  |
| 7000                        | 1.70             | 0.60                 | 4.4                                                    | 1.20             | 3.6                      | 11.5                    | 5.2            | 156.8                            | 681                                  | 4040                                  | 5.93                      | \$0.476                  |



Appendix E  
Calculations for Moving Material With a Caterpillar D9N Dozer

Material Movement By Dozing

|                                       |                        |                     |
|---------------------------------------|------------------------|---------------------|
| 1) Caterpillar D9N Dozer With U Blade |                        |                     |
| 2) Operating Costs                    | \$94.60 Per Hour       | 90% of DQCRG        |
| 3) Labor Costs                        | \$18.75 Per Hour       | WYDOT-WDD           |
| 4) Supervisor Labor Costs             | \$3.13 Per Hour        | 1/8 of 90% of DQCRG |
| 5) Supervisor Transportation          | <u>\$1.10 Per Hour</u> | 1/8 of 90% of DQCRG |
| 6) Total Hourly Costs                 | \$117.58 Per Hour      |                     |

TO USE TABLE: Locate your approximate grade by referencing "Grade" column. Determine cost per LCY by using the distance that best approximates your distance.

| Distance (FL) | Productivity (LCY/Hr.) | Job Correction Factors <sup>1</sup> |          |            |            | Grade (0%) | Adjusted Productivity (LCY/Hr.) | Costs (\$/LCY) |
|---------------|------------------------|-------------------------------------|----------|------------|------------|------------|---------------------------------|----------------|
|               |                        | Operator                            | Material | Visibility | Efficiency |            |                                 |                |
| 50            | 2100                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 1575                            | \$0.075        |
| 100           | 1200                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 900                             | \$0.131        |
| 150           | 900                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 675                             | \$0.174        |
| 200           | 700                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 525                             | \$0.224        |
| 250           | 570                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 428                             | \$0.275        |
| 300           | 480                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 360                             | \$0.327        |
| 350           | 410                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 308                             | \$0.382        |
| 400           | 370                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 278                             | \$0.423        |
| 450           | 350                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 263                             | \$0.447        |
| 500           | 340                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 255                             | \$0.461        |

| Distance (FL) | Productivity (LCY/Hr.) | Job Correction Factors <sup>1</sup> |          |            |            | Grade (-10%) | Adjusted Productivity (LCY/Hr.) | Costs (\$/LCY) |
|---------------|------------------------|-------------------------------------|----------|------------|------------|--------------|---------------------------------|----------------|
|               |                        | Operator                            | Material | Visibility | Efficiency |              |                                 |                |
| 50            | 2100                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 1890                            | \$0.062        |
| 100           | 1200                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 1080                            | \$0.109        |
| 150           | 900                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 810                             | \$0.145        |
| 200           | 700                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 630                             | \$0.187        |
| 250           | 570                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 513                             | \$0.229        |
| 300           | 480                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 432                             | \$0.272        |
| 350           | 410                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 369                             | \$0.317        |
| 400           | 370                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 333                             | \$0.353        |
| 450           | 350                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 315                             | \$0.373        |
| 500           | 340                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 306                             | \$0.384        |

<sup>1</sup> Job Correction Factors:  
 Operator      Excellent = 1.00  
 Material      Good      = 1.00  
 Visibility     Fair      = 0.90  
 Efficiency    50 min/hr = 0.83

Appendix E (Continued)  
Calculations for Moving Material With a Caterpillar D9N Dozer

Material Movement By Dozing

| Distance<br>(Pt.) | Productivity<br>(LCY/Hr.) | Job Correction Factors <sup>1</sup> |          |            |            | Grade<br>(-20%) | Adjusted<br>Productivity<br>(LCY/Hr.) | Costs<br>(\$/LCY) |
|-------------------|---------------------------|-------------------------------------|----------|------------|------------|-----------------|---------------------------------------|-------------------|
|                   |                           | Operator                            | Material | Visibility | Efficiency |                 |                                       |                   |
| 50                | 2100                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 2205                                  | \$0.053           |
| 100               | 1200                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 1260                                  | \$0.093           |
| 150               | 900                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 945                                   | \$0.124           |
| 200               | 700                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 735                                   | \$0.160           |
| 250               | 570                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 599                                   | \$0.196           |
| 300               | 480                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 504                                   | \$0.233           |
| 350               | 410                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 431                                   | \$0.273           |
| 400               | 370                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 389                                   | \$0.302           |
| 450               | 350                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 368                                   | \$0.320           |
| 500               | 340                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 357                                   | \$0.329           |

| Distance<br>(FL) | Productivity<br>(LCY/Hr.) | Job Correction Factors <sup>1</sup> |          |            |            | Grade<br>(10%) | Adjusted<br>Productivity<br>(LCY/Hr.) | Cost<br>(\$/LCY) |
|------------------|---------------------------|-------------------------------------|----------|------------|------------|----------------|---------------------------------------|------------------|
|                  |                           | Operator                            | Material | Visibility | Efficiency |                |                                       |                  |
| 50               | 2100                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 1181                                  | \$0.100          |
| 100              | 1200                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 675                                   | \$0.174          |
| 150              | 900                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 506                                   | \$0.232          |
| 200              | 700                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 394                                   | \$0.298          |
| 250              | 570                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 321                                   | \$0.366          |
| 300              | 480                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 270                                   | \$0.436          |
| 350              | 410                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 231                                   | \$0.509          |
| 400              | 370                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 208                                   | \$0.565          |
| 450              | 350                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 197                                   | \$0.600          |
| 500              | 340                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 191                                   | \$0.616          |

<sup>1</sup> Job Correction Factors:

|            |           |        |
|------------|-----------|--------|
| Operator   | Excellent | = 1.00 |
| Material   | Good      | = 1.00 |
| Visibility | Fair      | = 0.90 |
| Efficiency | 50 min/hr | = 0.83 |

Appendix F  
Calculations For Moving Material With a Caterpillar D11R Dozer

Material Movement By Dozing With D11R

|                                                                                 |                   |                     |
|---------------------------------------------------------------------------------|-------------------|---------------------|
| 1) Caterpillar D11R Dozer With U Blade (Operating Costs) \$223.85 per DataQuest |                   |                     |
| 2) Operating Costs                                                              | \$201.47 Per Hour | 90% of DQCRG        |
| 3) Labor Costs                                                                  | \$18.75 Per Hour  | WYDOT-WDD           |
| 4) Supervisor Labor Costs                                                       | \$3.13 Per Hour   | 1/8 of 90% of DQCRG |
| 5) Supervisor Transportation                                                    | \$1.10 Per Hour   | 1/8 of 90% of DQCRG |
| 6) Total Hourly Costs                                                           | \$224.45 Per Hour |                     |

TO USE TABLE: Locate your approximate grade by referencing "Grade" column. Determine cost per LCY by using the distance that best approximates your distance.

| Distance (Ft.) | Productivity (LCY/Hr.) | Job Correction Factors <sup>1</sup> |          |            |            | Grade (0%) | Adjusted Productivity (LCY/Hr.) | Costs (\$/LCY) |
|----------------|------------------------|-------------------------------------|----------|------------|------------|------------|---------------------------------|----------------|
|                |                        | Operator                            | Material | Visibility | Efficiency |            |                                 |                |
| 50             | 3200                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 2400                            | \$0.094        |
| 100            | 2700                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 2025                            | \$0.111        |
| 150            | 1800                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 1350                            | \$0.166        |
| 200            | 1400                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 1050                            | \$0.214        |
| 250            | 1150                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 863                             | \$0.260        |
| 300            | 1000                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 750                             | \$0.300        |
| 350            | 850                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 638                             | \$0.352        |
| 400            | 750                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 563                             | \$0.400        |
| 450            | 670                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 503                             | \$0.446        |
| 500            | 600                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.00       | 450                             | \$0.500        |

| Distance (Ft.) | Productivity (LCY/Hr.) | Job Correction Factors <sup>1</sup> |          |            |            | Grade (-10%) | Adjusted Productivity (LCY/Hr.) | Costs (\$/LCY) |
|----------------|------------------------|-------------------------------------|----------|------------|------------|--------------|---------------------------------|----------------|
|                |                        | Operator                            | Material | Visibility | Efficiency |              |                                 |                |
| 50             | 3200                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 2880                            | \$0.078        |
| 100            | 2700                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 2430                            | \$0.092        |
| 150            | 1800                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 1620                            | \$0.139        |
| 200            | 1400                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 1260                            | \$0.178        |
| 250            | 1150                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 1035                            | \$0.217        |
| 300            | 1000                   | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 900                             | \$0.249        |
| 350            | 850                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 765                             | \$0.293        |
| 400            | 750                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 675                             | \$0.333        |
| 450            | 670                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 603                             | \$0.372        |
| 500            | 600                    | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.20         | 540                             | \$0.416        |

<sup>1</sup> Job Correction Factors:  
 Operator      Excellent = 1.00  
 Material      Good      = 1.00  
 Visibility     Fair      = 0.90  
 Efficiency    50 min/hr = 0.83

Appendix F (Continued)  
Calculations For Moving Material With a Caterpillar D11R Dozer

Material Movement By Dozing With D11R

| Distance<br>(Ft.) | Productivity<br>(LCY/Hr.) | Job Correction Factors <sup>1</sup> |          |            |            | Grade<br>(-20%) | Adjusted<br>Productivity<br>(LCY/Hr.) | Costs<br>(\$/LCY) |
|-------------------|---------------------------|-------------------------------------|----------|------------|------------|-----------------|---------------------------------------|-------------------|
|                   |                           | Operator                            | Material | Visibility | Efficiency |                 |                                       |                   |
| 50                | 3200                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 3360                                  | \$0.067           |
| 100               | 2700                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 2835                                  | \$0.079           |
| 150               | 1800                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 1890                                  | \$0.119           |
| 200               | 1400                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 1470                                  | \$0.153           |
| 250               | 1150                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 1208                                  | \$0.186           |
| 300               | 1000                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 1050                                  | \$0.214           |
| 350               | 850                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 893                                   | \$0.251           |
| 400               | 750                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 788                                   | \$0.285           |
| 450               | 670                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 704                                   | \$0.319           |
| 500               | 600                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 1.40            | 630                                   | \$0.356           |

| Distance<br>(Ft.) | Productivity<br>(LCY/Hr.) | Job Correction Factors <sup>1</sup> |          |            |            | Grade<br>(10%) | Adjusted<br>Productivity<br>(LCY/Hr.) | Costs<br>(\$/LCY) |
|-------------------|---------------------------|-------------------------------------|----------|------------|------------|----------------|---------------------------------------|-------------------|
|                   |                           | Operator                            | Material | Visibility | Efficiency |                |                                       |                   |
| 50                | 3200                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 1800                                  | \$0.125           |
| 100               | 2700                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 1519                                  | \$0.148           |
| 150               | 1800                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 1013                                  | \$0.222           |
| 200               | 1400                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 788                                   | \$0.285           |
| 250               | 1150                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 647                                   | \$0.347           |
| 300               | 1000                      | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 563                                   | \$0.399           |
| 350               | 850                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 478                                   | \$0.470           |
| 400               | 750                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 422                                   | \$0.532           |
| 450               | 670                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 377                                   | \$0.595           |
| 500               | 600                       | 1.0                                 | 1.0      | 0.90       | 0.83       | 0.75           | 338                                   | \$0.664           |

<sup>1</sup> Job Correction Factors:

|            |           |        |
|------------|-----------|--------|
| Operator   | Excellent | = 1.00 |
| Material   | Good      | = 1.00 |
| Visibility | Fair      | = 0.90 |
| Efficiency | 50 min/hr | = 0.83 |

Appendix G  
Calculations for Final Grading With a Caterpillar 16H Motor Grader

Final Grading

|                                                                                        | INPUT, UNIT AS<br>INDICATED   | COMMENT/<br>SOURCE  |
|----------------------------------------------------------------------------------------|-------------------------------|---------------------|
| <b>Caterpillar 16H Motor Grader</b>                                                    |                               |                     |
| Speed in Miles Per Hour (Second Gear)                                                  | 3.3 Miles/Hour                | CPH 25              |
| Width of Grading Per Pass                                                              | 8 Feet                        | CPH 25              |
| Feet Per Mile                                                                          | 5,280 Feet                    |                     |
| Square Feet Per Acre                                                                   | 43,560 Sq. Ft.                |                     |
| Operating Efficiency Factor 50 Min./Hr.                                                | 0.83 %                        | CPH 25              |
| Operating Costs                                                                        | \$65.51 Per Hour              | 90% of DQCRG        |
| Labor Costs                                                                            | \$18.75 Per Hour              | WYDOT-WDD           |
| Supervision Labor Costs                                                                | \$3.13 Per Hour               | 1/8 of 90% of DQCRG |
| Supervisor Transportation                                                              | \$1.10 Per Hour               | 1/8 of 90% of DQCRG |
| Total Hourly Costs                                                                     | \$88.49                       |                     |
| <b>Grading Rate</b>                                                                    |                               |                     |
| $(3.3 \text{ Miles/Hour}) \times (5,280 \text{ Ft./Mile}) \times (8 \text{ Ft./Pass})$ | 139,392 Ft <sup>2</sup> /Hour |                     |
| $(139,392 \text{ Ft}^2/\text{Hour}) / (43,560 \text{ Ft}^2/\text{Acre})$               | 3.2 Acres/Hour                |                     |
| $(3.2 \text{ Acres/Hour}) \times (0.83 \text{ Efficiency Factor})$                     | 2.66 Acres/Hour               |                     |
| <b>Operating Costs</b>                                                                 |                               |                     |
| $(\$88.49/\text{Hour}) / (2.66 \text{ Acres/Hour})$                                    | \$33.27 Per Acre              |                     |

Appendix H  
 Cost Estimates for Handling Wire Fencing and Electrical Power Lines

| FENCING                      |                                | SOURCES                                                         |
|------------------------------|--------------------------------|-----------------------------------------------------------------|
| Construction 4-Strand Barbed | Overall Average -<br>\$1.15/LF | Wyoming Highway Department<br>Weighted Average Bid Prices, 1997 |
| Removal                      | Overall Average -<br>\$0.68/LF | Wyoming Highway Department,<br>Average Bid Prices, 1997         |
|                              | Power Line Removal             |                                                                 |
| Distribution Lines:          | No Charge                      | From: Tri-County Electric                                       |
| Transmission Lines:          | No Charge                      | From: Tri-County Electric                                       |

Note: Cost estimates for power line removal are based on phone contact with Tri-County Electric. Distribution lines are owned by Tri-County Electric and would be removed upon request at no charge by Tri-County Electric. Transmission lines (lines which go from the main metering point to various electrical substations and are not owned by Tri-County Electric) would be removed by Tri-County Electric at no cost for their salvage value.

Appendix I  
 Cost Estimate for Ripping Asphalt Using a Caterpillar D9R Dozer

Asphalt Ripping (3"-4" Mat)

|                                                               | INPUT, UNIT AS INDICATED     | COMMENT/SOURCE      |
|---------------------------------------------------------------|------------------------------|---------------------|
| <b>Caterpillar D9R Dozer With 3 Shank Ripper</b>              |                              |                     |
| Speed in Miles Per Hour                                       | 1 Mile/Hour                  | CPH 25              |
| Width of Ripping Pass                                         | 3 Feet                       | CPH 25              |
| Feet Per Mile                                                 | 5,280 Feet                   |                     |
| Square Feet Per Acre                                          | 43,560 Sq. Ft.               |                     |
| Operating Efficiency Factor 50 Min./Hr.                       | 0.83 %                       | CPH 25              |
| Operating Costs                                               | \$102.24 Per Hour            | 90% of DQCRG        |
| Operator Costs                                                | \$18.75 Per Hour             | WYDOT-WDD           |
| Supervision Labor Costs                                       | \$3.13 Per Hour              | 1/8 of 90% of DQCRG |
| Supervisor Transportation                                     | \$1.10 Per Hour              | 1/8 of 90% of DQCRG |
| <b>Total Hourly Costs</b>                                     | <b>\$125.22</b>              |                     |
| <b>Ripper Productivity</b>                                    |                              |                     |
| (1.0 Mile/Hour)x(5,280 Ft./Mile)x(3 Ft./Pass)                 | 15,840 Ft <sup>2</sup> /Hour |                     |
| (15,840 Ft <sup>2</sup> /Hour)/(43,560 Ft <sup>2</sup> /Acre) | 0.36 Acres/Hour              |                     |
| (0.36 Acres/Hour)x(0.83 Efficiency Factor)                    | 0.299 Acres/Hour             |                     |
| <b>Operating Costs</b>                                        |                              |                     |
| (\$125.22/Hour)/(0.299 Acres/Hour)                            | \$418.80 Per Acre            |                     |

Appendix II  
 Cost Estimate for Ripping Overburden Using a Caterpillar D10R Dozer

Overburden Ripping

|                                                                                       | INPUT, UNIT AS<br>INDICATED  | COMMENT/<br>SOURCE  |
|---------------------------------------------------------------------------------------|------------------------------|---------------------|
| <b>Caterpillar D10R Dozer With Single Shank Ripper</b>                                |                              |                     |
| Speed in Miles Per Hour                                                               | 1 Mile/Hour                  | CPH 25              |
| Width of Ripping Pass                                                                 | 3 Feet                       | CPH 25              |
| Feet Per Mile                                                                         | 5,280 Feet                   |                     |
| Square Feet Per Acre                                                                  | 43,560 Sq. Ft.               |                     |
| Operating Efficiency Factor 50 Min./Hr.                                               | 0.75 %                       | CPH 25              |
| Rip Depth                                                                             | 2 Feet                       | CPH 25              |
| Operating Costs                                                                       | \$134.07 Per Hour            | 90% of DQCRG        |
| Labor Costs                                                                           | \$18.75 Per Hour             | WYDOT-WDD           |
| Supervision Labor Costs                                                               | \$3.13 Per Hour              | 1/8 of 90% of DQCRG |
| Supervisor Transportation                                                             | \$1.10 Per Hour              | 1/8 of 90% of DQCRG |
| Total Hourly Costs                                                                    | \$157.05                     |                     |
| <b>Ripper Productivity</b>                                                            |                              |                     |
| $(1.0 \text{ Mile/Hour}) \times (5,280 \text{ Ft./Mile}) \times (3 \text{ Ft./Pass})$ | 15,840 Ft <sup>2</sup> /Hour |                     |
| $(15,840 \text{ Ft}^2/\text{Hour}) / (43,560 \text{ Ft}^2/\text{Acre})$               | 0.36 Acre/Hour               |                     |
| $(0.36 \text{ Acre/Hour}) \times (0.75 \text{ Efficiency Factor})$                    | 0.27 Acre/Hour               |                     |
| <b>Operating Costs</b>                                                                |                              |                     |
| $(\$157.05/\text{Hour}) / (0.27 \text{ Acre/Hour})$                                   | \$581.67 Per Acre            |                     |

Note: A 75 percent Efficiency Factor was used to account for slowing, raising ripper, maneuvering and turn time.



Appendix J  
Cost Estimate for Culvert Removal

Culvert Removal

|                                                                       | INPUT, UNIT AS<br>INDICATED | COMMENT/<br>SOURCE |
|-----------------------------------------------------------------------|-----------------------------|--------------------|
| Average Length of CMP Section                                         | 20 Feet                     |                    |
| Assumed Culvert Diameter                                              | 48 Inches                   |                    |
| Time to Cut One Band                                                  | 10 Minutes                  |                    |
| Time to Load One 20' Section (2 People)                               | 20 Minutes                  |                    |
| Average Haul, Dump and Return Time                                    | 30 Minutes                  |                    |
| Number of Sections of CMP Per Load                                    | 2                           |                    |
| Operating Efficiency Factor 50 Min./Hr.                               | 0.83 %                      |                    |
| Labor                                                                 | \$18.75 Per Hour            | WYDOT-WDD          |
| Dump Truck (10-12 yd <sup>3</sup> )                                   | \$26.52 Per Hour            | 90% of DQCRG       |
| Caterpillar 980F Front-End Loader                                     | \$57.94 Per Hour            | 90% of DQCRG       |
| <b>Cost to Remove One 20' Section of CMP</b>                          |                             |                    |
| Labor Cost x Time to Cut One Band                                     | \$3.13                      |                    |
| + ((Labor Cost x 2) + FEL Cost) x Time to Load 1 Section              | \$31.78                     |                    |
| + (Labor Cost + Truck Cost) x Haul Time                               | \$22.64                     |                    |
| Cost to Remove One 20' Section of CMP<br>(not including dirt removal) | \$57.55                     |                    |

Note: Culverts may be smashed and buried in place when feasible.

Appendix K  
 Cost Estimates for Demolition and Removal of Railroad Spurs and Facilities Buildings

| TASK                                                      | COST PER UNIT (\$)   | REGIONAL COST ADJUSTMENT <sup>1</sup> | ADJUSTED COST PER UNIT (\$) |
|-----------------------------------------------------------|----------------------|---------------------------------------|-----------------------------|
| Track Removal                                             | 6.19/lin. ft.        | 84.2%                                 | 5.21/lin. ft.               |
| Ballast Removal                                           | 2.54/cy              | 84.2%                                 | 2.14/cy                     |
| <b>Building Demolition and Disposal<sup>1, 2, 3</sup></b> |                      |                                       |                             |
| Mixture of Types                                          | 0.18/ft <sup>3</sup> | 84.2%                                 | 0.152/ft <sup>3</sup>       |
| Explosive Demolition, Concrete or Steel                   | 0.18/ft <sup>3</sup> | 84.2%                                 | 0.152/ft <sup>3</sup>       |
| Disposal                                                  | 6.47/cy              | 84.2%                                 | 5.45/cy                     |
| City Landfill Dump Charges                                | \$50.00/ton          | 84.2%                                 | \$42.10/ton                 |
| <b>Concrete Footings and Foundations</b>                  |                      |                                       |                             |
| Thick With Rebar                                          | 9.65/sq. ft.         | 84.2%                                 | 8.13/sq. ft.                |
| Footings - 2' Thick, 3' Wide                              | 13.15/lin. ft.       | 84.2%                                 | 11.07/lin. ft.              |
| Concrete Disposal On-Site                                 | 5.25/cy              | 84.2%                                 | 4.42/cy                     |

Note: Operators may also provide a verifiable cost estimate from a qualified contractor for these demolition tasks. This estimate may be used for one to three consecutive years, assuming few substantial changes in mine facilities.

- <sup>1</sup> Costs From: 1998 Means Heavy Construction Cost Data
- <sup>2</sup> Based on Total Volume of Building, does not include disposal cost
- <sup>3</sup> Based on Concrete Structures Volume Only, does not include disposal cost

Appendix L  
Abandonment and Sealing of Cased Drill Holes and Monitor Wells

| TASKS                                                                   | UNIT COST       | UNITS | TOTAL COST |
|-------------------------------------------------------------------------|-----------------|-------|------------|
| <b>DRILL HOLE RECLAMATION COSTS</b>                                     |                 |       |            |
| Site Locating                                                           | \$10.00/site    |       |            |
| Sealing Using High-Solids Bentonite Grout <sup>1,2</sup><br>≤ 500' deep | \$4.00/lin. ft. |       |            |
| ≤ 1,000' deep                                                           | \$6.28/lin. ft. |       |            |
| Capping Using a Pre-cast Concrete Cap (if needed)                       | \$7.50/hole     |       |            |
| Site Grading                                                            | \$30.00/site    |       |            |
| Seeding - Small Site (15' x 25')                                        | \$1.00/site     |       |            |
| Contouring & Seeding - Large Sites (100' x 100')                        | \$250.00/site   |       |            |
| <b>MONITORING WELL RECLAMATION COSTS</b>                                |                 |       |            |
| Site Locating                                                           | \$10.00/site    |       |            |
| Removal of Top Few Feet of Casing (Backhoe & Welder)                    | \$15.00/well    |       |            |
| Sealing Using High-Solids Bentonite Grout <sup>1,2</sup><br>≤ 500' deep | \$4.00/lin. ft. |       |            |
| ≤ 1,000' deep                                                           | \$6.28/lin. ft. |       |            |
| Site Smoothing (Hand Work) & Seeding                                    | \$5.00/site     |       |            |

Costs based on industry sources.

<sup>1</sup> Assumes a hole/well size of 5" diameter.

<sup>2</sup> Gassy or artesian wells would require class G neat cement plugging @ \$6.46/ft. for wells up to 500' deep and \$7.64/ft. for holes over 500' deep.

Appendix M  
 Cost Estimate for Rough Grading Backfill Using  
 Caterpillar D9R Dozer or Caterpillar 834B

| ITEMS                                                                                                                                                                                  | CATERPILLAR D9R<br>DOZER      | CATERPILLAR 834B<br>RUBBER TIRED<br>DOZER | COMMENT/SOURCE      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------|---------------------|
| Speed in Miles Per Hour (First Gear)                                                                                                                                                   | 2.0 Miles/Hour                | 4.0 Miles/Hour                            | CPH 25              |
| Width of Dozer Pass                                                                                                                                                                    | 14 Feet                       | 14 Feet                                   | CPH 25              |
| Feet Per Mile                                                                                                                                                                          | 5,280 Feet                    | 5,280 Feet                                |                     |
| Square Feet Per Acre                                                                                                                                                                   | 43,560 Sq. Ft.                | 43,560 Sq. Ft.                            |                     |
| Operating Efficiency Factor 50 Min./Hr.                                                                                                                                                | 0.83%                         | 0.83%                                     | CPH 25              |
| Operating Costs                                                                                                                                                                        | \$102.24 Per Hour             | \$86.40 Per Hour                          | 90% of DQCRG        |
| Labor Costs                                                                                                                                                                            | \$18.75 Per Hour              | \$18.75 Per Hour                          | WYDOT-WDD           |
| Supervision Labor Costs                                                                                                                                                                | \$3.13 Per Hour               | \$3.13 Per Hour                           | 1/8 of 90% of DQCRG |
| Supervisor Transportation                                                                                                                                                              | \$1.10 Per Hour               | \$1.10 Per Hour                           | 1/8 of 90% of DQCRG |
| Full Hourly Costs                                                                                                                                                                      | \$125.20                      | \$109.38                                  |                     |
| <b>SCARIFICATION RATE</b>                                                                                                                                                              |                               |                                           |                     |
| $(2.0 \text{ Miles/Hour}) \times (5,280 \text{ Ft./Mile}) \times (14 \text{ Ft./Pass})^1$<br>$(4.0 \text{ Miles/Hour}) \times (5,280 \text{ Ft./Mile}) \times (14 \text{ Ft./Pass})^2$ | 147,840 Ft <sup>2</sup> /Hour | 295,680 Ft <sup>2</sup> /Hour             |                     |
| $(147,890 \text{ Ft}^2/\text{Hour}) / (43,560 \text{ Ft}^2/\text{Acre})^1$<br>$(295,680 \text{ Ft}^2/\text{Hour}) / (43,560 \text{ Ft}^2/\text{Acre})^2$                               | 3.39 Acres/Hour               | 6.79 Acres/Hour                           |                     |
| $(3.39 \text{ Acres/Hour}) \times (0.83 \text{ Efficiency Factor})^1$<br>$(6.79 \text{ Acres/Hour}) \times (0.83 \text{ Efficiency Factor})^2$                                         | 2.82 Acres/Hour               | 5.66 Acres/Hour                           |                     |
| <b>OPERATING COSTS</b>                                                                                                                                                                 |                               |                                           |                     |
| $(\$125.20/\text{Hour}) / (2.82 \text{ Acres/Hour})^1$<br>$(\$109.38/\text{Hour}) / (5.66 \text{ Acres/Hour})^2$                                                                       | \$44.40 Per Acre              | \$19.33 Per Acre                          |                     |

<sup>1</sup> Caterpillar D9R Dozer

<sup>2</sup> Caterpillar 834B Rubber Tired Dozer

Appendix N

Cost Estimates for Demolition and Removal of One "Standard" Surface Water Monitoring Station

|                                                                                     | INPUT, UNIT AS<br>INDICATED | COMMENT/<br>SOURCE |
|-------------------------------------------------------------------------------------|-----------------------------|--------------------|
| Assumed Time to Remove One Station                                                  | 8 Hours                     |                    |
| Labor                                                                               | \$18.75 Per Hour            | WYDOT-WDD          |
| Dump Truck (10-12 yd <sup>3</sup> )                                                 | \$26.52 Per Hour            | 90% of DQCRG       |
| Caterpillar 980F Front-End Loader                                                   | \$57.94 Per Hour            | 90% of DQCRG       |
| Cost to Remove One Surface Water Station =<br>(Labor Cost x Time to Remove Station) | \$150.00                    |                    |
| + (Labor Cost + Truck Cost) x Time to Remove Station                                | \$362.16                    |                    |
| + (Labor Cost + Loader Cost) x Time to Remove Station                               | \$613.52                    |                    |
| Cost to Remove One Surface Water Station =                                          | \$1125.68                   |                    |

Appendix O

Cost Estimates for Demolition and Removal of One  
"Standard" Meteorological or Air Quality Monitoring Site

|                                                                                                     | INPUT, UNIT AS<br>INDICATED | COMMENT/<br>SOURCE |
|-----------------------------------------------------------------------------------------------------|-----------------------------|--------------------|
| Assumed Time to Remove One Station                                                                  | 4 Hours                     |                    |
| Labor                                                                                               | \$18.75 Per Hour            | WYDOT-WDD          |
| Dump Truck (10-12 yd <sup>3</sup> )                                                                 | \$26.52 Per Hour            | 90% of DQCRG       |
| Caterpillar 428B (2WD) Front-End Loader                                                             | \$15.07 Per Hour            | 90% of DQCRG       |
| Cost to Remove One Meteorological or Air Quality Station =<br>(Labor Cost x Time to Remove Station) | \$75.00                     |                    |
| + (Labor Cost + Truck Cost) x Time to Remove Station                                                | \$181.08                    |                    |
| + (Labor Cost + Loader Cost) x Time to Remove Station                                               | \$135.28                    |                    |
| Cost to Remove One Meteorological or Air Quality Station =                                          | \$391.36                    |                    |

Appendix P  
 Cost Estimate for Scarification of Compacted Surfaces

|                                                                                         | INPUT, UNIT AS<br>INDICATED   | COMMENT/<br>SOURCE  |
|-----------------------------------------------------------------------------------------|-------------------------------|---------------------|
| <b>CATERPILLAR 16H MOTOR GRADER</b>                                                     |                               |                     |
| Speed in Miles Per Hour (First Gear)                                                    | 2.4 Miles/Hour                | CPH 25              |
| Width of Scarifying Pass                                                                | 12 Feet                       | CPH 25              |
| Feet Per Mile                                                                           | 5,280 Feet                    |                     |
| Square Feet Per Acre                                                                    | 43,560 Sq. Ft.                |                     |
| Operating Efficiency Factor 50 Min./Hr.                                                 | 0.83 %                        | CPH 25              |
| Operating Costs                                                                         | \$65.51 Per Hour              | 90% of DQCRG        |
| Labor Costs                                                                             | \$18.75 Per Hour              | WYDOT-WDD           |
| Supervision Labor Costs                                                                 | \$3.13 Per Hour               | 1/8 of 90% of DQCRG |
| Supervisor Transportation                                                               | \$1.10 Per Hour               | 1/8 of 90% of DQCRG |
| Total Hourly Costs                                                                      | \$88.49                       |                     |
| <b>SCARIFICATION RATE</b>                                                               |                               |                     |
| $(2.4 \text{ Miles/Hour}) \times (5,280 \text{ Ft./Mile}) \times (12 \text{ Ft./Pass})$ | 152,064 Ft <sup>2</sup> /Hour |                     |
| $(152,064 \text{ Ft}^2/\text{Hour}) / (43,560 \text{ Ft}^2/\text{Acre})$                | 3.49 Acres/Hour               |                     |
| $(3.49 \text{ Acres/Hour}) \times (0.83 \text{ Efficiency Factor})$                     | 2.90 Acres/Hour               |                     |
| <b>OPERATING COSTS</b>                                                                  |                               |                     |
| $(\$88.49/\text{Hour}) / (2.90 \text{ Acres/Hour})$                                     | \$30.51 Per Acre              |                     |

Appendix A  
 REVEGETATION COST ESTIMATE

Use this form to estimate the cost of revegetation activities. The cost estimate should be based on the best available information, including the use of a recent Management Plan, if available. The cost estimate should be based on the best available information, including the use of a recent Management Plan, if available.

| General Revegetation Activity                                                                                                                                                                                                                                                                                                            | Calculate According To Specific Permit Commitments |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| <b>1) Seedbed Preparation</b>                                                                                                                                                                                                                                                                                                            |                                                    |
| Ripping                                                                                                                                                                                                                                                                                                                                  | \$                                                 |
| Chisel Plowing                                                                                                                                                                                                                                                                                                                           | \$                                                 |
| Disking                                                                                                                                                                                                                                                                                                                                  | \$                                                 |
| Harrowing or Cultipacking                                                                                                                                                                                                                                                                                                                | \$                                                 |
| <b>2) Drill Seed Stubble Mulch Mix</b>                                                                                                                                                                                                                                                                                                   |                                                    |
| Seed Costs                                                                                                                                                                                                                                                                                                                               | \$                                                 |
| Drill Seeding                                                                                                                                                                                                                                                                                                                            | \$                                                 |
| Mowing Prior to Planting Permanent Seed Mix                                                                                                                                                                                                                                                                                              | \$                                                 |
| <b>3) Seeding Permanent Mixes: Detail for each seed mix, if different seed mixes will be applied. The costs/acre for each individual mix should then be proportioned on the basis of acreage per parcels to derive a single weighted average cost/acre.</b>                                                                              |                                                    |
| Drill Seeding                                                                                                                                                                                                                                                                                                                            | \$                                                 |
| Broadcast Seeding                                                                                                                                                                                                                                                                                                                        | \$                                                 |
| Seed Costs                                                                                                                                                                                                                                                                                                                               | \$                                                 |
| <b>4) Mulching</b>                                                                                                                                                                                                                                                                                                                       |                                                    |
| Mulch Purchase                                                                                                                                                                                                                                                                                                                           | \$                                                 |
| Hydromulch Application                                                                                                                                                                                                                                                                                                                   | \$                                                 |
| Straw Mulch Placement and Crimping                                                                                                                                                                                                                                                                                                       | \$                                                 |
| <b>5) Fertilizer</b>                                                                                                                                                                                                                                                                                                                     |                                                    |
| Fertilizer Purchase by Defined Composition                                                                                                                                                                                                                                                                                               | \$                                                 |
| Application                                                                                                                                                                                                                                                                                                                              | \$                                                 |
| <b>6) Fencing</b>                                                                                                                                                                                                                                                                                                                        |                                                    |
| Construction                                                                                                                                                                                                                                                                                                                             | \$                                                 |
| Removal                                                                                                                                                                                                                                                                                                                                  | \$                                                 |
| <b>Subtotal</b>                                                                                                                                                                                                                                                                                                                          | <b>\$</b>                                          |
| <b>7) Maintenance Operations at 10% of Total Revegetation Costs: This cost addresses standard husbandry practices applied over the minimum 10-year bonding period, such as remedial seeding, mowing, selective weed treatment, etc. The 10 percent figure is derived from historical operator experience for the Powder River Basin.</b> | <b>\$</b>                                          |
| <b>Total Revegetation Cost Per Acre</b>                                                                                                                                                                                                                                                                                                  | <b>\$</b>                                          |

**ATTACHMENT E-6-3**  
**QUOTES AND PRICES**  
---  
**EQUIPMENT RATES**



Crownpoint Office  
P. O. Box 777  
Physical Address: 1/2 mile W of Crownpoint  
Crownpoint, New Mexico 87313  
Voice: 505-786-5845 Fax: 505-786-5555

MARK:

BACKHOE 140<sup>00</sup> / day 550<sup>00</sup> week 1650<sup>00</sup> MONTH

(RUST TRACEY  
RENTAL  
ALBUQ/FARM.

200<sup>00</sup> / day 600<sup>00</sup> week 1800<sup>00</sup> MONTH

ROAD MACHINERY  
ABQ / FARMING

ESCAVATORS (TRACK HOE)

54HP 400<sup>00</sup> / day 1200<sup>00</sup> week 3600<sup>00</sup> MONTH

ROAD MACHINERY

330<sup>00</sup> / day 1330<sup>00</sup> week 3990<sup>00</sup> MONTH

RUST RENTAL  
ABQ / FARMING

+ 35% FOR FUEL / OPERATOR / DELIVERY

I HAVE CALL IN TO AMERICAN CEMENT CORP ALBUQ  
FOR QUOTE ON BULK CEMENT DEL TO CHURCH ROCK  
505-753-6269 (Peter Cantor)

3300 cu yards x 21 SACKS per yard = 69,300 SACKS.

10/5/00 Salcedo

## 7. Building Decommissioning

### a Introduction and Description

All radiologically contaminated buildings, and other structures 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 brine concentration, and evaporation. Equipment which is not 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.

### b. Budget Assumptions

The Building Decommissioning Budget is formatted with the underlying assumptions integrated into the tabulation. The budget figures distinguish individually costs associated with decontamination, demolition, transportation and disposal costs.

Buildings sizes were estimated using the schematic diagram COP Figure 2.1-2 and by measuring existing structures at the Crownpoint location. At the Churchrock location wall heights were estimated. HRI used Wyoming Department of Environmental Quality guideline costs to estimate demolition costs for non-contaminated structures. Concrete demolition cost was estimated by local contractor (See Attachment E-7-3).

HRI assumed that, with the exception of the dryer building, 100 % of the buildings would be released for unrestricted disposal after decommissioning. The dryer building would require 10% disposal at a NRC facility because of fixed contamination. For concrete floors it was assumed that 100% of the CR Satellite would meet release standards, 99% of the Central Plant concrete floor would meet release standards and 95% of the Dryer concrete floor would meet release standards. These assumptions were used to determine disposal costs.

Management will be provided from the site staff who will be available six months after restoration. No credit is given for salvage value of any buildings.

All restricted and unrestricted disposal was priced at the bulk rate as shown in Attachment E-5-2.

A contingency was included for health and safety supplies such as disposable uniforms and respirators.

As shown in Attachment E-7-1, the total cost for building demolition and removal is projected to be \$249,874.

**ATTACHMENT E-7-1**  
**BUILDING DECOMMISSIONING BUDGET**

## Building and Demolition and Disposal

**Assumptions:**

Churchrock offices will be of modular design and sold  
 Crownpoint offices will be left intact after the project ends

|             |                                       | <u>Description</u>                                                                                      | <u>CR Satellite</u> | <u>Central Plant</u> | <u>Dryer</u>    | <u>Combined</u> |
|-------------|---------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------|----------------------|-----------------|-----------------|
| <b>I.</b>   | <b>Decontamination Costs</b>          |                                                                                                         |                     |                      |                 |                 |
| A.          | <b>Wall decontamination</b>           |                                                                                                         |                     |                      |                 |                 |
|             |                                       | Area to be decontaminated (ft <sup>2</sup> )                                                            | 12167               | 9600                 | 3400            |                 |
|             |                                       | Application rate (gallons/ft)                                                                           | 1                   | 1                    | 1               |                 |
|             |                                       | HCl acid wash, including labor (\$/gallon)                                                              | \$0.50              | \$0.50               | \$0.50          |                 |
|             |                                       | <b>Subtotal wall decontamination costs</b>                                                              | <b>\$6,083</b>      | <b>\$4,800</b>       | <b>\$1,700</b>  | <b>\$12,583</b> |
| B.          | <b>Concrete floor decontamination</b> |                                                                                                         |                     |                      |                 |                 |
|             |                                       | Area to be decontaminated (ft <sup>2</sup> )                                                            | 10491               | 6400                 | 2500            |                 |
|             |                                       | Application rate (gallons/ft)                                                                           | 4                   | 4                    | 4               |                 |
|             |                                       | HCl acid wash, including labor (\$/gallon)                                                              | \$0.50              | \$0.50               | \$0.50          |                 |
|             |                                       | <b>Subtotal concrete floor decontamination costs</b>                                                    | <b>\$20,982</b>     | <b>\$12,800</b>      | <b>\$5,000</b>  | <b>\$38,782</b> |
| <b>II.</b>  | <b>Demolition Costs</b>               |                                                                                                         |                     |                      |                 |                 |
| A.          | <b>Building</b>                       |                                                                                                         |                     |                      |                 |                 |
|             |                                       | Dryer bldg. demolition unit cost of \$0.75/ft <sup>3</sup> for additional radiation safety precautions. |                     |                      |                 |                 |
|             |                                       | Volume of building (ft <sup>3</sup> )                                                                   | 209820              | 192000               | 42500           |                 |
|             |                                       | Demolition unit cost per WDEQ Guideline No. 12 (\$/ft <sup>3</sup> )                                    | \$0.15              | \$0.15               |                 |                 |
|             |                                       | Dryer building demolition unit cost (\$/ft <sup>3</sup> )                                               |                     |                      | \$0.75          |                 |
|             |                                       | <b>Subtotal building demolition costs</b>                                                               | <b>\$31,893</b>     | <b>\$29,184</b>      | <b>\$31,875</b> | <b>\$92,952</b> |
| B.          | <b>Concrete floor</b>                 |                                                                                                         |                     |                      |                 |                 |
|             |                                       | Area of concrete floor (ft <sup>2</sup> )                                                               | 10491               | 6400                 | 2500            |                 |
|             |                                       | Demolition unit cost (ft <sup>3</sup> ) per local estimate                                              | \$1.20              | \$1.20               | \$1.20          |                 |
|             |                                       | <b>Subtotal concrete floor demolition costs</b>                                                         | <b>\$12,589</b>     | <b>\$7,680</b>       | <b>\$3,000</b>  | <b>\$23,269</b> |
| <b>III.</b> | <b>Disposal Costs</b>                 |                                                                                                         |                     |                      |                 |                 |
| A.          | <b>Building</b>                       |                                                                                                         |                     |                      |                 |                 |
|             |                                       | Volume of building (cy)                                                                                 | 7771                | 7111                 | 1574            |                 |
| 1           | <b>Unrestricted</b>                   |                                                                                                         |                     |                      |                 |                 |
|             |                                       | Unrestricted disposal cost of 26.7 \$/yd <sup>3</sup>                                                   | \$27.00             | \$27.00              | \$27.00         |                 |
|             |                                       | Building will collapse to 10% of standing volume                                                        | 777                 | 711                  | 157             |                 |
|             |                                       | Percentage (%) on site                                                                                  | 100                 | 100                  | 90              |                 |
|             |                                       | <b>Subtotal unrestricted disposal costs</b>                                                             | <b>\$20,982</b>     | <b>\$19,200</b>      | <b>\$3,825</b>  | <b>\$44,007</b> |
| 2           | <b>Restricted</b>                     |                                                                                                         |                     |                      |                 |                 |
|             |                                       | Percentage (%)                                                                                          |                     |                      | 10              |                 |
|             |                                       | Volume for disposal (ft <sup>3</sup> )                                                                  |                     |                      | 425             |                 |
|             |                                       | Volume for disposal assuming 10% void space (ft <sup>3</sup> )                                          |                     |                      | 467.5           |                 |
|             |                                       | Transportation and disposal unit cost (\$/ft <sup>3</sup> )                                             |                     |                      | \$2.78          |                 |
|             |                                       | <b>Subtotal NRC-licensed facility disposal costs</b>                                                    |                     |                      | <b>\$1,299</b>  | <b>\$1,299</b>  |
|             |                                       | <b>Subtotal building disposal costs</b>                                                                 |                     |                      |                 |                 |
| B.          | <b>Concrete floor</b>                 |                                                                                                         |                     |                      |                 |                 |
|             |                                       | Area of concrete floor (ft <sup>2</sup> )                                                               | 10491               | 6400                 | 2500            |                 |
|             |                                       | Average Thickness of concrete floor (ft)                                                                | 0.5                 | 0.5                  | 0.5             |                 |

|      |                                                               |         |         |          |                  |
|------|---------------------------------------------------------------|---------|---------|----------|------------------|
|      | Volume of concrete floor (ft <sup>3</sup> )                   | 5246    | 3200    | 1250     |                  |
|      | Volume of concrete floor (cy)                                 | 194     | 119     | 46       |                  |
| 1    | Unrestricted                                                  |         |         |          |                  |
|      | Percentage (%)                                                | 100     | 99      | 95       |                  |
|      | Volume for disposal (ft <sup>3</sup> )                        | 194     | 117     | 44       |                  |
|      | Disposal unit cost \$/cy                                      | \$27.00 | \$27.00 | \$27.00  |                  |
|      | Subtotal on-site disposal costs                               | \$5,246 | \$3,168 | \$1,188  | \$9,601          |
| 2    | Restricted                                                    |         |         |          |                  |
|      | Assumptions:                                                  |         |         |          |                  |
|      | Additional \$2.00/ft <sup>3</sup> for segregation of concrete |         |         |          |                  |
|      | Percentage (%)                                                | 0       | 1       | 5        |                  |
|      | Volume for disposal (ft <sup>3</sup> )                        |         | 1728    | 3375     |                  |
|      | Segregation and loading unit cost (\$/ft <sup>3</sup> )       |         | \$2.00  | \$2.00   |                  |
|      | Transportation and disposal unit cost (\$/ft <sup>3</sup> )   |         | \$2.78  | \$2.78   |                  |
|      | Subtotal NRC-licensed facility disposal costs                 |         | \$8,256 | \$16,125 | \$24,381         |
|      | Subtotal concrete floor disposal costs                        |         |         |          |                  |
| iii. | Health and Safety Costs                                       |         |         |          |                  |
|      | Radiation safety equipment                                    | 1,000   | 1,000   | 1,000    |                  |
|      | Total health and safety costs                                 |         |         |          | \$3,000          |
|      | <b>TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS</b>           |         |         |          | <b>\$249,874</b> |

**ATTACHMENT E-7-2**  
**BUDGET BACKUP**  
---  
**RELEASE STANDARDS**

**Limits for Release to Uncontrolled Areas**

| <u>Nuclide</u> | <u>Average</u> <sup>a</sup>   | <u>Maximum</u> <sup>b</sup>    | <u>Removable</u> <sup>c</sup> |
|----------------|-------------------------------|--------------------------------|-------------------------------|
| U-nat          | 5,000 dpm/100 cm <sup>2</sup> | 15,000 dpm/100 cm <sup>2</sup> | 1,000 dpm/100 cm <sup>2</sup> |
| 226-Ra         | 100 dpm/100 cm <sup>2</sup>   | 300 dpm/100 cm <sup>2</sup>    | 20 dpm/100 cm <sup>2</sup>    |

- a. Averaged over no more than 1 m<sup>2</sup>.
- b. Applies to an area of not more than 100 cm<sup>2</sup>.
- 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."

**ATTACHMENT E-7-3**  
**QUOTES AND PRICES**  
---  
**CONCRETE DEMOLITION**



# HRI, INC.

## Crownpoint Office

P. O. Box 777

Physical Address: 1/2 mile W of Crownpoint  
Crownpoint, New Mexico 87313

Voice: 505-786-5845 Fax: 505-786-5555

MARK :

PRICES FROM DENNIS FUH'S CONSTRUCTION

505-722-6909

Gallup

BREAK & Haul Concrete (\$Dispose)

CHURCHROCK (2500 SQ FT)  
6" thick

120 BREAK

110 Haul off

230 SQ. FT

CROWNPOINT (3000 SQ FT)

120 C BREAK

180 Haul off

300 SQ FT

NOT CONTAMINATED Haul to crusher &  
@ Gallup or Thoreau & REprocessed.

Salvador 9-14-00

## **8. Surface Reclamation**

### **a. Introduction and Description**

The purpose of the surface reclamation program will be to reestablish the sites to their premining topographic conditions, 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. It is anticipated that future land use will be similar to current uses.

### **b. Budget Assumptions**

The Surface Reclamation Budget is formatted with the underlying assumptions integrated into the tabulation. The budget figures distinguish individually costs associated with wellfield area reclamation, wellfield road reclamation, pond decommissioning, and satellite area reclamation. It was assumed that following decommissioning, the Crownpoint process area would be sold with existing buildings in place.

Wellfield sizes and road lengths were estimated using the schematic diagram COP Figure 1.4-8. Unit costs for road, wellfield, pond were calculated by HRI (See Attachment E-8-2).

After all of the equipment is removed the entire wellfield area will be surveyed to assure that no residual contamination remains on the soil. Surveys will be conducted according to the according to Regulatory Guide specified in Attachment E-6-2, and the hot spots are picked up and disposed of at a NRC licensed facility. The on site management would conduct these surveys.

All disposal was priced at the bulk rate as shown in Attachment E-5-2.

As shown in Attachment E-8-1, the total cost for final surface reclamation is \$139,660.

**ATTACHMENT E-8-1**  
**SURFACE RECLAMATION BUDGET**

## Wellfield and Satellite Surface Reclamation

|      | <u>Description</u>                                                 | <u>Unit</u> | <u>Total</u> |
|------|--------------------------------------------------------------------|-------------|--------------|
| I.   | <b>Wellfield Area Reclamation</b>                                  |             |              |
|      | Wellfields rea (acres)                                             | 40          |              |
|      | Disking/seeding unit cost (\$/acre)                                | \$200       |              |
|      | Subtotal reclamation costs for wellfield                           |             | \$8,000      |
| II.  | <b>Wellfield Road Reclamation</b>                                  |             |              |
|      | Length of wellfield roads (1000 ft)                                | 3.6         |              |
|      | Wellfield road reclamation unit cost (\$/1000 ft)                  | \$690       |              |
|      | Subtotal wellfield road reclamation costs                          |             | \$2,484      |
| III. | <b>Pond Decommissioning (120')</b>                                 |             |              |
|      | Assumptions:                                                       |             |              |
|      | Sediment disposal of 1 foot (ft3) deep                             | 3972        |              |
|      | 2 Pond dimension are 120 ft x 120 ft. x 10 ft. or 1 acre footprint | 1           |              |
|      | Disposal of inner and outer liners                                 |             |              |
|      | Soil below the liners is not contaminated.                         |             |              |
|      | Folded liner volume each (ft3).                                    | 600         |              |
|      | Backhoe hourly rate (w/operator)                                   | \$37.75     |              |
|      | Buldozer hourly rate (w/operator)                                  | \$37.75     |              |
| A.   | Removal and loading                                                |             |              |
|      | 1 Equipment                                                        |             |              |
|      | Number of backhoes                                                 | 1           |              |
|      | Number of hours                                                    | 10          |              |
|      | Number of bulldozers                                               | 1           |              |
|      | Number of hours                                                    | 10          |              |
|      | 2 Labor                                                            |             |              |
|      | Number of persons                                                  | 3           |              |
|      | Number of hours                                                    | 10          |              |
|      | \$/hr/person                                                       | \$15.00     |              |
|      | Total removal and loading costs                                    |             | \$1,205.00   |
| B.   | Transportation and disposal liners & sediment                      |             |              |
|      | Transportation and disposal unit costs (\$/ft3)                    | \$2.78      |              |
|      | Total transportation and disposal costs 2 liners                   |             | \$14,366.67  |
|      | Subtotal pond reclamation costs (2 ponds)                          |             | \$31,143     |
| IV.  | <b>Pond Decommissioning (350')</b>                                 |             |              |
|      | Assumptions:                                                       |             |              |
|      | Sediment disposal of 6 inches (ft3)                                | 26797       |              |
|      | Pond dimension are 350 ft x 350 ft. x 20 ft. or 3 acres            | 3           |              |
|      | Disposal of inner and outer liners                                 |             |              |
|      | Soil below the liners is not contaminated                          |             |              |
|      | Folded liner volume each (ft3).                                    | 2700        |              |
|      | Backhoe hourly rate (w/operator)                                   | \$37.75     |              |
|      | Buldozer hourly rate (w/operator)                                  | \$37.75     |              |
| A.   | Removal and loading                                                |             |              |
|      | 1 Equipment                                                        |             |              |
|      | Number of backhoes                                                 | 1           |              |

|    |                                                                |            |          |
|----|----------------------------------------------------------------|------------|----------|
|    | Number of hours                                                | 40         |          |
|    | Number of bulldozers                                           | 1          |          |
|    | Number of hours                                                | 40         |          |
| 2  | Labor                                                          |            |          |
|    | Number of persons                                              | 3          |          |
|    | Number of hours                                                | 40         |          |
|    | \$/hr/person                                                   | \$15.00    |          |
|    | Total removal and loading costs                                | \$4,820.00 |          |
| B. | Transportation and disposal                                    |            |          |
|    | Transportation and disposal unit costs (\$/ft3)                | \$2.78     |          |
|    | Total transportation and disposal costs (sediment and 1 liner) | \$81,936   |          |
|    | Subtotal pond reclamation costs (1 ponds)                      |            | \$86,756 |

**V. Soil**

Assumptions:

|    |                                               |         |         |
|----|-----------------------------------------------|---------|---------|
|    | Acres of plant area                           | 6       |         |
|    | Surveys by staff                              |         |         |
|    | Depth of contaminated soil (in)               | 2       |         |
|    | Percent of wellfield contaminated             | 1       |         |
|    | Soil analysis each                            | \$100   |         |
| A. | Survey costs                                  |         |         |
|    | 20 soil sample analysis                       | \$2,000 |         |
|    | Flags, and supplies                           | \$250   |         |
|    | Subtotal survey costs                         | \$2,250 |         |
| B. | Disposal costs                                |         |         |
|    | Backhoe one week                              | \$1,510 |         |
|    | Volume to disposal                            | 436     |         |
|    | NRC disposal unit cost (ft3)                  | \$2.78  |         |
|    | Subtotal NRC-licensed facility disposal costs | \$1,210 |         |
|    | Plant area soil D & D costs                   |         | \$3,460 |

**VI Final Satellite Area Reclamation**

Assumptions:

|    |                                                               |          |         |
|----|---------------------------------------------------------------|----------|---------|
|    | Area of disturbance (acres)                                   | 10       |         |
| A. | Ripping overburden with dozer                                 |          |         |
|    | Ripping unit cost per WDEQ Guideline No. 12, App.11 (\$/acre) | \$581.67 |         |
|    | Subtotal ripping costs                                        | \$5,817  |         |
| B. | Disking and seeding                                           |          |         |
|    | Disking/seeding unit cost (\$/acre)                           | \$200.00 |         |
|    | Subtotal disking/seeding costs                                | \$2,000  |         |
|    | Subtotal surface reclamation costs                            |          | \$7,817 |

**TOTAL WELLFIELD AND SATELLITE SURFACE RECLAMATION COSTS**

**\$139,660**

**ATTACHMENT E-8-2**  
**BUDGET CALCULATIONS**  
---  
**POND VOLUMES**  
**ROAD REMOVAL**

**PROGRAM TO CALCULATE THE VOLUME CONTAINED WITHIN  
A RECTANGULAR POND WITH KNOWN SLOPE AND DEPTH**

ALL DIMENSIONS ARE IN FEET

THE TOP OF THE POND MEASUREMENTS ARE:

|        |     |
|--------|-----|
| LENGTH | 350 |
| WIDTH  | 350 |
| DEPTH  | 20  |
| SLOPE  | 3   |

|                  |     |
|------------------|-----|
| W= BOTTOM WIDTH  | 230 |
| L= BOTTOM LENGTH | 230 |

| DEPTH | GALLONS   | CUBIC FEET | CUBIC YARDS |
|-------|-----------|------------|-------------|
| 0.50  | 200,438   | 26,797     | 992         |
| 1.00  | 406,104   | 54,292     | 2,011       |
| 1.50  | 617,066   | 82,496     | 3,055       |
| 2.00  | 833,392   | 111,416    | 4,127       |
| 2.50  | 1,055,148 | 141,063    | 5,225       |
| 3.00  | 1,282,401 | 171,444    | 6,350       |
| 3.50  | 1,515,220 | 202,570    | 7,503       |
| 4.00  | 1,753,671 | 234,448    | 8,683       |
| 4.50  | 1,997,822 | 267,089    | 9,892       |
| 5.00  | 2,247,740 | 300,500    | 11,130      |
| 5.50  | 2,503,492 | 334,692    | 12,396      |
| 6.00  | 2,765,147 | 369,672    | 13,692      |
| 6.50  | 3,032,770 | 405,451    | 15,017      |
| 7.00  | 3,306,429 | 442,036    | 16,372      |
| 7.50  | 3,586,193 | 479,438    | 17,757      |
| 8.00  | 3,872,127 | 517,664    | 19,173      |
| 8.50  | 4,164,299 | 556,725    | 20,619      |
| 9.00  | 4,462,777 | 596,628    | 22,097      |
| 9.50  | 4,767,629 | 637,384    | 23,607      |
| 10.00 | 5,078,920 | 679,000    | 25,148      |

Liner Size            375X375

**PROGRAM TO CALCULATE THE VOLUME CONTAINED WITHIN  
A RECTANGULAR POND WITH KNOWN SLOPE AND DEPTH**

ALL DIMENSIONS ARE IN FEET

THE TOP OF THE POND MEASUREMENTS ARE:

|        |     |
|--------|-----|
| LENGTH | 120 |
| WIDTH  | 120 |
| DEPTH  | 10  |
| SLOPE  | 3   |

|                  |    |
|------------------|----|
| W= BOTTOM WIDTH  | 60 |
| L= BOTTOM LENGTH | 60 |

| DEPTH | GALLONS | CUBIC FEET | CUBIC YARDS |
|-------|---------|------------|-------------|
| 0.50  | 14,148  | 1,892      | 70          |
| 1.00  | 29,711  | 3,972      | 147         |
| 1.50  | 46,754  | 6,251      | 232         |
| 2.00  | 65,345  | 8,736      | 324         |
| 2.50  | 85,553  | 11,438     | 424         |
| 3.00  | 107,443 | 14,364     | 532         |
| 3.50  | 131,083 | 17,525     | 649         |
| 4.00  | 156,541 | 20,928     | 775         |
| 4.50  | 183,885 | 24,584     | 911         |
| 5.00  | 213,180 | 28,500     | 1,056       |
| 5.50  | 244,495 | 32,687     | 1,211       |
| 6.00  | 277,897 | 37,152     | 1,376       |
| 6.50  | 313,453 | 41,906     | 1,552       |
| 7.00  | 351,231 | 46,956     | 1,739       |
| 7.50  | 391,298 | 52,313     | 1,938       |
| 8.00  | 433,720 | 57,984     | 2,148       |
| 8.50  | 478,567 | 63,980     | 2,370       |
| 9.00  | 525,904 | 70,308     | 2,604       |
| 9.50  | 575,799 | 76,979     | 2,851       |
| 10.00 | 628,320 | 84,000     | 3,111       |



## WELLFIELD ROAD RECLAMATION

### Assumptions:

1. Gravel road base removed at cost of \$0.60/cy/1000 ft (WDEQ Guideline No. 12, Appendix C)
2. Gravel road base: average depth = 0.5 ft, average width = 15 ft
3. Roads scarified prior to topsoil application at cost of \$30.51/acre (WDEQ Guideline No. 12, Appendix P)
4. Grading of scarified roads prior to topsoil application at cost of \$33.27/acre (WDEQ Guideline No. 12, Appendix G)
5. Topsoil applied at cost or \$0.60/cy/1000 ft (WDEQ Guideline No. 12, Appendix C, Surface Grade: level ground)
6. Stripped topsoil: average depth = 0.67 ft, average width = 25 ft
7. Discing/seeding cost of \$200/acre.

### Costs per 1000 ft of road

|                     | <u>Width (ft)</u> | <u>Thick (ft.)</u> | <u>Yd3</u> | <u>\$/Yd3</u> | <u>Total</u> |
|---------------------|-------------------|--------------------|------------|---------------|--------------|
| Road Base Removal   | 15                | 0.5                | 278        | \$0.60        | \$166.67     |
| Topsoil Application | 25                | 0.67               | 620        | \$0.60        | \$372.22     |

|                 | <u>Width (ft)</u> | <u>Acres</u> | <u>\$/Acres</u> | <u>Total</u> |
|-----------------|-------------------|--------------|-----------------|--------------|
| Scarification   | 25                | 0.6          | \$30.51         | \$17.51      |
| Grading         | 25                | 0.6          | \$33.27         | \$19.09      |
| Discing/Seeding | 25                | 0.6          | \$200.00        | \$114.78     |

**TOTAL WELLFIELD ROAD RECLAMATION** \$690.28

Section 8 Wellfield Road 3600 feet long. 2485.00

**9. Contingency/Profit**

Contractor profit has been included at 15% of the total cost. Shown in Attachment A-1  
Contingency/Profit is \$1,237,280.

## F. SURITY FUNDING SCHEDULE

As stated a number of times throughout this RAP, wellfield development will be progressive throughout the lifetime of the Churchrock mining project and the resulting liability for wellfield (groundwater) restoration will grow over the life of the mine. As also stated a number of times throughout this RAP, restoration of groundwater will occur concurrently with mining activity. The RAP groundwater restoration budget was overly conservative in calculating the groundwater restoration liability because it assumed that total cost of groundwater restoration at the end of the mining activity with no concurrent activity having been completed. Over the first year of planned activity only a fraction of the mine area will have been developed and only a fraction of the groundwater restoration liability will have been created. The same is true for well plugging costs because all wells will not be drilled at once. As the project matures, depleted areas will have been reclaimed as new mine areas are being developed so the liability will not be purely cumulative. Therefore, HRI proposes to fund one third of the surety for groundwater restoration and plugging costs prior to the beginning of operations. Based on anticipated new development and the amount of completed reclamation, HRI would project anticipated costs for the upcoming year and place that amount of surety according to the provisions of LC 9.5.

The liabilities associated with certain other activities do not change as a result of wellfield development. Specifically equipment and buildings become contaminated immediately and require the full decommissioning cost from the beginning. HRI would propose to place 100% of the surety for decommissioning costs prior to the beginning of operations.

In summary, HRI proposes the following surety percentages and resulting amount is tendered before operations begin.

### SURITY FUNDING SCHEDULE

| <u>Category</u>                               | <u>Initial Surety (%)</u> | <u>Initial Surety (\$)</u> |
|-----------------------------------------------|---------------------------|----------------------------|
| Groundwater Restoration                       | 33.3                      | \$2,401,600                |
| Groundwater Stability Analysis                | 100                       | \$80,000                   |
| Well Plugging                                 | 33.3                      | \$133,782                  |
| Equipment Removal                             | 100                       | \$67,626                   |
| Wellfield Decommissioning and Decontamination | 100                       | \$105,228                  |
| Building Decommissioning and Decontamination  | 100                       | \$249,874                  |
| Surface Reclamation                           | 100                       | \$139,660                  |
| Total Amount                                  |                           | \$3,177,770                |
| Contingency/Profit 15%                        |                           | \$476,665                  |
| Total with 15%                                |                           | \$3,654,435                |