40-8698

RETURN ORIGINAL TO PDR, HQ.

PLATEAU RESOURCES LIMITED

SHOOTARING CANYON URANIUM PROCESSING FACILITY
SOURCE MATERIAL LICENSE
SUA-1371
DOCKET NO. 40-8698

RENEWAL APPLICATION

November 1993

w/ltr 11/29/93
94-0097

9403010166 931129
PDR ADOCK 04008698
C PDR

plateau resources LIMITED

Corporate Offices:
877 North 8th West, Riverton, WY 82501
Tel: (307) 856-9271
Fax: (307) 857-3050

Shootaring Operations:
Box 2111, Ticaboo, Lake Powell, UT 84533
Tel: (801) 788-2120
Fax: (801) 788-2118

November 29, 1993

Mr. R.E. Hall, Director
United States Nuclear Regulatory Commission
Uranium Recovery Field Office
730 Simms Street, Suite 100
Golden, CO 80401

RE: Amendment and Renewal of Source Material License SUA-1371 Docket No. 40-8698, Ticaboo, Lake Powell, Utah

Dear Mr. Hall:

Plateau Resources Limited (Plateau) request an amendment and Renewal of Source Material License SUA-1371 (Expiration Date: December 31, 1993). Enclosed as Attachment I is the Application for Amendment to and Renewal of the License.

The Shootaring Canyon Uranium Processing Facility has been maintained on an interim standby status since 1986. In making this application, it is the intent of Plateau to continue to maintain the facility on an interim standby basis.

In making this application, Plateau is bound by SUA-1371 Amendment No. 12 dated 8-11-93, a copy of which is included as Attachment VII, and any other amendments as listed in Attachment II. The Environmental Report completed by Woodward-Clyde Consultants dated May 1978 still applies for the current activities on the site.

Amendment No. 12 is very clear and specific as to Plateau requirements should we consider the resumption of operations in the future, Plateau recognizes the need to provide additional information with respect to reclamation and decommissioning of the Facility.

The Plateau reporting requirements are detailed in Amendment No. 12. Plateau personnel have kept your office fully informed from 1986 through the present day. These requirements will continue to be fulfilled by Plateau.

There has been no change in status on the Facility since 1986 with the exception of the requirements of Amendments 1 through 9, 11 & 12 (10 not issued). There has been no change in principle site personnel or Noel Savignac, PhD, the Radiation Safety Officer since 1986. Principle Site Personnel and Noel Savignac, RSO Resumes are included in Attachment VI. We respectfully request that this Application be considered as complete and adequate to support the amendment request and renewal of the License.

The underlying basis for this Application is the Source Material License Renewal Application SUA-1371, Docket No. 40-8698 submitted to the NRC in November, 1984. This document has been reviewed by Plateau and any necessary revisions have been included in attachment V.

Please acknowledge receipt of this amendment request and renewal application and advise Plateau if you require any further information.

Sincerely,
PLATEAU RESOURCES LIMITED

Kenneth Webber

Kenneth Webber
Project Coordinator

KW:gd

Attachments:
- I. NRC Form 313 Dated
- II. List of NRC Material License Amendments
- III. Extracts from NRC Amendment No. 12
  - Stand-by Activities
  - Prior to Commencing Operations
  - Prior to Decommissioning
- IV. History of Document Submitted to NRC
- V. 1993 Revisions to 1984 Application
- VI. Corporate Organization Changes to Section 5.0 to Plateau's Renewal Application for SUA-1371 as Revised August 1985
  - Current Organizational Chart
  - Resumé of Standby Personnel
  - Radiation Safety Officer Resumé
- VII. Copy of Material License SUA-1371, Amendment No. 12

Attachment 1

NRC FORM 313
(3-92)
10 CFR 30, 32, 33
34, 35 and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIAL LICENSE

APPROVED BY OMB NO. 3150-0120
EXPIRES 6-30-93

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 3.25 HOURS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0120), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOUR ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLDAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHO[illegible] ISLAND, OR VERMONT, SEND APPLICATIONS TO:

[illegible]NSING ASSISTANT SECTION
[illegible]EAR MATERIALS SAFETY BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

NUCLEAR MATERIALS SAFETY SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION II
101 MARIETTA STREET, NW, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

MATERIAL RADIATION PROTECTION SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-8064

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVEDA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

NUCLEAR MATERIALS SAFETY SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION V
1450 MARIA LANE
WALNUT CREEK, CA 94596-5368

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

[ ] A. NEW LICENSE
[X] B. AMENDMENT TO LICENSE NUMBER SUA 1371
[X] C. RENEWAL OF LICENSE NUMBER SUA 1371

2. NAME AND MAILING ADDRESS OF APPLICANT *(Includes Zip Code)*

Plateau Resources Limited
Box 2111, Ticaboo
Lake Powell, UT 84533-2111

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED.

Plateau Resources Limited
Shootaring Canyon Uranium Processing Facility
Box 2111, Ticaboo, Lake Powell, UT 84533-2111

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION: Ken Webber

TELEPHONE NUMBER: (307) 856-9271

SUBMIT ITEMS 5 THROUGH 11 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTRED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*
FEE CATEGORY
AMOUNT ENCLOSED $ N/A

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN, IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948, 62 STAT. 749 MAKES IT A CRIMINAL OFFICE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

SIGNATURE – CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
[signature]	John L. Larsen	President & CEO	

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS

AMOUNT RECEIVED	CHECK NUMBER

APPROVED BY	DATE

Attachment II

Plateau Resources Limited
Shootaring Uranium Mill Site

License SUA-1371

List of NRC Material License Amendments

Amendment No.	Date	Amended Conditions
0	02-03-86	Interim Standby Status
1	03-05-86	02 - Mailing Address
2	12-18-86	25 - Tech Eval of Dam
3	11-23-87	02 - Mailing Address
4	11-20-87	33 - Ground Water Detection
5	04-19-88	26 - Decommissioning
6	06-07-88	33 - Modify Selenium and Arsenic Levels
7	08-28-88	39 - Financial Surety
8	06-21-90	39 - Financial Surety
9	08-28-90	22 & 35 Self Monitor & Sump Pump
10	*******	Not Issued
11	04-27-92	39 - Financial Surety
12	08-11-93	39 - Financial Surety

Attachment III

Plateau Resources Limited
Shootaring Uranium Mill Site

Extracts from License SUA 1371 Amendment No. 12

License Condition Number	Stand By Activities	Requirements
12.	Not authorized to produce uranium concentrates	*
17.	Radiation Work Permits	As needed
18.	ALARA Audit Report	Annually
24.	Fire Detention & Suppression Equipment	Quarterly
29.	Land Survey (5 mile radius)	Annually
30.	Radiation Safety Monitoring Program	*
30.	Radon Gas & Direct Radiation Monitoring (2)	*
33B.	Ground Water Detection Program (RM 4,5&6)	Semi Annual
33F.	Ground Water Flow & Direction under tailings	Minimum of Annual
35C.	Inspect Sump Pump - Document	Weekly
37.	Inspect Tailings Disposal System	Monthly
39.	Update Financial Surety Amount (Feb)	Annually
	Prior to Commencing Operations	
25.	Conduct Technical Evaluation of Berms & Dam	*
38.	Prepare Detailed Reclamation Plan (Decomm)	6 months notice
34.	Financial Survey (3 months after 38)	*
41.	Any Design Modifications to Tailings Impoundment	*
	Prior to Decommissioning	
26.	Detailed Decommissioning Plan	12 months notice

Attachment IV

Plateau Resources Limited
Shootaring Uranium Mill Site

License SUA 1371

History of Documents Submitted to NRC

		Submitted by	Date
1.	Environmental Report (Sections 1 - 12)	WCC	5-78
2.	Tailings Management Plan	WCC	6-78
3.	Final Environmental Statement	NRC	7-79
4.	License Renewal Application	PRL	11-84
5.	Revision to Application Section 5.0	PRL	8-8
6.	De:ommissioning & Reclamation Plan	NS&AK	2-88
7.	Material License Amendments 0 through 9, 11 & 12	NRC Please see Attachment II	8-93

Legend

WCC	Woodward Clyde Consultants
PRL	Plateau Resources Limited
NS & AK	Noel Savignac & Alan Kuhn
NRC	Nuclear Regulatory Commission

Plateau Resources Limited
Shootaring Uranium Mill Site

License SUA 1371

1993 Amendments* to the 1984 License Application and License Amendments 1 through 12

CONTENTS:

* We have highlighted the changes in each section by shading the revised portions of

1.0 PROPOSED ACTIVITIES

This Application is for a renewal of our Source Material License No. SUA-1371, Docket No. 40-8698, for the Plateau Resources Limited Shootaring Canyon Uranium Processing Facility, Garfield County, Utah. Communications regarding this renewal document should be addressed to:

Plateau Resources Limited
877 North 8th West
Riverton, Wyoming 82501
Attention: Kenneth Webber, Project Coordinator
Telephone: (307) 856-9271 (Riverton, Wyoming, 82501)
(801) 788-2120 (Ticaboo, Utah)

The processing facility is located in Garfield County, southeastern Utah, approximately 56 miles (90 km) south of Hanksville, Utah, 14 miles (22 km) north of Bullfrog Basin Marina, and 2 miles (3 km) west of Utah State Highway 276. The processing facility is currently in standby states.

1.1 PROPOSED LICENSE MODIFICATIONS

This Application for renewal of Source Material License No. SUA-1371 is intended to be complete and independent from other documents submitted to the United States Nuclear Regulatory Commission (NRC) unless specifically referenced. Many of the license conditions in the earlier license are either no longer applicable or should be replaced by commitments made in this renewal Application.

5.0 OPERATIONS

Section 5.0 presents the detailed radiological and environmental procedures used to control source materials both within the mill and in the environment around the mill.

5.1 CORPORATE ORGANIZATION AND ADMINISTRATIVE PROCEDURES

This section has been amended in its entirety.

The Corporate Headquarters are located at 877 North 8th West, Riverton, Wyoming 82501. The Shootaring Canyon Uranium Processing facility site offices are located at Ticaboo, Utah 84533.

The President is the Chief Executive Officer of Plateau and has general charge of its business, and is managing officer of Plateau with general charge of its business and operations.

The Shootaring Canyon Uranium Processing Facility is currently in an extended period of non-operations. Minimum personnel assisted by outside consultants are being utilized to maintain the facility. See Figure 5.1-1 for Plateau's current organization chart. When operations at the processing facility re-start, the mill staff will be considerably expanded. Prior to such start-up, the staff's qualifications and revised organizational chart will be submitted to the U.S. Nuclear Regulatory Commission for review. The standby Organizational Chart for quality assurance personnel, radiation protection personnel, technical site personnel and Resident Manager is in Attachment VI included as Figure 5.1-1 to this 1993 Renewal Application.

The organizational structure of the company has been designed to provide reporting channels for the standby operation personnel, the quality assurance personnel, and health and safety personnel through the Project Coordinator to the President of Plateau. The structure provides that all final approvals for implementation and revision of policies and practices rest with the President. However, the Environmental and Radiological Health Supervisor (ERHS) has the authority to partially or fully suspend standby operations that could be hazardous to workers. The ERHS also referred to by Plateau as the Radiation Safety Officer (RSO) will meet and possess all the qualifications as described in Regulatory Guide 8.31 "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Mills will be As Low As is Reasonably Achievable."

Reporting to the Resident Manager/Manager of Safety & Health are the ERHS, and Environmental Technician. The Manager of Safety and Health and his/her supervisory personnel must ensure adherence of facility operations to company procedures as well as to regulations and requirements administered by the U.S. Nuclear Regulatory

Commission and the Mine Safety and Health Administration. The safety and health personnel which include Electrical and Equipment Maintenance personnel, monitor daily operations and equipment, provide solutions to problems found during audits, and verify implementation of solutions.

Reporting to the Resident Manager are the Electrical and Equipment personnel. The Resident Manager and personnel ensure adherence of maintenance activities and operating procedures to radiation safety regulations and requirements as stipulated by the ERHS and the Project Coordinator; they also ensure adherence to standby and maintenance procedures as presented in license conditions and interpreted by the ERHS, Project Coordinator and the Quality Assurance Consultant.

The Project Coordinator acts as an advisor to the Resident Manager. Reporting to the Project Coordinator are the Quality Assurance Consultants and such other consultants as may be hired to assist in interpreting licensing and regulatory conditions affecting Plateau's operations and in obtaining necessary permits to operate. The Project Coordinator is responsible to inform the Resident Manager of the licensing conditions, radiological and environmental regulations, and changes to the same; to ensure that the quality assurance audits are conducted, to recommend, or provide solutions to any problems found during audit; to act as a liaison between the managers and licensing entities; and to administer any land transactions.

TABLE 1.1-1

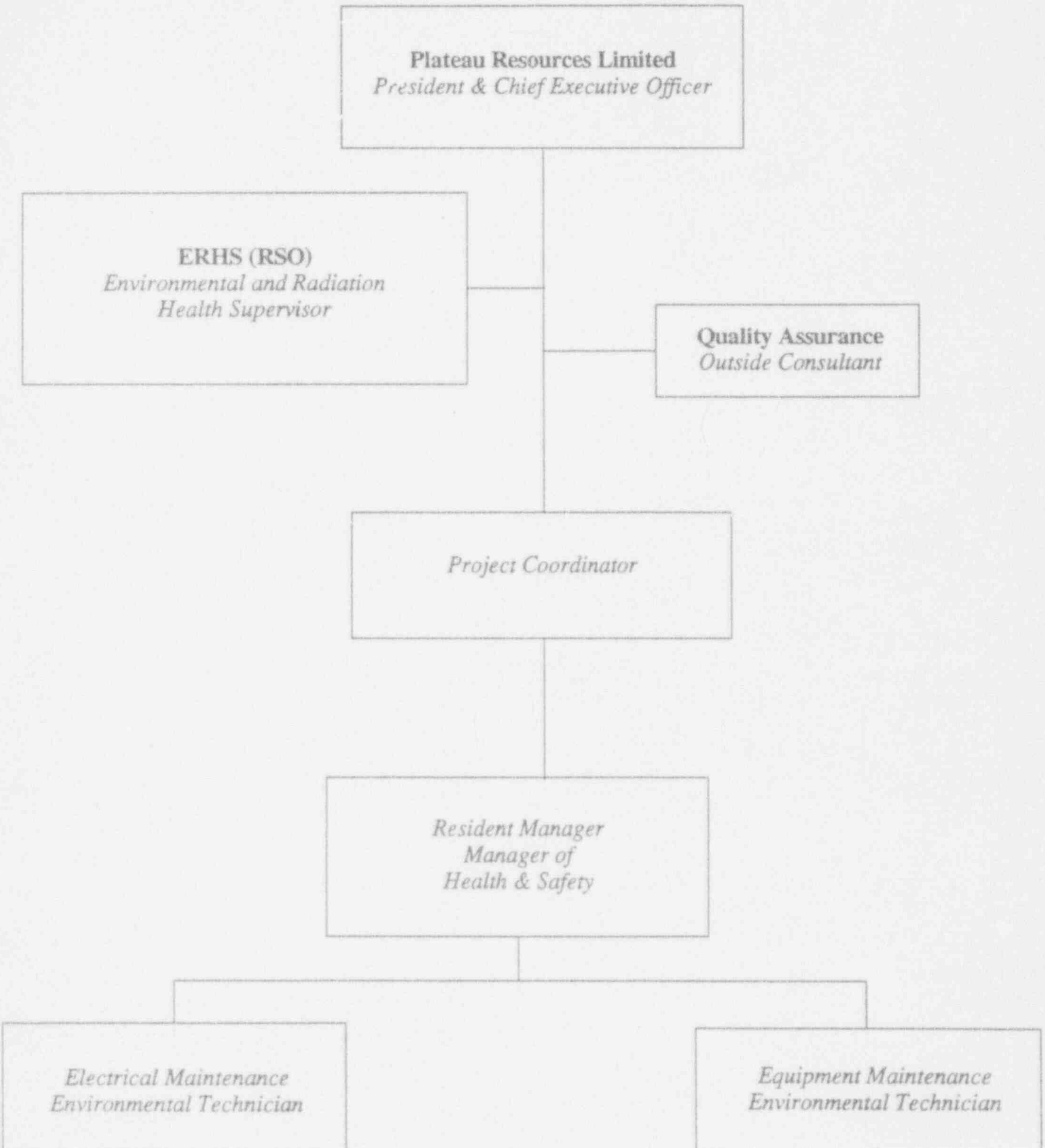
MANAGEMENT COMMITMENTS

A. The Summary of Management Committments are contained in the attached Materials License SUA 1371 and in accordance with statements, presentations and conditions contained in the Licensee's Renewal Application dated November 1984 and Amendments issued in 1986 through 1993 (refer to Attachment II of the Application Renewal of November 1993).

B. Plateau will implement the Standards for Protection Against Radiation as described in 10CFR20.1001 through 20.2401.

Figure 5.1-1

Plateau Resources Limited
Shootaring Canyon Processing Facility
Standby Organizational Chart



RESUMÉ - STANDBY PERSONNEL

PLATEAU RESOURCES LIMITED

Project Coordinator . . . . Kenneth Webber

Supervisor & Monitoring Technician . . . . Vance W. Morrill

Electrical Maintenance . . . . Dennis L. Womack

Equipment Maintenance . . . . Daryl P. Winters

CONSULTANTS

Radiation Safety Officer . . . . Noel Savignac

KENNETH WEBBER
239 West Sunset
Riverton, WY 82501
(307) 856-3204

SUMMARY 35 years experience in various phases of geology and mining. My duties over the years have included working with all agencies involved in the mining industry including environmental regulatory agencies. Responsible for environmental monitoring, waste management, surveying and data collection for maintaining records and filing of reports with regulatory agencies and obtaining permits. Directly involved in mineral property evaluations, and property and lease acquisition negotiations. In addition to my work in the mining industry. Wide background in real estate leasing including building construction and maintenance, and financing through State and Federal agencies.

EMPLOYMENT HISTORY

February 1987 to Present — **U.S. Energy Corp./Crested Corp., Riverton, WY**
Environmental Controller, Manager of Lands, Engineer. Responsible for preparing permit documents and obtaining and renewing various permits including mine permits, water appropriations, drill notifications, construction permits, NRC license renewals, other licenses, leases, etc. Project design, drafting and supervision of various phases of mining operation, environmental monitoring and radiation reporting. Responsible for preparing all reports for BLM, WDEQ, NRC and EPA including Annual Reports, assessment filings, bonding, and Mine Radon Emissions Reports. Responsible for development of interim stabilization plans, reclamation plans, decommissioning plans and Radiation Safety Programs. Other duties include evaluation, supervision and monitoring claim staking, Jeffrey City water system, Ticaboo townsite, the collection of baseline data for Permits, and consulting firms.

1/77 - 2/87 — **Chopping Chevrolet, Inc., Riverton, WY**
President, owner and general manager of Chevrolet/Oldsmobile dealership. Responsible for over all company management and supervision of 40 employees.

2/79 - 2/84 — **P. C. Bus Lines, Riverton, WY**
President, owner and general manager of busline company. Responsible for transporting 500+ employees daily to the Gas Hills Uranium Mines for Pathfinder Mines Corporation and Union Carbide. Operated 26 buses and a complete repair shop.

6/69 - 12/76 — **U.S. Energy Corp., Riverton, WY**
Secretary and Director, Landman, Geologist. Responsible for office management, mineral property evaluations, real estate construction and leasing, property negotiations and acquisitions, field surveying, claim staking and drafting. Responsible for preparation of annual reports and obtaining mine permits (for underground uranium projects). Obtained jade mine permits for Johnson Mines.

1/64 - 6/69	**Consulting Geological Services, Riverton, WY** Supervisor of claim staking projects.
	Architectural Design and Drafting Service, Riverton, WY Designed over 80 commercial and residential buildings.
9/58 - 1/64	**Robert Ford & Associates, Riverton, WY** Geologist and Surveyor.

OUTSIDE ACTIVITIES

1/77 - Present	**Sertoma Club of Riverton, WY** Donate services to the club. Responsible for forming four corporations involved in various phases of housing development for the elderly. President of four Sertoma-related corporations for the past 18 years. Designed and supervised construction of 100 units of housing for the elderly. Presently involved with a 40 acre, 150 unit elderly retirement complex including a 48 unit Assisted Living Unit.
1982 - Present	**Miniweb Leasing, Inc., Riverton, WY** Involved in all activity normally associated with a commercial real estate leasing company including construction plans, obtaining financing, building construction, maintenance and accounting for a 10 Unit Complex.

EDUCATION

College	**Michigan Technological University, 1958** Bachelor of Science Degree, Geological Engineering Major, Mining Engineer Minor
High School	**Stambaugh, Michigan, 1951**

SPECIAL TRAINING

Introduction to Hazardous Waste Management
Implementation of the Standards for Protection Against Radiation
(10CFR20.1001 - 20.2401)
Technical Conference on Rural Water Systems
Chlorination - Lead and Corrosion Control
Hazardous Substance and Related Waste Management Issues
Water Sample Collection and Preservation Techniques

VANCE W. MORRILL
344 SOUTH CENTER
P. O. BOX 29
HANKSVILLE, UTAH 84734
(801) 542-3435

Education:	Wayne High School 1970-1974 Bicknell, Utah College of Eastern Utah 1974-1975
Training:	Emergency Medical Technician 1978 368 EMT training hrs at seminars 1978-1993 40 hrs. Purchasing Agent Training Class, Denver CO 1981 Utah Motor Vehicle Safety Inspector (Utah Highway Patrol) 40 hrs Radiation Safety Training at Oklahoma State University 1988 40 hrs Certified Cross Connection Training 1991 (Utah State Department of Health and Rural Water Association) Occupational Safety and Health Course (Home Study) Utah State University 8 day BSA Wood Badge Leadership Training
Certifications:	Emergency Medical Technician Mine Safety and Health Administration Instructor Cross Connection and Backflow Technician
Experience: Oct 1977 to present	**Plateau Resources Limited** **Shootaring Canyon Uranium Mine and** **Mill, Garfield County, Utah**
October 1987 to Present	Environmental Health Radiation Safety Technician, Occupational Safety Advisor and On-Site Supervisor Supervise the day to day activities at the site. Responsible for compliance with NRC, EPA, and MSHA requirements plus all other State or Federal agencies that have an interest in Plateau's operations. This includes environmental air and groundwater sampling as well as radiation monitoring. My other duties are safety training, purchasing, taking people on tours of mill, maintenance of millsite, and anything else that needs to be done to keep the facility in operational and saleable condition.
November 1984 to October 1987	Equipment Operator and Maintenance Due to staff reduction at the site I was moved to the maintenance department. I operated ten wheel dump trucks, 6053 and 6453 loaders, a D6 Cat and a road grader. We cleaned up contaminated ground below the tailings dam, covered the

ore stockpiles with one foot of cover, and covered the mill tailings pond with about three feet of cover. During this time, I also did mechanic's work on the equipment and maintenance work at the mill and in Ticaboo Tonwsite. I was trained to be the backup Radiation Technician. I also went into the mine one day each week to do mine maintenance. In November of 1984, we decommissioned Plateau's Ore Buying Station. I was responsible for taking down some of the buildings and removing all of the equipment. We had to load the equipment on trucks and haul it 1290 miles back to the mill. It also required that we remove one foot of soil off 60 acres. During the last part of this job, I was the leadman on one of the crews.

1983 - 1984 — Warehouse and Mine
During the last part of 1983 I went back to run the warehouse because of layoffs in the Company. I was responsible for all warehouse activities and for ordering warehouse stock items. During 1984 I went back into the mine to do assessment mining and mine maintenance.

1980 - 1983 — Purchasing
During this time I was the buyer for all supplies and repair parts for the mine, mill, and Ticaboo Townsite. I had to use communication skills to deal with vendors and try to make the best buy for the Company. I was also involved in the purchase of some of the capital equipment used at the mine and Ticaboo. I was supervisor over one assistant buyer.

1978 - 1980 — Warehouse
From about May of 1978 to some time in 1980, I ran the mine warehouse. This included receiving inventory, stocking shelves, running a cardex system, setting reorder points, issuing parts and all other warehouse duties. I became very familiar with equipment, parts, and supplies used at a mining operation. I supervised from two to five other employees during this time.

December 1977 to May 1978 — Underground Mine Equipment Operator
During this time I worked in the mine. My main job was operating ore buggies and underground loaders. I also did mine maintenance and had some experience with explosives.

October 1977 December 1977 — Construction work
Helped build concrete portals at Tony M. Mine. Took down an old uranium mill. Operated a backhoe, dump truck and loader.

August 1977 to October 1977	<u>Laborer, U.S. Forest Service</u> Thinned trees and made trails.
August 1975 to August 1977	<u>LDS Church Mission</u>
Summer 1975	<u>Farmer</u>
Summer 1974	<u>Worked for Brick Layer</u>
Summer 1969 to 1973	<u>Farmer</u>
Community Service:	Hanksville Ambulance Team 13 years President Hanksville Water Company Hanksville Special Service District Board Member Bantam Wrestling Coach Hunter Safety Instructor Boy Scout Leader Bishop of Hanksville LDS Church
Hobbies:	Woodworking Hunting and Fishing Camping

DENNIS L. WOMACK
P. O. BOX 2108 - TICABOO
LAKE POWELL, UTAH 84533

Education:	North Fremont High School 1956 Radar Repair Course, Ft. Monmouth, NJ January 1958 to September 1958
Experience: 1977 to present	**Plateau Resources, Limited** **Ticaboo, Utah**
1982 to present	<u>Electrician A</u> Maintenance of electrical systems at the Mill and Ticaboo. Responsible for electrical repairs as necessary. During shutdown period, have assumed additional duties such as motel maintenance, Ticaboo water and sewer systems maintenance, trash collection. lawn care, equipment operator, (Front end loader, backhoe, dump truck) light vehicle service and maintenance.
1977 to 1982	<u>Electrical Supervisor, Tony M. Mine</u> Oversee installation of mine electrical system. Schedule the crews. Figure and order materials.
1973 to 1977	<u>Electrical Contractor, Green River, UT</u> New Residential and commercial wiring. Construction and rewiring of existing structures.
1972 to 1973	<u>AVCO Corporation, Maintenance Chief</u> Responsible for repair and maintenance of electrical meteorological equipment at the Utah Launch Complex
1970 to 1972	<u>Anaconda Company, Journeyman Electrician</u> Maintained electrical equipment at the uranium mill and open pit mine.
1965 to 1970	<u>AVCO Corporation Field Service Rep</u> Worked at various locations for AVCO doing maintenance work and repairs on electronic equipment
1963 to 1965	<u>Russ Electric, Electrician</u> Worked for contractor on electrical construction, both residential and commercial
1957 to 1963	<u>Military Service, U.S. Army</u> Radar repair Rank at discharge - SP/5 (E-5) Type of discharge - Honorable

DARYL P. WINTERS
P. O. BOX 2241 - TICABOO
LAKE POWELL, UT 84533

Experience: 1982 to present	**Plateau Resources Limited, Ticaboo Utah**
1984 to present	Maintenance Routine and specific maintenance, repairs and security required to keep the mill and Ticaboo Townsite in condition for operation or sale including: daily and routine maintenance on pumps, generators and fire systems; maintenance and repairs on vehicles and heavy equipment; operating trucks and heavy equipment (loader, Cat dozer, dump truck); lending assistance with any job needing to be done at the Ticaboo Townsite.
1982 to 1984	Shift Supervisor, Tony M. Mine Supervised drift and stope development
1981	Centennial Development Company-Lead Miner Underground drift development for Cypress Mining Corporation in Montana
1977 to 1980	Western Nuclear, Jeffrey City, WY. Grade A Miner Stoping and drift work at Sheep Mountain I
1970 to 1976	Centennial Development Company-Lead Miner Mined in Challis, Id; Bayhorse, Id; and Wenatchee, WA
1968 to 1970	Miner

Radiation Protection Consultant

Noel Savignac, Ph.D.

RESUME

CAPABILITY SUMMARY: Noel Savignac has over 23 years experience in radiation protection, compliance with environmental and radiological regulations, hazard assessment, radiological training, and licensing for users of radioactive materials. He has worked as a Manger of Environmental Services for a uranium mining and milling firm, as a Health Physicist at a nuclear power plant, and as a university Radiation Safety Officer and Instructor.

PROFESSIONAL EXPERIENCE:

Environmental and Radiological Regulations

- Prepared a radiological control manual implementation plan and a site specific RadCon Manual for a DOE contractor.
- Prepared a DOE environmental monitoring plan.
- Prepared an application to ship low-level radioactive waste to a DOE disposal site.
- Calculated radiological doses from airborne emissions for compliance with the EPA NESHAPS regulations.
- Determined contractor compliance with DOE Orders on occupational and environmental radiation protection.
- Incorporated DOE Orders into contractor performance objectives criteria.
- Assessed contractor compliance with environmental, safety, and health regulations in preparation for "Tiger Team" audits.
- Prepared environmental and radiological protection procedures for compliance with DOE Orders.
- Tested alpha-track detectors to measure radon in compliance with the EPA NESHAPS regulations.
- Determined reporting requirements under the EPA "Reportable Quantities" regulations.
- Determined DOT shipping requirements for uranium mines.
- Served on two Peer Review Panels for the DOE Uranium Mill Tailings Remedial Action Project to assess radiological measurement procedures and compliance with regulations.

6100 Uptown Boulevard N.E., Suite 700 · Albuquerque, New Mexico 87110
Bus: (505)881-4150 Res: (505)256-9603 FAX: (505)881-7420

Hazard Assessments

- Determined radiation doses from uranium during asbestos removal at a uranium mill.
- Determined hazards of a thorium oxide spill.
- Assessed environmental and radiological liabilities of a uranium mill prior to sales offering.
- Determined occupational doses from U-238 and Th-232 in SO_2 scrubber sludge from a copper smelter.
- Determined occupational doses and environmental hazards from Re-187 from a copper smelter.
- Determined occupational doses from Th-232 in a metal casting facility.
- Determined occupational doses and environmental contamination from Po-210 in kerosene-diesel fuel.
- Determined potential environmental doses from U-238 and Tc-99 in a disposal pond.
- Assessed environmental exposures from mercury released to a creek flowing through Oak Ridge, TN.
- Assessed environmental documentation on high-level nuclear waste repositories as part of a Peer Review Panel.
- Assessed remedial radiological actions required at the Fernald Feed Materials Production Center.

Radiological Training Courses Presented

- Compliance under the revised 10 CFR 20 (NRC Standards for Protection Against Radiation)
- Radiation Protection videos for DOE subcontractors, electronics firms, and uranium mills.
- Radiation Protection of the Fetus.
- Annual Refresher Courses in Radiation Protection.

Licensing and Registration

- Registration of a 13.5 MeV linear accelerator.
- Radioactive materials license for an 8,000 Ci Co-60 gamma irradiator.
- New radioactive materials license and several license renewals and amendments for uranium mills.

EMPLOYMENT HISTORY:

Noel Savignac Consultants 1980 - Present Provides consulting Health Physics services to DOE, states, and corporations.

United Nuclear Corporation 1974 - 1980 Obtained radioactive materials licenses for uranium mills, trained environmental and occupational monitoring personnel, calculated radiological exposures and prepared sections of environmental reports as the Manager of Environmental Services.

University of Wyoming 1971 - 1974 Managed the Radiation Safety Office and taught radiation safety courses as Radiation Safety Officer.

EDUCATION:

Colorado State University, Doctor of Philosophy
(Health Physics), 1974.
Colorado State University, Master of Science
(Health Physics), 1968.
University of New Mexico, Master of Science
(Physiology), 1967.
Lake Forest College, Bachelor of Arts
(Biology), 1965

ASSOCIATIONS: (current and past)

American Institute of Mining Engineers
American Mining Congress, Uranium Environmental Subcommittee
(Chairman, 1978-1980)
American Nuclear Society
Beta Beta Beta
Health Physics Society
Rio Grande Chapter Health Physics Society (President, 1990)
National Council of Radiation Protection and Measurements, contributing author to the draft NCRP Report "Radiation Protection in the Mineral Extraction Industry"
New Mexico Mining Association, Uranium Environmental Subcommittee
Radiation Research Society
Ronald McDonald House Board of Directors
Sigma Xi
Wyoming Mining Association, Uranium Environmental Subcommittee.

CLIENT LIST:

- All-Tec Inc.
- Assagai Analytical Labs
- Atlas Minerals Corp.
- Aware, Inc.
- BDM Corp.
- Black Law Firm
- Chem-Nuclear Systems, Inc.
- Cyprus Miami Mining Corp.
- Energy Fuels Nuclear, Inc.
- Envir. Sci. & Engr., Inc.
- Federal American Partners
- Franchini Law Firm
- Giant Industries Inc.
- Hecla Mining Company
- Hollington Law Firm
- Homestake Mining Company
- ICF Kaiser Engineers, Inc.
- IT Corporation/D'Appolonia
- Inhal. Tox. Res. Inst.
- Intera, Inc.
- Jacobs Engineering Inc.
- Marline Uranium Corp.
- Montgomery & Andrews
- NM Environment Department
- Pathfinder Mines Corp.
- Plains Electric
- Plateau Resources Ltd.
- Precision Castparts Corp.
- Remote Sensing Systems
- Rio Algom Corp.
- Sandia National Labs (through subcontactors)
- Simmons Law Firm
- Thunderbird/Red Lion Inns
- Titan/Spectron Dev. Labs
- Umetco
- United Nuclear Corp.
- Woodward Clyde Consult.

NOEL SAVIGNAC - URANIUM PROJECT EXPERIENCE

1) New Mexico Operations:

a) United Nuclear Corporation, Gallup, NM - Principle investigator for the Church Rock Mill license application. Negotiated license conditions with the New Mexico Environmental Improvement Division (NMEID). Hired and trained entire environmental and radiation protection staff. Prepared mining plans for Dalton Pass Mine and Canyon Mines for USGS. Contributing author to mill license renewal submitted to NMEID.

b) Homestake Mining Company, Grants, NM - Contributing author to mill license renewal submitted to NMEID. Performed MILDOS computer evaluation of radiological impacts of mill on surrounding population. Wrote radiological assessment for mill.

c) Mobil Oil Company, Crown Point, NM - Conducted a MILDOS computer evaluation of radiological impacts of in situ uranium extraction facility for the NMEID. Conducted laboratory quality assessment for a laboratory processing environmental or occupational samples.

d) Conoco Oil Company, Crown Point, NM - Contributing author to environmental report for anticipated mill. Wrote radiological assessment section of environmental report.

2) Colorado Operations:

a) Homestake Mining Company, Gunnison, CO -Wrote portions of environmental baseline monitoring program for an anticipated mill at the Pitch project site, submitted to the Colorado Department of Health. Attended public hearings.

b) UMETCO, Uravan, CO - Prepared radiological and environmental assessment sections of license application for Spring Creek Mesa tailings disposal facility; submitted to the Colorado Department of Health. Attended public hearings.

3) Wyoming Operations:

a) Pathfinder Mining Company, Riverton, WY - Conducted radiological and environmental audit and Ra-226 exposure assessment required by the Nuclear Regulatory Commission (NRC).

b) Federal American Partners, Riverton, WY - Negotiated with NRC a reduction of the radiological and environmental monitoring programs for shut-down status of mill. Conducted radiological audits and wrote applications for license amendments.

c) United Nuclear Corporation, Casper, WY - Prepared radiological and environmental sections of the license application for the proposed Morton Ranch Uranium Mill.

4) Utah Operations:

a) Atlas Minerals Corporation, Moab, UT - Project Coordinator and contributing author of mill license renewal submitted to NRC. Conducted several audits of environmental and radiological monitoring program. Wrote radiological and environmental procedures manual and radiological training manual.

b) Energy Fuels Nuclear (UMETCO), Blanding, UT - Conducted environmental and radiological audits.

c) Plateau Resources Limited, Ticaboo, UT - Wrote mill license renewal application submitted to NRC. Wrote and revised environmental and radiological monitoring procedures. Submitted several license amendments to NRC. Prepared mill and tailings decommissioning and reclamation plans. Served as (consulting) Environmental and Radiological Health Supervisor. Conducted audits of radiological and environmental monitoring program. Prepared groundwater monitoring program.

d) Rio Algom Mining Company, Moab, UT - Prepared license renewal application and license amendments submitted to NRC. Conducted audits of environmental and radiological monitoring programs. Prepared radiological training manual. Rewrote environmental and radiological monitoring procedures. Assessed groundwater flow patterns.

5) Virginia Operations:

Marline Uranium Corporation, Danville, VA - Prepared assessment of surface water impacts and radiological impacts using MILDOS computer code of the proposed Swanson Mill submitted to the State of Virginia. Attended several public hearings and public relations sessions.

6) U.S.A.

National Commission on Radiological Protection and Measurements (NCRP), U.S.A. Author of "Effluent Monitoring and Environmental Surveillance" in Radiation Protection in the Mineral Extraction Industry, NCRP report to be published.

American Miming Congress, Uranium Environmental Subcommittee past chairman.

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 40 and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

COPY

Licensee	
1. Plateau Resources Limited Shootaring Canyon Uranium Processing Facility 2. Box 2111 Ticaboo Lake Powell, Utah 84533-2111 [Applicable Amendments: 1,3]	3. License number: SUA-1371, Amendment No. 12 4. Expiration date: December 31, 1993 5. Docket or Reference No.: 40-8698

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
a. Natural Uranium	a. Any	a. Residual quantities entrained in the circuit.
b. Uranium Byproducts	b. Any	b. Unlimited

9. Authorized place of use: The licensee's uranium milling facilities located in Garfield County, Utah.

10. The licensee is hereby authorized to possess byproduct material in the form of uranium waste tailings and other byproduct wastes which were generated by the licensee's uranium recovery operations previously authorized under SUA-1371.

11. For use in accordance with statements, representations and conditions contained in Sections 3.1, 4.2.1, 4.3, 5.1.2, 5.1.3, 5.1.4, 5.2, 5.3, 5.4, 5.5, 6.0, 7.0, Appendices A and G, Figures 3.0-1 and 3.1-1 and Tables 5.5-1, 5.5-2, 5.5-3, 5.5-5, 5.5-6, 5.5-7, 5.5-8 and 5.5-9 of the licensee's renewal application dated November 26, 1984 and the addendum dated August 13, 1985 where it supersedes the November 26, 1984 application, except where superseded by license conditions below.

    Whenever the word "will" is used in the above referenced sections, it shall denote a requirement.

12. The licensee is not authorized to produce uranium concentrates without the approval of the NRC in the form of a license amendment.

13. The licensee is hereby exempted from the requirements of Section 20.203(e)(3) of 10 CFR 20 for areas within the mill, provided that all entrances to the mill are conspicuously posted in accordance with Section 20.203(e)(2) and with the words, "Any Area Within this Mill May Contain Radioactive Material."

14. Any changes in the mill circuit as illustrated in Figure 3.1-1 of the renewal application dated November 26, 1984 shall require approval of the U.S. Nuclear Regulatory Commission in the form of a license amendment.

15. Mill tailings other than samples for research or analysis shall not be transferred from the site without specific prior approval of the NRC in the form of a license amendment. The licensee shall maintain a permanent record of all transfers made under the provisions of this condition.

16. The licensee shall submit to the NRC, Uranium Recovery Field Office, for review and approval in the form of a license amendment, at least six months prior to resuming the processing of ore, a description of the qualifications of all mill management, and radiation safety personnel, and a revised organization chart listing responsibilities appropriate for full operation.

    In addition, the licensee shall assure that any consultant who carries out any of the duties of the ERHS meets the minimum qualifications of Section 2.4.1 of Regulatory Guide 8.31 dated May, 1983.

17. The licensee shall issue a Radiation Work Permit (RWP) to cover nonroutine activities posing a radiological risk to employees and for which no standard written procedure already exists. The RWP shall be signed by the ERHS or his designate and shall at least describe the following:

    A. The scope of the work to be performed.

    B. Any precautions necessary to reduce exposure to uranium and its daughters which shall include monitoring for radon progeny prior to entering the 600 area.

    C. The supplemental radiological monitoring and sampling necessary prior to, during and following completion of the work.

18. A copy of the annual ALARA audit report shall be sent to the NRC, Uranium Recovery Field Office, P.O. Box 25325, Denver, CO 80225, within 30 days of its submittal by the licensee's Quality Assurance Consultant to the licensee's ALARA committee.

19. Occupational exposure calculations shall be documented within one week of the end of each regulatory compliance period as specified in 10 CFR 20.103(a)(2) and 10 CFR 20.103(b)(2). Nonroutine ore dust and yellowcake samples shall be analyzed and the results reviewed by the ERHS or his designate within two working days after receipt of the analytical results by the ERHS or his designate.

20. The ERHS or his designate shall conduct an investigation of an employee's exposure conditions when an action level of 25% of the maximum permissible time weighted exposure for the week or quarter is reached depending on the material solubility. Any personnel exposure exceeding 25% of the maximum permissible external penetrating exposure in any calendar quarter shall also be investigated. Corrective actions resulting from the investigations shall be promptly implemented.

21. The licensee is authorized to use protection factors for respirators not to exceed the values specified in Appendix A of 10 CFR 20 for the purpose of assigning an exposure to airborne radionuclides provided that the respiratory protection program specified in Appendix G of the PRL renewal application dated November 26, 1984 is implemented.

    In addition, PRL shall assure that only respiratory protective equipment that has been specifically certified or had certification extended by NIOSH/MSHA shall be utilized.

22. Personnel leaving the restricted area must self monitor for alpha contamination whenever a Radiation Work Permit is required by License Condition No. 17, and follow applicable procedures presented in Appendix F of the renewal application dated November 26, 1984. [Applicable Amendment: 9]

23. Release of equipment or packages from the restricted area shall be in accordance with Attachment No. 1 to this license entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials" dated September 1984.

24. The licensee shall maintain and inspect on a quarterly basis fire detection and suppression equipment as described in the "Inspections of Fire Suppression Equipment" section of Appendix H of the renewal application dated November 26, 1984.

25. Prior to resuming operations and contingent upon demonstration of continued interim stabilization of the tailings as specified in License Condition No. 42 as rapidly as conditions allow, the licensee shall conduct a technical evaluation of the cross-valley berm and tailings dam, including a review of all embankment instrumentation data and inspection reports. This evaluation and subsequent annual evaluations shall be performed by a qualified geotechnical individual familiar with the design, construction and operation of the berm and dam. A copy of these reports shall be submitted to the NRC, Uranium Recovery Field Office, within one (1) month of completion of the report. [Applicable Amendment: 2]

26. The licensee shall submit, in addition to the decommissioning plans contained in the application dated November 26, 1984 and submittal dated February 8, 1988, a detailed decommissioning plan to the NRC at least twelve (12) months prior to planned decommissioning activities. [Applicable Amendment: 5]

27. Before engaging in any activity within the permit boundary not previously evaluated by the NRC, the licensee shall prepare a written environmental evaluation of such activities and obtain prior approval from the NRC in the form of a license amendment unless the NRC agrees in writing that no significant adverse environmental impact will result from the proposed activity.

28. The licensee shall immediately notify the NRC and the Office of State Historic Preservation if artifacts are discovered during disturbance of the mill or the tailings disposal areas and shall have an archeological survey performed prior to disturbing any previously unsurveyed areas.

29. The licensee shall conduct an annual survey of land use (private residences, grazing areas, private and public potable water and agricultural wells, and nonresidential structures and uses) in the area within five miles (8.05 km) of any portion of the permit boundary and submit a report of this survey to the NRC, Uranium Recovery Field Office. This report shall indicate any differences in land use from that described in the last report.

30. During the period of interim shutdown, the licensee shall implement the interim mill radiation safety monitoring program specified in Table 5.5-3 and the effluent and environmental monitoring program specified in Table 5.5-8 of the renewal application addendum dated August 13, 1985. Until interim stabilization activities have been completed, the licensee shall monitor for radon gas and direct radiation at one upwind and one downwind location.

31. The results of all effluent and environmental monitoring required by this license shall be reported in accordance with 10 CFR 40, Section 40.65 with copies of the report sent directly to the U.S. Nuclear Regulatory Commission, Uranium Recovery Field Office. Data shall be reported in the format shown in Attachment No. 2 to this license entitled, "Sample Format for Reporting Monitoring Data."

32. The licensee shall utilize the lower limits of detection in accordance with Section 5 of the Regulatory Guide 4.14, Revision 1 dated April 1980, for analysis of effluent and environmental samples.

33. The licensee shall implement a ground-water detection monitoring program to ensure compliance with 10 CFR 40, Appendix A, which includes the following:

    A. Monitor at the point of compliance and the background wells for the following indicator parameters: arsenic, chloride, selenium, natural uranium and pH.

    B. The determination of compliance shall be based on sampling Wells RM-4, RM-5 and RM-6.

    C. The licensee shall sample for those parameters specified in subsection (A) at those wells designated in subsection (B) at least twice annually. All semiannual samples shall be taken at least 4 months apart.

    D. The licensee shall, within 30 days of issuance of this amendment, utilize the following threshold values: arsenic = 0.022 mg/l, chloride = 40 mg/l, selenium = 0.022 mg/l and pH = 6.8 standard units to determine if a significant change has occurred and within this 30-day period, notify the NRC, Uranium Recovery Field Office, of the finding. Should the threshold limits be exceeded, the licensee shall within an additional 60 days propose in the form of a license modification, an expanded detection monitoring program which defines the extent and concentration of hazardous constituents in the regulated unit.

    E. The licensee shall report the data required by subsection (C) and perform the threshold test defined in subsection (D) semiannually along with those data required by License Condition No. 31 in accordance with the reporting format, Attachment No. 3 to SUA-1371, "Sample Format for Reporting Detection Monitoring Data."

F. The licensee shall report at least annually in accordance with the reporting requirements specified in subsection (E), the rate and direction of ground-water flow under the tailings impoundment.

[Applicable Amendments: 4, 6]

34. No liquid effluents shall be discharged into the tailings impoundment after the free water surface in the impoundment has been eliminated.

35. The licensee shall implement the following corrective actions in order to prevent a future overflow of the existing tailings berm sump:

A. PRL shall maintain a manually controlled backup pump and spare parts for the primary sump pump.

B. PRL shall maintain a tailings sump pump with automatic level control as backup to the primary sumo pump.

C. The sump pumping system shall be inspected and documented once per week.

D. PRL shall maintain a sump level alarm which turns on automatically if the solution level in the primary sump were to reach a point above the normal cycle level of the sump.

[Applicable Amendment: 9]

36. Construction, maintenance, and operation of the tailings retention system shall be in accordance with the specifications, representations, and commitments contained in the following documents.

A. "Tailings Management Plan and Geotechnical Engineering Studies, Shootaring Canyon Uranium Project," Woodward-Clyde Consultants, September 1978.

B. Letter from M. B. Bennedsen, Senior Project Engineer, Woodward-Clyde Consultants to Mr. Ross A. Scarano, NRC, January 19, 1979.

C. "Stage I - Tailings Impoundment and Dam Final Design Report, Shootaring Canyon Uranium Project," Woodward-Clyde Consultants May 24, 1979, including contract drawings and supplemental data dated June 12, 1979.

D. Report, "Groundwater Monitoring Wells - Shootaring Canyon Uranium Project" enclosed with letter from R. B. Sewell to Pete Garcia dated June 6, 1979.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

COPY

License number
SUA-1341, Amendment No. 12

Docket or Reference number
40-8698

AUG 11 1993

The licensee shall not expand the tailings impoundment area by raising the height of the dam beyond that specified in document (C) above, or by constructing any additional dams not specified in the documents listed above without specific prior approval of the NRC obtained through application for amendment of this license.

37. The licensee shall conduct and document an inspection of the tailings disposal system at least monthly during the interim shutdown program. The licensee shall immediately notify the NRC, Uranium Recovery Field Office, by telephone and/or telegraph of any failure in the tailings embankment or tailings discharge system which results in the release of radioactive material. This requirement is in addition to the requirements of 10 CFR Part 20.

38. Notwithstanding the reclamation plan contained in Section 5.5.9 of the licensee's renewal application, the licensee shall submit to the NRC, Uranium Recovery Field Office, for review and approval in the form of a license amendment at least six (6) months prior to resuming operations, a detailed reclamation plan which includes the following:

A. A post operations interim stabilization plan which details methods to prevent wind and water erosion and recharge of the tailings area.

B. A proposed methodology to dewater and/or consolidate the tailings cells prior to placement of the final reclamation cover.

C. Plan and cross-sectional views of a final reclamation cover which detail the location and elevation of tailings. The plan shall include details on cover thickness, physical characteristics of cover materials, proposed testing of cover materials (specifications and QA), the estimated volumes of cover materials and their availability and location.

D. Detailed plans for placement of rock or vegetative cover on the final reclaimed tailings pile and mill site area.

E. A proposed reclamation schedule for items A through D above which defines the sequence of events and expected time ranges.

F. An analysis to show that the proposed type and thickness of soil cover is adequate to provide appropriate attenuation of radon and is adequate to assure long term stability.

G. The licensee shall include a detailed cost analysis of each phase of the reclamation plan to include contractor costs, projected costs of inflation based upon the schedule proposed in item E, a proposed contingency cost, and the costs of long term maintenance and monitoring.

In addition, the licensee shall submit within 9 months of issuance of this license, for NRC review and approval in the form of a license amendment, a proposed reclamation plan for Cells 1-3 addressing Items A-G above, as warranted.

License number
SUA-1341, Amendment No. 12
MATERIALS LICENSE
SUPPLEMENTARY SHEET
COPY
Docket or Reference number
40-8698
AUG 11 1993

39. The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, for reclamation of any tailings or waste disposal areas, ground water restoration as warranted and the long-term surveillance fee. Within 3 months of NRC approval of a revised reclamation/decommissioning plan, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved plan exceed the amount covered in the existing financial surety. The revised surety shall then be in effect within 3 months of written NRC approval.

Annual Updates to the surety amount, required by 10 CFR 40, Appendix A, Criteria 9 and 10, shall be submitted to the NRC at least 3 months prior to the anniversary of the effective date of the approved surety arrangement. If the NRC has not approved a proposed revision to the surety coverage 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing surety arrangement for 1 year. Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency fee, changes in engineering plans, activities performed, and any other conditions affecting estimated costs for site closure. The basis for the cost estimate is the NRC approved reclamation/decommissioning plan or NRC approved revisions to the plan. The attachment entitled "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates" outlines the minimum considerations used by the NRC in the review of site closure estimates. Reclamation/decommissioning plans and annual updates should follow this outline.

The currently approved financial surety arrangement, a Surety Trust Agreement between Plateau Resources Limited and Rocky Mountain Bank Federal Savings Bank, shall be continuously maintained in an amount no less than $2,353,333 for the purpose of complying with 10 CFR 40, Appendix A, Criteria 9 and 10, until a replacement is authorized by the NRC.

[Applicable Amendments: 7, 8, 10, 11, 12]

40. Prior to termination of this license, the licensee shall provide for transfer of title to byproduct material and land, including any interests therein (other than land owned by the United States or the State of Utah) which is used for the disposal of such byproduct material or is essential to ensure the long term stability of such disposal site to the United States or the State of Utah, at the State's option.

41. Prior to commencing operation, the licensee shall submit to the NRC for review and approval, in the form of a license amendment, a design modification to assure compliance with 40 CFR 192 for use of any additional portion of the tailings impoundment, or submit a request to the NRC for variance from the 40 CFR 192 requirement for a synthetic liner.

NRC Form 374A
(5-84)

U.S. NUCLEAR REGULATORY COMMISSION

PAGE 8 OF 8 PAGES

License number
SUA-1341, Amendment No. 12

MATERIALS LICENSE
SUPPLEMENTARY SHEET

COPY

Docket or Reference number
40-8698

AUG 11 1993

42. The licensee shall implement interim stabilization of tailings impoundment Cells 1 and 3 and the ore stockpile by October 1, 1986. In addition to the stabilization measures propcsed in Section 5.5.7 of the licensee's August 13, 1985 submittal, the licensee shall:

A. Cover the stockpile with at least six inches of soil and contour the pile such that the soil will not easily erode.

B. Cover the mill tailings with at least one foot of soil and/or rubble rock.

Visual inspection of the stabilized areas shall be performed and documented monthly. Maintenance activities shall be performed as soon as possible following identification of need.

FOR THE NUCLEAR REGULATORY COMMISSION

Date: AUG 11 1993

Ramon E. Hall, Director
Uranium Recovery Field Office
Region IV

40-3453

RETURN ORIGINAL TO PDR, HQ.

ATLAS CORPORATION

Republic Plaza, 370 Seventeenth Street, Suite 3150
Denver, CO 80202
Telephone: (303) 825-1200 Fax: (303) 892-8808

RICHARD E. BLUBAUGH
Vice President of Environmental
and Governmental Affairs

December 13, 1993

HAND-DELIVERED
Mr. Ramon E. Hall
Uranium Recovery Field Office
U.S. Nuclear Regulatory Commission
P.O. Box 25325
Denver, CO 80225

Re: **License SUA-917**
Docket No. 40-3453
October 8, 1993 Request for Information

Dear Mr. Hall:
Transmitted herewith is Atlas' response to the request for information received from the NRC concerning conceptual alternative disposal site design, estimated costs and groundwater compliance issues. Canonie Environmental Services Corp. developed the information contained in the enclosed document at Atlas' request.

The estimated costs are for comparison purposes only. They include two offsite conceptual disposal designs as well as the proposed design. Actual costs will vary depending on design changes which may be necessary for final approval and contractor bids at the time the work is performed.

We trust this information is helpful in the ongoing reevaluation process. Also, we recognize that there may be additional questions as the process continues. Be assured that Atlas will cooperate to see this process completed at the earliest opportunity in order to eliminate the continuing uncertainty concerning the reclamation of the Moab Site

Sincerely,

Richard E. Blubaugh

Richard E. Blubaugh
Vice President, Environmental
and Governmental Affairs

DESIGNATED ORIGINAL
Certified By Mary C. Hood

94-0116

CONCEPTUAL DESIGN, COST AND
GROUND WATER COMPLIANCE INFORMATION
NUCLEAR REGULATORY COMMISSION
REQUEST FOR INFORMATION
MOAB, UTAH, URANIUM MILL SITE

1.0 INTRODUCTION

Canonie Environmental Services Corp. has prepared a response to the Nuclear Regulatory Commission's (NRC's) request for information in its letter dated October 8, 1993. The request for information relates to conceptual design and cost information for alternative disposal sites and ground water compliance to Atlas Corporation's (Atlas') Moab Mill site. The requested cost information is summarized in Table 1 and includes comparisons of the costs associated with the reclamation plan versus two conceptual off-site disposal alternatives. The costs associated with ground water monitoring for the in-place reclamation site and the alternative disposal sites are included in the cost estimates. Also, a discussion is provided on how proposed alternative concentration limits (ACLs) for ground water may be permitted considering applicable laws.

2.0 RECLAMATION ALTERNATIVES

2.1 In-Place Reclamation

Appendix A shows the costs associated with in-place reclamation at the site consistent with the closure plan. These are direct costs exclusive of contractor profit and contingency. Table 1 provides an estimate of the total contract price. This estimate assumes a 10-percent variance from the number presented in the attachments. The range that could be expected for this scope of work, including contractor's fee and contingency, would be $13 million to $16 million for the reclamation. This estimate also addresses the cost associated with the current ground water treatment program. The direct costs are shown on Sheet 33 of Appendix A. The estimated costs for the ground water treatment program are $96,000 per year. As requested, all costs are in 1993 dollars.

2.2 Alternative Disposal Site "A"

Appendix B shows the cost estimate for a disposal site designated as Site "A," as discussed in the Dames and Moore report entitled "Tailings Management and Reclamation Alternatives Study for Atlas Minerals at Moab, Utah" dated October 1977. This site is located approximately 8 miles from the tailings site as shown on Figure 1. A conceptual design for the site is included as Figure 2. Alternative Disposal Site A is located in a box canyon on the west side of Moab Canyon. The site slopes gently to the northwest and has a drainage area of approximately 0.6 square mile. The soil and bedrock conditions at the site consist of a thin veneer of coarse alluvium overlying the Moenkopi Formation. The Moenkopi Formation consists of siltstone and sandstone and is generally of low permeability. The sidewalls of the box canyon are over 400 feet high. The Chinle Formation, consisting of a basal conglomeratic sandstone and overlying mudstones, siltstones, and sandstones, is exposed on the canyon sidewalls. The formation is generally well cemented and stable in vertical cuts.

The costs in this estimate include moving approximately 10.5 million tons of tailings by truck and disposing them in the repository. Assuming the same 10-percent variance as presented in the on-site alternative, the range of costs that could be expected for this scope of work would be $89 million to $107 million. The cost for performing an environmental impact statement for this alternative site is included in this estimate. The cost for ground water monitoring is assumed to be the same as that presented in Appendix A. Additionally, as shown on Sheets 38 and 40, the estimated cost for ground water monitoring is $84,000 per year during the treatment operations and a total of $139,000 for subsequent long-term monitoring.

2.3 Alternative Disposal Site "B"

Appendix C shows the cost estimate for Alternative Disposal Site "B," located approximately 18 miles to the northwest of the tailings site. As shown on Figure 1, this site would be approximately 2.5 miles southwest of the airport. A conceptual design for the site is included on Figure 3. Alternative Disposal Site B is located in a relatively flat area known as Klondike Flat. The ground surface slopes up steeply north of the site and is relatively flat for several miles south, east and west of the site. The site is underlain by the Mancos Shale. The Mancos Shale consists mostly of a marine shale with some marine and non-marine sandstone units.

The costs included in this estimate include moving approximately 10.5 million tons of tailings by rail and disposing them in the repository. Assuming a 10-percent variance, the range of costs that could be expected for this scope of work would be $94 million to $114 million. A cost has also been included for performing an environmental impact statement for the new location. Additionally, as shown on Sheets 39 and 40, the estimated costs for ground water monitoring are the same as provided with the Alternative Disposal Site A estimate.

3.0 GROUND WATER ISSUES

Provisions for establishing ACLs have been incorporated into the NRC's regulations governing the disposal of uranium mill tailings (10 CFR Part 40, Appendix A). Also, the U.S. Environmental Protection Agency's (EPA's) protection standards for uranium and thorium mill tailings (40 CFR Part 192) indicate that ACLs can be established by EPA at designated processing or depository sites. It is our understanding that NRC has not finalized the guidance or methodology for establishing ACLs at uranium mills, however, the NRC regulations (10 CFR Part 40, Appendix A) provide the factors [Appendix A to Part 40, Criterion 5B(6)] for consideration when making a present and potential hazard finding for a particular constituent ACL. If these factors are followed, the constituent ACL will provide protection of human health and the environment based on health protection standards. Also, NRC has developed a "Draft Technical Position on Alternate Concentration Limits for Uranium Mills, Standard Format and Content Guide and Standard Review Plan for Alternate Concentration Limit Application" (June, 1988).

In making the present and potential hazard finding, the factors listed below will be addressed. Preliminary responses on how these factors relate to the Moab Mill site and additional technical analyses that may be required to support ACLs are provided.

"(a) Potential adverse effects on ground-water quality, considering-

(i) The physical and chemical characteristics of the waste in the licensed site including its potential for migration;"

> Response - The physical and chemical characteristics of the waste have been well characterized. The active dewatering system and the minimization of infiltration by runoff control and capping will prevent expansion of the contaminant plume.

"(ii) The hydrogeological characteristics of the facility and surrounding land;"

Response - The hydrogeological characteristics of the facility and surrounding land have been well characterized. However, some additional characterization of the interaction of the alluvial aquifer below the tailings with the deeper salt water or brine zone, the bedrock, and the Colorado River will be performed.

"(iii) The quantity of ground water and the direction of ground-water flow;"

Response - The direction of ground water flow is defined. Using existing data, a model will be developed indicating ground water flow conditions after completion of reclamation.

"(iv) The proximity and withdrawal rates of ground-water users;"

Response - No water supply wells exist in the vicinity of the facility.

"(v) The current and future uses of ground water in the area;"

Response - The ground water in the vicinity of the facility is not being used and future use will be precluded by institutional controls.

"(vi) The existing quality of ground water, including other sources of contamination and their cumulative impact on the ground-water quality;"

Response - The shallow ground water below the tailings has been impacted. The reduction of infiltration through the facility will improve water quality over time. The impact of infiltration on the existing ground water conditions under the reclaimed site will be evaluated.

"(vii) The potential for health risks caused by human exposure to waste constituents;"

Response - Institutional controls that prevent human exposure to hazards in the ground water will be implemented.

"(viii) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;"

Response - The reclamation plan and institutional controls will provide protection of the environment to exposure from contaminated ground water.

"(ix) The persistence and permanence of the potential adverse effects."

Response - Because of relatively low ground water velocities, uranium concentrations in the ground water below the tailings may be elevated for a number of years. However, implementation of the reclamation plan and institutional controls will minimize the impact on human health and the environment, and this persistence will have no significant adverse effect.

"(b) Potential adverse effects on hydraulically-connected surface water quality, considering -

"(i) The volume and physical and chemical characteristics of the waste in the licensed site;

"(ii) The hydrogeological characteristics of the facility and surrounding land;

"(iii) The quantity and quality of ground water, and the direction of ground-water flow;

"(iv) The patterns of rainfall in the region;"

Response - All of the above factors relate to the impact infiltration through the tailings will have on ground water quality. The active dewatering system and implementation of the reclamation plan will minimize infiltration. An evaluation of infiltration through the reclaimed site and the impact this infiltration will have on ground water flow conditions and ground water quality will be performed.

"(v) The proximity of the licensed site to surface waters;

"(vi) The current and future uses of surface waters in the area and any water quality standards established for those surface waters;

"(vii) The existing quality of surface water including other sources of the contamination and the cumulative impact on surface water quality;"

Response - As previously mentioned, the interaction of site ground water with vicinity surface water will be evaluated. This will include an evaluation of the impact proposed ACLs for ground water will have on the Colorado River if ground water having these concentrations is discharged to the river. Also, the current and future uses of the Colorado River will be evaluated as will any future impact on surface water quality. Currently, ground water seepage to the Colorado River has no impact on surface water quality.

"(viii) The potential for health risks caused by human exposure to waste constituents;

"(ix) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and

"(x) The persistence and permanence of the potential adverse effects."

Response - A human health and ecological risk assessment will be performed to assess the potential hazards of ground water containing proposed ACLs being released to vicinity surface water.

It is recognized that Atlas must provide the basis for proposed ACLs, including consideration of practicable corrective actions and that the ACLs are as low as reasonably achievable (ALARA). Atlas has been implementing the only technically feasible ground water remediation for the site, consisting of active dewatering of the tailings. The in-place reclamation plan will improve ground water quality further by controlling surface water infiltration to the dewatered tailings. Resultant seepage to the ground water system will be minimal.

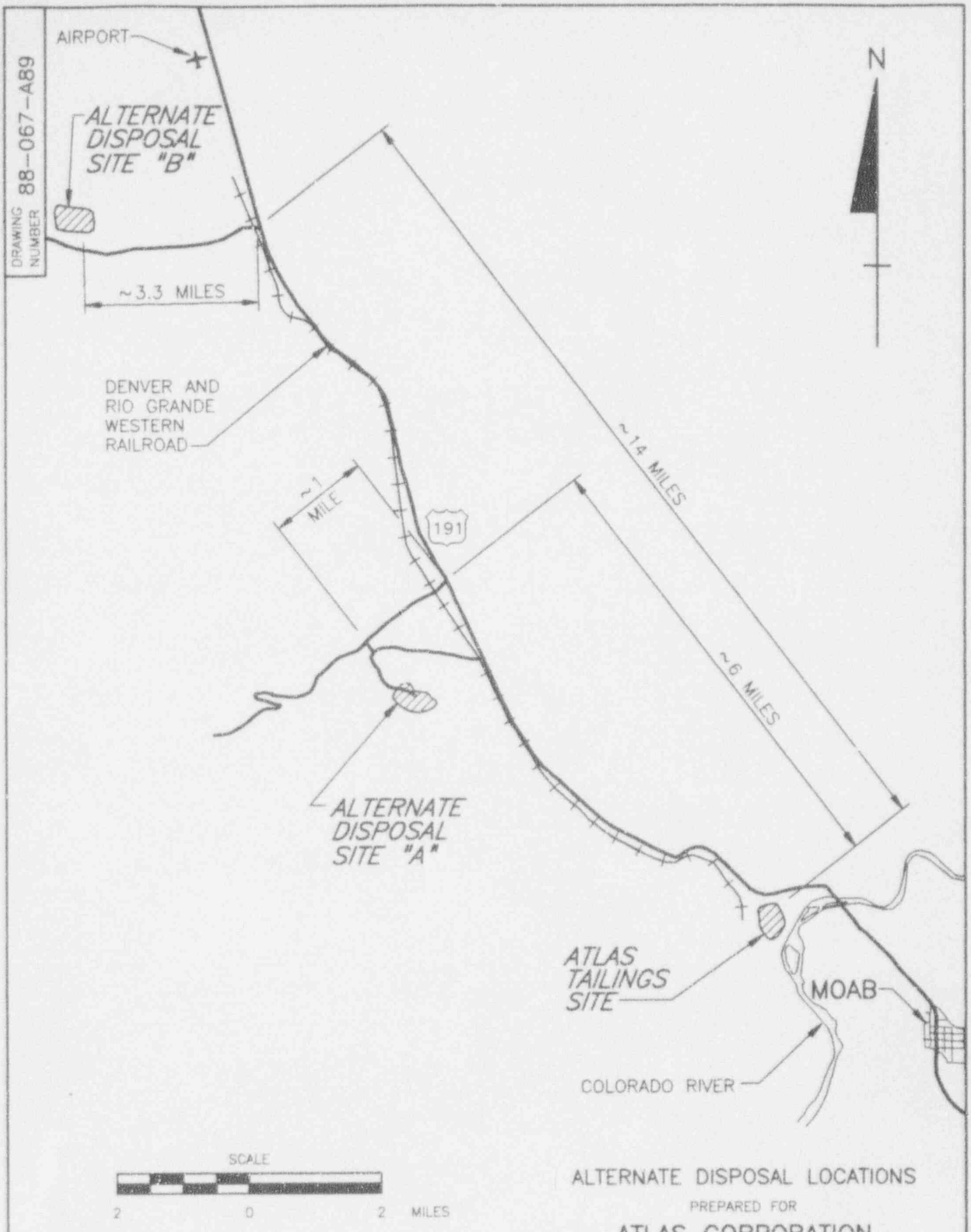
ACL application is appropriate since the majority of seepage has already entered the foundation soils; removal of the tailings will not influence seepage which has already migrated from the tailings. Pumping of that water adjacent to the Colorado River is not technically feasible. Therefore, considering the cost of off-site reclamation with little added benefit, the most practicable and cost-effective option is to implement in-place reclamation. The cost of in-place reclamation is $10 to $15 million. The cost of relocation is approximately $100 million. The relocation option will require local and federal financial support.

Because of the extreme cost, long duration, and impact on human health and environment related to the relocation option, Atlas chooses to establish ACLs for use as ground water protection standards at this site. The human health and environmental impacts related to relocation include air quality impacts related to excavation and transportation, increased accident and fatality frequency and a longer period of impact on tourism and property development.

TABLE 1

ESTIMATED RANGE OF COSTS
ON-SITE CLOSURE VS. OFF-SITE DISPOSAL

Item Description	On-site Control Estimated Range (000's)		Alternate Site A Estimated Range (000's)		Alternate Site B Estimated Ranges (000's)	
Direct Cost	$9,429	$11,409	$66,526	$80,497	$70,804	$85,674
Subtotal	$9,429	$11,409	$66,526	$80,497	$70,804	$85,674
Contractor Overhead and Profit (15%)	$1,414	$1,711	$9,979	$12,074	$10,621	$12,851
Subtotal	$10,843	$13,120	$76,505	$92,571	$81,425	$98,525
Contingency (15%)	$1,626	$1,968	$11,476	$13,886	$12,214	$14,779
NRC Long Term Surveillance	$650	$650	$650	$650	$650	$650
Total Estimated Cost	$13,119	$15,738	$88,631	$107,107	$94,289	$113,954



ALTERNATE DISPOSAL LOCATIONS

PREPARED FOR

ATLAS CORPORATION

Canonie Environmental

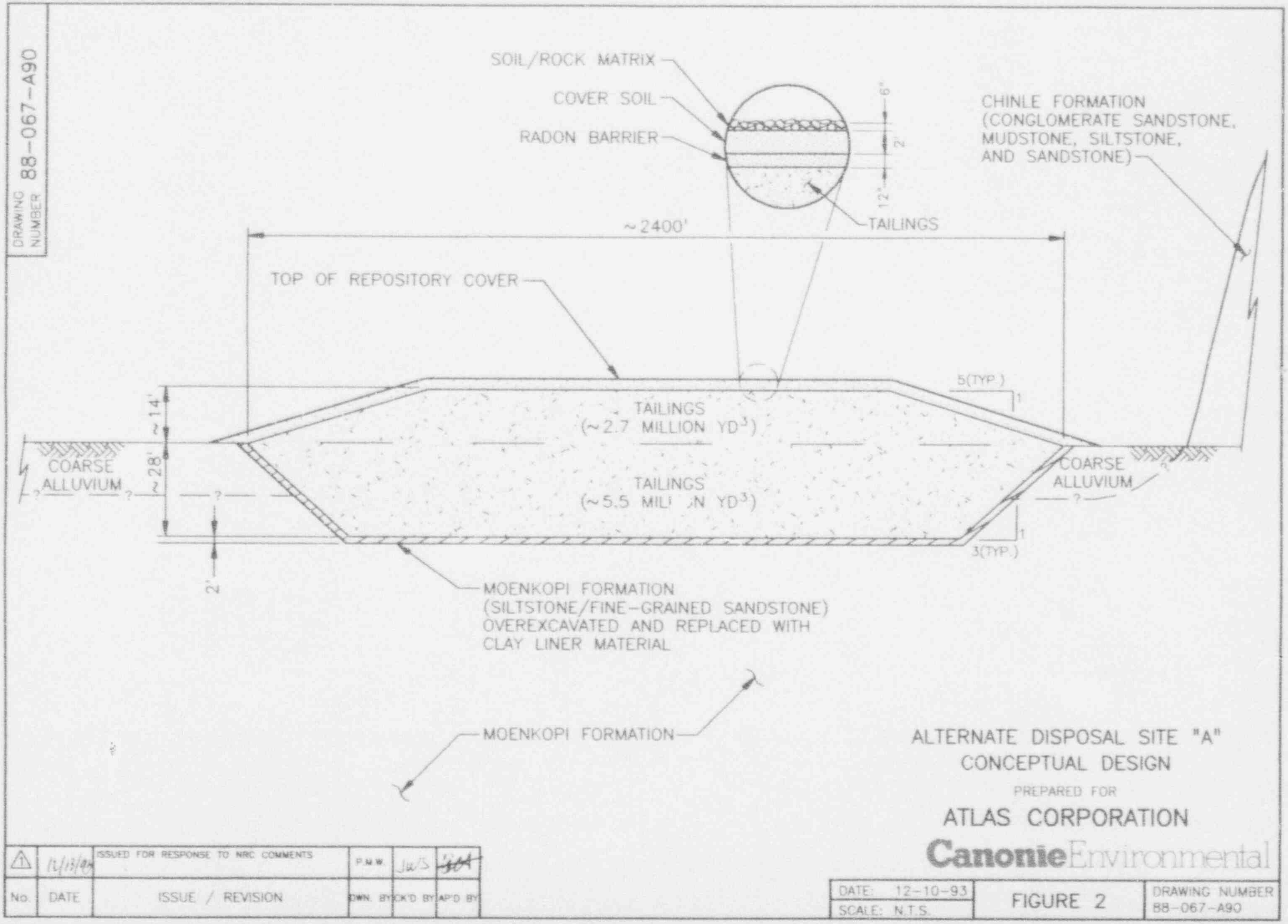
No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY
1	12/6/93	ISSUED FOR RESPONSE TO NRC COMMENTS	M.T.H.	DJR	[illegible]

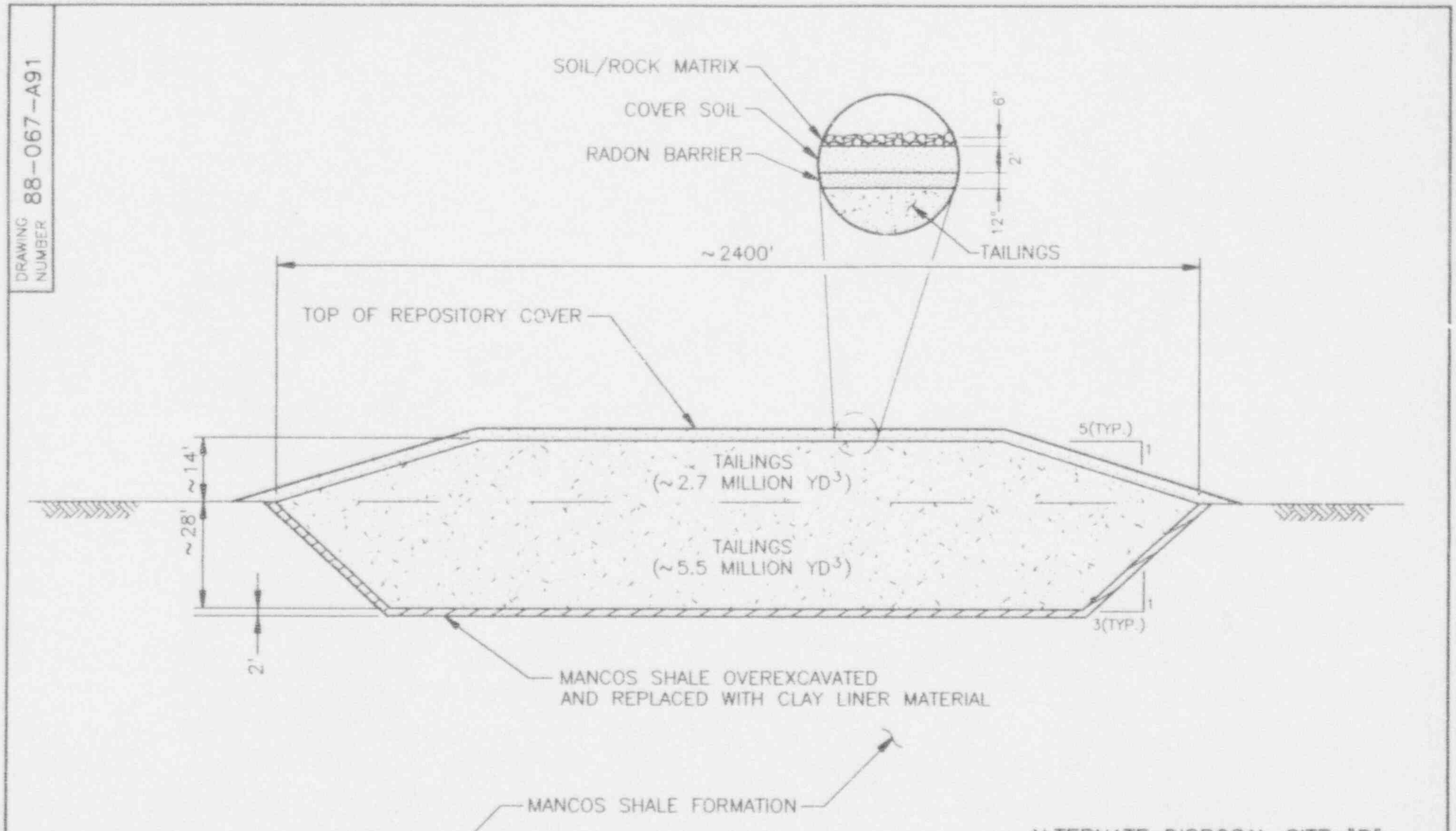
DATE: 12-8-93
SCALE: AS SHOWN

FIGURE 1

DRAWING NUMBER 88-067-A89

1


DRAWING NUMBER 88-067-A90
SOIL/ROCK MATRIX
COVER SOIL
RADON BARRIER
TAILINGS
6"
2'
12"
CHINLE FORMATION (CONGLOMERATE SANDSTONE, MUDSTONE, SILTSTONE, AND SANDSTONE)
~2400'
TOP OF REPOSITORY COVER
5(TYP.)
1
~14'
TAILINGS ($\sim$2.7 MILLION YD^3)
COARSE ALLUVIUM
~28'
TAILINGS ($\sim$5.5 MILLION YD^3)
COARSE ALLUVIUM
3(TYP.)
2'
MOENKOPI FORMATION (SILTSTONE/FINE-GRAINED SANDSTONE) OVEREXCAVATED AND REPLACED WITH CLAY LINER MATERIAL
MOENKOPI FORMATION
ALTERNATE DISPOSAL SITE "A" CONCEPTUAL DESIGN
PREPARED FOR
ATLAS CORPORATION
Canonie Environmental
1 | 12/13/93 | ISSUED FOR RESPONSE TO NRC COMMENTS | P.M.W. | JWS
No. | DATE | ISSUE / REVISION | DWN. BY | CK'D BY | AP'D BY
DATE: 12-10-93
SCALE: N.T.S.
FIGURE 2
DRAWING NUMBER 88-067-A90



ALTERNATE DISPOSAL SITE "B"
CONCEPTUAL DESIGN

PREPARED FOR

ATLAS CORPORATION

Canonie Environmental

No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY
△	12/13/93	ISSUED FOR RESPONSE TO NRC COMMENTS	P.M.W.	JWS	[illegible]

DATE: 12-10-93 SCALE: N.T.S.	FIGURE 3	DRAWING NUMBER 88-067-A91

PROJECT: Atlas Minerals Revised NRC EsESTIMATOR: CRS FILE NAME: Atarc.wr1 SHT 1 OF SHT 35
CLIENT: Atlas Minerals
JOB NO.: 08-067-10
LOCATION: Moab Utah DATE: 08-Dec-93 TIME: 04:44 PM

ESTIMATE SUMMARY

ITEM DESCRIPTION	DETAIL SHEET	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIAL	SUBS	TRAVEL	UNIT COSTS	TOTAL COSTS
TOTAL FIXED COSTS SITE SUPERVISIO	SHT 6	1	LS	0	0	0	0	0	0		0	0	0.00	0
VARIABLE JOBSITE SUPERVISION	SHT 7	75	WEEKS	736,855	56,550	313,039	44,700	37,013	73,875		0	0	16,800.42	1,260,031
Mobilization	SHT 8	1	ea	8,228	0	8,293	1,260	1,000	2,500	0	35,000	0	56,361.00	56,361
Site Security	SHT 9	75	wks	0	0	0	0	0	0	0	105,000	0	1,400.00	105,000
Radiological Monitoring	SHT 10	75	wks	0	0	0	0	0	0	0	281,250	0	3,750.00	281,250
Regrade Impoundment Slopes	SHT 11	295,500	cy	47,569	0	176,972	23,220	15,795	0	0	0	0	0.89	263,556
Windblown Tailings	SHT 12	71,000	cy	14,027	0	56,009	7,254	4,896	0	0	0	0	1.16	82,196
Flood Dike Removal	SHT 13	14,700	cy	3,714	0	16,364	2,084	1,392	0	0	0	0	1.60	23,554
S.E. Contaminated Soil	SHT 14	25,000	cy	6,499	0	28,638	3,647	2,436	0	0	0	0	1.65	41,220
Regrade Tailings	SHT 15	223,500	cy	50,901	0	160,926	21,334	14,796	0	62,500	0	0	1.39	310,457
Slimes Excavation	SHT 16	15,000	cy	13,890	0	27,045	2,250	1,900	0	0	0	0	3.01	45,085
Utility Relocation	SHT 17	1	ea	0	0	0	0	0	0	0	1,055,803	0	1,055,803	1,055,803
Contaminated Soils Excavation	SHT 18	200,000	cy	42,201	0	156,986	20,037	13,972	0	0	0	0	1.17	233,196
Clean Fill Excavation	SHT 19	718,300	cy	144,753	0	538,530	70,659	48,065	0	0	0	0	1.12	802,007
Construct Ditches	SHT 20	50,000	sy	4,660	0	10,656	1,438	1,375	0	0	0	0	0.36	18,129
Rip-Rap Ditches	SHT 21	15,505	cy	6,490	0	5,629	872	733	0	161,996	74,424	0	16.00	248,144
Armor Stone, Emb. Slopes	SHT 22	49,986	cy	28,330	0	35,514	5,503	4,623	0	586,895	239,549	0	18.04	900,413
Rockwall Toe Protection	SHT 23	3,852	cy	4,274	0	13,511	1,791	1,242	0	45,300	18,490	0	21.96	84,607
Clay Cover	SHT 24	73,300	cy	140,741	0	416,590	11,728	10,506	0	38,849	10,000	0	8.57	628,422
Soil Rock Matrix (Rock)	SHT 25	54,260	cy	23,278	0	29,187	4,522	3,798	0	825,620	260,448	0	21.14	1,146,847
Soil Rock Matrix (Soil)	SHT 26	48,640	cy	9,802	0	37,696	5,063	3,366	0	0	0	0	1.15	55,927
Revegetation	SHT 27	220	ac	0	0	0	0	0	0	0	220,000	0	1,000.00	220,000
Demobilization	SHT 28	1	ea	8,228	0	8,293	1,260	1,000	2,500	0	35,000	0	56,361.00	56,361
Clearing and Grubbing	SHT 29	5	ac	2,286	0	1,730	275	225	500	0	0	0	1,003.20	5,016
Fencing	SHT 30	18,700	lf	0	0	0	0	0	0	0	148,400	0	7.94	148,400
Backfill Contaminated Soil Exc.	SHT 31	75,000	cy	6,435	0	14,100	2,200	1,500	0	0	0	0	0.32	24,235
Filter Rock	SHT 32	50,754	cy	20,831	0	36,143	5,601	4,704	0	557,888	243,619	0	17.28	876,786
Radiological Survey	SHT 33	1	ea	0	0	0	0	0	0	0	26,250	0	26,250.00	26,250
Well Maintenance	SHT 34	10	yr	387,677	0	104,000	20,000	20,000	106,000	66,780	250,750	0	95,681	956,807
NRC Oversight Costs	SHT 35	10	yr	0	0	0	0	0	0	0	415,872	0	41,587	415,872
SUBTOTAL				1,715,669	56,550	2,195,853	257,498	195,297	185,375	2,345,827	3,419,855	0		10,371,923
													check	10,371,923

PROJECT: Atlas Option 2 Truck Transportation
CLIENT: ATLAS CORP.
JOB NO.: 88-67-10
LOCATION: Moab Utah

DATE: 03-Dec-93
TIME: 07:17 AM
ESTIMATOR: AGS

ESTIMATOR NOTES:

---

1. ASSUME THE FOLLOWING PRICES FOR ROCK AND AGGREGATES

				SUB TOTAL	SPREAD COSTS	
FILTER I	76,430 TN	47,769 CY	6.20	296,168	503,485	
FILTER II	4,776 TN	2,985 CY	4.52	13,492	22,937	
ROCK MULCH 1"	61,008 TN	38,130 CY	7.10	270,723	460,229	
ROCK MULCH 3"	25,808 TN	16,130 CY	11.62	187,431	318,632	
UPPER DRAINAGE CHANNEL	10,328 TN	6,455 CY	5.72	36,923	62,768	
LOWER S.W. DRAINAGE CHANNEL	7,600 TN	4,750 CY	6.55	31,113	52,891	
LOWER IMPOUNDMENT CHANNEL	6,880 TN	4,300 CY	5.08	21,844	37,135	
10:2 EMBANKMENT AGG	86,013 TN	53,758 CY	6.28	337,600	596,108	
SUBTOTAL	278,843 TN	174,277 CY			2,054,186	
DRILL AND SHOOT		219,137 CY	2.50	547,843		
OVERSHOOT AT 20%		43,827 CY	2.50	109,569		
MOVE INTO STOCKPILE		262,964 CY	0.50	131,482		
PIT PERMITTING		1 EA	35,000.00	35,000		
PIT RECLAMATION		10 AC	3,500.00	35,000		858893.2
						0.41811848
						1.7
				2,054,186		

AVERAGE COST PER TON	7.37 PER TON
AVERAGE COST OF RIPRAP	6.16 PER TON
AVERAGE COST OF ROCK MULCH	8.97 PER TON
AVERAGE COST OF FILTER MATL.	6.48 PER TON
AVERAGE COST 10:1 AND 10:3	6.93 PER TON

ASSUME AGGREGATE PIT IS 20 MILES FROM SITE.

[redacted] JOB #[redacted] [redacted]8-067-[redacted] [redacted] F[redacted] [redacted]04:44 [redacted]

LOCATION: Moab Utah

WEEKLY WORK HOUR BASIS: ESTIMATOR: CKS

****

1) PROJECT BASED ON WORKING 60 HOURS PER WEEK.

2) RATES ARE BASED ON CANONIE RATES AS USED FOR Utah

SUBSISTENCE AND TRAVEL COST CALCULATIONS: AMOUNTS APPLIED TO THE FIRST 60 HOURS OF WORK

S&T CLASS	GENERAL DESCRIPITOR	TRAVEL BASIS (WKS/TRP)	TRAVEL COST (PER TRIP)	LODGING COST (PER NIGHT)	SUBSISTENCE COST (PER WEEK)	HOURLY COSTS TRAVEL	LODGING	SUBSISTENCE	TOTALS
FULL TIME PERSONNEL:									
S1	TRAVEL BY AIR	2				$0.00	$0.00	$0.00	$0.00
S2	TRAVEL BY AUTO (DISTANT)	2				$0.00	$0.00	$0.00	$0.00
S3	TRAVEL BY AUTO (LOCAL)	1				$0.00	$0.00	$0.00	$0.00
S4						ERR	ERR	$0.00	ERR
S5						ERR	ERR	$0.00	ERR
SITE HIRE PERSONNEL:									
H1	TRAVEL BY AIR	3				$0.00	$0.00	$0.00	$0.00
H2	TRAVEL BY AUTO (DISTANT)	3				$0.00	$2.86	$0.00	$0.00
H3	TRAVEL BY AUTO (LOCAL)	1				$0.00	$0.96	$0.00	$0.00
H4						ERR	ERR	$0.00	ERR
H5						ERR	ERR	$0.00	ERR

TAX AND INSURANCE CALCULATIONS:

DESCRIPTION	NON-REP	SALARY	REMARKS
* FUI %	0.80%	0.80%	STANDARD FEDERAL RATE APPLIED TO ALL WAGES PAID
* SUI %	2.60%	2.60%	RATE VARIES WITH STATE, APPLIES TO ALL WAGES PAID
* FICA %	7.65%	7.65%	STANDARD FEDERAL RATE APPLIED TO ALL WAGES PAID
WC %	6.12%	6.12%	VARIES BY CRAFT SEE WAGE RATE TABLE, BASE WAGE ONLY
HEALTH (MNTHLY)	$350	$350	MONTHLY COST, CANONIE COVERAGE, FIRST 40 HOURS (AVG $350)
LTL %	N/A	1.18%	SALARY EMPLOYEES ONLY, BASE WAGE ONLY.
STRAIGHT %	17.17%	18.35%	
* OVERTIME %	11.05%	11.05%	

CLIENT: Minerals Services NRC Estimate ... 08-Dec-93
Atlas Minerals
JOB NO.: 88-067-10
LOCATION: Moab Utah TIME: 04:44 PM

ESTIMATOR: CES

WAGE RATE TABLE

	C	D	E	F	G	H	I	J	K	L
	ESCAL			<= TAXABLE FRINGES =>		<= NON-TXBLE FRNGS =>		<===== CANONIE ADDITIONS =====>		
DESCRIPTION	FACTOR MULTIPLIER	SUB & TRVL CLASS	BASE WAGE	VACATION	ALL OTHER	H&W	ALL OTHER	WRKS COMP %'AGE	HEALTH INS	SUB & TRAVEL
*****HOURLY SITE HIRES*****										
72 FIELD FORMAN	1.00		$13.92					6.12%	$1.99	$0.00
73 MECHANIC	1.00		$13.92					6.12%	$1.99	$0.00
74 MECHANIC HELPER	1.00		$11.60					6.12%	$1.99	$0.00
75 KEY OPERATOR	1.00		$12.76					6.12%	$1.99	$0.00
76 LOCAL OPERATOR	1.00		$12.76					6.12%	$1.99	$0.00
77 OILER	1.00							6.12%	$0.00	$0.00
78 KEY LABORER	1.00		$9.00					6.12%	$1.99	$0.00
79 LOCAL LABORER	1.00		$9.00					6.12%	$1.99	$0.00
80 PIPEFITTER	1.00							6.12%	$0.00	$0.00
81 ELECTRICIAN	1.00							6.12%	$0.00	$0.00
82 CARPENTER FRM.	1.00		$13.92					6.12%	$1.99	$0.00
83 CARPENTER	1.00		$12.76					6.12%	$1.99	$0.00
84 CEMENT MASONS	1.00							6.12%	$0.00	$0.00
85 TEAMSTERS	1.00							6.12%	$0.00	$0.00
86										
*****FULL TIME EXEMPT*****										
88 PROJECT MANAGER	1.00		$32.00					6.12%	$1.99	$0.00
89 SUPERINTENDENT	1.00		$27.76					6.12%	$1.99	$0.00
90 PROJ. SUPERVISOR	1.00		$25.96					6.12%	$1.99	$0.00
91 PROJ. ENGINEER	1.00		$23.00					6.12%	$1.99	$0.00
92 H&S OFFICER	1.00		$21.63					6.12%	$1.99	$0.00
93 CHEMIST	1.00		$21.63					6.12%	$1.99	$0.00
94								6.12%	$0.00	$0.00
*****FULL TIME NON-EXEMPT*****										
96 H&S TECHNICIAN	1.00		$20.19					6.12%	$1.99	$0.00
97 AST. PROJ. ENG.	1.00		$20.19					6.12%	$1.99	$0.00
98 ENGINEER TECH.	1.00		$18.27					6.12%	$1.99	$0.00
99								6.12%	$0.00	$0.00
100								6.12%	$0.00	$0.00
*****FULL TIME HOURLY*****										
102 OFFICE MANAGER	1.00		$9.50					6.12%	$1.99	$0.00
103 CLERK	1.00		$8.50					6.12%	$1.99	$0.00
104										

LOCATION: Moab Utah ... 11 ... RLY FU ... IS BAS ...
UPON PAYING $1.00 PER GALLO

ESTIMATOR: CES

EQUIPMENT RENTAL RATES

BASED ON OPERATING 176 HOURS PER MONTH

DESCRIPTION	TYPE		F MONTHLY RENTAL	G USE TAX	H HOURLY RENTAL 176 HR/MO	I HOURLY FUEL RATE	J HOURLY REPAIRS RATE	K PERIOD USAGE D,W,M	L ADJUSTMEN FACTOR APPLIED
****** INTERNAL EQUIPMENT ******									
121				1.00	$0.00	$0.00	$0.00		0.00
122				1.00	$0.00	$0.00	$0.00		0.00
123				1.00	$0.00	$0.00	$0.00		0.00
124				1.00	$0.00	$0.00	$0.00		0.00
****** EXTERNAL EQUIPMENT ******									
126 CASE 580 LDR/BKH	LOADER/BACKHOE		$2,500	1.06	$15.06	$3.00	$2.00	M	1.00
127 CAT 215 BKH	BACKHOE	(1.25 LCY)		1.06	$0.00	$4.00	$3.50		0.00
128 CAT EL 200	BACKHOE	(1.62 LCY)	$4,150	1.06	$24.99	$4.50	$4.25	M	1.00
129 CAT 235 BKH	BACKHOE	(2.75 LCY)	$11,500	1.06	$69.26	$6.50	$6.00	M	1.00
130 CAT 245 BKH	BACKHOE	(3.75 LCY)	$17,400	1.06	$104.80	$11.00	$7.50	M	1.00
131									
132 CAT 936 FEL	FEL	(2.75 LCY)		1.06	$0.00	$4.00	$4.00		0.00
133 CAT 950 FEL	FEL	(3.25 LCY)		1.06	$0.00	$5.00	$5.00		0.00
134 CAT 966 FEL	FEL	(4.50 LCY)	$7,650	1.06	$46.07	$7.00	$6.00	M	1.00
135 CAT 988 FEL	FEL	(7.00 LCY)	$16,265	1.06	$97.96	$8.00	$10.00	M	1.00
136 CAT 963 FEL	FEL/track	(2.50 LCY)	$7,390	1.06	$44.51	$4.00	$6.00	M	1.00
137 CAT D5 DZR	DOZER			1.06	$0.00	$4.00	$4.50		0.00
138 CAT D6 DZR	DOZER		$5,745	1.06	$34.60	$5.50	$4.50	M	1.00
139 CAT D6 DZR/LG	DOZER/LGP		$8,610	1.06	$51.86	$5.50	$4.50	M	1.00
140 CAT D7 DZR	DOZER			1.06	$0.00	$7.00	$5.25		0.00
141 CAT D8 DZR	DOZER		$11,705	1.06	$70.50	$11.00	$7.50	M	1.00
142 CAT D9 DZR	DOZER		$14,660	1.06	$88.29	$16.00	$10.00	M	1.00
143 CAT D9 DZR	DOZER		$16,120	1.06	$97.09	$16.00	$10.00	M	1.00
144 CAT 14 GDR	GRADER		$8,410	1.06	$50.65	$6.00	$6.50	M	1.00
145 CAT 16 GDR	GRADER		$13,730	1.06	$82.69	$8.00	$8.00	M	1.00
146 CAT 12 GDR	GRADER		$4,700	1.06	$28.31	$6.00	$6.50	M	1.00
147 CAT 563 VIB COMP	COMPACTOR		$4,315	1.06	$25.99	$5.00	$4.00	M	1.00
148 BOMAG WALK BEHIND	COMPACTOR	(48 INCH)		1.06	$0.00	$2.00	$2.00		0.00
149 CAT 815 COMP	COMPACTOR	SHEEPSFOOT	7985	1.06	$48.09	$10.00	$6.00	M	1.06
150									
151 CAT 615 SCPR	SCRAPER/ELEV	(16 LCY)	9950	1.06	$59.93	$8.75	$8.75	M	1.00
152 CAT 631 SCPR	SCRAPER/SINGLE	(31 LCY)	20330	1.06	$122.44	$14.75	$9.50	M	1.00
153 CAT 627 SCPR/T	SCRAPER/TWIN	(20 LCY)	$17,070	1.06	$102.81	$17.75	$12.50	M	1.00
154 CAT 637 SCPR/T	SCRAPER/TWIN	(31 LCY)	$28,210	1.06	$169.90	$23.75	$17.50	M	1.00
155									
156 WATER WAGON	SCRAPER 631		$13,000	1.06	$78.30	$7.00	$6.00	M	1.00
157 TANDEM WATER TRUCK	MISC. EQUIPMENT		$3,500	1.06	$21.08	$3.00	$4.00	M	1.00
158 4"/6" PUMP	MISC. EQUIPMENT			1.06	$0.00	$1.00	$0.50		0.00
159 350 CFM COMPRESSOR	MISC. EQUIPMENT			1.06	$0.00	$4.00	$2.00		0.00
160 65 TON CRANE	MISC. EQUIPMENT			1.06	$0.00	$5.00	$4.00		0.00
161 RENTAL TRUCK			$8,800	1.06	$53.00	$0.00	$0.00	M	1.00
162 End Dumps	MISC. EQUIPMENT		11400	1.06	$68.66	$0.00	$0.00	M	1.00
163	MISC. EQUIPMENT			1.06	$0.00	$0.00	$0.00		0.00

DESCRIPTION	REQUIRED T OR E	REQUIRED QUANTITY	UNIT RATE	I LABOR	J INT EQUIP	K EXT EQUIP	L FUEL
*****SITE UTILITY HOOKUPS*****							
185 ELECTRIC			1200				
186 WATER (NO METER VLT OR BKFLW PRVNTR)			500				
187 SEWER							
188 GAS							
189 TELEPHONE			350				
190							
*****INITIAL HEALTH AND SAFETY COSTS*****							
192 PHYSICALS			1300				
193 H & S TRAINING-OPERATORS			1,178	0			
194 H & S TRAINING-LABORERS			1,001	0			
195 TRAINING CLASS COSTS-EXTERNAL			700				
196 TRAINING CLASS COSTS-INTERNAL			450				
197 INITIAL H & S PURCHASES			350				
198							
199							
200							
*****INSURANCE AND TAXES*****							
202 CLIENT NAMED AS ADDITIONAL INSURED			8750				
203 BUILDERS RISK INSURANCE (0.60 % OF REV.)							
204 POLLUTION LIABILITY INSURANCE							
205 SPECIAL TAXES							
206							
207							
*****SITE OFFICE EQUIPMENT*****							
209 OFFICE FURNITURE (PER UNIT)			75				
210 FAX MACHINE			600				
211 COMPUTER			750				
212 COMPUTER SOFTWARE			250				
213							
214							
*****MISCELLANEOUS COSTS*****							
216 PERMITS			100				
217 ROYALTIES ON PROCESSES							
218 TEMPORARY FENCING			1.5				
219 MOVING EXPENSES (LONG TERM PROJECT)							
220 PROJECT SIGN			150				
221							
222							
223							
224							
225							
TOTAL FIXED COSTS SITE SUPERVISION				0	0	0	0

JOB NO.: 88-067-10 TIME: 11:56 AM
LOCATION: Moab Utah

VARIABLE COST ONSITE OVERHEADS ESTIMATOR: CBS PROJECT DURATION = 75.0

DESCRIPTION	REQUIRED Y OR N	REQUIRED QUANTITY	DURATION	UNIT RATE	I TOTAL LABOR	J WEEKLY LABOR	K WEEKLY INT EQUIP	L WEEKLY EXT EQUIP
*****FULL TIME EXEMPT*****								
246 PROJECT MANAGER								
247 SUPERINTENDENT			75	$1,636	0	0		
248 PROJ. SUPERVISOR	Y	1	77	$1,394	107,338	1,431	154	
249 PROJ. ENGINEER			75	$1,309	0	0		
250 H&S OFFICER	[illegible]	1	77	$1,172	90,244	1,203		
251 CHEMIST	Y	1	5	$1,104	5,520	74		
252			75	$1,104	0	0		
253			75					
			75					
*****FULL TIME NON-EXEMPT*****								
256 H&S TECHNICIAN								
257 AST. PROJ. ENG.			75	$1,513	0	0		
258 ENGINEER TECH.			75	$1,513	0	0		
259	Y	1	75	$1,377	103,275	1,377		
260			75					
			75					
*****HOURLY SITE HIRES*****								
263 FIELD FORMAN								
264 MECHANIC	Y	1	75	$1,213	90,955	1,213		
265 MECHANIC HELPER	Y	1	75	$1,213	90,955	1,213		150
266 OFFICE MANAGER	Y	1	75	$1,024	76,790	1,024		
267 CLERK			75	$853	0	0		
268	Y	1	75	$772	57,900	772		
269			75					
			75					
*****INTERNAL EQUIPMENT RENTAL*****								
272 PRESSURE WASHER (INTERNAL RATE)								
273 SAFETY EQUIPMENT (AIR SAMPLING/OVA)			75	$30			0	
274 SITE PICKUPS			75	$130			0	
275	Y	4	75	150			600	200
			75				0	
*****EXTERNAL EQUIPMENT RENTAL*****								
278 OFFICE TRAILER								
279 TOOL TRAILER	Y	2	75	$100				200
	Y	1	75	$75				75

282 [illegible] TRAILER			75	$100			0
283 FUEL TRUCK	Y	1	75	$221			221
284 GREASE TRUCK	Y	1	75				0
285 MISC. EQUIP			75	$75			0
286 SITE SCALES			75	$500			0
287 PROJECT VEHICLES			75	$150			0
288 STREET SWEEPER			75	$390			0
289			75				0
290			75				0
*****SUPPLIES*****							
293 OFFICE SUPPLIES	Y	1	75	$25			
294 SURVEY SUPPLIES	Y	1	75	$50			
295 SAFETY SUPPLIES	Y	1	75	$600			
296 COPY MACHINE	Y	1	75	$50			
297 PHONE SERVICE	Y	1	75	$150			
298 UTILITY SERVICES			75	$40			
299 POTABLE WATER	Y	1	75	$40			
300 SANITARY FACILITIES	Y	1	75	$30			
301 SMALL TOOLS	Y	1	75	$25			
302 JOBSITE PHOTOS	Y	1	75	$15			
303 ON-SITE QC TESTING EQUIP.			75	$200			
304 ON SITE LAB SUPPLIES			75				
305 DECONTAMINATION SUPPLIES			75				
306			75				
307 Grader for Haul Roads	Y	1	75		766		2,279
308 Water Truck for Haul Roads	Y	1	75		766		949
309			75				
310			75				
*****SUBCONTRACTS*****							
313 SURVEY CREW (BASED ON $140/HR FOR 40 HRS)			75	$5,600			
314 SECURITY (FULL TIME AT $12/HOUR)			75	$2,016			
315			75				
316			75				
317			75				
*****TRAVEL COSTS*****							
320 TRAVEL, EXECUTIVE			75	$250			
321 KEY OPERATOR ADJUSTMENT			75	$0	0		
322 KEY LABORER ADJUSTMENT			75	$0	0		
323			75				
VARIABLE JOBSITE SUPERVISION (WEEKLY)					9,798	754	4,374
VARIABLE JOBSITE SUPERVISION (TOTAL)	75 WEEKS				734,855	56,550	313,039

PROJECT: Atlas Minerals Revised NRC EstimaDATE: 08-Dec-93 SHT 5 OF SHT 35
CLIENT: Atlas Minerals
JOB NO.: 38 067-10 TIME: 11:56 AM SALES TAX RATE ------->
LOCATION: Moab Utah
ESTIMATOR: CRS

SUMMARY OF MATERIAL AND SUBCONTRACT PRICES
USED IN CURRENT ESTIMATE

B	E	F	G	H	I	J
DESCRIPTION	QUANTITY	UNIT	QUOTED UNIT PRICE	SALES TAX	UNIT PRICE WITH TAX	TOTAL PRICE
		PERMANENT MATERIAL PRICES				
		============================				
349 Rip Rap	132,516	tn	$6.16	1.06	$6.53	$865,329.48
350 Armor Stone	85,968	tn	$8.97	1.06	$9.51	$817,555.68
351 Filter Rock	81,081	tn	$6.48	1.06	$6.87	$557,026.47
352 Geotextile	1,250,000	sf	$0.05	1.06	$0.05	$62,500.00
353 Clay	73,300	cy	$0.50	1.06	$0.53	$38,849.00
354 Rock Mulch			$8.97	1.06	$9.51	$0.00
355 Embankment Rock			$6.93	1.06	$7.35	$0.00
		MAJOR SUPPLY PRICES:				
		========================				
358				1.06	$0.00	$0.00
359				1.06	$0.00	$0.00
		SUBCONTRACT PRICES:				
		===================				
363 Radiological Survey	82	wks	$3,750.00	1.00	$3,750.00	$307,500.00
364 Seed and Mulch	230	ac	$1,000.00	1.00	$1,000.00	$230,000.00
365 Site Security Services	75	wks	$1,400.00	1.00	$1,400.00	$105,000.00
366 Electric line relocation	1	ea	$50,000.00	1.00	$50,000.00	$50,000.00
367 Gas line relocation	1,300	lf	$576.00	1.00	$576.00	$748,800.00
368 Oil line relocation	1,300	lf	$192.31	1.00	$192.31	$250,003.00
369 Telephone line relocation	1	ea	$7,000.00	1.00	$7,000.00	$7,000.00
370 Radiological Survey		wk	$4,000.00	1.00	$4,000.00	$0.00
371 Chain Link w/Barb Wire	10,700	lf	$12.00	1.00	$12.00	$128,400.00
372 Barbed Wire (4 strand)	8,000	lf	$2.50	1.00	$2.50	$20,000.00
373 Haul Rock		tn	$3.00	1.00	$3.00	$0.00

PROJECT:	Atlas Uravan Revised NRC Estimate	ESTIMATOR:	CBS
CLIENT:	Atlas Minerals	SHT 8 OF SHT 35	
JOB NO:	88-067-10	DATE:	08-Dec-93
LOCATION:	Moab Utah	TIME:	04:44 PM
ITEM DESCRIPTION:	Mobilization	JOB QUANTITY:	1 ea

ESTIMATOR NOTES AND ASSUMPTIONS:

-Allow 3 weeks to mobilize to Jobsite
-Include site set-up

DURATION = 100 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	18.64		46.87	7.00	6.00				0.00		
LOCAL LABORER	2.00	EA	27.67								0.00		
CREW			85.71	0.00	46.87	7.00	6.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	104.78
SUBTOTAL	100	HOURS	8,228	0	8,293	1,260	1,000	0	0	0	0	18,861	18,861.00
MATERIALS:													
												0	
-Non-permit loads	10	ea								5,000		5,000	
-Permit Loads	20	ea								30,000		30,000	
-Misc Supplies	1	ea						2,500				2,500	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			8,228	0	8,293	1,260	1,000	2,500	0	35,000	0	56,361	56,361.00

PROJECT:	Atlas Minerals Revised RRC Estimate	ESTIMATOR:	CES	SHT 5 OF	SHT 15
CLIENT:	Atlas Minerals				
JOB NO:	08-067-18	DATE:	08-Dec-93	TIME:	04:44 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Site Security			JOB QUANTITY:	75 wks

ESTIMATOR NOTES AND ASSUMPTIONS:

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
Site Security Services	75 wks									105,000		105,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	105,000	0	105,000	1,400.00

PROJECT: Atlas Minerals Revised NRC Estimate ESTIMATOR: CRS SHT 19 OF SHT 35
CLIENT: Atlas Minerals
JOB NO: 88-067-10 DATE: 08-Dec-93 TIME: 11:56 AM
LOCATION: Moab Utah
ITEM DESCRIPTION: Radiological Monitoring JOB QUANTITY: 75 wks

ESTIMATOR NOTES AND ASSUMPTIONS:

-Provide radiological monitoring of all personnel working on the site for a duration of 71 weeks.

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	DURATION = HOURS UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
Radiological Survey	75	wks								281,250		281,250	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	281,250	0	281,250	3,750.00

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CBS		SHT 11	OF	SHT 35
CLIENT:	Atlas Minerals						
JOB NO:	88-067-10	DATE:	08 Dec 93		TIME:		11:56 AM
LOCATION:	Moab Utah						
ITEM DESCRIPTION:	Regrade Impoundment Slopes				JOB QUANTITY:		295,500 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

Existing impoundment slopes (terraced) to be graded to uniform 10:1 slope.
-Material to be hauled into impoundment and used for regrading of impoundment area.
-Average Haul Distance = 1000 lf.

DURATION = 270 HOURS

DESCRIPTION	QUANTITY UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	4.00 EA	74.55		489.76	59.00	38.00				0.00		
CAT D8 DZR	1.00 EA	18.64		70.50	11.00	7.50				0.00		
CAT D6 DZR	2.00 EA	37.28		69.20	11.00	9.00				0.00		
CAT 563 VIB COMP	1.00 EA	18.64		25.99	5.00	4.00				0.00		
LOCAL LABORER	2.00 EA	27.07								0.00		
CREW		176.10	0.00	655.65	86.00	58.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	976.13
SUBTOTAL	270 HOURS	47,569	0	176,972	23,220	15,795	0	0	0	0	263,556	0.89
MATERIALS:												
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
TOTALS		47,569	0	176,972	23,220	15,795	0	0	0	0	263,556	0.89

PROJECT: Atlas Minerals Revised NRC Estimate
CLIENT: Atlas Minerals
JOB NO: 88-067-10
LOCATION: Moab Utah
ITEM DESCRIPTION: Windblown Tailings

ESTIMATOR: CBS
SHT 12 OF SHT 35
DATE: 08-Dec-93
TIME: 11:56 AM
JOB QUANTITY: 71,000 cy

ESTIMATOR NOTES AND ASSUMPTIONS:
-41,000 cy of tailings are located in a 50 acre area at a 6 inch depth.
-30,000 cy of tailings are already stockpiled on the site
-All tailings to be hauled to impoundment area for use in regrading.
-Haul Distance for stockpiled material = 2,500 lf.
-Haul distance for others = 3,500 lf.
-Average haul distance = 3,100 lf.

DURATION = 72 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	5.00	EA	93.19		612.20	73.75	47.50				0.00		
CAT D8 DZR	1.00	EA	18.64		70.50	11.00	7.50				0.00		
CAT D6 DZR	2.00	EA	37.28		69.20	11.00	9.00				0.00		
CAT 563 VIB COMP	1.00	EA	18.64		25.99	5.00	4.00				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			194.82	0.00	777.89	100.75	60.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,181.46
SUBTOTAL	72 HOURS		14,027	0	56,009	7,254	4,896	0	0	0	0	82,186	1.16
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			14,027	0	56,009	7,254	4,896	0	0	0	0	82,186	1.16

PROJECT:	Atlas Minerals Revised DRC Estimate	ESTIMATOR:	CRS	SHT 13	OF	SHT 35
CLIENT:	Atlas Minerals					
JOB NO:	88-047-10	DATE:	08-Dec-91	TIME:		11:56 AM
LOCATION:	Moab Utah					
ITEM DESCRIPTION:	Flood Dike Removal			JOB QUANTITY:		14,700 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Dike to be removed and hauled up into impoundment.
-Material to be used as fill in the regrading of impoundment prior to capping.
-Average Haul Distance = 5,600 lf

DURATION = 16 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	7.00	EA	130.47		857.00	101.25	66.50				0.00		
CAT D8 DZR	1.00	EA	18.64		70.50	11.00	7.50				0.00		
CAT D6 DZR	2.00	EA	37.28		69.28	11.00	5.00				0.00		
CAT 563 VIB COMP	1.00	EA	18.64		25.99	5.00	6.00				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			232.10	0.00	1022.77	130.25	87.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,472.12
SUBTOTAL	16 HOURS		3,714	0	16,364	2,084	1,392	0	0	0	0	23,554	1.60
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			3,714	0	16,364	2,084	1,392	0	0	0	0	23,554	1.60

PROJECT:	Atlas Minerals Revised BRC Estimate	ESTIMATOR:	CES	SHT 14	OF ??? 45
CLIENT:	Atlas Minerals				
JOB NO:	86 467 18	DATE:	08-Dec-93	TIME:	11:56 Am
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	S.E. Contaminated Soil			JOB QUANTITY:	25,000 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Material to be removed and hauled up into impoundment.
-Material to be used as fill in the regrading of impoundment prior to capping.
-Average haul distance = 2,500ft

DURATION = 28 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	7.00	EA	130.47		857.08	103.25	66.50				0.00		
CAT D8 DZR	1.00	EA	18.64		70.50	11.00	7.50				0.00		
CAT D6 DZR	2.00	EA	37.28		69.20	11.00	9.00				0.00		
CAT 563 VIB COMP	1.00	EA	18.64		25.99	5.00	4.00				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			232.10	0.00	1022.77	130.25	87.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,47[illegible].22
SUBTOTAL	28 HOURS		6,499	0	28,638	3,647	2,436	0	0	0	0	41,220	1.65
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			6,499	0	28,638	3,647	2,436	0	0	0	0	41,[illegible]	[illegible]

PROJECT:	Atlas Minerals Revised adC Estimate	ESTIMATOR:	CES	SHT 15 OF SHT 35	
CLIENT:	Atlas Minerals				
JOB NO:	88-067-10	DATE:	08-Dec-93	TIME:	11:56 AM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Regrade Tailings			JOB QUANTITY:	223,500 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Reshaping of tailings impoundment area too establish drainage grades prior to capping.

-Average haul distance = 1400 lf.

DURATION = 229 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	4.00	EA	78.55		489.76	59.00	38.00				0.00		
CAT D8 DZR	1.00	EA	18.64		70.58	[illegible]	7.50				0.00		
CAT D6 DZR	2.00	EA	37.28		69.28	[illegible]	[illegible]				0.00		
CAT 563 VIB COMP	1.00	EA	18.64		25.99		[illegible]				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CAT 744 FEL	1.00	EA	18.64		46.07	7.00	[illegible]				[illegible]		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			221.89	0.00	701.52	93.00	64.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,080.91
SUBTOTAL	229 HOURS		50,901	0	160,926	21,334	14,796	0	0	0	0	247,957	1.11
MATERIALS:													
Geotextile	1,250,000	sf							62,500			62,500	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			50,901	0	160,926	21,334	14,796	0	62,500	0	0	310,457	1.39

PROJECT: Atlas Minerals Revised NRC Estimate
CLIENT: Atlas Minerals
JOB NO: [illegible]-10
LOCATION: Moab Utah
ITEM DESCRIPTION: Slimes Excavation

ESTIMATOR: CRS
DATE: 08-Dec-93
SHT 16 OF SHT 35
TIME: 11:56 AM
JOB QUANTITY: 15,000 cy

ESTIMATOR NOTES AND ASSUMPTIONS:
-Slimes to be excavated and backfilled with tailings to give required cover.
-Average haul distance of 1000 ft.

DURATION = 100 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 235 BEH	1.00	EA	18.64		69.26	6.50	6.00				0.00		
RENTAL TRUCK	2.00	EA	37.28		106.00	0.00	0.00				0.00		
CAT D6 DZR	2.00	EA	37.28		69.20	11.00	5.00				0.00		
CAT 563 VIB COMP	1.00	EA	18.64		25.99	5.00	4.00				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			138.90	0.00	270.45	22.50	19.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	650.85
SUBTOTAL	100 HOURS		13,890	0	27,045	2,250	1,900	0	0	0	0	45,085	3.01
MATERIALS:												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			13,890	0	27,045	2,250	1,900	0	0	0	0	45,085	3.01

PROJECT: Atlas Minerals Revised NRC Estimate
CLIENT: Atlas Minerals
JOB NO: 58-067-10
LOCATION: Moab Utah
ITEM DESCRIPTION: Utility Relocation

ESTIMATOR: CRS
SHT 17 OF SHT 35
DATE: 08-Dec-93
TIME: 11:56 AM
JOB QUANTITY: 1 ea

ESTIMATOR NOTES AND ASSUMPTIONS:

-Include relocation of oil line, gas line, telephone lines, and electrical lines which are located in the area of the channel reconfiguration.
-Prices used are those provided by the respective companies for electrical and telephone (1988 estimate).
-Prices used for oil and gas lines, combined are a 1993 estimate from the utility.

DURATION - HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
Electric line relocation	1	ea								50,000		50,000	
Gas line relocation	1,300	lf								748,000		748,000	
Oil line relocation	1,300	lf								250,003		250,003	
Telephone line relocation	1	ea								7,000		7,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	1,055,003	0	1,055,003	1,055,003.00

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CBS	SHT 18 OF	SHT 35
CLIENT:	Atlas Minerals				
JOB NO:	88-067-18	DATE:	08 Dec 93	TIME:	11:56 AM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Contaminated Soils Excavation			JOB QUANTITY:	200,000 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Soil is located in the area of the existing mill. Depths of excavation vary and some of the material will be below water table.
-This material will be toploaded into scarpers with a backhoe and transported to th impoundment.
-163,000 cy of material in scraper excavation.
-Average haul distance = 8700 ft

DURATION = 217 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	4.00	EA	78.55		689.76	59.00	30.00				0.00		
CAT D8 DZR	1.00	EA	18.64		78.50	11.00	7.50				0.00		
CAT D6 DZR	2.00	EA	37.28		69.28	11.00	9.00				0.00		
CAT 563 VIB COMP	1.00	EA	18.64		25.99	5.00	6.00				0.00		
LOCAL LABOR29	2.00	EA	27.07								0.00		
CAT 235 BKH	1	EA	18.638312		69.26	6.5	6				0		
CREW			194.82	0.00	726.31	92.50	64.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,076.53
SUBTOTAL	217 HOURS		42,281	0	156,986	20,017	13,972	0	0	0	0	233,196	1.17
MATERIALS:												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			[illegible]	0	156,986	20,017	13,972	0	0	0	0	[illegible]	[illegible]

ESTIMATOR NOTES AND ASSUMPTIONS:

-This material will be excaved from the area of the reconfigured channel and hauled int impoundment area

-material is considered p

-Average Haul distance = 1000 ft.

DURATION = 822 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	6.00	EA	74.55		489.76	59.00	30.00				0.00		
CAT D8 DZR	1.00	EA	18.64		70.50	11.00	7.50				0.00		
CAT D6 DZR	2.00	EA	37.28		69.20	11.00	9.00				0.00		
CAT 563 VIB COMP	1.00	EA	18.64		25.99	5.00	6.00				0.00		
LOCAL LABORER	2.00	EA	21.07								0.00		
												HOURLY	
CREW			176.18	0.00	655.45	86.00	58.50	0.00	0.00	0.00	0.00	CREW COSTS	976.13
SUBTOTAL	822	HOURS	144,753	0	538,530	70,659	48,065	0	0	0	0	802,007	1.12
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTAL:			144,753	0	538,530	70,659	48,065	0	0	0	0	802,0[illegible]	1.12

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CBS	SHT 20 OF	SHT 35
CLIENT:	Atlas Minerals				
JOB NO:	98 067-10	DATE:	08-Dec-93	TIME:	11:56 AM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Construct Ditches			JOB QUANTITY:	50,000 sy

ESTIMATOR NOTES AND ASSUMPTIONS:

Use Dozer and Grader to Finish
Earth lready moved in Clean Fill Excavation.

DURATION - 125 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 14 GDR	1.00	EA	18.64		50.65	6.00	6.50				0.00		
CAT D6 DZR	1.00	EA	18.64		34.60	5.50	4.50				0.00		
CREW			37.28	0.00	85.25	11.50	11.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	145.01
SUBTOTAL	125 HOURS		4,660	0	10,656	1,438	1,375	0	0	0	0	18,129	0.36
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			4,660	0	10,656	1,438	1,375	0	0	0	0	18,129	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CES	SHT 21 OF	SHT 35
CLIENT:	Atlas Minerals				
JOB NO:	88-067-10	DATE:	08-Dec-93	TIME:	11:56 AM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Rip Rap Ditches			JOB QUANTITY:	15,505 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Place material with Cat 966 fel and spread with small dozer (Cat D6)
-Assume all material is delivered to the immediate area

DURATION = 70 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	IMP EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	18.64		46.07	7.00	4.00				0.00		
CAT D6 DZR	1.00	EA	18.64		34.60	5.50	6.50				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			64.35	0.00	80.67	12.50	10.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	168.02
SUBTOTAL	70	HOURS	4,490	0	5,629	872	733	0	0	0	0	11,724	0.76
MATERIALS:													
Rip-Rap	24,909	tn							161,996			161,996	
Haul Rock	24,808	tn								74,424		74,424	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			4,490	0	5,629	872	733	0	161,996	74,424	0	248,144	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CES	SHT 11 OF	SHT 15
CLIENT:	Atlas Minerals				
JOB NO:	88-067-10	DATE:	08 Dec 93	TIME:	11:56 AM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Armor Stone, Emb. Slopes			JOB QUANTITY:	65,986 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Place material with Cat 966 fel and spread with small dozer (Cat D6)
-Assume all material is delivered to the immediate area

DURATION = 440 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	18.64		46.07	7.00	6.00				0.00		
CAT D6 DZR	1.00	EA	18.64		34.60	5.50	4.50				0.00		
LOCAL LABOR	2.00	EA	27.07								0.00		
CREW			64.35	0.00	80.67	12.50	10.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	168.02
SUBTOTAL	440	HOURS	28,330	0	35,514	5,503	4,623	0	0	0	0	73,970	1.08
MATERIALS:													
Embankment Rock	79,850	tn							586,895			586,895	
Haul Rock	79,850	tn								239,549		239,549	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			28,330	0	35,514	5,503	4,623	0	586,895	239,549	0	900,4[illegible]	13.04

PROJECT: Atlas Minerals Revised NRC Estimate
CLIENT: Atlas Minerals
JOB NO: 00-067-10
LOCATION: Moab Utah
ITEM DESCRIPTION: Rockwall Toe Protection

ESTIMATOR: CRS
DATE: 08-Dec-93
SHT 21 OF SHT 35
TIME: 11:56 AM
JOB QUANTITY: 3,852 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Assume excavation of toe to 12 feet deep vertically
-Assume excavation and soil replacement by scraper spread
-Assume rock placement by loader and dozer.
-Total Soil Excavation @ 18,500 cy
-Total armor placement at 3770 cy

DURATION = 19 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL		UNIT COST
CAT 631 SCPR	4.00	EA	74.55		689.76	59.00	38.00				0.00			
CAT D8 DZR	1.00	EA	18.64		70.50	11.00	7.50				0.00			
CAT D6 DZR	1.00	EA	18.54		34.60	5.50	6.50				0.00			
LOCAL LABORER	2.00	EA	27.07								0.00			
CAT 563 VIB COMP	1.00	EA	18.64		25.99	5.00	4.00				0.00			
CAT 966 FEL	1.00	EA	18.64		46.07	7.00	6.00				0.00			
CAT D6 DZR	1	EA	18.638312		34.6	5.5	4.5				0			
LOCAL LABORER	2	EA	27.073615								0			
CREW			221.89	0.00	701.52	93.00	64.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS		1,090.51
SUBTOTAL	19 HOURS		4,274	0	13,511	1,791	1,242	0	0	0	0	20,818		5.40
MATERIALS:														
Embankment Rock	6,163	tn							45,300			41,300		
Haul Rock	6,163	tn								18,490		19,490		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
TOTALS			4,274	0	13,511	1,791	1,242	0	45,300	19,490	0	64,607		21.94

PROJECT:	Atlas Minerals Revised BRC Estimate	ESTIMATOR:	
CLIENT:	Atlas Minerals		
JOB NO:	88-067-10	DATE:	08-Dec-93
LOCATION:	Moab Utah	TIME:	11:56 AM
ITEM DESCRIPTION:	Clay Cover	JOB QUANTITY:	73,300 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Clay haul estimated at 18.5 miles
-Include equipment to excavate/load/place
-Transport using enddump trailers

DURATION - 489 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	18.64		46.07	7.00	6.00				0.00		
CAT D6 DZR	2.00	EA	37.28		69.20	11.00	9.00				0.00		
CAT 14 GDR	1.00	EA	18.54		50.65	6.00	6.50				0.00		
LOCAL LABORER	2.00	EA	27.87								0.00		
End Dumps	10.00	EA	186.38		686.60	0.00	0.00				0.00		
CREW			288.81	0.00	852.52	24.00	21.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,186.83
SUBTOTAL	489	HOURS	180,741	0	416,598	11,728	10,506	0	0	0	0	579,573	7.91
MATERIALS:													
Clay	73,300	cy							38,845			38,845	
Seed and Mulch	10	ac								10,000		10,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
1,1[illegible]			180,741	0	416,598	11,728	10,506	0	38,845	10,000	0	[illegible]	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CRS	SHT 25 OF SHT 35	
CLIENT:	Atlas Minerals				
JOB NO:	88-061-10	DATE:	08-Dec-93	TIME:	11:56 AM
LOCATION	Moab Utah				
ITEM DESCRIPTION:	Soil Rock Matrix (Rock)			JOB QUANTITY:	54,260 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-Qty is a total of 38,130 cy of 1.3 inch riprap and 16,130 cy of 3 inch riprap
-Assume trucks can directly dump in place.

DURATION - 362 HOURS

DESCRIPTION	QUANTITY UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00 EA	18.64		46.07	7.00	6.00				0.00		
CAT D6 DZR	1.00 EA	18.64		34.60	5.50	4.50				0.00		
LOCAL LABORER	2.00 EA	27.07								0.00		
CREW		64.35	0.00	80.67	12.50	10.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	168.02
SUBTOTAL	362 HOURS	23,278	0	29,181	4,522	3,798	0	0	0	0	60,779	1.12
MATERIALS:												
Rock Mulch	86,816 tn							825,620			825,620	
Haul Rock	86,816 tn								260,448		260,448	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
TOTALS		23,278	0	29,181	4,522	3,798	0	825,620	260,448	0	[illegible]	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR: CBS	SHT 26 OF SHT 35
CLIENT:	Atlas Minerals		
JOB NO:	08-067-10	DATE: 06 Dec 93	TIME: 11:54 AM
LOCATION:	Moab Utah		
ITEM DESCRIPTION:	Soil Rock Matrix (Soil)		JOB QUANTITY: 48,100 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

-This material will be excaved from the area of the reconfigured channel and ditchlines.
-assume compacting this material into the previously placed rock using a sheepsfoot compactor.
-Average Haul distance = 3000 lf

DURATION = 56 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	4.00	EA	74.55		489.76	59.00	38.00				0.00		
CAT D8 DZR	1.00	EA	18.64		78.50	11.00	7.50				0.00		
CAT D6 DZR	2.00	EA	37.28		69.20	11.00	9.00				0.00		
CAT 815 COMP	1.00	EA	18.64		40.09	10.00	6.00				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			176.18	0.00	677.55	91.00	60.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,005.23
SUBTOTAL	56 HOURS		9,862	0	37,696	5,063	3,366	0	0	0	0	55,927	1.15
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			[illegible]	0	37,696	5,061	3,366	0	0	0	0	[illegible]	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CBS	SHT 27 OF	SHT 35
CLIENT:	Atlas Minerals				
JOB NO:	88-047-10	DATE:	08-Dec-93	TIME:	11:56 AM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Revegetation			JOB QUANTITY:	220 ac

ESTIMATOR NOTES AND ASSUMPTIONS:

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	DURATION - HOURS UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
Seed and Mulch	220 ac									220,000		220,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	220,000	0	[illegible]	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CES	SHT 28 OF SHT 35
CLIENT:	Atlas Minerals			
JOB NO:	08-067 10	DATE:	08-Dec-93	TIME: 11:56 AM
LOCATION:	Moab Utah			
ITEM DESCRIPTION:	Demobilization			JOB QUANTITY: 1 ea

ESTIMATOR NOTES AND ASSUMPTIONS:

-Allow 3 weeks to demobilize to Jobsite

DURATION - 100 HOURS

DESCRIPTION	QUANTITY UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00 EA	18.64		46.07	7.00	6.00				0.00		
LOCAL LABORER	2.00 EA	27.07								0.00		
CREW		65.71	0.00	46.07	7.00	6.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	184.78
SUBTOTAL	100 HOURS	6,278	0	8,293	1,260	1,080	0	0	0	0	18,861	18,861.00
MATERIALS:												
											0	
-Non permit loads	10 ea								5,000		5,000	
-Permit Loads	20 ea								30,000		30,000	
-Misc Supplies	1 ea						2,500				2,500	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
TOTAL		[illegible]	0	8,293	1,260	1,080	2,500	0	35,000	0	[illegible]	[illegible]

PROJECT:	Atlas Minerals Revised RAC Estimate	ESTIMATOR:	CES	SHT 29 OF SHT 35
CLIENT:	Atlas Minerals			
JOB NO:	88 067-10	DATE:	08-Dec-93	TIME: 11:56 AM
LOCATION:	Moab Utah			
ITEM DESCRIPTION:	Clearing and Grubbing			JOB QUANTITY: 5 ac

ESTIMATOR NOTES AND ASSUMPTIONS:

-Includes removal of light brush in area of S.N. Contaminated Soil excavation.
-Use dozer to place in piles and then burn.

DURATION = 50 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D6 DZR	1.00	EA	18.64		34.60	5.50	4.50				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			65.71	0.00	34.60	5.50	4.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	90.31
SUBTOTAL	50 HOURS		2,286	0	1,730	275	225	0	0	0	0	4,516	903.20
MATERIALS:													
Misc. Supplies	1	ls						500				500	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTAL			[illegible]	0	1,730	275	225	500	0	0	0	[illegible]	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CBS	SHT 30	OF SHT 35
CLIENT:	Atlas Minerals				
JOB NO:	88-067-10	DATE:	08-Dec-93	TIME:	11:56 AM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Fencing			JOB QUANTITY:	10,700 lf

ESTIMATOR NOTES AND ASSUMPTIONS:

-Installation of a total of 10,700 lf of 6 ft chainlink with 4 strand barbwire.
-Installation of a total of 8,000 lf of 4 strand barbwire.

DURATION - HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	OWN EQUIP	RNT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUB	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
Chain Link w/Barb Wire	10,700 lf									128,400		128,400	
Barbed Wire (4 strand)	8,000 lf									20,000		20,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	148,400	0	[illegible]	[illegible]

PROJECT:	Atlas Minerals Revised ARC Estimate	ESTIMATOR:	CBS	SHT 31	OF	SHT 35
CLIENT:	Atlas Minerals					
JOB NO:	30-067-10	DATE:	08 Dec 93	TIME:		11:56 AM
LOCATION:	Moab Utah					
ITEM DESCRIPTION:	Backfill Contaminated Soil Exc			JOB QUANTITY:		75,000 cy

ESTIMATOR NOTES AND ASSUMPTIONS:
-Regrading of the excavation area.
-Average Haul Distance = 700 ft.

DURATION = 200 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D8 DZR	1.00	EA	18.64		78.50	11.00	7.50				0.00		
LOCAL LABORER	1.00	EA	13.54								0.00		
CREW			32.18	0.00	78.50	11.00	7.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	121.18
SUBTOTAL	200	HOURS	6,435	0	14,100	2,200	1,500	0	0	0	0	24,235	0.32
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			6,435	0	14,100	2,200	1,500	0	0	0	0	24,235	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CBS	SHT 32 OF SHT 35	
CLIENT:	Atlas Minerals				
JOB NO:	88-967-10	DATE:	08 Dec 93	TIME:	11:56 AM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	Filter Rock			JOB QUANTITY:	50,754 cy

ESTIMATOR NOTES AND ASSUMPTIONS:

Channels		8137	1573		
Embankment		37429			
08 Debris Pit	61				
9" Rock Wall		1612	1412		
6" Rock Wall		591			
		47769	2985	=	50754

DURATION = 448 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	18.64		46.07	7.00	6.00				0.00		
CAT D6 DZR	1.00	EA	18.64		38.60	5.50	4.50				0.00		
LOCAL LABORER	2.00	EA	27.07								0.00		
CREW			64.35	0.00	84.67	12.50	10.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	168.02
SUBTOTAL	448 HOURS		28,831	0	36,143	5,601	4,704	0	0	0	0	75,279	1.45
MATERIALS:													
Filter Rock	81,206 tn								557,888			557,888	
Haul Rock	81,206 tn									243,619		243,619	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			28,831	0	36,143	5,601	4,704	0	557,888	243,619	0	[illegible]	

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	CRS
CLIENT:	Atlas Minerals		
JOB NO:	68-067-10	DATE:	06-Dec-93
LOCATION:	Moab Utah		
ITEM DESCRIPTION:	Radiological Survey		

SHT 11 OF SHT 35

TIME: 11:56 AM

JOB QUANTITY: 1 ea

ESTIMATOR NOTES AND ASSUMPTIONS:

DURATION - HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
Radiological Survey	7	wks								26,250		26,250	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	26,250	0	26,250	[illegible]

PROJECT:	Atlas Minerals Revised NRC Estimate	ESTIMATOR:	0
CLIENT:	Atlas Minerals	SHT 17 OF	0
JOB NO:	08-067-10	DATE:	08-Dec-93
LOCATION:	Moab Utah	TIME:	11:56 AM
ITEM DESCRIPTION:	Well Maintenance	JOB QUANTITY:	10 yr

ESTIMATOR NOTES AND ASSUMPTIONS:

-Assume using 1 operator and 1 truck full time Labor = 20800

Wells @= 175 lf/year

-7- 4inch Extraction Wells Pumps @ 3.5 ea/year

-7 3.75 inch extraction pumps

-Wells and pumps need changed every two years

-Assume wells @ 50 feet deep

Period of time = 10 years

DURATION = 20,800 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
LOCAL OPERATOR	1.00	EA	19										
-Pickup	1.00	EA			5	1.00	1.00						
CREW			18.64	0.00	5.00	1.00	1.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	25.64
SUBTOTAL	20,800	HOURS	387,677	0	104,000	20,800	20,800	0	0	0	0	533,277	53,327.70
MATERIALS:													
Buy Pumps and Risers	35	ea							66,780			66,780	
Well Installation	1,750	lf								50,750		50,750	
-STS for Wells	10	yrs						10,000				10,000	
ELECTRICAL	1,200,000	KWH						96,000				96,000	
-CONSTRUCT EVAPORATION POND	2	AC								200,000		0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			387,677	0	104,000	20,800	20,800	106,000	66,780	250,750	0	[illegible]	[illegible]

PROJECT: Atlas Minerals Revised NRC Estimate | ESTIMATOR: CES | OF SHT 35
CLIENT: Atlas Minerals
JOB NO: 88 467 10 | DATE: 09 Dec 93 | TIME: 11:56 AM
LOCATION: Moab Utah
ITEM DESCRIPTION: NRC Oversight Costs | JOB QUANTITY: 10 Yr

ESTIMATOR NOTES AND ASSUMPTIONS:

Assume a cost of 114 dollars per hour

Year 1	192 hours	once per month at 2 days	192 hours per year
Year 2-10	3456 hours	twice per month at 2 days	384 hours per year
	3648 hours		

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
												0	
												0	
NRC oversight	3,648 hours									415,872		415,872	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	415,872	0	415,872	41,587.20

PROJECT: [illegible] Option All [illegible] ESTIMATOR: [illegible] FILE NAME: [illegible] SHT 1 OF SHT 40
CLIENT: [illegible]
JOB #: [illegible]
LOCATION: [illegible] DATE: [illegible] TIME: 03:16 PM

ESTIMATE SUMMARY

ITEM DESCRIPTION	DETAIL SHEET	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIAL	SUBS	TRAVEL	UNIT COSTS	TOTAL COSTS	UNIT BID	TOTAL BID
TOTAL FIXED OVERHEADS	SHT 5	1	LS	0	0	0	0	0	179,025		0	0	179,025.00	179,025	217,325.50	[illegible]
VARIABLE JOBSITE OVERHEADS	SHT 7	624	WEEKS	3,651,024	0	0	0	0	0		0	93,600	6,001.00	3,744,624	12,020.[illegible]	[illegible]
MOBILIZATION, DEMOBILIZATION, DECON	SHT [illegible]	1	EA	56,374	0	0	0	50,000	0	0	350,600	0	456,974.00	456,974	582,628.13	582,628
ROAD REPAIRS	SHT 9	18,500	LF	0	0	0	0	0	0	0	402,528	0	21.76	402,528	25.31	[illegible]
CONSTRUCT [illegible]	SHT 10	1	EA	0	0	0	0	0	0	0	1,350,000	0	1,350,000.00	1,350,000	1,570,534.07	1,570,534
EXCAVATE, LOAD TAILINGS	SHT 11	7,800,000	CY	5,132,452	0	8,628,905	1,391,650	1,057,271	0	0	15,120,000	0	4.02	31,[illegible]	5.31	41,418,000
OFF LOAD AND DISPOSAL	SHT 12	7,800,000	CY	3,624,099	0	4,893,459	722,453	540,888	0	0	0	0	1.26	9,790,899	1.90	14,[illegible]
UTILITY RELOCATION AND INSTALLATI	SHT 13	1	EA	0	0	0	0	0	1,000,000	0	140,000	0	1,140,000.00	1,140,000	1,276,[illegible]	1,276,[illegible]
SITE RECLAMATION	SHT 14	340	AC	32,091	0	81,497	12,458	10,190	0	0	340,000	0	1,403.64	477,236	1,729.[illegible]	588,108
EXCAVATE [illegible] REPOSITORY	SHT 15	5,300,000	CY	1,542,[illegible]	0	4,[illegible]	565,000	456,[illegible]	0	0	0	0	1.27	7,002,[illegible]	1.[illegible]	[illegible]
[illegible] ROCK MATRIX	SHT 16	122,800	CY	170,047	0	383,787	57,256	40,217	0	1,168,749	0	0	14.82	1,820,056	[illegible]	[illegible],754
ROCK ARMOR	SHT 17	26,000	CY	57,622	0	85,171	12,480	10,660	0	860,730	0	0	39.49	1,026,662	48.05	1,249,300
RIPRAP PLACEMENT	SHT 18	25,000	CY	57,406	0	81,895	12,000	10,250	0	715,875	0	0	35.02	875,426	42.85	1,071,250
MISC STRUCTURES	SHT 19	1	LS	0	0	0	0	0	0	0	100,000	0	100,000.00	100,000	116,3[illegible]	116,[illegible]
COMPACT CONDITION CLAY LINER	SHT 20	425,000	CY	217,700	0	487,518	63,074	43,659	0	0	0	0	1.92	814,151	2.74	1,164,500
PLACE RADON CAP	SHT 21	210,000	CY	107,759	0	227,847	28,111	19,664	0	0	0	0	1.79	375,581	2.52	529,700
PLACE FINAL CAP	SHT 22	419,000	CY	138,050	0	481,324	52,280	36,948	0	0	0	0	1.69	708,602	2.44	1,022,360
FENCING	SHT 23	15,000	LF	0	0	0	0	0	0	0	180,000	0	12.00	180,000	13.96	209,400
MONITORING CONTROL	SHT 24	1	EA	0	0	0	0	0	0	0	66,500	0	66,500.00	66,500	77,362.35	77,362
ACCESS ROADS	SHT 25	20,000	LF	47,082	0	60,280	9,000	7,200	0	32,340	0	0	7.80	155,902	11.29	[illegible]
MILL SITE SOILS EXCAVATION	SHT 26	300,000	CY	277,422	0	474,279	78,879	59,376	0	0	472,000	0	4.41	1,321,956	6.02	1,806,000
PLACEMENT OF MILL SOILS	SHT 27	300,000	CY	192,088	0	198,252	28,178	20,808	0	0	0	0	1.40	419,326	2.19	657,000
TAILING EMBANKMENT SOILS EXCAVATI	SHT 28	100,000	CY	78,254	0	79,156	12,569	9,679	0	0	144,000	0	3.24	323,658	4.49	449,000
PLACEMENT EMBANKMENT SOIL	SHT 29	100,000	CY	60,596	0	62,751	9,393	6,936	0	0	0	0	1.40	139,676	[illegible]	[illegible]
TRANSPORT MILL DEMO DEBRIS	SHT 30	35,000	CY	206,700	0	450,597	9,450	11,900	0	0	0	0	19.39	678,647	28.32	991,200
DUST CONTROL WATER TRANSPORT	SHT 31	11	YEAR	464,116	15,000	125,000	45,300	52,000	0	0	1,566,296	0	206,155.64	2,267,712	277,204.20	3,049,246
PERMITTING AND ACCESS AGREEMENT	SHT 32	1	EA	98,863	0	0	0	0	0	0	825,000	4,160	928,023.00	928,023	1,164,843.64	1,164,844
DESIGN COSTS	SHT 33	1	EA	500,000	0	0	0	0	0	0		0	500,000.00	500,000	1,011,616.16	1,011,616
AIR MONITORING/HEATH AND SAFETY	SHT 34	11	YR	1,152,637	321,000	0	0	0	0	0	0	44,600	138,021.55	1,518,237	252,351.70	2,775,869
PURCHASE LAND	SHT 35	640	AC	0	0	0	0	0	0	339,200	0	0	530.00	339,200	616.58	394,611
ANALYTICAL COSTS	SHT 36	11	YR	0	0	0	0	0	0	0	289,154	0	26,286.73	289,154	30,590.93	336,370
Well Maintenance	SHT 37	5	yr	255,914	0	25,594	15,600	10,400	53,000	33,390	25,375	0	83,852.60	419,263	142,619.38	[illegible]
NRC Surveilance	SHT 38	10	yr	0	0	0	0	0	0	0	415,872	0	41,587.20	415,872	48,380.81	483,808
Long Term Monitoring	SHT 39	30	year	0	0	0	0	0	0	0	120,000	0	4,000.00	120,000	4,653.42	[illegible]
Environmental Impact Statement	SHT 40	1	ea	0	0	0	0	0	0	0	1,500,000	0	1,500,000.00	1,500,000	1,745,037.8[illegible]	1,745,038
SUBTOTAL				18,167,042	336,000	21,092,002	1,236,131	2,456,256	1,232,025	3,150,284	23,367,325	142,360		73,179,425		
WEATHER FACTOR USED IN CALCS =		0.00%		0	0	0			0			0		0		
TOTAL ESTIMATE				18,367,042	336,000	21,092,002	1,236,131	2,456,256	1,232,025	3,150,284	23,367,325	142,360		73,179,425		

73,179,425 <=== ESTIMATE CHECK

1,020,435 <= LIAB. INS # 1.00%

MARK-UP SUMMARY	COST	MARK UP %'AGE	MARK UP	TOTAL

LABOR ANALYSIS

LABOR	[illegible],147,042	100.00%	18,147,04[illegible]	[illegible],334,084
INTERNAL EQUIPMENT	336,000	20.00%	67,200	40[illegible],200
EXTERNAL EQUIPMENT	21,092,000	20.00%	4,218,400	25,310,40[illegible]
FUEL	[illegible]	20.00%	647,226	1,88[illegible],357
REPAIRS	[illegible]	20.00%	371,[illegible]	[illegible]
SUPPLIES	1,232,025	20.00%	246,405	1,478,430
TRAVEL	142,360	20.00%	28,472	170,832
MATERIAL	3,150,284	15.00%	472,543	3,622,827
SUBS	23,367,325	15.00%	3,505,099	26,872,424
BONDS	1,020,435	15.00%	153,065	1,173,500
	===========		========================	
TOTALS	74,193,860		27,996,703	102,190,563

	WORK ITEMS	VARIABLE OVERHEADS	FIXED OVERHEADS	LUMP SUM ENTRIES	TOTALS
BASE LABOR	10,913,001	2,838,744	0	637,020	14,394,765
BURDENED $ MARKED	27,757,998	7,302,048	0	1,274,040	36,334,086
AVG MULTIPLIER	2.54	2.57	ERR	2.00	2.52

% - BOND @ [illegible]%
% - PR COST @ [illegible]%

TOTAL COST 74,193,860   TOTAL BID 102,[illegible],228

EQUALS 37.7% ON TOTAL COST
EQUALS 27.4% ON TOTAL REVENUES

PROJECT: [illegible] | DATE: 03-Dec-[illegible] | SHT [illegible] OF SHT 40
CLIENT: [illegible]
JOB NO.: [illegible]
LOCATION: Moab Utah | TIME: 03:16 PM
ESTIMATOR: AGS

ESTIMATOR NOTES:

PROJECT [illegible] DATE [illegible]
CLIENT [illegible]
[illegible]
[illegible]
[illegible] ESTIMATOR [illegible]

[illegible] 50 HOURS PER WEEK

[illegible]

SUBSISTENCE AND TRAVEL COST CALCULATIONS: AMOUNTS APPLIED TO THE FIRST 40 HOURS OF WORK

[illegible]	GENERAL [illegible]	TRAVEL BASIS [illegible]	TRAVEL COST (PER TRIP)	LODGING COST (PER NIGHT)	SUBSISTENCE COST (PER WEEK)	HOURLY COSTS TRAVEL	LODGING	SUBSISTENCE	TOTALS
[illegible]									
1	TRAVEL BY AIR	[illegible]				$0.00	$0.00	$0.00	$0.00
[illegible]	TRAVEL BY AUTO (DISTANT)	[illegible]				$0.00	$0.00	$0.00	$0.00
[illegible]	TRAVEL BY AUTO (LOCAL)	1	$10			$1.25	$0.00	$0.00	$1.25
[illegible]						ERR	ERR	$0.00	ERR
[illegible]						ERR	[illegible]	$0.00	ERR
[illegible]									
[illegible]	TRAVEL BY AIR	[illegible]				$0.00	$0.00	$0.00	$0.00
[illegible]	TRAVEL BY AUTO (DISTANT)	[illegible]				$0.00	$0.00	$0.00	$0.00
[illegible]	TRAVEL BY AUTO (LOCAL)	1				$0.00	$0.00	$0.00	$0.00
H8						ERR	ERR	$0.00	ERR
H9						ERR	ERR	$0.00	ERR

TAX AND INSURANCE CALCULATIONS:

	[illegible]	[illegible]	[illegible]	REMARKS
*	[illegible]	0.80%	0.80%	STANDARD FEDERAL RATE APPLIED TO ALL WAGES PAID
*	[illegible]	2.40%	2.40%	RATE VARIES WITH STATE, APPLIED TO ALL WAGES PAID
*	[illegible] %	7.15%	7.15%	STANDARD FEDERAL RATE APPLIED TO ALL WAGES PAID
	W[illegible] %	7.89%	7.89%	VARIES BY CRAFT SEE WAGE RATE TABLE, BASE WAGE ONLY
	[illegible]	$.50	$.50	MONTHLY COST, COVERAGE, [illegible] 40 HOURS (AVG $[illegible])
	[illegible] %	N/A	1.10%	SALARY EMPLOYEES ONLY, BASE WAGE ONLY
	STRAIGHT %	19.[illegible]%	20.11%	
*	OVERTIME %	11.0[illegible]%	11.0[illegible]%	

PROJECT [illegible] Alternate Site A DATE [illegible]
CLIENT [illegible]
JOB NO [illegible]
LOCATION [illegible]
TIME [illegible] PM
ESTIMATOR AGS

WAGE RATE TABLE

	E	D	C	F	G	H	I	J	K	L	M	N	O	P	Q	R
				TAXABLE FRINGES		NON TXBLE FRNGS		CANONIE ADDITIONS			STRAIGHT HOURLY		PREMIUM HOURLY		AVG HOURLY @ 50 HRS	
DESCRIPTION	ESCAL FACTOR MULTIPLIER	SUP & TRVL CLASS	BASE WAGE	VACATION	ALL OTHER	H&W	ALL OTHER	WKRS COMP %AGE	HEALTH INS	SUB & TRAVEL	BARE HOURLY	TOTAL HOURLY	BARE HOURLY	TOTAL HOURLY	BARE HOURLY	TOTAL HOURLY
*****HOURLY [illegible] HIRE *****																
[illegible] FOREMAN	1.[illegible]		$19.70					7.88%	$1.99	$0.00	$18.30	$23.75	$27.45	$31.[illegible]	$20.13	$25.[illegible]
[illegible] MECHANIC	1.00		$17.00					7.88%	$1.99	$0.00	$17.00	$22.21	$25.50	$[illegible]	$18.70	$21.70
[illegible] MECHANIC HELPER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
[illegible] KEY OPERATOR	1.00		$17.70					7.88%	$1.99	$0.00	$17.70	$23.04	$26.55	$30.88	$19.47	$24.[illegible]
76 LOCAL OPERATOR	1.00		$17.70					7.88%	$1.99	$0.00	$17.70	$23.04	$26.55	$30.88	$19.47	$24.81
[illegible] OILER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
[illegible] KEY LABORER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
[illegible] LOCAL LABORER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
[illegible]	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.[illegible]	$18.50
[illegible] ELECTRICIAN	1.00		$17.00					7.88%	$1.99	$0.00	$17.00	$22.21	$25.50	$[illegible]	$18.70	$[illegible]
[illegible] CARPENTER [illegible]	1.00							7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
[illegible] CARPENTER	1.00							7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
[illegible] CEMENT MASON	1.00							7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
[illegible] TEAMSTERS	1.00		$15.00					7.88%	$1.99	$0.00	$15.00	$19.83	$22.50	$26.17	$16.50	$21.10
[illegible]																
*****FULL TIME EXEMPT*****																
[illegible] MANAGER	1.00		$[illegible]					7.88%	$1.99	$0.00	$32.88	$41.48	$0.00	$0.00	$26.30	$37.[illegible]
[illegible]	1.00		$27.76					7.88%	$1.99	$1.25	$27.76	$36.59	$0.00	$0.00	$[illegible]	$[illegible]
[illegible] SUPERVISOR	1.00	[illegible]	$25.[illegible]					7.88%	$1.99	$1.25	$25.96	$34.42	$0.00	$0.00	$20.77	$[illegible]
[illegible] ENGINEER	1.00	[illegible]	$23.08					7.88%	$1.99	$1.25	$23.08	$30.96	$0.00	$0.00	$18.46	$[illegible]
[illegible]	1.00	52	$21.63					7.88%	$1.99	$1.25	$21.63	$29.22	$0.00	$0.00	$17.31	$[illegible]
[illegible] CHEMIST	1.00	52	$21.63					7.88%	$1.99	$1.25	$21.63	$29.22	$0.00	$0.00	$17.31	$[illegible]
[illegible]								7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$[illegible]
*****FULL TIME NON-EXEMPT*****																
[illegible] TECHNICIAN	1.00	52	$20.19					7.88%	$1.99	$1.25	$20.19	$[illegible]	$20.19	$24.25	$20.19	$[illegible]
[illegible] ENG.	1.00	52	$20.19					7.88%	$1.99	$1.25	$20.19	$27.49	$20.19	$24.25	$20.19	$[illegible]
[illegible] TECH	1.00	52	$18.27					7.88%	$1.99	$1.25	$18.27	$[illegible]	$18.27	$21.94	$18.27	$[illegible]
[illegible]								7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
100								7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
*****FULL TIME HOURLY*****																
[illegible] OFFICE MANAGER	1.00		$9.50					[illegible]	$1.[illegible]	$0.[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]	$10.[illegible]	$[illegible]
[illegible] CLERK	1.[illegible]		$[illegible]					[illegible]	$1.[illegible]	$0.00	$[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]	$[illegible]
104																

CLIENT: [illegible] COAL CORP. DATE: [illegible] USE TAX RATE ------ [illegible]
JOB NO.: [illegible]
LOCATION: [illegible] TIME: [illegible] PM HOURLY FUEL RATE IS BASED UPON RATING $1.00 PER GALLON
ESTIMATOR: [illegible]

EQUIPMENT RENTAL RATES

BASED ON OPERATING 176 HOURS PER MONTH

DESCRIPTION	TYPE		F MONTHLY RENTAL	G USE TAX	H HOURLY RENTAL 176 HR/MO	I HOURLY FUEL RATE	J HOURLY REPAIRS RATE	K PERIOD USAGE D,W,M	L ADJUSTMENT FACTOR APPLIED
****** INTERNAL EQUIPMENT ******									
1[illegible]				1.00	$0.00	$0.00	$0.00		0.00
1[illegible]				1.00	$0.00	$0.00	$0.00		0.00
1[illegible]				1.00	$0.00	$0.00	$0.00		0.00
1[illegible]				1.00	$0.00	$0.00	$0.00		0.00
****** EXTERNAL EQUIPMENT ******									
125 [illegible]	LOADER BACKHOE		$[illegible],000	1.08	$12.30	$3.00	$2.00	M	1.00
[illegible]	BACKHOE	(1.25 LCY)		1.08	$0.00	$4.00	$3.50		0.00
1[illegible] CAT [illegible]	BACKHOE	(1.63 LCY)		1.00	$0.00	$4.[illegible]	$4.25		0.00
[illegible] CAT [illegible]	BACKHOE	(2.75 LCY)	$9,000	1.08	$55.36	$6.50	$6.00	M	1.00
1[illegible]	BACKHOE	(3.[illegible] LCY)		1.08	$0.00	$11.00	$7.50		0.00
131									
132 CAT [illegible]	FEL	(2.75 LCY)		1.08	$0.00	$4.00	$4.00		0.00
133 CAT [illegible]	FEL	(10 LCY)	$16,[illegible]	1.08	$100.04	$5.00	$5.00	M	1.00
134 [illegible]	FEL	(4.50 LCY)	$7,650	1.08	$47.05	$7.00	$6.00	M	1.00
135 CAT [illegible]	FEL/TRACK	(2.50 LCY)	$7,390	1.08	$45.45	$6.00	$7.00	M	1.00
136									
137 CAT D[illegible]	DOZER			1.00	$0.00	$4.00	$4.50		0.00
138 CAT [illegible]	DOZER			1.08	$0.00	$5.50	$4.50		0.00
139 CAT [illegible]	DOZER LGP			1.08	$0.00	$5.50	$4.50		0.00
140 CAT [illegible]	DOZER			1.08	$0.00	$7.00	$5.25		0.00
14[illegible]	DOZER		$11,590	1.08	$71.29	$11.00	$7.50	M	1.00
14[illegible]	DOZER		$14,515	1.08	$89.28	$16.00	$10.00	M	1.00
1[illegible]									
144 CAT 14 GDR	GRADER		$8,410	1.08	$51.73	$6.00	$6.50	M	1.00
14[illegible] CAT [illegible]	GRADER		$13,730	1.08	$84.45	$8.00	$8.00	M	1.00
146									
1[illegible] COMP	COMPACTOR		$4,150	1.08	$25.52	$5.00	$4.00	M	1.00
148 BOMAG WALK BEHIND	COMPACTOR	(48 INCH)		1.08	$0.00	$2.00	$2.00		0.00
14[illegible] COMP	COMPACTOR	SHEEPSFOOT	10800	1.08	$66.43	$10.00	$6.00	M	1.00
150									
15[illegible] CAT [illegible]	SCRAPER ELEV	(18 LCY)		1.08	$0.00	$9.[illegible]	$8.[illegible]		0.00
[illegible]	SCRAPER SINGLE	(21 LCY)	17070	1.[illegible]	$10[illegible]	$14.[illegible]	$7.50	M	1.0[illegible]
15[illegible] CAT [illegible]	SCRAPER TWIN	(1.0 LCY)	$14,000	1.08	$86.11	$1[illegible]	$12.[illegible]	M	1.[illegible]
[illegible] CAT [illegible]	SCRAPER TWIN	(31 LCY)	$[illegible],210	1.08	$1[illegible].60	$21.75	$1[illegible]	M	1.[illegible]
1[illegible]									
[illegible] WATER TRUCK	MISC. EQUIPMENT		$4,1[illegible]	1.08	$25.[illegible]	$4.[illegible]	$[illegible]	M	1.[illegible]
1[illegible] TANDEM DUMP TRUCK	MISC. EQUIPMENT			1.08	$0.[illegible]	$0.00	$0.[illegible]		[illegible]
15[illegible] END DUMP TRUCK	MISC. EQUIPMENT		$9,000	1.08	$14.[illegible]	$1.00	$[illegible]		[illegible]
15[illegible] 900 CFM COMPRESSOR	MISC. EQUIPMENT			1.08	$0.00	$[illegible]	$[illegible]		[illegible]
1[illegible]	MISC. EQUIPMENT			1.[illegible]	$[illegible]	$[illegible]	$[illegible]		[illegible]
1[illegible] BAKER TANK RENTAL	MISC. EQUIPMENT			1.08	$0.00	$0.[illegible]	$0.[illegible]		[illegible]
1[illegible] WATER WAGON	MISC. EQUIPMENT		[illegible]	1.0[illegible]	$[illegible]	$[illegible]	$[illegible]	M	1.00
1[illegible]	MISC. EQUIPMENT		4[illegible]	1.[illegible]	$[illegible]	$[illegible]	$[illegible]	M	1.0[illegible]

EQUIPMENT ADJUSTMENT FACTORS

MONTHLY	M	1.00
WEEKLY	W	1.44
DAILY	D	1.81

LOCATION

SUMMARY OF MATERIAL AND SUBCONTRACT PRICES
USED IN CURRENT ESTIMATE

TIME [illegible] SALES TAX RATE

DESCRIPTION	E QUANTITY	F UNIT	G QUOTED UNIT PRICE	H SALES TAX	I UNIT PRICE WITH TAX	J TOTAL PRICE
		PERMANENT MATERIAL PRICES				
[illegible] (FOB PIT)	[illegible],500 TN		$6.16	1.06	$6.53	$244,875.00
[illegible] TRANSPORTATION	37,500 TN		$3.00	1.06	$3.18	$119,250.00
[illegible]	131,100 TN		$8.97	1.06	$9.51	************
[illegible] ARMOR TRANSPORTATION	131,100 TN		$3.00	1.06	$3.18	$416,898.00
[illegible] STONE (FOB SITE)	4,400 TN		$6.92	1.06	$7.35	$32,340.00
[illegible] LAND	640 AC		$500.00	1.06	$530.00	$339,200.00
[illegible] FILTER MATERIAL (FOB PIT)	71,400 TN		$6.48	1.06	$6.[illegible]	$490,518.00
[illegible] Pump and Riser	19 ea		$1,800.00	1.06	$1,908.00	$33,390.00
[illegible] FILTER MATERIAL TRANSPORTATION	71,400 TN		$3.00	1.06	$3.18	$227,052.00
		MAJOR SUPPLY PRICES				
[illegible]	13,100,000 KWH		$0.0[illegible]	1.06	$0.08	************
[illegible]				1.06	$0.00	$0.00
[illegible]				1.06	$0.00	$0.00
		SUBCONTRACT PRICES				
[illegible] INSTALL TRACK AND BALLAST		LF	$45.00	1.00	$45.00	$0.00
[illegible] CONSTRUCTION OF CONCRETE LOAD HOPPER	1 EA		$50,000.00	1.00	$50,000.00	$50,000.00
[illegible] INSTALL [illegible] CONVEYOR	[illegible],000 LF		$650.00	1.00	$650.00	************
[illegible] RAIL LOADING FACILITY		EA	$300,000.00	1.00	$300,000.00	$0.00
[illegible] RAIL UNLOADING FACILITY		EA	$400,000.00	1.00	$400,000.00	$0.00
[illegible] FENCE INSTALLATION	15,000 LF		$12.00	1.00	$12.00	$180,000.00
[illegible] AND MULCH	340 AC		$600.00	1.00	$600.00	$204,000.00
[illegible] INSTALL MONITOR WELLS	[illegible],000 LF		$25.00	1.00	$25.00	$50,000.00
[illegible] INSTALL [illegible]OMETERS	1,000 LF		$12.00	1.00	$12.00	$1[illegible],000.00
[illegible]	15 EA		$300.00	1.00	$300.00	$4,500.00
[illegible]	[illegible]		$400.00	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LF		$11.00	1.00	$11.[illegible]	************
[illegible]		EA	$45,000.00	1.00	$45,000.00	$1[illegible],000.00
[illegible]	[illegible] GAL		[illegible]	1.00	$1.00	$200,000.00
[illegible]	325 LF		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	10,000 [illegible]		[illegible]	[illegible]	$3[illegible]	$300,000.00
[illegible]	112,[illegible] [illegible]		$0.[illegible]	[illegible]	[illegible]	[illegible]
[illegible] HAUL [illegible]	[illegible],000 TN-MILE		[illegible]	1.0[illegible]	[illegible]	************

FIXED COST JOBSITE OVERHEADS

DESCRIPTION	INCLUDED Y or N	REQUIRED QUANTITY	UNIT RATE	I LABOR	J INT EQUIP	K EXT EQUIP	L FUEL	M REPAIRS	N SUPPLIES	O SUBS	P TRAVEL	Q TOTALS
***** [illegible] *****												
195 ELECTRIC			1200							0		0
196 WATER (NO METER SET OR BKFLW PRVNTR)			500							0		0
197 SEWER										0		0
[illegible]										0		0
[illegible]			150							0		0
[illegible]										0		0
*****[illegible] HEALTH AND [illegible] COSTS*****												
[illegible]	Y	300	500						150000			150000
1?3 H & S TRAINING-OPERATOR			1,422	0								0
?94 H & S TRAINING LABORER			1,178	0								0
1?? TRAINING [illegible] COSTS EXTERNAL			700							0		0
[illegible] TRAINING [illegible] COSTS INTERNAL			450						0			0
[illegible] COVERAGE			350						0			0
[illegible]									0			0
[illegible]									0			0
[illegible]									0			0
*****INSURANCE AND TAXES*****												
20? CLIENT NAMED AS ADDITIONAL INSURED			8750						0			0
20? BUILDER'S RISK INSURANCE (0.?0 % OF REV.)									0			0
204 [illegible] LIABILITY INSURANCE									0			0
20? [illegible]									0			0
[illegible]									0			0
[illegible]									0			[illegible]
***** [illegible] EQUIPMENT*****												
[illegible] FURNITURE ([illegible] UNIT)	Y	15	75						1125			11??
210 FAX MACHINE	Y	1	400						400			?02
[illegible]	Y	1	3000						3000			3000
[illegible] SOFTWARE	Y	1	4500						4500			4500
[illegible] COMPLETE	[illegible]	1	20000						20000			20000
[illegible]									0			0
*****[illegible] COSTS*****												
21? PERMITS			100						0			0
217 ROYALTIES ON PROCESS									0			0
2?? [illegible]			[illegible]						0			0
21? MOVING EXPENSES (LONG TERM PROJECT)									0			0
2?? [illegible]			150						0			0
221									[illegible]			[illegible]
[illegible]												[illegible]
[illegible]												0
[illegible]												0
[illegible]									[illegible]			0
TOTAL FIXED OVERHEADS									[illegible]			1??,025

PROJECT:	Atlas Option Alternate Site A	DATE:	09-Dec-91	SHT 2 OF SHT 40
CLIENT:	ATLAS CORP			
JOB NO.:	[illegible]	TIME:	03:17 PM	
LOCATION:	Moab Utah			
		ESTIMATOR:	AGS	PROJECT DURATION = 624.0 WEEKS

VARIABLE COST JOBSITE OVERHEADS

DESCRIPTION	REQUIRED Y OR N	REQUIRED QUANTITY	DURATION	UNIT RATE	I TOTAL LABOR	J WEEKLY LABOR	K WEEKLY INT EQUIP	L WEEKLY EXT EQUIP	M WEEKLY FUEL	N WEEKLY REPAIRS	O WEEKLY SUPPLIES	T WEEKLY SUBS	Q WEEKLY TRAVEL	Q WEEKLY TOTALS
*****FULL TIME EXEMPT*****														
246 PROJECT MANAGER	Y	1	624	$1,659	1,035,216	1,659							0	1,659
247 SUPERINTENDENT			624	$1,413	0	0							0	0
248 PROJ. SUPERVISOR			624	$1,327	0	0							0	0
249 PROJ. ENGINEER	Y	2	624	$1,188	1,482,624	2,376							100	2,476
250 H&S OFFICER	Y	1	624	$1,119	698,256	1,119							50	1,169
251 CHEMIST			624	$1,119	0	0							0	0
252			624											0
253			624											0
														0
*****FULL TIME NON-EXEMPT*****														0
256 H&S TECHNICIAN			624	$1,292	0	0							0	0
257 AST. PROJ. ENG.			624	$1,292	0	0							0	0
258 ENGINEER TECH			624	$1,177	0	0							0	0
259			624											0
260			624											0
														0
*****HOURLY SITE HIRES*****														0
263 FIELD FORMAN			624	$1,263	0	0							0	0
264 MECHANIC			624	$1,185	0	0		0					0	0
265 MECHANIC HELPER			624	$925	0	0							0	0
266 OFFICE MANAGER	Y	1	624	$697	434,928	697							0	697
267 CLERK			624	$632	0	0							0	0
268			624											0
269			624											0
														0
*****INTERNAL EQUIPMENT RENTAL*****														0
272 PRESSURE WASHER (INTERNAL RATE)			624	$30			0							0
273 SAFETY EQUIPMENT (AIR SAMPLING/OVA)			624	$130			0							0
274			624				0							0
275			624				0							0
														0
*****EXTERNAL EQUIPMENT RENTAL*****														0
278 OFFICE TRAILER			624	$100				0						0
279 TOOL TRAILER			624	$75				0						[illegible]
280 CHANGE TRAILER			624	$100				0						0
281 DECONTAMINATION TRAILER			624	$225				0						0
282 LAB TRAILER			624	$100				0						0
283 FUEL TRUCK			624	$221				0						0
284 GREASE TRUCK			624					0						0
285 MISC. EQUIP			624	$75				0						0
286 SITE SCALES			624	$100				0						0
287 PROJECT VEHICLES			624	$150				[illegible]						0
288 STREET SWEEPER			624	[illegible]				[illegible]						[illegible]

289			624				0						0
290			624				0						0
													0
*****SUPPLIES*****													0
293 OFFICE SUPPLIES	Y	1	624	$30						0			0
294 SURVEY SUPPLIES	Y	1	624	$50						0			0
295 SAFETY SUPPLIES			624	$30						0			0
296 COPY MACHINE	Y	1	624	$40						0			0
297 PHONE SERVICE	Y	1	624	$50						0			0
298 UTILITY SERVICES			624	$40						0			0
299 POTABLE WATER			624	$40						0			0
300 SANITARY FACILITIES			624	$30						0			0
301 SMALL TOOLS			624	$150						0			0
302 JOBSITE PHOTOS	Y	1	624	$5						0			0
303 ON SITE QC TESTING EQUIP.			624	$200						0			0
304 ON SITE LAB SUPPLIES			624							0			0
305 DECONTAMINATION SUPPLIES	Y	1	624	15						0			0
306			624							0			0
307			624							0			0
308			624							0			0
309			624							0			0
310			624							0			0
													0
*****SUBCONTRACT *****													0
313 SURVEY CREW (BASED ON $140/HR FOR 40 HRS)			624	$5,600							0		0
314 SECURITY (FULL TIME AT $12/HOUR)			624	$2,016							0		0
315			624								0		0
316			624								0		0
317			624								0		0
													0
*****TRAVEL COSTS*****													0
320 TRAVEL, EXECUTIVE			624	$250								0	0
321 KEY OPERATOR ADJUSTMENT			624	$0	0							0	0
322 KEY LABORER ADJUSTMENT			624	$0	0							0	0
323			624									0	0
VARIABLE JOBSITE OVERHEADS (WEEKLY)					5,951	0	0	0	0	0	0	150	6,001
VARIABLE JOBSITE OVERHEADS (TOTAL)	624 WEEKS				3,651,024	0	0	0	0	0	0	93,600	3,744,624

PROJECT	Atlas Optio Alternate Site #	ESTIMATOR	AGS	SHT #	OF [illegible]
CLIENT	ATLAS CORP				
JOB NO	88-47-10	DATE	[illegible]-Dec-93	TIME	07:16 PM
LOCATION	Moab Utah				
ITEM DESCRIPTION:	MOBILIZATION, DEMOBILZATION, DECONTAMINATION			JOB QUANTITY	1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

ITEM DESCRIPTION	QTY	MILES	$EA	TOTAL
LOCAL LOADS	206	28	50	10300
REGIONAL LOADS	150	175	600	90000
SPECIAL LOADS	50	1200	1500	75000
MOBILIZATION	406			175300
DEMOB RAIL CAP	356			100300
TOTAL MOB DEMOB	762			275600

DECONTAMINATION, ASSUME TWO LABORERS AT 2 HOURS PER EACH

DURATION = 1,524 HOURS

DESCRIPTION	QUANTITY UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
LOCAL LABORER	2.00 EA	36.99								0.00		
CREW		36.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	36.99
SUBTOTAL	1,524 HOURS	56,374	0	0	0	0	0	0	0	0	56,374	56,374.00
MATERIALS												
MOBILIZATION DEMOB	762 EA								275,600		275,600	
PERSONNEL MOBILIZATION	15 EA								75,000		75,000	
DECONTAMINATION SUPPLIES	1 EA					50,000					50,000	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
											0	
TOTAL		56,374	0	0	0	50,000	0	0	[illegible]		[illegible]	[illegible]

PROJECT:	Atlas Option Altern te Site A	ESTIMATOR:	AGS	SHT 9 OF SHT 40
CLIENT:	ATLAS CORP.			
JOB NO:	98-67-10	DATE:	09-Dec-93	TIME: 02:1? PM
LOCATION:	Moab Utah			
ITEM DESCRIPTION:	ROAD REPAIRS		JOB QUANTITY:	18,500 LF

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME THAT THE EIGHT MILE LENGTH OF ROAD WILL REQUIRE PROFILLING AND ASPHALT OVERLAY
-ASSUME 110 LBS PER SY INCH ON ASPHALT
-ASSUME TOTAL OF 10,000 TONS REQUIRED

DURATION = 0 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIAL													
OVERLAY ASPHALT	10,000	TNS								380,000		90,000	
PROFILE ROAD	112,640	SYIN								22,528		22,528	
												0	
												0	
												0	
												0	
												[illegible]	
												0	
												0	
												[illegible]	
												[illegible]	
												0	
TOTALS			0	0	0	0	0	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]1.76

PROJECT	Atlas Option Alternate Site A	ESTIMATOR: AGS	SHT 10 OF SHT 40
CLIENT:	ATLAS CORP.		
JOB NO:	88-67-10	DATE: 09-Dec-93	TIME: 03:16 PM
LOCATION:	Moab Utah		
ITEM DESCRIPTION:	CONSTRUCT LOADING FACILITY		JOB QUANTITY: 1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME CONSTRUCTION OF 2500 LF CONVEYOR SYSTEM TO TRUCK LOADING AREA
-ASSUME CONSTRUCTING A FEED HOPPER STRUCTURE FOR LOADING BY DOZER
-ASSUME USING A SILO LOADING FACILITY AT THE SIDING WITH 1200 TN CAPACITY

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
CONSTRUCTION OF CONCRETE LOA	1	EA								50,000		50,000	
INSTALL COVERED CONVEYOR	2,000	LF								1,300,000		1,300,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	1,350,000	0	1,350,000	1,350,000.00

PROJECT: Atlas Option Alternate Site A | ESTIMATOR: AGS | SHT 11 OF SHT 40
CLIENT: ATLAS CORP.
JOB NO: 98-67-10 | DATE: 09-Dec-93 | TIME: 03:17 PM
LOCATION: Moab Utah
ITEM DESCRIPTION: EXCAVATE, LOAD TAILINGS | JOB QUANTITY: 7900000 CY

ESTIMATOR NOTES AND ASSUMPTIONS: 7,900,000

ASSUME PRODUCTION BASED ON LOADING FACILITY AND TRANSPORTATION CAPACITY
ASSUME 40 MINUTE FOR TRUCK CYCLE 0.8
ASSUME AVERAGE CONVERSION OF TAILING AT 1.4 TONS PER CY
PRODUCTION = 4500 TNS PER DAY = 3461 CY PER DAY
DURATION = 7800000 CY/ 3461 CY/DAY = 2253.68390 DAYS OR = 6.17447645 YEARS AT 7 DAYS PER WEEK ALL YEAR ROUND 3640 HR/YR
8.66801502 YEARS AT 5 DAYS PER WEEK ALL YEAR ROUND 2600 HR/YR

ASSUME USING 1 637, 2-D8, 1-WATER TRUCK AND 1 GRADER FOR EXCAVATION
ASSUME USING 3 CONVEYOR AND LOADING OPERATORS AND 3 LABORERS

DURATION = 22,537 HOURS

DESCRIPTION		QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 637 SCPR		1.00	EA	24.61		136.60	23.75	17.50				0.00		
CAT 14 GDR	*	1.00	EA			51.73	6.00	6.50						
CAT D8 DZR		2.00	EA	49.21		142.58	22.00	15.00				0.00		
PICKUP	*	2.00	EA			4.92	3.00	2.00						
CAT 966 FEL		1.00	EA	24.61		47.05	7.00	6.00				0.00		
LOCAL OPERATOR		3.00	EA	73.82								0.00		
LOCAL LABORER		3.00	EA	55.49								0.00		
CREW				227.74	0.00	382.88	61.75	47.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	719.37
SUBTOTAL		22,537	HOURS	5,132,452	0	8,628,905	1,391,650	1,059,231	0	0	0	0	16,212,238	2.08
MATERIALS:														
HAUL TAILINGS		**********	TN-MILE								15,120,000		15,120,000	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
TOTALS				5,132,452	0	8,628,905	1,391,650	1,059,231	0	0	15,120,000	0	31,332,[illegible]	4.02

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR: AGS	SHT 12 OF SHT 80
CLIENT:	ATLAS CORP.		
JOB NO:	88-67-10	DATE: 09-Dec-93	TIME: 03:17 PM
LOCATION:	Moab Utah		
ITEM DESCRIPTION:	OFF-LOAD AND DISPOSAL		JOB QUANTITY: **********CY 7,800,009

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME MATERIALS CAN BE PLACED WITHIN 100 FEET OF FILL PLACEMENT
-ASSUME USING A D8, GRADER, WATER TRUCK AND COMPACTOR, AND FOREMAN

DURATION = 22,537 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 825 COMP	1.00	EA	24.61		66.43	10.00	6.00				0.00		
WATER TRUCK *	1.00	EA			25.22	4.00	3.00						
CAT 14 GDR *	1.00	EA			51.73	6.00	6.50						
FIELD FORMAN	1.00	EA	25.39								0.00		
PICKUP	1.00	EA	24.61		2.46	1.50	1.00				0.00		
LOCAL OPERATOR	1	EA	24.607104								0		
LOCAL LABORER	2	EA	36.990918								0		
CREW			160.81	0.00	217.13	32.50	24.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	434.44
SUBTOTAL	22,537	HOURS	3,624,099	0	4,893,459	732,453	540,888	0	0	0	0	9,790,899	1.26
MATERIALS												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			3,624,099	0	4,893,459	732,453	540,888	0	0	0	0	[illegible]	1.26

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 11 OF	SHT 40
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	09-Dec-93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	UTILITY RELOCATION AND INSTALLATION			JOB QUANTITY:	1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

-RELOCATE POWER POLES	35000
-SERVICE TO LOADING HOPPER	25000
-SERVICE TO LOADING FACILITY	45000
-SERVICE TO OFF LOADING FACILITY	35000

	140000

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
ELECTRICAL	************	MH						1,000,000				1,000,000	
-UTILITY SERVICES	1	EA								140,000		140,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	1,000,000	0	140,000	0	1,140,000	1,140,000.00

PROJECT: Atlas Option Alternate Site 4
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: SITE RECLAMATION

ESTIMATOR: AGS
DATE: 09-Dec-93
SHT 14 OF SHT 40
TIME: 03:17 PM
JOB QUANTITY: 340 AC

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME RECLAMATION OF 130 ACRES
-ASSUME PLACEMENT OF SILTY SOILS FOR GROUND COVER AT 4 INCHES THICK
-QUANTITY IS ASSUMED TO BE 69212 CY
-USE 2 SCRAPERS AT COMBINED PRODUCTION OF 360 CY/HR AT 2000 FT HAUL
-DURATION = 192.25555 HOURS

DURATION = 192 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 637 SCFR[T	2.00	EA	49.21		273.20	47.50	35.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
WATER TRUCK	1.00	EA	24.61		25.22	4.00	3.00				0.00		
LOCAL LABORER	1.00	EA	18.50								0.00		
FIELD FORMAN	1.00	EA	25.39								0.00		
PICKUP	1.00	EA			2.46	1.50	1.00						
CREW			166.92	0.00	423.90	70.00	53.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	713.82
SUBTOTAL	192	HOURS	32,091	0	81,497	13,458	10,190	0	0	0	0	137,236	403.64
MATERIALS													
HYDROSEED AND MULCH	340	AC								204,000		204,000	
IRRIGATION	340	AC								136,000		136,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			32,091	0	81,497	13,458	10,190	0	0	340,000	0	477,236	1,403.64

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 15	OF	SHT 40
CLIENT:	ATLAS CORP					
JOB NO:	38 57 10	DATE:	09-Dec-93	TIME:		03:17 PM
LOCATION:	Moab Utah					
ITEM DESCRIPTION:	EXCAVATE OVERBURDEN REPOSITORY			JOB QUANTITY:		*********CY
						5,500.00

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME USING 631 FLEET AT 2000 FOOT HAUL
-ASSUME PRODUCTION AT 1100 CY/HR
-DURATION = 5500000 / 1100 CY/HR= 5000 HOURS

DURATION = 5,000 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	5.00	EA	123.04		524.95	73.75	47.50				0.00		
CAT D9 DZR	2.00	EA	49.21		178.56	32.00	20.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
WATER WAGON	1.00	EA	24.61		38.75	8.75	8.75				0.00		
PICKUP	1.00	EA			2.46	1.50	1.00						
FIELD FORMAN	1.00	EA	25.39								0.00		
LOCAL LABORER	2	EA	36.770918								0		
CREW			308.45	0.00	967.74	133.00	91.25	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,400.44
SUBTOTAL	5,000	HOURS	1,542,246	0	4,338,700	665,000	456,250	0	0	0	0	7,002,196	1.27
MATERIALS												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			1,542,246	0	4,338,700	665,000	456,250	0	0	0	0	7,002,196	1.27

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 16 OF SHT 40
CLIENT:	ATLAS CORP.			
JOB NO:	98 6" 10	DATE:	09-Dec-92	TIME: 03:17 PM
LOCATION:	Moab Utah			
ITEM DESCRIPTION:	SOIL ROCK MATRIX			JOB QUANTITY: 122,800 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

-QUANTITY IS ASSUMED TO BE 61400 CY OF ROCK AND 61400 CY OF SOIL
-ASSUME DELIVERY OF ROCK @ 1000 CY/DAY
-DURATION = 61.4 DAYS OR 614 HOURS
INCLUDE CREW TO PLACE SOILS

DURATION = 614 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL		UNIT COST
CAT 631 SCPR	3.00	EA	73.82		314.97	44.25	28.50				0.00			
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00			
CAT 563 VIB COMP	1.00	EA	24.61		25.52	5.00	4.00				0.00			
CAT D9 DZR	1.00	EA	24.61		89.28	16.00	10.00				0.00			
LOCAL LABORER	3.00	EA	55.49								0.00			
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00			
CAT D8 DZR	1	EA	24.607104		71.29	11	7.5				0			
WATER TRUCK	1	EA	24.607104		25.22	4	3				0			
CREW			276.95	0.00	625.06	93.25	65.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS		1,040.76
SUBTOTAL	614	HOURS	170,047	0	383,787	57,256	40,217	0	0	0	0	651,307		5.30
MATERIALS:														
ROCK ARMOR (FOB PIT)	92,100	TN							875,871			875,871		
ROCK ARMOR TRANSPORTATION	92,100	TN							292,878			292,878		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
TOTALS			170,047	0	383,787	57,256	40,217	0	1,1[illegible],749	0	0	1,820,056		14.82

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 17 OF	SHT 40
CLIENT:	ATLAS CORP.				
JOB NO:	88-67 10	DATE:	09-Dec-93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	ROCK ARMOR			JOB QUANTITY:	26,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME CONVERSION AT 1.5 TNS PER CY
-PLACE ROCK BY DOZER, LOADER AND TRACK LOADER
-ASSUME DELIVER OF STONE AT 1000 CY/DAY = 1500 TN/DAY
-TOTAL LOADS AT 23 TON PER LOAD = 65 TRUCKS PER DAY

-ASSUME SAME QUANTITY OF FILTER MATERIAL

DURATION = 520 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 963 FEL;T	1.00	EA	24.61		45.45	6.00	7.00				0.00		
LOCAL LABORER	2.00	EA	36.99								0.00		
CREW			110.81	0.00	163.79	24.00	20.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	317.10
SUBTOTAL	520	HOURS	57,622	0	85,171	12,480	10,660	0	0	0	0	165,933	6.38
MATERIALS:													
ROCK ARMOR (FOB PIT)	39,000	TN							370,890			370,890	
ROCK ARMOR TRANSPORTATION	39,000	TN							124,020			124,020	
FILTER MATERIAL (FOB PIT)	36,400	TN							250,068			250,068	
FILTER MATERIAL TRANSPORTATI	36,400	TN							115,752			115,752	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			57,622	0	85,171	12,480	10,660	0	860,730	0	0	1,026,663	39.49

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR	AGS	SHT 18 OF	SHT 40
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE	09-Dec-93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	RIPRAP PLACEMENT			JOB QUANTITY:	25,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME CONVERSION AT 1.5 TNS PER CY
-PLACE ROCK BY DOZER, LOADER AND TRACK LOADER
-ASSUME DELIVER OF STONE AT 1000 CY/DAY = 1500 TN/DAY
-TOTAL LOADS AT 23 TON PER LOAD = 65 TRUCKS PER DAY
-ASSUME PLACING RIPRAP IS DRAINAGE DITCHES AND CHANNELS

-ASSUME SAME THICKNESS OF FILTER LAYER

DURATION = 500 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 963 FEL/T	1.00	EA	24.61		45.45	6.00	7.00				0.00		
LOCAL LABORER	2.00	EA	36.99								0.00		
CREW			110.81	0.00	163.79	24.00	20.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	319.10
SUBTOTAL	500	HOURS	55,406	0	81,895	12,000	10,250	0	0	0	0	159,551	6.38
MATERIALS:													
RIP RAP (FOB PIT)	37,500	TN							244,875			244,875	
RIP RAP TRANSPORTATION	37,500	TN							119,250			119,250	
FILTER MATERIAL (FOB PIT)	35,000	TN							240,450			240,450	
FILTER MATERIAL TRANSPORTATI	35,000	TN							111,300			111,300	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			55,406	0	81,895	12,000	10,250	0	715,875	0	0	875,426	35.02

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 19 OF SHT 40
CLIENT:	ATLAS CORP.			
JOB NO:	88-67-10	DATE:	09-Dec-93	TIME: 03:17 PM
LOCATION:	Moab Utah			
ITEM DESCRIPTION:	MISC STRUCTURES			JOB QUANTITY: 1 LS

ESTIMATOR NOTES AND ASSUMPTIONS:

-CERTAIN DRAINAGE STRUCTURES WILL BE REQUIRED, FROM BOX CULVERT TO HEADWALLS.
-ASSUME AN ALLOWANCE TO 100,000 FOR ENTIRE PROJECT

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIAL:													
												0	
-MISC STRUCTURES	1	LS								100,000		100,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	100,000	0	100,000	100,000.00

PROJECT	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 20 OF	SHT 40
CLIENT	ATLAS CORP.				
JOB NO:	66-67-10	DATE:	09-Dec-93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	COMPACT CONDITION CLAY LINER			JOB QUANTITY:	425,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME OVEREXCAVATING 1 FOOT OF LINER AND RECOMPACTING AND CONDITIONING.
-USE SCRAPERS TO MOVE THE MATERIALS
-INCLUDE AN ADDITIONAL D-9 FOR RIPPING OF ROCK
-INCLUDE TWO COMPACTOR TO KEEP UP WITH COMPACTION EFFORTS
-PRODUCTION AT 1100 CY/HR
-DURATION = 425000 CY/ 1100 CY/HR = 386.363636
-ASSUME WATER AVAILABLE ON SITE FROM STORAGE SURGE TANK FOR DUST CONTROL AND COMPACTION NEEDS
-ASSUME HAUL DISTANCE OF 1200 FT

DURATION = 386 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL		UNIT COST
CAT D9 DZR	2.00	EA	49.21		178.56	32.00	20.00				0.00			
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00			
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00			
CAT 825 COMP	2.00	EA	49.21		132.86	20.00	12.00				0.00			
CAT 631 SCPR	5.00	EA	123.04		524.95	73.75	47.50				0.00			
WATER WAGON	2.00	EA	49.21		77.50	17.50	17.50				0.00			
LOCAL LABORER	3.00	EA	55.49								0.00			
FIELD FORMAN	2	EA	50.774628								0			
PICKUP *	2	EA			4.92	3	2							
CREW			426.15	0.00	1041.81	163.25	113.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS		1,744.21
SUBTOTAL	386	HOURS	164,650	0	402,518	63,074	43,659	0	0	0	0	673,901		1.59
MATERIALS:														
												0		
PREWET COMPACTION	425,000		55,250.00		85,000.00							140,250		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
TOTALS			217,900	0	487,518	63,074	43,6[illegible]	0	0	0	0	[illegible]		[illegible]

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS
CLIENT:	ATLAS CORP	SHT 21 OF	SHT 4C
JOB NO:	88-67-10	DATE:	09-Dec-93
LOCATION:	Moab Utah	TIME:	03:17 PM
ITEM DESCRIPTION:	PLACE RADON CAP	JOB QUANTITY:	210,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME PLACEMENT OF TC RADON CAP AT 1 FOOT OF MATERIAL
-USE SCRAPERS TO MOVE THE MATERIALS
-INCLUDE AN ADDITIONAL D-9 FOR RIPPING OF ROCK

-PRODUCTION AT 1100 CY/HR
DURATION = 210000 CY/ 1100 CY/HR = 190.909090
-ASSUME WATER AVAILABLE ON SITE FOR DUST CONTROL AND COMPACTION NEEDS
-ASSUME HAUL DISTANCE OF 1,00 FT

DURATION = 191 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D9 DZR	1.00	EA	24.61		89.28	16.00	10.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT 825 COMP	2.00	EA	49.21		132.86	20.00	12.00				0.00		
CAT 631 SCPR	5.00	EA	123.04		524.15	73.75	47.50				0.00		
WATER WAGON	2.00	EA	49.21		77.50	17.50	17.50				0.00		
LOCAL LABORER	3.00	EA	35.49								0.00		
FIELD FORMAN	2	EA	50.774628								0		
PICKUP	2	EA			4.92	3	2						
CREW			401.55	0.00	952.53	147.25	103.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,604.33
SUBTOTAL	191	HOURS	76,659	0	181,847	28,111	19,664	0	0	0	0	306,281	1.46
MATERIALS:													
												0	
-FREWET COMPACTION	210,000		27,300.00		42,000.00							69,300	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			103,959	0	223,847	28,111	[illegible]	0	0	0	0	[illegible]	[illegible]

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS CORP
JOB NO: 88 67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: PLACE FINAL CAP

ESTIMATOR: AGS
DATE: 07 Dec 93
SHT 22 OF SHT 40
TIME: 03.17 PM
JOB QUANTITY: 419,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME PLACEMENT OF FINAL COVER AT 2 FOOT THICK
-USE SCRAPERS TO MOVE THE MATERIALS
-INCLUDE AN ADDITIONAL D-9 FOR RIPPING OF ROCK

-PRODUCTION AT 1100 CY/HR
-DURATION : 419000 CY/ 1100 CY/HR = 380.909090
-ASSUME WATER AVAILABLE ON SITE FOR DUST CONTROL AND COMPACTION NEEDS
-ASSUME HAUL DISTANCE OF 1200 FT

DURATION = 381 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D9 DZR	1.00	EA	24.61		89.28	16.00	10.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT 825 COMP	1.00	EA	24.61		66.43	10.00	6.00				0.00		
CAT 631 SCPR	5.00	EA	123.04		524.95	73.75	47.50				0.00		
WATER WAGON	2.00	EA	49.21		77.50	17.50	17.50				0.00		
LOCAL LABORER	3.00	EA	55.49								0.00		
FIELD FORMAN	2	EA	50.774628								0		
PICKUP	2	EA			4.92	3	2						
CREW			376.94	0.00	886.10	137.25	97.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,497.29
SUBTOTAL	381	HOURS	143,580	0	337,524	52,280	36,948	0	0	0	0	570,332	1.36
MATERIALS													
												0	
-PREWET COMPACTION	419,000		54,470.00		83,800.00							138,270	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			198,050	0	421,324	52,280	36,948	0	0	0	0	[illegible]	1.69

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 23 OF	SHT 40
CLIENT:	ATLAS CORP				
JOB NO:	98-67-10	DATE:	07-Dec-93	TIME:	03:17 PM
LOCATION	Moab Utah				
ITEM DESCRIPTION:	FENCING			JOB QUANTITY:	15,000 LF

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME FENCING OF PERIMETER OF REPOSITORY FOR INSTITUTIONAL CONTROL

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
FENCE INSTALLATION	15,000 LF									180,000		180,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	180,000	0	180,000	12.00

PROJECT: Atlas Option Alternate Site 4
CLIENT: ATLAS (DAT
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: MONITORING CONTROL

ESTIMATOR: AGS
DATE: 09-Dec-93
SHT 24 OF SHT 40
TIME: 03:17 PM
JOB QUANTITY: 1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME INSTALLATION OF 10 PIEZOMETERS
-ASSUME INSTALLATION OF 20 MONITORING WELLS AT 100 FT DEPTH
-ASSUME ALLOWANCE FOR SETTLEMENT MARKERS AND SURVEY MONUMENTS

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
INSTALL MONITOR WELLS	2,000	LF								50,000		50,000	
INSTALL PIEZOMETERS	1,000	LF								12,000		12,000	
INSTALL SETTLEMENT MARKERS	15	EA								4,500		4,500	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	66,500	0	66,500	66,500.00

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 25 OF	SHT 40
CLIENT:	ATLAS CORP				
JOB NO:	88-67-10	DATE:	09-Dec-93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	ACCESS ROADS			JOB QUANTITY:	20,000 LF

ESTIMATOR NOTES AND ASSUMPTIONS:

ASSUME ACCESS ROAD ALONG NEW REPOSITORY AREA
ASSUME ROAD AT 12 FOOT WIDE AND 4 INCHES THICK

QUANTITY = 2933.3333 CY
ASSUME CONSTRUCT AT 50 LF HR = 400 HOURS

DURATION = 400 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
WATER TRUCK	1.00	EA	24.61		25.22	4.00	3.00				0.00		
LOCAL LABORER	1.00	EA	18.50								0.00		
PICKUP *	1.00	EA			2.46	1.56	1.00						
FIELD FORMAN	1.00	EA	25.37								0.00		
CREW			117.70	0.00	150.70	22.50	18.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	308.90
SUBTOTAL	400	HOURS	47,082	0	60,280	9,000	7,200	0	0	0	0	123,562	6.18
MATERIALS													
CRUSHED STONE (OFF SITE)	4,400	TN							32,340			32,340	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			47,082	0	60,280	9,000	7,200	0	32,340	0	0	155,902	7.80

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 2?	OF SHT 4?
CLIENT:	ATLAS 36F				
JOB NO:	5E-5? 10	DATE:	09-Dec-93	TIME:	03:17 PM
LOCATION	Moab Utah				
ITEM DESCRIPTION:	MILL SITE SOILS EXCAVATION			JOB QUANTITY:	300,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS: FUEL COST OF 0.9 PER GAL

-ASSUME PRODUCTION BASED ON LOADING FACILITY AND TRANSPORTATION CAPACITY

-ASSUME AVERAGE CONVERSION OF TAILING AT 1.4 TONS PER CY
-PRODUCTION = 4500 TNS PER DAY = 3461 CY PER DAY
-DURATION = 300000 CY/ 3461 CY/DAY = 86.6801502 DAYS OR = 0.23747986 YEARS AT 7 DAYS PER WEEK ALL YEAR ROUND 3640 HR/YR
0.33338519 YEARS AT 5 DAYS PER WEEK ALL YEAR ROUND 2600 HR/YR

DURATION = 867 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 637 SCRPR	2.00	EA	49.21		273.20	47.50	35.00				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT D8 DZR	2.00	EA	49.21		142.58	22.00	15.00				0.00		
PICKUP	3.00	EA			7.38	4.50	3.00						
CAT 966 FEL	1.00	EA	24.61		4[illegible].05	7.00	6.00				0.00		
LOCAL OPERATOR	3.00	EA	73.82								0.00		
LOCAL LABORER	4.00	EA	[illegible]								0.00		
WATER TRUCK	1	EA	24.607104		25.22	4	3				0		
CREW			320.05	0.00	547.16	91.00	68.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,026.71
SUBTOTAL	867	HOURS	277,422	0	474,279	78,879	59,376	0	0	0	0	889,956	2.97
MATERIALS													
HAUL TAILINGS	2,400,000	TN MILE								432,000		432,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			277,422	0	474,279	78,879	59,376	0	0	432,000	0	[illegible]	4.41

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS COST
JOB NO: 98-67 10
LOCATION: Moab Utah
ITEM DESCRIPTION: PLACEMENT OF MILL SOILS

ESTIMATOR: AGS
SHT 27 OF SHT 40
DATE: 09-Dec-93
TIME: 02:17 PM
JOB QUANTITY: 200,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME DUMPING WITH TRUCKS AND SPREADING WITH DOZER SPREAD.

DURATION = 867 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 825 COMP	1.00	EA	24.61		66.43	10.00	6.00				0.00		
WATER TRUCK	1.00	EA	24.61		25.22	4.00	3.00				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
FIELD FORMAN	1.00	EA	25.39								0.00		
PICKUP	1.00	EA	24.61		2.46	1.50	1.00				0.00		
LOCAL OPERATOR	1	EA	24.607104								0		
LOCAL LABORER	2	EA	36.990918								0		
CREW			210.02	0.00	217.13	32.50	24.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	483.65
SUBTOTAL	867	HOURS	182,088	0	188,252	28,178	20,808	0	0	0	0	419,326	1.40
MATERIALS:												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			182,088	0	188,252	28,178	20,808	0	0	0	0	419,[illegible]	1.40

PROJECT	Atlas Option Alternate Site A	ESTIMATOR	AGS
CLIENT	ATLAS CORP		
JOB NO	3F-47-10	DATE	09-Dec-93
LOCATION	Moab Utah		
ITEM DESCRIPTION:	TAILING EMBANKMENT SOILS EXCAVATION		

SHT 28 OF SHT 40

TIME 02:17 PM

JOB QUANTITY: 100,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

FUEL COST OF 0.8 PER GAL

-ASSUME PRODUCTION BASED ON LOADING FACILITY AND TRANSPORTATION CAPACITY

-ASSUME AVERAGE CONVERSION OF TAILING AT 1.4 TONS PER CY

-PRODUCTION : 4500 TNS PER DAY = 3461 CY PER DAY

-DURATION = 100000 CY/ 3461 CY/DAY = 28.8933834 DAYS OR = 0.07915995 YEARS AT 7 DAYS PER WEEK ALL YEAR ROUND 3640 HR/YR

0.11112839 YEARS AT 5 DAYS PER WEEK ALL YEAR ROUND 2600 HR/YR

-ASSUME USING 2 CONVEYOR AND LOADING OPERATORS AND 3 LABORERS

DURATION = 289 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 14 GDE	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT D8 DIZ	2.00	EA	49.21		142.58	22.00	15.00				0.00		
PICKUP	* 3.00	EA			7.38	4.50	3.00						
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
LOCAL OPERATOR	3.00	EA	73.82								0.00		
LOCAL LABORER	4.00	EA	73.98								0.00		
WATER TRUCK	1	EA	24.607104		25.22	4	3				0		
CREW			270.84	0.00	273.96	43.50	33.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	621.80
SUBTOTAL	289	HOURS	78,254	0	79,156	12,569	9,677	0	0	0	0	179,658	1.80
MATERIALS													
HAUL TAILINGS	800,000	TN-MILE								144,000		144,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTAL:			78,254	0	79,156	12,569	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 29	OF SHT 40
CLIENT:	ATLAS CORP.				
JOB NO:	85-47.10	DATE:	09-Dec 93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	PLACEMENT EMBANKMENT SOILS			JOB QUANTITY:	100,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME DUMPING TRUCKS AND SPREADING WITH D8 SPREAD.

DURATION = 289 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 825 COMP	1.00	EA	24.61		66.43	10.00	6.00				0.00		
WATER TRUCK	1.00	EA	24.61		25.22	4.50	3.00				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
FIELD FORMAN	1.00	EA	25.39								0.00		
PICKUP	1.00	EA	24.61		2.46	1.50	1.00				0.00		
LOCAL OPERATOR	1	EA	24.607104								0		
LOCAL LABORER	2	EA	36.990918								0		
CREW			210.02	0.00	217.13	32.50	24.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	483.65
SUBTOTAL	289	HOURS	60,696	0	62,751	[illegible]	6,936	0	0	0	0	139,776	1.40
MATERIALS												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			60,696	0	62,751	[illegible]	6,936	0	0	0	0	139,776	1.40

PROJECT	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 30 OF	SHT 40
CLIENT	ATLAS CORP.				
JOB NO	08-17-10	DATE	09 Dec 93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	TRANSPORT MILL DEMO DEBRIS			JOB QUANTITY:	35,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

- WITH DEMO DEBRIS ASSUME 10 CY PER 16 CY END DUMP
- ASSUME TRANSPORTING BY TARPED ENDDUMP @ 2 HR ROUND TRIP
- USE 10 TRUCKS AT 10 HOURS PER DAY = 50 LOAD PER DAY
- DURATION = 35000 CY/ 500 cy PER DAY = 70 DAYS
  700 HOURS

DURATION = 700 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 235 BKH	1.00	EA	24.61		55.36	6.50	6.00				0.00		
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
END DUMP TRUCK	10.00	EA	246.07		541.30	0.00	5.00				0.00		
CREW			295.29	0.00	643.71	13.50	17.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	969.50
SUBTOTAL	700	HOURS	206,700	0	450,597	9,450	11,900	0	0	0	0	678,647	19.39
MATERIALS													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			206,700	0	450,597	9,450	11,900	0	0	0	[illegible]	678,647	19.39

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	SHT 31 OF SHT 40	
CLIENT:	ATLAS CORP				
JOB NO:	[illegible] 10	DATE:	09-Dec-93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	DUST CONTROL-WATER TRANSPORT			JOB QUANTITY:	11 YEAR

ESTIMATOR NOTES AND ASSUMPTIONS:

ASSUME DUST CONTROL IS NEEDED OVER CERTAIN AREA OF HAUL AND ACCESS ROAD OVER COURSE OF PROJECT.
USE ONE WATER TRUCK, PUMP AND DRIVER

ASSUME INSTALLATION OF 6 INCH HDPE WATER LINE

DURATION = 22,000 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
TEAMSTERS	1.00	EA	21.10								0.00		
CREW			21.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	21.10
SUBTOTAL	22,000	HOURS	464,116	0	0	0	0	0	0	0	0	464,116	42,192.36
MATERIALS:													
HDPE 6INCH WATER LINE (SDR 2	111,936	LF								1,231,296		1,231,296	
PUMP	1	EA		15,000								15,000	
PUMP STATIONS	3	EA								135,000		135,000	
SURGE TANK	200,000	GAL								200,000		200,000	
BUY WATER TRUCK	1	EA			125,000	45,100	52,000					[illegible]	
												0	
												0	
												0	
												[illegible]	
												[illegible]	
												[illegible]	
												0	
TOTALS			464,116	15,000	125,000	45,100	52,000	0	0	[illegible]		[illegible]	206,155.64

PROJECT:	Atlas Option Alternate Site A	ESTIMATOR:	AGS	[illegible] 32 OF [illegible] 40	
CLIENT:	ATLAS CORP				
JOB NO:	88 5? 10	DATE:	09-Dec-93	TIME:	03:17 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	PERMITTING AND ACCESS AGREEMENT			JOB QUANTITY:	1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

ASSUME 2 ENGINEERS FOR 1 YEAR		2080 HOURS
ENVIRONMENTAL IMPACT STATEMENT	$750,000	
ASSUME PERMIT FEES	$75,000	
	$825,000	

DURATION = 2,080 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
PROJ. ENGINEER	2.00	EA	47.53								2.00		
CREW			47.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	HOURLY CREW COSTS	49.53
SUBTOTAL	2,080	HOURS	98,863	0	0	0	0	0	0	0	4,160	103,023	103,023.00
MATERIALS:													
												0	
-PERMITTING	1	EA								825,000		825,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			98,863	0	0	0	0	0	0	825,000	4,160	[illegible]	[illegible]

PROJECT: Atlas Option Alternate Site 4
CLIENT: ATLAS COST
JOB NO: 08 47 10
LOCATION: Moab Utah
ITEM DESCRIPTION: DESIGN COSTS

ESTIMATOR: AGS
SHT [illegible] OF SHT 40
DATE: 09 Dec 92
TIME: 01:17 PM
JOB QUANTITY: 1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

ASSUME DESIGN COST OF 500000

500000

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
												HOURLY	
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS													
DESIGN AND SUPPORT	1 EA		500,000									500,000	
TOTALS			500,000	0	0	0	0	0	0	0	0	500,000	500,000.00

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: AIR MONITORING/HEATH AND SAFETY

ESTIMATOR: AGS SHT 34 OF SHT 40
DATE: 09-Dec-93 TIME: 03:17 PM
JOB QUANTITY: 11 YR

ESTIMATOR NOTES AND ASSUMPTIONS:

ASSUME MONITORING FOR AMBIENT DUST PM-10

ASSUME 4 STATIONS IN THE EXCAVATION AND 3 AT THE REPOSITORY
ASSUME ONE TECHS TO RUN SYSTEM ALONG WITH RADON CANISTERS AND MINI RAM AND PERSONNAL MONITORS.
ASSUME IQAT TEAM ONCE PER YEAR MONITORS QA/QC

DURATION = 22,300 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
H&S TECHNICIAN	2.00	EA	51.69								2.00		
												HOURLY	
CREW			51.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	CREW COSTS	53.[illegible]
SUBTOTAL	22,300	HOURS	1,152,637	0	0	0	0	0	0	0	44,600	1,197,237	108,839.73
MATERIALS													
												0	
AIR MONITORING EQUIPMENT	1	EA		100,000								100,000	
BIO ASSAYS	11	YR		40,000								40,000	
TLD BADGES	11	YR		5,000								5,000	
H&S SUPPLIES	11	YR		132,000								132,000	
IQAT	11	YR		44,000								44,000	
												0	
												0	
												0	
												0	
												0	
												0	
TOTAL			1,152,637	[illegible]	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS CORP
JOB NO: 08-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: PURCHASE LAND

ESTIMATOR: AG3   SHT 2? OF SHT 40
DATE: 09-Dec-93   TIME: 03:17 PM
JOB QUANTITY: 640 AC

ESTIMATOR NOTES AND ASSUMPTIONS:

ASSUME PURCHASE OF LAND FOR REPOSITORY AND ACCESS ROADS

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
PURCHASE LAND	640	AC							339,200			339,200	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	339,[illegible]	0	[illegible]	[illegible]	530.00

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS CORP
JOB NO: 35 67 10
LOCATION: Moab Utah
ITEM DESCRIPTION: ANALYTICAL COSTS

ESTIMATOR: AGS
DATE: 09 Dec 93
SHT 76 OF SHT 90
TIME: 03:17 PM
JOB QUANTITY: 11 YR

ESTIMATOR NOTES AND ASSUMPTIONS:

RADIOLOGICAL SURVEY (POST)	70000	
AIR MONITORING	154154	ASSUME MONITORING ONCE PER WEEK @ 7 LOCATION FOR 11 YEARS = 4004 SAMPLES PLUS QA @ 35 PER EACH
RADON MONITORING	45000	
GEOTECHNICAL	20000	
	289154	

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS													
ANALYSIS	11	YR								289,154		289,154	
TOTALS			0	0	0	0	0	0	0	289,154	0	289,154	26,286.73

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS CORP.
JOB NO: 38 17 10
LOCATION: Moab Utah
ITEM DESCRIPTION: Well Maintenance

ESTIMATOR: MGS
DATE: 09-Dec-93
SHT 37 OF SHT 40
TIME: 02:12 PM
JOB QUANTITY: 5 yr

ESTIMATOR NOTES AND ASSUMPTIONS:

Assume Wells only operate for 5 years
Assume using 1 operator and 1 truck full time
7- 4inch Extraction Wells
7 3.75 inch extraction pumps

Labor = 10400
Wells # 175 lf/year
Pumps # 3.5 ea/year

-Wells and pumps need changed every two years
-Assume wells # 50 feet deep

Period of time = 5 years

DURATION = 10,400 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
LOCAL OPERATOR	1.00	EA	24.61								0.00		
PICKUP *	1.00	EA			2.46	1.50	1.00						
CREW			24.61	0.00	2.46	1.50	1.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	29.57
SUBTOTAL	10,400	HOURS	255,914	0	25,584	15,600	10,400	0	0	0	0	307,498	61,499.60
MATERIALS:													
Buy Pumps and Riser	18	ea							33,390			33,390	
Well Installation	[illegible]	lf								25,375		25,375	
[illegible] for Wells	5	yrs						5,000				5,000	
ELECTRICAL	600,000	KWH						48,000				48,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			255,914	0	25,584	[illegible]	10,400	53,000	[illegible]	[illegible]	0	[illegible]	83,852.60

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS CORP
JOB NO: 88-67.10
LOCATION: Moab Utah
ITEM DESCRIPTION: NRC Surveillance

ESTIMATOR: AG. SHT 39 OF SHT 80
DATE: 09 Dec-93 TIME: 03:17 PM
JOB QUANTITY: 10 yr

ESTIMATOR NOTES AND ASSUMPTIONS:

Assume 10 hours per month

-Total -

	year 1	192 hours/year
114 $ per hour	year 2-10	384 hours/year

DURATION = 0 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIAL													
												0	
												0	
NRC Surveillance	3,648	hours								$415,8[illegible]		$415,872	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTAL			0	0	0	0	0	0	0	[illegible]	0	[illegible]	$1,587.20

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS CORP.
JOB NO: 88 67 10
LOCATION: Moab Utah
ITEM DESCRIPTION: Long Term Monitoring

ESTIMATOR: AGS
SHT 39 OF SHT 40
DATE: 09-Dec-93
TIME: 02:17 PM
JOB QUANTITY: 30 year

ESTIMATOR NOTES AND ASSUMPTIONS:

-Assume quarterly samples of [illegible] wells for 10 years

-Cost per sampling event approximately $1,000
-Cost estimation at $4,000 per year.

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIAL:													
												0	
Long term monito[illegible]	30	year								120,000		120,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS:			0	0	0	0	0	0		[illegible]	0	[illegible]	4,000.00

PROJECT: Atlas Option Alternate Site A
CLIENT: ATLAS CORP
JOB NO: 93-47-10
LOCATION: Moab Utah
ITEM DESCRIPTION: Env. Impact Statement

ESTIMATOR: AGI
DATE: 09 Dec 93
SHT 40 OF SHT 40
TIME: 03:17 PM
JOB QUANTITY: 1 ea

ESTIMATOR NOTES AND ASSUMPTIONS:

-Assume cost of EIS at 1.5 million

DURATION - HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
Env. Impact Statem	1	ea								1,500,000		0	
												1,500,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
				0	0	0	0	0	[illegible]	[illegible]		[illegible]	[illegible]

PROJECT: Atlas Option 1 RR TransportatESTIMATOR: AGS FILE NAME: Atlas SHT 1 OF SHT 41
CLIENT: ATLAS CORP.
JOB NO.: 08-67-10
LOCATION: Moab Utah DATE: 08-Dec-93 TIME: 05:54 PM

ESTIMATE SUMMARY

ITEM DESCRIPTION	DETAIL SHEET	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIAL	SUBS	TRAVEL	UNIT COSTS	TOTAL COSTS	UNIT BID	TOTAL BID
TOTAL FIXED OVERHEADS	SHT 6	1	LS	0	0	0	0	6	179,025		0	0	179,025.00	179,025	217,325.50	217,326
VARIABLE JOBSITE OVERHEADS	SHT 7	624	WEEKS	3,651,024	0	0	0	0	0		0	93,600	6,001.00	3,744,624	12,020.02	7,500,492
MOBILIZATION, DEMOBILIZATION, DECOSHT 8		1	EA	56,374	0	0	0	50,000	0	0	350,600	0	456,974.00	456,974	582,628.19	582,628
CONSTRUCT NEW RAIL AND EMBANKMENTSHT 9		18,500	LF	51,310	0	114,772	17,625	12,338	0	0	832,500	0	55.60	1,028,545	67.46	1,248,010
RAILROAD EQUIPMENT RENTAL	SHT 10	132	MO	0	0	10,910,625	0	0	0	0	0	0	82,656.25	10,910,625	100,339.68	13,244,838
CONSTRUCT LOADING FACILITY	SHT 11	1	EA	0	0	0	0	0	0	0	2,050,000	0	2,050,000.00	2,050,000	2,384,885.10	2,384,885
EXCAVATE, LOAD TAILINGS	SHT 12	7,800,000	CY	5,132,452	0	8,628,905	2,112,829	1,059,231	0	0	0	0	2.17	16,933,417	3.17	24,726,000
OFF-LOAD AND DISPOSAL	SHT 13	7,800,000	CY	4,733,240	0	9,625,778	1,397,294	969,091	0	0	0	0	2.14	16,725,403	3.09	24,102,000
UTILITY RELOCATION AND INSTALLATISHT 14		1	EA	0	0	0	0	0	1,000,000	0	140,000	0	1,140,000.00	1,140,000	1,376,809.60	1,376,810
SITE RECLAMATION	SHT 15	340	AC	32,091	0	81,497	13,458	10,190	0	0	340,000	0	1,403.64	477,236	1,729.73	588,108
EXCAVATE OVERBURDEN REPOSITORY	SHT 16	5,500,000	CY	1,542,246	0	4,338,700	665,000	456,250	0	0	0	0	1.27	7,002,196	1.77	9,735,000
SOIL ROCK MATRIX	SHT 17	122,800	CY	170,047	0	383,787	57,256	40,217	0	1,168,749	0	0	14.82	1,820,056	18.63	2,287,764
ROCK ARMOR	SHT 18	26,000	CY	57,622	0	85,171	12,480	10,660	0	860,730	0	0	39.49	1,026,663	48.05	1,249,300
RIPRAP PLACEMENT	SHT 19	25,000	CY	55,406	0	81,895	12,000	10,256	0	715,875	0	0	35.02	875,426	42.85	1,071,250
MISC STRUCTURES	SHT 20	1	LS	0	0	0	0	0	0	0	100,000	0	100,000.00	100,000	116,335.86	116,336
COMPACT CONDITION CLAY LINER	SHT 21	425,000	CY	219,900	0	487,518	63,074	43,659	0	0	0	0	1.92	814,151	2.74	1,164,500
PLACE RADON CAP	SHT 22	210,000	CY	103,959	0	223,847	28,111	19,664	0	0	0	0	1.79	375,581	2.57	539,700
PLACE FINAL CAP	SHT 23	419,000	CY	198,050	0	421,324	52,280	36,948	0	0	0	0	1.69	708,602	2.44	1,022,360
FENCING	SHT 24	15,000	LF	0	0	0	0	0	0	0	180,000	0	12.00	180,000	13.96	209,400
MONITORING CONTROL	SHT 25	1	EA	0	0	0	0	0	0	0	66,500	0	66,500.00	66,500	77,363.35	77,363
ACCESS ROADS	SHT 26	20,000	LF	47,082	0	60,280	9,000	7,200	0	32,340	0	0	7.80	155,902	11.29	225,800
MILL SITE SOILS EXCAVATION	SHT 27	300,000	CY	277,422	0	474,279	106,617	59,376	0	0	0	0	3.06	917,694	4.46	1,338,000
OFFLOAD MILL SOILS	SHT 28	300,000	CY	224,757	0	370,304	53,754	37,281	0	0	0	0	2.29	686,096	3.38	1,014,000
TAILING EMBANKMENT SOILS EXCAVATISHT 29		100,000	CY	92,474	0	158,093	35,539	19,792	0	0	0	0	3.06	305,898	4.46	446,000
OFFLOAD EMBANKMENT SOILS	SHT 30	100,000	CY	74,919	0	123,435	17,918	12,427	0	0	0	0	2.29	228,699	3.38	338,000
TRANSPORT MILL DEMO DEBRIS	SHT 31	35,000	CY	206,700	0	450,597	9,450	11,900	0	0	0	0	19.39	678,647	28.32	991,200
DUST CONTROL/WATER TRANSPORT	SHT 32	11	YEAR	464,116	15,000	125,000	45,300	52,000	0	0	1,566,296	0	206,155.64	2,267,712	277,204.20	3,049,246
PERMITTING AND ACCESS AGREEMENT	SHT 33	1	EA	98,863	0	0	0	0	0	0	825,000	4,160	928,023.00	928,023	1,164,843.64	1,164,844
DESIGN COSTS	SHT 34	1	EA	500,000	0	0	0	0	0	0	0	0	500,000.00	500,000	1,011,616.16	1,011,616
AIR MONITORING/HEATH AND SAFETY	SHT 35	11	YR	1,152,637	321,000	0	0	0	0	0	0	44,600	138,021.55	1,518,237	252,351.70	2,775,869
PURCHASE LAND	SHT 36	640	AC	0	0	0	0	0	0	339,200	0	0	530.00	339,200	616.58	394,611
ANALYTICAL COSTS	SHT 37	11	YR	0	0	0	0	0	0	0	289,154	0	26,286.73	289,154	30,580.89	336,390
Well Maintenance	SHT 38	5	yr	255,914	0	25,584	15,600	10,400	53,000	33,390	25,375	0	83,852.60	419,263	142,619.38	713,097
NRC Surveilance	SHT 39	10	yr	0	0	0	0	0	0	0	415,872	0	41,587.20	415,872	48,380.83	483,808
Long Term Monitoring	SHT 40	30	year	0	0	0	0	0	0	0	120,000	0	4,000.00	120,000	4,653.43	139,603
Environmental Impact Statement	SHT 41	1	ea	0	0	0	0	0	0	0	1,500,000	0	1,500,000.00	1,500,000	1,745,037.08	1,745,038
SUBTOTAL				19,398,605	336,000	37,171,391	4,724,584	2,928,874	1,232,025	3,150,284	8,801,297	142,360		77,885,420		

PROJECT: Atlas Option I RR Transportation DATE: 08-Dec 93
CLIENT: ATLAS CORP.
JOB NO.: 08-67-10 TIME: 04:35 PM
LOCATION: Moab Utah
WEEKLY WORK HOUR BASIS: ESTIMATOR: AGS

1) PROJECT BASED ON WORKING 50 HOURS PER WEEK.

2) RATES ARE BASED ON PREVAILING WAGE RATES FOR UTAH

SUBSISTENCE AND TRAVEL COST CALCULATIONS: AMOUNTS APPLIED TO THE FIRST 40 HOURS OF WORK

S&T CLASS	GENERAL DESCRIPITON	TRAVEL BASIS (WKS/TRP)	TRAVEL COST (PER TRIP)	LODGING COST (PER NIGHT)	SUBSISTENCE COST (PER WEEK)	HOURLY COSTS TRAVEL	LODGING	SUBSISTENCE	TOTALS
FULL TIME PERSONNEL:									
S1	TRAVEL BY AIR	2				$0.00	$0.00	$0.00	$0.00
S2	TRAVEL BY AUTO (DISTANT)	2				$0.00	$0.00	$0.00	$0.00
S3	TRAVEL BY AUTO (LOCAL)	1	$50			$1.25	$0.00	$0.00	$1.25
S4						ERR	ERR	$0.00	ERR
S5						ERR	ERR	$0.00	ERR
SITE HIRE PERSONNEL:									
H1	TRAVEL BY AIR	3				$0.00	$0.00	$0.00	$0.00
H2	TRAVEL BY AUTO (DISTANT)	3				$0.00	$0.00	$0.00	$0.00
H3	TRAVEL BY AUTO (LOCAL)	1				$0.00	$0.00	$0.00	$0.00
H4						ERR	ERR	$0.00	ERR
H5						ERR	ERR	$0.00	ERR

TAX AND INSURANCE CALCULATIONS:

	DESCRIPTION	NON-REP	SALARY	REMARKS
*	FUI %	0.80%	0.80%	STANDARD FEDERAL RATE APPLIED TO ALL WAGES PAID
*	SUI %	2.60%	2.60%	RATE VARIES WITH STATE, APPLIES TO ALL WAGES PAID
*	FICA %	7.65%	7.65%	STANDARD FEDERAL RATE APPLIED TO ALL WAGES PAID
	WC %	7.88%	7.88%	VARIES BY CRAFT SEE WAGE RATE TABLE, BASE WAGE ONLY
	HEALTH (MNTHLY)	$350	$350	MONTHLY COST, COVERAGE, FIRST 40 HOURS (AVG $350)
	LTL %	N/A	1.18%	SALARY EMPLOYEES ONLY, BASE WAGE ONLY.
	STRAIGHT %	18.93%	20.11%	
*	OVERTIME %	11.05%	11.05%	

PROJECT: Atlas Option I RR Transportation DATE: 08-Dec-93 SHT 3b OF SHT 41
CLIENT: ATLAS CORP.
JOB NO.: 08-67-10 TIME: 04:35 PM
LOCATION: Moab Utah
ESTIMATOR: AGS

WAGE RATE TABLE

	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
	ESCAL			<= TAXABLE FRINGES =>		<= NON-TXBLE FRNGS =>		<===== CANONIE ADDITIONS =====>			STRAIGHT HOURLY		PREMIUM HOURLY		AVG HOURLY @ 50 HRS	
DESCRIPTION	FACTOR MULTIPLIER	SUB & TRVL CLASS	BASE WAGE	VACATION	ALL OTHER	H&W	ALL OTHER	WKRS COMP %'AGE	HEALTH INS	SUB & TRAVEL	BARE HOURLY	TOTAL HOURLY	BARE HOURLY	TOTAL HOURLY	BARE HOURLY	TOTAL HOURLY
*****HOURLY SITE HIRES*****																
72 FIELD FORMAN	1.00		$18.30					7.88%	$1.99	$0.00	$18.30	$23.75	$27.45	$31.93	$20.13	$25.39
73 MECHANIC	1.00		$17.00					7.88%	$1.99	$0.00	$17.00	$22.21	$25.50	$29.66	$18.70	$23.70
74 MECHANIC HELPER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
75 KEY OPERATOR	1.00		$17.70					7.68%	$1.99	$0.00	$17.70	$23.04	$26.55	$30.88	$19.47	$24.61
76 LOCAL OPERATOR	1.00		$17.70					7.88%	$1.99	$0.00	$17.70	$23.04	$26.55	$30.88	$19.47	$24.61
77 OILER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
78 KEY LABORER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
79 LOCAL LABORER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
80 PIPEFITTER	1.00		$13.00					7.88%	$1.99	$0.00	$13.00	$17.45	$19.50	$22.68	$14.30	$18.50
81 ELECTRICIAN	1.00		$17.00					7.88%	$1.99	$0.00	$17.00	$22.21	$25.50	$29.66	$18.70	$23.70
82 CARPENTER FRM.	1.00							7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
83 CARPENTER	1.00							7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
84 CEMENT MASONS	1.00							7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
85 TEAMSTERS	1.00		$15.00					7.88%	$1.99	$0.00	$15.00	$19.93	$22.50	$26.17	$16.50	$21.10
86																
*****FULL TIME EXEMPT*****																
88 PROJECT MANAGER	1.00		$32.88					7.88%	$1.99	$0.00	$32.88	$41.48	$0.00	$0.00	$26.30	$33.19
89 SUPERINTENDENT	1.00	$3	$27.76					7.88%	$1.99	$1.25	$27.76	$36.59	$0.00	$0.00	$22.21	$29.27
90 PROJ. SUPERVISOR	1.00	$3	$25.96					7.88%	$1.99	$1.25	$25.96	$34.42	$0.00	$0.00	$20.77	$27.54
91 PROJ. ENGINEER	1.00	$3	$23.08					7.88%	$1.99	$1.25	$23.08	$30.96	$0.00	$0.00	$18.46	$24.77
92 H&S OFFICER	1.00	$3	$21.63					7.88%	$1.99	$1.25	$21.63	$29.22	$0.00	$0.00	$17.31	$23.38
93 CHEMIST	1.00	$3	$21.63					7.88%	$1.99	$1.25	$21.63	$29.22	$0.00	$0.00	$17.31	$23.38
94								7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
*****FULL TIME NON-EXEMPT*****																
96 H&S TECHNICIAN	1.00	$3	$20.19					7.88%	$1.99	$1.25	$20.19	$27.49	$20.19	$24.25	$20.19	$26.04
97 AST. PROJ. ENG.	1.00	$3	$20.19					7.88%	$1.99	$1.25	$20.19	$27.49	$20.19	$24.25	$20.19	$26.04
98 ENGINEER TECH.	1.00	$3	$18.27					7.88%	$1.99	$1.25	$18.27	$25.18	$18.27	$21.94	$18.27	$24.53
99								7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
100								7.88%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
*****FULL TIME HOURLY*****																
102 OFFICE MANAGER	1.00		$9.50					7.88%	$1.99	$0.00	$9.50	$13.29	$14.25	$16.57	$10.45	$13.94
103 CLERK	1.00		$8.50					7.88%	$1.99	$0.00	$8.50	$12.10	$12.75	$14.83	$9.35	$12.64
104																

PROJECT:	Atlas Option 1 R8 Transportation	DATE: 08-Dec-93	USE TAX RATE ------> 8.25%
CLIENT:	ATLAS CORP.		
JOB NO.:	88-67-10	TIME: 04:35 PM	HOURLY FUEL RATE IS BASED
LOCATION:	Moab Utah		UPON PAYING $1.00 PER GALLON.
		ESTIMATOR: AGS	

EQUIPMENT RENTAL RATES

EQUIPMENT ADJUSTMENT FACTORS:

MONTHLY	M	1.00
WEEKLY	W	1.44
DAILY	D	1.81

BASED ON OPERATING 176 HOURS PER MONTH

DESCRIPTION	TYPE		F MONTHLY RENTAL	G USE TAX	H HOURLY RENTAL 176 HR/MO	I HOURLY FUEL RATE	J HOURLY REPAIRS RATE	K PERIOD USAGE D,W,M	L ADJUSTMENT FACTOR APPLIED
****** INTERNAL EQUIPMENT ******									
121				1.08	$0.00	$0.00	$0.00		0.00
122				1.08	$0.00	$0.00	$0.00		0.00
123				1.08	$0.00	$0.00	$0.00		0.00
124				1.08	$0.00	$0.00	$0.00		0.00
****** EXTERNAL EQUIPMENT ******									
126 CASE 580 LDR/BKH	LOADER/BACKHOE		$2,000	1.08	$12.30	$3.00	$2.00	M	1.00
127 CAT 215 BKH	BACKHOE	(1.25 LCY)		1.08	$0.00	$4.00	$3.50		0.00
128 CAT 225 BKH W/THUM	BACKHOE	(1.62 LCY)		1.08	$0.00	$4.50	$4.25		0.00
129 CAT 235 BKH	BACKHOE	(2.75 LCY)	$9,000	1.08	$55.36	$6.50	$6.00	M	1.00
130 CAT 245 BKH	BACKHOE	(3.75 LCY)		1.08	$0.00	$11.00	$7.50		0.00
131									
132 CAT 936 FEL	FEL	(2.75 LCY)		1.08	$0.00	$4.00	$4.00		0.00
133 CAT 988 FEL	FEL	(10 LCY)	$16,265	1.08	$100.04	$5.00	$5.00	M	1.00
134 CAT 966 FEL	FEL	(4.50 LCY)	$7,650	1.08	$47.05	$7.00	$6.00	M	1.00
135 CAT 963 FEL|T	FEL/TRACK	(2.50 LCY)	$7,390	1.08	$45.45	$6.00	$7.00	M	1.00
136									
137 CAT D5 DZR	DOZER			1.08	$0.00	$4.00	$4.50		0.00
138 CAT D6 DZR	DOZER			1.08	$0.00	$5.50	$4.50		0.00
139 CAT D6 DZR|LG	DOZER/LGP			1.08	$0.00	$5.50	$4.50		0.00
140 CAT D7 DZR	DOZER			1.08	$0.00	$7.00	$5.25		0.00
141 CAT D8 DZR	DOZER		$11,590	1.08	$71.29	$11.00	$7.50	M	1.00
142 CAT D9 DZR	DOZER		$14,515	1.08	$89.28	$16.00	$10.00	M	1.00
143									
144 CAT 14 GDR	GRADER		$8,410	1.08	$51.73	$6.00	$6.50	M	1.00
145 CAT 16 GDR	GRADER		$13,730	1.08	$84.45	$8.00	$8.00	M	1.00
146									
147 CAT 563 VIB COMP	COMPACTOR		$4,150	1.08	$25.52	$5.00	$4.00	M	1.00
148 BOMAG WALK BEHIND	COMPACTOR	(48 INCH)		1.08	$0.00	$2.00	$2.00		0.00
149 CAT 825 COMP	COMPACTOR	SHEEPSFOOT	10800	1.08	$66.43	$10.00	$6.00	M	1.00
150									
151 CAT 615 SCPR	SCRAPER/ELEV	(16 LCY)		1.08	$0.00	$8.75	$8.75		0.00
152 CAT 631 SCPR	SCRAPER/SINGLE	(31 LCY)	17070	1.08	$104.99	$16.75	$9.56	M	1.00
153 CAT 627 SCPR|T	SCRAPER/TWIN	(20 LCY)	$14,000	1.08	$86.11	$17.75	$12.50	M	1.00
154 CAT 637 SCPR|T	SCRAPER/TWIN	(31 LCY)	$22,210	1.08	$136.60	$23.75	$17.50	M	1.00
155									
156 WATER TRUCK	MISC. EQUIPMENT		$4,100	1.08	$25.22	$4.00	$3.00	M	1.00
157 TANDEM DUMP TRUCK	MISC. EQUIPMENT			1.08	$0.00	$0.00	$0.00		0.00
158 RBD DUMP TRUCK	MISC. EQUIPMENT		$8,800	1.08	$54.13	$0.00	$0.50	M	1.00
159 350 CFM COMPRESSOR	MISC. EQUIPMENT			1.08	$0.00	$4.00	$2.00		0.00
160 65 TON CRANE	MISC. EQUIPMENT			1.08	$0.00	$5.00	$4.00		0.00
161 BAKER TANK RENTAL	MISC. EQUIPMENT			1.08	$0.00	$0.00	$0.00		0.00
162 WATER WAGON	MISC. EQUIPMENT		6300	1.08	$38.75	$8.75	$8.75	M	1.00
163 PICKUP	MISC. EQUIPMENT		400	1.08	$2.46	$1.50	$1.00	M	1.00

PROJECT: Atlas Option 1 RR Transportation DATE: 08-Dec-93 SHT 5 OF SHT 41
CLIENT: ATLAS CORP.
JOB NO.: 98-67-10 TIME: 04:35 PM SALES TAX RATE -------> 6.00%
LOCATION: Moab Utah
ESTIMATOR: AGS

SUMMARY OF MATERIAL AND SUBCONTRACT PRICES
USED IN CURRENT ESTIMATE

D	E	F	G	H	I	J
DESCRIPTION	QUANTITY	UNIT	QUOTED UNIT PRICE	SALES TAX	UNIT PRICE WITH TAX	TOTAL PRICE
		PERMANENT MATERIAL PRICES				
		****************************				
349 RIP RAP (FOB PIT)	37,500	TN	$6.16	1.06	$6.53	$244,875.00
350 RIP RAP TRANSPORTATION	37,500	TN	$3.00	1.06	$3.18	$119,250.00
351 ROCK ARMOR (FOB PIT)	131,100	TN	$8.97	1.06	$9.51	************
352 ROCK ARMOR TRANSPORTATION	131,100	TN	$3.00	1.06	$3.18	$416,898.00
353 CRUSHED STONE (FOB SITE)	4,400	TN	$6.93	1.06	$7.35	$32,340.00
354 PURCHASE LAND	640	AC	$500.00	1.06	$530.00	$339,200.00
355 FILTER MATERIAL (FOB PIT)	71,400	TN	$6.48	1.06	$6.87	$490,518.00
356 Buy Pumps and Riser	18	ea	$1,800.00	1.06	$1,908.00	$33,390.00
357 FILTER MATERIAL TRANSPORTATION	71,400	TN	$3.00	1.06	$3.18	$227,052.00
		MAJOR SUPPLY PRICES:				
		**********************				
360 ELECTRICAL	13,100,000	KWH	$0.43	1.06	$0.05	************
361				1.06	$0.00	$0.00
362				1.06	$0.00	$0.00
		SUBCONTRACT PRICES:				
		******************				
365 INSTALL TRACK AND BALLAST	18,500	LF	$45.00	1.00	$45.00	$832,500.00
366 CONSTRUCTION OF CONCRETE LOAD HOPPER	1	EA	$50,000.00	1.00	$50,000.00	$50,000.00
367 INSTALL COVERED CONVEYOR	2,000	LF	$650.00	1.00	$650.00	************
368 CONSTRUCT RAIL LOADING FACILITY	1	EA	$300,000.00	1.00	$300,000.00	$300,000.00
369 CONSTRUCT RAIL UNLOADING FACILITY	1	EA	$400,000.00	1.00	$400,000.00	$400,000.00
370 FENCE INSTALLATION	15,000	LF	$12.00	1.00	$12.00	$180,000.00
371 HYDROSEED AND MULCH	340	AC	$600.00	1.00	$600.00	$204,000.00
372 INSTALL MONITOR WELLS	2,000	LF	$25.00	1.00	$25.00	$50,000.00
373 INSTALL PIEZOMETERS	1,000	LF	$12.00	1.00	$12.00	$12,000.00
374 INSTALL SETTLEMENT MARKERS	15	EA	$300.00	1.00	$300.00	$4,500.00
375 IRRIGATION	340	AC	$400.00	1.00	$400.00	$136,000.00
376 HDPE 6INCH WATER LINE (SDR 21)	111,936	LF	$11.00	1.00	$11.00	************
377 PUMP STATIONS	3	EA	$45,000.00	1.00	$45,000.00	$135,000.00
378 SURGE TANK	200,000	GAL	$1.00	1.00	$1.00	$200,000.00
379 Well Installation	875	lf	$29.00	1.00	$29.00	$25,375.00

PROJECT: Atlas Option 1 RR Transportat DATE: 08-Dec-93 SHT 6 OF SHT 41
CLIENT: ATLAS CORP.
JOB NO.: 08-67-10 TIME: 04:35 PM
LOCATION: Moab Utah
EST:MATGR. AGS

FIXED COST JOBSITE OVERHEADS

DESCRIPTION	REQUIRED Y OR N	REQUIRED QUANTITY	UNIT RATE	I LABOR	J INT EQUIP	K EXT EQUIP	L FUEL	M REPAIRS	N SUPPLIES	O SUBS	P TRAVEL	Q TOTALS
*****SITE UTILITY HOOKUPS*****												
185 ELECTRIC			1200							0		0
186 WATER (NO METER VLT OR BKFLW PRVNTR)			500							0		0
187 SEWER										0		0
188 GAS										0		0
189 TELEPHONE			350							0		0
190										0		0
*****INITIAL HEALTH AND SAFETY COSTS*****												
192 PHYSICALS	Y	300	500						150000			150000
193 H & S TRAINING-OPERATORS			1,422	0								0
194 H & S TRAINING-LABORERS			1,198	0								0
195 TRAINING CLASS COSTS-EXTERNAL			700							0		0
196 TRAINING CLASS COSTS-INTERNAL			450						0			0
197 INITIAL H & S PURCHASES			350						0			0
198									0			0
199									0			0
200									0			0
*****INSURANCE AND TAXES*****												
202 CLIENT NAMED AS ADDITIONAL INSURED			8750						0			0
203 BUILDERS RISK INSURANCE (0.60 % OF REV.)									0			0
204 POLLUTION LIABILITY INSURANCE									0			0
205 SPECIAL TAXES									0			0
206									0			0
207									0			0
*****SITE OFFICE EQUIPMENT*****												
209 OFFICE FURNITURE (PER UNIT)	Y	15	75						1125			1125
210 FAX MACHINE	Y	1	400						400			400
211 COMPUTER	Y	1	3000						3000			3000
212 COMPUTER SOFTWARE	Y	1	4500						4500			4500
213 OFFICE BUILDING (COMPLETE	Y	1	20000						20000			20000
214									0			0
*****MISCELLANEOUS COSTS*****												
216 PERMITS			100						0			0
217 ROYALITIES ON PROCESSES									0			0
218 TEMPORARY FENCING			1.5						0			0
219 MOVING EXPENSES (LONG TERM PROJECT)									0			0
220 PROJECT SIGN			150						0			0
221									0			0
222									0			0
223									0			0
224									0			0
225									0			0
TOTAL FIXED OVERHEADS				0	0	0	0	0	179,025	0	0	179,025

PROJECT: Atlas Option I RR Transportation DATE: 08-Dec-93 SHT 7 OF SHT 41
CLIENT: ATLAS CORP.
JOB NO.: 88-67-10 TIME: 04:15 PM
LOCATION: Moab Utah
ESTIMATOR: AGS PROJECT DURATION = 624.0 WEEKS

VARIABLE COST JOBSITE OVERHEADS

DESCRIPTION	REQUIRED Y OR N	REQUIRED QUANTITY	DURATION	UNIT RATE	I TOTAL LABOR	J WEEKLY LABOR	K WEEKLY INT EQUIP	L WEEKLY EXT EQUIP	M WEEKLY FUEL	N WEEKLY REPAIRS	O WEEKLY SUPPLIES	P WEEKLY SUBS	Q WEEKLY TRAVEL	Q WEEKLY TOTALS
*****FULL TIME EXEMPT*****														
246 PROJECT MANAGER	Y	1	624	$1,659	1,035,216	1,659							0	1,659
247 SUPERINTENDENT			624	$1,413	0	0							0	0
248 PROJ. SUPERVISOR			624	$1,327	0	0							0	0
249 PROJ. ENGINEER	Y	2	624	$1,188	1,482,624	2,376							100	2,476
250 H&S OFFICER	Y	1	624	$1,119	698,256	1,119							50	1,169
251 CHEMIST			624	$1,119	0	0							0	0
252			624											0
253			624											0
														0
*****FULL TIME NON-EXEMPT*****														0
256 H&S TECHNICIAN			624	$1,292	0	0								0
257 AST. PROJ. EN			624	$1,292	0	0							0	0
258 ENGINEER TECH			624	$1,177	0	0							0	0
259			624										0	0
260			624											0
														0
*****HOURLY SITE HIRES*****														0
263 FIELD FORMAN			624	$1,269	0	0								0
264 MECHANIC			624	$1,185	0	0		0					0	0
265 MECHANIC HELPER			624	$925	0	0							0	0
266 OFFICE MANAGER	Y	1	624	$697	434,928	697							0	0
267 CLERK			624	$632	0	0							0	697
268			624										0	0
269			624											0
														0
*****INTERNAL EQUIPMENT RENTAL*****														0
272 PRESSURE WASHER (INTERNAL RATE)			624	$30			0							0
273 SAFETY EQUIPMENT (AIR SAMPLING/OVA)			624	$130			0							0
274			624				0							0
275			624				0							0
														0
*****EXTERNAL EQUIPMENT RENTAL*****														0
278 OFFICE TRAILER			624	$100				0						0
279 TOOL TRAILER			624	$75				0						0
280 CHANGE TRAILER			624	$100				0						0
281 DECONTAMINATION TRAILER			624	$225				0						0
282 LAB TRAILER			624	$100				0						0
283 FUEL TRUCK			624	$221				0						0
284 GREASE TRUCK			624					0						0
285 MISC. EQUIP			624	$75				0						0
286 SITE SCALES			624	$500				0						0
287 PROJECT VEHICLES			624	$150				0	0	0				0
288 STREET SWEEPER			624	$390				0						0

289			624				0						0
290			624				0						0
*****SUPPLIES*****													
293 OFFICE SUPPLIES	Y	1	624	$30						0			0
294 SURVEY SUPPLIES	Y	1	624	$50						0			0
295 SAFETY SUPPLIES			624	$30						0			0
296 COPY MACHINE	Y	1	624	$40						0			0
297 PHONE SERVICE	Y	1	624	$50						0			0
298 UTILITY SERVICES			624	$80						0			0
299 POTABLE WATER			624	$40						0			0
300 SANITARY FACILITIES			624	$30						0			0
301 SMALL TOOLS			624	$150						0			0
302 JOBSITE PHOTOS	Y	1	624	$5						0			0
303 ON-SITE QC TESTING EQUIP.			624	$200						0			0
304 ON SITE LAB SUPPLIES			624							0			0
305 DECONTAMINATION SUPPLIES	Y	1	624	$5						0			0
306			624							0			0
307			624							0			0
308			624							0			0
309			624							0			0
310			624							0			0
*****SUBCONTRACTS*****													
313 SURVEY CREW (BASED ON $140/HR FOR 40 HRS)			624	$5,600							0		0
314 SECURITY (FULL TIME AT $12/HOUR)			624	$2,016							0		0
315			624								0		0
316			624								0		0
317			624								0		0
*****TRAVEL COSTS*****													
320 TRAVEL, EXECUTIVE			624	$250								0	0
321 KEY OPERATOR ADJUSTMENT			624	$0	0							0	0
322 KEY LABORER ADJUSTMENT			624	$0	0							0	0
323			624									0	0
VARIABLE JOBSITE OVERHEADS (WEEKLY)					5,851	0	0	0	0	0	0	150	6,001
VARIABLE JOBSITE OVERHEADS (TOTAL)	624 WEEKS				3,651,024	0	0	0	0	0	0	93,600	3,744,624

PROJECT: Atlas Option I RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 08-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: MOBILIZATION, DEMOBILIZATION, DECONTAMINATION

ESTIMATOR: AGS   SHT 8 OF SHT 41
DATE: 08-Dec-93   TIME: 04:35 PM
JOB QUANTITY: 1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

-ITEM DESCRIPTION-	QTY	MILES	$EA	TOTAL
LOCAL LOADS	206	20	50	10300
REGIONAL LOADS	150	175	600	90000
SPECIAL LOADS	50	1200	1500	75000
MOBILIZATION	406			175300
DEMOB - RAIL CARS	356			100300
TOTAL MOB/DEMOB	762			275600

-DECONTAMINATION, ASSUME TWO LABORERS AT 2 HOURS PER EACH

DURATION = 1,524 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
LOCAL LABORER	2.00	EA	36.99								0.00		
CREW			36.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	36.99
SUBTOTAL	1,524	HOURS	56,374	0	0	0	0	0	0	0	0	56,374	56,374.00
MATERIALS:													
-MOBILIZATION/DEMOB	762	EA								275,600		275,600	
-PERSONNEL MOBILIZATION	15	EA								75,000		75,000	
-DECONTAMINATION SUPPLIES	1	EA					50,000					50,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			56,374	0	0	0	50,000	0	0	350,600	0	656,974	656,974.00

PROJECT:	Atlas Option I RR Transportation	ESTIMATOR:	AGS	SHT 9 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	CONSTRUCT NEW RAIL AND EMBANKMENT			JOB QUANTITY:	18,500 LF

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME CONSTRUCTION OF 3.5 MILES OF RAILWAY = 18480 LF
-ASSUME CROSS SECTION OF EMBANKMENT AT 51 SF PER FOOT
-QUANTITY = 35,000 CY
-ASSUME 50,000 CY IN GRADE LEVELING
-TOTAL ASSUMED QUANTITY = 85000 CY
-USE SCRAPER FLEET OF 3 AT AVERAGE HAUL OF 1200 FT
-PRODUCTION = 650 CY/HR= 85000 CY/ 650 CY/HR = 130.769230 HRS
-ADD MOBILIZATION SETUP AND TEARDOWN OF 1 WEEK 50 HOURS
\-\-\-\-\-\-\-\-\-\-\-
180.769230 HOURS

-RAIL AND BALLAST PLACEMENT TO BE DONE BY RIO GRANDE

DURATION = 181 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	3.00	EA	73.82		314.97	44.25	28.50				0.00		
CAT D9 DZR	1.00	EA	24.61		89.28	16.00	10.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT 825 COMP	1.00	EA	24.61		66.63	10.00	6.00				0.00		
WATER WAGON	1.00	EA	24.61		38.75	8.75	8.75				0.00		
PICKUP	1.00	EA	24.61		2.46	1.50	1.00				0.00		
FIELD FORMAN	1	EA	25.387314								0		
LOCAL LABORER	2	EA	36.990918								0		
CREW			283.84	0.00	634.91	97.50	68.25	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,084.50
SUBTOTAL	181	HOURS	51,310	0	114,772	17,625	12,338	0	0	0	0	196,045	10.60
MATERIALS:													
INSTALL TRACK AND BALLAST	18,500	LF								832,500		832,500	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			51,310	0	114,772	17,625	12,338	0	0	832,500	0	1,028,545	55.60

PROJECT:	Atlas Option 1 WR Transportation	ESTIMATOR:	AGS	SHT 10 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	RAILROAD EQUIPMENT RENTAL			JOB QUANTITY:	132 MO

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME PURCHASE OF RAIL ROAD EQUIPMENT AND AMORTIZING FOR EFFECT LIFE -ASSUME 11 YEARS

--PURCHASE TWO ELECTRIC ENGINES

3000000 * 1.15 26136.3636 + MAINTENCE @ 15% = 30056.8181
132 MONTHS

-PURCHASE 30 EA OPEN GONDOLAS

5250000 * 1.15 45738.6363 + MAINTENCE @ 15% = 52599.4318
132 MONTHS

==========

TOTAL MONTHLY RENTAL 82656.25

DURATION = 21,120 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	21,120	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
												0	
-RR EQUIPMENT RENTAL	132	MO			10,910,625							10,910,625	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	10,910,625	0	0	0	0	0	0	10,910,625	82,656.25

PROJECT:	Atlas Option I RR Transportation	ESTIMATOR:	AGS	SHT 11 OF SHT 41	
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	CONSTRUCT LOADING FACILITY			JOB QUANTITY:	1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME CONSTRUCTION OF 2500 LF CONVEYOR SYSTEM TO SIDING TRACKS.
-ASSUME CONSTRUCTING A FEED HOPPER STRUCTURE FOR LOADING BY DOZER
-ASSUME USING A SILO LOADING FACILITY AT THE SIDING WITH 1200 TN CAPACITY

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
CONSTRUCTION OF CONCRETE LOA	1	EA								50,000		50,000	
INSTALL COVERED CONVEYOR	2,000	LF								1,300,000		1,300,000	
CONSTRUCT RAIL LOADING FACIL	1	EA								300,000		300,000	
CONSTRUCT RAIL UNLOADING FAC	1	EA								400,000		400,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	2,050,000	0	2,050,000	2,050,000.00

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: EXCAVATE, LOAD TAILINGS

ESTIMATOR: AGS

DATE: 08-Dec-93 TIME: 04:35 PM

JOB QUANTITY: *********CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME PRODUCTION BASED ON LOADING FACILITY AND TRANSPORTATION CAPACITY
-ASSUME 25 GONDOLA'S AT 90 TNS PER EACH @ TWO TRIPS PER DAY
-ASSUME AVERAGE CONVERSION OF TAILING AT 1.4 TONS PER CY
-PRODUCTION = 4500 TNS PER DAY = 3461 CY PER DAY
-DURATION = 7800000 CY/ 3461 CY/DAY = 2253.68390 DAYS OR = 6.17447645 YEARS AT 7 DAYS PER WEEK ALL YEAR ROUND 3640 HR/YR
8.66801502 YEARS AT 5 DAYS PER WEEK ALL YEAR ROUND 2600 HR/YR

-FUEL FOR LOCOMOTIVE @ 5 GPH IDLE AND 50 GPH UNDER LOAD @ AVG 7,800,000
20 GAL PER HOUR PER EACH
-FUEL COSTS FOR DIESEL AT 0.8

-ASSUME USING 1-637, 2-D8, 1-WATER TRUCK AND 1 GRADER FOR EXCAVATION
-ASSUME USING 3 CONVEYOR AND LOADING OPERATORS AND 3 LABORERS

DURATION = 22,537 HOURS

DESCRIPTION		QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 637 SCPR(?		1.00	EA	24.61		136.60	23.75	17.50				0.00		
CAT 14 GDR	*	1.00	EA			51.73	6.50	6.50						
CAT D8 DZR		2.00	EA	49.21		142.58	22.00	15.00				0.00		
PICKUP	*	2.00	EA			4.92	3.00	2.00						
CAT 966 FEL		1.00	EA	24.61		47.05	7.00	6.00				0.00		
LOCAL OPERATOR		3.00	EA	73.82								0.00		
LOCAL LABORER		3.00	EA	55.49								0.00		
CREW				227.74	0.00	382.88	61.75	47.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	719.37
SUBTOTAL		22,537	HOURS	5,132,452	0	8,628,905	1,391,650	1,059,231	0	0	0	0	16,212,238	2.08
MATERIALS:														
-FUEL		901,474	GAL				721,179						721,179	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
													0	
TOTALS				5,132,452	0	8,628,905	2,112,829	1,059,231	0	0	0	0	16,933,417	2.17

PROJECT: Atlas Option I RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: OFF-LOAD AND DISPOSAL

ESTIMATOR: AGS
DATE: 08-Dec-93

SHT 13 OF SHT 41
TIME: 04:35 PM

JOB QUANTITY: *********CY
7,800,000

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME OFF-LOADING OPEN TOP GONDOLAS WITH MOUNTED BACKHOE
-ASSUME MATERIALS LOADED OUT OF STOCKPILE BY SCRAPER WITH DOZER ASSISTANCE
-ASSUME USING 2-631, 1-D8, GRADER, WATER TRUCK AND COMPACTOR, BACKHOE OPERATOR AND FOREMAN

DURATION = 22,537 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 631 SCPR	2.00	EA	49.21		289.98	29.50	19.00				0.00		
CAT 825 COMP	1.00	EA	24.61		66.43	10.00	6.00				0.00		
WATER TRUCK *	1.00	EA			25.22	4.00	3.00						
CAT 14 GDR *	1.00	EA			51.72	6.00	6.50						
FIELD FORMAN	1.00	EA	25.39								0.00		
PICKUP	1.00	EA	24.61		2.46	1.50	1.00				0.00		
LOCAL OPERATOR	1	EA	24.607104								0		
LOCAL LABORER	2	EA	36.990918								0		
CREW			210.02	0.00	427.11	62.00	43.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	742.13
SUBTOTAL	22,537	HOURS	4,733,260	0	9,625,778	1,397,294	969,091	0	0	0	0	16,725,403	2.14
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			6,733,260	0	9,625,778	1,397,294	969,091	0	0	0	0	16,725,403	2.14

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 98-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: UTILITY RELOCATION AND INSTALLATION

ESTIMATOR: AGS
SHT 14 OF SHT 41
DATE: 08-Dec-93
TIME: 04:35 PM
JOB QUANTITY: 1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

-RELOCATE POWER POLES	35000
-SERVICE TO LOADING HOPPER	25000
-SERVICE TO LOADING FACILITY	45000
-SERVICE TO OFF LOADING FACILITY	35000

	140000

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	DURATION HOURS UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
ELECTRICAL	*********	KWH						1,000,000				1,000,000	
-UTILITY SERVICES	1	EA								140,000		140,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	1,000,000	0	140,000	0	1,140,000	1,140,000.00

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS	SHT 15 OF	SHT 43
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	SITE RECLAMATION			JOB QUANTITY:	340 AC

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME RECLAMATION OF 130 ACRES
-ASSUME PLACEMENT OF SILTY SOILS FOR GROUND COVER AT 4 INCHES THICK
-QUANTITY IS ASSUMED TO BE 69212 CY
-USE 2 SCRAPERS AT COMBINED PRODUCTION OF 360 CY/HR AT 2000 FT HAUL
-DURATION = 192.25555 HOURS

DURATION = 192 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 637 SCPR|T	2.00	EA	49.21		273.20	47.50	35.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
WATER TRUCK	1.00	EA	24.61		25.22	4.00	3.00				0.00		
LOCAL LABORER	1.00	EA	18.50								0.00		
FIELD FORMAN	1.00	EA	25.39								0.00		
PICKUP	1.00	EA			2.45	1.50	1.00						
CREW			166.92	0.00	423.90	70.00	53.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	713.82
SUBTOTAL	192	HOURS	32,091	0	81,497	13,458	10,190	0	0	0	0	137,236	403.64
MATERIALS:													
HYDROSEED AND MULCH	340	AC								204,000		204,000	
IRRIGATION	340	AC								136,000		136,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			32,091	0	81,497	13,458	10,190	0	0	340,000	0	477,236	1,403.64

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: EXCAVATE OVERBURDEN REPOSITORY

ESTIMATOR: AGS
DATE: 08-Dec-93

TIME: 04:35 PM

JOB QUANTITY: *********CY

5,500,00

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME USING 631 FLEET AT 2000 FOOT HAUL
-ASSUME PRODUCTION OF 1100 CY/HR
-DURATION = 5500000 / 1100 CY/HR= 5000 HOURS

DURATION = 5,000 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	RNT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	5.00	EA	123.04		524.95	73.75	47.50				0.00		
CAT D9 DZR	2.00	EA	49.21		178.56	32.00	20.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
WATER WAGON	1.00	EA	24.61		38.75	8.75	8.75				0.00		
PICKUP	1.00	EA			2.46	1.50	1.00						
FIELD FORMAN	1.00	EA	25.39								0.00		
LOCAL LABORER	2	EA	36.930918								0		
CREW			308.45	0.00	867.74	133.00	91.25	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,400.44
SUBTOTAL	5,000	HOURS	1,542,246	0	4,338,700	665,000	456,250	0	0	0	0	7,002,196	1.27
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			1,542,246	0	4,338,700	665,000	456,250	0	0	0	0	7,002,196	1.27

PROJECT: Atlas Option I RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 58-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: SOIL ROCK MATRIX

ESTIMATOR: AGS
DATE: 08-Dec-93

TIME: 04:35 PM
JOB QUANTITY: 122,800 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-QUANTITY IS ASSUMED TO BE 61400 CY OF ROCK AND 61400 CY OF SOIL
-ASSUME DELIVERY OF ROCK @ 1000 CY/DAY
-DURATION = 61.4 DAYS OR 614 HOURS
-INCLUDE CREW TO PLACE SOILS

DURATION = 614 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 631 SCPR	3.00	EA	73.82		314.97	44.25	28.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT 563 VIB COMP	1.00	EA	24.61		25.52	5.00	4.00				0.00		
CAT D9 DZR	1.00	EA	24.61		89.28	16.00	10.00				0.00		
LOCAL LABORER	3.00	EA	55.49								0.00		
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
CAT D8 DZR	1	EA	24.607104		71.29	11	7.5				0		
WATER TRUCK	1	EA	24.607104		25.22	4	3				0		
CREW			276.95	0.00	625.06	93.25	65.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,060.76
SUBTOTAL	614	HOURS	170,047	0	383,787	57,256	40,217	0	0	0	0	651,307	5.30
MATERIALS:													
ROCK ARMOR (FOB PIT)	92,100	TN							875,871			875,871	
ROCK ARMOR TRANSPORTATION	92,100	TN							292,878			292,878	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			170,047	0	383,787	57,256	40,217	0	1,168,749	0	0	1,820,056	14.82

PROJECT:	Atlas Option I RR Transportation	ESTIMATOR:	AGS	SHT 18 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	08-67-10	DATE:	06 Dec 93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	ROCK ARMOR			JOB QUANTITY:	26,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME CONVERSION AT 1.5 TNS PER CY
-PLACE ROCK BY DOZER, LOADER AND TRACK LOADER
-ASSUME DELIVER OF STONE AT 1000 CY/DAY = 1500 TN/DAY
-TOTAL LOADS AT 23 TON PER LOAD = 65 TRUCKS PER DAY

-ASSUME SAME QUANTITY OF FILTER MATERIAL

DURATION = 520 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 963 FELT	1.00	EA	24.61		45.45	6.00	7.00				0.00		
LOCAL LABORER	2.00	EA	36.99								0.00		
CREW			110.81	0.00	163.79	24.00	20.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	31[illegible].10
SUBTOTAL	520	HOURS	57,622	0	85,171	12,480	10,660	0	0	0	0	165,933	6.38
MATERIALS:													
ROCK ARMOR (FOB PIT)	39,000	TN							370,890			370,890	
ROCK ARMOR TRANSPORTATION	39,000	TN							124,020			124,020	
FILTER MATERIAL (FOB PIT)	36,400	TN							250,068			250,068	
FILTER MATERIAL TRANSPORTATI	36,400	TN							115,752			115,752	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			57,622	0	85,171	12,480	10,660	0	860,730	0	0	1,026,663	39.49

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS	SHT 19 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	08-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	RIPRAP PLACEMENT			JOB QUANTITY:	25,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME CONVERSION AT 1.5 TNS PER CY
-PLACE ROCK BY DOZER, LOADER AND TRACK LOADER
-ASSUME DELIVER OF STONE AT 1000 CY/DAY = 1500 TN/DAY
-TOTAL LOADS AT 23 TON PER LOAD = 65 TRUCKS PER DAY
-ASSUME PLACING RIPRAP IS DRAINAGE DITCHES AND CHANNELS

-ASSUME SAME THICKNESS OF FILTER LAYER

DURATION = 500 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 963 FEL|T	1.00	EA	24.61		45.45	6.00	7.00				0.00		
LOCAL LABORER	2.00	EA	36.99								0.00		
CREW			110.81	0.00	163.79	24.00	20.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	319.10
SUBTOTAL	500	HOURS	55,406	0	81,895	12,000	10,250	0	0	0	0	159,551	6.38
MATERIALS:													
RIP RAP (FOB PIT)	37,500	TN							244,875			244,875	
RIP RAP TRANSPORTATION	37,500	TN							119,250			119,250	
FILTER MATERIAL (FOB PIT)	35,000	TN							240,450			240,450	
FILTER MATERIAL TRANSPORTATI	35,000	TN							111,300			111,300	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			55,406	0	81,895	12,000	10,250	0	715,875	0	0	875,426	35.02

PROJECT: Atlas Option i RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 86-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: MISC STRUCTURES

ESTIMATOR: AGS
DATE: 08-Dec-93
SHT 20 OF SHT 41
TIME: 04:35 PM
JOB QUANTITY: 1 LS

ESTIMATOR NOTES AND ASSUMPTIONS:

-CERTAIN DRAINAGE STRUCTURES WILL BE REQUIRED, FROM BOX CULVERT TO HEADWALLS.
-ASSUME AN ALLOWANCE TO 100,000 FOR ENTIRE PROJECT

DURATION - HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
-MISC STRUCTURES	1	LS								100,000		100,000	
TOTALS			0	0	0	0	0	0	0	100,000	0	100,000	100,000.00

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS
CLIENT:	ATLAS CORP.	SHT 21 OF SHT 41	
JOB NO:	08-67-10	DATE:	08-Dec-93
LOCATION:	Moab Utah	TIME:	04:35 PM
ITEM DESCRIPTION:	COMPACT CONDITION CLAY LINER	JOB QUANTITY:	425,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME OVEREXCAVATING 3 FOOT OF LINER AND RECOMPACTING AND CONDITIONING.
-USE SCRAPERS TO MOVE THE MATERIALS
-INCLUDE AN ADDITIONAL D-9 FOR RIPPING OF ROCK
-INCLUDE TWO COMPACTOR TO KEEP UP WITH COMPACTION EFFORTS
-PRODUCTION AT 1100 CY/HR
-DURATION = 425000 CY/ 1100 CY/HR = 386.363636
-ASSUME WATER AVAILABLE ON SITE FROM STORAGE SURGE TANK FOR DUST CONTROL AND COMPACTION NEEDS
-ASSUME HAUL DISTANCE OF 1200 FT

DURATION = 386 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D9 DZR	2.00	EA	49.21		178.56	32.00	20.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT 825 COMP	2.00	EA	49.21		132.86	20.00	12.00				0.00		
CAT 631 SCPR	5.00	EA	123.04		524.95	73.75	47.50				0.00		
WATER WAGON	2.00	EA	49.21		77.50	17.50	17.50				0.00		
LOCAL LABORER	3.00	EA	55.49								0.00		
FIELD FORMAN	2	EA	50.774628								0.00		
PICKUP *	2	EA			4.92	3	2				0		
CREW			426.15	0.00	1041.81	163.25	113.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,744.21
SUBTOTAL	386	HOURS	164,650	0	402,518	63,074	43,659	0	0	0	0	673,901	1.59
MATERIALS:													
												0	
-PREWET COMPACTION	425,000		55,250.00		85,000.00							140,250	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			219,900	0	487,518	63,074	43,659	0	0	0	0	814,151	1.92

PROJECT:	Atlas Option I RR Transportation	ESTIMATOR:	AGS	SHT 22 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	08 Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	PLACE RADON CAP			JOB QUANTITY:	210,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME PLACEMENT OF TO RADON CAP AT 1 FOOT OF MATERIAL
-USE SCRAPERS TO MOVE THE MATERIALS
-INCLUDE AN ADDITIONAL D-9 FOR RIPPING OF ROCK

-PRODUCTION AT 1100 CY/HR
-DURATION = 210000 CY/ 1100 CY/HR = 190.909090
-ASSUME WATER AVAILABLE ON SITE FOR DUST CONTROL AND COMPACTION NEEDS
-ASSUME HAUL DISTANCE OF 1200 FT

DURATION = 191 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D9 DIR	1.00	EA	24.61		89.28	16.00	10.00				0.00		
CAT D8 DIR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT 825 COMP	2.00	EA	49.21		132.86	20.00	12.00				0.00		
CAT 631 SCPR	5.00	EA	123.04		524.95	73.75	47.50				0.00		
WATER WAGON	2.00	EA	49.21		77.50	17.50	17.50				0.00		
LOCAL LABORER	3.00	EA	55.49								0.00		
FIELD FORMAN	2	EA	50.774620								0.00		
PICKUP	2	EA			4.92	3	2				0		
CREW			401.55	0.00	952.53	147.25	103.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,604.33
SUBTOTAL	191	HOURS	76,659	0	181,847	28,111	19,664	0	0	0	0	306,281	1.46
MATERIALS:													
												0	
-PREMET COMPACTION	210,000		27,300.00		42,000.00							69,300	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			103,959	0	223,847	28,111	19,664	0	0	0	0	375,581	1.79

PROJECT: Atlas Option 1 RR Transportation ESTIMATOR: AGS SHT 23 OF SHT 41
CLIENT: ATLAS CORP.
JOB NO: 88-67-10 DATE: 08-Dec-93 TIME: 04:35 PM
LOCATION: Moab Utah
ITEM DESCRIPTION: PLACE FINAL CAP JOB QUANTITY: 419,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME PLACEMENT OF FINAL COVER AT 2 FOOT THICK
-USE SCRAPERS TO MOVE THE MATERIALS
-INCLUDE AN ADDITIONAL D-9 FOR RIPPING OF ROCK

-PRODUCTION AT 1100 CY/HR
-DURATION = 419000 CY/ 1100 CY/HR = 380.909090
-ASSUME WATER AVAILABLE ON SITE FOR DUST CONTROL AND COMPACTION NEEDS
-ASSUME HAUL DISTANCE OF 1200 FT

DURATION = 381 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D9 DZR	1.00	EA	24.61		89.28	20	10.00				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT 825 COMP	1.00	EA	24.61		66.63	10.00	6.00				0.00		
CAT 631 SCPR	5.00	EA	123.04		524.95	73.75	47.50				0.00		
WATER WAGON	2.00	EA	49.21		77.50	17.50	17.50				0.00		
LOCAL LABORER	3.00	EA	55.49								0.00		
FIELD FORMAN	2	EA	50.774628								0		
PICKUP *	2	EA			4.92	3	2						
CREW			376.94	0.00	886.10	137.25	97.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,497.29
SUBTOTAL	381	HOURS	143,580	0	337,524	52,280	36,948	0	0	0	0	570,332	1.36
MATERIALS:													
												0	
-PREVET COMPACTION	4:9,000		54,470.00		83,800.00							138,270	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			198,050	0	421,324	52,280	36,948	0	0	0	0	708,602	1.69

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: FENCING

ESTIMATOR: AGS
DATE: 08-Dec-93
SHT 24 OF SHT 41
TIME: 04:35 PM
JOB QUANTITY: 15,000 LF

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME FENCING OF PERIMETER OF REPOSITORY FOR INSTITUTIONAL CONTROL

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
FENCE INSTALLATION	15,000 LF									180,000		180,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	180,000	0	180,000	12.00

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: MONITORING CONTROL

ESTIMATOR: AGS
DATE: 08-Dec-93

TIME: 04:35 PM

JOB QUANTITY: 1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME INSTALLATION OF 10 PIEZOMETERS
-ASSUME INSTALLATION OF 20 MONITORING WELLS AT 100 FT DEPTH
-ASSUME ALLOWANCE FOR SETTLEMENT MARKERS AND SURVEY MONUMENTS

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
INSTALL MONITOR WELLS	2,000	LF								50,000		50,000	
INSTALL PIEZOMETERS	1,000	LF								12,000		12,000	
INSTALL SETTLEMENT MARKERS	15	EA								4,500		4,500	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	66,500	0	66,500	66,500.00

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 08-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: AC??SS ROADS

ESTIMATOR: AGS
SHT 26 OF SHT 41
DATE: 08-Dec-93
TIME: 04:35 PM
JOB QUANTITY: 20,000 LF

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME ACCESS ROAD ALONG NEW RAIL SPUR AND REPOSITORY AREA
-ASSUME ROAD AT 12 FOOT WIDE AND 4 INCHES THICK

QUANTITY = 2933.3333 CY
-ASSUME CONSTRUCT AT 50 LF HR = 400 HOURS

DURATION = 400 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
WATER TRUCK	1.00	EA	24.61		25.22	4.00	3.00				0.00		
LOCAL LABORER	1.00	EA	18.50								0.00		
PICKUP	1.00	EA			2.46	1.50	1.00						
FIELD FORMAN	1.00	EA	25.39								0.00		
CREW			117.70	0.00	150.70	22.50	18.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	308.90
SUBTOTAL	400	HOURS	47,082	0	60,280	9,000	7,200	0	0	0	0	123,562	6.18
MATERIALS:													
CRUSHED STONE (FOB SITE)	4,400	TN							32,340			32,340	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			47,082	0	60,280	9,000	7,200	0	32,340	0	0	155,902	7.80

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: MILL SITE SOILS EXCAVATION

ESTIMATOR: AGS SHT 27 OF SHT 41
DATE: 08-Dec-93 TIME: 04:35 PM
JOB QUANTITY: 300,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS: FUEL COST OF 0.8 PER GAL

-ASSUME PRODUCTION BASED ON LOADING FACILITY AND TRANSPORTATION CAPACITY
-ASSUME 25 GONDOLA'S AT 90 TNS PER EACH @ TWO TRIPS PER DAY
-ASSUME AVERAGE CONVERSION OF TAILING AT 1.4 TONS PER CY
-PRODUCTION = 4500 TNS PER DAY = 3461 CY PER DAY
-DURATION = 300000 CY/ 3461 CY/DAY = 86.6801502 DAYS OR = 0.23747986 YEARS AT 7 DAYS PER WEEK ALL YEAR ROUND 3640 HR/YR
0.33338519 YEARS AT 5 DAYS PER WEEK ALL YEAR ROUND 2600 HR/YR

-ASSUME USING 2-637, 2-D8, 1-WATER TRUCK AND 1 GRADER FOR EXCAVATION
-ASSUME USING 3 CONVEYOR AND LOADING OPERATORS AND 3 LABORERS

DURATION = 867 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 637 SCPR|T	2.00	EA	49.21		273.20	47.50	35.00				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	5.00	6.50				0.00		
CAT D8 DZR	2.00	EA	49.21		142.50	22.00	15.00				0.00		
PICKUP *	3.00	EA			7.38	4.50	3.00						
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
LOCAL OPERATOR	3.00	EA	73.82								0.00		
LOCAL LABORER	4.00	EA	73.98								0.00		
WATER TRUCK	1	EA	24.607104		25.22	4	3				0		
CREW			320.05	0.00	547.16	91.00	68.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,026.71
SUBTOTAL	867	HOURS	277,422	0	474,279	78,879	59,376	0	0	0	0	889,956	2.97
MATERIALS:													
												0	
-FUEL	34,672	GAL				27,738						27,738	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			277,422	0	474,279	106,617	59,376	0	0	0	0	917,694	3.06

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: OFFLOAD MILL SOILS

ESTIMATOR: AGS
DATE: 08-Dec-93

TIME: 05:54 PM
JOB QUANTITY: 300,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME OFF-LOADING OPEN TOP GONDOLAS WITH MOUNTED BACKHOE
-ASSUME MATERIALS LOADED OUT OF STOCKPILE BY SCRAPER WITH DOZER ASSISTANCE
-ASSUME USING 2-631, 1-D8, GRADER, WATER TRUCK AND COMPACTOR, BACKHOE OPERATOR AND FOREMAN

DURATION = 867 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	RNT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 631 SCPR	2.00	EA	49.21		209.98	29.50	19.00				0.00		
CAT 825 COMP	1.00	EA	24.61		66.43	10.00	6.00				0.00		
WATER TRUCK	1.00	EA	24.61		25.22	4.00	3.00				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
FIELD FORMAN	1.00	EA	25.39								0.00		
PICKUP	1.00	EA	24.61		2.46	1.50	1.00				0.00		
LOCAL OPERATOR	1	EA	24.607104								0.00		
LOCAL LABORER	2	EA	36.990918								0		
											0		
CREW			259.24	0.00	427.11	62.00	43.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	791.35
SUBTOTAL	867	HOURS	224,757	0	370,304	53,754	37,281	0	0	0	0	686,096	2.29
MATERIALS:													
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			224,757	0	304	53,754	37,281	0	0	0	0	686,096	2.29

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS	SHT 29 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	TAILING EMBANKMENT SOILS EXCAVATION			JOB QUANTITY:	100,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS: FUEL COST OF 0.8 PER GAL

-ASSUME PRODUCTION BASED ON LOADING FACILITY AND TRANSPORTATION CAPACITY
-ASSUME 25 GONDOLA'S AT 90 TNS PER EACH @ TWO TRIPS PER DAY
-ASSUME AVERAGE CONVERSION OF TAILING AT 1.4 TONS PER CY
-PRODUCTION = 4500 TNS PER DAY = 3461 CY PER DAY
-DURATION = 100000 CY/ 3461 CY/DAY = 28.8933834 DAYS OR = 0.07915995 YEARS AT 7 DAYS PER WEEK ALL YEAR ROUND 3640 HR/YR
0.11112839 YEARS AT 5 DAYS PER WEEK ALL YEAR ROUND 2600 HR/YR

-ASSUME USING 2-637, 2-D8, 1-WATER TRUCK AND 1 GRADER FOR EXCAVATION
-ASSUME USING 3 CONVEYOR AND LOADING OPERATORS AND 3 LABORERS

DURATION = 289 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 637 SCPRJT	2.00	EA	49.21		273.20	47.50	35.00				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
CAT D8 DZR	2.00	EA	49.21		142.58	22.06	15.00				0.00		
PICKUP *	3.00	EA			7.38	4.50	3.00						
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
LOCAL OPERATOR	3.00	EA	73.82								0.00		
LOCAL LABORER	4.00	EA	73.98								0.00		
WATER TRUCK	1	EA	24.607104		25.22	4	3				0		
CREW			320.05	0.00	547.16	91.00	68.50	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	1,026.71
SUBTOTAL	289	HOURS	92,474	0	158,093	26,293	19,792	0	0	0	0	296,652	2.97
MATERIALS:													
												0	
-FUEL	11,557	GAL				9,246						9,246	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			92,474	0	158,093	35,539	19,792	0	0	0	0	305,898	3.06

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS
CLIENT:	ATLAS CORP.		
JOB NO:	88-67-10	DATE:	08-Dec-93
LOCATION:	Moab Utah		
ITEM DESCRIPTION:	OFFLOAD EMBANKMENT SOILS		

SHT 30 OF SHT 41

TIME: 04:35 PM

JOB QUANTITY: 100,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:
-ASSUME OFF-LOADING OPEN TOP GONDOLAS WITH MOUNTED BACKHOE
-ASSUME MATERIALS LOADED OUT OF STOCKPILE BY SCRAPER WITH DOZER ASSISTANCE
-ASSUME USING 2-631, 1-D8, GRADER, WATER TRUCK AND COMPACTOR, BACKHOE OPERATOR AND FOREMAN

DURATION = 289 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT D8 DZR	1.00	EA	24.61		71.29	11.00	7.50				0.00		
CAT 631 SCPR	2.00	EA	49.21		209.98	29.50	19.00				0.00		
CAT 825 COMP	1.00	EA	24.61		66.43	10.00	6.00				0.00		
WATER TRUCK	1.00	EA	24.61		25.22	4.00	3.00				0.00		
CAT 14 GDR	1.00	EA	24.61		51.73	6.00	6.50				0.00		
FIELD FORMAN	1.00	EA	25.39								0.00		
PICKUP	1.00	EA	24.61		2.46	1.50	1.00				0.00		
LOCAL OPERATOR	1	EA	24.607104								0		
LOCAL LABORER	2	EA	36.390918								0		
CREW			259.24	0.00	427.11	62.00	43.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	791.35
SUBTOTAL	289 HOURS		74,919	0	123,435	17,918	12,427	0	0	0	0	228,699	2.29
MATERIALS:												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			74,919	0	123,435	17,918	12,427	0	0	0	0	228,699	2.29

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS	SHT 31 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	TRANSPORT MILL DEMO DEBRIS			JOB QUANTITY:	35,000 CY

ESTIMATOR NOTES AND ASSUMPTIONS:

-WITH DEMO DEBRIS ASSUME 10 CY PER 16 CY END DUMP
-ASSUME TRANSPORTING BY TARPED ENDDUMP @ 2 HR ROUND TRIP
-USE 10 TRUCKS AT 10 HOURS PER DAY = 50 LOAD PER DAY
-DURATION = 35000 CY/ 500 cy PER DAY = 70 DAYS
700 HOURS

DURATION = 700 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CAT 235 BKH	1.00	EA	24.61		55.36	6.50	6.00				0.00		
CAT 966 FEL	1.00	EA	24.61		47.05	7.00	6.00				0.00		
END DUMP TRUCK	10.00	EA	246.07		541.30	0.00	5.00				0.00		
CREW			295.29	0.00	643.71	13.50	17.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	969.50
SUBTOTAL	700	HOURS	206,700	0	450,597	9,450	11,900	0	0	0	0	678,647	19.39
MATERIALS:												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			206,700	0	450,597	9,450	11,900	0	0	0	0	678,647	19.39

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS
CLIENT:	ATLAS CORP.	SHT 32 OF	SHT 61
JOB NO:	88-67-10	DATE:	08-Dec-93
LOCATION:	Moab Utah	TIME:	04:35 PM
ITEM DESCRIPTION:	DUST CONTROL/WATER TRANSPORT	JOB QUANTITY:	11 YEAR

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME DUST CONTROL IS NEEDED OVER CERTAIN AREA OF HAUL AND ACCESS ROAD OVER COURSE OF PROJECT.
-USE ONE WATER TRUCK, PUMP AND DRIVER

-ASSUME INSTALLTION OF 6 INCH HDPE WATER LINE

DURATION = 22,000 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
TEAMSTERS	1.00	EA	21.10								0.00		
CREW			21.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	21.10
SUBTOTAL	22,000	HOURS	464,116	0	0	0	0	0	0	0	0	464,116	42,192.36
MATERIALS:													
HDPE 6INCH WATER LINE (SDR 2	111,936	LF								1,231,296		1,231,296	
-PUMP	1	EA		15,000								15,000	
PUMP STATIONS	3	EA								135,000		135,000	
SURGE TANK	200,000	GAL								200,000		200,000	
-BUY WATER TRUCK	1	EA			125,000	45,300	52,000					222,300	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			464,116	15,000	125,000	45,300	52,000	0	0	1,566,296	0	2,267,712	206,155.64

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS	SHT 33 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	98-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	PERMITTING AND ACCESS AGREEMENT			JOB QUANTITY:	1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME 3 ENGINEERS FOR 1 YEAR		2080 HOURS
-ENVIRONMENTAL IMPACT STATEMENT	$750,000	
-ASSUME PERMIT FEES	$75,000	

	$825,000	

DURATION = 2,080 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL		UNIT COST
PROJ. ENGINEER	2.00	EA	47.53								2.00			
CREW			47.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	HOURLY CREW COSTS		49.53
SUBTOTAL	2,080	HOURS	98,863	0	0	0	0	0	0	0	4,160	103,023		103,023.00
MATERIALS:														
												0		
-PERMITTING	1	EA								825,000		825,000		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
												0		
TOTALS			98,863	0	0	0	0	0	0	825,000	4,160	928,023		928,023.00

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: DESIGN COSTS

ESTIMATOR: AGS
SHT 34 OF SHT 41
DATE: 08-Dec-93
TIME: 04:35 PM
JOB QUANTITY: 1 EA

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME DESIGN COST OF 500000

500000

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
												0	
-DESIGN AND SUPPORT	1 EA		500,000									500,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			500,000	0	0	0	0	0	0	0	0	500,000	500,000.00

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: AIR MONITORING/HEATH AND SAFETY

ESTIMATOR: AGS
DATE: 08-Dec-93

TIME: 04:35 PM
JOB QUANTITY: 11 YR

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME MONITORING FOR AMBIENT DUST PM-10

-ASSUME 4 STATIONS IN THE EXCAVATION AND 3 AT THE REPOSITORY
-ASSUME ONE TECHS TO RUN SYSTEM ALONG WITH RADON CANISTERS AND MINI RAM AND PERSONNAL MONITORS.
-ASSUME IQAT TEAM ONCE PER YEAR MONITORS QA/QC

DURATION = 22,300 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL		UNIT COST
H&S TECHNICIAN	2.00	EA	51.69								2.00			
CREW			51.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	HOURLY CREW COSTS		53.69
SUBTOTAL	22,300	HOURS	1,152,637	0	0	0	0	0	0	0	44,600	1,197,237		108,839.73
MATERIALS:														
												0		
-AIR MONITORING EQUIPMENT	1	EA		100,000								100,000		
-BIO ASSAYS	11	YR		40,000								40,000		
-TLD BADGES	11	YR		5,000								5,000		
-H&S SUPPLIES	11	YR		132,000								132,000		
-IQAT	11	YR		44,000								44,000		
												0		
												0		
												0		
												0		
												0		
												0		
TOTALS			1,152,637	321,000	0	0	0	0	0	0	44,500	1,518,237		138,021.55

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: PURCHASE LAND

ESTIMATOR: AGS
DATE: 08-Dec-93
SHT 36 OF SHT 41
TIME: 04:35 PM
JOB QUANTITY: 640 AC

ESTIMATOR NOTES AND ASSUMPTIONS:

-ASSUME PURCHASE OF LAND FOR REPOSITORY AND ACCESS ROADS

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0	HOURS	0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
PURCHASE LAND	640	AC							339,200			339,200	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	339,200	0	0	339,200	530.00

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS	SHT 37	OF	SHT 41
CLIENT:	ATLAS CORP.					
JOB NO:	88-67-10	DATE:	08-Dec-93	TIME:		04:35 PM
LOCATION:	Moab Utah					
ITEM DESCRIPTION:	ANALYTICAL COSTS			JOB QUANTITY:		11 YR

ESTIMATOR NOTES AND ASSUMPTIONS:

RADIOLOGICAL SURVEY (POST)	70000	
AIR MONITORING	154154	ASSUME MONITORING ONCE PER WEEK @ 7 LOCATION FOR 11 YEARS = 4004 SAMPLES PLUS QA @ 35 PER EACH
RADON MONITORING	45000	
GEOTECHNICAL	20000	

	289154	

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
												0	
												0	
-ANALYSIS	11 YR									289,154		289,154	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	289,154	0	289,154	26,286.73

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-18
LOCATION: Moab Utah
ITEM DESCRIPTION: Well Maintenance

ESTIMATOR: RGS
DATE: 08-Dec-93

TIME: 04:35 PM
JOB QUANTITY: 5 yr

ESTIMATOR NOTES AND ASSUMPTIONS:
- -Assume Wells only operate for 5 years
- -Assume using 1 operator and 1 truck full time
- -7- 4inch Extraction Wells
- -7 3.75 inch extraction pumps

Labor = 10400
Wells @= 175 lf/year
Pumps # 3.5 ea/year

- -Wells and pumps need changed every two years
- -Assume wells @ 50 feet deep

Period of time = 5 years

DURATION = 10,400 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
LOCAL OPERATOR	1.00	EA	24.61								0.00		
PICKUP	1.00	EA			2.46	1.50	1.00						
CREW			24.61	0.00	2.46	1.50	1.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	29.57
SUBTOTAL	10,400	HOURS	255,914	0	25,584	15,600	10,400	0	0	0	0	307,498	61,499.60
MATERIALS:													
Buy Pumps and Riser	10	ea							33,390			33,390	
Well Installation	875	lf								25,375		25,375	
-STS for Wells	5	yrs						5,000				5,000	
ELECTRICAL	600,000	KWH						48,000				48,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			255,914	0	25,584	15,600	10,400	53,000	33,390	25,375	0	419,263	83,852.60

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR:	AGS	SHT 39 OF	SHT 41
CLIENT:	ATLAS CORP.				
JOB NO:	88-67-10	DATE:	08-Dec-93	TIME:	04:35 PM
LOCATION:	Moab Utah				
ITEM DESCRIPTION:	NRC Surveilance			JOB QUANTITY:	10 yr

ESTIMATOR NOTES AND ASSUMPTIONS:

-Assume 10 hours per month

-Total =

	year 1	192 hours/year
114 $ per hour	year 2-10	384 hours/year

DURATION = 0 HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
												0	
												0	
-NRC Surveilance	3,648 hours									415,872		415,872	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	415,872	0	415,872	41,587.20

PROJECT:	Atlas Option 1 RR Transportation	ESTIMATOR: AGS	SHT 40 OF SHT 41
CLIENT:	ATLAS CORP.		
JOB NO:	88-67-10	DATE: 08-Dec-93	TIME: 04:35 PM
LOCATION:	Moab Utah		
ITEM DESCRIPTION:	Long Term Monitoring		JOB QUANTITY: 30 year

ESTIMATOR NOTES AND ASSUMPTIONS:

-Assume quarterly samples of 3 wells for 10 years

-Cost per sampling event approximately $1,000
-Cost assumtion at $4,000 per year.

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INT EQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0C	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	[illegible]	0	0.00
MATERIALS:													
												0	
-Long term monitoring	30 year									120,000		120,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	120,000	0	120,000	4,000.00

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO: 88-67-10
LOCATION: Moab Utah
ITEM DESCRIPTION: Environmental Impact Statement

ESTIMATOR: AGS SHT 61 OF SHT 61
DATE: 08-Dec-93 TIME: 04:35 PM
JOB QUANTITY: 1 ea

ESTIMATOR NOTES AND ASSUMPTIONS:

-Assume cost of EIS at 1.5 million

DURATION = HOURS

DESCRIPTION	QUANTITY	UNIT	LABOR	INV EQUIP	RENT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	UNIT COST
CREW			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HOURLY CREW COSTS	0.00
SUBTOTAL	0 HOURS		0	0	0	0	0	0	0	0	0	0	0.00
MATERIALS:													
												0	
-Environmental Impact Statem	1 ea									1,500,000		1,500,000	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
												0	
TOTALS			0	0	0	0	0	0	0	1,500,000	0	1,500,000	1,500,000.00

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP
JOB NO.: 80-67-10
LOCATION: Moab Utah

LABOR BASED ON 50 HOURS/WEEK

EQUIPMENT BASED ON 176 HOURS/MONTH

CHECK ON JOB TOTAL: **********FROM RECAP
**********FROM TOTAL SHEET

DATE: 08-Dec-93

TIME: 04:35 PM

ESTIMATOR: AGS

RECAP SHEET:

LABOR	LABOR HOURS	LABOR WEEKS	TOTAL LABOR	TOTAL SUB & TRAVEL
LOCAL LABORER	100,378	2,007.6	2,596,352	0
LOCAL OPERATOR	406,463	8,129.3	10,001,879	0
FIELD FORMAN	31,382	627.6	796,715	0
-PRENET COMPACTION			137,020	0
TEAMSTERS	22,000	440.0	464,116	0
PROJ. ENGINEER	4,160	83.2	98,863	4,160
-DESIGN AND SUPPORT			500,000	0
H&S TECHNICIAN	44,600	892.0	1,152,637	44,600
RECAP SUBTOTAL	648,983	12,979.7	15,747,581	48,760
ADMIN SUBTOTALS			3,651,024	93,600
JOB TOTAL			19,398,605	142,360

EQUIPMENT	EQUIP HOURS	EQUIP WEEKS	FOF & REPAIR	TOTAL RENTAL COST
-DECONTAMINATION SUPPLIES				50,000
CAT 631 SCPR	79,561	1,957.4	1,929,360	8,351,132
CAT D9 DZR	12,139	298.7	315,622	1,083,798
CAT D8 DZR	79,443	1,954.5	1,469,702	5,663,517
CAT 14 GDR	54,731	1,346.5	684,135	2,831,223
CAT 825 COMP	25,409	625.1	406,548	1,687,935
WATER WAGON	7,097	174.6	124,200	275,014
PICKUP	90,323	2,222.2	225,808	222,195
-RR EQUIPMENT RENTAL				10,910,625
CAT 637 SCPR|T	25,233	620.8	1,040,854	3,446,803
CAT 966 FEL	26,027	640.3	338,345	1,224,550
-FUEL				758,162
WATER TRUCK	26,055	641.0	182,385	657,187
CAT 563 VIB COMP	614	15.1	5,526	15,669
CAT 963 FEL|T	1,020	25.1	13,260	46,359
CAT 235 BKR	700	17.2	8,750	38,752
END DUMP TRUCK	7,000	172.2	3,500	378,910
-PUMP				15,000
-BUY WATER TRUCK				222,300
-AIR MONITORING EQUIPMENT				100,000
-BIO ASSAYS				40,000
-TLD BADGES				5,000
-H&S SUPPLIES				132,000
-IQAT				44,000
RECAP SUBTOTAL	435,353	10,710.7	6,747,994	38,202,052
ADMIN SUBTOTALS			0	0
JOB TOTAL			6,747,994	38,202,052

SUPPLIES	QTY	UNIT	TOTAL
ELECTRICAL	**********	KWH	1,048,000
-STS for Wells	5	yrs	5,000
RECAP SUBTOTAL			1,053,000
ADMIN SUBTOTALS			179,825
JOB TOTAL			1,232,825

PROJECT: Atlas Option 1 RR Transportation
CLIENT: ATLAS CORP.
JOB NO.: 88-67-10
LOCATION: Moab Utah

LABOR BASED ON 50 HOURS/WEEK

EQUIPMENT BASED ON 176 HOURS/MONTH

CHECK ON JOB TOTAL: **********FROM RECAP
**********FROM TOTAL SHEET

DATE: 08-Dec-93

TIME: 04:35 PM

ESTIMATOR: AGS

RECAP SHEET:

MATERIAL	QTY	UNIT	TOTAL	SUBS	QTY	UNIT	TOTAL
ROCK ARMOR (FOR PIT)	131,100	TN	1,246,761	-MOBILIZATION/DEMOB	762	EA	275,600
ROCK ARMOR TRANSPORTATION	131,100	TN	416,898	-PERSONNEL MOBILIZATION	15	EA	75,000
FILTER MATERIAL (FOR PIT)	71,400	TN	490,518	INSTALL TRACK AND BALLAST	18,500	LF	"832,500
FILTER MATERIAL TRANSPORT	71,400	TN	227,052	CONSTRUCTION OF CONCRETE	1	EA	50,000
RIP RAP (FOR PIT)	37,500	TN	244,875	INSTALL COVERED CONVEYOR	2,000	LF	1,300,000
RIP RAP TRANSPORTATION	37,500	TN	119,250	CONSTRUCT RAIL LOADING FA	1	EA	300,000
CRUSHED STONE (FOR SITE)	4,400	TN	32,340	CONSTRUCT RAIL UNLOADING	1	EA	400,000
PURCHASE LAND	640	AC	339,200	-UTILITY SERVICES	1	EA	140,000
Buy Pumps and Riser	10	ea	33,390	HYDROSEED AND MULCH	340	AC	204,000
				IRRIGATION	340	AC	136,000
				-MISC STRUCTURES	1	LS	100,000
				FENCE INSTALLATION	15,000	LF	100,000
				INSTALL MONITOR WELLS	2,000	LF	50,000
				INSTALL PIEZOMETERS	1,000	LF	12,000
				INSTALL SETTLEMENT MARKER	15	EA	4,500
				HDPE 6INCH WATER LINE (SD	111,936	LF	1,231,296
				PUMP STATIONS	3	EA	135,000
				SURGE TANK	200,000	GAL	200,000
				-PERMITTING	1	EA	825,000
				-ANALYSIS	11	YR	289,154
				Well Installation	875	lf	25,375
				-NRC Surveillance	3,648	hour	415,872
				-Long term monitoring	30	year	120,000
				-Environmental Impact Sta	1	ea	1,500,000
			3,150,284				8,801,297
							0
			3,150,284				8,801,297

40-1162

WESTERN NUCLEAR, INC.

UNION PLAZA SUITE 300, 200 UNION BOULEVARD, LAKEWOOD, COLORADO 80228
TELECOPIER (303) 989-8993 TELEPHONE (303) 989-8675

RETURN ORIGINAL TO PDR, HQ.

December 1, 1993

DOCKETED
DEC 01 1993
USNRC
MAIL SECTION
DOCKET CLERK

DEC 1993
RECEIVED

Mr. Ramon Hall, Director
Uranium Recovery Field Office
U.S. Nuclear Regulatory Commission
P.O. Box 25325
Denver, CO 80225

RE: DOCKET NO. 40-1162, SUA-56, LICENSE CONDITION NO. 10, DAY LOMA

Dear Mr. Hall:

In accordance with Nuclear Regulatory Commission [NRC] letters dated 02 August 1991 and 26 November 1991, please find enclosed four [4] copies of a comprehensive analysis of the long-term performance of the reclaimed Day Loma site relative to current closure criteria set forth in Appendix A, 10 CFR 40. The analysis was performed by Centurion Nuclear, Inc. [Centurion].

Western Nuclear, Inc. [WNI] believes submittal of the Centurion analysis satisfies NRC requirements regarding license termination and, therefore, requests that all references to the Day Loma site be deleted from SUA-56.

We look forward to our 01 December 1993 meeting with you to allow Centurion the opportunity to discuss the results of their analysis.

Should you have any questions, please contact us at your earliest convenience.

Sincerely,

Stephanie J. Baker
Manager of Environmental Services

SJB/tic
w/attachments
cc: RWC
EMS
H. Shaver, Esq.

DESIGNATED ORIGINAL
Certified By Mary C. Hood

94-0100

40-1162

centurion nuclear, inc.

one tabor center • suite 2500
1200 seventeenth street • denver, colorado 80202

(303) 623-8317
twx 910-931-2561

December 1, 1993

Mr. E.M. Schern
Western Nuclear, Inc.
200 Union Blvd, Suite 300
Lakewood, Colorado 80228

Dear Mr. Schern:

Re: Day Loma Property

Enclosed herewith is a report ("SMI Report") prepared by Shepherd Miller, Inc. ("SMI"), of Fort Collins, Colorado. The SMI report was prepared at the request of Centurion Nuclear, Inc. ("CNI") to evaluate the property commonly referred to as the Day Loma Heap Leach in Fremont County, Wyoming.

The SMI report is submitted to assist Western Nuclear, Inc. ("WNI") in obtaining deletion of the Day Loma Heap Leach site from its source materials license. The Nuclear Regulatory Commission ("NRC") staff, while recognizing that the reclamation work performed at the site complies with all license conditions, has questioned whether or not the site meets current "closure criteria" as developed by NRC staff.

If the site does not meet current closure criteria, the deletion may nevertheless still occur if it is demonstrated that meeting such criteria will not further enhance the protection of health nor further minimize the danger to life or property. The SMI Report shows that the existing condition at the site has reduced the risk to the public health and safety as low as reasonably achievable and therefore deletion of the site should occur.

As you will see from the data in the SMI Report, compliance with NRC staff's current interpretation of the closure requirements would cost approximately $3.0 million despite the existing reclamation work having met all license conditions imposed by the NRC. The SMI Report demonstrates that, in the context of the Gas Hills Mining District, the Day Loma Heap Leach site does not present, by itself, any meaningful risk to the public health.

94-0100

Accordingly, when (i) the cost of achieving the very minimal improvement to the public health and (ii) the other socioeconomic considerations arising from further activity in the area are considered, the only logical conclusion is to leave the site in its current condition.

As directed by Appendix A to Part 40[1], the SMI Report takes into account the local and regional conditions in the area of the Day Loma Heap Leach site. Part of these conditions are, of course, the history and impacts of the mining activity in the area. Key points in time specific to the Day Loma Heap Leach site are presented in the following table.

1961	WNI obtains a source materials license that includes the Day Loma Heap Leach Site
1961	WNI begins operation of Day Loma Heap Leach
1963	Operations at Day Loma Heap Leach suspended
1966	Operations at Day Loma Heap Leach renewed
1972	Operations at Day Loma Heap Leach terminated
1978	Property sold to Energy Fuels; CNI becomes owner; Energy Fuels Nuclear, Inc. ("EFN") becomes contract operator for CNI; WNI remains as licensee
1980	WNI Source Material License renewed with requirement that reclamation plan for Day Loma Heap Leach be submitted to NRC
1981	Plan for on-site reclamation of Day Loma heap leach material submitted to NRC; NRC requests amendments to the drainage channel design; license amendment issued directing reclamation of the Day Loma Heap Leach Site in accordance with amended reclamation plan
1981	Operations at Split Rock Mill under License SUA-56 terminated
1982	Reclamation work performed at Day Loma Heap Leach Site; Construction Report submitted to NRC; NRC review and supplemental information requested and submitted

[1]10 Code of Federal Regulation ("CFR") 40, Appendix A

1983	NRC determines that "No further action is necessary"
1984	Inspection of reclaimed Day Loma Heap Leach Site; Vegetation, erosion and stability concerns raised;
1985	Remediation plan submitted for vegetation and erosion issues;
1986	Remedial work performed on Day Loma;
1987	WNI formally requests deletion of Day Loma Heap Leach Site from its source materials license
1989	NRC reviews reclamation activity on Day Loma Heap Leach Site -- concludes "reclamation activities were performed in accordance with license requirements" and that "No further action is ... necessary concerning site reclamation activities"; NRC inquires as to ability of WNI/CNI to transfer land to a government entity if such action is determined necessary
1989	WNI responds to NRC inquiry as to nearby residences and population centers, activity of reclaimed material, possible uses of the land and status of land ownership
1990	NRC requests submittal showing either that (i) site meets "current" closure criteria or (ii) meeting "current" criteria will not "further enhance the protection of health nor further minimize the danger to health or property"
1992	NRC denies deletion of Day Loma Heap Leach Site from source materials license
1993	BLM declares mining claims covering Day Loma Heap Leach Site void
1993	Preparation of Shepherd Miller Report

The reclamation plan as originally submitted went through revisions requested by the NRC staff. As finally implemented, the plan addressed all concerns raised. It is important to remember that the material being reclaimed was not mill tailings with their attendant concerns but rather heap leach material that was very similar to other mine spoils in the Gas Hills District.

As noted above, the mining claims that had been held by CNI and others have been declared void by the Bureau of Land Management ("BLM") for lack of ongoing assessment work. We believe the surface rights may be held by a ranching concern. As of this date, there has been no discussion of land status with the BLM. We are unable to transfer ownership of the land to any government entity. We have not addressed perpetual care given the lack of any meaningful risk to the public health and safety from this specific site.

There are several points from the SMI Report that are worth reiteration. In its current condition, the Day Loma Heap Leach site meets all radon flux criteria. In fact, under data collected by consultants to the State of Wyoming, the radon flux from the Day Loma Heap Leach site is lower than much of surrounding area.

The SMI Report shows that the Day Loma Heap Leach site will not adversely impact groundwater in the area. Prior data collected by CNI shows that there are no residences within several miles of the site and any habitation near the area is extremely remote given the general condition of the area.

It is possible that erosion of the area could expose the heap leach material. Such exposure is likely to occur, if ever, in the context of a storm event that will result in erosion of significant amounts of material surrounding the Day Loma Heap Leach site. The SMI Report evaluates this situation in terms of the contribution the heap leach material would make to the exposure of the public to radium activity in the area downstream of the Day Loma Heap Leach site.

In summary, the SMI Report concludes that the contribution of the Day Loma Heap Leach site is 1.2% of the soil loss to the downstream point and 8.5% of the radium activity at that downstream point. The balance of soil loss and radium activity comes predominantly from other mine spoil in the area. An expenditure of some $3.0 million to reduce this very limited contribution to some slightly smaller percentage is not practicable.

Inevitably, the quarrying of rock, the moving of earth and other construction activities associated with further attempts at enhancement of the existing situation will result in the risk of industrial accidents and impacts to air quality. The risk of injury or loss of human life may be much greater, and certainly more immediate, than the small incremental increase in the concentration of radionuclides in the environment should a failure of the heap leach cover occur. These health and safety risks can be avoided by leaving the existing approved reclamation cover in place.

We anticipate that WNI will renew its request for deletion of the Day Loma Heap Leach site from its source material license based on the data and conclusions contained in the SMI Report. A meeting with the NRC staff that has been scheduled for December 1, 1993, will further that proce s.

Sincerely,

Rich A. Munson

Rich A. Munson

/ram
enclosure

EVALUATION OF THE DAY LOMA HEAP LEACH AREA

Prepared By:

Shepherd Miller, Inc.
Fort Collins, Colorado

November, 1993

TABLE OF CONTENTS

Page

List of Tables

List of Figures

List of Appendices

1.0 INTRODUCTION

The reclaimed Day Loma Heap Leach area is located within the Gas Hills Mining District of Fremont County, Wyoming, approximately 60 miles southeast of Riverton. This report evaluates the reclamation of the heap leach and also evaluates its significance in relation to the surrounding mined lands. The evaluation includes an erosion potential analysis of the existing reclaimed heap leach area, radiological conditions of the heap leach and surrounding spoils (as a result of significant mining activity within the area), regional ground-water quality, and associated impacts in the event significant erosion occurs.

1.1 Background

Centurion Nuclear, Inc. (CNI), completed reclamation of the Day Loma Heap Leach area on July 2, 1982. Western Nuclear, Inc. (WNI), remained the holder of the source materials license for the site. Reclamation activities included regrading of the heap leach area, placement of random fill, placement of a two foot layer of clay material, and placement of approximately six inches of topsoil, in accordance with a plan developed by CNI in conjunction with Nuclear Regulatory Commission (NRC). Diversion channels were constructed parallel to the reclaimed area to provide runoff protection of the outslopes of the heap leach area. The NRC determined that reclamation met all license requirements and in 1987, WNI requested deletion of the site from its license. In August 1990, NRC requested that WNI review the reclamation design and construction, and compare the closure with current reclamation criteria, or show that meeting the criteria would not further enhance the protection of health.

In response to the August 1990 NRC request, CNI directed Shepherd Miller, Inc (SMI) to evaluate; (1) the erosional stability of the site pursuant to current NRC reclamation criteria, (2) the impacts to the public health from failure of the reclamation, and (3) the cost of meeting current closure criteria and the benefits therefrom. In task (1), SMI used the NRC's "Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill

Tailings Sites," (August 1990) to evaluate Day Loma erosional stability in conjunction with the reclamation criteria presented in 10 CFR Part 40, Appendix A.

In addition to the erosional stability analysis under the STP, a comparison of erosional impacts to a downstream point from the heap leach area and the surrounding spoils was conducted to assist in the determination of whether further reclamation efforts are warranted. This comparison was performed to assess the risk to human health and safety from loss of the reclaimed heap leach material, as opposed to loss of the surrounding exposed spoil material which will occur regardless of what work is performed at the heap leach site. An evaluation of current radiological conditions including the existing radon barrier covering the heap leach material was also made.

1.2 Purpose of Report

This report has been developed to evaluate the reclamation performed on the heap leach, the overall significance of the heap leach with respect to the surrounding disturbed and mined lands, compliance with regulatory requirements, and to determine whether any significant impacts can be anticipated which would pose a threat to human health and safety if no further work is performed. In addition, the site was evaluated to determine if any significant benefits would be gained from additional reclamation efforts and the costs for such reclamation activities.

2.0 CURRENT LAND STATUS

The Day Loma Heap Leach area is located in the S1/2, SW1/4 of Section 13, within Township 32 North and Range 91 West. An area of approximately 500 feet by 300 feet in size extends into the S1/2, SE1/4 of Section 14, Township 32 North and Range 91 West. Mineral ownership for these parcels is U.S. Bureau of Land Management. No patented or unpatented mineral claims are held by any entity on the property affected by the Day Loma Heap Leach area.

3.0 DESCRIPTION OF THE AREA

As mentioned in Section 1, the Day Loma site lies within the Gas Hills Mining district. The following sections discuss the demographics and surrounding terrain for the area.

3.1 Demographics

The Gas Hills area is open rangeland utilized for grazing by domestic stock and wildlife. Uranium mining and milling has historically been a significant land use in the area with the Pathfinder, Umetco, Federal American Partners, and Split Rock mills and mining complexes all within a 30 kilometer radius of the Day Loma site. Mining was principally by open pit methods resulting in large disturbance areas, much of which is considered abandoned, and is unreclaimed.

The area is sparsely populated. The nearest full time resident is a security guard at the pathfinder Lucky Mac Mill located in Section 22, T33N and R90W. This resident is approximately 10 kilometers northeast of the heap leach site. The next closest residents are at the J.E. Ranch located in Section 36, T33N and R89W, approximately 23 kilometers northeast of the heap leach site. Plate 1 attached at the end of this report shows all known full time residents within a 25 kilometer radius. Jeffrey City is the closest town and is located approximately 30 kilometers south of the site. Jeffrey City has a population of approximately 100 based on a 1990 estimate.

Mineral rights survey within the SW 1/4 of Section 13 indicates four valid claims held by Power Resources, Inc., a Colorado Corporation, exist on site. These claims do not reside directly on the heap leach area, but potentially could be effected if construction activities took place on the north outslope.

3.2 Surrounding Terrain

The Gas Hills Mining District contains numerous mining activities and disturbances. The Day Loma Heap Leach is surrounded by exposed mine spoils and disturbed, unreclaimed lands.

Reclamation plans for these undisturbed lands have been or are currently being developed under the Abandoned Mine Land (AML) Program for the Wyoming Department of Environmental Quality, Land Quality Division. Reclamation of the mine spoils may take place if funding becomes available in the future.

The site lies to the north of the Beaver Divide and to the southeast of the Gas Hills haul road. The area is naturally drained by Coyote Creek to the east and north, and Muskrat Creek to the west. Coyote Creek joins Muskrat Creek approximately 6.5 kilometers to the north of the site. Muskrat Creek flows north and west to eventually join the Wind River near Boysen Reservoir. Both Coyote Creek and Muskrat Creek are ephemeral streams flowing only in response to rainfall events.

Within the "Day Loma Master Plan," prepared for the Wyoming Department of Environmental Quality, Abandoned Mine Land (AML) Program (Lidstone & Anderson, Inc., 1991), the Day Loma study area encompassed a total of approximately 2400 acres, approximately 1254 acres of which are disturbed and unreclaimed land. Of this total disturbed area, the reclaimed Day Loma Heap Leach area of only approximately 26 acres represents approximately 2 percent. Approximately 33,569 total acres are within the drainage area for the confluence of Coyote and Muskrat Creeks. A delineation of the drainage is shown on Drawing 1 located at the end of Appendix C.

Heap leach material consisted of an estimated 250,000 tons of low grade uranium bearing rock which was leached with sulfuric acid to recover uranium values. Spoil material is overburden and mine waste.

3.3 Current Site Status

As mentioned in Section 1.1, the heap leach was reclaimed in 1982 and approved by the NRC in 1983. Since covering and placement of topsoil in 1982, vegetation has been established over the reclaimed surface and only minimal erosion has occurred. The heap leach was constructed on an impervious liner which was placed on top of mine spoil. The spoil material extends north and east from the heap leach area at the existing angle of repose, and several large gullies exist in the spoil outslopes. Coyote Creek, an ephemeral drainage, is adjacent to the toe of the spoils material on the eastern end and near the toe of the spoils material to the north (see Figure 1). Due to the presence and close proximity of spoils material in relation to Coyote Creek, erosion of spoils material has occurred and creek alignment has been altered.

4.0 EXISTING RADIOLOGICAL CONDITIONS

The following sections discuss the radium activity of the heap cover, heap leach material, and surrounding spoils, and radon emanation from the reclaimed heap leach area and the mine spoil piles. An evaluation was performed to assess the radiological conditions of the reclaimed heap leach and to determine the impact of the reclaimed heap leach pad with respect to impacts to public health and safety.

4.1 Radium Activity of Heap Cover and Heap Leach Material

The concentration of radium 226 within the heap leach material covering the heap leach was determined by drilling and sampling of the heap leach area. A hollow stem auger was used to collect cover and heap samples for physical and radiochemical analysis, and to determine the average thickness of cover. Drilling was performed on October 12 and 13, 1992. Appendix D includes a drilling/sampling report prepared by Inberg-Miller Engineers of Riverton, Wyoming and contains a complete description of methods, logs of test borings and test borehole locations.

As presented in Appendix D, a total of seven borings were drilled in the reclaimed heap leach. Boring HL-8 was chosen to represent the average profile through the reclaimed heap leach. Materials from HL-8 were tested to determine the radium content of the cover and heap leach material. Additionally, heap leach material from HL-1, HL-2, HL-9, and HL-10 were also analyzed for radium.

On the basis of these analyses, average radium 226 content in the cover was determined to be 3.5 pCi/g. Average radium 226 content in heap leach material was approximately 119.5 pCi/g based on four individual samples and two composite samples. This average radium content is discussed in more detail in Appendix B. Testing for physical characteristics of samples were performed by Inberg-Miller Engineers and radiological testing was performed by Energy Laboratories, Inc. of Casper, Wyoming. Test results are provided in Appendix D.

4.2 Radium Content of Surrounding Spoils

In July of 1993, CNI and Energy Laboratories personnel of Casper, Wyoming collected soil samples from 19 locations on two spoil piles in close proximity to the heap leach area. These sites are identified on Figure 2. Test results indicate an average radium content of the surrounding spoils to be approximately 61 pCi/g. Average radium content was determined to be 98.3 pCi/g for areas where runoff from spoils would enter Coyote or Muskrat Creeks. Analytical results are provided in Appendix D.

At the same locations spoil samples were taken for analysis, radon flux measurements were also performed. The results of this testing is provided in Section 4.3 below.

Radium content of spoil in the Day Loma mining area was also determined by consultants working for the Wyoming AML program (Lidstone & Anderson, Inc., 1991). The results of AML's analysis indicate an average radium-226 content of 17.7 pCi/g from 978 individual surface measurements within the Day Loma mining area. Approximately 245 acres were identified as extreme surface radiological hazards, some areas reporting as high as 100-200 pCi/g. These values are consistent with the recent measurements taken by CNI.

With the surrounding spoils averaging 61 pCi/g, background concentration of radium is now considerably higher than before mining activity was initiated in the area. Additionally, the radium concentrations in the heap are only slightly higher than the concentrations in the nearby spoils. This is not surprising since the heap material was low grade ore. Given that the heap material is only slightly higher in radium content than the much larger volume of adjacent spoil material, the relative impact of the slightly higher radium in the heap is insignificant compared to the surrounding materials.

4.3 Radon Emanation

Radon flux measurements were conducted over the surface of the reclaimed heap leach and over the surface of surrounding spoils materials. The large Area Activated Charcoal Canister (LAACC) method (EPA Method 115 per 40 CFR 61, NESHAPS) for determining radon flux was used for the analysis. Locations of where measurements were taken on the surrounding spoils are shown on Figure 2, and for the reclaimed heap leach the locations are identical to the drill hole locations shown on Figure B.1 within Appendix B. Canisters were delivered to Energy Laboratories, Inc., for analysis. Results indicate the average radon flux from the cover of the reclaimed heap leach system to be 8.10 pCi/m^2s. The average flux from the surrounding spoil is 92.4 pCi/m^2s. The radon flux measured from the reclaimed heap leach is much less than 20 pCi/m^2s and furthermore, is much less than the measured value from the spoil area. The AML plan includes placing the spoil with the highest radium content into pits and covering them with soil. The other spoils will be regraded and covered with topsoil. It is not expected that these activities will significantly reduce the radon flux from the spoils since only the most radioactive spoils will have a significant thickness of cover material. Spoil material similar to that measured for radon flux will be covered only with a thin layer of topsoil which will not significantly attenuate radon flux.

Based on existing heap leach material and cover soil characteristics, radon flux was also calculated using the RADON computer model. This analysis is discussed in Section 5.1 below.

5.0 ANALYSIS OF EXISTING RECLAMATION SYSTEM RELATIVE TO CURRENT REGULATORY STATUS

In order to evaluate the effectiveness of the existing reclamation system, radon barrier and ground water quality, analyses were performed and are described below.

5.1 Analysis of Existing Radon Barrier

The existing reclamation cover was evaluated for effectiveness in reducing radon flux. Radon flux calculations were performed for the cover surface using the RADON (USNRC, 1989) computer model. Input into the RADON model was based upon both measured and default parameters of the site specific reclamation cover and heap leach materials. Existing average cover thickness was obtained from field investigations performed during October 1992. During the field investigation, samples were collected for laboratory testing in order to classify the types of soils present. Average radium activity for the heap leach material was determined from laboratory testing of samples collected during the field investigation.

5.1.1 Heap Leach Material Characteristics

Samples collected during the drilling program performed in October 1992, and subsequent laboratory testing indicate the average radium content of the heap leach material is approximately 119.5 pCi/g. Results of testing performed on a sample collected from the heap leach material indicated the material has a dry density of 110.8 lb/ft^3, a moisture content of 10.4 percent, and 15.8 percent passing the #200 sieve. Test methods and results are included in Appendices B and D. Figure 1 delineates the areal extent of the reclaimed heap leach.

At Day Loma, the cutoff ore grade during mining was approximately 0.06% U_3O_8 as presented in the "Environmental Statement (ES) Related to Operation of Split Rock Uranium Mill," NRC 1980, corresponding to a radium activity of approximately 170 pCi/g. Also presented in the ES is the assumption of ore grade for the heap leach material of 0.05 U_3O_8, corresponding to a radium activity of approximately 142 pCi/g. These values are slightly higher than the 119.5 pCi/g obtained from actual sampling of the material as discussed above. For analysis of the existing radon barrier, both the maximum ore grade corresponding to a radium activity of 170 pCi/g and the testing results on heap leach material of 119.5 pCi/g were used in the RADON model.

5.1.2 Existing Reclamation Cover Material Thickness and Characteristics

The drilling program indicated 8 to 13 feet of existing reclamation cover soil exists over the heap leach material and consists of interbedded sands and clays with varying dry densities and moisture contents. Test results are provided in Appendix D. From the samples tested, the two lowest percent passing the #200 sieve (24.7 and 34.7) and the two highest percent passing the #200 sieve (92.4 and 95.9) were averaged and used as separate input into the radon flux computer model analyses to provide a range of radon flux calculations. The average low percent passing the #200 sieve was determined to be 29.7 percent and the average high percent passing the #200 sieve was 94.2 percent. Densities and moisture contents were analyzed for one of the low percent passing #200 sieve samples and for one of the high percent passing #200 sieve samples. Corresponding dry densities and moisture contents were determined to be 109.2 lb/ft^3 and 13.6 for the low percent passing the #200 sieve, and 104.0 lb/ft^3 and 18.9 percent for the high percent passing the #200 sieve.

Long term moistures for the existing reclamation cover soil were calculated and used as conservative input to the RADON computer model. Long term moisture contents were based upon the percent passing the #200 sieve and were calculated using the equation presented in the "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design," NUREG/CR-3533 (NRC, 1984). Appendix B presents the calculations in more detail. Long term moisture contents for the cover soil ranged from 6.0 percent for the soil with 29.7% passing the #200 sieve and 9.1 percent for the soil with 94.2% passing the #200 sieve. These values represent the range of soils that exist within the cover. These values were used in the RADON computer model for determining the adequacy of the cover for radon attenuation.

5.1.3 Radon Model Results

The RADON model indicates approximately 5 to 8 feet of soil cover is required to meet an exit flux of less than 20 pCi/g specified by 10 CFR Part 40, Appendix A. The average depth of existing cover is approximately 8 to 13 feet. Therefore, the existing cover is more than sufficient to attenuate radon flux to less than 20 pCi/m^2sec. A summary of the results are provided in Table 1 below. Results and model output are provided in Appendix B.

Table 1 - Radon Model Results

		Heap Leach Activity of 119.5 pCi/g	Heap Leach Activity of 170.0 pCi/g
Cover Material Moisture Content (%)	Cover Material Mass Density (lb/ft^3)	Required Depth (ft)	Required Depth (ft)
6.0	109.2	6.52	7.75
9.1	104.0	5.26	6.27

5.2 Ground Water

Existing data from surrounding nearby ground water monitoring wells were reviewed to determine previous and current water quality in area. The data along with a discussion of ground water quality impacts are discussed in the following sections.

5.2.1 Available Data

Water-quality data were taken from AML's 1990 data presented in the "Day Loma Master Plan" (Lidstone & Anderson, Inc., 1991).

5.2.2 Discussion of Ground Water Impacts

The impact of the heap leach area on ground water was evaluated by comparing water quality from up-gradient wells and the up-gradient pits to the well down-gradient from the reclaimed heap area. Data from the AML sampling program conducted in October 1990 were used since they represent the most current and complete data base for the Day Loma area.

Figure 3 shows the ground water contours and the sampling points for the area around the reclaimed heap leach area. Wells P-1, P-2, DL-2 and the Clyde and Day Loma pits are up-gradient from the heap leach area. Well P-5 is immediately down-gradient from the heap leach area. While the pit water levels are currently lower than the water level in P-5, the pits will likely be up-gradient of the heap leach area after steady state conditions are achieved, as shown by the regional ground water contours provided in Figure 3. Therefore the water quality of the pits was included in the background water quality determination.

The range of sulfate, TDS and uranium for the three up-gradient wells, the two pits and the down-gradient well are presented on Table 2. Sulfate, TDS and uranium were chosen since these parameters are typically used as indicators of seepage from uranium process facilities. Uranium was chosen since it is the most mobile of the radionuclides. Sulfates and TDS are both considered conservative contaminates that are indicative of overall changes in water quality. In addition, sulfuric acid was used in the leach process and, therefore, sulfates should be elevated in P-5 if the heap leach area were contributing to ground water contamination.

As can be seen from Table 2 below, the sulfate, TDS and uranium values in the down-gradient well (P-5) are the same or less than measured in the up-gradient wells (P-1, P-2 and DL-2). The sulfate, TDS and uranium values from the pits are higher than for P-5. The Clyde pit has values that are much greater than the values in the down-gradient well.

It can therefore be concluded that if there is any contribution to ground water quality from the reclaimed heap leach system, the contribution is negligible and indistinguishable from the regional ground water quality baseline. In fact, the existing water quality down-gradient from the heap is as good or better than the up-gradient wells and much better than the waters in both the Clyde and Day Loma pits. Table 2 below provides a summary of the ground water quality observed.

TABLE 2 - Ground-Water Quality

Sample location	Constituent (mg/l)		
	Sulfate	TDS	Uranium
Well P-1	620	1216	0.005
Well P-2	495	1037	0.010
Well DL-2	708	1102	0.051
Day Loma Pit	845	1336	0.736
Clyde Pit	2340	3442	1.076
Well P-5	450	1096	0.020

5.3 Analysis of Erosional Stability

An erosional stability analysis of the site was performed in order to provide a comparative evaluation of current site conditions as they relate to long-term site performance. The NRC's letter dated August 31, 1990 specifically requests a comparison of current site conditions to reclamation criteria as described in 10 CFR Part 40, Appendix A. Current NRC position includes an assessment of the site pursuant to the NRC's "Final Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites," August 1990. Therefore, for purposes of this report, the guidelines presented in the STP were assumed to be the proper guidelines to be used to determine erosional stability of the Day Loma Heap Leach area.

In reviewing the reclaimed Day Loma Heap Leach area, various alternatives were considered. For example, storm events less severe than the full PMP were analyzed. For initial analysis, the 200-year 24-hour storm event was used to determine the erosional stability. This storm event was considered the smallest event that could be considered for the site. Analyses indicated that the cost of erosional protection for the 200-year event was unreasonable and therefore analysis of larger events that would require even more extensive erosion protection was not necessary. Section 6.0 below describes the costs in more detail.

5.3.1 Hydrology

The erosional stability of the site was evaluated using the 200-year 24-hour storm event which CNI feels is appropriate for the existing as-built configuration. The 200-year 24-hour storm event of 3.7 inches was developed by extrapolation using less severe storm events obtained from the National Oceanic and Atmospheric Administration (NOAA), 1973.

Under the storm event cited above, erosional stability was analyzed for the existing cover surface, the outslopes located on the northern edge of the heap leach area, the cover channels immediately below the heap leach area to the north and south, the southern edge of the heap leach area, and Coyote Creek (see Figure 1). The following sections and Appendix A discuss the approach and analyses in more detail.

5.3.2 Hydraulic Analysis

Hydraulic analyses were performed for the reclamation cover surface, the outslopes, and Coyote Creek for the storm event previously discussed. Hydraulic analyses for each area are discussed separately in the following sections.

5.3.2.1 Cover Surface

Cover surface erosional stability was analyzed under the 200-year 24-hour storm event. Following STP guidelines, stable slope, sacrificial slope, and permissible velocity methods were employed to determine the stability under these storm events.

The stable slope calculations were performed. Input parameters are presented in Appendix A. The storm intensity was derived as presented in Appendix A; allowable shear stress was obtained from Temple (Temple, 1987) based on laboratory testing on site specific cover soils, and the slope length representing the steepest section on the cover surface. Results indicate the surface will require modification to meet the guidelines presented in the STP.

Due to the thickness of the existing cover, sacrificial slope calculations were performed to determine if erosion would impact the heap leach material. Potential gullying depth was calculated under the 200-year 24-hour storm event using the sacrificial slope procedures presented in the STP. Analyses indicate a potential approximate gully depth of greater than 10 feet. This gully depth exceeds the cover thickness in some areas of the heap leach obtained from the field investigation carried out October 11 and 12, 1992.

5.3.2.2 Outslopes

The outslopes on the northern edge of the heap leach area were evaluated for erosional stability. Due to the steep slopes in this area, sacrificial slope calculations were performed to determine the erosional stability. The steepest sections were used in the analysis.

Sacrificial slope calculations were used to determine if potential gullying would encroach into the heap leach material under extreme storm events. The type of cover material was determined during the field investigation, and based on the laboratory testing for percent passing #200 sieve indicated this material to be a fine sand. Under the 200-year 24-hour storm event, the analysis indicates these areas would require modification to meet guidelines presented in the STP since potential gullying depths affect the reclaimed heap leach material.

5.3.2.3 Cover Channels

Two cover channels were constructed during reclamation, one immediately below the heap leach area to the north (labelled the North Cover Channel), and a second below the heap leach area to the south (labelled the South Cover Channel) (see Figure 1). These channels prevent run-on to the outslopes by intercepting flow from the cover and surrounding areas and conveying it away from the site cover. The existing diversion channels were thus analyzed for stability under the 200-year 24-hour storm event.

Using the site specific channel soils (and not accounting for vegetation) the channels were analyzed using the STP permissible velocity method. The permissible velocity was obtained from Chow, 1959. See Appendix A for more details. For the 200-year 24-hour storm event, the flow velocities exceed the permissible velocity for a majority of the channel reach.

5.3.2.4 Coyote Creek Drainage

The Coyote Creek drainage, which lies north of the heap leach area, was analyzed for erosional stability to determine potential heap leach area impacts under extreme storm events. Currently, the outslope of spoils to the northeast of the heap leach area directly contacts the Coyote Creek drainage. Therefore, this area was selected for analysis in the initial calculations.

The 200-year 24-hour storm event was used for the analysis. The drainage basin area that contributes to Coyote Creek is presented in Appendix A. Results of the analyses indicate Coyote Creek has erosive velocities at the northeastern outslope of the heap leach area.

Although the remaining drainage down-gradient of the outslope of spoils northeast of the heap leach area does not directly contact the outslopes, flow resulting from extreme storm events may still impact the outslopes. Although geomorphic studies were not performed, it is very probable that drainage movement (incision) may occur in the future because of the fine sandy material present in the natural drainage. In any event, analyses indicate the 200-year 24-hour storm flow will impact the existing spoil outslopes directly north of the heap leach area. Calculated velocities indicate erosional instability. Modifications to the Coyote Creek drainage would be required to establish stability along the northern edge of the heap leach area. Appendix A presents the analysis in more detail.

5.4 Summary

In summary, all components of the existing reclamation system are not erosionally stable as they currently exist under the 200-year 24-hour storm event.

6.0 CURRENT SITUATION ALTERNATIVES

An evaluation was performed of the existing reclamation system to determine the benefits and risks associated with implementing additional reclamation efforts to the site, and the costs, benefits, and associated risks with no additional reclamation to the reclaimed heap leach area.

Provided below is a conceptual alternative for additional reclamation efforts on the cover surface, outslopes, cover channels, and Coyote Creek. Implementation of this alternative would provide additional long-term stability and ensure design guidelines presented in the STP are achieved. Also provided below is an analysis of the current reclamation, associated costs, benefits, and risks associated without modifying the existing reclaimed heap leach area.

6.1 Existing Completed Reclamation

The approved reclamation was evaluated to determine costs, benefits and associated risks for performing no additional reclamation work.

6.1.1 Description

Figure 1 shows the existing configuration of the reclaimed heap leach area and spoil outslopes. The reclamation cover and configuration was described in Section 1.1. As mentioned previously, the reclaimed heap leach area resides above mine spoil material. Spoil outslopes at angle of repose surround the reclaimed heap leach area to the north and northeast. Coyote Creek lies to the east and north of the area and contacts the spoil outslope to the northeast of the heap leach area.

6.1.2 Costs

No costs are associated with this option. Existing reclamation would remain as is and modifications to the site would be performed.

6.1.3 Benefits

No additional disturbance would be necessary if reclamation was left in place. Established vegetation would remain undisturbed and allowed to continue development.

With no further activity, the benefits would also include no consumption of fuel for equipment, no reduction in air quality, no deaths of wildlife resulting from equipment usage and activities, no occupational risk to human injury or death from construction activity, and would maintain the potential environmental and mine resources of the site.

6.1.4 Risk Evaluation

If no additional reclamation work is performed on the heap leach area, the risks would be the release of heap leach material to the environment. Erosion would occur as a result of the 200-year 24-hour storm event to undisturbed natural ground in the vicinity, the cover surface, the spoil material outslopes immediately below the heap leach area, and spoil dumps surrounding the project area. To quantify the risk associated with no action, a fluvial sedimentation analysis was performed using SEDCAD+ Version 3 computer model developed by Civil Software Design (Warner and Schwab, 1992). The purpose of the analysis was to demonstrate the relative impacts in the event the integrity of the existing cover is altered, resulting in the loss of heap leach material, and a comparison of this material loss to erosion from natural land and surrounding spoils material containing elevated levels of radium.

The fluvial sedimentation analysis indicates the majority of the soil loss at the confluence of Muskrat and Coyote Creeks to be contributed by the undisturbed areas for the 200-year 24-hour storm event. The relative comparison of radium contents within spoil and heap leach material indicates a large percentage of radium being contributed by the spoils material. Given this fact, relative impacts should the heap leach material be transported to the confluence of Muskrat and Coyote Creeks are minimal. The resulting soil loss and corresponding radium contributions for the various surfaces are summarized in Table 3 below. A complete description of the analysis is provided in Appendix C.

TABLE 3 - Fluvial Sedimentation Results

Material	Soil Loss Tons	Radium Activity pCi/g	Percentage of Total	Incremental Increase pCi/g
Heap Leach Material	1,046	119.5	8.5	1.5
Spoils	12,736	98.3	86.9	14.7
Undisturbed	71,217	1	4.6	0.8
TOTAL	84,999	NA	100	17

Incremental increase if radium in pCi/g contributed by heap leach material is calculated by:

$$\frac{1046 \text{ tons (heap)} * 119.5 \text{ pCi/g}}{84{,}999 \text{ tons (total)}} = 1.5 \text{ pCi/g}$$

6.2 Stabilize Heap Leach Cover and Outslopes at 2.5H:1V

An alternative conceptual design was developed that would meet the guidelines presented in the STP and comply with 10 CFR 40, Appendix A. A description of the design and associated costs and benefits along with the risks are presented below.

6.2.1 Description

The conceptual alternative includes placement of a rock mulch over the cover surface, placement of rock protection in the existing diversion channels, regrading the outslopes to 2.5H:1V, placement of rock protection on the surface of the outslopes, redesigning Coyote Creek in certain locations, and placement of rock protection in the Coyote Creek drainage. These items are described in more detail below.

In order to provide erosional stability for the cover surface under STP guidelines, a rock mulch constructed over the entire surface of the heap leach area (approximately 26 acres, see Figure 4) would be required. Analyses for the design of the rock mulch are presented in Appendix A. The analyses indicate a rock mulch of approximately 1 inch D_{50} is required on the surface for establishing stability under the 200-year 24-hour storm event.

Regrading and the placement of rock protection would be required to establish erosional stability of the northern outslopes under the 200-year 24-hour storm event. This would include establishing a 2.5H (horizontal):1V (Vertical) slope and placement of rock protection on the regraded surface. A cut and fill package within AutoCAD was used to determine the amount of fill required to obtain a 2.5H:1V slope, which totaled approximately 132,400 cubic yards. For establishing erosional stability, the required rock size on the outslopes is 1 inch D_{50}.

The existing north and south cover channels require modifications to fully meet stability guidelines. The channels would require 2 inch D_{50} rock protection.

As presented above, rock protection is required in the Coyote Creek drainage to prevent erosive velocities from impacting the heap leach area outslopes. For the majority of the drainage, approximately 3 inch to 18 inch D_{50} rock is required to provide protection under the 200-year 24-hour storm event. One area of the drainage will require a 4.8 feet D_{50} for erosional stability, and is described in Appendix A. This area has a greater bed slope resulting in higher flow velocities.

6.2.2 Costs

A cost estimate was prepared by Bartell & Associates based on the estimated quantities of earthwork and rock protection for the proposed configuration. Included in the estimate were costs for all equipment including mobilization and demobilization, purchasing and hauling of rock protection including filter material from an existing operating quarry, excavation and placement of fill material, supervisors, operators, laborers, quality control, surveying, service and repair, engineering, lab testing, revegetation of disturbed areas, and a 15 percent contingency. Based on the activities, the total estimated costs for this alternative totals approximately $2,779,000. CNI has escalated the amount to account for additional cost associated with riprap protection to a total of $2,943,000. The assumptions and basis for the associated costs are included in Appendix E.

6.2.3 Benefits

The additional reclamation work would establish stability according to the guidelines presented in the STP. The conceptual alternative would limit the loss of heap leach material by adding additional erosion protection to the cover, adjacent outslopes, and Coyote Creek. The benefit would be the establishment of long-term stability for the site.

6.2.4 Risk Evaluation

For the additional reclamation work, significant earth moving equipment would be required for establishing the final configuration. Additional activity would result in reduced air quality, consumption of large quantities of gasoline and diesel fuel. Environmental resources such as vegetative growth and animal habitat would be lost, wildlife kill as a result of equipment usage would most likely occur, as well as risk to human health and safety during construction.

7.0 CONCLUSION

The analyses of the existing reclamation and the cost estimates for the alternative reclamation lead to the following conclusions:

1. The existing reclamation is presently performing all of the objectives required. The radon flux, both measured and calculated is less than 20 $pCi/m^2/sec$. Ground water quality is not being impacted by the heap. Physical isolation of the heap leach material has been accomplished.

2. Erosional stability analysis indicates the site will not be erosionally stable under extreme events (i.e. 200-year 24-hour storm).

3. The additional costs required to provide erosional stability for the 200-year 24-hour event is approximately $3,000,000.

4. Since the surrounding spoil and the heap leach material have very similar radium concentrations, and the area of the spoils is much greater than the heap, the contribution of the heap to sediment in Coyote Creek during an extreme storm event would be very small.

Given the results of the analyses it is concluded that while the existing reclamation does not provide the long-term erosional stability required in the STP, additional reclamation to meet the requirements of the STP would be extremely expensive and little if any benefits would result. Therefore additional reclamation activities at the Day Loma heap leach area are not warranted.

8.0 REFERENCES

Chow, V. T., 1959. Open-Channel Hydraulics, McGraw-Hill Book Co., Inc., New York, N.Y.

Lidstone & Anderson, Inc., 1991. "Day Loma Master Plan," AML-16-G and Attachments. Wyoming Department of Environmental Quality, Land Mine Division, Abandoned Mine Land Program.

National Oceanic and Atmospheric Administration (NOAA), 1973. National Weather Service, "Precipitation-Frequency Atlas of Western United States, Atlas 2, Volume VII-Nevada," U.S. Department of Commerce, Washington, D.C.

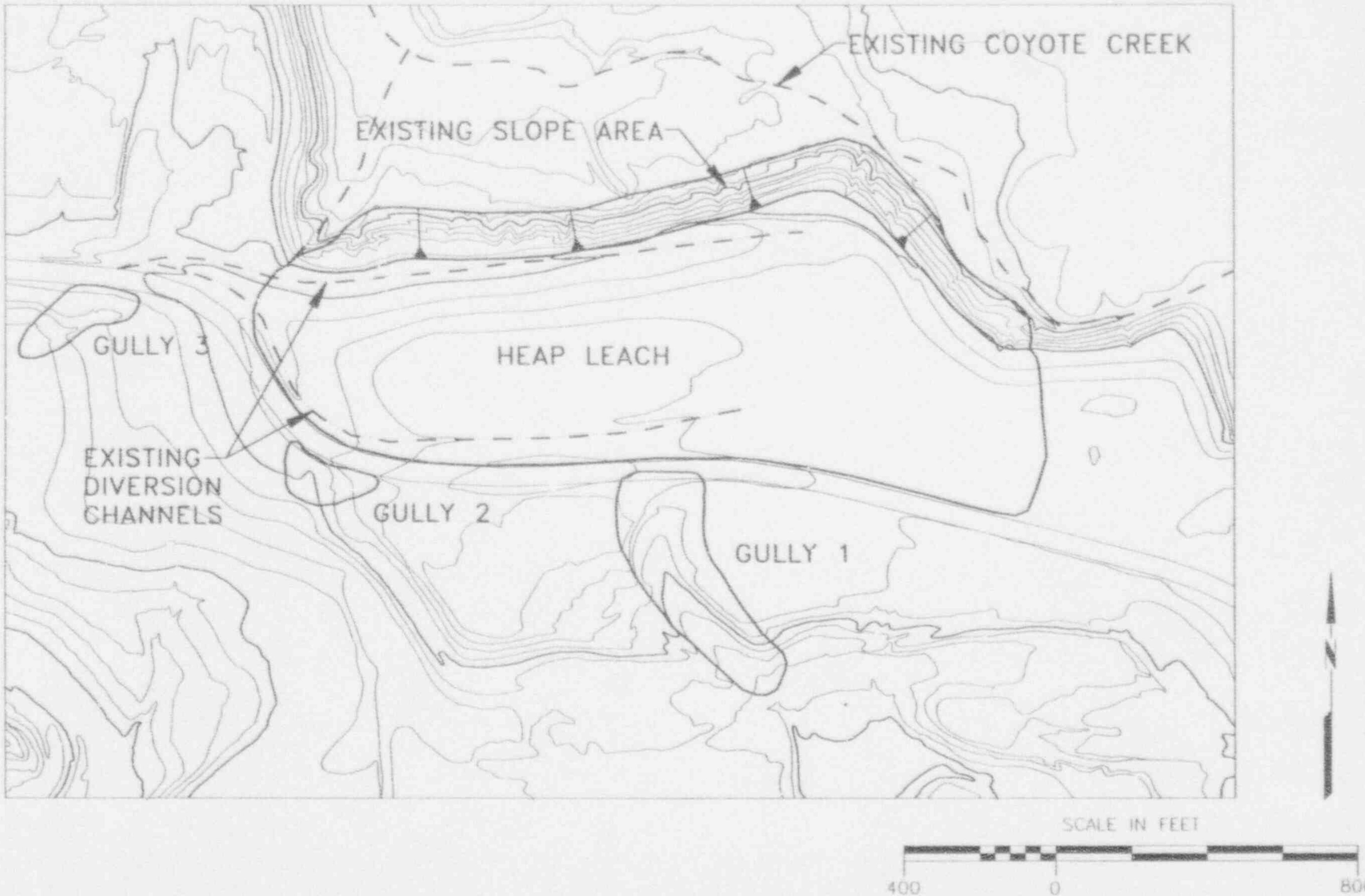
Temple, D. M., et al.,(1987). U.S Department of Agriculture (USDA), "Stability Design of Grass-Lined Open Channels", Agriculture Handbook Number 667

U. S. Nuclear Regulatory Commission, 1984. "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design," NUREG/CR-3533. Prepared by Rogers, et al, April.

U. S. Nuclear Regulatory Commission, 1989. "Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers," Regulatory Guide 3.64, Task WM 503-4). Version 1.2, G.F. Birchard, June.

U. S. Nuclear Regulatory Commission, 1990. "Final Staff Technical Position Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites".

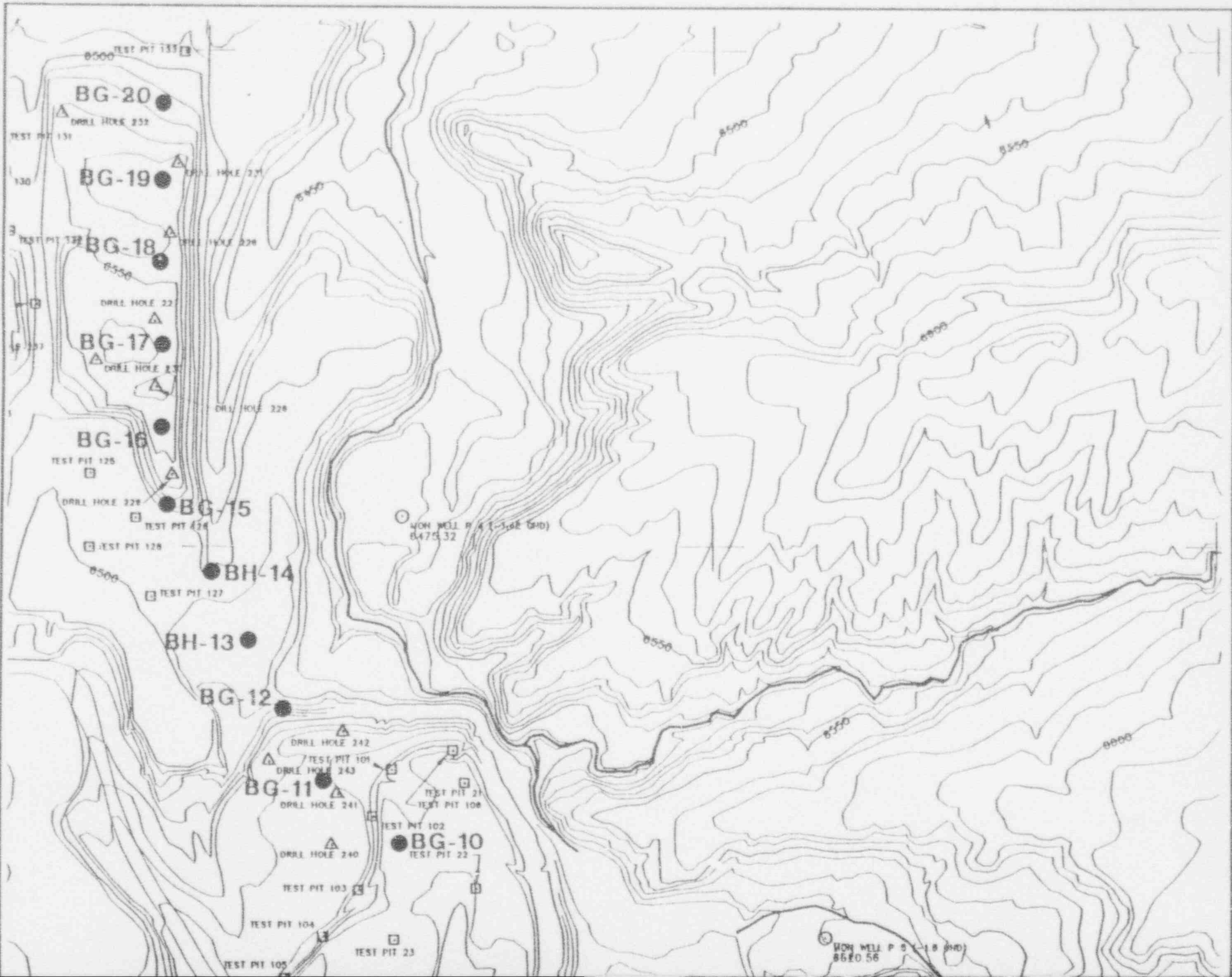
Warner, Dr. Richard C., and Pamela Schwab, 1992. SEDCAD+ Version 3 developed by Civil Software Design, Ames, Iowa.

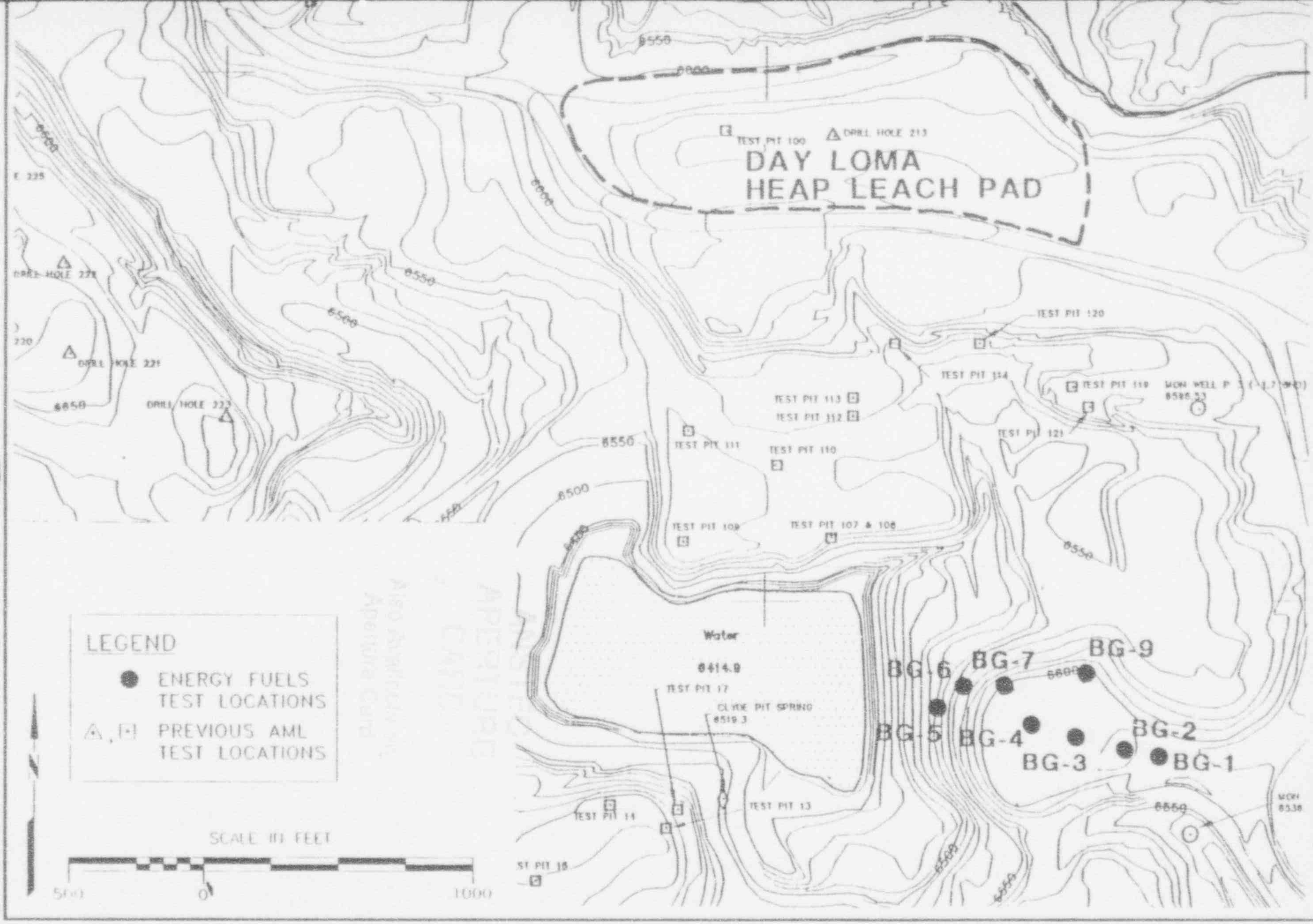


SMI
SHEPHERD MILLER, INC.

FIGURE 1
EXISTING CONFIGURATION
DAY LOMA HEAP LEACH AREA

Date:	NOV., 1993
Project:	350
File:	EXISTING


BG-20
BG-19
BG-18
BG-17
BG-16
BG-15
BH-14
BH-13
BG-12
BG-11
BG-10
TEST PIT 133
TEST PIT 131
TEST PIT 125
TEST PIT 128
TEST PIT 127
TEST PIT 101
TEST PIT 21
TEST PIT 102
TEST PIT 22
TEST PIT 103
TEST PIT 104
TEST PIT 105
TEST PIT 23
DRILL HOLE 232
DRILL HOLE 228
DRILL HOLE 242
DRILL HOLE 243
DRILL HOLE 241
DRILL HOLE 240
8500
8550
8600
8450
6475.32
8610.56

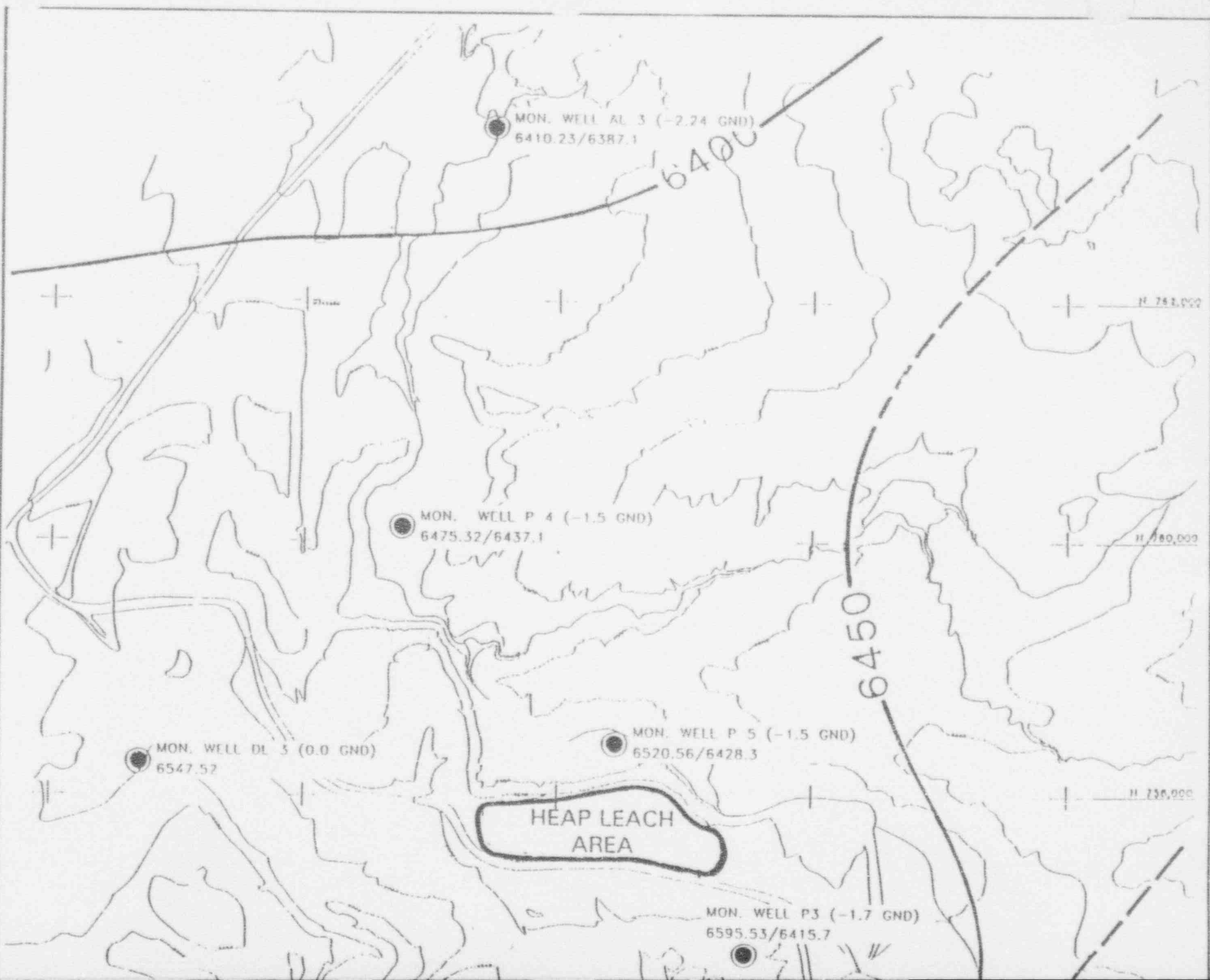


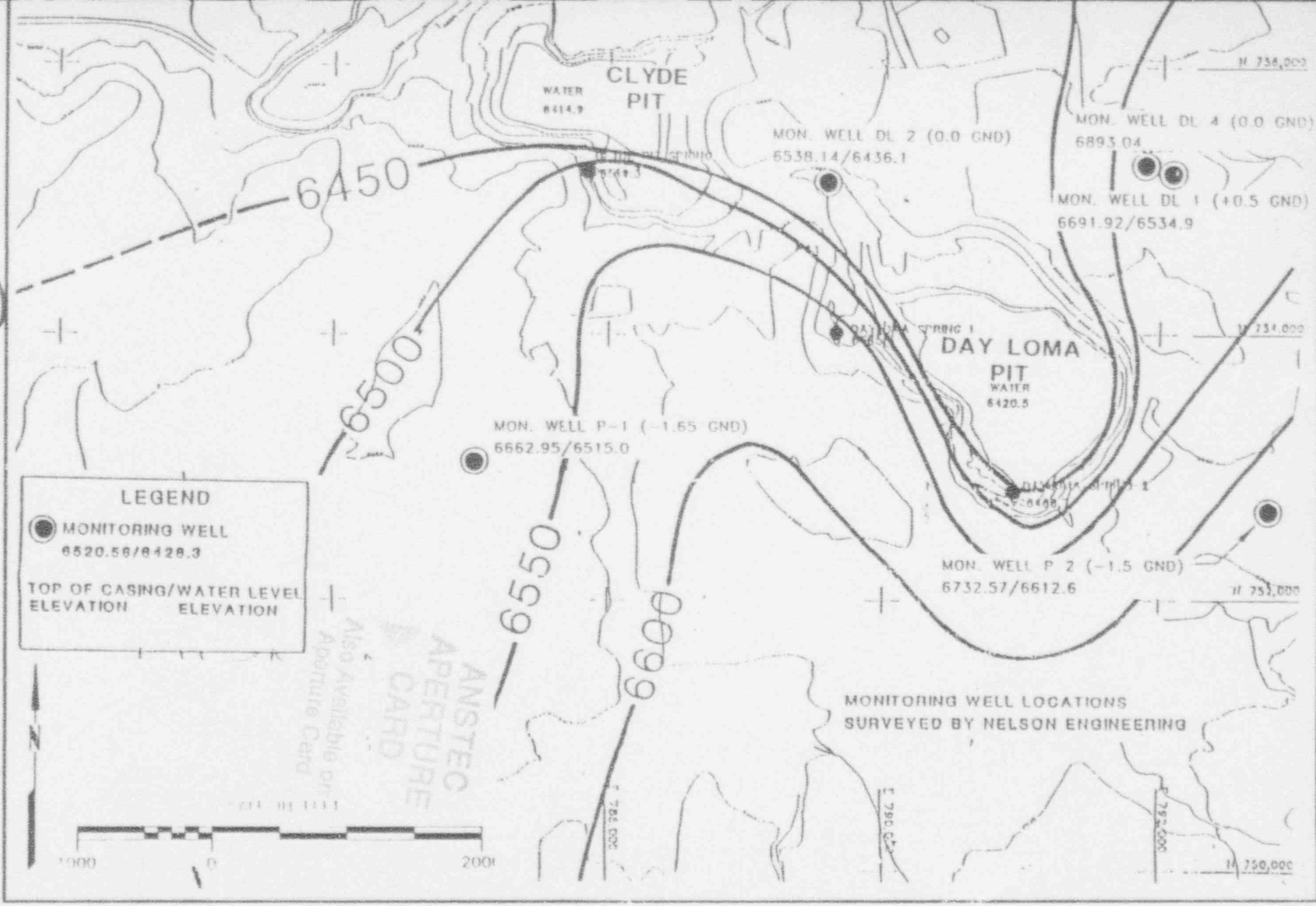
SMI
SHEPHERD MILLER, INC.

FIGURE 2
RADIUM 226 AND RADON
SAMPLE LOCATIONS DAY LOMA AREA

Date: NOV., 1993
Project: 350
File: T-BLOCK2

9403010166-01


MON. WELL AL 3 (-2.24 GND)
6410.23/6387.1
6400
MON. WELL P 4 (-1.5 GND)
6475.32/6437.1
6450
MON. WELL DL 3 (0.0 GND)
6547.52
MON. WELL P 5 (-1.5 GND)
6520.56/6428.3
HEAP LEACH
AREA
MON. WELL P3 (-1.7 GND)
6595.53/6415.7



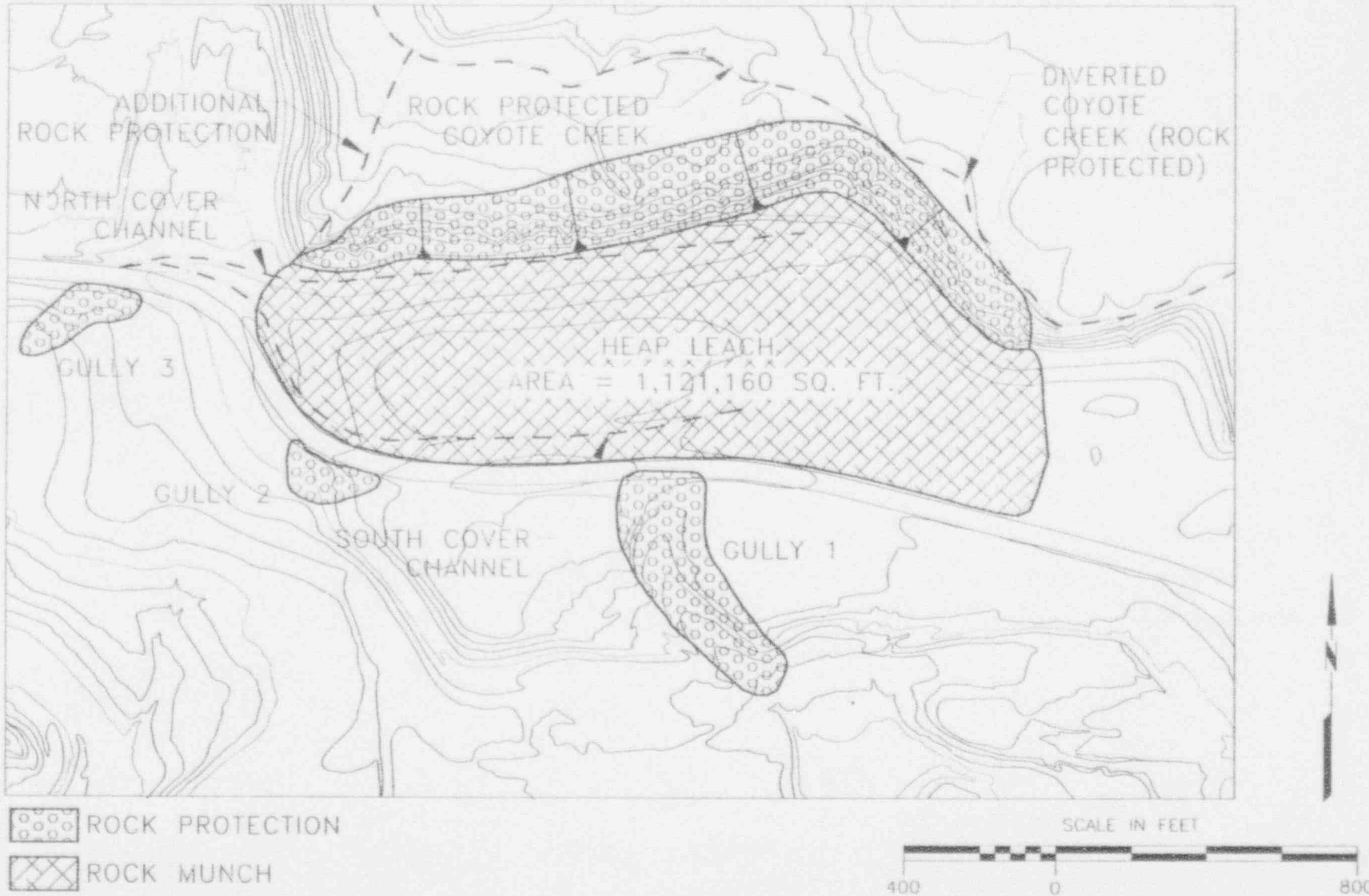
ANSTEC APERTURE CARD
Also Available on Aperture Card

SMI
SHEPHERD MILLER, INC

FIGURE 3
POTENTIOMETRIC SURFACE MAP DAY LOMA AREA
(FROM LIDSTONE & ANDERSON, INC. 1991)

Date: NOV., 199
Project: 350
File: T-BLOCK1

9403010166-02



SMI
SHEPHERD MILLER, INC.

FIGURE 4
CONCEPTUAL COVER DESIGN
DAY LOMA HEAP LEACH AREA

Date:	NOV., 1993
Project:	350
File:	VOLUME

OVERSIZE DOCUMENT PAGE PULLED

SEE APERTURE CARDS

NUMBER OF OVERSIZE PAGES FILMED ON APERTURE CARDS 1

9403010166-03

APERTURE CARD/HARD COPY AVAILABLE FROM

RECORDS AND REPORTS MANAGEMENT BRANCH

APPENDIX A
HYDROLOGIC/HYDRAULIC ANALYSIS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

A.1 HYDROLOGIC ANALYSIS

The Day Loma Heap Leach area was evaluated to determine if the site is erosionally stable under the 200-year 24-hour storm event. The U. S. Army Corps of Engineers (COE) HEC-1 computer model was used to estimate the magnitude of the peak discharges generated by the storm events for the cover surface, outslopes, diversion channels, and Coyote Creek. This model predicts watershed response to precipitation events. The required parameters include rainfall depth and distribution as well as sub-basin area, curve number, average basin slope, hydraulic length, and lag time. These parameters are discussed in more detail below. Methods referenced in the STP were employed to determine rainfall intensities resulting from the storm events.

A.1.1 Storm Events

The 200-year 24-hour storm event was used to model basin runoff. The 200-year 24-hour storm event of 3.7 inches was developed by extrapolation using subsequently smaller storm events (the 2, 5, 10, 25, 50, and 100-year 24-hour storms) obtained from the National Oceanic and Atmospheric Administration (NOAA), 1973. The resulting precipitation was distributed over the 24-hour time interval using the SCS Type II distribution (SCS, 1973). Rainfall intensity for the 200-year 24-hour storm event corresponding to the time of concentration was developed as outlined in NOAA. Although the 200-year storm event is not specifically referenced in NOAA, extrapolation procedures were performed simulating those presented for subsequently smaller storm events to develop rainfall intensity.

A.1.2 Watershed Characteristics

Discussed below are the parameters mentioned in Section A.1 above used to represent the watershed characteristics. These parameters represent existing site conditions and estimates were made where no specific information was available.

The curve number is based on soil type, land use, and vegetation in each sub-basin. The areal soil best fits an overall SCS classification of hydrologic soil group "C". The areal land use is described as pasture or range land in fair condition for the undisturbed areas. To be conservative, Antecedent Moisture Condition III (AMC III), representing saturated soil conditions, was used to adjust the curve number when analyzing the storm event runoff. For these conditions the corresponding curve number, adjusted to AMC III, was determined to be 91 (Barfield, 1981).

Each watershed was divided into sub-basins to more adequately model the storm event. The average basin slope for each sub-basin was determined from topographic maps of the surrounding area. Weighted averages were taken to provide an estimated average basin slope. Figure A.1 shows a delineation of the watersheds.

Lag time is defined as the time from the center of mass of the effective rainfall to the peak of the runoff hydrograph and is calculated by the equation:

$$t_l = \frac{L^{0.8}(S+1)^{0.7}}{1900y^{0.5}}$$

where:

t_l = lag time (hours),

L = hydraulic length (feet),

y = average basin slope (%), and

S = (1000/CN)-10, where CN = curve number.

The parameters for all sub-basins are given in Table A.1. Where multiple sub-basins exist, flood routing, per the Muskingham routing method, was performed within HEC-1 to determine peak discharges.

A.1.3 Description of Areas Analyzed

The hydrologic and hydraulic analyses were performed for four different areas; the cover surface, the outslopes, the cover channels immediately below the Heap Leach area, and Coyote Creek drainage. These areas are described below.

A.1.3.1 Cover Surface

The steepest slope section of the cover surface was analyzed for the calculation of permissible velocity and for sizing rock protection. The watershed consisted of a 100-foot wide strip that parallels the direction of surface flow. This area was input into HEC-1, along with watershed characteristics, to calculate runoff. For the stable slope and sacrificial slope calculations, the steepest slope section on the cover surface was again used in the runoff analysis.

A.1.3.2 Outslopes

The outslopes to the north of the Heap Leach area were analyzed for erosional stability for the 200-year 24-hour storm event. For the sacrificial slope calculations, the steepest slope section of the outslopes was used in the analysis. The same area was used for sizing rock protection. Three additional conceptual outslope geometries were also evaluated for long term erosional stability.

Currently, three existing gullies are present to the south and west of the Heap Leach area (see Figures 1-4). These areas were also analyzed for erosional stability under the 200-year 24-hour storm event.

A.1.3.3 Cover Channels

Diversion channels exist below the heap leach area. The North Cover Channel collects and conveys flow off and away from the northern leach area and the South Cover Channel collects and conveys flow off and away from the southern portion of the leach area. These channels were evaluated for erosional stability using permissible velocity criteria.

The slope directly above the North Cover Channel was divided into small sub-basins approximately 200 feet wide in order to determine the magnitude of runoff contributing to channel flow at regular intervals. Calculated channel velocities under the design storm events were then compared to the maximum permissible velocity.

The Southern Cover Channel was considered analogous to the North Cover Channel. Although, less watershed exists for the catchment area of the Southern Cover Channel, considering the same peak discharge for this channel provides a conservative estimate.

A.1.3.4 Coyote Creek

The entire area contributing to the Coyote Creek drainage upgradient from the Heap Leach area was used in the erosional stability analysis. Depth of flow and corresponding velocities were analyzed adjacent to the Heap Leach area.

A.1.4 Results

The results of the hydrologic analysis provides peak discharges for Coyote Creek, the Cover Channels, the outslopes, and the cover surface. Peak discharges for these areas are presented in Table A.1 below.

Table A.1
Sub-Basin Hydrologic Parameters

Basin ID	Basin Slope (%)	Hydraulic Length (ft)	Basin Area (miles^2)	CN	Lag Time (hrs)	Discharge (cfs) 200 yr/24 hr
Coyote Creek						
1	9	6024	0.46	91	0.300	669
2	7	8020	0.26	91	0.428	310
3	8	7023	0.35	91	0.357	1428
4a	4	7004	0.149	91	0.537	1438
4b	15	570	0.058	91	0.035	1452
4c	15	550	0.041	91	0.034	1462
4d	15	875	0.052	91	0.050	1476
100 ft Wide Cover Strip						
1	7.7	130	0.00046	91	0.015	1
2	25	80	0.00028	91	0.006	2
3	8	100	0.00036	91	0.012	2
Cover Channel						
1	4.7	800	0.00474	91	0.083	10
2	20	250	0.00573	91	0.016	23
3	20	250	0.00484	91	0.016	33
4	13	100	0.00309	91	0.009	40
100 ft Wide Outslope Strip	40	215	0.00072	91	0.010	2

A.2 HYDRAULIC ANALYSIS

Long term erosional stability of the Day Loma Heap Leach area was evaluated under several reclamation configurations. Flow characteristics of the diversion channels and of Coyote Creek were evaluated using Manning's equation and the U.S. Army Corps of Engineers (1991) HEC-2 water surface profiles computer model. The HEC-2 model calculates water surface profiles and associated hydraulic conditions in natural and designed channels. Data requirements for the HEC-2 program include:

1. Discharge,
2. Flow regime,
3. Starting water surface elevations,
4. Manning's "n" values,
5. Cross-section geometry, and
6. Reach length.

The discharge values are resulting storm event HEC-1 peak flows. The peak discharge for watersheds above each channel was input into HEC-2. Using peak flows in this manner produces conservative (maximum) calculated flow depths and velocities.

Flow regime refers to whether subcritical or supercritical flow conditions prevail for a given channel. HEC-2 results indicate flow from the design storm events is supercritical in most of the existing un-lined channels as well as the reclaimed rock-lined channels.

The slope-area method for specifying starting water surface elevation was used for the analysis of stream profiles. The HEC-2 model performs a normal depth calculation using a specified energy grade line which is estimated as the starting channel bed slope.

The Manning's "n" values for the existing Coyote Creek drainage were obtained from the Day Loma Master Plan (Lidstone & Anderson, AML-16-G, 1991). The method used to calculate Manning's "n" for the reclaimed, rock-lined channel was obtained from application of equations developed by Abt, et. al. (1988) and Anderson, et al, (1970) and are a function of the median stone size, as presented below.

Abt - for slopes greater than 2 percent.

$$n = 0.0456\ (d_{50} * s)^{0.159}$$

where d_{50} is the median diameter of the rock, in inches.

Anderson - for slopes less than 2 percent

$$n = 0.0395\ (D_{50})^{0.167}$$

where: n = Manning's "n"

D_{50} = Median stone size

Geometry for water surface profile computations is specified in the HEC-2 program by stream cross-sections and distances along the stream between the cross sections. The sections are placed at representative locations along each channel characterizing the channel shape. HEC-2 outputs for the North Cover Channel and Coyote Creek drainage are included at the end of this appendix.

A.2.1 Cover Analysis

Unit discharges for the steepest sections were obtained by dividing the resulting discharge by the watershed width of 100 feet. Depths of flow and velocities were then determined using Manning's equation. Manning's "n" values were calculated with the same procedures as presented in Section A.2 above. The results for the cover stability calculations are presented below. HEC-1 output is attached at the end of this appendix.

The cover surface stability was analyzed using the Comparative Shear Stress (Temple, 1987), Permissible Velocity (Chow, 1959) methods as well as Stable Slope and Sacrificial Slope Criteria (NRC, 1990). The cover soil varied from clayey to sandy material. However, the sandy material was determined to control erosional stability and was therefore used in the subsequent analyses. Permissible velocity was obtained from Chow using appropriate methods for reducing permissible velocities for shallow depths.

A.2.1.1 Comparative Shear Stress

Manning's "n" for the cover was obtained using the same procedures as presented in Section A.2. Equations for determining allowable stress for various soil types are presented in Temple (1987). Calculation of the effective soil stress required determining several additional parameters. The effective stress equation is:

$$\tau_e = \gamma \, D \, S \, (1-C_F) \, (n_s/n)^2$$

where:
τ_e = actual, or effective, stress in lb/ft^2,
γ = unit weight of water (62.4 lb/ft^3),
D = maximum depth of flow in ft,

S = slope of the energy grade line in ft/ft and is approximately the slope of the ground surface,

C_F = vegetal cover factor,

n_s = soil grain roughness coefficient, and

n = Manning's roughness value.

Depth of flow was determined from Manning's Equation. Slope was obtained from a topographic relief map of the reclamation site. The vegetal cover factor, C_F, was conservatively assumed to be 0.0 for nonvegetated soil slopes. Soil grain roughness, n_s, for noncohesive soils is 0.0156 (Temple, 1987).

Using the Temple method, the effective stress for the steepest section was determined to be 0.095 lb/ft^2 for the 200 year storm event. This value is greater than the allowable stress of 0.02 lb/ft^2 obtained from Temple, 1987, for noncohesive soils with $D_{75} < 0.05$ inches.

A.2.1.2 Permissible velocity

Runoff analysis for the cover was performed using a 100-foot wide strip oriented parallel to the direction of flow. HEC-1 was used to determine the peak flow of the strip. The permissible velocity of 5 ft/s (Chow, 1959) was multiplied by the correction factor (correction factors are also presented in the STP) of .5 to obtain a new permissible velocity of 2.5 ft/s. The maximum velocity for the steepest section was determined to be 1.6 ft/s for the 200-year storm event. Therefore, the steepest section on the existing cover surface meets the permissible velocity requirements with the 200-year storm event.

A.2.1.3 Stable Slope

The STP presents a stable slope equation for direct solution of the stable slope necessary to prevent the initiation of gullying due to a single, intense rainfall event. The stable slope derived from this equation should also reflect the slope able to resist gullying due to several rainfall events, of lower intensities, which would be expected over a 200 to 1000 year period. This equation is:

$$Ss^{7/6} = \frac{65(\tau)^{5/3}}{P\ L\ F\ n}$$

where:

- Ss = Stable Slope (ft/ft)
- τ = Allowable Shear Stress (lb/ft^2)
- P = Rainfall intensity (in/hr)
- L = Flow length (ft)
- F = Flow Concentration Factor
- n = Manning's Roughness Coefficient

The allowable shear stress (τ) of 0.02 lb/ft was obtained from Temple, 1987 for a noncohesive soil with a $D_{75} < 0.05$ inches. The rainfall intensity (P) for the 200-year storm event was developed from precipitation-duration curves. The flow length was determined from topographic maps of the study area. The flow concentration factor (F) was set equal to 3.0 as per the STP. Manning's roughness coefficient (n) was estimated to be 0.030 for the sandy cover material based on Chow, 1959. The existing soil cover stable slope was calculated to be 0.0038 ft/ft for the 200-year storm event, significantly less than the existing cover slope indicating that modification of the cover is required for long term erosional stability.

A.2.1.4 Sacrificial Slope

The STP presents a procedure for determining sacrificial slope requirements (i.e., specific depth of gullying and heap leach material setback distance from edge of embankment crest) for protective slopes. This procedure assumes no drainage area above the embankment crest and is based on the assumption that a specific depth of gullying will not be exceeded within a 200 year period.

For this analysis the stable slope was calculated for the cover as described above. The transitional slope (S_t) was then determined using the relationships presented in Nelson et al., 1986, and the following equation:

$$S_t = S_i \; e^{-G \, S_s \, t}$$

where:

S_t = Transitional Slope (ft/ft)
S_i = Initial Slope (ft/ft)
G = Coefficient (Nelson et al., Table 4.3)
t = Time (years, not to exceed 200 years)
S_s = Stable Slope (ft/ft)

The transitional slope (S_t) was calculated to be 0.052 ft/ft for the 200-year storm event. A uniformity coefficient ($C_u = D_{60}/D_{10}$) for the cover material of 10 was assumed. Using Nelson et al., 1986, the location and maximum depth of gullying were calculated with the following equations:

$$D_{max} = \frac{L_D}{L}\,[H - L(S_t)]$$

where:

L_D = Distance from toe of maximum depth of gullying (ft)

L = Horizontal distance of heap leach material from toe of embankment (ft)

H = Vertical distance from crest of embankment to toe of slope (ft)

S_t = Transitional slope (ft/ft)

The location and maximum depth of gullying (D_{max}) for the cover analyses are summarized in Table A.2.

Table A.2

Summary of Gullying Calculations

Storm Event	Slope Length (ft)	Stable Slope (%)	G (Nelson et al., 1986 Table 4.3)	Initial Slope (%)	Transition Slope (%)	L_D/L (Nelson et al., 1986. Table 4.4)	Depth of Gullying (ft) (D_{max})	Location of Maximum depth (ft) (L_D)
200 yr	80	0.39	2	25	5.2	0.66	10.4	52.8

A.2.1.5 Rock Protection

For the 200-year storm event, the rock size for the rock mulch to be placed on the surface was calculated using the Stephensen's method (Abt, 1988). The Stephensen equation is given by:

$$D_{50} = \left[\frac{q\ (\tan\theta)^{7/6}\ n^{1/6}}{C\ g^{1/2}\ [(1-n)\ (s-1)\ \cos\theta\ (\tan\phi - \tan\theta)]^{5/3}} \right]^{2/3}$$

where:

q = maximum unit discharge,

n = rockfill porosity,

g = acceleration due to gravity,

s = relative density of the rock,

θ = angle of the slope measured from horizontal,

ϕ = angle of friction of the rock, and

C = empirical factor.

The unit discharge was determined from the HEC-1 and Manning's equation presented above. The unit discharge for the cover surface is 0.016 cfs/ft. The friction angle of the rock used in the equation was 40 degrees. The rockfill porosity was assumed to be 0.32, and the specific gravity was determined to be 2.65. The steepest slope of the cover is approximately 25 percent. The empirical factor, C, varies from 0.22 for gravel and pebbles to 0.27 for crushed granite; a value of 0.25 was used because this most closely represents the type of rock present. The maximum flow rate q was multiplied by Oliviers' constant to ensure stability (Abt et al, 1988). The Oliviers' constants are 1.2 for gravel and 1.8 for crushed rock. The value used was 1.8 for the crushed rock present. The D_{50} of rock required to protect the cover from the erosive forces is 1 inch.

A.2.2 Cover Channels

Diversion channels at the toe of the heap leach cover prevent cover runoff from contributing to erosion of the outslope below. As mentioned in Section A.1.3.3 above, two cover channels exist at the toe of the heap leach cover, one on the south and one on the north side of the cover. The erosional stability of these channels was evaluated using the permissible velocity criteria described in Section A.2.1.2.

A.2.2.1 Permissible Velocity

The permissible velocity is defined as the maximum flow velocity which will not cause erosion of the channel bed soils. The permissible velocity for the channels was determined to be 5 feet per second (fps). This value was based on tables presented in Chow (1959) for unvegetated slopes composed of graded loam to cobbles when noncolloidal. The north diversion channel was modeled using the U. S. Army Corps of Engineers (COE) HEC-1 computer model to estimate the magnitude of the peak discharges in the channels under the design storm events. The South Cover Channel, very similar in geometry and grade, was modeled by analogy with the North Cover Channel. HEC-2 was used to determine corresponding depths of flow and velocities at selected cross sections.

A.2.2.2 Rock Protection

The required rock size was determined with the HEC-2 results in accordance with the criteria set forth in NUREG/CR-4651 (Abt, et al, 1988). The method used to examine the appropriate sizes of riprap was the U.S. Army Corps of Engineers Method (COE). The COE method was developed to protect embankments from local shear forces and localized high velocities. The COE method utilizes depth of flow and velocity (calculated from HEC-2) to determine riprap size. Other data pertinent to the design of the riprap include channel roughness (wherein D_{50}, the representative median stone size, is used as a measurement of the roughness), the side slope and bed slope of the channel, and the riprap angle of repose.

Several equations are used to determine the D_{50} of the riprap size in the COE method. The equation used to calculate the local boundary shear is as follows.

$$\tau_o = \frac{(\gamma_w V^2)}{(32.6\log_{10}\frac{12.2D}{k})^2}$$

where: τ_o = local boundary shear, lb/ft^2,

γ_w = unit weight of water,

V = average cross-sectional velocity, fps,

D = depth of flow, ft, and

k = equivalent channel boundary surface roughness, with D_{50} substituting for k.

The design shear for the riprap to be placed on the slope or bank of the open channel is calculated from

$$\tau_D = \tau(1 - \frac{\sin^2\theta}{\sin^2\phi})^{0.5}$$

where:

$$\tau = a(\gamma_s - \gamma_w)D_{50}$$

and: τ_D = design shear, lb/ft^2,

τ = initial design shear, lb/ft^2,

θ = the angle of the side slope with the horizontal,

ϕ = the angle of repose of the riprap (normally 40°),

γ_s = the specific weight of surface-dry but saturated stone,

γ_w = unit weight of water, and

a = 0.04.

Using the above equations, the ratio of design shear to local boundary shear is used to calculate a factor of safety. A recommended D_{50} size for riprap in each of the channels is then determined by obtaining a factor of safety of 1.0. These riprap sizes are the highest values obtained in each channel and only occur in limited areas.

Based on the above analyses, a D_{50} of 2 inches is required to stabilize the channels for the 200-year storm event.

A.2.3 Outslopes

The existing outslope below the heap leach cover to the north was evaluated for erosional stability using the sacrificial slope criteria described in Section A.2.1.4. The geometry consisted of a continuous 2.5H:1V slope extending from the toe of the cover to the flood plain of Coyote Creek.

To the south of the Heap Leach area exists three apparent gullies. These gullies were analyzed in order to provide adequate stability for the storm events mentioned above.

A.2.3.1 Sacrificial Slope

The embankment outslope surface below the cover was analyzed for long term stability by using the sacrificial slope calculations described in Section A.2.1.4. The results of the analysis are summarized in Table A.3. The existing outslope was determined to be insufficient to provide long-term protection of the heap leach material from gullying. Therefore, an alternative conceptual outslope geometry was evaluated for long term erosional stability. The surface geometry was also evaluated with the sacrificial slope criteria and found to require rock protection for erosional stability. This analysis is summarized in Table A.3

Table A.3

Summary of Gullying Calculations

Location	Slope Length (ft)	Stable Slope (%)	G (Nelson et al., 1986 Table 4.3)	Initial Slope (%)	Transition Slope (%)	L_D/L (Nelson et al., 1986. Table 4.4)	Depth of Gullying (ft) (D_{max})	Location of Maximum depth (ft) (L_D)
Out-Slope: Existing								
200 yr	97	0.34	2.3	57.5	12.0	0.42	16.1	40.7
2.5H:1V Slope								
200 yr	200	0.179	5	40	6.7	0.60	40*	120

* Approximate depth.

A.2.3.2 Rock Protection

The required riprap size to maintain stability for the various outslope options was determined using the resulting peak discharge for the outslope surface. The Stephensen method referenced in Section A.2.1.5 was used to size the riprap on the surface of the outslope. The unit discharge was determined from the HEC-1 and Manning's equation presented above. The unit discharge for the outslope is 0.016 cfs/ft, 0.04 cfs/ft, and 0.01 cfs/ft, for the 200 year storm event. The friction angle of the rock used in the equation was 40 degrees. The rockfill porosity was assumed to be 0.32, and the specific gravity was determined to be 2.65. The slope of the outslope options ranges from 25 to 40 percent. The empirical factor, C, varies from 0.22 for gravel and pebbles to 0.27 for crushed granite; a value of 0.25 was used for the type of rock most likely to be used in this area. The maximum flow rate q was multiplied by Oliviers' constant to ensure stability (Abt et al, 1988). The Oliviers' constants are 1.2 for gravel and 1.8 for crushed rock. The value used was 1.8 for crushed rock. The required riprap D_{50} for the outslope was determined to be 1 inch.

The three existing gullies south of the Heap Leach area were determined to require rock protection of greater than 36 inch D_{50}. Rock size was determined using the U.S. Army Corps of Engineers method. This large rock size in these areas is due to the concentrated flow resulting from the extreme storm events.

A.2.4 Coyote Creek

Coyote Creek runs from west to east along the north side of the Day Loma Heap Leach area as shown on Figure A.2. As mentioned in Section A.1.3.4, the drainage was analyzed for erosional stability. Erosional stability of the drainage was analyzed for the existing condition, and for all three conceptual options mentioned above. Permissible velocity method was used in the analyses, along with the U.S. Army Corps of Engineers method for sizing of appropriate rock size to establish erosional stability.

The analyses indicate the 200-year design flow from the existing Coyote Creek drainage would impact the northern toe of the heap leach area outslope by approximately two feet of flow depth. Therefore, rock protection is required within the Coyote Creek drainage with minor stream re-routing.

A.2.4.1 Permissible Velocity

As defined in Section A.2.2.1 above, the permissible velocity is the maximum flow velocity which will not cause erosion of the channel bed soils. The permissible velocity for Coyote Creek drainage was determined to be 5 feet per second (fps). This value was based on tables presented in Chow (1959) for unvegetated slopes composed of graded loam to cobbles when noncolloidal. For the 200-year 24-hour storm event, velocities in the drainage ranged from approximately 8 feet/second to greater than 20 feet/second in some locations, exceeding the permissible velocity. Therefore, sizing the required rock protection for establishing erosional stability of the drainage was performed.

A.2.4.2 Rock Protection

Based on the HEC-2 analysis for resulting depths of flow and velocities, and using methods described in Section A.2.2.2 above, appropriate rock sizes were determined throughout the drainage reach. In addition to the COE method for sizing the riprap as presented in A.2.2.2, the Safety Factors method also presented Abt, et al, 1988, was used for a particular area in Coyote Creek, namely between cross-sections 10.5 and 20, because higher elevation change was required to meet natural channel gradients and the COE method did not converge under these flow characteristics.

With changing bed slope along the drainage reach, appropriate rock sizes varied. Figure A.2 shows the Coyote Creek cross-section locations. The following rock sizes for channel protection were calculated:

Table A.4

Riprap Sizes for Coyote Creek

Cross-Section Location	Required D_{50}
0 to 10	11 inches
10 to 10.5	5 inches
10.5 to 20	4.8 feet (Safety Factors Method)
20 to 30	1.5 feet
30 to 40	1.5 feet
40 to 50	3 inches

HEC-2 output and riprap sizing results are included at the end of this appendix.

A.2.5 Summary

In establishing STP criteria for erosional stability of the Day Loma Heap Leach, at a minimum regrading and the addition of rock mulch or rock protection is required for a large percentage of the area. This is a result of the Heap Leach being in close proximity to a natural drainage, the erodible soils existing in the area, not accounting for vegetation on the cover surface, and the extreme storm events used in analyzing the stability. Although with more information and testing the requirements may be refined, those presented above provide a close approximation for establishing erosional stability and compliance with STP criteria.

REFERENCES

Anderson, A.G., A.S. Paintal, and J.T. Davenport, 1970. Tentative Design Procedure for Riprap Lined Channels, NCHRP Report No. 10.

Abt, S. R., R. J. Wittler, J. F. Ruff, D. L. LaGrone, M.S. Khattak, J.D. Nelson, N.E. Hinkle, and D.W. Lee, 1988. "Development of Riprap Design Criteria by Riprap Testing in Flumes: Phase II; Following-up Investigations," Vol. 2, NUREG/CR-4651, ORNL/TM-10100/V2, prepared for U.S. Nuclear Regulatory Commission, Washington, D.C.

Barfield, B. J., R.C. Warner, and C.T. Haan, 1981. Applied Hydrology and Sedimentology for Disturbed Areas, Oklahoma Technical Press, Stillwater, OK.

Chow, V. T., 1959. Open-Channel Hydraulics, McGraw-Hill Book Co., Inc., New York, N.Y.

Lidstone & Anderson, Inc., 1991. "Day Loma Master Plan," AML-16-G and Attachments. Wyoming Department of Environmental Quality, Land Mine Division, Abandoned Mine Land Program.

Nelson, J.D., S.R. Abt, R.L. Volpe, D. van Zyl, 1986. "Methodologies for Evaluating Long-Term Stabilization Designs of Uranium Mill Tailings Impoundments." NUREG/CR-4620, ORNL/TM-10067, prepared for the U.S. Nuclear Regulatory Commission, Washington, D.C.

National Oceanic and Atmcspheric Administration (NOAA), 1973. National Weather Service, "Precipitation-Frequency Atlas of Western United States, Atlas 2, Volume VII-Nevada," U.S. Department of Commerce, Washington, D.C.

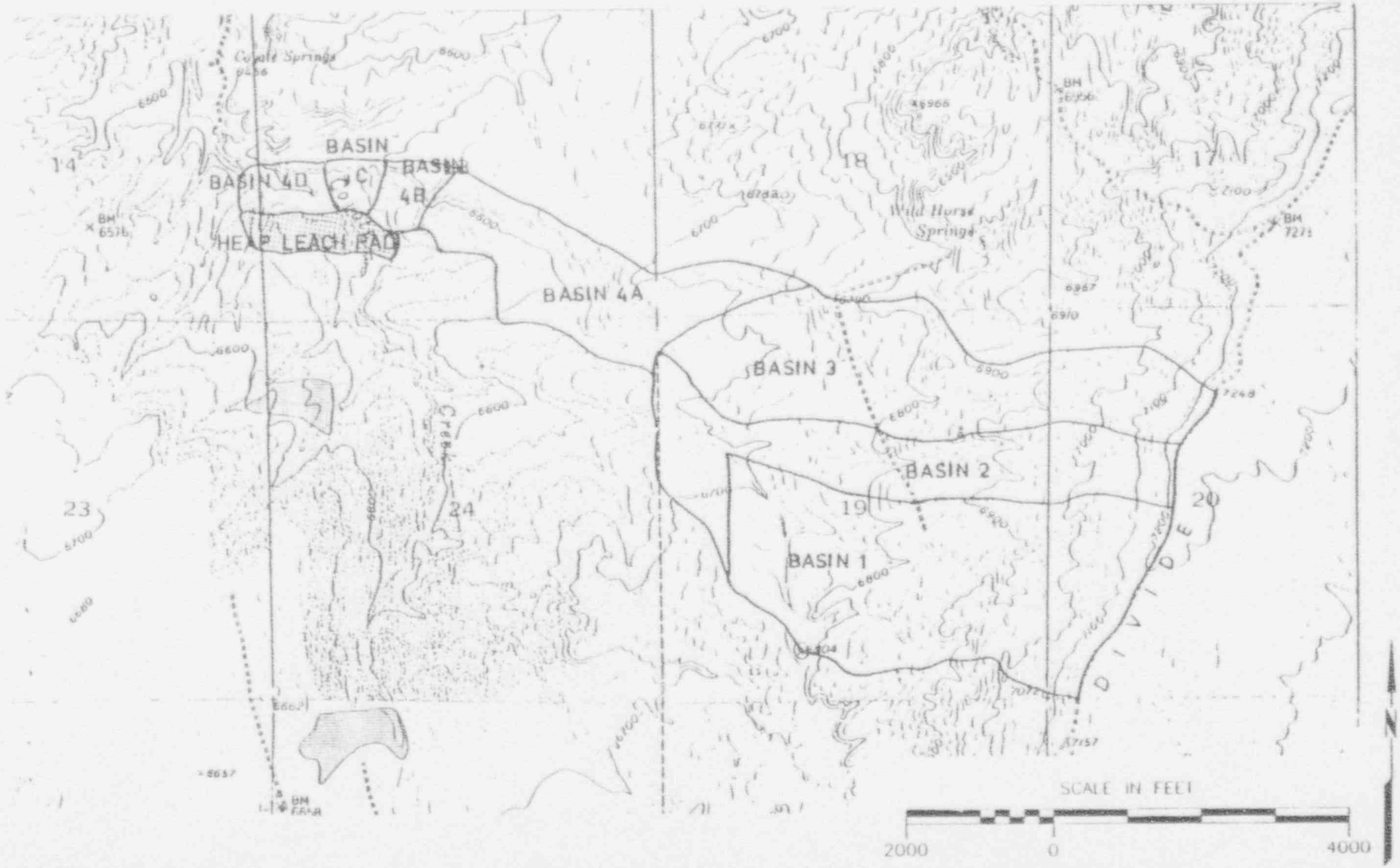
Soil Conservation Service (SCS), 1973. "A Method for Estimating Volume and Rate of Runoff in Small Watersheds," SCS-TP-149, Water Resources Publications, Littleton, Colorado, April.

Temple, D. M., et al.,(1987). U.S Department of Agriculture (USDA), "Stability Design of Grass-Lined Open Channels", Agriculture Handbook Number 667

U.S. Army Corp of Engineers (USCOE), 1991. "HEC-2, Water Surface Profiles", Computer Program Version 4.6.2, U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, California, May.

U.S. Army Corp of Engineers (USCOE), 1990. "HEC-1, Flood Hydrograph Package", Computer Program Version 4.0, Hydrologic Engineering Center, Davis, California, September.

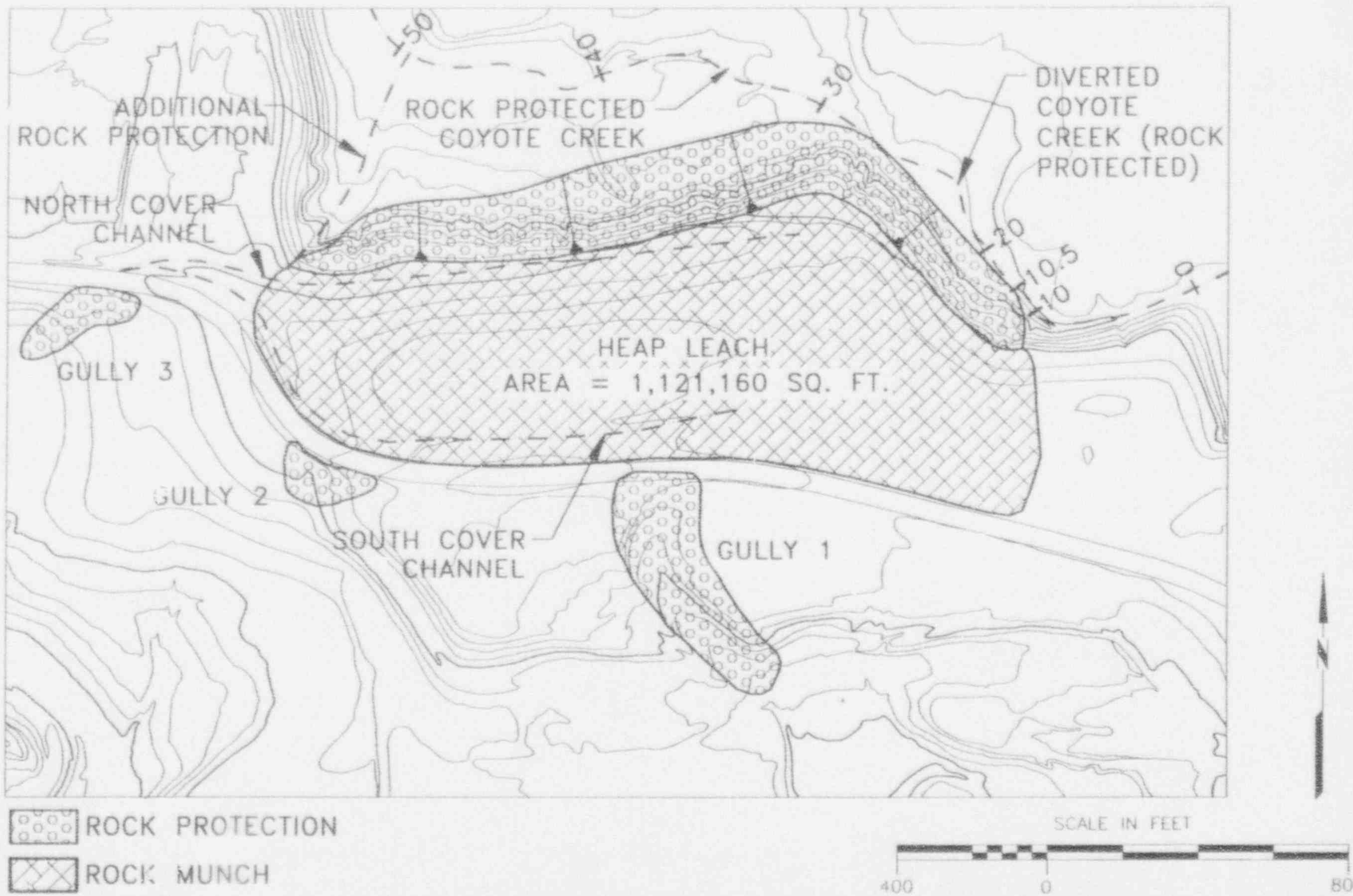
U.S. Nuclear Regulatory Commission (USNRC), 1990. "Final Staff Technical Position Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites".



SMI SHEPHERD MILLER, INC.	

FIGURE A.1
DRAINAGE BASIN DELINEATION

Date:	NOV., 1993
Project:	350
File:	BORDERE



SMI
SHEPHERD MILLER, INC.

FIGURE A.2
CONCEPTUAL COVER DESIGN
DAY LOMA HEAP LEACH AREA

Date:	NOV., 1993
Project:	350
File:	VOLUME

HEC-1 OUTPUT

```
1*****************************************                 *****************************************
*                                       *                 *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                 *   U.S. ARMY CORPS OF ENGINEERS        *
*             MAY  1991                 *                 *   HYDROLOGIC ENGINEERING CENTER       *
*          VERSION 4.0.1E               *                 *        609 SECOND STREET              *
*                                       *                 *   DAVIS, CALIFORNIA 95616             *
*  RUN DATE  11/30/92  TIME  07:12:17   *                 *        (916) 551-1748                 *
*                                       *                 *                                       *
*****************************************                 *****************************************
```

```
X     X  XXXXXXX   XXXXX        X
X     X  X        X     X      XX
X     X  X        X             X
XXXXXXX  XXXX     X      XXXXX  X
X     X  X        X             X
X     X  X        X     X       X
X     X  XXXXXXX   XXXXX       XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                              HEC-1 INPUT                                  PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID   Project:  ENERGY FUELS DAY LOMA #350  SMI, 11/92
   2         ID   Input File NAME     DLCOVR24.IH1
   3         ID   HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD
   4         ID   200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
   5         ID   RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
   6         IT      1      0   0000   1440   0000
   7         IN     15      0      0
   8         IO      5      0

   9         KK  NORTH SIDE SEGMENT 1
  10         PB     3.7
  11         PC  0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
  12         PC  0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
  13         PC  0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
  14         PC  0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
  15         PC  0.1800 0.1900 0.2020 0.2160 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
  16         PC  0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
  17         PC  0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
  18         PC  0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
  19         PC  0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
  20         PC  0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
  21         BA  .00046
  22         LS      0     91
  23         UD  .01508

  24         KK   R-N2
```

```
25        RK     80    .25    .02     0   TRAP    100      1

26        KK  NORTH SIDE SEGMENT 2
27        BA  .00028
28        LS     0     91
29        UD  .00567

30        KK    C-N2
31        KO     0      0      0      0     21
32        HC     2

33        KK  ROUTE TO NODE 3
34        KO     0      0      0      0     21
35        RK   100    .08    .02     0   TRAP    100      1

36        KK  NORTH SIDE SEGMENT 3
37        BA  .00036
38        LS     0     91
39        UD  .01199

40        KK    C-N3
41        KO     0      0      0      0     21
42        HC     2
```

1   HEC-1 INPUT   PAGE 2

```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


43        KK  SOUTH SIDE SEGMENT 1
44        BA  .00054
45        LS     0     91
46        UD  .02031

47        KK   SR N2
48        KO     0      0      0      0     21
49        RK   100    .08    .02     0   TRAP    100      1

50        KK  SOUTH SIDE SEGMENT 2
51        BA  .00028
52        LS     0     91
53        UD  .00567

54        KK    C-S2
55        KO     0      0      0      0     21
56        HC     2
57        ZZ
```

1**

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* RUN DATE 11/30/92 TIME 07:12:17 *

****

* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 *

****

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME DLCOVR24.IH1
HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	NORTH	1.	12.00	0.	0.	0.	0.00		
+	ROUTED TO	R-N2	1.	11.98	0.	0.	0.	0.00		
+	HYDROGRAPH AT	NORTH	1.	12.00	0.	0.	0.	0.00		
+	2 COMBINED AT	C-N2	2.	12.00	0.	0.	0.	0.00		
+	ROUTED TO	ROUTE	2.	12.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	NORTH	1.	12.00	0.	0.	0.	0.00		
+	2 COMBINED AT	C-N3	2.	12.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	SOUTH	1.	12.00	0.	0.	0.	0.00		
+	ROUTED TO	SR N2	1.	12.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	SOUTH	1.	12.00	0.	0.	0.	0.00		
+	2 COMBINED AT	C-S2	2.	12.00	0.	0.	0.	0.00		

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
INTERPOLATED TO
COMPUTATION INTERVAL

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
R-N2	MANE	0.30	1.03	719.89	2.73	1.00	1.02	720.00	2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6698E-01 EXCESS=0.0000E+00 OUTFLOW=0.6694E-01 BASIN STORAGE=0.5606E-04 PERCENT ERROR= 0.0

ROUTE	MANE	0.34	1.65	719.96	2.73	1.00	1.65	720.00	2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1077E+00 EXCESS=0.0000E+00 OUTFLOW=0.1077E+00 BASIN STORAGE=0.1304E-03 PERCENT ERROR= -0.1

SR N2	MANE	0.43	1.20	719.72	2.73	1.00	1.20	720.00	2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7862E-01 EXCESS=0.0000E+00 OUTFLOW=0.7854E-01 BASIN STORAGE=0.1084E-03 PERCENT ERROR= 0.0

*** NORMAL END OF HEC-1 ***

```
1*****************************************                 *****************************************
*                                       *                 *                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                 *  U.S. ARMY CORPS OF ENGINEERS         *
*           MAY  1991                   *                 *  HYDROLOGIC ENGINEERING CENTER        *
*        VERSION 4.0.1E                 *                 *  609 SECOND STREET                    *
*                                       *                 *  DAVIS, CALIFORNIA 95616              *
* RUN DATE  12/01/92  TIME  07:05:53    *                 *  (916) 551-1748                       *
*                                       *                 *                                       *
*****************************************                 *****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                 HEC-1 INPUT                                        PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID   Project:  ENERGY FUELS DAY LOMA #350  SMI, 11/92
   2         ID   Input File NAME     DLCOV24.IH1
   3         ID   HEC-1 RUNOFF CALC. FOR WATERSHED ON HEAP LEACH PAD
   4         ID   200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
   5         ID   RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
   6         IT      1      0      0   1440      0      0
   7         IN     15      0      0
   8         IO      5      0

   9         KK   BASIN1
  10         KO      0      0      0      0     21
  11         PB    3.7
  12         PC 0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
  13         PC 0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
  14         PC 0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
  15         PC 0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
  16         PC 0.1800 0.1900 0.2020 0.2160 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
  17         PC 0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
  18         PC 0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
  19         PC 0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
  20         PC 0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
  21         PC 0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
  22         BA  .00474
  23         LS      0     91
  24         UD  .08255
```

```
 25        KK   R1-2
 26        KO      0      0      0      0     21
 27        RK    550   .021   .020      0   TRAP      5      4

 28        KK BASIN2
 29        BA .00573
 30        LS      0     91
 31        UD .01578

 32        KK    C-1
 33        KO      0      0      0      0     21
 34        HC      2

 35        KK   R2-3
 36        KO      0      0      0      0     21
 37        RK    500   .005   .020      0   TRAP      5      4

 38        KK BASIN3
 39        BA .00484
 40        LS      0     91
 41        UD .01578

 42        KK    C-2
 43        KO      0      0      0      0     21
 44        HC      2
1                              HEC-1 INPUT                              PAGE 2

LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 45        KK   R3-4
 46        KO      0      0      0      0     21
 47        RK    700    .01   .020      0   TRAP      5      4

 48        KK BASIN4
 49        BA .00309
 50        LS      0     91
 51        UD .00940

 52        KK    C-3
 53        KO      0      0      0      0     21
 54        HC      2
 55        ZZ
```

```
1*****************************************                 *****************************************
*                                       *                 *                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                 *  U.S. ARMY CORPS OF ENGINEERS         *
*           MAY  1991                   *                 *  HYDROLOGIC ENGINEERING CENTER        *
*         VERSION 4.0.1E                *                 *       609 SECOND STREET               *
*                                       *                 *  DAVIS, CALIFORNIA 95616              *
* RUN DATE  12/01/92  TIME  07:05:53    *                 *       (916) 551-1748                  *
*                                       *                 *                                       *
*****************************************                 *****************************************
```

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME DLCOV24.IH1
HEC-1 RUNOFF CALC. FOR WATERSHED ON HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	BASI	10.	12.02	1.	0.	0.	0.00		
+	ROUTED TO	R1-2	10.	12.02	1.	0.	0.	0.00		
+	HYDROGRAPH AT	BASIN2	13.	12.00	1.	0.	0.	0.01		
+	2 COMBINED AT	C-1	23.	12.00	2.	1.	1.	0.01		
+	ROUTED TO	R2-3	23.	12.00	2.	1.	1.	0.01		
+	HYDROGRAPH AT	BASIN3	11.	12.00	1.	0.	0.	0.00		
+	2 COMBINED AT	C-2	33.	12.00	4.	1.	1.	0.02		
+	ROUTED TO	R3-4	33.	12.02	4.	1.	1.	0.02		
+	HYDROGRAPH AT	BASIN4	7.	12.00	1.	0.	0.	0.00		
+	2 COMBINED AT	C-3	40.	12.00	4.	1.	1.	0.02		

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME

	(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
R1-2 MANE	0.63	10.11	721.64	2.73	1.00	10.10	721.00	2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6892E+00 EXCESS=0.0000E+00 OUTFLOW=0.6889E+00 BASIN STORAGE=0.6433E-03 PERCENT ERROR= 0.0

R2-3 MANE	0.75	22.55	720.14	2.73	1.00	22.52	720.00	2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1523E+01 EXCESS=0.0000E+00 OUTFLOW=0.1522E+01 BASIN STORAGE=0.1771E-02 PERCENT ERROR= 0.0

R3-4 MANE	0.61	33.16	720.49	2.73	1.00	33.10	721.00	2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2226E+01 EXCESS=0.0000E+00 OUTFLOW=0.2226E+01 BASIN STORAGE=0.2532E-02 PERCENT ERROR= -0.1

*** NORMAL END OF HEC-1 ***

```
1*****************************************                  ****************************************
*                                       *                  *                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                  *   U.S. ARMY CORPS OF ENGINEERINGS    *
*            MAY  1991                  *                  *   HYDROLOGIC ENGINEERING CENTER      *
*          VERSION 4.0.1E               *                  *        609 SECOND STREET             *
*                                       *                  *     DAVIS, CALIFORNIA 95616          *
*  RUN DATE  12/06/92  TIME  16:59:16   *                  *          (916) 551-1748              *
*                                       *                  *                                      *
*****************************************                  ****************************************


               X     X  XXXXXXX   XXXXX          X
               X     X  X        X     X        XX
               X     X  X        X               X
               XXXXXXX  XXXX     X       XXXXX   X
               X     X  X        X               X
               X     X  X        X     X         X
               X     X  XXXXXXX   XXXXX         XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                  HEC-1 INPUT                                          PAGE  1

 LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1        ID   Project:  ENERGY FUELS DAY LOMA #350  SMI, 11/92
   2        ID   Input File NAME      OUTSL2.IH1
   3        ID   HEC-1 RUNOFF CALC. FOR OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
   4        ID   200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
   5        ID   RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
   6        IT      1      0   0000    1440    0000
   7        IN     15      0      0
   8        IO      5      0

   9        KK  NORTH SIDE SEGMENT 1
  10        KO      0      0      0      0     21
  11        PB    3.7
  12        PC  0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
  13        PC  0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
  14        PC  0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
  15        PC  0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
  16        PC  0.1800 0.1900 0.2020 0.2150 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
  17        PC  0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
  18        PC  0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
  19        PC  0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
  20        PC  0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
  21        PC  0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
  22        BA  .00072
  23        LS      0     91
  24        UD  .00989
  25        ZZ
```

```
1*****************************************            *****************************************
*                                       *            *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *            *   U.S. ARMY CORPS OF ENGINEERS        *
*           MAY  1991                   *            *   HYDROLOGIC ENGINEERING CENTER       *
*         VERSION 4.0.1E                *            *        609 SECOND STREET              *
*                                       *            *   DAVIS, CALIFORNIA 95616             *
*  RUN DATE  12/06/92  TIME  16:59:16   *            *        (916) 551-1748                 *
*                                       *            *                                       *
*****************************************            *****************************************
```

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME OUTSL2.IH1
HEC-1 RUNOFF CALC. FOR OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

```
                                PEAK   TIME OF    AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN    MAXIMUM     TIME OF
       OPERATION     STATION    FLOW    PEAK                                            AREA     STAGE     MAX STAGE
+                                                6-HOUR     24-HOUR    72-HOUR

       HYDROGRAPH AT
+                    NORTH        2.   12.00        0.         0.         0.    0.00
```

*** NORMAL END OF HEC-1 ***

```
1****************************************          ****************************************
*                                      *          *                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *          *  U.S. ARMY CORPS OF ENGINEERS        *
*           MAY   1991                 *          *  HYDROLOGIC ENGINEERING CENTER       *
*        VERSION 4.0.1E                *          *       609 SECOND STREET              *
*                                      *          *  DAVIS, CALIFORNIA 95616             *
*  RUN DATE  12/08/92  TIME  16:22:29  *          *       (916) 551-1748                 *
*                                      *          *                                      *
****************************************          ****************************************


                    X     X  XXXXXXX   XXXXX         X
                    X     X  X        X     X       XX
                    X     X  X        X              X
                    XXXXXXX  XXXX     X      XXXXX   X
                    X     X  X        X              X
                    X     X  X        X     X        X
                    X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                              HEC-1 INPUT                                  PAGE  1

 LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1        ID   Project:  ENERGY FUELS DAY LOMA #350  SMI. 11/92
   2        ID   Input File NAME      OUTSL8.IH1 (OPTION 2)
   3        ID   HEC-1 RUNOFF CALC. FOR AML OPTION OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
   4        ID   200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
   5        ID   RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
   6        IT       1       0    0000    1440    0000
   7        IN      15       0       0
   8        IO       5       0

   9        KK   NORTH SIDE SEGMENT 1
  10        KO       0       0       0       0      21
  11        PB     3.7
  12        PC  0.0000  0.0030  0.0050  0.0080  0.0110  0.0130  0.0160  0.0190  0.0220  0.0250
  13        PC  0.0280  0.0310  0.0340  0.0370  0.0410  0.0440  0.0480  0.0510  0.0550  0.0580
  14        PC  0.0620  0.0660  0.0700  0.0740  0.0790  0.0830  0.0880  0.0920  0.0970  0.1020
  15        PC  0.1080  0.1130  0.1190  0.1250  0.1310  0.1380  0.1450  0.1530  0.1610  0.1700
  16        PC  0.1800  0.1900  0.2020  0.2160  0.2350  0.2570  0.2900  0.4000  0.6600  0.7100
  17        PC  0.7350  0.7560  0.7720  0.7880  0.8000  0.8100  0.8200  0.8300  0.8390  0.8470
  18        PC  0.8550  0.8620  0.8690  0.8750  0.8810  0.8870  0.8920  0.8980  0.9030  0.9080
  19        PC  0.9120  0.9170  0.9210  0.9260  0.9300  0.9340  0.9380  0.9420  0.9450  0.9490
  20        PC  0.9520  0.9560  0.9590  0.9630  0.9660  0.9690  0.9720  0.9750  0.9780  0.9810
  21        PC  0.9840  0.9870  0.9890  0.9920  0.9950  0.9970  1.0000
  22        BA  .00162
  23        LS       0      91
  24        UD  .02570
  25        ZZ
```

```
1*****************************************                    *****************************************
*                                       *                    *                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                    *  U.S. ARMY CORPS OF ENGINEERS         *
*           MAY  1991                   *                    *  HYDROLOGIC ENGINEERING CENTER        *
*        VERSION 4.0.1E                 *                    *        609 SECOND STREET              *
*                                       *                    *  DAVIS, CALIFORNIA 95616              *
*  RUN DATE  12/08/92  TIME  16:22:29   *                    *        (916) 551-1748                 *
*                                       *                    *                                       *
*****************************************                    *****************************************


                    Project:  ENERGY FUELS DAY LOMA #350  SMI, 11/92
                    Input File NAME      OUTSL8.IH1 (OPTION 2)
                    HEC-1 RUNOFF CALC. FOR AML OPTION OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
                    200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
                    RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

                                  RUNOFF SUMMARY
                             FLOW IN CUBIC FEET PER SECOND
                           TIME IN HOURS,  AREA IN SQUARE MILES

                          PEAK   TIME OF    AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN    MAXIMUM    TIME OF
    OPERATION     STATION    FLOW    PEAK                                AREA     STAGE    MAX STAGE
+                                    6-HOUR    24-HOUR    72-HOUR

    HYDROGRAPH AT
+                  NORTH        4.   12.00        0.         0.         0.      0.00


*** NORMAL END OF HEC-1 ***
```

```
1****************************************                    ****************************************
*                                      *                    *                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *  U.S. ARMY CORPS OF ENGINEERS        *
*            MAY  1991                 *                    *  HYDROLOGIC ENGINEERING CENTER       *
*         VERSION 4.0.1E               *                    *      609 SECOND STREET               *
*                                      *                    *  DAVIS, CALIFORNIA 95616             *
*  RUN DATE  12/08/92  TIME  10:17:21  *                    *      (916) 551-1748                  *
*                                      *                    *                                      *
****************************************                    ****************************************


        X     X  XXXXXXX   XXXXX        X
        X     X  X        X     X      XX
        X     X  X        X             X
        XXXXXXX  XXXX     X     XXXXX   X
        X     X  X        X             X
        X     X  X        X     X       X
        X     X  XXXXXXX   XXXXX       XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                HEC-1 INPUT                                        PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID   Project:  ENERGY FUELS DAY LOMA #350  SMI, 11/92
   2         ID   Input File NAME     OUTSL4.IH1 (OPTION 3)
   3         ID   HEC-1 RUNOFF CALC. FOR OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
   4         ID   200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
   5         ID   RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
   6         IT       1       0    0000    1440    0000
   7         IN      15       0       0
   8         IO       5       0

   9         KK   NORTH SIDE SEGMENT 1
  10         KO       0       0       0       0      21
  11         PB     3.7
  12         PC  0.0000  0.0030  0.0050  0.0080  0.0110  0.0130  0.0160  0.0190  0.0220  0.0250
  13         PC  0.0280  0.0310  0.0340  0.0370  0.0410  0.0440  0.0480  0.0510  0.0550  0.0580
  14         PC  0.0620  0.0660  0.0700  0.0740  0.0790  0.0830  0.0880  0.0920  0.0970  0.1020
  15         PC  0.1080  0.1130  0.1190  0.1250  0.1310  0.1380  0.1450  0.1530  0.1610  0.1700
  16         PC  0.1800  0.1900  0.2020  0.2160  0.2350  0.2570  0.2900  0.4000  0.6600  0.7100
  17         PC  0.7350  0.7560  0.7720  0.7880  0.8000  0.8100  0.8200  0.8300  0.8390  0.8470
  18         PC  0.8550  0.8620  0.8690  0.8750  0.8810  0.8870  0.8920  0.8980  0.9030  0.9080
  19         PC  0.9120  0.9170  0.9210  0.9260  0.9300  0.9340  0.9380  0.9420  0.9450  0.9490
  20         PC  0.9520  0.9560  0.9590  0.9630  0.9660  0.9690  0.9720  0.9750  0.9780  0.9810
  21         PC  0.9840  0.9870  0.9890  0.9920  0.9950  0.9970  1.0000
  22         BA  .00033
  23         LS       0      91
  24         UD  .00536
```

```
KK  BENCH
KO    0    0    0    0   21
BA  .00011
LS    0   91
UD  .00420

KK  COMBINE
KO    0    0    0    0   21
HC    2
ZZ
```

```
1*****************************************                        ****************************************
*                                       *                         *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                         *  U.S. ARMY CORPS OF ENGINEERS        *
*             MAY   1991                *                         *  HYDROLOGIC ENGINEERING CENTER       *
*          VERSION 4.0.1E               *                         *        609 SECOND STREET             *
*                                       *                         *      DAVIS, CALIFORNIA 95616         *
*  RUN DATE  12/08/92  TIME  10:17:21   *                         *          (916) 551-1748              *
*                                       *                         *                                      *
*****************************************                        ****************************************
```

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME OUTSL4.IH1 (OPTION 3)
HEC-1 RUNOFF CALC. FOR OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
	HYDROGRAPH AT									
+		NORTH	1.	12.00	0.	0.	0.	0.00		
	HYDROGRAPH AT									
+		BENCH	0.	12.00	0.	0.	0.	0.00		
	2 COMBINED AT									
+		COMBIN	1.	12.00	0.	0.	0.	0.00		

*** NORMAL END OF HEC-1 ***

```
1****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *  U.S. ARMY CORPS OF ENGINEERS        *
*              MAY  1991               *                    *  HYDROLOGIC ENGINEERING CENTER       *
*           VERSION 4.0.1E             *                    *       609 SECOND STREET              *
*                                      *                    *    DAVIS, CALIFORNIA 95616           *
*  RUN DATE  12/08/92  TIME  13:58:07  *                    *         (916) 551-1748               *
*                                      *                    *                                      *
****************************************                    ****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                 HEC-1 INPUT                                      PAGE  1

 LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1        ID   Project:  ENERGY FUELS DAY LOMA #350  SMI, 11/92
   2        ID   Input File NAME      OUTSL6.IH1  (option 3)
   3        ID   HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD
   4        ID   200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
   5        ID   RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
   6        IT      1       0       0    1640       0       0
   7        IN     15       0       0
   8        IO      5       0

   9        KK   BASIN1
  10        KO      0       0       0       0      21
  11        PB    3.7
  12        PC 0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
  13        PC 0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
  14        PC 0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
  15        PC 0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
  16        PC 0.1800 0.1900 0.2020 0.2160 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
  17        PC 0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
  18        PC 0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
  19        PC 0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
  20        PC 0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
  21        PC 0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
  22        BA  .00033
  23        LS      0      91
  24        UD  .00536
```

```
KK  BENCH SECTION 1
BA  .00011
LS     0     91
UD  .00420

KK   COMBINE
KO     0     0     0     0     21
HC     2

KK    R1-2
KO     0     0     0     0     21
RK   200   .005   .028    0   TRAP    0    1

KK  BASIN2
BA  .00033
LS     0     91
UD  .00536

KK  BENCH SECTION 2
BA  .00011
LS     0     91
UD  .00420

KK    C-1
KO     0     0     0     0     21
HC     3
```



```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

KK    R2-3
KO     0     0     0     0     21
RK   200   .005   .028    0   TRAP    0    1

KK  BASIN3
BA  .00033
LS     0     91
UD  .00536

KK  BENCH SECTION 3
BA  .00011
LS     0     91
UD  .00420

KK    C-2
KO     0     0     0     0     21
HC     3

KK    R3-4
KO     0     0     0     0     21
RK   200   .005   .028    0   TRAP    0    1

KK  BASIN4
BA  .00033
LS     0     91
UD  .00536

KK  BENCH SECTION 4
BA  .00011
LS     0     91
UD  .00420

KK    C-3
KO     0     0     0     0     21
```

```
 73        HC      3

 74        KK    R4-5
 75        KO      0      0      0      0     21
 76        RK    200   .005   .028      0   TRAP      0      1

 77        KK  BASIN5
 78        BA  .00033
 79        LS      0     91
 80        UD  .00536

 81        KK  BENCH SECTION 5
 82        BA  .00011
 83        LS      0     91
 84        UD  .00420
1                                   HEC-1 INPUT                                        PAGE 3

LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 85        KK     C-4
 86        KO      0      0      0      0     21
 87        HC      3

 88        KK    R5-6
 89        KO      0      0      0      0     21
 90        RK    200   .005   .028      0   TRAP      0      1

 91        KK  BASIN6
 92        BA  .00033
 93        LS      0     91
 94        UD  .00536

 95        KK  BENCH SECTION 6
 96        BA  .00011
 97        LS      0     91
 98        UD  .00420

 99        KK     C-5
100        KO      0      0      0      0     21
101        HC      3

102        KK    R6-7
103        KO      0      0      0      0     21
104        RK    200   .005   .028      0   TRAP      0      1

105        KK  BASIN7
106        BA  .00033
107        LS      0     91
108        UD  .00536

109        KK  BENCH SECTION 7
110        BA  .00011
111        LS      0     91
112        UD  .00420

113        KK     C-6
114        KO      0      0      0      0     21
115        HC      3

116        KK    R7-8
117        KO      0      0      0      0     21
118        RK    200   .005   .028      0   TRAP      0      1

119        KK  BASIN8
```

```
 120          BA  .00033
 121          LS     0     91
 122          UD  .00536
1                                    HEC-1 INPUT                                    PAGE  4

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 123          KK  BENCH SECTION 8
 124          BA  .00011
 125          LS     0     91
 126          UD  .00420

 127          KK    C-7
 128          KO     0       0       0       0      21
 129          HC     3

 130          KK    R8-9
 131          KO     0       0       0       0      21
 132          RK    200    .005    .028       0    TRAP       0       1

 133          KK  BASIN9
 134          BA  .00033
 135          LS     0     91
 136          UD  .00536

 137          KK  BENCH SECTION 9
 138          BA  .00011
 139          LS     0     91
 140          UD  .00420

 141          KK    C-8
 142          KO     0       0       0       0      21
 143          HC     3

 144          KK    R9-10
 145          KO     0       0       0       0      21
 146          RK    200    .005    .028       0    TRAP       0       1

 147          KK  BASIN10
 148          BA  .00033
 149          LS     0     91
 150          UD  .00536

 151          KK  BENCH SECTION 10
 152          BA  .00011
 153          LS     0     91
 154          UD  .00420

 155          KK    C-9
 156          KO     0       0       0       0      21
 157          HC     3

 158          KK  R10-11
 159          KO     0       0       0       0      21
 160          RK    200    .005    .028       0    TRAP       0       1
1                                    HEC-1 INPUT                                    PAGE  5

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 161          KK  BASIN11
 162          BA  .00033
 163          LS     0     91
 164          UD  .00536
```

```
KK  BENCH SECTION 11
BA  .00011
LS     0     91
UD  .00420

KK    C-10
KO     0     0     0     0     21
HC     3

KK  R11-12
KO     0     0     0     0     21
RK    200   .005   .028     0   TRAP     0     1

KK  BASIN12
BA  .00033
LS     0     91
UD  .00536

KK  BENCH SECTION 12
BA  .00011
LS     0     91
UD  .00420

KK    C-11
KO     0     0     0     0     21
HC     3
ZZ
```

```
1*****************************************                  *****************************************
*                                       *                   *                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                   *   U.S. ARMY CORPS OF ENGINEERS        *
*           MAY   1991                  *                   *   HYDROLOGIC ENGINEERING CENTER       *
*         VERSION 4.0.1E                *                   *   609 SECOND STREET                   *
*                                       *                   *   DAVIS, CALIFORNIA 95616             *
*  RUN DATE  12/08/92  TIME  13:58:07   *                   *   (916) 551-1748                      *
*                                       *                   *                                       *
*****************************************                  *****************************************
```

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME   OUTSL6.IH1 (option 3)
HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	BASI	1.	12.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	BENCH	0.	12.00	0.	0.	0.	0.00		
+	2 COMBINED AT	COMBI	1.	12.00	0.	0.	0.	0.00		
+	ROUTED TO	R1-2	1.	12.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	BASIN2	1.	12.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	BENCH	0.	12.00	0.	0.	0.	0.00		
+	3 COMBINED AT	C-1	2.	12.00	0.	0.	0.	0.00		
+	ROUTED TO	R2-3	2.	12.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	BASIN3	1.	12.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	BENCH	0.	12.00	0.	0.	0.	0.00		
+	3 COMBINED AT	C-2	3.	12.00	0.	0.	0.	0.00		
+	ROUTED TO	R3-4	3.	12.00	0.	0.	0.	0.00		

HYDROGRAPH AT

+		BASIN4	1.	12.00	0.	0.	0.	0.00
	HYDROGRAPH AT							
+		BENCH	0.	12.00	0.	0.	0.	0.00
	3 COMBINED AT							
+		C-3	4.	12.00	0.	0.	0.	0.00
	ROUTED TO							
+		R4-5	4.	12.00	0.	0.	0.	0.00
	HYDROGRAPH AT							
+		BASIN5	1.	12.00	0.	0.	0.	0.00
	HYDROGRAPH AT							
+		BENCH	0.	12.00	0.	0.	0.	0.00
	3 COMBINED AT							
+		C-4	5.	12.00	1.	0.	0.	0.00
	ROUTED TO							
+		R5-6	5.	12.00	1.	0.	0.	0.00
	HYDROGRAPH AT							
+		BASIN6	1.	12.00	0.	0.	0.	0.00
	HYDROGRAPH AT							
+		BENCH	0.	12.00	0.	0.	0.	0.00
	3 COMBINED AT							
+		C-5	6.	12.00	1.	0.	0.	0.00
	ROUTED TO							
+		R6-7	6.	12.00	1.	0.	0.	0.00
	HYDROGRAPH AT							
+		BASIN7	1.	12.00	0.	0.	0.	0.00
	HYDROGRAPH AT							
+		BENCH	0.	12.00	0.	0.	0.	0.00
	3 COMBINED AT							
+		C-6	7.	12.00	1.	0.	0.	0.00
	ROUTED TO							
+		R7-8	7.	12.00	1.	0.	0.	0.00
	HYDROGRAPH AT							
+		BASIN8	1.	12.00	0.	0.	0.	0.00
	HYDROGRAPH AT							
+		BENCH	0.	12.00	0.	0.	0.	0.00
	3 COMBINED AT							
+		C-7	8.	12.00	1.	0.	0.	0.00
	ROUTED TO							
+		R8-9	8.	12.00	1.	0.	0.	0.00
	HYDROGRAPH AT							
+		BASIN9	1.	12.00	0.	0.	0.	0.00
	HYDROGRAPH AT							
+		BENCH	0.	12.00	0.	0.	0.	0.00

```
3 COMBINED AT
+              C-8       9.  12.00        1.      0.      0.    0.00

ROUTED TO
+              R9-10     9.  12.00        1.      0.      0.    0.00

HYDROGRAPH AT
+              BASIN1    1.  12.00        0.      0.      0.    0.00

HYDROGRAPH AT
+              BENCH     0.  12.00        0.      0.      0.    0.00

3 COMBINED AT
+              C-9      10.  12.00        1.      0.      0.    0.00

ROUTED TO
+              R10-11   10.  12.00        1.      0.      0.    0.00

HYDROGRAPH AT
+              BASIN1    1.  12.00        0.      0.      0.    0.00

HYDROGRAPH AT
+              BENCH     0.  12.00        0.      0.      0.    0.00

3 COMBINED AT
+              C-10     11.  12.00        1.      0.      0.    0.00

ROUTED TO
+              R11-12   11.  12.00        1.      0.      0.    0.00

HYDROGRAPH AT
+              BASIN1    1.  12.00        0.      0.      0.    0.00

HYDROGRAPH AT
+              BENCH     0.  12.00        0.      0.      0.    0.00

3 COMBINED AT
+              C-11     12.  12.00        1.      0.      0.    0.01
1
```

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT (INTERPOLATED TO COMPUTATION INTERVAL)	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
R1-2	MANE	0.56	0.98	720.58	2.73	1.00	0.98	720.00	2.74

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6407E-01 EXCESS=0.0000E+00 OUTFLOW=0.6412E-01 BASIN STORAGE=0.6441E-04 PERCENT ERROR= -0.2

R2-3	MANE	0.51	1.96	720.03	2.73	1.00	1.96	720.00	2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1283E+00 EXCESS=0.0000E+00 OUTFLOW=0.1283E+00 BASIN STORAGE=0.1012E-03 PERCENT ERROR= -0.1

R3-4	MANE	0.51	2.94	719.82	2.73	1.00	2.93	720.00	2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1923E+00 EXCESS=0.0000E+00 OUTFLOW=0.1922E+00 BASIN STORAGE=0.1372E-03 PERCENT ERROR= 0.0

R4-5 MANE 0.49 3.90 719.71 2.73 1.00 3.90 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2562E+00 EXCESS=0.0000E+00 OUTFLOW=0.2561E+00 BASIN STORAGE=0.1713E-03 PERCENT ERROR= 0.0

R5-6 MANE 0.48 4.87 719.81 2.73 1.00 4.87 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3201E+00 EXCESS=0.0000E+00 OUTFLOW=0.3200E+00 BASIN STORAGE=0.2018E-03 PERCENT ERROR= 0.0

R6-7 MANE 0.47 5.84 720.14 2.73 1.00 5.84 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3840E+00 EXCESS=0.0000E+00 OUTFLOW=0.3838E+00 BASIN STORAGE=0.2294E-03 PERCENT ERROR= 0.0

R7-8 MANE 0.48 6.80 720.06 2.73 1.00 6.80 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4478E+00 EXCESS=0.0000E+00 OUTFLOW=0.4477E+00 BASIN STORAGE=0.2557E-03 PERCENT ERROR= 0.0

R8-9 MANE 0.47 7.77 720.00 2.73 1.00 7.77 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5117E+00 EXCESS=0.0000E+00 OUTFLOW=0.5116E+00 BASIN STORAGE=0.2793E-03 PERCENT ERROR= 0.0

R9-10 MANE 0.33 8.73 720.40 2.72 1.00 8.73 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5755E+00 EXCESS=0.0000E+00 OUTFLOW=0.5754E+00 BASIN STORAGE=0.3009E-03 PERCENT ERROR= 0.0

R10-11 MANE 0.31 9.70 720.32 2.72 1.00 9.69 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6394E+00 EXCESS=0.0000E+00 OUTFLOW=0.6392E+00 BASIN STORAGE=0.3219E-03 PERCENT ERROR= 0.0

R11-12 MANE 0.32 10.64 720.14 2.72 1.00 10.64 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7032E+00 EXCESS=0.0000E+00 OUTFLOW=0.7030E+00 BASIN STORAGE=0.3448E-03 PERCENT ERROR= 0.0

*** NORMAL END OF HEC-1 ***

```
1*****************************************                          ***************************************
*                                       *                          *                                     *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                          *  U.S. ARMY CORPS OF ENGINEERS       *
*            MAY  1991                  *                          *  HYDROLOGIC ENGINEERING CENTER      *
*          VERSION 4.0.1E               *                          *        609 SECOND STREET            *
*                                       *                          *    DAVIS, CALIFORNIA 95616          *
*  RUN DATE  11/27/92  TIME  15:58:02   *                          *        (916) 551-1748               *
*                                       *                          *                                     *
*****************************************                          ***************************************


                    X     X  XXXXXXX   XXXXX        X
                    X     X  X        X     X      XX
                    X     X  X        X             X
                    XXXXXXX  XXXX     X     XXXXX   X
                    X     X  X        X             X
                    X     X  X        X     X       X
                    X     X  XXXXXXX   XXXXX       XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                HEC-1 INPUT                                       PAGE  1

     LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

       1         ID   Project:  ENERGY FUELS DAY LOMA #350  SMI, 11/92
       2         ID   Input File NAME      DL20024.IH1
       3         ID   HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD
       4         ID   200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
       5         ID   RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC III
       6         IT     1     0   0000   1440     0     0
       7         IN    15     0     0
       8         IO     5     0

       9         KK  BASIN1
      10         PB    3.7
      11         PC  0.0000  0.0030  0.0050  0.0080  0.0110  0.0130  0.0160  0.0190  0.0220  0.0250
      12         PC  0.0280  0.0310  0.0340  0.0370  0.0410  0.0440  0.0480  0.0510  0.0550  0.0580
      13         PC  0.0620  0.0660  0.0700  0.0740  0.0790  0.0830  0.0880  0.0920  0.0970  0.1020
      14         PC  0.1080  0.1130  0.1190  0.1250  0.1310  0.1380  0.1450  0.1530  0.1610  0.1700
      15         PC  0.1800  0.1900  0.2020  0.2160  0.2350  0.2570  0.2900  0.4000  0.6600  0.7100
      16         PC  0.7350  0.7560  0.7720  0.7880  0.8000  0.8100  0.8200  0.8300  0.8390  0.8470
      17         PC  0.8550  0.8620  0.8690  0.8750  0.8810  0.8870  0.8920  0.8980  0.9030  0.9080
      18         PC  0.9120  0.9170  0.9210  0.9260  0.9300  0.9340  0.9380  0.9420  0.9450  0.9490
      19         PC  0.9520  0.9560  0.9590  0.9630  0.9660  0.9690  0.9720  0.9750  0.9780  0.9810
      20         PC  0.9840  0.9870  0.9890  0.9920  0.9950  0.9970  1.0000
      21         BA    .46
      22         LS     0    91
      23         UD   .300

      24         KK  ROUTE A TO B
```

```
25          KO      0      0      0      0     21
26          RK    2000  0.0286   0.03      0   TRAP     20     10

27          KK  BASIN2
28          BA     .26
29          UD    .428

30          KK  BASIN3
31          BA     .35
32          UD    .357

33          KK  COMBINE BASINS 2 AND 3 WITH ROUTED BASIN 1
34          KO      0      0      0      0     21
35          KM  COMBINE 3
36          HC      3

37          KK  ROUTE B TO C
38          KO      0      0      0      0     21
39          RK    3600   .017    .03      0   TRAP     20     10

40          KK  BASIN4A
41          KO      0      0      0      0     21
42          BA   .0149
43          UD    .537
1                                  HEC-1 INPUT                               PAGE  2

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


44          KK  COMBINE BASIN 4A WITH ROUTED B TO C
45          KO      0      0      0      0     21
46          KM  COMBINE 2
47          HC      2

48          KK  ROUTE C TO D
49          KO      0      0      0      0     21
50          RK    1270   .012    .03      0   TRAP     20     10

51          KK  BASIN 4B
52          KO      0      0      0      0     21
53          BA    .058
54          LS      0     91
55          UD    .035

56          KK  COMBINE BASIN 4B WITH ROUTED C TO D
57          KO      0      0      0      0     21
58          KM  COMBINE 2
59          HC      2

60          KK  ROUTE D TO E
61          KO      0      0      0      0     21
62          RK    1050  .0333    .03      0   TRAP     20     10

63          KK  BASIN 4C
64          KO      0      0      0      0     21
65          BA    .041
66          LS      0     91
67          UD    .034

68          KK  COMBINE BASIN 4C WITH ROUTED D TO E
69          KO      0      0      0      0     21
70          KM  COMBINE 2
71          HC      2

72          KK  ROUTE E TO F
```

```
KO      0      0      0      0     21
RK   1100   .023    .03      0   TRAP     20     10

KK  BASIN 4D
KO      0      0      0      0     21
BA   .052
LS      0     91
UD    .05

KK  COMBINE BASIN 4D WITH ROUTED E TO F
KO      0      0      0      0     21
KM  COMBINE 2
HC      2
ZZ
```

```
1*****************************************                 *****************************************
*                                        *                 *                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)     *                 *  U.S. ARMY CORPS OF ENGINEERS         *
*           MAY   1991                   *                 *  HYDROLOGIC ENGINEERING CENTER        *
*        VERSION 4.0.1E                  *                 *       609 SECOND STREET               *
*                                        *                 *  DAVIS, CALIFORNIA 95616              *
* RUN DATE  11/27/92  TIME  15:58:02     *                 *       (916) 551-1748                  *
*                                        *                 *                                       *
*****************************************                 *****************************************
```

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME DL20024.IH1
HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC III

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	BASIN1	669.	12.18	107.	34.	34.	0.46		
+	ROUTED TO	ROUTE	667.	12.22	107.	34.	34.	0.46		
+	HYDROGRAPH AT	BASIN2	310.	12.30	60.	19.	19.	0.26		
+	HYDROGRAPH AT	BASIN3	463.	12.23	81.	26.	26.	0.35		
+	3 COMBINED AT	COMBIN	1428.	12.23	249.	78.	78.	1.07		
+	ROUTED TO	ROUTE	1423.	12.30	249.	78.	78.	1.07		
+	HYDROGRAPH AT	BASIN4	15.	12.40	3.	1.	1.	0.01		
+	2 COMBINED AT	COMBIN	1438.	12.30	253.	79.	79.	1.08		
+	ROUTED TO	ROUTE	1437.	12.32	253.	79.	79.	1.08		
+	HYDROGRAPH AT	BASIN	129.	12.00	14.	4.	4.	0.06		
+	2 COMBINED AT	COMBIN	1452.	12.30	266.	83.	83.	1.14		
+	ROUTED TO	ROUTE	1452.	12.32	266.	83.	83.	1.14		
	HYDROGRAPH AT									

```
+               BASIN      91.   12.00      10.      3.      3.     0.04

     2 COMBINED AT
+               COMBIN     1463.  12.32     276.     86.     86.    1.18

     ROUTED TO
+               ROUTE      1462.  12.33     276.     86.     86.    1.18

     HYDROGRAPH AT
+               BASIN      115.   12.00     12.      4.      4.     0.05

     2 COMBINED AT
+               COMBIN     1476.  12.33     288.     90.     90.    1.24
1
```

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
ROUTE	MANE	0.88	667.82	732.31	2.71	1.00	667.33	733.00	2.71

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6664E+02 EXCESS=0.0000E+00 OUTFLOW=0.6658E+02 BASIN STORAGE=0.9697E-01 PERCENT ERROR= -0.1

ROUTE	MANE	1.00	1425.14	737.40	2.70	1.00	1423.29	738.00	2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1548E+03 EXCESS=0.0000E+00 OUTFLOW=0.1543E+03 BASIN STORAGE=0.5166E+00 PERCENT ERROR= 0.0

ROUTE	MANE	0.77	1436.85	738.40	2.70	1.00	1436.59	739.00	2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1564E+03 EXCESS=0.0000E+00 OUTFLOW=0.1563E+03 BASIN STORAGE=0.1797E+00 PERCENT ERROR= 0.0

ROUTE	MANE	0.41	1452.12	738.90	2.70	1.00	1452.07	739.00	2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1647E+03 EXCESS=0.0000E+00 OUTFLOW=0.1646E+03 BASIN STORAGE=0.1080E+00 PERCENT ERROR= 0.0

ROUTE	MANE	0.43	1462.29	739.96	2.70	1.00	1462.18	740.00	2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1706E+03 EXCESS=0.0000E+00 OUTFLOW=0.1705E+03 BASIN STORAGE=0.1331E+00 PERCENT ERROR= 0.0

*** NORMAL END OF HEC-1 ***

HEC-2 OUPUT

```
1*********************************************          ****************************************
* HEC-2 WATER SURFACE PROFILES              *           * U.S. ARMY CORPS OF ENGINEERS        *
*                                           *           * HYDROLOGIC ENGINEERING CENTER       *
* Version  4.6.2;  May 1991                 *           * 609 SECOND STREET, SUITE D          *
*                                           *           * DAVIS, CALIFORNIA 95616-4687        *
* RUN DATE   01DEC92   TIME   15:55:58      *           *          (916) 756-1104             *
*********************************************          ****************************************
```

```
X     X  XXXXXXX   XXXXX          XXXXX
X     X  X         X     X       X     X
X     X  X         X                   X
XXXXXXX  XXXX      X        XXXXX  XXXXX
X     X  X         X             X
X     X  X         X     X       X
X     X  XXXXXXX   XXXXX         XXXXXXX
```

```
1
  01DEC92     15:55:58                                                  PAGE  1
```

```
                                                THIS RUN EXECUTED 01DEC92    15:55:58
**************************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
**************************************


T1  DAY LOMA - EXISTING COVER CHANNEL, DLCOV.DAT (Subcritical)
T2  OVERBANK N=0.020, CHANNEL N=0.020, Q=varies SUBCRIT., PMP,1/2 PMP,200yr
T3       WESTERN NUCLEAR/ENERGY FUELS, JOB#350, SHEPHERD MILLER, 11/92 lmw

J1  ICHECK   INQ     NINV    IDIR    STRT     METRIC   HVINS    Q      WSEL     FQ

       0      2        0       0    0.002       0        0       0   6597.9      0

J2  NPROF    IPLOT    PRFVS   XSECV   XSECH    FN      ALLDC    IBW     CHNIM    ITRACE

       1       0       -1       0       0       0       -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

       0      38      43       1       2      26       8

NC      .02     .02     .02       0       0
QT        3      40     146     315
       SECTION 8
X1        8       7    47.5    72.5       0       0       0   0.000    6500       0
GR     99.2    47.5    96.7    57.5    96.4    58.5    96.2      60    96.4    61.5
GR     96.7    62.5    99.2    72.5

       SECTION 7.1
X1      7.1       7    47.5    72.5     150     150     150   0.000    6500       0
GR     99.5    47.5      97    57.5    96.7    58.5    96.5      60    96.7    61.5
GR     97.0    62.5    99.5    72.5
```

```
      SECTION 7
X1      7       7      47.5     72.5      50      50      50    0.000    6500      0
GR    99.6    47.5     97.1     57.5     96.8    58.5    96.6     60     96.8     61.5
GR    97.1    62.5     99.6     72.5

QT      3      34      123      261
      SECTION 6
X1      6       7      47.5     72.5      75      75      75    0.000    6500      0
GR    99.8    47.5     97.3     57.5      97     58.5    96.8     60      97      61.5
GR    97.3    62.5     99.8     72.5

      SECTION 5
X1      5       7      47.5     72.5     200     200     200    0.000    6500      0
GR   100.2    47.5     97.7     57.5     97.4    58.5    97.2     60     97.4     61.5
GR    97.7    62.5    100.2     72.5
1
  01DEC92    15:55:58                                                PAGE   2


      SECTION 4
X1      4       7      47.5     72.5     200     200     200    0.000    6500      0
GR   100.6    47.5     98.1     57.5     97.8    58.5    97.6     60     97.8     61.5
GR    98.1    62.5    100.6     72.5

QT      3      23       76      165
      SECTION 3
X1      3       7      47.5     72.5     200     200     200    0.000    6500      0
GR     103    47.5    100.5     57.5    100.2    58.5     100     60    100.2     61.5
GR   100.5    62.5      103     72.5

      SECTION 2
X1      2       7      47.5     72.5     210     210     210    0.000    6500      0
GR     105    47.5    102.5     57.5    102.2    58.5     102     60    102.2     61.5
GR   102.5    62.5      105     72.5

QT      3      10       35       74
      SECTION 1
X1      1       7      47.5     72.5     210     210     210    0.000    6500      0
GR     113    47.5    110.5     57.5    110.2    58.5     110     60    110.2     61.5
GR   110.5    62.5      113     72.5
1
  01DEC92    15:55:58                                                PAGE   3



                                          THIS RUN EXECUTED 01DEC92    15:56:04
**************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
**************************************


NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST


WESTERN NUCLEAR/ENERGY F

SUMMARY PRINTOUT


     SECNO      Q      CWSEL    CRIWS     VCH     DEPTH
```

	8.000	40.00	6597.89	6597.52	3.06	1.69
	8.000	146.00	6599.01	6598.48	4.24	2.81
	8.000	315.00	6599.94	6599.32	5.49	3.74
	7.100	40.00	6598.19	6597.81	3.05	1.69
	7.100	146.00	6599.32	6598.79	4.22	2.82
	7.100	315.00	6600.24	6599.62	5.48	3.74
	7.000	40.00	6598.29	6597.92	3.05	1.69
	7.000	146.00	6599.42	6598.88	4.22	2.82
	7.000	315.00	6600.34	6599.72	5.48	3.74
	6.000	34.00	6598.46	6598.02	2.72	.66
	6.000	123.00	6599.63	6598.92	3.53	[illegible].83
	6.000	261.00	6600.63	6599.72	4.37	3.[illegible]
	5.000	34.00	6598.80	6598.42	2.89	1.60
	5.000	123.00	6599.90	6599.33	3.85	2.70
	5.000	261.00	6600.85	6600.12	4.72	3.65
	4.000	34.00	6599.19	6598.83	2.92	1.58
	4.000	123.00	6600.26	6599.72	3.98	2.66
	4.000	261.00	6601.15	6600.52	4.94	3.55
*	3.000	23.00	6601.03	6601.03	4.33	1.03
*	3.000	76.00	6601.73	6601.73	5.53	1.73
*	3.000	165.00	6602.40	6602.40	6.47	2.40
*	2.000	23.00	6603.03	6603.03	4.35	1.03
*	2.000	76.00	6603.74	6603.74	5.51	1.74
*	2.000	165.00	6604.41	6604.41	6.43	2.41

	SECNO	Q	CWSEL	CRIWS	VCH	DEPTH
*	1.000	10.00	6610.71	6610.71	3.67	.71
*	1.000	35.00	6611.24	6611.24	4.71	1.24
*	1.000	74.00	6611.72	6611.72	5.49	1.72

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 3.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 3.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 2 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 3.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 3 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 2.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2.000 PROFILE= 2 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2.000 PROFILE= 3 MINIMUM SPECIFIC ENERGY

```
CAUTION SECNO=     1.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.000  PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.000  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.000  PROFILE=  3  MINIMUM SPECIFIC ENERGY
```

RIPRAP SIZING USING 1970 COE METHOD
Ref: COE, 1970. Hydraulic Design of Flood Control Channels,
EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1
Date: 11/04/93
Location: DAY LOMA
SECTION 10 10.5

INPUT COEFFICIENTS: (see manual for description)

INPUT: radius of curv. (ft)=	250
INPUT: topwidth of flow (ft)=	41.65
R/W=	6.0
INPUT: side slope (xH:1V)=	2
side slope angle (deg)=	26.6
INPUT: angle of repose (deg)=	40
INPUT: rock specific gravity=	2.65
INPUT: velocity (fps)=	8.510
INPUT: depth (ft)=	5.630

Flow (cfs):	1476
Riprap D-50 (ft):	0.416666
Manning's n:	0.0341
Bottom Width (ft):	20
Right Side Slope, z:	2
Left Side Slope, z:	2
Channel Slope (ft/ft):	0.00561

D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	BOTTOM SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM SF	SIDE SLOPE SF
0.9166	1.210	1.556	3.775	2.712	2.43	1.74
0.8333	1.158	1.489	3.432	2.465	2.30	1.66
0.5	0.930	1.196	2.059	1.479	1.72	1.24
0.41666	0.865	1.112	1.716	1.233	1.54	1.11
0.333	0.794	1.021	1.371	0.985	1.34	0.97

RIPRAP SIZING USING 1970 COE METHOD
Ref: COE, 1970. Hydraulic Design of Flood Control Channels,
EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1
Date: 11/04/93
Location: DAY LOMA
SECTION 20 30

INPUT COEFFICIENTS: (see manual for description)

INPUT: radius of curv. (ft)=	355
INPUT: topwidth of flow (ft)=	36.08
R/W=	9.8
INPUT: side slope (xH:1V)=	2
side slope angle (deg)=	26.6
INPUT: angle of repose (deg)=	40
INPUT: rock specific gravity=	2.65
INPUT: velocity (fps)=	13.090
INPUT: depth (ft)=	4.030

Flow (cfs):	1476
Riprap D-50 (ft):	1.5
Manning's n:	0.0404
Bottom Width (ft):	20
Right Side Slope, z:	2
Left Side Slope, z:	2
Channel Slope (ft/ft):	0.0258

D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	BOTTOM SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM SF	SIDE SLOPE SF
1.5	4.380	4.398	6.178	4.437	1.40	1.01
0.8333	3.208	3.222	3.432	2.465	1.07	0.77
0.5	2.534	2.544	2.059	1.479	0.81	0.58
0.41666	2.344	2.354	1.716	1.233	0.73	0.52
0.25	1.912	1.920	1.030	0.740	0.54	0.39

RIPRAP SIZING USING 1970 COE METHOD
Ref: COE, 1970. Hydraulic Design of Flood Control Channels, EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1
Date: 11/04/93
Location: DAY LOMA
SECTION 30 40

INPUT COEFFICIENTS: (see manual for description)

INPUT: radius of curv. (ft)=	325
INPUT: topwidth of flow (ft)=	36.45
R/W=	8.9
INPUT: side slope (xH:1V)=	2
side slope angle (deg)=	26.6
INPUT: angle of repose (deg)=	40
INPUT: rock specific gravity=	2.65
INPUT: velocity (fps)=	12.710
INPUT: depth (ft)=	4.110

Flow (cfs):	1476
Riprap D-50 (ft):	1.5
Manning's n:	0.0393
Bottom Width (ft):	20
Right Side Slope, z:	2
Left Side Slope, z:	2
Channel Slope (ft/ft):	0.0217

D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	BOTTOM SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM SF	SIDE SLOPE SF
1.5	4.083	4.307	6.178	4.437	1.43	1.03
0.8333	2.996	3.160	3.432	2.465	1.09	0.78
0.5	2.368	2.498	2.059	1.479	0.82	0.59
0.41666	2.191	2.312	1.716	1.233	0.74	0.53
0.333	2.000	2.110	1.371	0.985	0.65	0.47

RIPRAP SIZING USING 1970 COE METHOD
Ref: COE, 1970. Hydraulic Design of Flood Control Channels,
EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1
Date: 11/04/93
Location: DAY LOMA
SECTION 40 50

INPUT COEFFICIENTS: (see manual for description)

INPUT: radius of curv. (ft)=	275
INPUT: topwidth of flow (ft)=	54.12
R/W=	5.1
INPUT: side slope (xH:1V)=	2
side slope angle (deg)=	26.6
INPUT: angle of repose (deg)=	40
INPUT: rock specific gravity=	2.65
INPUT: velocity (fps)=	6.930
INPUT: depth (ft)=	4.780

Flow (cfs):	1476
Riprap D-50 (ft):	0.25
Manning's n:	0.0313
Bottom Width (ft):	35
Right Side Slope, z:	2
Left Side Slope, z:	2
Channel Slope (ft/ft):	0.0025

D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	BOTTOM SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM SF	SIDE SLOPE SF
1.5	1.116	1.559	6.178	4.437	3.96	2.85
0.8333	0.828	1.158	3.432	2.465	2.96	2.13
0.5	0.660	0.922	2.059	1.479	2.23	1.60
0.41666	0.612	0.856	1.716	1.233	2.01	1.44
0.25	0.503	0.703	1.030	0.740	1.46	1.05

RIPRAP SIZING

SAFETY FACTOR METHOD

NORMAL DEPTH CALCULATION AND RIPRAP SIZING USING SAFETY FACTOR METHOD

Location: Day Loma - Coyote Creek Drop Structure

Channel hydraulic properties:

Flow (cfs):	1476
Riprap D-50 (ft):	4.8
Manning's n:	0.0513
Bottom Width (ft):	20
Right Side Slope, z:	2
Left Side Slope, z:	2
Channel Slope (ft/ft):	0.079

Calculated Manning's n = 0.051305

QPro "Solve For" tool:

variable: formula:

Depth	F(y)
3.2700	20.66

Depth (ft) =	3.270
Hydraulic Radius (ft) =	2.507
Cross Sectional Area (sq ft) =	86.79
Average Velocity (fps) =	17.05
Topwidth (ft) =	33.08
Froude Number =	1.86
Flow Condition:	supercritical

Riprap size:

	SLOPE	RADS	DEGREES
Bed slope:	0.079	0.079	4.52
Bank slope:	0.5	0.464	26.57
Angle of repose (degrees):		0.698	40.00

Side slope shear reduction factor:	0.75
Specific gravity of riprap:	2.65

Side Slope:

D-50 (ft)	TRACTIVE FORCE	STABILITY PARAM., N	B (RADS)	B DEGREES	N'	SAFETY FACTOR
4.8	12.09	0.51	0.43	24.84	0.38	1.03
0.75	12.09	3.29	1.19	67.99	3.21	0.26
0.667	12.09	3.70	1.22	69.78	3.63	0.23
0.5	12.09	4.93	1.28	73.52	4.88	0.18
0.13	12.09	18.97	1.44	82.29	18.95	0.05

Channel Bottom:

D-50 (ft)	TRACTIVE FORCE	STABILITY PARAM., N	SAFETY FACTOR
4.8	16.12	0.68	1.28
0.75	16.12	4.38	0.22
0.667	16.12	4.93	0.20
0.6	16.12	5.48	0.18
0.11	16.12	29.89	0.03

RIPRAP SIZING
STEPHENSON'S METHOD

STEPHENSON'S METHOD FOR SIZING RIPRAP
BASED UPON PHASE II, ABT ET AL.

DAY LOMA-HEAP LEACH AREA COVER WITH 200 yr/24 hr EVENT
SMI #350, CONCEPTUAL COVER DESIGN

FLOW RATE PER UNIT WIDTH	=	0.016	CFS/FT		
ROCKFILL POROSITY	=	0.32			
SPECIFIC GRAVITY	=	2.65			
SLOPE OF EMBANKMENT	=	25	PERCENT		
FRICTION ANGLE	=	40	DEGREES		
EMPIRICAL FACTOR	=	0.25			
OLIVIERS' CONSTANT	=	1.8			
MEDIAN STONE SIZE D50	=	0.04	FT	0.4	IN

STEPHENSON'S METHOD FOR SIZING RIPRAP
BASED UPON PHASE II, ABT ET AL.

DAY LOMA-HEAP LEACH PAD OUTSLOPE WITH 200yr/24hr EVENT
SMI #350, CONCEPTUAL DESIGN OPTION 1, 2.5:1 SLOPE

FLOW RATE PER UNIT WIDTH	=	0.016	CFS/FT
ROCKFILL POROSITY	=	0.32	
SPECIFIC GRAVITY	=	2.65	
SLOPE OF EMBANKMENT	=	40	PERCENT
FRICTION ANGLE	=	40	DEGREES
EMPIRICAL FACTOR	=	0.25	
OLIVIERS' CONSTANT	=	1.8	

MEDIAN STONE SIZE D50	=	0.08	FT	0.9	IN

```
1*********************************************          ****************************************
* HEC-2 WATER SURFACE PROFILES                   *       * U.S. ARMY CORPS OF ENGINEERS          *
*                                                *       * HYDROLOGIC ENGINEERING CENTER         *
* Version   4.6.2;  May 1991                     *       * 609 SECOND STREET, SUITE D            *
*                                                *       * DAVIS, CALIFORNIA 95616-4687          *
* RUN DATE   01DEC92   TIME   16:54:03           *       *       (916) 756-1104                  *
*********************************************          ****************************************


                    X     X  XXXXXXX   XXXXX           XXXXX
                    X     X  X        X     X         X     X
                    X     X  X        X                     X
                    XXXXXXX  XXXX     X         XXXXX   XXXXX
                    X     X  X        X                X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX          XXXXXXX
1
  01DEC92    16:54:03                                                  PAGE   1


                                       THIS RUN EXECUTED 01DEC92    16:54:03
  ***********************************
  HEC-2 WATER SURFACE PROFILES

  Version   4.6.2;  May 1991
  ***********************************


T1  DAY LOMA - EXISTING COVER CHANNEL, DLCOV.DAT (Supercritical)
T2  OVERBANK N=0.020, CHANNEL N=0.020, Q=varies SUBCRIT., PMP,1/2 PMP,200yr
T3      WESTERN NUCLEAR/ENERGY FUELS, JOB#350, SHEPHERD MILLER, 11/92 lmw

J1  ICHECK   INQ     NINV    IDIR    STRT     METRIC   HVINS    Q      WSEL     FQ

       0      2        0       1      .02        0       0       0    6610.7     0

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN      ALLDC    IBW     CHNIM    ITRACE

       1      0       -1        0        0       0       -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

       0      38      43        1        2       26       8

NC     .02     .02     .02      0        0
QT       3      10      35     74
    SECTION 1
X1       1       7    47.5   72.5      210      210      210    0.000    6500       0
GR     113    47.5   110.5   57.5    110.2     58.5      110       60   110.2    61.5
GR   110.5    62.5     113   72.5

QT       3      23      76    165
    SECTION 2
X1       2       7    47.5   72.5      210      210      210    0.000    6500       0
GR     105    47.5   102.5   57.5    102.2     58.5      102       60   102.2    61.5
GR   102.5    62.5     105   72.5
```

```
        SECTION 3
X1      3       7     47.5     72.5      200      200      200    0.000     6500       0
GR    103    47.5    100.5     57.5    100.2     58.5      100       60    100.2    61.5
GR  100.5    62.5      103     72.5

        SECTION 4
X1      4       7     47.5     72.5      200      200      200    0.000     6500       0
GR  100.6    47.5     98.1     57.5     97.8     58.5     97.6       60     97.8    61.5
GR   98.1    62.5    100.6     72.5

QT      3      34      123      261
1
  01DEC92    16:54:03                                                     PAGE   2


        SECTION 5
X1      5       7     47.5     72.5      200      200      200    0.000     6500       0
GR  100.2    47.5     97.7     57.5     97.4     58.5     97.2       60     97.4    61.5
GR   97.7    62.5    100.2     72.5

        SECTION 6
X1      6       7     47.5     72.5       75       75       75    0.000     6500       0
GR   99.8    47.5     97.3     57.5       97     58.5     96.8       60       97    61.5
GR   97.3    62.5     99.8     72.5

QT      3      40      146      315
        SECTION 7
X1      7       7     47.5     72.5       50       50       50    0.000     6500       0
GR   99.6    47.5     97.1     57.5     96.8     58.5     96.6       60     96.8    61.5
GR   97.1    62.5     99.6     72.5

        SECTION 7.1
X1    7.1       7     47.5     72.5      150      150      150    0.000     6500       0
GR   99.5    47.5       97     57.5     96.7     58.5     96.5       60     96.7    61.5
GR   97.0    62.5     99.5     72.5

        SECTION 8
X1      8       7     47.5     72.5        0        0        0    0.000     6500       0
GR   99.2    47.5     96.7     57.5     96.4     58.5     96.2       60     96.4    61.5
GR   96.7    62.5     99.2     72.5
1
  01DEC92    16:54:03                                                     PAGE   3


                                              THIS RUN EXECUTED 01DEC92    16:54:11
**************************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
**************************************


NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST


WESTERN NUCLEAR/ENERGY F

SUMMARY PRINTOUT


    SECNO      Q     CWSEL    CRIWS     VCH    DEPTH

    1.000   10.00  6610.59  6610.71    5.08      .59
```

	1.000	35.00	6611.00	6611.24	7.00	1.00
	1.000	74.00	6611.36	6611.72	8.43	1.36
*	2.000	23.00	6602.71	6603.04	8.53	.71
*	2.000	76.00	6603.20	6603.74	11.07	1.20
*	2.000	165.00	6603.67	6604.42	12.88	1.67
*	3.000	23.00	6601.03	6601.03	4.36	1.03
*	3.000	76.00	6601.71	6601.73	5.68	1.71
*	3.000	165.00	6602.25	6602.40	7.37	2.25
*	4.000	23.00	6598.44	6598.63	6.21	.84
*	4.000	76.00	6598.98	6599.34	8.35	1.38
	4.000	165.00	6599.58	6600.00	9.27	1.98
*	5.000	34.00	6598.43	6598.43	4.70	1.23
*	5.000	123.00	6599.32	6599.32	6.11	2.12
*	5.000	261.00	6600.12	6600.12	7.07	2.92
*	6.000	34.00	6598.03	6598.03	4.68	1.23
*	6.000	123.00	6598.93	6598.93	6.04	2.13
*	6.000	261.00	6599.72	6599.72	7.03	2.92
*	7.000	40.00	6597.92	6597.92	4.85	1.32
*	7.000	146.00	6598.89	6598.89	6.29	2.29
*	7.000	315.00	6599.72	6599.72	7.48	3.12
*	7.100	40.00	6597.82	6597.82	4.83	1.32
*	7.100	146.00	6598.79	6598.79	6.29	2.29
*	7.100	315.00	6599.63	6599.63	7.46	3.13

1

01DEC92 16:54:03 PAGE 15

	SECNO	Q	CWSEL	CRIWS	VCH	DEPTH
*	8.000	40.00	6597.52	6597.52	4.85	1.32
*	8.000	146.00	6598.49	6598.49	6.27	2.29
*	8.000	315.00	6599.33	6599.33	7.45	3.13

1

01DEC92 16:54:03 PAGE 16

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.000 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO= 3.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 3.000 PROFILE= 1 WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO= 3.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
WARNING SECNO= 3.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 3.000 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 4.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 4.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO= 5.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 5.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 5.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 5.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 5.000 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 5.000 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 5.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 5.000 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 5.000 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 6.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 6.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 6.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.000 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 6.000 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 6.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.000 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 6.000 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 7.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 7.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.000 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.000 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 7.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.000 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.000 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 7.100 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.100 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.100 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 7.100 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.100 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.100 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 7.100 PROFILE= 3 CRITICAL DEPTH ASSUMED
1

CAUTION SECNO= 7.100 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.100 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 8.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 8.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.000 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.000 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 8.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.000 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.000 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

```
1*********************************************                    ****************************************
*  HEC-2 WATER SURFACE PROFILES             *                    *  U.S. ARMY CORPS OF ENGINEERS        *
*                                           *                    *  HYDROLOGIC ENGINEERING CENTER       *
*  Version  4.6.2;  May 1991                *                    *  609 SECOND STREET, SUITE D          *
*                                           *                    *  DAVIS, CALIFORNIA 95616-4687        *
*  RUN DATE   01DEC92   TIME   15:55:58     *                    *  (916) 756-1104                      *
*********************************************                    ****************************************


                    X    X XXXXXXX  XXXXX           XXXXX
                    X    X X        X     X        X     X
                    X    X X        X                    X
                    XXXXXXX XXXX    X          XXXXX  XXXXX
                    X    X X        X               X
                    X    X X        X     X        X
                    X    X XXXXXXX  XXXXX          XXXXXXX
1
  01DEC92     15:55:58                                          PAGE   1


                                        THIS RUN EXECUTED 01DEC92    15:55:58

  *************************************
  HEC-2 WATER SURFACE PROFILES

  Version   4.6.2;  May 1991
  *************************************


T1  DAY LOMA - EXISTING COVER CHANNEL, DLCOV.DAT (Subcritical)
T2  OVERBANK N=0.020, CHANNEL N=0.020, Q=varies SUBCRIT., PMP,1/2 PMP,200yr
T3       WESTERN NUCLEAR/ENERGY FUELS, JOB#350, SHEPHERD MILLER, 11/92 lmw

J1  ICHECK   INQ     NINV     IDIR     STRT     METRIC    HVINS     Q        WSEL      FQ

       0       2        0        0    0.002        0        0        0    6597.9        0

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH     FN      ALLDC     IBW      CHNIM     ITRACE

       1       0       -1        0        0        0       -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

       0      38       43        1        2       26        8

NC      .02      .02      .02        0        0
QT        3       40      146      315
        SECTION 8
X1        8        7     47.5     72.5        0        0        0    0.000     6500        0
GR     99.2     47.5     96.7     57.5     96.4     58.5     96.2       60     96.4     61.5
GR     96.7     62.5     99.2     72.5

        SECTION 7.1
X1      7.1        7     47.5     72.5      150      150      150    0.000     6500        0
GR     99.5     47.5       97     57.5     96.7     58.5     96.5       60     96.7     61.5
GR     97.0     62.5     99.5     72.5
```

```
      SECTION 7
X1     7       7     47.5    72.5     50      50      50    0.000    6500      0
GR   99.6    47.5    97.1    57.5    96.8    58.5    96.6     60     96.8    61.5
GR   97.1    62.5    99.6    72.5

QT     3      34     123     261
      SECTION 6
X1     6       7     47.5    72.5     75      75      75    0.000    6500      0
GR   99.8    47.5    97.3    57.5     97     58.5    96.8     60      97     61.5
GR   97.3    62.5    99.8    72.5

      SECTION 5
X1     5       7     47.5    72.5    200     200     200    0.000    6500      0
GR  100.2    47.5    97.7    57.5    97.4    58.5    97.2     60     97.4    61.5
GR   97.7    62.5   100.2    72.5
1
 01DEC92    15:55:58                                                PAGE   2



      SECTION 4
X1     4       7     47.5    72.5    200     200     200    0.000    6500      0
GR  100.6    47.5    98.1    57.5    97.8    58.5    97.6     60     97.8    61.5
GR   98.1    62.5   100.6    72.5

QT     3      23      76     165
      SECTION 3
X1     3       7     47.5    72.5    200     200     200    0.000    6500      0
GR    103    47.5   100.5    57.5   100.2    58.5     100     60    100.2    61.5
GR  100.5    62.5     103    72.5

      SECTION 2
X1     2       7     47.5    72.5    210     210     210    0.000    6500      0
GR    105    47.5   102.5    57.5   102.2    58.5     102     60    102.2    61.5
GR  102.5    62.5     105    72.5

QT     3      10      35      74
      SECTION 1
X1     1       7     47.5    72.5    210     210     210    0.000    6500      0
GR    113    47.5   110.5    57.5   110.2    58.5     110     60    110.2    61.5
GR  110.5    62.5     113    72.5
1
 01DEC92    15:55:58                                                PAGE   3



                                          THIS RUN EXECUTED 01DEC92    15:56:04
**************************************
HEC-2 WATER SURFACE PROFILES

Version  4.6.2;  May 1991
**************************************


NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST


WESTERN NUCLEAR/ENERGY F

SUMMARY PRINTOUT


   SECNO      Q      CWSEL     CRIWS     VCH     DEPTH
```

	8.000	40.00	6597.89	6597.52	3.06	1.69
	8.000	146.00	6599.01	6598.48	4.24	2.81
	8.000	315.00	6599.94	6599.32	5.49	3.74
	7.100	40.00	6598.19	6597.81	3.05	1.69
	7.100	146.00	6599.32	6598.79	4.22	2.82
	7.100	315.00	6600.24	6599.62	5.48	3.74
	7.000	40.00	6598.29	6597.92	3.05	1.69
	7.000	146.00	6599.42	6598.88	4.22	2.82
	7.000	315.00	6600.34	6599.72	5.48	3.74
	6.000	34.00	6598.46	6598.02	2.72	1.66
	6.000	123.00	6599.63	6598.92	3.53	2.83
	6.000	261.00	6600.63	6599.72	4.37	3.83
	5.000	34.00	6598.80	6598.42	2.89	1.60
	5.000	123.00	6599.90	6599.33	3.85	2.70
	5.000	261.00	6600.85	6600.12	4.72	3.65
	4.000	34.00	6599.19	6598.83	2.92	1.58
	4.000	123.00	6600.26	6599.72	3.98	2.66
	4.000	261.00	6601.15	6600.52	4.94	3.55
*	3.000	23.00	6601.03	6601.03	4.33	1.03
*	3.000	76.00	6601.73	6601.73	5.53	1.73
*	3.000	165.00	6602.40	6602.40	6.47	2.40
*	2.000	23.00	6603.03	6603.03	4.35	1.03
*	2.000	76.00	6603.74	6603.74	5.51	1.74
*	2.000	165.00	6604.41	6604.41	6.43	2.41

1

01DEC92 15:55:58 PAGE 13

	SECNO	Q	CWSEL	CRIWS	VCH	DEPTH
*	1.000	10.00	6610.71	6610.71	3.67	.71
*	1.000	35.00	6611.24	6611.24	4.71	1.24
*	1.000	74.00	6611.72	6611.72	5.49	1.72

1

01DEC92 15:55:58 PAGE 14

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 3.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 3.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 2 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 3.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 3 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 2.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2.000 PROFILE= 2 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2.000 PROFILE= 3 MINIMUM SPECIFIC ENERGY

```
CAUTION SECNO=     1.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.000  PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.000  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.000  PROFILE=  3  MINIMUM SPECIFIC ENERGY
```

```
|**********************************************          ****************************************
* HEC-2 WATER SURFACE PROFILES                 *          * U.S. ARMY CORPS OF ENGINEERS        *
*                                              *          * HYDROLOGIC ENGINEERING CENTER       *
* Version  4.6.2; May 1991                     *          * 609 SECOND STREET, SUITE D          *
*                                              *          * DAVIS, CALIFORNIA 95616-4687        *
* RUN DATE   01DEC92   TIME   16:54:03         *          *    (916) 756-1104                   *
**********************************************          ****************************************
```

```
X     X  XXXXXXX   XXXXX          XXXXX
X     X  X        X     X        X     X
X     X  X        X                    X
XXXXXXX  XXXX     X        XXXXX  XXXXX
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXXXXXX
```

1
01DEC92   16:54:03   PAGE 1

THIS RUN EXECUTED 01DEC92   16:54:03

```
*************************************
HEC-2 WATER SURFACE PROFILES

Version   4.6.2;  May 1991
*************************************
```

```
T1  DAY LOMA - EXISTING COVER CHANNEL, DLCOV.DAT (Supercritical)
T2  OVERBANK N=0.020, CHANNEL N=0.020, Q=varies SUBCRIT., PMP,1/2 PMP,200yr
T3      WESTERN NUCLEAR/ENERGY FUELS, JOB#350, SHEPHERD MILLER, 11/92 lmw

J1  ICHECK   INQ     NINV    IDIR    STRT     METRIC   HVINS   Q       WSEL     FQ

       0       2       0       1     .02        0        0       0   6610.7     0

J2  NPROF   IPLOT   PRFVS   XSECV   XSECH    FN     ALLDC    IBW     CHNIM    ITRACE

       1       0      -1       0       0       0      -1

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

       0      38      43       1       2      26       8

NC     .02     .02     .02       0       0
QT       3      10      35      74
        SECTION 1
X1       1       7    47.5    72.5     210     210     210   0.000    6500       0
GR     113    47.5   110.5    57.5   110.2    58.5     110      60   110.2    61.5
GR   110.5    62.5     113    72.5

QT       3      23      76     165
        SECTION 2
X1       2       7    47.5    72.5     210     210     210   0.000    6500       0
GR     105    47.5   102.5    57.5   102.2    58.5     102      60   102.2    61.5
GR   102.5    62.5     105    72.5
```

```
      SECTION 3
X1      3       7     47.5    72.5     200     200     200   0.000    6500      0
GR    103    47.5    100.5    57.5   100.2    58.5     100      60   100.2   61.5
GR  100.5    62.5      103    72.5

      SECTION 4
X1      4       7     47.5    72.5     200     200     200   0.000    6500      0
GR  100.6    47.5     98.1    57.5    97.8    58.5    97.6      60    97.8   61.5
GR   98.1    62.5    100.6    72.5

QT      3      34      123     261
1
  01DEC92    16:54:03                                                   PAGE   2


      SECTION 5
X1      5       7     47.5    72.5     200     200     200   0.000    6500      0
GR  100.2    47.5     97.7    57.5    97.4    58.5    97.2      60    97.4   61.5
GR   97.7    62.5    100.2    72.5

      SECTION 6
X1      6       7     47.5    72.5      75      75      75   0.000    6500      0
GR   99.8    47.5     97.3    57.5      97    58.5    96.8      60      97   61.5
GR   97.3    62.5     99.8    72.5

QT      3      40      146     315
      SECTION 7
X1      7       7     47.5    72.5      50      50      50   0.000    6500      0
GR   99.6    47.5     97.1    57.5    96.8    58.5    96.6      60    96.8   61.5
GR   97.1    62.5     99.6    72.5

      SECTION 7.1
X1    7.1       7     47.5    72.5     150     150     150   0.000    6500      0
GR   99.5    47.5       97    57.5    96.7    58.5    96.5      60    96.7   61.5
GR   97.0    62.5     99.5    72.5

      SECTION 8
X1      8       7     47.5    72.5       0       0       0   0.000    6500      0
GR   99.2    47.5     96.7    57.5    96.4    58.5    96.2      60    96.4   61.5
GR   96.7    62.5     99.2    72.5
1
  01DEC92    16:54:03                                                   PAGE   3


                                          THIS RUN EXECUTED 01DEC92    16:54:11

************************************
HEC-2 WATER SURFACE PROFILES

Version  4.6.2;  May 1991
************************************


NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST


WESTERN NUCLEAR/ENERGY F

SUMMARY PRINTOUT


     SECNO       Q     CWSEL    CRIWS     VCH    DEPTH

     1.000   10.00  6610.59  6610.71    5.08      .59
```

	1.000	35.00	6611.00	6611.24	7.00	1.00
	1.000	74.00	6611.36	6611.72	8.43	1.36
*	2.000	23.00	6602.71	6603.04	8.53	.71
*	2.000	76.00	6603.20	6603.74	11.07	1.20
*	2.000	165.00	6603.67	6604.42	12.88	1.67
*	3.000	23.00	6601.03	6601.03	4.36	1.03
*	3.000	76.00	6601.71	6601.73	5.68	1.71
*	3.000	165.00	6602.25	6602.40	7.37	2.25
*	4.000	23.00	6598.44	6598.63	6.21	.84
*	4.000	76.00	6598.98	6599.34	8.35	1.38
	4.000	165.00	6599.58	6600.00	9.27	1.98
*	5.000	34.00	6598.43	6598.43	4.70	1.23
*	5.000	123.00	6599.32	6599.32	6.11	2.12
*	5.000	261.00	6600.12	6600.12	7.07	2.92
*	6.000	34.00	6598.03	6598.03	4.68	1.23
*	6.000	123.00	6598.93	6598.93	6.04	2.13
*	6.000	261.00	6599.72	6599.72	7.03	2.92
*	7.000	40.00	6597.92	6597.92	4.85	1.32
*	7.000	146.00	6598.89	6598.89	6.29	2.29
*	7.000	315.00	6599.72	6599.72	7.48	3.12
*	7.100	40.00	6597.82	6597.82	4.83	1.32
*	7.100	146.00	6598.79	6598.79	6.29	2.29
*	7.100	315.00	6599.63	6599.63	7.46	3.13

	SECNO	Q	CWSEL	CRIWS	VCH	DEPTH
*	8.000	40.00	6597.52	6597.52	4.85	1.32
*	8.000	146.00	6598.49	6598.49	6.27	2.29
*	8.000	315.00	6599.33	6599.33	7.45	3.13

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.000 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO= 3.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 3.000 PROFILE= 1 WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO= 3.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
WARNING SECNO= 3.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 3.000 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 4.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 4.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO= 5.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 5.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 5.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 5.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 5.000 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 5.000 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 5.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 5.000 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 5.000 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 6.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 6.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 6.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.000 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 6.000 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 6.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.000 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 6.000 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 7.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 7.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.000 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.000 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 7.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.000 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.000 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 7.100 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.100 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.100 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 7.100 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.100 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.100 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 7.100 PROFILE= 3 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 7.100 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 7.100 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 8.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 8.000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.000 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.000 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 8.000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.000 PROFILE= 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.000 PROFILE= 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

```
1*********************************************        ****************************************
 *  HEC-2 WATER SURFACE PROFILES               *       *  U.S. ARMY CORPS OF ENGINEERS        *
 *                                             *       *  HYDROLOGIC ENGINEERING CENTER       *
 *  Version   4.6.2;  May 1991                 *       *  609 SECOND STREET, SUITE D          *
 *                                             *       *  DAVIS, CALIFORNIA 95616-4687        *
 *  RUN DATE    04NOV93    TIME   22:02:04     *       *          (916) 756-1104              *
 *********************************************        ****************************************
```

```
X     X  XXXXXXX   XXXXX           XXXXX
X     X  X        X     X         X     X
X     X  X        X                     X
XXXXXXX  XXXX     X         XXXXX  XXXXX
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX          XXXXXXX
```


THIS RUN EXECUTED 04NOV93   22:02:04

```
**************************************
HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
**************************************
```

T1 COYOTE CREEK RECLAMATION, AML-16-G EXISTING CHANNEL DESIGN

T2 SUPERCRIT, 200YR (24HR),PMP --FILE: R:\PROJECTS\350\HEC2\RREVSPXS.DAT

T3 ENERGY FUELS, JOB#350, SHEPHERD MILLER, 10/93 kmw

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	1	.015012	0	0	0	6555.17	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	-1	0	0	0	-1			

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

38	43	8	26	25	5	42	17	33	4

QT 1 1476

```
NC    .0389    .0389    .0389      .1       .3

X1        0        4        0      42      100     100      100        0     6000        0
GR      556        0    550.5      11    550.5      31      556       42

X1        1        4        0      42      100     100      100        0     6000        0
GR   554.61        0      549      11      549      31   554.61       42

X1        2        4        0      42      100     100      100        0     6000        0
GR   553.23        0   547.50      11   547.50      31   553.23       42

X1        3        4        0      42      100     100      100        0     6000        0
GR   551.84        0      546      11      546      31   551.84       42

X1        4        4        0      42       33      33       33        0     6000        0
GR   550.46        0    544.5      11    544.5      31   550.46       42

NC    .0341    .0341    .0341      .1       .3
X1       10        4        0      44       50      50       50        0     6000        0
GR      550        0      544      12      544      32      550       44
```



```
X1     10.2        4        0      44       40      40       40        0     6000        0
GR   549.44        0   543.72      12   543.72      32   549.44       42

NC    .0513    .0513    .0513      .1       .3
X1     10.5        4        0      42       50      50       50        0     6000        0
GR      549        0    543.5      11    543.5      31      549       42

X1       11        4        0      42       50      50       50        0     6000        0
GR   545.04        0   539.54      11   539.54      31   545.04       42

X1       12        4        0      42       39      39       39        0     6000        0
GR   541.08        0   535.59      11   535.59      31   541.08       42

NC    .0404    .0404    .0404      .1       .3
X1       20        4        0      42      100     100      100    0.000     6000        0
GR      538        0    532.5      11    532.5      31      538       42
```

X1	21	4	0	42	100	100	100	0.000	6000	0
GR	535.42	0	529.92	11	529.92	31	535.42	42		
X1	22	4	0	42	100	100	100	0.000	6000	0
GR	532.84	0	527.34	11	527.34	31	532.84	42		
X1	23	4	0	42	100	100	100	0	6000	0
GR	530.26	0	524.76	11	524.76	31	530.26	42		
X1	24	4	0	42	100	100	100	0	6000	0
GR	527.67	0	522.18	11	522.18	31	527.67	42		
X1	25	4	0	42	100	100	100	0	6000	0
GR	525.10	0	519.60	11	519.60	31	525.10	42		
X1	26	4	0	42	20	20	20	0	6000	0
GR	522.52	0	517.016	11	517.016	31	522.52	42		
NC	.0393	.0393	.0393	.1	.3					

X1	30	4	0	42	100	100	100	0.000	6000	0
GR	522	0	516.5	11	516.5	31	522	42		
X1	31	4	0	42	100	100	100	0.000	6000	0
GR	519.82	0	514.33	11	514.33	31	519.82	42		
X1	32	4	0	42	100	100	100	0.000	6000	0
GR	517.65	0	512.15	11	512.15	31	517.65	42		
X1	33	4	0	42	100	100	100	0.000	6000	0
GR	515.48	0	509.97	11	509.97	31	515.48	42		
X1	34	4	0	42	100	100	100	0.000	6000	0
GR	513.30	0	507.8	11	507.8	31	513.3	42		
X1	35	4	0	42	100	100	100	0.000	6000	0
GR	511.13	0	505.63	11	505.63	31	511.13	42		

X1	36	4	0	42	67	67	67	0.000	6000	0
GR	508.96	0	503.46	11	503.46	31	508.96	42		
	.0313	.0313	.0313	.1	.5					
X1	40	4	0	57	100	100	100	0.000	6000	0
GR	507.5	0	502	11	502	46	507.5	57		
X1	41	4	0	57	100	100	100	0.000	6000	0
GR	507.25	0	501.75	11	501.75	46	507.25	57		
X1	42	4	0	57	100	100	100	0.000	6000	0
GR	507	0	501.5	11	501.5	46	507	57		
X1	43	4	0	57	100	100	100	0.000	6000	0
GR	506.75	0	501.25	11	501.25	46	506.75	57		
X1	44	4	0	57	100	100	100	0.000	6000	0
GR	506.5	0	501	11	501	46	506.5	57		

X1	45	4	0	57	97	97	97	0.000	6000	0
GR	506.25	0	500.75	11	50C.75	46	506.25	57		
X1	50	4	0	53	200	200	200	0.000	6000	0
GR	506	0	500.5	9	500.5	44	506	53		
NC	.0329	.0329	.0329	.1	.5					
X1	51	4	0	82	0	0	0	0.000	6000	0
GR	503	0	500	6	500	76	503	82		

THIS RUN EXECUTED 04NOV93 22:02:08

****

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

GY FUELS, JOB#350, SHEPH

SUMMARY PRINTOUT

	SECNO	Q	DEPTH	VCH	AREA	10*KS	ELMIN	K*XNCH	K*CHSL	TOPWID
*	.000	1476.00	4.68	10.74	137.47	157.09	6550.50	38.90	.00	38.73
*	1.000	1476.00	4.69	10.77	137.00	157.41	6549.00	38.90	-15.00	38.40
*	2.000	1476.00	4.71	10.80	136.62	157.42	6547.50	38.90	-15.00	38.07
*	3.000	1476.00	4.72	10.82	136.39	157.07	6546.00	38.90	-15.00	37.78
*	4.000	1476.00	4.73	10.85	136.00	157.17	6544.50	38.90	-15.00	37.47
	10.000	1476.00	4.40	11.70	126.18	153.72	6544.00	34.10	-15.15	37.54
*	10.200	1476.00	4.70	10.81	136.54	121.29	6543.72	34.10	-5.61	38.08
*	10.500	1476.00	4.67	10.77	137.09	275.33	6543.50	51.30	-5.49	38.69
*	11.000	1476.00	3.26	17.05	86.59	1018.91	6539.54	51.30	-79.20	33.06
	12.000	1476.00	3.58	15.19	97.18	731.93	6535.59	51.30	-79.00	34.33
	20.000	1476.00	3.33	16.63	88.75	588.73	6532.50	40.40	-79.23	33.32
*	21.000	1476.00	4.59	11.02	133.97	182.21	6529.92	40.40	-25.80	38.36
	22.000	1476.00	4.03	13.09	112.77	296.09	6527.34	40.40	-25.80	36.09
	23.000	1476.00	4.31	11.96	123.41	229.77	6524.76	40.40	-25.80	37.25
	24.000	1476.00	4.13	12.63	116.84	268.45	6522.18	40.40	-25.80	36.56
	25.000	1476.00	4.24	12.26	120.35	246.70	6519.60	40.40	-25.80	36.92
	26.000	1476.00	4.15	12.56	117.52	263.82	6517.02	40.40	-25.84	36.60

1

04NOV93 22:02:04 PAGE 13

SECNO	Q	DEPTH	VCH	AREA	10*KS	ELMIN	K*XNCH	K*CHSL	TOPWID
30.000	1476.00	4.21	12.38	119.20	239.90	6516.50	39.30	-25.81	36.79
31.000	1476.00	4.44	11.53	128.06	195.97	6514.33	39.30	-21.70	37.77

	32.000	1476.00	4.26	12.14	121.56	226.93	6512.15	39.30	-21.80	37.05
	33.000	1476.00	4.38	11.74	125.68	206.37	6509.97	39.30	-21.80	37.47
	34.000	1476.00	4.30	12.02	122.75	220.73	6507.80	39.30	-21.70	37.18
	35.000	1476.00	4.34	11.88	124.25	213.31	6505.63	39.30	-21.70	37.34
	36.000	1476.00	4.29	12.01	122.90	219.99	6503.46	39.30	-21.70	37.19
	40.000	1476.00	2.45	15.08	97.85	368.61	6502.00	31.30	-21.79	44.81
*	41.000	1476.00	3.54	9.90	149.09	103.60	6501.75	31.30	-2.50	49.17
*	42.000	1476.00	3.54	9.92	148.73	104.35	6501.50	31.30	-2.50	49.14
*	43.000	1476.00	3.54	9.92	148.73	104.35	6501.25	31.30	-2.50	49.14
*	44.000	1476.00	3.54	9.92	148.73	104.35	6501.00	31.30	-2.50	49.14
*	45.000	1476.00	3.54	9.92	148.73	104.35	6500.75	31.30	-2.50	49.14
*	50.000	1476.00	3.59	10.05	146.85	103.10	6500.50	31.30	-2.58	46.76
*	51.000	1476.00	2.34	8.46	174.39	125.15	6500.00	32.90	-2.50	79.34

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= .000 PROFILE= 1 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 1.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 2.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 2.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 2.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 3.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 3.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 3.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 4.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 4.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 4.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 10.200 PROFILE= 1 CRITICAL DEPTH ASSUMED

```
CAUTION SECNO=     10.200  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     10.200  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     10.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     10.500  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     10.500  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     11.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     21.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     41.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     41.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     41.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     42.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     42.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     42.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     43.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     43.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     43.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     44.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     44.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     44.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     45.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     45.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     45.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     50.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
```


```
CAUTION SECNO=     50.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     50.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     51.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     51.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     51.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
```

```
1*********************************************                    **************************************
 *  HEC-2 WATER SURFACE PROFILES            *                    * U.S. ARMY CORPS OF ENGINEERS       *
 *                                          *                    * HYDROLOGIC ENGINEERING CENTER      *
 *  Version   4.6.2;  May 1991              *                    * 609 SECOND STREET, SUITE D         *
 *                                          *                    * DAVIS, CALIFORNIA 95616-4687       *
 *  RUN DATE    04NOV93    TIME   22:00:53  *                    *         (916) 756-1104             *
 ********************************************                    **************************************


                    X     X  XXXXXXX   XXXXX              XXXXX
                    X     X  X        X     X            X     X
                    X     X  X        X                        X
                    XXXXXXX  XXXX     X          XXXXX    XXXXX
                    X     X  X        X                  X
                    X     X  X        X     X            X
                    X     X  XXXXXXX   XXXXX             XXXXXXX
1
   04NOV93      22:00:53                                                       PAGE    1


                                                  THIS RUN EXECUTED 04NOV93    22:00:53

 ***********************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
 ***********************************


T1  COYOTE CREEK RECLAMATION, AML-16-G EXISTING CHANNEL DESIGN
T2  SUBCRIT, 200YR (24HR),PMP --FILE: R:\PROJECTS\350\HEC2\SUBCRICO.DAT
T3  ENERGY FUELS, JOB#350, SHEPHERD MILLER, 10/93 kmw

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC    HVINS     Q       WSEL      FQ

       0        2        0        0      .025        0         0        0   6502.34      0

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH      FN      ALLDC     IBW      CHNIM    ITRACE

      1        0       -1        0        0         0       -1

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     38       43        8       26       25         5       42       17       33        4

QT       1     1476
```

NC	.0329	.0329	.0329	.1	.5					
X1	51	4	0	88	0	0	0	0.000	6000	0
GR	505	0	500	9	500	79	505	88		
[illegible]	50	4	0	53	200	200	200	0.000	6000	0
GR	506	0	500.5	9	500.5	44	506	53		
NC	.0313	.0313	.0313	.1	.5					
X1	45	4	0	57	97	97	97	0.000	6000	0
GR	506.25	0	500.75	11	500.75	46	506.25	57		
X1	44	4	0	57	100	100	100	0.000	6000	0
GR	506.5	0	501	11	501	46	506.5	57		
X1	43	4	0	57	100	100	100	0.000	6000	0
GR	506.75	0	501.25	11	501.25	46	506.75	57		

X1	42	4	0	57	100	100	100	0.000	6000	0
GR	507	0	501.5	11	501.5	46	507	57		
X1	41	4	0	57	100	100	100	0.000	6000	0
GR	507.24	0	501.75	11	501.75	46	507.24	57		
X1	40	4	0	57	100	100	100	0.000	6000	0
GR	507.5	0	502	11	502	46	507.5	57		
NC	.0393	.0393	.0393	.1	.3					
X1	36	4	0	42	67	67	67	0.000	6000	0
GR	508.96	0	503.46	11	503.46	31	508.96	42		
X1	35	4	0	42	100	100	100	0.000	6000	0
GR	511.13	0	505.63	11	505.63	31	511.13	42		
X1	34	4	0	42	100	100	100	0.000	6000	0
GR	513.30	0	507.8	11	507.8	31	513.3	42		
X1	33	4	0	42	100	100	100	0.000	6000	0

GR	515.48	0	509.98	11	509.98	31	515.48	42		
X1	32	4	0	42	100	100	100	0.000	6000	0
	517.65	0	512.15	11	512.15	31	517.65	42		
X1	31	4	0	42	100	100	100	0.000	6000	0
GR	519.82	0	514.33	11	514.33	31	519.82	42		
X1	30	4	0	42	100	100	100	0.000	6000	0
GR	522	0	516.5	11	516.5	31	522	42		
NC	.0404	.0404	.0404	.1	.3					
X1	26	4	0	42	20	20	20	0	6000	0
GR	522.52	0	517.02	11	517.02	31	522.52	42		
X1	25	4	0	42	100	100	100	0	6000	0
GR	525.10	0	519.60	11	519.60	31	525.10	42		

X1	24	4	0	42	100	100	100	0	6000	0
	527.67	0	522.18	11	522.18	31	527.67	42		
X1	23	4	0	42	100	100	100	0	6000	0
GR	530.26	0	524.76	11	524.76	31	530.26	42		
X1	22	4	0	42	100	100	100	0.000	6000	0
GR	532.84	0	527.34	11	527.34	31	532.84	42		
X1	21	4	0	42	100	100	100	0.000	6000	0
GR	535.42	0	529.92	11	529.92	31	535.42	42		
X1	20	4	0	42	100	100	100	0.000	6000	0
GR	538	0	532.5	11	532.5	31	538	42		
NC	.0513	.0513	.0513	.1	.3					
X1	12	4	0	42	39	39	39	0	6000	0
GR	541.08	0	535.59	11	535.59	31	541.08	42		
X1	11	4	0	42	50	50	50	0	6000	0

GR	545.04	0	539.54	11	539.54	31	545.04	42		
	10.5	4	0	42	50	50	50	0	6000	0
GR	549	0	543.5	11	543.5	31	549	42		
NC	.0341	.0341	.0341	.1	.3					
X1	10.2	4	0	44	40	40	40	0	6000	0
GR	549.44	0	543.72	12	543.72	32	549.44	42		
X1	10	4	0	44	50	50	50	0	6000	0
GR	550	0	544	12	544	32	550	44		
NC	.0381	.0381	.0381	.1	.3					
X1	4	4	0	42	33	33	33	0	6000	0
GR	550.46	0	544.5	11	544.5	31	550.46	42		

X1	3	4	0	42	100	100	100	0	6000	0
GR	551.84	0	546	11	546	31	551.84	42		
	2	4	0	42	100	100	100	0	6000	0
GR	553.23	0	547.50	11	547.50	31	553.23	42		
X1	1	4	0	42	100	100	100	0	6000	0
GR	554.61	0	549	11	549	31	554.61	42		
X1	0	4	0	42	100	100	100	0	6000	0
GR	556	0	550.5	11	550.5	31	556	42		

THIS RUN EXECUTED 04NOV93 22:00:57

```
**************************************
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
**************************************
```

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

GY FUELS, JOB#350, SHEPH

	SECNO	Q	DEPTH	VCH	AREA	10*KS	ELMIN	K*XNCH	K*CHSL	TOPWID
*	51.000	1476.00	2.35	8.48	174.10	124.20	6500.00	32.90	.00	78.44
	50.000	1476.00	3.84	9.31	158.50	90.61	6500.50	32.90	2.50	47.57
*	45.000	1476.00	4.78	6.93	212.93	36.23	6500.75	31.30	2.58	54.12
	44.000	1476.00	4.93	6.67	221.41	32.34	6501.00	31.30	2.50	54.74
	43.000	1476.00	5.03	6.52	226.34	30.33	6501.25	31.30	2.50	55.10
	42.000	1476.00	5.10	6.42	230.01	28.95	6501.50	31.30	2.50	55.36
	41.000	1476.00	5.15	6.34	232.98	27.91	6501.75	31.30	2.50	55.61
	40.000	1476.00	5.19	6.28	235.11	27.16	6502.00	31.30	2.50	55.73
*	36.000	1476.00	4.68	10.75	137.24	161.08	6503.46	39.30	21.79	38.70
*	35.000	1476.00	4.68	10.74	137.43	160.46	6505.63	39.30	21.70	38.72
*	34.000	1476.00	4.68	10.75	137.30	160.90	6507.80	39.30	21.70	38.71
*	33.000	1476.00	4.68	10.75	137.30	160.90	6509.98	39.30	21.80	38.71
	32.000	1476.00	4.68	10.75	137.30	160.90	6512.15	39.30	21.70	38.71
*	31.000	1476.00	4.68	10.74	137.38	160.74	6514.33	39.30	21.80	38.74
*	30.000	1476.00	4.68	10.75	137.30	160.90	6516.50	39.30	21.70	38.71
*	26.000	1476.00	4.68	10.75	137.30	170.03	6517.02	40.40	26.00	38.71
*	25.000	1476.00	4.68	10.75	137.30	170.03	6519.60	40.40	25.80	38.71

	SECNO	Q	DEPTH	VCH	AREA	10*KS	ELMIN	K*XNCH	K*CHSL	TOPWID
*	24.000	1476.00	4.68	10.74	137.38	169.86	6522.18	40.40	25.80	38.74
*	23.000	1476.00	4.68	10.75	137.30	170.03	6524.76	40.40	25.80	38.71
*	22.000	1476.00	4.68	10.75	137.30	170.03	6527.34	40.40	25.80	38.71
*	21.000	1476.00	4.68	10.75	137.30	170.03	6529.92	40.40	25.80	38.71

*	20.000	1476.00	4.68	10.75	137.30	170.03	6532.50	40.40	25.80	38.71
*	12.000	1476.00	4.68	10.74	137.38	273.90	6535.59	51.30	79.23	38.74
	11.000	1476.00	4.68	10.75	137.30	274.15	6539.54	51.30	79.00	38.71
*	10.500	1476.00	4.68	10.75	137.30	274.15	6543.50	51.30	79.20	38.71
*	10.200	1476.00	5.67	8.43	175.10	60.38	6543.72	34.10	5.49	41.80
	10.000	1476.00	5.76	8.13	181.55	55.41	6544.00	34.10	5.61	43.04
	4.000	1476.00	5.25	9.47	155.83	102.79	6544.50	38.10	15.15	39.38
*	3.000	1476.00	4.71	10.86	135.97	152.00	6546.00	38.10	15.00	37.74
	2.000	1476.00	4.78	10.57	139.62	142.03	6547.50	38.10	15.00	38.37
	1.000	1476.00	4.70	10.74	137.40	149.79	6549.00	38.10	15.00	38.44
	.000	1476.00	4.72	10.63	138.79	146.67	6550.50	38.10	15.00	38.86

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 51.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

WARNING SECNO= 45.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO= 36.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 36.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 35.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 35.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 34.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 34.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 33.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 33.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 32.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 32.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 31.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 31.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 30.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

```
CAUTION SECNO=     30.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     26.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     26.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     25.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     25.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     24.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     24.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     23.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     23.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     22.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     22.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     21.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     21.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     20.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     20.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     12.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     12.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     11.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     11.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
```



```
CAUTION SECNO=     10.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     10.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     10.200  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      3.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
```

RIPRAP SIZING
CORPS OF ENGINEERS METHOD

NORMAL DEPTH CALCULATION AND RIPRAP SIZING USING COE METHOD

Location: DAY LOMA HEAP LEACH PAD
CONCEPTUAL DESIGN
RECLAIMED COVER - CHANNEL RIPRAP DESIGN: 200yr/24 hr EVENT

Channel hydraulic properties:

Flow (cfs):	40
Assumed D-50 (ft):	0.16
Manning's n:	0.0291
Bottom Width (ft):	0
Right Side Slope, z:	4
Left Side Slope, z:	4
Channel Slope (ft/ft):	0.01

QPro "Solve For" tool:

variable: formula:

Depth	F(y)
1.5402	-0.00

Depth (ft) =	1.540
Hydraulic Radius (ft) =	0.747
Cross-Sectional Area (sq ft) =	9.49
Average Velocity (fps) =	4.22
Topwidth (ft) =	12.32
Froude Number =	0.85
Flow Condition:	subcritical

rap size:

INPUT COEFFICIENTS: (see manual for description)

Safety Factor:	1.1	(no addition is applied)
Shape Coefficient:	0.3	(for angular rock)
Curvature Coefficient:	1.28	(adjusted for R/W)
Thickness Coefficient:	1	(thickness = 1 * D100)
INPUT Side Slope (H:1V):	4	
side slope angle (deg):	14.0	
INPUT angle of repose (deg):	40	
constant K1:	0.926	
INPUT rock specific gravity:	2.65	
Velocity (fps):	4.216	
Depth (ft):	1.540	
D-30 rock size (ft):	0.11	
D-30 rock size (in):	1.3	
D-50 rock size (ft):	0.15	(assuming D30 = 0.7 * D50)
D-50 rock size (in):	1.8	

f: COE, 1991. Hydraulic Design of Flood Control Channels,
EM 1110-2-1601, pp. 3-1 - 3-7.

RIPRAP SIZING USING 1970 COE METHOD
Ref: COE, 1970. Hydraulic Design of Flood Control Channels,
EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1
Date: 11/04/93
Location: DAY LOMA
SECTION 0 10

INPUT COEFFICIENTS: (see manual for description)

INPUT: radius of curv. (ft)=	275
INPUT: topwidth of flow (ft)=	38.02
R/W=	7.2
INPUT: side slope (xH:1V)=	2
side slope angle (deg)=	26.6
INPUT: angle of repose (deg)=	40
INPUT: rock specific gravity=	2.65
INPUT: velocity (fps)=	11.070
INPUT: depth (ft)=	4.600

Flow (cfs):	1476
Riprap D-50 (ft):	0.91666
Manning's n:	0.0389
Bottom Width (ft):	20
Right Side Slope, z:	2
Left Side Slope, z:	2
Channel Slope (ft/ft):	0.0151

D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	BOTTOM SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM SF	SIDE SLOPE SF
0.9166	2.253	2.639	3.775	2.712	1.43	1.03
0.8333	2.152	2.521	3.432	2.465	1.36	0.98
0.5	1.712	2.005	2.059	1.479	1.03	0.74
0.41666	1.587	1.859	1.716	1.233	0.92	0.66
0.333	1.451	1.700	1.371	0.985	0.81	0.58

APPENDIX B
RADON CALCULATIONS

TABLE OF CONTENTS

List of Tables

List of Figures

B.1 INTRODUCTION

Radon flux calculations were performed for the cover surface using the RADON (NRC, 1989) computer model. Input into the program was based upon the characteristics of the site specific cover and heap leach materials. Existing average cover thickness was obtained from field investigations performed during October, 1992. During the field investigation, samples were collected for laboratory testing in order to classify the types of soils present. Average radium activity for the heap leach material was determined from laboratory testing on samples also collected during the field investigation. This average radium activity was compared to the source term concentrations based upon the cutoff ore grade during mining. Parameters used in the model are described in more detail below.

B.2 COVER THICKNESS

Based on the field investigation, the cover thickness ranged from approximately 8.0 to 13.0 feet. Bore hole locations from the field investigation are shown on Figure B.1. The depth to heap leach material below the cover was based upon visual inspection and the change in radium activity of the soil. Drill logs from the field investigation are included in Appendix D.

B.3 SOIL CLASSIFICATION

Laboratory testing was performed on selected samples from the field investigation to determine moisture content, dry density, and percent passing the #200 sieve. Table B.1 below provides a summary of the test results. Additional test results and drill logs are provided in Appendix D.

TABLE B.1
SOIL TESTING RESULTS

Sample No.	Sample Depth (ft)	Percent Passing No. 200 Sieve	Dry Unit Weight (lb/ft^3)	Moisture Content (%)
HL-1-3B	5.5 - 6.5	80.2		
HL-2-2A	2.5 - 3.0	34.7	109.2	13.6
HL-2-4	7.5 - 9.0	14.5		
HL-3-6B	13.0 - 14.0	42.6		
HL-8-3	5.0 - 6.5	24.7		
HL-8-4B	8.0 - 8.5	95.9	104.0	18.9
HL-8-5	10.0 - 11.5	92.4		
HL-8-6C	13.5 - 14.0	15.8	110.8	10.4
HL-9-2	2.5 - 4.0	36.5		

Based upon the percent passing the #200 sieve, long term moisture was calculated using the equation below (NRC, 1984):

$$m_r = (0.124P^{1/2} - 0.0012E - 0.04 + 0.156f_{cm})$$

where;

m_r = residual soil moisture (fraction of saturation)

P = annual precipitation (in)

E = annual lake evaporation (in)

f_{cm} = soil fraction passing #200 sieve

Average annual precipitation was determined to be 8-12 inches and average annual evaporation was determined to be 40 inches (Midwest Plan Service, 1983).

Several types of soil were apparent in the field investigation. The 8 to 13 feet of existing reclamation cover soil consists of interbedded sands and clays with varying dry densities and moisture contents. From the samples tested, the two lowest percent passing the #200 sieve and the two highest percent passing the #200 sieve were averaged and used as separate input into the radon flux computer model analyses to provide a range of radon flux calculations. Average low percent passing the #200 sieve was determined to be 29.7 percent and the average high percent passing the #200 sieve was 94.2 percent. Densities and moisture contents were analyzed for one of the low percent passing #200 sieve samples and one of the high percent passing #200 sieve samples. Corresponding dry densities and moisture contents were determined to be 109.2 lb/ft^3 and 13.6 for the low percent passing the #200 sieve, and 104.0 lb/ft^3 and 18.9 percent for the high percent passing the #200 sieve, respectively.

These values represent the range of soils that exist within the existing reclamation cover. These values were used in the RADON computer model for determining the adequacy of the reclamation cover for radon attenuation. Long term moistures for the cover soil were calculated and used as conservative input to the RADON computer model. Long term moisture contents were based upon the percent passing the #200 sieve and were calculated using the equation presented in the "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design," NUREG/CR-3533 (NRC, 1984). Based upon the soil characteristics described above, and using the long term moisture equation, long term moisture contents for the cover soil ranged from 6.0 to 9.1 percent.

B.4 RADIUM ACTIVITY

Heap Leach samples were collected during the field investigation to determine radium activity. Sample locations are shown on Figure B.1. Listed below are the laboratory test results for heap leach radium activity.

TABLE B.2
RADIUM ACTIVITY

SAMPLE IDENTIFICATION	*APPROXIMATE DEPTH (FT)	RADIUM ACTIVITY pCi/g
HL - 1	11.5	86.9
HL - 2.1	19.0	86.8
HL - 8.5	14.0	413
Composite HL-1-5,HL-1-6	10.0-11.5,12.5-14.0	58.9
Composite HL-9-6,HL-9-7	12.5-14.0,15.0-16.5	34.4
HL - 10.4	~6.0	37
	AVERAGE	119.5

* Depth below existing ground surface.

Laboratory test results indicate the heap leach samples collected during the field investigation averaged approximately 119.5 pCi/g for radium activity. "The Environmental Statement Related to Operation of Spilt Rock Uranium Mill" (NRC, 1980) indicates the Day Loma site heap leaching consisted of low-grade ore, with a cutoff grade of approximately 0.06% U_3O_8, corresponding to approximately 170 pCi/g. Both the 119.5 pCi/g average tested value and the higher value of radium activity, 170 pCi/g, were used as input into the model.

B.5 RESULTS

The Radon model indicates approximately a maximum of 6.3 to 7.8 feet of soil depth using the 170 pCi/g value and a minimum of 5.3 to 6.5 feet of soil depth for the 119.5 pCi/g value is required to meet an exit flux of less than 20 pCi/g specified by 10 CFR Part 40, Appendix A. Average depth of cover is approximately 8 to 13 feet, exceeding the required soil depth for radon attenuation. Radon output is included for reference at the end of this appendix.

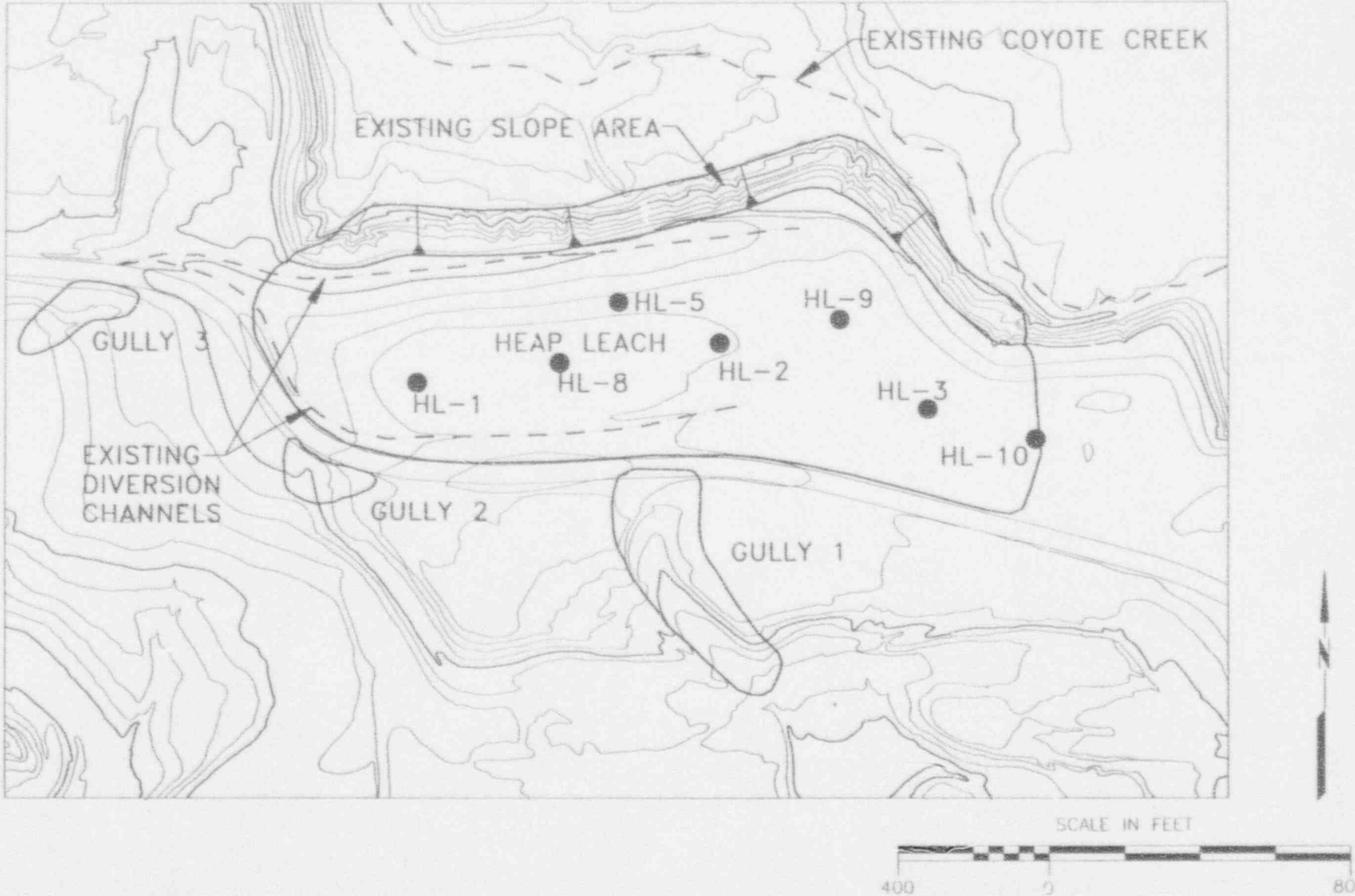
REFERENCES

Midwest Plan Service, 1983. "Structures and Environment Handbook," Eleventh Edition. Iowa State University, Ames Iowa.

Nuclear Regulatory Commission, 1980. "Environmental Statement Related to Operation of Split Rock Uranium Mill, Western Nuclear, Inc." Docket No. 40-1162, NUREG 0639, February.

Nuclear Regulatory Commission, 1984. "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design," NUREG/CR-3533. Prepared by Rogers, et al, April.

Nuclear Regulatory Commission, 1989. "Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers," Regulatory Guide 3.64, Task WM 503-4). Version 1.2, G.F. Birchard, June.



SMI
SHEPHERD MILLER, INC.

FIGURE B.1
EXISTING CONFIGURATION WITH BORING LOCATIONS
DAY LOMA HEAP LEACH AREA

Date:	NOV., 1993
Project:	350
File:	BORING

RADON MODEL OUTPUT

-----*****! RADON !*****-----

Version 1.2 - MAY 22, 1989 - G.F. Birchard tel.# (301)492-7000
U.S. Nuclear Regulatory Commission Office of Research

RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS ARE CALCULATED FOR MULTIPLE LAYERS

OUTPUT FILE: 1A.OUT

DESCRIPTION: DAY LOMA HEAP LEACH AREA

CONSTANTS

RADON DECAY CONSTANT	.0000021	s^-1
RADON WATER/AIR PAPTITION COEFFICIENT	.26	
DEFAULT SPECIFIC GRAVITY OF COVER & TAILINGS	2.65	

GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	2	
RADON FLUX LIMIT	20	pCi m^-2 s^-1
NO. OF THE LAYER TO BE OPTIMIZED	2	
DEFAULT SURFACE RADON CONCENTRATION	0	pCi l^-1
SURFACE FLUX PRECISION	.01	pCi m^-2 s^-1

LAYER INPUT PARAMETERS

LAYER 1 HEAP LEACH

THICKNESS	500	cm
CALCULATED POROSITY	0.332	
MEASURED MASS DENSITY	1.77	g cm^-3
MEASURED RADIUM ACTIVITY	119.5	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	4.682D-04	pCi cm^-3 s^-1
WEIGHT % MOISTURE	10.4	%
MOISTURE SATURATION FRACTION	.554	
CALCULATED DIFFUSION COEFFICIENT	7.896D-03	cm^2 s^-1

LAYER 2 SANDY COVER

THICKNESS	300	cm
CALCULATED POROSITY	0.340	
MEASURED MASS DENSITY	1.75	g cm^-3
MEASURED RADIUM ACTIVITY	0	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	0.000D+00	pCi cm^-3 s^-1
WEIGHT % MOISTURE	6	%
MOISTURE SATURATION FRACTION	.309	
CALCULATED DIFFUSION COEFFICIENT	2.318D-02	cm^2 s^-1

DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

M	F01	CN1	ICOST	CRITJ	ACC
2	-1.000D+00	0.000D+00	2	2.000D+01	1.000D-02

LAYER	DX	D	P	Q	XMS	RHO
1	5.000D+02	7.896D-03	3.321D-01	4.682D-04	5.543D-01	1.770
2	3.000D+02	2.318D-02	3.396(01	0.000D+00	3.092D-01	1.750

BARE SOURCE FLUX FROM LAYER 1: 9.530D+01 pCi m^-2 s^-1

RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS (cm)	EXIT FLUX (pCi m^-2 s^-1)	EXIT CONC. (pCi l^-1)
1	5.000D+02	6.726D+01	6.560D+04
2	1.988D+02	1.983D+01	0.000D+00

-----*****! RADON !*****-----

Version 1.2 - MAY 22, 1989 - G.F. Birchard tel.# (301)492-7000
U.S. Nuclear Regulatory Commission Office of Research

RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS ARE CALCULATED FOR MULTIPLE LAYERS

OUTPUT FILE: 4A.OUT

DESCRIPTION: DAY LOMA HEAP LEACH AREA

CONSTANTS

RADON DECAY CONSTANT	.0000021	s^-1
RADON WATER/AIR PARTITION COEFFICIENT	.26	
DEFAULT SPECIFIC GRAVITY OF COVER & TAILINGS	2.65	

GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	2	
RADON FLUX LIMIT	20	pCi m^-2 s^-1
NO. OF THE LAYER TO BE OPTIMIZED	2	
DEFAULT SURFACE RADON CONCENTRATION	0	pCi l^-1
SURFACE FLUX PRECISION	.01	pCi m^-2 s^-1

LAYER INPUT PARAMETERS

LAYER 1 HEAP LEACH

THICKNESS	500	cm
CALCULATED POROSITY	0.332	
MEASURED MASS DENSITY	1.77	g cm^-3
MEASURED RADIUM ACTIVITY	119.5	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	4.682D-04	pCi cm^-3 s^-1
WEIGHT % MOISTURE	10.4	%
MOISTURE SATURATION FRACTION	.554	
CALCULATED DIFFUSION COEFFICIENT	7.896D-03	cm^2 s^-1

LAYER 2 CLAYEY COVER

THICKNESS	300	cm
CALCULATED POROSITY	0.370	
MEASURED MASS DENSITY	1.67	g cm^-3
MEASURED RADIUM ACTIVITY	0	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	0.000D+00	pCi cm^-3 s^-1
WEIGHT % MOISTURE	9.1	%
MOISTURE SATURATION FRACTION	.411	
CALCULATED DIFFUSION COEFFICIENT	1.616D-02	cm^2 s^-1

DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

N	F01	CN1	ICOST	CRITJ	ACC
2	-1.000D+00	0.000D+00	2	2.000D+01	1.000D-02

LAYER	DX	D	P	Q	XMS	RHO
1	5.000D+02	7.896D-03	3.321D-01	4.682D-04	5.543D-01	1.770
2	3.000D+02	1.616D-02	3.698D-01	0.000D+00	4.109D-01	1.670

BARE SOURCE FLUX FROM LAYER 1: 9.530D+01 pCi m^-2 s^-1

RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS (cm)	EXIT FLUX (pCi m^-2 s^-1)	EXIT CONC. (pCi l^-1)
1	5.000D+02	6.333D+01	7.480D+04
2	1.602D+02	1.989D+01	0.000D+00

-----*****| RADON |*****-----

[illegible]on 1.2 - MAY 22, 1989 - G.F. Birchard tel.# (301)492-7000
U.S. Nuclear Regulatory Commission Office of Research

RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS ARE CALCULATED FOR MULTIPLE LAYERS

OUTPUT FILE: SANDY6.OUT

DESCRIPTION: DAY LOMA HEAP LEACH AREA

CONSTANTS

RADON DECAY CONSTANT	.0000021	s^-1
RADON WATER/AIR PARTITION COEFFICIENT	.26	
DEFAULT SPECIFIC GRAVITY OF COVER & TAILINGS	2.65	

GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	2	
RADON FLUX LIMIT	20	pCi m^-2 s^-1
NO. OF THE LAYER TO BE OPTIMIZED	2	
DEFAULT SURFACE RADON CONCENTRATION	0	pCi l^-1
SURFACE FLUX PRECISION	.01	pCi m^-2 s^-1

LAYER INPUT PARAMETERS

LAYER 1 HEAP LEACH

THICKNESS	500	cm
CALCULATED POROSITY	0.332	
MEASURED MASS DENSITY	1.77	g cm^-3
MEASURED RADIUM ACTIVITY	170	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	6.660D-04	pCi cm^-3 s^-1
WEIGHT % MOISTURE	10.4	%
MOISTURE SATURATION FRACTION	.554	
CALCULATED DIFFUSION COEFFICIENT	7.896D-03	cm^2 s^-1

LAYER 2 SANDY COVER

THICKNESS	300	cm
CALCULATED POROSITY	0.340	
MEASURED MASS DENSITY	1.75	g cm^-3
MEASURED RADIUM ACTIVITY	0	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	0.000D+00	pCi cm^-3 s^-1
[illegible]HT % MOISTURE	6	%
[illegible]STURE SATURATION FRACTION	.309	
CALCULATED DIFFUSION COEFFICIENT	2.318D-02	cm^2 s^-1

DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

N	F01	CN1	ICOST	CRITJ	ACC
2	-1.000D+00	0.000D+00	2	2.000D+01	1.000D-02

LAYER	DX	D	P	Q	XMS	RHO
1	5.000D+02	7.896D-03	3.321D-01	6.660D-04	5.543D-01	1.770
2	3.000D+02	2.318D-02	3.396D-01	0.000D+00	3.092D-01	1.750

BARE SOURCE FLUX FROM LAYER 1: 1.356D+02 pCi m^-2 s^-1

RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS (cm)	EXIT FLUX (pCi m^-2 s^-1)	EXIT CONC. (pCi l^-1)
1	5.000D+02	9.503D+01	9.486D+04
2	2.363D+02	1.982D+01	0.000D+00

-----*****! RADON !*****-----

Version 1.2 - MAY 22, 1989 - G.F. Birchard tel.# (30')492-7000
U.S. Nuclear Regulatory Commission Office of Research

RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS ARE CALCULATED FOR MULTIPLE LAYERS

OUTPUT FILE: CLAYEY91.OUT

DESCRIPTION: DAY LOMA HEAP LEACH AREA

CONSTANTS

RADON DECAY CONSTANT	.0000021	s^-1
RADON WATER/AIR PARTITION COEFFICIENT	.26	
DEFAULT SPECIFIC GRAVITY OF COVER & TAILINGS	2.65	

GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	2	
RADON FLUX LIMIT	20	pCi m^-2 s^-1
NO. OF THE LAYER TO BE OPTIMIZED	2	
DEFAULT SURFACE RADON CONCENTRATION	0	pCi l^-1
SURFACE FLUX PRECISION	.01	pCi m^-2 s^-1

LAYER INPUT PARAMETERS

LAYER 1 HEAP LEACH

THICKNESS	500	cm
CALCULATED POROSITY	0.332	
MEASURED MASS DENSITY	1.77	g cm^-3
MEASURED RADIUM ACTIVITY	170	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	6.660D-04	pCi cm^-3 s^-1
WEIGHT % MOISTURE	10.4	%
MOISTURE SATURATION FRACTION	.554	
CALCULATED DIFFUSION COEFFICIENT	7.896D-03	cm^2 s^-1

LAYER 2 CLAYEY COVER

THICKNESS	300	cm
CALCULATED POROSITY	0.370	
MEASURED MASS DENSITY	1.67	g cm^-3
MEASURED RADIUM ACTIVITY	0	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	0.000D+00	pCi cm^-3 s^-1
WEIGHT % MOISTURE	9.1	%
MOISTURE SATURATION FRACTION	.411	
CALCULATED DIFFUSION COEFFICIENT	1.616D-02	cm^2 s^-1

DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

N	F01	CN1	ICOST	CRITJ	ACC
2	-1.0000D+00	0.0000D+00	2	2.0000D+01	1.0000D-02

LAYER	DX	D	P	Q	XMS	RHO
1	5.0000D+02	7.896D-03	3.321D-01	6.660D-04	5.543D-01	1.770
2	3.0000D+02	1.616D-02	3.698D-01	0.0000D+00	4.109D-01	1.670

BARE SOURCE FLUX FROM LAYER 1: 1.356D+02 pCi m^-2 s^-1

RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS (cm)	EXIT FLUX (pCi m^-2 s^-1)	EXIT CONC. (pCi l^-1)
1	5.000D+02	8.929D+01	1.063D+05
2	1.912D+02	1.994D+01	0.000D+00

APPENDIX C

FLUVIAL SEDIMENTATION ANALYSIS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

C.1 INTRODUCTION

A fluvial sedimentation analysis was performed for Muskrat Creek and Coyote Creek located within Fremont County, Wyoming. The area generally consists of undisturbed natural land with sagebrush and small bunch grasses, and mining disturbance resulting in areas of bare ground, open pits, spoil stockpiles, and reclaimed surfaces. The purpose of this fluvial sedimentation investigation is to determine the sedimentation loss from each watershed to determine relative impacts of the unreclaimed spoils and the reclaimed Day Loma heap leach area, with respect to soil lost by surrounding undisturbed areas during a particular storm event.

C.2 ASSUMPTIONS

Several assumptions were made in the analysis in completing the fluvial sedimentation analysis. These assumptions include:

- Entire undisturbed area considered soil covered, with no bedrock outcroppings present.

- Reduced the number of representable undisturbed surface soils in the area to two. Averages were taken from the most prominent soils in the area to develop the two soil groups used in the computer model. This was done to alleviate tedious soil group delineations and also to meet the limitations of the computer model used to calculate the sediment loss.

- Where particle distributions of the various soils were incomplete, distributions were assumed based on typical values for these types of materials. No hydrometer tests were performed for any of the soils.

- Assumed no cover present on the Day Loma heap leach area to provide a conservative soil loss estimate. Results of field tests, however, show an average of 8 to 13 feet of reclamation cover overlies the heap leach materials; therefore, this assumption is very conservative.

- Soil erodibility factor for the surrounding undisturbed natural watersheds was set equal to 0.32 (representing a loam soil). Soil erodibility for the heap leach area and spoils was set equal to 0.15 (sand).

- Maximum slope length (LS) was set equal to 400 feet even though some areas had total overland flow lengths much greater. A slope length of 400 feet is considered the maximum slope length before deposition is expected to occur (estimated). Where total slope lengths did not exceed 400, actual slope lengths for these areas were used.

- The CP factor for undisturbed watersheds was set equal to 0.045. CP for spoils and heap leach material was set equal to 0.90. The CP factor is defined below.

- Gullies were used in the total soil loss with the assumption that one gully every 200 feet on the heap leach area and surrounding spoils would occur.

C.3 METHOD OF ANALYSIS

Fluvial sedimentation was performed using the SEDCAD+ Version 3 computer model, developed by Civil Software Design (Warner and Schwab, 1992). SEDCAD+ is a hydrology and sedimentology computer model developed to predict peak discharge and soil loss as a result of a particular storm event. The model uses a double triangular unit hydrograph along with a user specified distribution to develop the corresponding peak discharges. For this analysis, the SCS Type II distribution was used to predict runoff.

RUSLE was used as the method for determining soil loss. Required inputs for RUSLE are rainfall-runoff erosivity factor, soil erodibility factor, slope length and steepness factors, cover-management factor, and support practice factor.

C.4 STORM EVENT

The 200-year 24-hour storm event of 3.7 inches was used for the analysis. The derivation of this storm is presented in Appendix A.

C.5 WATERSHED CHARACTERISTICS

Particular characteristics of each watershed within the drainage areas were determined based on a site investigation performed in October, 1992, and from SCS soil survey data obtained from the Wyoming state office (currently unpublished information for this area of Fremont County). In addition, laboratory testing was performed for the Day Loma heap leach area cover soil and sub-soils for percent passing the #200 sieve. Figure 5 provides the gradation curves for the soils used in the analysis. The numbers 148-136 and 174-131 correspond to SCS symbols for various soils in the vicinity.

The Curve Number (CN) for the undisturbed areas used in Appendix A were also used in the sedimentation analysis with minor adjustments for the types of soils present, and the heap leach and spoil areas were assigned CN's of 84. A CN of 84 represents an SCS classification of hydrologic soil group "A", adjusted to Antecedent Moisture Condition III (AMC III), representing saturated soil conditions prior to the storm event.

Time of concentration for each basin was determined using the SCS Upland Curve Method (SCS, 1973) which is the primary method within SEDCAD+. In SEDCAD+, the model requires input for the particular land use(s) that are apparent for each basin. For undisturbed land, the land use for overland flow was set to "short grass pasture" and for concentrated flow the land use was set to "low flowing streams." For the heap leach and spoils, overland flow land use was set to "bare & untilled soil surface," and for concentrated flow the land use was set to "large gullies." These settings were discussed with Civil Software Design, Inc. staff, and were determined to be realistic and appropriate for the regional area and soil types.

The CP factor is made up of two separate characteristics; C representing the cover-management factor, and P representing the support-practice factor. Although there exists variability in the undisturbed soil groups present within the surrounding area, 0.045 was chosen to represent the entire undisturbed area, representing average cover on natural land. The 0.9 value for the spoils/heap leach representing a loose bare soil condition (Barfield, 1981).

C.6 WATERSHED DELINEATIONS AND ROUTING PROCEDURES

SEDCAD+ uses networking to accurately model peak discharges and sedimentation from a multiple structured diverse hydraulic system. In order to provide necessary input into SEDCAD+, watersheds were delineated throughout the entire area and appropriate routing procedures between watersheds were calculated and were used as input into the model. The entire drainage basin is shown on Drawing 1 with watersheds shown on Figures 1-3. A flow diagram depicting the routing procedures used in the analyses is shown on Figure 4.

C.7 RESULTING SOIL LOSS

The attachment included at the end of this appendix provides the SEDCAD+ output data and results. In addition to the SEDCAD+ soil loss predictions, gullies were assumed to be formed during the storm events at a frequency of one for every 200 feet of spoils and heap leach material and included in the total soil loss calculations, providing a maximum estimate of soil loss. Table 1 below provides the soil loss results of the various watersheds, with the gullies included as a separate item.

TABLE 1 - Soil Loss From The 200-Year, 24-Hour Storm Event

MATERIAL	SEDCAD+ SOIL LOSS (TONS)	PERCENT	GULLY SOIL LOSS (TONS)	TOTAL W/GULLY (TONS)	TOTAL PERCENT
Heap Leach	146	0.18	900	1,046	1.2
Mine Spoils	9,436	11.72	3,300	12,736	15.0
Undisturbed	71,217	88.10	NA	71,217	83.8
TOTAL	80,799	100	4,200	84,999	100

C.8 RADIUM ACTIVITY COMPARISON

A relative comparison of the contributing amount of radium was performed at the confluence of Muskrat and Coyote Creeks. Average radium content of the spoils material in areas that would potentially erode into Coyote or Muskrat Creeks was obtained from actual surface sampling performed by Centurion Nuclear, Inc., and was determined to be 98.3 pCi/g. This value was assumed to be consistent and representative for all spoils material that would potentially erode and reach the creeks.

For the heap leach material, an average radium content of 119.5 pCi/g was used. This value represents the average tested radium content from samples collected of actual leached material during the October, 1992 drilling program. An analysis was also made using the assumption that there was no radium loss from leaching activity. In this analysis, 170 pCi/g was used for representation of the heap leach material as this value corresponds to the cut-off ore grade as presented in "The Environmental Statement Related to Operation of Spilt Rock Uranium Mill," (NRC, 1980).

With these radium contents and corresponding soil loss tonnages, the following relative impacts at the confluence of Muskrat and Coyote Creeks were developed. Table 2 represents the heap leach material radium activity of 119.5 pCi/g and Table 3 represents heap leach radium activity of 170 pCi/g.

TABLE 2 - Radium Activity Comparison - 119.5 pCi/g

Material	Soil Loss Tons	Radium Activity pCi/g	Percentage of Total	Incremental Increase pCi/g
Heap Leach Material	1,046	119.5	8.5	1.5
Spoils	12,736	98.3	86.9	14.7
Undisturbed	71,217	1	4.6	0.8
TOTAL	84,999	NA	100	17

TABLE 3 - Radium Activity Comparison - 170 pCi/g

Material	Soil Loss Tons	Radium Activity pCi/g	Percentage of Total	Incremental Increase pCi/g
Heap Leach	1,046	170	11.8	2.1
Spoils	12,736	98.3	83.7	14.7
Undisturbed	71,217	1	4.5	0.8
	84,999	NA	100	17.6

C.9 CONCLUSIONS

The fluvial sedimentation analysis indicates the majority of the soil loss at the confluence of Muskrat and Coyote Creeks to be contributed by the undisturbed areas for both storm events evaluated. The relative comparison of radium contents indicates a large percentage of radium being contributed by the spoils material. With these analyses, relative impacts should the heap leach material be transported to the confluence of Muskrat and Coyote Creeks are minimal in comparison.

REFERENCES

Warner, Dr. Richard C., and Pamela Schwab, 1992. SEDCAD+ Version 3 developed by Civil Software Design, Ames, Iowa.

TABLE 7. SEDCAD BASIN PARAMETERS

JUNCTION NO	BASIN IDENTITY	BASIN	NO	AREA (acres)	LAND DISTURBANCE	AT STRUCTURE	BASIN TC1 - V (ft)	BASIN TC1 - H (ft)	BASIN - 1 SLOPE (%)	BASIN TC2 - V (ft)	BASIN TC2 - H (ft)	BASIN SLOPE (%)	V-1 TO CREEK (ft)	H-1 TO CREEK (ft)	CREEK SLOPE (%)	V-1 TO STRUCTURE (ft)	H-1 TO STRUCTURE (ft)	STRUCTURE SLOPE (%)	SOIL GROUP
JUNCTION 1	BRANCH 1																		
	J1B1S1	SWS	1	458	UND	N	80	1092	7.3	340	4619	7.4	0	0	NA	64	2985	2.1	1
	J1B1S1	SWS	2	46	UND	Y	13	286	4.5	18	731	2.5	0	0	NA	0	0	NA	1
	J1B1S1	SWS	3	267	UND	Y	240	1142	21.0	600	7109	8.4	0	0	NA	0	0	NA	1
	J1B1S2	SWS	1	69	UND	N	130	2363	5.5	0	0	NA	0	0	NA	65	3992	2.1	1
	J1B1S2	SWS	2	42	UND	N	100	5363	1.9	25	6575	0.4	0	0	NA	65	3992	2.1	1
	J1B1S2	SWS	3	13	SP	N	30	784	3.8	*	*	NA	20	373	5.4	60	3122	1.9	4
	J1B1S2	SWS	4	14	TAILS	N	15	323	4.6	*	*	NA	75	672	11.2	20	1268	1.8	3
	J1B1S2	SWS	5	10	SP-OUTSLOPES	N	75	217	34.6	*	*	NA	20	448	4.5	20	1269	1.6	4
	J1B1S2	SWS	6	7	SP	Y	110	250	44.0	*	*	NA			NA	@		NA	4
	J1B1S2	SWS	7	37	UND	N	130	2488	5.2	*	*	NA	0	0	NA	40	1610	2.5	1
	J1B1S2	SWS	8	27	UND	Y	80	995	8.0	*	*	NA			NA	@		NA	1
							* NOT AP												
JUNCTION 1	BRANCH 2																		
	J1B2S1	SWS	1	1076	UND	Y	240	1393	17.2	510	13796	3.7	0	0	NA	0	0	NA	1

TABLE 7. SEDCAD BASIN PARAMETERS

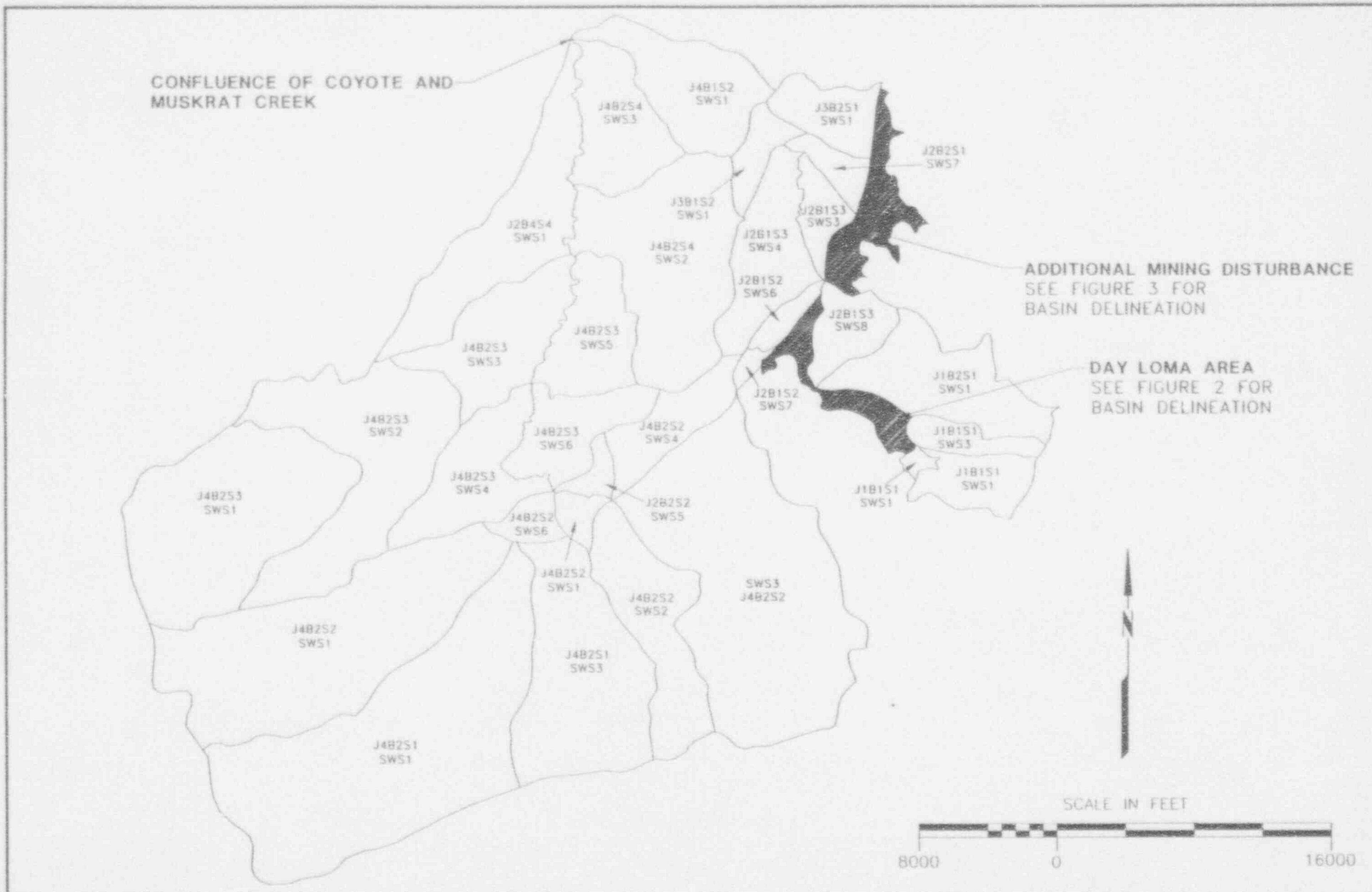
JUNCTION NO.	BASIN IDENTITY	BASIN	NO	AREA (acres)	LAND DISTURBANCE	AT STRUCTURE	BASIN TC1 - V (ft)	BASIN TC1 - H (ft)	BASIN - 1 SLOPE (%)	BASIN TC2 - V (ft)	BASIN TC2 - H (ft)	BASIN SLOPE (%)	V-1 TO CREEK (ft)	H-1 TO CREEK (ft)	CREEK SLOPE (%)	V-1 TO STRUCTURE (ft)	H-1 TO STRUCTURE (ft)	STRUCTURE SLOPE (%)	SOIL GROUP
JUNCTION 2	BRANCH 1																		
	J2B1S1	SWS	1	1	SP	Y	125	500	25.0	*	*	NA			NA	@		NA	1
	J2B1S2	SWS	1	8	SP	N	127	721	17.8	*	*	NA	40	336	11.9	70	7289	1.0	4
	J2B:S2	SWS	2	12	SP	N	100	672	14.9	*	*	NA	20	995	2.0	57	6668	0.9	4
	J2B1S2	SWS	3	25	UND	N	20	350	5.7	50	1940	2.6	0	0	NA	57	6668	0.9	1
	J2B1S2	SWS	4	40	SP	N	40	1841	2.2	30	768	3.9	0	0	NA	115	3781	3.0	4
	J2B1S2	SWS	5	47	UND	N	40	855	4.7	20	944	2.1	0	0	NA	35	1891	1.9	1
	J2B1S2	SWS	6	40	UND	Y	60	1230	4.9	220	4582	4.8	0	0	NA	0	0	NA	1
	J2B1S2	SWS	7	64	UND	N	80	2040	3.9	*	*	NA	0	0	NA	170	6219	2.7	1
	J2B1S2	SWS	8	423	UND	Y	160	2090	8.6	160	2686	5.5	0	0	NA	0	0	NA	1
	J2B1S2	SWS	9	12	UND	N	55	506	10.9	*	8	0.0	0	0	NA	70	2836	2.5	1
	J2B1S2	SWS	10	77	UND	Y	45	1032	4.4	150	2825	5.3	0	0	NA	0	0	NA	1
	J2B1S2	SWS	11	17	SP	N	50	740	6.8	*	*	NA	0	0	NA	140	2444	5.7	4
	J2B1S3	SWS	1	87	UND	N	190	1539	11.6	*	*	NA	0	0	NA	90	10000	0.9	2
	J2B1S3	SWS	2	19	UND	N	140	920	15.2	125	789	15.8	0	0	NA	120	7512	1.6	2
	J2B1S3	SWS	3	273	UND	Y	100	1442	6.9	60	2002	3.0	0	0	NA	0	0	NA	2
	J2B1S3	SWS	4	862	UND	Y	40	1020	3.9	220	7674	2.9	0	0	NA	0	0	NA	2
JUNCTION 2	BRANCH 2																		
													ROAD	ROAD					
	J2B2S1	SWS	1	69	UND	N	95	1085	8.8	22	1035	2.1	0	0	NA	160	6266	2.6	1
	J2B2S1	SWS	2	17	UND	N	50	904	5.5	60	741	8.1	140	2954	4.7	160	6266	2.6	1
	J2B2S1	SWS	3	45	SP	N	120	668	18.0	25	502	5.0	80	1766	4.5	160	6266	2.6	4
	J2B2S1	SWS	4	69	UND	N	33	520	6.3	80	3250	2.5	0	0	NA	160	6266	2.6	1
	J2B2S1	SWS	5	25	SP	N	95	632	15.0	20	599	3.3	30	1710	1.8	160	266	60.2	4
	J2B2S1	SWS	6	36	UND	N	190	1500	12.7	55	398	13.9	75	2835	2.6	160	6266	2.6	1
	J2B2S1	SWS	7	207	UND	Y	80	995	8.0	160	6735	2.4	0	0	NA	0	0	NA	1

TABLE 7. SEDCAD BASIN PARAMETERS

JUNCTION NO.	BASIN IDENTITY	BASIN	NO.	AREA (acres)	LAND DISTURBANCE	AT STRUCTURE	BASIN TC1 -V (ft)	BASIN TC1 - H (ft)	BASIN - 1 SLOPE (%)	BASIN TC2 - V (ft)	BASIN TC2 - H (ft)	BASIN SLOPE (%)	V-1 TO CREEK (ft)	H-1 TO CREEK (ft)	CREEK SLOPE (%)	V-1 TO STRUCTURE (ft)	H-1 TO STRUCTURE (ft)	STRUCTURE SLOPE (%)	SOIL GROUP
JUNCTION 3	BRANCH 1																		
	J3B1S1	SWS	1																
	J3B1S2	SWS	1	261	UND	Y	40	1124	3.6	100	4238	2.4	0	0	NA	0	0	NA	1
JUNCTION 3	BRANCH 2																		
	J3B2S1	SWS	1	449	UND	Y	180	8756	2.1	*	*	NA	0	0	NA	0	0	NA	2
	J3B2S1	SWS	2	30	UND	N	50	970	5.2	*	*	NA	0	0	NA	140	7413	1.9	2
	J3B2S1	SWS	3	51	SP	N	45	1000	4.5	55	1990	2.8	0	0	NA	160	7612	2.1	4

TABLE 7. SEDCAD BASIN PARAMETERS

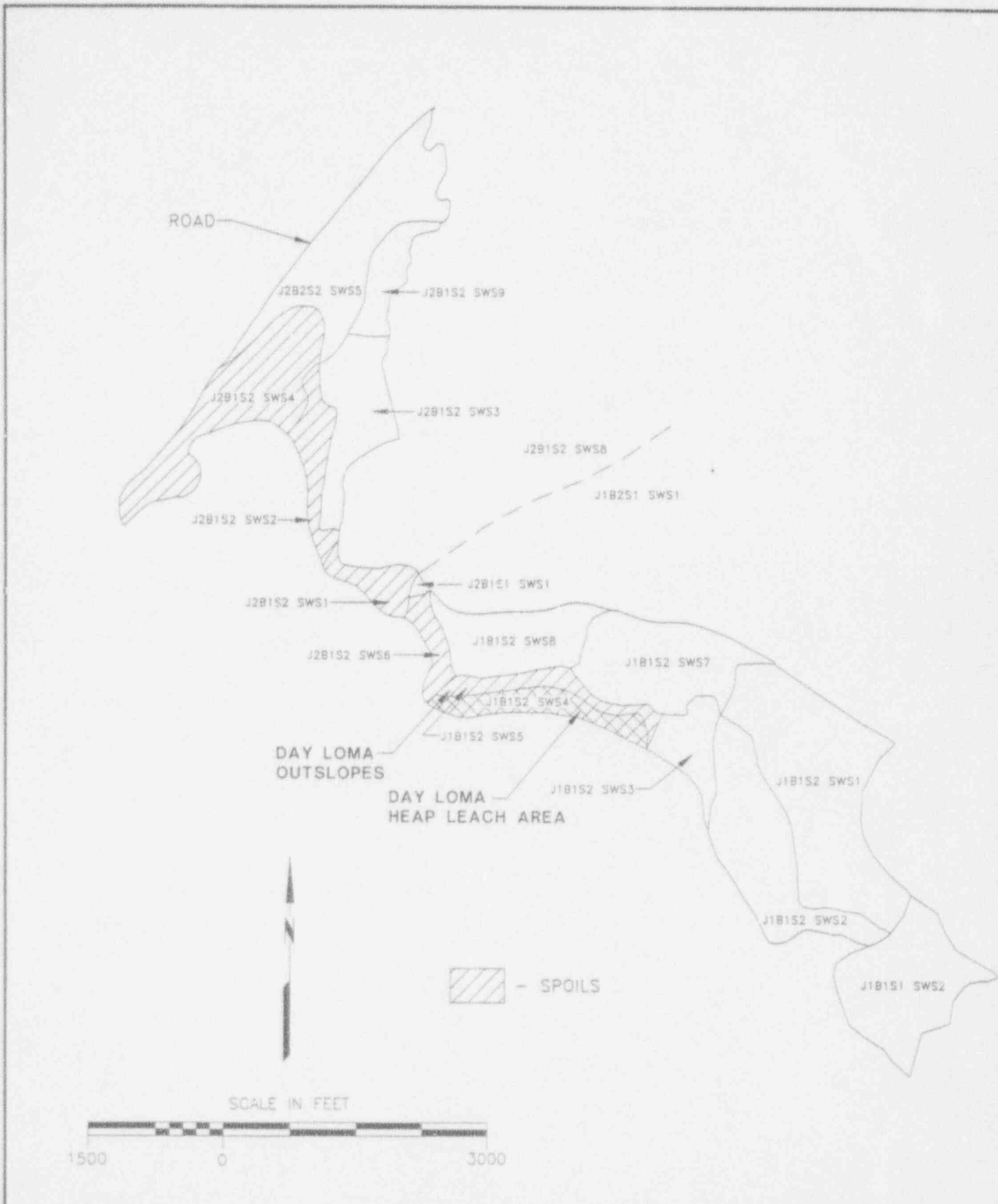
JUNCTION NO	BASIN IDENTITY	BASIN	NO.	AREA (acres)	LAND DISTURBANCE	AT STRUCTURE	BASIN TC1 - V (ft)	BASIN TC1 - H (ft)	BASIN - 1 SLOPE (%)	BASIN TC2 - V (ft)	BASIN TC2 - H (ft)	BASIN SLOPE (%)	V-1 TO CREEK (ft)	H-1 TO CREEK (ft)	CREEK SLOPE (%)	V-1 TO STRUCTURE (ft)	H-1 TO STRUCTURE (ft)	STRUCTURE SLOPE (%)	SOIL GROUP
JUNCTION 4	BRANCH 1																		
	J4B1S1	SWS	1																
	J4B1S2	SWS	1	1000	UND	Y	80	1692	4.7	200	8249	3.2	0	0	NA	0	0	NA	1
JUNCTION 4	BRANCH 2																		
	J4B2S1	SWS	1	3024	UND	Y	120	1343	8.9	700	23432	3.0	0	0	NA	0	0	NA	1
	J4B2S1	SWS	2	3916	UND	Y	120	1388	8.8	280	23383	1.2	0	0	NA	0	0	NA	1
	J4B2S1	SWS	3	1905	UND	Y	80	1791	4.5	400	14428	2.8	0	0	NA	0	0	NA	1
	J4B2S2	SWS	1	153	UND	Y	20	2299	0.9	40	1196	3.3	0	0	NA	0	0	NA	1
	J4B2S2	SWS	2	1134	UND	N	60	1891	3.2	400	14726	2.7	0	0	NA	60	3731	1.6	1
	J4B2S2	SWS	3	3640	UND	N	30	3234	0.9	440	23084	[illegible]	0	0	NA	60	3731	1.6	1
	J4B2S2	SWS	4	567	UND	N	40	1493	2.7	140	10199	1.4	0	0	NA	60	3731	1.6	1
	J4B2S2	SWS	5	136	UND	Y	20	1144	1.7	120	2430	4.8	0	0	NA	0	0	NA	1
	J4B2S2	SWS	6	202	UND	Y	100	2587	3.9	*	*	NA	0	0	NA	0	0	NA	1
	J4B2S3	SWS	1	2431	UND	N	487	2637	18.5	420	12736	3.3	260	19651	1.3	0	0	NA	1
	J4B2S3	SWS	2	2092	UND	N	120	2090	5.7	360	16716	2.2	140	12288	1.1	0	0	NA	1
	J4B2S3	SWS	3	1028	UND	N	80	1243	6.4	280	13144	2.1	0	0	NA	0	0	NA	2
	J4B2S3	SWS	4	908	UND	N	40	1636	2.4	280	7572	3.7	0	0	NA	40	13283	0.3	1
	J4B2S3	SWS	5	777	UND	Y	120	1393	8.6	220	4577	4.8	0	0	NA	0	0	NA	1
	J4B2S3	SWS	6	664	UND	N	20	1767	1.1	300	6479	4.6	0	0	NA	40	13283	0.3	1
	J4B2S4	SWS	1	1449	UND	Y	80	1124	7.1	330	15151	2.2	0	0	NA	0	0	NA	1
	J4B2S4	SWS	2	1970	UND	N	25	597	4.2	400	15273	2.6	0	0	NA	55	8159	0.7	1
	J4B2S4	SWS	3	846	UND	Y	60	1294	4.8	120	5871	2.0	0	0	NA	0	0	NA	2
JUNCTION 5	BRANCH 1																		
	J5B1S1	SWS	1																



SMI
SHEPHERD MILLER, INC.

FIGURE 1
BASIN DELINEATION TOTAL DRAINAGE AREA
CONFLUENCE OF COYOTE & MUSKRAT CREEKS

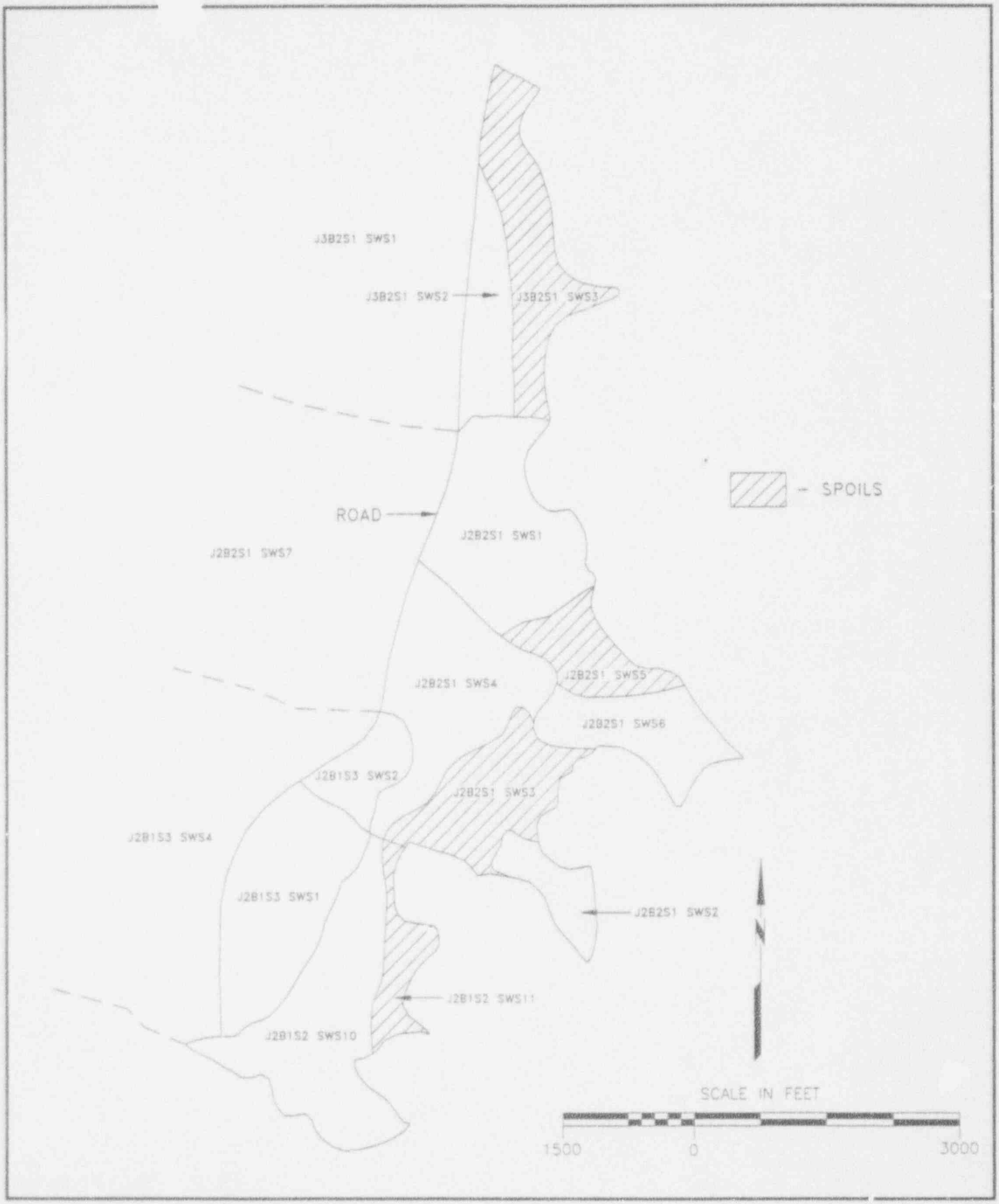
Date:	SEPT., 1993
Project:	350
File:	CONFLNCE



SMI
SHEPHERD MILLER, INC.

FIGURE 2
BASIN DELINEATION
DAY LOMA AREA

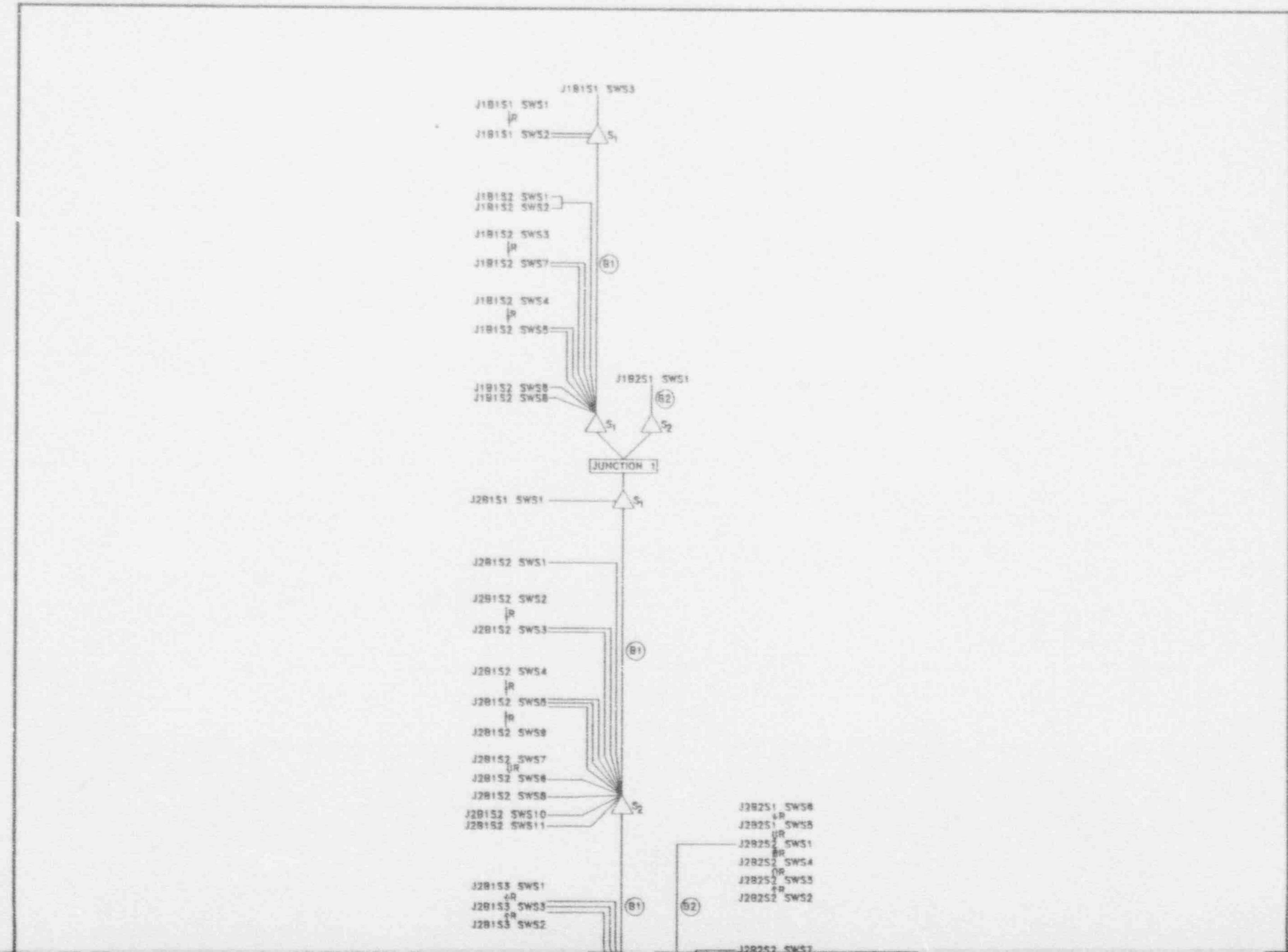
Date:	SEPT., 1993
Project:	350
File:	DAYLOMA



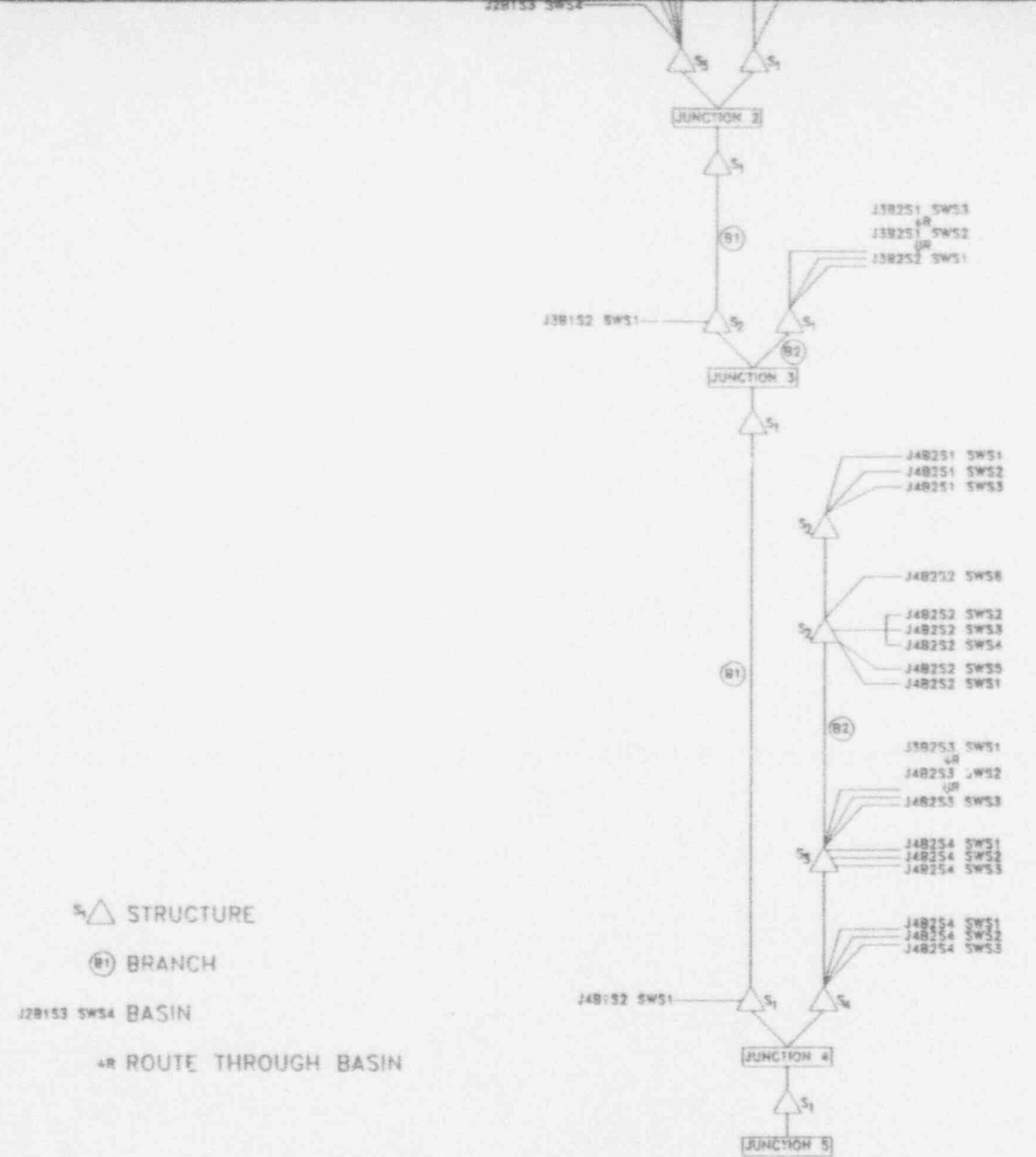
SMI
SHEPHERD MILLER, INC.

FIGURE 3
BASIN DELINEATION
ADDITIONAL MINING DISTURBANCE

Date:	SEPT., 1993
Project:	350
File:	BASIN-U



J1B1S1 SWS3
J1B1S1 SWS1
R
J1B1S1 SWS2
J1B1S2 SWS1
J1B1S2 SWS2
J1B1S2 SWS3
R
J1B1S2 SWS7
B1
J1B1S2 SWS4
R
J1B1S2 SWS5
J1B2S1 SWS1
B2
J1B1S2 SWS8
J1B1S2 SWS8
JUNCTION 1
J2B1S1 SWS1
J2B1S2 SWS1
J2B1S2 SWS2
R
J2B1S2 SWS3
B1
J2B1S2 SWS4
R
J2B1S2 SWS5
R
J2B1S2 SWS8
J2B1S2 SWS7
R
J2B1S2 SWS6
J2B1S2 SWS8
J2B1S2 SWS10
J2B1S2 SWS11
J2B2S1 SWS8
R
J2B2S1 SWS5
R
J2B2S2 SWS1
R
J2B2S2 SWS4
R
J2B2S2 SWS3
R
J2B2S2 SWS2
J2B1S3 SWS1
R
J2B1S3 SWS3
R
J2B1S3 SWS2
B1
B2



ANSTEC
APERTURE
CARD

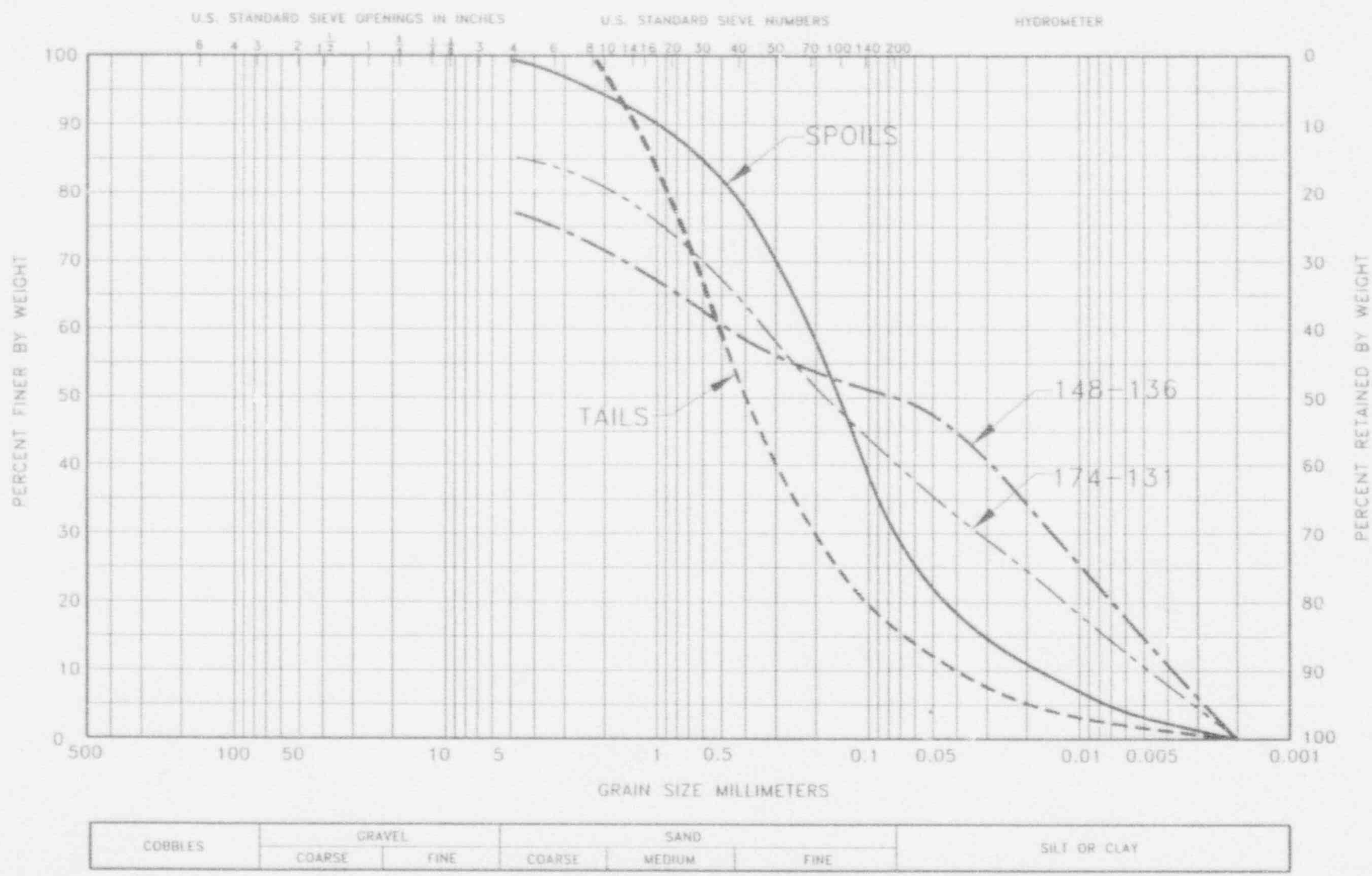
Also Available on
Aperture Card

SMI
SHEPHERD MILLER, INC.

FIGURE 4
DRAINAGE AREA FLOW DIAGRAM
MUSKRAT AND COYOTE CREEKS

Date:	SEPT., 1993
Project:	350
File:	350FLOW

9403010166-04



SMI
SHEPHERD MILLER, INC.

FIGURE 5
PARTICLE DISTRIBUTIONS
FOR SEDIMENTOLOGY

Date:	SEPT., 1993
Project:	350
File:	GSD

APPENDIX C ATTACHMENT

SEDCAD+ OUTPUT

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

DAY LOMA FLUVIAL SEDIMENTATION ANALYSIS - COYOTE & MUSKRAT CREEKS

by

Name: BLC & KMW

Company Name: SHEPHERD MILLER INC.

File Name: C:\SEDCAD3\DAYLOMA

Date: 09-29-1993

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: SHEPHERD MILLER INC.
Filename: C:\SEDCAD3\DAYLOMA User: BLC & KMW
Date: 09-29-1993 Time: 13:53:04
Day Loma Fluvial Sedimentation Analysis - Coyote & Muskrat Creeks
Storm: 3.70 inches, 200 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

GENERAL INPUT TABLE

Specific Gravity: 2.50
Submerged Bulk Specific Gravity: 1.35

Particle Size Distribution(s):

Size (mm)	Group 174-131 % Finer	Group 148-136 % Finer	TAILINGS % Finer	SPOILS % Finer
5.0000	100.00	100.00	100.00	100.00
4.7500	86.00	77.00	99.90	99.90
2.0000	83.00	73.00	99.80	95.00
0.4250	64.00	59.00	55.00	80.00
0.0750	41.00	51.00	15.80	27.00
0.0020	0.00	0.00	0.00	0.00

Detailed Between Structure Routing:

To J B S	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Muskingum K (hr)	Muskingum X
1 1 2	1	8	5772.95	2.60	4.84	0.33	0.331	0.369
2 1 1	1	8	1400.14	1.43	3.59	0.11	0.108	0.339
2 1 2	1	8	8358.43	1.02	3.03	0.77	0.767	0.320
2 1 3	1	8	10846.66	1.11	3.16	0.95	0.954	0.324
3 1 2	1	8	4726.10	0.63	2.39	0.55	0.549	0.2[illegible]2
4 1 2	1	8	14975.96	1.14	3.20	1.30	1.301	0.326
4 2 2	1	8	3881.46	1.55	3.73	0.29	0.289	0.343
4 2 3	1	8	21102.77	0.85	2.77	2.12	2.115	0.309
4 2 4	1	8	16755.97	1.07	3.11	1.50	1.496	0.323

Civil Software Design -- SEDCAD+ Version 3.1

Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: SHEPHERD MILLER INC.

Filename: C:\SEDCAD3\DAYLOMA User: BLC & KMW

Date: 09-29-1993 Time: 13:53:04

Day Loma Fluvial Sedimentation Analysis - Coyote & Muskrat Creeks

Storm: 3.70 inches, 200 year-24 hour, SCS Type II

Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	458.00	91	M	0.835	0.188	0.360	0.0	104.23	543.40
111	2	461.00	91	M	0.238	0.000	0.000	0.0	104.92	945.56
111	3	267.00	91	M	1.069	0.000	0.000	0.0	60.76	272.20
			Type: Null			Label: J1B1S1-SWS1-A				
111	Structure	1186.00							269.91	
111	Total IN/OUT	1186.00							269.91	1372.74
112	1	69.00	91	M	0.399	0.253	0.360	0.0	15.70	119.84
[illegible]	2	42.00	91	M	0.455	0.253	0.360	0.0	9.56	69.04
[illegible]	3	13.00*	84	F	0.111	0.223	0.361	0.0	2.28	27.76
112	4	14.00*	84	F	0.050	0.063	0.403	0.0	2.46	29.89
112	5	10.00*	84	F	0.010	0.113	0.361	0.0	1.76	21.35
112	6	7.00*	84	F	0.010	0.000	0.000	0.0	1.23	14.95
112	7	37.00	91	M	0.431	0.094	0.367	0.0	8.42	62.30
1 .	8	27.00	91	M	0.139	0.000	0.000	0.0	6.14	60.66
			Type: Null			Label: J1B1S2				
112	Structure	219.00							317.47	
112	Total IN/OUT	1405.00							317.47	1558.26
111 to 112	Routing					0.331	0.369			
121	1	1076.00	1	M	0.797	0.000	0.000	0.0	0.00	0.00
			Type: Null			Label: J1B2S1				
121	Structure	1076.00							0.00	
121	Total IN/OUT	1076.00							0.00	0.00
211	1	1.00*	84	F	0.027	0.000	0.000	0.0	0.18	2.14
			Type: Null			Label: J2B1S1				
211	Structure	1.00							317.65	
211	Total IN/OUT	2482.00							317.65	1539.70
[illegible] to 211	Routing					0.108	0.339			
212	1	8.00*	84	F	0.047	0.697	0.328	0.0	1.41	17.08
212	2	12.00*	84	F	0.048	0.732	0.317	0.0	2.11	25.62
212	3	25.00	[illegible]	M	0.537	0.667	0.310	0.0	5.69	37.96

212	4	40.00*	84	F	0.382	0.200	0.377	0.0	7.03	64.91
212	5	47.00	91	M	0.216	0.128	0.352	0.0	10.70	98.96
212	6	40.00	91	M	0.414	0.000	0.000	0.0	9.10	68.48
212	7	64.00	91	M	0.408	0.348	0.372	0.0	14.57	110.21
[illegible]	8	423.00	91	M	0.396	0.000	0.000	0.0	96.27	736.72
212	9	12.00	91	M	0.060	0.167	0.367	0.0	2.73	30.56
212	10	77.00	91	M	0.309	0.000	0.000	0.0	17.52	144.97
212	11	17.00*	84	F	0.079	0.094	0.404	0.0	2.99	36.30
			Type: Null		Label: J2B1S2					
212 Structure		765.00							487.75	
212 Total IN/OUT		3247.00							487.75	1695.91
211 to 212 Routing						0.767	0.320			
213	1	67.00	91	M	0.191	0.976	0.313	0.0	15.25	145.58
213	2	19.00	91	M	0.093	0.550	0.345	0.0	4.32	48.38
213	3	273.00	91	M	0.324	0.000	0.000	0.0	62.13	506.57
213	4	862.00	91	M	0.624	0.000	0.000	0.0	196.18	1208.23
			Type: Null		Label: J2B1S3					
213 Structure		1221.00							765.63	
213 Total IN/OUT		4468.00							765.63	1941.87
212 to 213 Routing						0.954	0.324			
221	1	69.00	91	M	0.211	0.363	0.369	0.0	15.70	146.04
221	2	17.00	91	M	0.176	0.488	0.379	0.0	3.87	37.75
221	3	45.00*	84	F	0.050	0.440	0.375	0.0	7.91	96.08
[illegible]	4	69.00	91	M	0.273	0.363	0.369	0.0	15.70	135.38
[illegible]	5	25.00*	84	F	0.075	0.482	0.365	0.0	4.39	53.38
221	6	36.00	91	M	0.177	0.524	0.369	0.0	8.19	79.84
221	7	207.00	91	M	0.543	0.000	0.000	0.0	47.11	312.51
			Type: Null		Label: J2B2S1					
221 Structure		468.00							102.88	
221 Total IN/OUT		468.00							102.88	750.42
311	1	0.00	0	M	0.000	0.000	0.000	0.0	0.00	0.00
			Type: Null		Label: J3B1S1					
311 Structure		0.00							868.51	
311 Total IN/OUT		4936.00							868.51	2621.82
213 to 311 Routing						0.000	0.000			
312	1	261.00	91	M	0.491	0.000	0.000	0.0	59.40	414.39
			Type: Null		Label: J3B1S2					
312 Structure		261.00							927.91	
312 Total IN/OUT		5197.00							927.91	2617.07
311 to 312 Routing						0.549	0.292			
321	1	449.00	91	M	2.423	0.000	0.000	0.0	102.18	259.98
[illegible]	2	30.00	91	M	0.169	0.499	0.354	0.0	6.83	67.21
321	3	51.00*	84	F	0.241	0.486	0.359	0.0	8.96	95.85
			Type: Null		Label: J3B2S1					
321 Structure		530.00							117.97	

321	Total IN/OUT	530.00							117.97	299.15
411	1	0.00	0	M	0.000	0.000	0.000	0.0	0.00	0.00
			Type: Null		Label: J4B1S1					
[illegible]	Structure	0.00							1045.88	
411	Total IN/OUT	5727.00							1045.88	2900.83
312 to 411	Routing					0.000	0.000			
412	1	1000.00	91	M	0.632	0.000	0.000	0.0	227.58	1391.98
			Type: Null		Label: J4B1S2					
412	Structure	1000.00							1273.46	
412	Total IN/OUT	6727.00							1273.46	2995.21
411 to 412	Routing					1.301	0.326			
421	1	3024.00	91	M	1.433	0.000	0.000	0.0	688.21	2540.51
421	2	3916.00	91	M	2.165	0.000	0.000	0.0	891.21	2461.29
421	3	1905.00	91	M	1.138	0.000	0.000	0.0	433.54	1865.79
			Type: Null		Label: J4B2S1					
421	Structure	8845.00							2012.96	
421	Total IN/OUT	8845.00							2012.96	6346.47
422	1	153.00	91	M	1.038	0.000	0.000	0.0	34.82	158.89
422	2	1134.00	91	M	1.248	0.272	0.345	0.0	258.08	1045.56
422	3	3640.00	91	M	2.880	0.272	0.345	0.0	828.40	1855.53
[illegible]	4	567.00	91	M	1.167	0.272	0.345	0.0	129.04	546.35
[illegible]	5	136.00	91	M	0.447	0.000	0.000	0.0	30.95	225.35
422	6	202.00	91	M	0.522	0.000	0.000	0.0	45.97	311.22
			Type: Null		Label: J4B2S2					
422	Structure	5832.00							3340.21	
422	Total IN/OUT	14677.00							3340.21	9256.75
421 to 422	Routing					0.289	0.343			
423	1	2431.00	91	M	0.892	1.581	0.334	0.0	553.25	2771.51
423	2	2092.00	91	M	1.400	1.065	0.326	0.0	476.10	1785.61
423	3	1028.00	91	M	1.028	0.000	0.000	0.0	233.95	1074.09
423	4	908.00	91	M	0.779	2.241	0.245	0.0	206.64	1122.42
423	5	777.00	91	M	0.381	0.000	0.000	0.0	176.83	1371.93
423	6	664.00	91	M	0.937	2.241	0.245	0.0	151.11	734.62
			Type: Null		Label: J4B2S3					
423	Structure	7900.00							5138.11	
423	Total IN/OUT	22577.00							5138.11	12033.38
422 to 423	Routing					2.115	0.309			
424	1	1449.00	91	M	1.117	0.000	0.000	0.0	329.77	1436.27
424	2	1970.00	91	M	0.989	0.920	0.295	0.0	448.34	2108.30
424	3	846.00	91	M	0.618	0.000	0.000	0.0	192.53	1192.30
			Type: Null		Label: J4B2S4					
[illegible]	Structure	4265.00							6108.74	
424	Total IN/OUT	26842.00							6108.74	12334.46

423 to 424 Routing 1.496 0.323

511	1	0.00	0	M	0.000	0.000	0.000	0.0	0.00	0.00

Type: Null Label: J5B1S1

Structure 0.00 7382.21

511 Total IN/OUT 33569.00 7382.21 14222.80

412 to 511 Routing 0.000 0.000

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Sedimentology-

SED: Sediment
SCp: Peak Sediment Concentration
SSp: Peak Settleable Concentration
24VW: Volume Weighted Average Settleable Concentration - Peak 24 hours
24AA: Arithmetic Average Settleable Concentration - Peak 24 hours

	JBS	SWS	K	L (ft)	S (%)	CP	Tt (hrs)	PS #	SED (tons)	SCp (mg/l)	SSp (ml/l)	24VW (ml/l)	24AA (ml/l)
R	111	1	0.32	400.0	7.3	0.045	0.188	1	1112.7				
R	111	2	0.32	400.0	4.5	0.045	0.000	1	961.2				
R	111	3	0.32	400.0	21.0	0.045	0.000	1	2618.6				
	Type: Null Label: J1B1S1-SWS1-A												
	1 Structure								4653.8				
	111 Total IN/OUT								4653.8	20353	10.76	6.63	2.89
R	112	1	0.32	400.0	5.5	0.045	0.253	1	126.2				
R	112	2	0.32	400.0	4.2	0.045	0.253	1	54.4				
R	112	3	0.15	400.0	3.8	0.900	0.223	4	88.9				
R	112	4	0.15	323.0	4.6	0.900	0.063	3	146.1				
R	112	5	0.15	217.0	34.6	0.900	0.113	4	955.7				
R	112	6	0.15	250.0	44.0	0.900	0.000	4	877.0				
R	112	7	0.32	400.0	5.2	0.045	0.094	1	58.5				
R	112	8	0.32	400.0	8.0	0.045	0.000	1	72.9				
	Type: Null Label: J1B1S2												
	112 Structure								7072.0				
	112 Total IN/OUT								7032.0	74290	41.91	9.05	4.04
	111 to 112 Routing						0.331						
R	121	1	0.32	400.0	17.2	0.045	0.000	1	0.0				
	Type: Null Label: J1B2S1												
	121 Structure								0.0				
	121 Total IN/OUT								0.0	0	0.00	0.00	0.00
	1	1	0.15	400.0	25.0	0.900	0.000	4	74.7				
	Type: Null Label: J2B1S1												
	211 Structure								7072.8				
	211 Total IN/OUT								7072.8	76327	43.06	9.10	4.06

```
==============================================================================
112 to 211 Routing                    0.108
==============================================================================
R 212  1   0.15  400.0  17.6 0.900  0.697 4   514.8
R 212  2   0.15  400.0  14.9 0.900  0.732 4   661.8
R 212  3   0.32  350.0   5.7 0.045  0.667 1    36.3
R 212  4   0.15  400.0   2.2 0.900  0.200 4   163.0
R 212  5   0.32  400.0   4.7 0.045  0.128 1    78.8
R 212  6   0.32  400.0   4.9 0.045  0.000 1    60.9
R 212  7   0.32  400.0   3.9 0.045  0.348 1    59.3
R 212  8   0.32  400.0   8.6 0.045  0.000 1  1544.0
R 212  9   0.32  400.0  10.9 0.045  0.167 1    59.6
R 212 10   0.32  400.0   4.4 0.045  0.000 1   120.9
R 212 11   0.15  400.0   6.8 0.900  0.094 4   292.9
                          Type: Null    Label: J2B1S2
212 Structure                                8867.0
------------------------------------------------------------------------------
212 Total IN/OUT                             8867.0   38889  21.25   7.22   3.16
==============================================================================
211 to 212 Routing                    0.767
==============================================================================
R 213  1   0.32  400.0  11.6 0.045  0.976 2   408.0
R 213  2   0.32  400.0  15.2 0.045  0.550 2   154.4
R 213  3   0.32  400.0   6.9 0.045  0.000 2   758.6
R 213  4   0.32  400.0   3.9 0.045  0.000 2   973.1
                          Type: Null    Label: J2B1S3
213 Structure                                8478.2
------------------------------------------------------------------------------
213 Total IN/OUT                             8478.2   21594  10.59   3.97   1.90
==============================================================================
212 to 213 Routing                    0.954
==============================================================================
R 221  1   0.32  400.0   8.8 0.045  0.363 1   234.3
R 221  2   0.32  400.0   5.5 0.045  0.488 1    30.2
R 221  3   0.15  400.0  18.0 0.900  0.440 4  3658.8
R 221  4   0.32  400.0   6.3 0.045  0.363 1   153.8
R 221  5   0.15  400.0  15.0 0.900  0.482 4  1518.3
R 221  6   0.32  400.0  12.7 0.045  0.524 1   232.4
R 221  7   0.32  400.0   3.1 0.045  0.000 1   165.9
                          Type: Null    Label: J2B2S1
221 Structure                                5983.4
------------------------------------------------------------------------------
221 Total IN/OUT                             5983.4  104729  66.42  26.27   7.42
==============================================================================
R 311  1   0.00    0.0   0.0 0.000  0.000 0     0.0
                          Type: Null    Label: J3B1S1
311 Structure                               14461.7
------------------------------------------------------------------------------
311 Total IN/OUT                            14461.7   36193  19.87   6.66   2.82
==============================================================================
213 to 311 Routing                    0.000
==============================================================================
R 312  1   0.32  400.0   3.6 0.045  0.000 1   254.1
                          Type: Null    Label: J3B1S2
312 Structure                               14691.2
------------------------------------------------------------------------------
312 Total IN/OUT                            14691.2   34010  18.67   6.34   2.73
==============================================================================
311 to 312 Routing                    0.549
==============================================================================
```

```
R 321  1   0.32  400.0   2.1 0.045  0.000 2   162.4
R 321  2   0.32  400.0   5.2 0.045  0.499 2    54.3
R 321  3   0.15  400.0   4.5 0.900  0.486 4   630.6
                     Type: Null   Label: J3B2S1
  321 Structure                              626.2
 ------------------------------------------------------------------------------
  321 Total IN/OUT                           626.2   20623  11.10   2.12   0.82
 ==============================================================================
R 411  1   0.00    0.0   0.0 0.000  0.000 0     0.0
                     Type: Null   Label: J4B1S1
  411 Structure                            15317.4
 ------------------------------------------------------------------------------
  411 Total IN/OUT                         15317.4   31464  17.26   5.87   2.48
 ==============================================================================
  312 to 411 Routing                 0.000
 ==============================================================================
R 412  1   0.32  400.0   4.7 0.045  0.000 1 1918.6
                     Type: Null   Label: J4B1S2
  412 Structure                            15506.6
 ------------------------------------------------------------------------------
  412 Total IN/OUT                         15506.6   25897  13.69   4.72   2.25
 ==============================================================================
  411 to 412 Routing                 1.301
 ==============================================================================
R 421  1   0.32  400.0   8.9 0.045  0.000 1 9804.6
R 421  2   0.32  400.0   8.6 0.045  0.000 110549.9
R 421  3   0.32  400.0   4.5 0.045  0.000 1 3113.0
                     Type: Null   Label: J4B2S1
  421 Structure                            23467.4
 ------------------------------------------------------------------------------
  421 Total IN/OUT                         23467.4   12965   6.11   4.06   2.05
 ==============================================================================
R 422  1   0.32  400.0   0.9 0.045  0.000 1    33.3
R 422  2   0.32  400.0   3.2 0.045  0.272 1   870.9
R 422  3   0.32  400.0   0.9 0.045  0.272 1   778.3
R 422  4   0.32  400.0   2.7 0.045  0.272 1   351.6
R 422  5   0.32  400.0   1.7 0.045  0.000 1    63.9
R 422  6   0.32  400.0   3.9 0.045  0.000 1   202.0
                     Type: Null   Label: J4B2S2
  422 Structure                            25763.6
 ------------------------------------------------------------------------------
  422 Total IN/OUT                         25763.6    9509   4.49   2.79   1.33
 ==============================================================================
  421 to 422 Routing                 0.289
 ==============================================================================
R 423  1   0.32  400.0  18.5 0.045  1.581 128586.0
R 423  2   0.32  400.0   5.7 0.045  1.065 1 4003.7
R 423  3   0.32  400.0   6.4 0.045  0.000 2 2259.5
R 423  4   0.32  400.0   2.4 0.045  2.241 1  615.8
R 423  5   0.32  400.0   8.6 0.045  0.000 1 3074.3
R 423  6   0.32  400.0   1.1 0.045  2.241 1  209.2
                     Type: Null   Label: J4B2S3
  423 Structure                            61425.3
 ------------------------------------------------------------------------------
  423 Total IN/OUT                         61425.3   21420  10.50   4.36   2.44
 ==============================================================================
  422 to 423 Routing                 2.115
 ==============================================================================
R 424  1   0.32  400.0   7.1 0.045  0.000 1 3558.9
R 424  2   0.32  400.0   4.2 0.045  0.920 1 3183.4
```

```
R 424  3   0.32  400.0   4.6 0.045  0.000 2 1569.8
                    Type: Null   Label: J4B2S4
  424 Structure                          65292.3
-------------------------------------------------------------------------------
  424 Total IN/OUT                       65292.3   18063   8.61   3.79   2.21
===============================================================================
  423 to 424 Routing               1.496
===============================================================================
R 511  1   0.00    0.0   0.0 0.000  0.000 0    0.0
                    Type: Null   Label: J5B1S1
  511 Structure                          80799.0
-------------------------------------------------------------------------------
  511 Total IN/OUT                       80799.0   17595   8.57   3.98   2.26
===============================================================================
  412 to 511 Routing               0.000
===============================================================================
```

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

Civil Software Design -- SEDCAD+ Version 3.1

Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: SHEPHERD MILLER INC.

Filename: C:\SEDCAD3\DAYLOMA User: BLC & KMW

Date: 09-29-1993 Time: 13:53:04

Day Loma Fluvial Sedimentation Analysis - Coyote & Muskrat Creeks

Storm: 3.70 inches, 200 year-24 hour, SCS Type II

Hydrograph Convolution Interval: 0.1 hr

DETAILED SUBWATERSHED INPUT/OUTPUT TABLE

J B S SWS	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Time Conc. (hr)	Muskingum K (hr)	Muskingum X
1 1 1 1	-a	3	1092.00	7.33	1.89	0.16			
	-b	3	4619.00	7.36	1.90	0.68	0.835		
1 1 1 1	-1	8	2985.69	2.14	4.39	0.19		0.188	0.360
1 1 1 2	-a	3	286.00	4.55	1.49	0.05			
	-b	3	731.00	2.46	1.10	0.18	0.238		
1 1 1 3	-a	3	1142.00	21.02	3.21	0.10			
	-b	3	7109.00	8.44	2.03	0.97	1.069		
[illegible] 1	-a	3	[illegible]363.00	5.50	1.64	0.40	0.399		
1 1 2 1	-1	8	3992.90	2.13	4.38	0.25		0.253	0.360
1 1 2 [illegible]	[illegible]	3	2363.00	4.23	1.44	0.46	0.455		
1 1 2 2	-1	8	3992 90	2.13	4.38	0.25		0.253	0.360
1 1 2 3	-a	5	784.00	3.83	1.96	0.11	0.111		
1 1 2 3	-1	8	373.54	5.36	6.95	0.01			
	-2	8	3122.[illegible]8	1.92	4.16	0.21		0.223	0.361
1 1 2 4	-a	5	323.00	3.10	1.76	0.05	0.050		
1 1 2 4	-1	5	323.35	4.64	2.15	0.04			
	-2	8	229.51	22.32	14.17	0.00			
	-3	8	448.70	5.58	7.09	0.02		0.063	0.403
1 1 2 5	-a	5	217.00	34.56	5.88	0.01	0.010		
1 1 2 5	-1	8	448.45	4.46	6.34	0.02			
	-2	8	1269.16	1.58	3.77	0.09		0.11[illegible]	0.361
1 1 2 6	-a	5	250.00	44.00	6.63	0.01	0.010		
[illegible] 2 7	-a	3	2488.00	5.23	1.60	0.43	0.431		
1 1 2 7	-1	8	1610.50	2.48	4.73	0.09		0.094	0.367
1 1 2 8	-a	3	995.0[illegible]	8.04	1.98	0.14	0.139		

1 2 1 1	-a	3	1393.00	17.23	2.91	0.13			
	-b	8	13796.00	3.70	5.77	0.66	0.797		
[illegible] 1 1	-a	5	500.00	25.00	5.00	0.03	0.027		
2 1 2 1	-a	5	721.00	17.61	4.20	0.05	0.047		
2 1 2 1	-1	8	338.37	11.90	10.35	0.01			
	-2	8	7289.34	0.96	2.94	0.69		0.697	0.328
2 1 2 2	-a	5	672.00	14.88	3.86	0.05	0.048		
2 1 2 2	-1	8	995.20	2.01	4.25	0.06			
	-2	8	6668.24	0.85	2.77	0.67		0.732	0.317
2 1 2 3	-a	3	350.00	5.71	1.67	0.06			
	-b	3	1940.00	2.58	1.12	0.48	0.537		
2 1 2 3	-1	8	6668.24	0.85	2.77	0.67		0.667	0.310
2 1 2 4	-a	5	1841.00	2.17	1.47	0.35			
	-b	8	768.00	3.91	5.93	0.04	0.382		
2 1 2 4	-1	8	3782.75	3.04	5.23	0.20		0.200	0.377
2 1 2 5	-a	3	855.00	4.68	1.51	0.16			
	-b	8	944.00	2.12	4.37	0.06	0.216		
[illegible] 2 5	-1	8	1891.32	1.85	4.08	0.13		0.128	0.352
2 1 2 6	-a	3	1230.00	4.88	1.55	0.22			
	-b	8	4582.00	4.80	6.57	0.19	0.414		
2 1 2 7	-a	3	2040.00	3.92	1.39	0.41	0.408		
2 1 2 7	-1	8	6221.32	2.73	4.96	0.35		0.348	0.372
2 1 2 8	-a	3	2090.00	8.61	2.05	0.28			
	-b	8	2886.00	5.54	7.06	0.11	0.396		
2 1 2 9	-a	3	506.00	10.87	2.31	0.06	0.060		
2 1 2 9	-1	8	2836.86	2.47	4.71	0.17		0.167	0.367
2 1 2 10	-a	3	1032.00	4.36	1.46	0.20			
	-b	8	2825.00	5.31	6.91	0.11	0.309		
2 1 2 11	-a	5	740.00	6.76	2.60	0.08	0.079		
2 1 2 11	-1	8	2448.01	5.73	7.18	0.09		0.094	0.404
2 1 3 1	-a	3	1639.00	11.59	2.38	0.19	0.191		
2 1 3 1	-1	8	10000.41	0.90	2.85	0.98		0.976	0.313
[illegible] 1 3 2	-a	3	920.00	15.22	2.73	0.09	0.093		
2 1 3 2	-1	8	7512.96	1.60	3.79	0.55		0.550	0.345

2 1 3 3	-a	3	1442.00	6.93	1.84	0.22			
	-b	8	2002.00	3.00	5.19	0.11	0.324		
2 1 3 4	-a	3	1020.00	3.92	1.39	0.20			
	-b	8	7674.00	2.87	5.08	0.42	0.624		
2 2 1 1	-a	3	1085.00	8.76	2.07	0.15			
	-b	8	1035.00	2.13	4.37	0.07	0.211		
2 2 1 1	-1	8	6268.04	2.55	4.79	0.36		0.363	0.369
2 2 1 2	-a	3	904.00	5.53	1.65	0.15			
	-b	8	741.00	8.10	8.54	0.02	0.176		
2 2 1 2	-1	8	2957.32	4.74	6.53	0.13			
	-2	8	6268.04	2.55	4.79	0.36		0.488	0.379
2 2 1 3	-a	5	668.00	17.96	4.24	0.04			
	-b	8	502.00	49.80	21.17	0.01	0.050		
2 2 1 3	-1	8	1769.81	4.52	6.38	0.08			
	-2	8	6268.04	2.55	4.79	0.36		0.440	0.375
2 2 1 4	-a	3	520.00	6.35	1.76	0.08			
	-b	8	3250.00	2.46	4.71	0.19	0.273		
2 2 1 4	-1	8	6268.04	2.55	4.79	0.36		0.363	0.369
2 2 1 5	-a	5	632.00	15.03	3.88	0.05			
	-b	8	599.00	3.34	5.48	0.03	0.075		
2 2 1 5	-1	8	1710.26	1.75	3.97	0.12			
	-2	8	6268.04	2.55	4.79	0.36		0.482	0.365
2 2 1 6	-a	3	1500.00	12.67	2.49	0.17			
	-b	8	396.00	13.89	11.18	0.01	0.177		
2 2 1 6	-1	8	2835.99	2.65	4.88	0.16			
	-2	8	6268.04	2.55	4.79	0.36		0.524	0.369
2 2 1 7	-a	3	995.00	8.04	1.98	0.14			
	-b	8	6735.00	2.38	4.62	0.40	0.543		
3 1 2 1	-a	3	1124.00	3.56	1.32	0.24			
	-b	8	4238.00	2.36	4.61	0.26	0.491		
3 2 1 1	-a	3	8756.00	2.06	1.00	2.42	2.423		
3 2 1 2	-a	3	970.00	5.15	1.59	0.17	0.169		
3 2 1 2	-1	8	7414.32	1.89	4.12	0.50		0.499	0.354
3 2 1 3	-a	5	1000.00	4.50	2.12	0.13			
	-b	8	1990.00	2.76	4.99	0.11	0.241		
[illegible] 1 3	-1	8	7613.68	2.10	4.35	0.49		0.486	0.359
4 1 2 1	-a	3	1692.00	4.73	1.52	0.31			
	-b	8	6249.00	3.20	5.37	0.32	0.632		

4 2 1 1	-a	3	1343.00	8.94	2.09	0.18			
	-b	8	23432.00	2.99	5.19	1.26	1.433		
4 2 1 2	-a	3	1388.00	8.65	2.06	0.19			
	-b	8	23383.00	1.20	3.28	1.98	2.165		
4 2 1 3	-a	3	1791.00	4.47	1.48	0.34			
	-b	8	14428.00	2.77	5.00	0.80	1.138		
4 2 2 1	-a	3	2299.00	0.87	0.65	0.98			
	-b	8	1196.00	3.34	5.49	0.06	1.038		
4 2 2 2	-a	3	1891.00	3.17	1.25	0.42			
	-b	8	14726.00	2.72	4.94	0.83	1.248		
4 2 2 2	-1	8	3731.48	1.61	3.80	0.2		0.272	0.345
4 2 2 3	-a	3	3234.00	0.93	0.67	1.33			
	-b	8	23084.00	1.91	4.14	1.55	2.880		
4 2 2 3	-1	8	3731.48	1.61	3.80	0.27		0.272	0.345
4 2 2 4	-a	3	1493.00	2.68	1.15	0.36			
	-b	8	10199.00	1.37	3.51	0.81	1.167		
4 2 2 4	-1	8	3731.48	1.61	3.80	0.27		0.272	0.345
4 2 2 5	-a	3	1144.00	1.75	0.93	0.34			
	-b	8	2480.00	4.84	6.60	0.10	0.447		
[illegible] 2 6	-a	3	2587.00	3.87	1.38	0.52	0.522		
4 2 3 1	-a	3	2637.00	18.47	3.01	0.24			
	-b	8	12736.00	3.30	5.45	0.65	0.892		
4 2 3 1	-1	8	19652.72	1.32	3.45	1.58		1.581	0.334
4 2 3 2	-a	3	2090.00	5.74	1.68	0.35			
	-b	8	16716.00	2.15	4.40	1.05	1.400		
4 2 3 2	-1	8	12288.80	1.14	3.20	1.07		1.065	0.326
4 2 3 3	-a	3	1243.00	6.44	1.78	0.19			
	-b	8	13144.00	2.13	4.38	0.83	1.028		
4 2 3 4	-a	3	1636.00	2.44	1.09	0.42			
	-b	8	7572.00	3.70	5.77	0.36	0.779		
4 2 3 4	-1	8	13283.06	0.30	1.65	2.24		2.241	0.245
4 2 3 5	-a	3	1393.00	8.61	2.05	0.19			
	-b	8	4577.00	4.81	6.58	0.19	0.381		
4 2 3 6	-a	3	1767.00	1.13	0.74	0.66			
	-b	8	6479.00	4.63	6.46	0.28	0.937		
[illegible] 3 6	-1	8	13283.06	0.30	1.65	2.24		2.241	0.245
4 2 4 1	-a	3	1124.00	7.12	1.87	0.17			
	-b	8	15151.00	2.18	4.43	0.95	1.117		

4 2 4 2	-a	3	597.00	4.19	1.43	0.12		
	-b	8	15273.00	2.62	4.85	0.87	0.989	
[illegible] 4 2	-1	8	8159.19	0.67	2.46	0.92		0.920 0.295
4 2 4 3	-a	3	1294.00	4.64	1.51	0.24		
	-b	8	5871.00	2.04	4.29	0.38	0.618	

OVERSIZE DOCUMENT PAGE PULLED

SEE APERTURE CARDS

NUMBER OF OVERSIZE PAGES FILMED ON APERTURE CARDS 1

9403010166-05

APERTURE CARD/HARD COPY AVAILABLE FROM

RECORDS AND REPORTS MANAGEMENT BRANCH

APPENDIX D
LABORATORY TEST RESULTS
AND SAMPLING INFORMATION

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

November 13, 1992 5930-RX

Energy Fuels Nuclear, Inc.
One Tabor Center, Suite 2500
Denver, Colorado 80202

ATTENTION: MR. BILL ALMAS

RE: DAY LOMA MINE

Gentlemen:

The following is a report of the following services which we have provided for the above-referenced project:

1. Drilling and sampling (including test boring logs).
2. Laboratory testing of selected soil samples.
3. Surveying and drafting test boring locations.

These services have been completed per our September 29, 1992 Service Agreement which was executed by Energy Fuels Nuclear, Inc. on October 1, 1992.

FIELD EXPLORATION

The field work was performed using a Mobile B-57 truck-mounted drilling rig at the site on October 12 and 13, 1992. Seven (7) test borings were advanced to depths ranging from 14.0 to 21.5 feet. Drilling was performed using 8.5" diameter hollow-shaft augers. The augers act as continuously advancing steel casing. The method prevents test holes from caving in above the levels to be tested. Sampling tools are lowered inside the hollow stem for testing into undisturbed soils.

Drilling and field sampling were performed according to the following standard specifications:

1. "Soil Investigation and Sampling by Auger Borings," ASTM D1452.

2. Sampling with a two-inch O.D. split-barrel (split-spoon) per ASTM D1586, "Penetration Test and Split-Barrel Sampling of Soils." Forty-eight (48) such tests were performed.

3. Sampling with a 2.5-inch I.D., thick-wall sampler driven with procedure and effort of ASTM D1586. Four (4) such samples were obtained.

The soil samples were field classified by the Field Engineer, sealed in containers to prevent loss of moisture and returned to our laboratory. They were then inspected by the Geotechnical Engineer prior to the preparation of this report, and reclassified visually in accordance with ASTM D2487.

A field log was prepared for each boring during exploration. After the retrieved samples were checked in the laboratory, a Final Log for each boring was prepared which contained the work method, samples recovered and the indication of the presence of various soil types. The Final Logs are enclosed as YELLOW SHEETS.

The Final Logs contain both factual and interpretive information. On the Final Logs, horizontal lines designating the interface between differing materials encountered represent approximate boundaries. The transition between soil layers is typically gradual.

LABORATORY TESTING PROGRAM

As specifically requested by Mr. Bill Almas (Energy Fuels Nuclear, Inc.) and Mr. Barry Carlson (Shepherd Miller, Inc.), the following laboratory soil tests were performed:

		TESTS
1.	Moisture Content (ASTM D2216)	3
2.	Unit Weight Determination (ASTM D2937)	3
3.	Sieve Analysis - #200 (ASTM D1140)	9

The results of the above-listed soil tests are as follows:

Sample No.	Sample Depth (Ft.)	Passing No. 200 Sieve (percent)	Dry Unit Weight (PCF)	Water Content (percent)
HL-1-3B	5.5 to 6.5	80.2		
HL-2-2A	2.5 to 3.0	34.7	109.2	13.6
HL-2-4	7.5 to 9.0	14.5		
HL-3-6B	13.0 to 14.0	42.6		
HL-8-3	5.0 to [illegible].5	24.7		
HL-8-4B	8.0 to 8.5	95.9	104.0	18.9
HL-8-5	10.0 to 11.5	92.4		
HL-8-6C	13.5 to 14.0	15.8	110.8	10.4
HL-9-2	2.5 to 4.0	36.5		

 5930-RX

SURVEYING AND DRAFTING

On October 24, 1992, our survey crew was present on the site to survey the test boring locations. The control point used in the survey for the basis of location and elevation was the section corner common to Sections 13, 14, 23 and 24, T.32 N., R.91 W. 6 P.M., Fremont County, Wyoming. Following the completion of the field survey, the test borings were plotted on the "Reclaimed Areas" map you provided to us. We have enclosed this map for your use as requested.

CLOSURE

We appreciate the opportunity to be of service to you on this phase of the project. If you have any questions regarding the information contained herein, or if we may be of further assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Jon C. Howell

Jon C. Howell, P.E.
Geotechnical Engineer

JCH:dcr:soil80

LOG OF TEST BORING NO. HL-1

Project: Day Loma Mine Job No.: 5930-RX
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.
Surface El.(Ft) Benchmark(Ft)

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS PER FT)	q_p (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-1 0.0-1.5 17	Medium dense, dry, light brown, sandy SILT 0.5'		18					
		Medium dense, damp, light olive gray, clayey, fine to medium SAND							
	SS-2 2.5-4.0 16	3.5'		17					
		Stiff, damp, light olive gray and grayish blue, silty CLAY with some fine sand							
05	SS-3 5.0-6.5 16			13					-#200=80.2%
	SS-4 7.5-9.0 17	--Some reddish brown below 8.0'		15					
		9.0'							
		Medium dense, damp, gray and black, clayey, fine to medium SAND with occassional fine to coarse gravel (tailings)							
10	SS-5 10.0-11.5 17			16					
	SS-6 12.5-14.0 16			25					
		14.0'							
15									

WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES
Initial Occurrence While Drilling Dry	Date Begun 10-12-92 Comp. 10-12-92
Time After Drilling 0 hrs	Crew JCH/ELL Rig Mobile B-57
Depth to Water dry	Method 8.5" Diameter H.S.A.
Depth to Cave-In 10.4'	Termination Depth: 14.0'

LOG OF TEST BORING NO. HL-2

Project: Day Loma Mine
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc. Job No.: 5930-RX
Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS PER FT)	q_u (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-1 0.0-1.5 17	Medium dense, dry, light brown, sandy SILT 0.5'		24					
	DC-2 2.5-4.0 16	Medium dense, damp, light reddish tan and olive gray, silty, fine to medium SAND with some clay 3.0'				13.6	124.8 109.9		-#200=34.7%
		Stiff, damp, olive gray, silty CLAY with fine to medium sand and gravel seams							
05	SS-3 5.0-6.5 17			24					
	SS-4 7.5-9.0 16	8.0'		24					-#200=14.5%
		Interbedded medium dense, damp, light oliver gray, clayey, fine to medium SAND and stiff, damp, light olive gray sandy CLAY							
10	SS-5 10.0-11.5 17			28					
	SS-6 12.5-14.0 18			24					
15	SS-7 15.0-16.5 17	17.0'		34					
	SS-8 17.5-19.0 16	Medium dense to loose, damp, olive gray, clayey, fine to medium SAND (tailings)		24					

(Log Continued on Next Page)

LOG OF TEST BORING NO. HL-2, Cont.

Project: Day Loma Mine Job No.: 5930-RX
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.
Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS/FT)	q_p (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-9 20.0-21.5 17	Loose, damp, olive gray, clayey, fine to medium SAND		10					
		21.5'							
25									
30									
35									

WATER LEVEL OBSERVATIONS			
Initial Occurrence While Drilling	Dry		
Time After Drilling	0 hrs		
Depth to Water	dry		
Depth to Cave-In	16.8'		

DRILLING AND SAMPLING NOTES			
Date Begun	10-12-92	Comp.	10-12-92
Crew	JCH/ELL	Rig	Mobile B-57
Method	8.5" Diameter H.S.A.		
Termination Depth:	21.5'		

LOG OF TEST BORING NO. HL-3

Project: Day Loma Mine Job No.: 5930-RX
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.
Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS/PER FT)	q_u (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-1 0.0-1.5 17	Medium dense, dry, light brown, sandy SILT 0.5'		16					
		Stiff to firm, damp, light olive gray, sandy CLAY with intermittent silty, fine to medium sand seams							
	SS-2 2.5-4.0 18			18					
05	SS-3 5.0-6.5 18			21					
	DC-4 6.5-8.0 18								
10	SS-5 10.0-11.5 18	Possible tailings(?) from 10.0' to 12.0'		6					
	SS-6 12.5-14.0 18	More sand and moist from 13.0' to 15.0'		5					-#200=42.6%
15	SS-7 15.0-16.5 17			24					

(Log Continued on Next Page)

LOG OF TEST BORING NO. HL-3, Cont.

Project: Dav Loma Mine   Job No.: 5930-RX
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.
Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS/PER FT)	q_u (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-8 20.0-21.5 17	Very stiff, damp, light olive gray, sandy CLAY		39					
		21.5'							
25									
30									
35									

WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES
Initial Occurrence While Drilling: Dry	Date Begun: 10-12-92 Comp.: 10-12-92
Time After Drilling: 0 hrs	Crew: JCH/ELL Rig: Mobile B-57
Depth to Water: dry	Method: 8.5" Diameter H.S.A.
Depth to Cave-In: 18.8'	Termination Depth: 21.5'

LOG OF TEST BORING NO. HL-3

Project: Day Loma Mine — Job No.: 5930-RX
Location: Gas Hills, Wyoming — Client: Energy Fuels Nuclear, Inc.
Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS/PER FT)	q_p (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-1 0.0-1.5 16	Loose, dry, light brown, sandy SILT 0.5'		8					
		Medium dense, damp, light reddish tan and light olive gray, silty, fine to medium SAND							
	SS-2 2.5-4.0 17			13					
		Some sand and gravel below 4.0'							
05	SS-3 5.0-6.5 17			21					
	SS-4 7.5-9.0 18	8.5'		17					
		Stiff, moist, brown, sandy CLAY (possible tailings?) 10.0'							
10	SS-5 10.0-11.5 18	Loose, moist, light reddish tan and light olive gray clayey, fine to medium SAND		14					
	SS-6 12.5-14.0 17			9					
		14.0'							
15									

WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES
Initial Occurrence While Drilling: Dry	Date Begun: 10-12-92 Comp.: 10-12-92
Time After Drilling: 0 hrs	Crew: JCH/ELL Rig: Mobile B-57
Depth to Water: dry	Method: 8.5" Diameter H.S.A.
Depth to Cave-In: 10.2'	Termination Depth: 14.0'

LOG OF TEST BORING NO. HL-8

Project: Day Loma Mine Job No.: 5930-RX
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.
Surface El. (Ft) ______ Benchmark (Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS PER FT)	q_p (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI	OTHER TESTS
	SS-1 0.0-1.5 16	Medium dense, dry, light brown, sandy SILT 0.5'		14					
	SS-2 2.5-4.0 17	Medium dense, damp, light reddish tan and light olive gray, clayey, fine to medium SAND		21					
05	SS-3 5.0-6.5 17	7.0'		12					-#200=24.7%
	DC-4 7.5-9.0 15	Very stiff to stiff, damp, reddish tan and olive gray, sandy and silty CLAY		33		18.9	123.7 104.0		-#200=95.9%
10	SS-5 10.0-11.5 17	11.5'		19					-#200=92.4%
	DC-6 12.5-14.0 18	Dense to medium dense, black, gray and dark olive gray, clayey, fine to medium SAND (tailings)		35		10.4	122.3 110.8		-#200=15.8%
15	SS-7 15.0-16.5 16	16.5'		20					

WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES
Initial Occurrence While Drilling: Dry	Date Begun 10-13-92 Comp. 10-13-92
Time After Drilling: 0 hrs	Crew JCH/ELL Rig Mobile B-57
Depth to Water: dry	Method 8.5" Diameter H.S.A.
Depth to Cave-In: 11.9'	Termination Depth: 16.5'

LOG OF TEST BORING NO. HL-9

Project: Dav Loma Mine Job No.: 5930-RX

Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.

Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS/FT)	q_p (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-1 0.0-1.5 17	Medium dense, dry, light, brown, sandy SILT 0.5'		21					
		Stiff, damp, light reddish tan and light olive gray clayey, fine to medium SAND 3.0'							
	SS-2 2.5-4.0 18	Medium dense to loose, damp, light reddish tan and light olive gray, silty, fine to medium SAND		20					-#200=36.5%
05	SS-3 5.0-6.5 18	7.0'		19					
	SS-4 7.5-9.0 18	Stiff, moist, olive gray, sandy CLAY		7					
10	SS-5 10.0-11.5 17	13.0'		19					
	SS-6 12.5-14.0 17	Stiff, damp, gray and black, sandy CLAY with some gravel (tailings)		33					
15	SS-7 15.0-16.5 18	20.0'		16					

(Log Continued on Next Page)

LOG OF TEST BORING NO. HL-9, Cont.

Project: Dav Loma Mine Job No.: 5930-RX
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.
Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS/PER FT)	q_p (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-8 20.0-21.5 17	Very stiff, damp, olive gray sandy CLAY		25					
		21.5'							
25									
30									
35									

WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES
Initial Occurrence While Drilling Dry	Date Begun 10-13-92 Comp. 10-13-92
Time After Drilling 0 hrs	Crew JCH/ELL Rig Mobile B-57
Depth to Water dry	Method 8.5" Diameter H.S.A.
Depth to Cave-In 17.7'	Termination Depth: 21.5'

LOG OF TEST BORING NO. HL-10

Project: Dav Loma Mine Job No.: 5930-RX
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.
Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS PER FT)	q_p (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-1 0.0-1.5 16	Medium dense, dry, brown, sandy SILT 0.5'		17					
		Stiff, damp, light reddish tan and light olive gray, sandy CLAY with clayey fine to medium sand seams and layers							
	SS-2 2.5-4.0 17			20					
		5.0'							
05	SS-3 5.0-6.5 17	Medium dense, damp, olive gray and black clayey, fine to medium SAND (possible tailings?)		38					
	SS-4 7.5-9.0 17			23					
		10.0'							
10	SS-5 10.0-11.5 18	Firm to very stiff, moist, olive gray and bluish gray, sandy CLAY		9					
	SS-6 12.5-14.0 18	Very moist at 13.0'		6					
15	SS-7 15.0-16.5 18			40					

(Log Continued on Next Page)

LOG OF TEST BORING NO. HL-10, Cont.

Project: Day Loma Mine Job No.: 5930-RX
Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.
Surface El.(Ft) ______ Benchmark(Ft) ______

DEPTH (FT)	SAMPLING TYPE - NO. DEPTH (FT) RECOVERY (IN)	SOIL DESCRIPTION	USCS	N (BLOWS/PER FT)	q_p (TSF)	W (%)	γ_m γ_d (PCF)	LL PL PI (%)	OTHER TESTS
	SS-8 20.0-21.5 17	Stiff, moist, olive gray sandy CLAY		24					
		21.5'							
25									
30									
35									

WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES
Initial Occurrence While Drilling Dry	Date Begun 10-13-92 Comp. 10-13-92
Time After Drilling 0 hrs	Crew JCH/ELL Rig Mobile B-57
Depth to Water dry	Method 8.5" Diameter H.S.A.
Depth to Cave-In 18.3'	Termination Depth: 21.5'

SUBJECT LABORATORY TEST RESULTS PROJECT NO. 5930-RX PAGE 1/1

CLIENT ENERGY FUELS NUCLEAR, INC. DATE 11-11-92 BY JCH

PROJECT GAS HILLS - DAY LOMA MINE CHECKED BY

SAMPLE NO/ ~~DEPTH (FT)~~	PASSING NO. 200 SIEVE (%)	
HL-2-2A	34.7	
HL-8-4B	95.9 *	
HL-8-6C	15.8 *	Grain Size and Atterberg Limits

INBERG-MILLER ENGINEERS

ENERGY LABORATORIES
ENERGY LABORATORIES, INC.
P.O. BOX 3258 • CASPER, WY 82602 • PHONE (307) 235-0515
254 NORTH CENTER, SUITE 100 • CASPER, WY 82601 • FAX (307) 234-1639

ENERGY FUELS
SOIL ANALYSIS REPORT

Date Submitted: 10-16-92
Date Received: 10-19-92
Report Date: 11-04-92
Analyst: DB

LAB I.D.	Sample I.D.	Sample Date	Sample Time	U-nat pCi/gm	Ra226 pCi/gm	Ra226 Prec. +/-
92-41336	HL-1	10-12-92	09:55	71.8	86.9	1.0
92-41337	HL-2	10-12-92	11:05	3.5	2.5	0.1
92-41338	HL-2.1	10-12-92	12:00	151	86.8	0.9
92-41339	HL-8.0	10-13-92	13:30	2.7	1.6	0.1
92-41340	HL-8.1	10-13-92	13:45	1.9	1.5	0.1
92-41341	HL-8.2	10-13-92	14:00	4.1	1.2	0.1
92-41342	HL-8.3	10-13-92	14:15	2.6	2.3	0.1
92-41343	HL-8.4	10-13-92	14:30	28.4	15.7	0.4
92-41344	HL-8.5	10-13-92	14:30	579	413	2.1
	HL-10.4				37.0	

REPORT APPROVED BY: R. A. Sensbury

tdc

ENERGY LABORATORIES
ENERGY LABORATORIES, INC.
P.O. BOX 3258 • CASPER, WY 82602 • PHONE (307) 235-0515
254 NORTH CENTER, SUITE 100 • CASPER, WY 82601 • FAX (307) 234-1639

SOIL ANALYSIS REPORT - ENERGY FUELS

Project: Gas Hills

Report Date: 08/11/93

LAB I.D.	SAMPLE I.D.	Date Sampled	Ra226 (Chemical) pCi/g	Net CPM 1 A°	Net CPM 2 A∞	(A∞ - A°)/A∞ 3
93-28610	HL-1-6, HL-1-5 Composite	10-12-93	58.9 ± 0.7	262.5	275.3	0.0465
93-28611	HL-9-7, HL-9-6 Composite	10-12-93	34.4 ± 0.6	95.0	110.2	0.1379

1 A° - Net CPM after de-emanation
2 A∞ - Net CPM after full ingrowth
3 (A∞ - A°)/A∞ Radon Emanation Coefficient

Report Approved By: DB Rea

kmk e328610.ef

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.

P.O. BOX 3258 • CASPER, WY 82602 • PHONE (307) 235-0515
254 NORTH CENTER, SUITE 100 • CASPER, WY 82601 • FAX (307) 234-1639

SOIL ANALYSIS REPORT - ENERGY FUELS

Project: Day Loma

Report Date: 08/11/93

LAB I.D.	SAMPLE I.D.	Date Sampled	Time Sampled	Ra226 (Chemical)	Net CPM 1 A°	Net CPM 2 A_{∞}	$(A_{\infty} - A^{\circ})/A_{\infty}$
93-24420	BG-4	07-07-93	15:00	6.1 ± 0.2	25.3	31.4	0.1943
93-24421	BG-6	07-07-93	15:00	4.1 ± 0.2	7.1	13.6	0.4779
93-24422	BG-12	07-07-93	15:00	186 ± 1.3	544	563	0.0338
93-24423	BG-15	07-07-93	15:00	3.8 ± 0.2	12.7	19.0	0.3316
93-24424	B6-20	07-07-93	15:00	105 ± 1.2	511	549	0.0692
93-24425	HL-8	07-07-93	15:00	1.9 ± 0.1	8.8	15.3	0.4248
93-24426	HL-10A	07-07-93	15:00	5.0 ± 0.2	27.7	34.0	0.1853

[1] A° - Net CPM after de-emanation
[2] A_{∞} - Net CPM after full ingrowth
[3] $(A_{\infty} - A^{\circ})/A_{\infty}$ Radon Emanation Coefficient

Report Approved By: RB Rea

kmk e324420.ef

ENERGY LABORATORIES
ENERGY LABORATORIES, INC.
P.O. BOX 3258 • CASPER, WY 82602 • PHONE (307) 235-0515
254 NORTH CENTER, SUITE 100 • CASPER, WY 82601 • FAX (307) 234-1639

REC'D JUL 20 1993

Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: ENERGY FUELS | Date Set: July 7, 1993
Site: Day Loma Project | Date Remove: July 8, 1993
Location: Heap Leach Pile/Mine Spoils Pile | Weather: Clear, min. 40.0 F+/-
Report Date: July 14, 1993 | Date Counted: July 9, 1993

Method: Energy Fuels and ELI's representatives placed and retrieved LAACC units
EPA Method 115 per 40 CFR 61 (NESHAPs)
Radon Flux measurements have been corrected
for instrument & charcoal background counts

Lab I.D.	LAACC #	Canister #	Location*	07/07/93 Time Set	07/08/93 Time Remove	Radon Flux pCi/m2s	Field Gamma Reading, uR/hr
HEAP LEACH PILE							
93-24218	14	3	HL-8	09:33	13:29	8.9	36
93-24219	15	4	HL-1	09:38	13:24	6.7	44
DUPLICATE						5.7	
93-24220	18	5	HL-1A	09:42	13:18	6.6	44
93-24221	19	6	HL-1B	09:47	13:22	5.2	40
93-24222	20	7	HL-5	09:52	13:31	11.1	35
93-24223	7	8	HL-2	10:09	13:40	5.4	33
93-24224	9	9	HL-3	10:21	14:03	4.7	35
93-24225	12	13	HL-10	10:26	14:06	6.5	33
93-24226	16	14	HL-10A	10:31	14:08	18.7	42
93-24227	17	15	HL-9	10:42	13:37	8.3	45
DUPLICATE						7.0	
MINE SPOILS PILE							
93-24228	5	11	BG-4	11:38	14:16	6.7	90
93-24229	6	12	BG-5	11:45	14:17	8.0	39
93-24230	13	19	BG-1	11:27	14:14	4.8	43
93-24231	8	16	BG-6	11:49	14:19	6.7	45
93-24232	1	20	BG-7	11:55	14:23	5.7	48
93-24233	11	18	BG-10	13:15	11:33	49.5	110
93-24234	3	21	BG-9	12:00	14:23	5.4	42
93-24235	4	22	BG-16	14:23	12:13	282.5	350
93-24236	39	23	BG-3	11:35	14:15	40.3	290
93-24237	40	24	BG-2	11:30	14:15	2.1	100
93-24238	29	29	BG-17	14:26	12:15	285.5	420
93-24239	30	30	BG-18	14:30	12:18	103.8	380
93-24240	32	26	BG-13	14:04	12:01	33.6	135
DUPLICATE						30.2	
93-24241	31	31	BG-14	14:10	12:08	524.9	1800
93-24242	36	36	BG-20	14:35	12:22	80.6	320
93-24243	38	25	BG-15	14:16	12:11	23.4	260
93-24244	37	28	BG-12	13:24	12:04	63.1	260
93-24245	35	35	BG-19	14:32	12:20	78.8	260
93-24246	34	32	BG-11	13:19	11:40	149.7	700

* See attached Chain of Custody/Field Notes for further description of LAACC location.

ELI

REC'D JUL 20 1993

Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: ENERGY FUELS
Site: Day Loma Project
Location: Heap Leach Pile/Mine Spoils Pile
Report Date: July 14, 1993

Quality Assurance/Quality Control Data

Date Set: July 7, 1993 Date Remove: July 8, 1993

Date Counted	Standard No. 1 cpm	Standard No. 2 cpm
07/09/93	2275	4280
	2397	4453

Sample No.	Cannister #	Radon Flux* pCi/m2s
1	Trip Blank	<0.5
2	Trip Blank	<0.5
3	Trip Blank	<0.5
4	Trip Blank	<0.5
5	Trip Blank	<0.5
1	Field Cannister Back.	<0.5
2	Field Cannister Back.	<0.5
49	Field Cannister Back.	<0.5
50	Field Cannister Back.	<0.5
91	Field Cannister Back.	<0.5
92	Field Cannister Back.	<0.5

*Note: ELI's radon Flux Practical Quantitation Limit (PQL) is 0.5 pCi/m2s

Total Number of Laboratory Duplicates:	3	
Total Number of Field Duplicates:	0	
Total Number of Field Blank Cannisters Reported:	5	
Total Number of Measurements On Heap Leach Pile	10	
Average Radon Flux For Heap Leach Pile:	8.10	pCi/m2s
Minimum:	4.7	pCi/m2s
Maximum:	18.7	pCi/m2s
Total Number of Measurements On Mine Spoils Pile	19	
Average Radon Flux For Mine Spoils Pile:	92.37	pCi/m2s
Minimum:	2.1	pCi/m2s
Maximum:	524.9	pCi/m2s

REPORT APPROVED BY: R. A. Garling, by K.K.
eeg p2efdl1.ws

APPENDIX E
COST ESTIMATE

JOB SIZING

The duration of the heap leach project should be completed in one season; in the Gas Hills this is about six months. A recap of estimated costs follows in the next section.

Allowing for two weeks of inclement weather, one week for mobilization and demobilization and one week for miscellaneous delays, the work period is about five months or 105 days.

Reshaping the outslope will require 132,400 compacted cubic yards of material. Of this, 97,850 cubic yards will be obtained from the spoil pile with the remainder coming from job site excavation. Scrapers will move 130,250 cubic yards of material. Two 20 cubic yard push pull scrapers will load and haul about 400 bank cubic yards of material per hour, given the conditions and haul distance for the project. At 2800 cubic yards per day, the scrapers will operate 47 days. The plan calls for building the outslope from the bottom up so as to get good compation. Some bulldozer pushing will be required on the spoil pile initially, but the hauls generally will be flat. In addition to the scraper units, a 370 hp bulldozer, a motor grader, a 5000 gallon water truck and a compactor will be required for reshaping the outslope. A minor amount of excavation will be accomplished with a bulldozer in areas such as the gullies and for short pushes.

As shown later on a materials handling exhibit, the range of rock to be emplaced varies from sand to 72 inch pieces. Handling this range of material calls for a 2 1/2 cubic yard loader and a 25 ton hydraulic excavator or crane. For the majority, the material can be spotted where it is to be emplaced. The production rate of emplacement varies from 500 cubic yards per day to 175 cubic yards per day. For estimating purposes, each unit is rated at 300 cubic yards per day. Four laborers have been included in the estimate for rock emplacement. With 64,250 cubic yards of material to be emplaced, the job duration is 107 days.

The haulage fleet required to transport material to the site is sized at 600 loose cubic yards per day. The distance from the quarry to the heap leach area will be about 25 miles. For a two hour cycle time, six 35 ton off highway trucks, each hauling 25 loose cubic yards, will be required. In addition, a 5 1/2 cubic yard loader and a 370 hp bulldozer will be used for loading the trucks. The haul road will be maintained and dust will be allayed with a motor grader and water truck. The additional equipment is expected to be in use 50 percent of the time and costed at standby rates for the remaining time. Off highway trucks were chosen as much of the material is large and this type of truck can better cope with the job conditions.

On site testing of material will be required for gradation and durability. As estimated by Shepard Miller, one gradation test per 5000 cubic yards will be required at a

DAY-LOMA
HEAP LEACH REMEDIATION
COST ESTIMATE

Based on data provided by Shepard Miller Inc. of Fort Collins, CO, the estimated cost for remediation of the Day Loma heap leach site is $2,779,000. The SMI hydrological study of the site has resulted in plan whereby the steep outslope to the north of the heapleach area will be shaped to a 2.5:1 slope. The heap leach area as well as the outslope will be armored with rock mulch and riprap. In addition, there are three gullies that exist to the south of the heap leach area that are to be riprapped. And, a 2080 ft. drainage channel with apron and drop structure is to be constructed to cope with design runoff in Coyote Creek. This report only considers stabilization in place as proposed by Shepard Miller.

ASSUMPTIONS

In deriving a cost estimate for remediating the heap leach site, certain assumptions were made which weigh heavily on the unit costs of materials and emplacement. These assumptions include the following:

Riprap and Filter Bla[illegible]ket Material. As Western Nuclear Inc. is planning to set u[illegible] a granite quarry for their upcoming riprap requirements, [illegible]t is expected that the necessary rock materials can be obtained from that source at their estimated cost of $9.00 per loose cubic yard plus an allowance of $1.50 per cubic yard for additional screening or crushing. With an estimated cost of $10.93 per loose cubic yard for loading, hauling and haul road maintenance, the total cost for riprap materials at $21 [illegible] [illegible]cy is less expensive than an alternate source - [illegible] Enterprises. That firm's charge for ri[illegible]ap to the Gas [illegible] runs $20.00/ton or about $27.00/lcy.

Outslope Fill Material. It is expected that material for reshaping the outslope can be obtained from a spoils pile which lies adjacent and to the northwest of the heapleach site. The average haul distance is approximately 2000 ft. It is to be noted that this material has higher than background radiation.

Riprap Emplacement. It is assumed that the riprap can be machine placed, without much need for hand emplacement. Should hand emplacement be required, costs for emplacement are variously quoted between $15 and $18 per cubic yard. In addition, rock mulch emplacement on the heap leach cover is three inches thick. Should a six inch thickness be required because of NRC preferences, an additional 10,500 cubic yards of material will be required which will add $308,000 to the estimated cost.

cost of $1500 per test. One durability test per 10,000 cubic yards will be required at a cost of $650 per test.

While the job duration is contained within a six month time frame, an additional month has been imputed for staff costs. On site staff will consist of a supervisor, quality control supervisor, two survey personnel and a clerk. On site engineering and inspection is included in a five percent allowance for engineering costs.

An allowance of five percent of project costs is included for engineering, pre-project tests and lab fees. This allowance accounts for studies, reports and on site clerk-of-the-works engineering activities.

It is expected that the spoils and traffic areas will have to be revegetated. In laying back the spoils bank to a 2.5 to 1 slope a four acre disturbance will be incurred.

Other cost items such as home office expenses and a reasonable contingency allowance are shown separately and below the line for identified costs.

BARTELL & ASSOCIATES
390 Del Street
LANDER, WYOMING 82520
(307) 332-4077

JOB Day-Loma Heapleach
SHEET NO ______ OF ______
CALCULATED BY ______ DATE ______
CHECKED BY ______ DATE ______
SCALE ______

ESTIMATED EQUIPMENT COSTS

COSTS BASED ON 1990 MONTHLY RENTAL RATES & UNFACTORED TO REFLECT DISCOUNTS. ESTIMATED OPERATING COSTS BASED ON 1988 BLUE BOOK RATES (COST OF FUEL, SUPPLIES NOT MUCH DIFFERENT). STANDBY RATES @ 60% OF RENTAL RATES.

	RENTAL	OPER COST
D9 N W/ 3SHANK RIPPER	86.90	45.00
D9 N WO RIPPER	80.85	42.40
627E (PP)	72.75	40.50
5000 GAL WATER TRUCK	35.79	13.85
35 TON OFF HIGHWAY TRUCK	55.40	23.70
815 B COMPACTOR	44.06	19.30
140 MOTOR GRADER	30.14	13.85
980C WHEEL LOADER	55.40	28.55
953 CRAWLER LOADER	29.49	11.35
235 EXCAVATOR/CRANE	65.34	27.00

MANPOWER

SUPERVISOR	$ 50,000/YR
Q C SUPERVISOR	40,000
SURVEYOR	35,000
HELPER	25,000
CLERK	20,000
	$170,000/YR
30% PAC	51,000
	$221,000/YR = $18,420/MO

EQUIPMENT OPERATOR	$15.00 INC PAC
LABORER	11.25 " "
REPAIR & SERVICE PERS	INCLUDED IN OPERATING COSTS

BARTELL & ASSOCIATES
390 Del Street
LANDER, WYOMING 82520
(307) 332-4077

JOB
SHEET NO. OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE

MATERIAL HANDLING

AREA	EXCAVATION FILL		FILTER BLANKET			RIPRAP/ROCK MULCH		
HEAP LEACH			—			10,500 CY	D50 1"	3" De
OUTSLOPE	132,400 CY		—			7500	1"	6"
GULLY 1	3,000		4300 CY		24"	6400	24"	36"
GULLY 2	500		1700		24"	2600	24"	36"
GULLY 3	500		2700		24"	4000	24"	36"
NORTH CHANNEL	1400	BULLDOZE	700		6"	700	2"	6"
SOUTH CHANNEL	1000	DOZE TO SOUTH	500		6"	500	2"	6"
COYOTE CREEK:								
APRON	1,400	SCRAPER	150	3"	12"	450	18"	36"
DROP STRUCTURE	750	BULLDOZE	150	VAR	24"	600	48	72"
CHANNEL	31,000	SCRAPER	5600	VAR	12"	10,400	VAR	VAR
ADDITIONAL ROCK			1900		24"	2900	36"	72"
	171,950		17,700 CY			46,550		

ROCK SIZE DISTRIBUTION

SIZE	FILTER BED	RIPRAP	SIZE	FILTER BED	RIPRAP
SAND	750 CY		D50 7"		250 CY
GRAVEL	650		D50 11"		1,600
D50 .5"	800		D50 15"		3,450
D50 1"	3,662	18,000 CY	D50 18"		4,750
D50 2"	1,200	1,200	D50 24"		13,000
D50 3"	4,312		D50 36"		2,900
D50 4"	1,	800	D50 48"		600
D50 5"	1,600				
D50 6"	5,925				

DAY LOMA HEAP LEACH REMEDIATION
COST ESTIMATE RECAP

NRC Licence Amendment		$ 150,000
Reshape Outslope		221,425
Gully Excavation		3,575
Riprap, Rock Mulch, Filter Bed Mining and Hauling		1,376,878
Riprap, Rock Mulch, Filter Bed Emplacement		191,611
Testing		16,500
Supervision, Staff and Surveying		128,940
Indirect Costs		31,225
Mobilization and Demobilization		49,040
Revegetate 4 acre Spoil Area		1,600
Subtotal	$2,170,794	
Home Office Overhead @ 6%		130,248
Subtotal	$2,301,042	
Engineering, Test and Lab @ 5%		115,052
Subtotal	$2,416,094	
Contingency @ 15%		362,414
Total Estimated Cost		$2,778,508
		$2,779,000