



energy fuels nuclear, inc.

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

(303) 623-8317
twx 910-931-2561
fax 303-595-0930

March 10, 1994

40-9024

Elizal ?

Mr. Joe Holonich
U.S. Nuclear Regulatory Commission
Mail Stop 5E-4
1 White Flint North
11555 Rockville Pike
Rockville, MD 20852

Dear Mr. Holonich:

Re: Reno Creek ISL Source Material License Application

Enclosed please find four copies of the Table of Contents for the Reno Creek ISL Project. These were inadvertently excluded from the package of revisions transmitted to the NRC on March 3, 1994. Please include this with those revisions.

Sorry for the inconvenience. Please call me if you have any questions.

Sincerely,

William J. Almas

WJA/sju

Enclosure

cc: Mr. Ramon Hill
NRC
Uranium Recovery Field Office
Box 26325
Denver, CO 80225

Director,
Division of Radiation Safety and Safeguards
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011

220079

NK10/11

9403240110 940310
PDR ADOCK 04009024
C PDR

delete: LA/nmsj/llur

TABLE OF CONTENTS
RENO CREEK ISL PROJECT
VOLUME I

<u>Section</u>	<u>Page</u>
1. GENERAL PROJECT DESCRIPTION	1-1
1.1 PROJECT SUMMARY	1-1
1.2 PROJECT LOCATION	1-2
1.3 PROJECT OWNERS	1-2
1.4 MINING OPERATIONS	1-2
1.4.1 WELLFIELD	1-2
1.4.2 PROCESSING PLANT	1-4
1.5 RECLAMATION AND AQUIFER RESTORATION OPERATIONS	1-5
2. JUDICICATION APPENDIX A: NAMES AND LAST KNOWN ADDRESSES	
OF OWNERS OF RECORD WITHIN THE PERMIT AMENDMENT AREA	2-1
2.1 SURFACE OWNERSHIP	2-2
2.2 SURFACE RIGHTS GRANTED BY SURFACE USE AGREEMENTS OR GRAZING LEASES	2-4
2.3 SURFACE RIGHTS GRANTED BY RIGHTS OF WAYS OR EASEMENTS	2-6
2.4 MINERAL OWNERSHIP (ALL MINERALS, INCLUDING OIL AND GAS)	2-9
2.5 OIL AND GAS LEASEHOLD INTERESTS	2-13
2.5.1 FEDERAL OIL AND GAS LEASEHOLD INTERESTS	2-13
2.5.2 PRIVATE OIL AND GAS LEASEHOLD INTERESTS	2-15
2.5.3 OIL AND GAS WELLS	2-19
2.5.4 OVERRIDING ROYALTY INTEREST HOLDERS	2-20
2.6 MINERAL INTERESTS (OTHER THAN OIL AND GAS)	2-23
2.6.1 MINERAL LEASES	2-23
2.6.2 MINING CLAIMS	2-24
2.7 SURFACE OWNER CONSENTS	2-25

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
3. ADJUDICATION APPENDIX B: NAMES AND LAST KNOWN ADDRESSES OF OWNERS OF RECORD WITHIN ONE-HALF MILE OF THE PERMIT AMENDMENT AREA BOUNDARY	3-1
3.1 SURFACE OWNERSHIP	3-2
3.2 SURFACE RIGHTS GRANTED BY SURFACE USE AGREEMENTS OR GRAZING LEASES	3-5
3.3 SURFACE RIGHTS GRANTED BY RIGHTS OF WAYS OR EASEMENTS	3-9
3.4 MINERAL OWNERSHIP (ALL MINERALS, INCLUDING OIL AND GAS)	3-14
3.5 OIL AND GAS LEASEHOLD INTERESTS	3-27
3.5.1 FEDERAL OIL AND GAS LEASEHOLD INTERESTS	3-27
3.5.2 STATE OIL AND GAS LEASEHOLD INTERESTS	3-31
3.5.3 PRIVATE OIL AND GAS LEASEHOLD INTERESTS	3-32
3.5.4 OIL AND GAS WELLS	3-37
3.5.5 OVERRIDING ROYALTY INTEREST HOLDERS	3-37
3.6 MINERAL INTERESTS (OTHER THAN OIL AND GAS)	3-43
3.6.1 MINERAL LEASES	3-43
3.6.2 MINING CLAIMS	3-44
3.7 MASTER MAILING NOTIFICATION LIST	3-45
3.7.1 SURFACE OWNERS INSIDE PERMIT AMENDMENT AREA	3-45
3.7.2 SURFACE OWNERS WITHIN 1/2 MILE OF PERMIT AMENDMENT AREA	3-45
3.7.3 OPERATORS OF OIL AND GAS WELLS INSIDE PERMIT AMENDMENT AREA	3-46
3.7.4 LESSEES OF OIL AND GAS LEASES INSIDE PERMIT AMENDMENT AREA WITH NO OPERATING WELLS	3-46
3.7.5 OTHERS WITH SURFACE INTERESTS FROM WHOM SURFACE CONSENTS WERE SOUGHT	3-46
3.7.6 CONSOLIDATED, ALPHABETICAL MAILING LIST	3-47
3.8 PROOF OF MAILINGS	3-50

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
4. ADJUDICATION APPENDIX C: LEGAL DESCRIPTIONS	4-1
4.1 LANDS WITHIN PERMIT AMENDMENT AREA	4-1
4.2 LANDS WITHIN PERMIT AMENDMENT BOUNDARY WHERE NO RIGHT TO MINE IS CLAIMED	4-1
4.3 LANDS WITHIN EXISTING PERMITTED AREAS	4-2
4.3.1 MAIN PILOT PLANT SITE	4-2
4.3.2 CONTINGENCY RESERVOIR AND ROAD	4-3
4.4 LANDS LOCATED WITHIN OTHER PERMIT AREAS	4-3
4.5 GEOLOGICAL SURVEY TOPOGRAPHIC MAP	4-3
5. LAND USE AND DEMOGRAPHY (BASELINE APPENDIX D-1)	5-1
5.1 LAND USE	5-1
5.2 DEMOGRAPHY	5-1
6. BRIEF HISTORY OF THE AREA (BASELINE APPENDIX D-3)	6-1
7. ARCHAEOLOGY (BASELINE APPENDIX D-3, CONT.)	7-1
8. CLIMATOLOGY (BASELINE APPENDIX D-4)	8-1
8.1 DATA SOURCES	8-1
8.2 GENERAL CONDITIONS	8-1
8.3 PRECIPITATION	8-1
8.4 RELATIVE HUMIDITY	8-2
8.5 TEMPERATURE	8-3
8.6 EVAPORATION	8-3
8.7 SKY COVER	8-3
8.8 WIND	8-12

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
9. GEOLOGY AND TOPOGRAPHY (BASELINE APPENDIX D-5)	9-1
9.1 GENERAL GEOLOGIC DESCRIPTION	9-1
9.2 TOPOGRAPHY	9-1
9.3 STRATIGRAPHY	9-3
9.4 STRATIGRAPHIC SECTION OF THE RENO CREEK AREA	9-5
9.5 STRUCTURE	9-7
9.6 SEISMICITY	9-7
9.7 EXPLORATION HOLES	9-9
10. HYDROLOGY (BASELINE APPENDIX D-6)	10-1
10.1 GENERAL	10-3
10.2 SURFACE WATER	10-4
10.2.1 AREA SURFACE WATER FLOW	10-4
10.2.2 SURFACE WATER QUANTITY	10-4
10.2.3 SURFACE WATER QUALITY	10-5
10.3 GROUNDWATER	10-14
10.3.1 REGIONAL GEOLOGIC SETTING	10-14
10.3.2 AQUIFER CHARACTERISTICS	10-15
10.3.3 CONFINING UNIT CHARACTERISTICS	10-17
10.3.4 GROUNDWATER FLOW	10-19
10.3.5 GROUNDWATER QUALITY	10-19
10.4 WATER RIGHTS	10-56
10.4.1 SURFACE WATER RIGHTS	10-56
10.4.2 GROUNDWATER RIGHTS	10-56
10.4.2.1 ADJUDICATED WATER RIGHTS.	10-56

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
10.4.2.2 UNADJUDICATED WATER RIGHTS.	10-56
10.4.2.2.1 ACTIVE PERMITS WITHIN PERMIT AMENDMENT AREA	10-58
10.4.2.2.2 ABANDONED OR CANCELLED PERMITS WITHIN THE PERMIT AMENDMENT AREA	10-62
10.4.2.2.3 ACTIVE PERMITS WITHIN ONE-HALF MILE OF PERMIT AMENDMENT AREA BOUNDARY	10-64
10.4.2.2.4 ABANDONED OR CANCELLED PERMITS WITHIN ONE-HALF MILE OF PERMIT AMENDMENT AREA BOUNDARY	10-66
10.4.2.3 WELL COMPLETION INFORMATION	10-67
10.4.3 POTENTIAL IMPACTS ON EXISTING WATER RIGHTS	10-86
10.5 HYDROLOGIC MONITORING	10-87
10.5.1 ZONE OF CONTROL FOR MINING UNIT #1	10-87
10.5.1.1 DRAWDOWN ESTIMATES	10-88
10.5.1.2 WELLFIELD SIMULATION	10-88
10.5.1.3 GRADIENT REVERSAL	10-89
10.5.2 RECOMMENDED SPACING OF MONITORING RING	10-90
10.5.3 EXCURSION RETRIEVAL	10-91
10.5.4 PERMIT MONITORING	10-92
10.5.5 PREDICTED HEADS BETWEEN INJECTION AND RECOVERY WELLS	10-92
10.6 HYDROLOGIC REFERENCES	10-124

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
11. SOILS ASSESSMENT (BASELINE APPENDIX D-7)	11-1
11.1 INTRODUCTION	11-1
11.2 METHODS	11-2
11.2.1 REVIEW OF EXISTING LITERATURE	11-2
11.2.2 1991 PROJECT PARTICIPANTS	11-2
11.2.3 SOIL SURVEY	11-2
11.2.4 FIELD SAMPLING	11-3
11.2.5 LABORATORY ANALYSIS	11-5
11.3 RESULTS AND DISCUSSION	11-6
11.3.1 SOIL SURVEY - GENERAL	11-6
11.3.2 SOIL MAPPING UNIT INTERPRETATION	11-7
11.3.3 ANALYTICAL RESULTS	11-8
11.3.4 EVALUATION OF SOIL SUITABILITY AS A PLANT GROWTH MEDIUM	11-8
11.3.5 TOPSOIL VOLUME CALCULATIONS	11-9
11.3.6 PRIME FARMLAND ASSESSMENT	11-10
11.3.7 REFERENCES	11-10
12. VEGETATION (APPENDIX D-8)	12-1
12.1 INTRODUCTION	12-1
12.2 METHODOLOGY	12-1
12.2.1 VEGETATIVE TYPE DETERMINATION AND MAPPING	12-2
12.2.2 SPECIES COMPOSITION	12-2
12.2.3 STUDY AREA SAMPLING DESIGN	12-3
12.2.4 EXTENDED REFERENCE AREA ESTABLISHMENT	12-3
12.2.5 EXTENDED REFERENCE AREA DESCRIPTION	12-4
12.2.6 TIME OF SAMPLING	12-4
12.2.7 PLOT SIZE AND SHAPE	12-4

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>		<u>Page</u>
12.2.8	MEASUREMENTS	12-4
12.2.8.1	COLLECTION AND ANALYSIS OF COVER DATA	12-4
12.2.8.2	COLLECTION AND ANALYSIS OF PRODUCTIVITY DATA	12-5
12.2.8.3	COLLECTION AND ANALYSIS OF TREE AND SHRUB DENSITY DATA	12-5
12.2.9	PRIME FARMLAND ASSESSMENT	12-5
12.2.10	WETLANDS INVENTORY	12-6
12.2.11	EVALUATING POST-MINING RECLAMATION SUCCESS	12-6
12.3	RESULTS	12-6
12.3.1	DESCRIPTION OF VEGETATION TYPES	12-6
12.3.2	VEGETATION MAP	12-8
12.3.3	WEEDS, SELENIUM INDICATORS, ENDANGERED OR THREATENED SPECIES	12-8
12.3.4	SPECIES COMPOSITION	12-9
12.3.5	NATIVE VEGETATION TYPE COVER ANALYSIS	12-9
12.3.6	STOCK PONDS AND OTHER DISTURBED OR DEVELOPED SITES	12-11
12.3.7	SAMPLE ADEQUACY	12-12
12.4	DISCUSSION	12-12
12.5	REFERENCES	12-26
ADDENDUM 1	CORRESPONDENCE	12-28
ADDENDUM 2	PHOTOGRAPHS OF VEGETATION TYPES	12-30
ADDENDUM 3	1993 PLANT SPECIES LIST	12-33
ADDENDUM 4	COVER RAW DATA	12-37

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
13. WILDLIFE INVENTORY (BASELINE APPENDIX D-9)	13-1
13.1 STUDY AREA	13-2
13.2 METHODS	13-2
13.2.1 BIG GAME	13-3
13.2.2 UPLAND GAME BIRDS	13-3
13.2.3 NESTING RAPTORS	13-4
13.2.4 MIGRATORY BIRDS OF HIGH FEDERAL INTEREST (MBHFI)	13-5
13.2.5 THREATENED AND ENDANGERED SPECIES	13-5
13.3 RESULTS AND DISCUSSION	13-5
13.3.1 HABITAT DESCRIPTIONS	13-6
13.3.1.1 SAGEBRUSH-GRASSLAND	13-6
13.3.1.2 GRASSLAND	13-6
13.3.1.3 BOTTOMLAND	13-7
13.3.1.4 SEEDDED GRASSLAND	13-7
13.3.1.5 DISTURBED	13-7
13.3.2 BIG GAME	13-8
13.3.2.1 PRONGHORN	13-8
13.3.2.2 MULE DEER	13-11
13.3.3 UPLAND GAME BIRDS	13-13
13.3.4 NESTING RAPTORS	13-13
13.3.5 MIGRATORY BIRDS OF HIGH FEDERAL INTEREST (MBHFI)	13-16
13.3.6 THREATENED AND ENDANGERED SPECIES	13-18
13.4 IMPACT ASSESSMENT	13-18
LITERATURE CITED	13-20
13.5 POTENTIAL AND OBSERVED MAMMALIAN SPECIES LIST	13-21

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
14. PRE-MINING RADIOLOGICAL ASSESSMENT (BASELINE APPENDIX D-10)	14-1
14.1 ENVIRONMENTAL BASELINE RADIOLOGICAL DATA	14-1
14.1.1 RADIONUCLIDE CONCENTRATION IN VEGETATION-1993 DATA COLLECTION	14-1
14.1.2 CONCENTRATIONS IN VEGETATION-PRE-1993	14-4
14.1.3 CONCENTRATIONS IN SOIL	14-5
14.1.4 CONCENTRATIONS IN SEDIMENT	14-6
14.1.5 GAMMA RADIATION SURVEY	14-6
14.1.6 THERMOLUMINESCENT DOSIMETRY FOR DETERMINATION OF REGIONAL GAMMA RADIATION	14-7
14.1.7 CONCENTRATIONS OF RADIONUCLIDES IN GROUNDWATER	14-9
14.1.8 CONCENTRATIONS OF RADIONUCLIDES IN SURFACE WATER	14-9
14.2 RADIOLOGICAL IMPACT ON BIOTA AND MAN	14-10
14.2.1 RADON EXPOSURES TO THE SURROUNDING POPULATION	14-11
14.2.2 ATMOSPHERIC DISPERSION COMPUTER PROGRAM (MILDOS)	14-12
15. MINE PLAN	15-1
15.1 SITE LOCATION AND LAYOUT	15-1
15.2 ORE BODY DESCRIPTION	15-1
15.3 IN SITU LEACH MINING METHOD	15-5
15.4 GENERAL DESCRIPTION OF OPERATIONS	15-5
15.5 ACCESS AND WELLFIELD ROADS	15-8
15.6 WELLFIELD DESIGN AND OPERATION	15-12
15.7 WELL DRILLING AND COMPLETION	15-13
15.7.1 WELL COMPLETION METHODOLOGY	15-13
15.7.2 WELL DRILLING INTEGRITY LOGGING	15-15

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
15.8 RECOVERY PROCESS AND FACILITIES	15-19
15.8.1 PROCESS DESCRIPTION	15-19
15.8.2 LIXIVIANANT COMPOSITION	15-20
15.8.3 CHEMICAL REACTIONS	15-21
15.8.4 ABSORPTION CIRCUIT AND RESIN TRANSFER	15-21
15.8.5 PLANT BUILDING AND FACILITIES	15-23
15.8.6 PLANT EQUIPMENT, INSTRUMENTATION AND CONTROL	15-27
15.9 WASTE WATER TREATMENT SYSTEM	15-27
15.10 LAND APPLICATION OF WELLFIELD SOLUTIONS	15-33
15.10.1 INTRODUCTION	15-34
15.10.2 FACILITIES AND PROCESS DESCRIPTION	15-34
15.10.2.1. SITE LOCATION AND LAYOUT	15-34
15.10.2.2 URANIUM RECOVERY PROCESS DESCRIPTION	15-36
15.10.2.3 WASTE WATER TREATMENT	15-37
15.10.2.4 WASTE WATER STREAM DESCRIPTION	15-38
15.10.2.5 ESTIMATED WATER QUALITY FOR WASTE STREAMS	15-41
15.10.2.5.1. WORST CASE	15-41
15.10.2.5.2 MOST LIKELY CASE	15-43
15.10.2.6 IRRIGATION SYSTEM SPECIFICATION AND DESIGN ..	15-44
15.10.2.7 IRRIGATION AREA PLANTINGS AND CULTURAL PRACTICES	15-44
15.10.3 DESCRIPTION OF THE IRRIGATION AREA	15-45
15.10.3.1 TOPOGRAPHY AND SURFACE DRAINAGE	15-45
15.10.3.2 SOILS	15-46
15.10.3.3 VEGETATION	15-47
15.10.3.4 GROUND WATER HYDROLOGY	15-49
15.10.3.5 EXISTING WATER RIGHTS	15-51
15.10.4 METEOROLOGY	15-51
15.10.5 PROJECT SCHEDULE	15-51

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
15.10.6 IRRIGATION MANAGEMENT PRACTICES	15-52
15.10.6.1 SALINITY MANAGEMENT	15-52
15.10.6.1.1 CROP SELECTION	15-52
15.10.6.1.2 LEACHING FRACTION	15-52
15.10.6.1.3 IRRIGATION DEPTH	15-53
15.10.6.1.4 IRRIGATION SEQUENCING	15-54
15.10.6.1.5 CROP MANAGEMENT FACTORS	15-56
15.10.6.1.6 SOIL PROFILE MODIFICATION	15-56
15.10.6.2 LAND GRADING	15-56
15.10.6.3 IRRIGATION FREQUENCY	15-56
15.10.7 ENVIRONMENTAL IMPACTS	15-57
15.10.7.1 GENERAL	15-57
15.10.7.2 SOILS	15-57
15.10.7.2.1 SALINITY	15-58
15.10.7.2.2 SODICITY	15-59
15.10.7.2.3 SOIL RECLAMATION	15-59
15.10.7.2.4 RADIONUCLIDES	15-60
15.10.7.3 SELENIUM ACCUMULATION	15-61
15.10.7.3.1 SELENIUM ACCUMULATION IN THE SOILS	15-62
15.10.7.3.2 SELENIUM IMPACTS TO THE GROUND WATER	15-63
15.10.7.4 GROUND WATER	15-64
15.10.7.5 SURFACE WATER	15-64
15.10.7.6 WILDLIFE	15-65
15.10.8 ENVIRONMENTAL MONITORING	15-66
15.10.8.1 SUBSURFACE MONITORING	15-67
15.10.8.2 SURFACE WATER AND SEDIMENT MONITORING	15-67
15.10.8.3 SOIL SAMPLING	18-68

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
15.10.8.4 VEGETATION SAMPLING	15-68
15.10.9 RECLAMATION	15-71
15.10.10 IRRIGATION WATER AND SOIL MODELING	15-71
15.10.10.1 MODEL INPUTS	15-72
15.10.10.1.1 SOIL PROFILE	15-72
15.10.10.1.2 PLANT GROWTH AND CONSUMPTIVE WATER USE	15-73
15.10.10.1.3 IRRIGATION AND PRECIPITATION	15-73
15.10.10.2 MODEL SIMULATIONS	15-74
15.10.10.2.1 ROOT ZONE SIMULATION	15-74
15.10.10.2.2 GROUND WATER IMPACT SIMULATION	15-75
15.10.11 REFERENCES	15-77
15.11 PROJECTED MINING SCHEDULE	15-98
15.12 TOPSOIL MANAGEMENT PLAN	15-100
15.12.1 IDENTIFICATION OF TOPSOIL FOR SALVAGE	15-102
16. ENVIRONMENTAL MONITORING AND REPORTING	16-1
16.1 GROUNDWATER MONITORING	16-1
16.1.1 EXCURSION MONITORING	16-1
16.1.1.1 GENERAL DESCRIPTION	16-1
16.1.1.2 BASELINE GROUNDWATER QUALITY FOR DETECTION OF EXCURSIONS	16-2
16.1.1.3 EXCURSION PARAMETERS MONITORED DURING MINING	16-3
16.1.1.4 UPPER CONTROL LIMITS	16-3
16.1.1.5 EXCUSION REPORTING PROCEDURE	16-6
16.1.2 RESTORATION MONITORING	16-7

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>		<u>Page</u>
	16.1.2.1 GENERAL DESCRIPTION	16-7
	16.1.2.2 BASELINE GROUNDWATER QUALITY FOR RESTORATION WITHIN A MINING UNIT	16-7
	16.1.2.3 POST MINING RESTORATION SAMPLING AND REPORTING	16-8
	16.1.2.4 STABILITY SAMPLING AND WELLFIELD RELEASE	16-9
	16.1.3 RADIUM SETTLING POND LEAK DETECTION SYSTEM	16-9
16.2	SURFACE WATER AND SEDIMENT MONITORING	16-10
16.3	SOIL AND SEDIMENT SAMPLING DURING OPERATIONS	16-11
	16.3.1 SOIL SAMPLING IN PROCESS AREAS	16-11
	16.3.2 SOIL SAMPLING IN THE LAND APPLICATION AREA	16-12
16.4	VEGETATION SAMPLING	16-13
16.5	WILDLIFE MONITORING	16-14
16.6	RADIOLOGICAL MONITORING	16-17
	16.6.1 ENVIRONMENTAL THERMOLUMINESCENT DOSIMETRY	16-18
	16.6.2 ATMOSPHERIC RADON-222 MONITORING	16-18
16.7	LIQUID EFFLUENT MONITORING ASSOCIATED WITH LAND APPLICATION	16-18
	16.7.1 POND AND IRRIGATION MONITORING	16-18
	16.7.2 SHALLOW SOIL TENSIMETERS	16-20
	16.7.3 UNSATURATED ZONE MONITOR WELLS	16-20
16.8	SETTLING POND LEAK DETECTION SYSTEM	16-20
17.	RESTORATION AND RECLAMATION PLAN	17-1
	17.1 GROUND WATER RESTORATION SEQUENCE AND TIMING	17-1
	17.1.1 GROUND WATER QUALITY CLASSIFICATION	17-1
	17.1.2 RESTORATION - RESEARCH AND DEVELOPMENT	17-2
	17.1.3 RESTORATION DURING COMMERCIAL OPERATIONS	17-2
	17.2 SURFACE RECLAMATION	17-4

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
17.2.1 POST-MINING LAND USE	17-4
17.2.2 CONTOURING PLAN	17-5
17.2.3 WELLFIELD AND PLANT DISMANTLING	17-7
17.2.4 REVEGETATION PRACTICES	17-7
17.2.4.1 TEMPORARY STABILIZATION OF DISTURBED LANDS	17-7
17.2.4.2 FINAL REVEGETATION PROCEDURES	17-8
17.2.4.3 SEEDING SURFACE OWNER CONSENT FORMS	17-9
17.2.5 EVALUATION OF RECLAMATION SUCCESS	17-9
17.2.5.1 RECLAMATION GOALS AND COMMITMENTS	17-9
17.2.5.2 PROCEDURES FOR EVALUATION OF RECLAMATION SUCCESS	17-10
17.3 WELL ABANDONMENT PROCEDURE	17-12
17.4 RECLAMATION BOND ESTIMATE	17-13
17.4.1 BOND ESTIMATE - YEAR ONE	17-14
17.4.1.1 GROUNDWATER RESTORATION	17-15
17.4.1.2 WELLFIELD ABANDONMENT AND RECLAMATION	17-16
17.4.1.3 PLANT FACILITIES RECLAMATION	17-18
17.4.1.4 WATER TREATMENT PONDS AND IRRIGATION RESERVOIR	17-21
17.4.1.5 OTHER STRUCTURES AND FACILITIES	17-22
17.4.2 BOND ESTIMATE - YEAR FIVE	17-24
17.4.2.1 GROUNDWATER RESTORATION	17-24
17.4.2.2 WELLFIELD ABANDONMENT AND RECLAMATION	17-25
17.4.2.3 PLANT FACILITIES RECLAMATION	17-27
17.4.2.4 WATER TREATMENT PONDS AND IRRIGATION RESERVOIR	17-30
17.4.2.5 OTHER STRUCTURES AND FACILITIES	17-31

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
18. U.S. NUCLEAR REGULATORY COMMISSION SUPPORTING INFORMATION	18-1
18.1 RADIATION AND SAFETY PROGRAM	18-1
18.1.1 CORPORATE STRUCTURE	18-1
18.1.1.1 PRESIDENT, ENERGY FUELS NUCLEAR, INC.	18-1
18.1.1.2 GENERAL MANAGER AND RADIATION SAFETY AND ENVIRONMENTAL OFFICER	18-1
18.1.1.3 WELLFIELD GEOLOGIST/ENGINEER	18-3
18.1.1.4 OPERATIONS FOREMAN AND STAFF	18-3
18.1.1.5 MANAGER OF ENVIRONMENTAL AFFAIRS, HEALTH AND SAFETY	18-4
18.1.2 OPERATIONS MANUAL AND SPECIAL WORK PERMITS	18-4
18.1.3 INSPECTION AND AUDIT PROGRAM	18-4
18.1.4 GENERAL MANAGER AND RADIATION SAFETY AND ENVIRONMENTAL OFFICER QUALIFICATIONS	18-6
18.1.5 RADIATION AND SAFETY TRAINING PROGRAM	18-6
18.1.6 SITE SECURITY	18-6
18.1.7 PERSONNEL RADIATION MONITORING PROGRAM	18-8
18.1.7.1 SOURCES AND CONTROL OF EFFLUENT	18-8
18.1.7.2 GAMMA SURVEYS	18-9
18.1.7.3 PERSONNEL THERMOLUMINESCENT DOSIMETRY	18-9
18.1.7.4 BIOASSAY PROGRAM	18-10
18.1.7.5 AIRBORNE URANIUM PARTICULATE MONITORING	18-10
18.1.7.6 RADON DAUGHTER SURVEYS	18-10
18.1.7.7 PERSONNEL EXPOSURE DETERMINATIONS	18-10
18.1.7.8 ALPHA SURVEYS	18-11
18.1.7.9 RADIATION INSTRUMENTATION	18-11
18.1.7.10 PROTECTIVE EQUIPMENT AND CLOTHING	18-13
18.1.8 AIRBORNE EFFLUENT MONITORING	18-13
18.1.9 ENVIRONMENTAL MONITORING PROGRAM	18-13

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
18.2 ENVIRONMENTAL EFFECTS OF ACCIDENTS	18-13
18.2.1 SURFACE ACCIDENTS	18-14
18.2.1.1 FAILURE OF PROCESS AND CHEMICAL STORAGE TANKS	18-14
18.2.1.2 PIPE FAILURES	18-14
18.2.1.3 RADIUM TREATMENT POND LEAKAGE	18-15
18.2.1.4 TORNADOS	18-15
18.2.2 SUBSURFACE ACCIDENTS	18-15
18.2.2.1 WELL CASING FAILURE	18-15
18.2.2.2 HYDRAULIC FRACTURING	18-16
18.2.2.3 EXCURSION CONTROL - MONITOR WELLS	18-16
18.2.3 TRANSPORTATION ACCIDENTS	18-16
18.2.3.1 CHEMICALS AND FUELS SHIPMENT ACCIDENTS	18-17
18.2.3.2 RESIN SHIPMENT ACCIDENTS	18-17
18.3 ECONOMIC AND SOCIAL EFFECTS OF THE PROJECTS	18-18
18.3.1 BENEFITS	18-18
18.3.1.1 UNITED STATES NUCLEAR ENERGY SUPPLY	18-18
18.3.1.2 EMPLOYMENT AND INCOME	18-18
18.3.1.3 TAXES	18-19
18.3.1.4 ROADS	18-19
18.3.2 COSTS	18-19
18.3.2.1 PUBLIC FACILITIES AND SERVICES	18-19
18.3.2.2 HOUSING	18-20
18.3.2.3 IMPAIRMENT OF HISTORICAL, SCENIC AND RECREATION VALUES	18-20
18.4 ALTERNATIVES TO THE PROPOSED PLAN	18-20
18.4.1 ALTERNATE METHODS OF MINING	18-20
18.4.2 ALTERNATE CHEMICAL PROCESSES FOR LEACHING	18-21
18.4.3 ALTERNATIVE SITES	18-21
18.4.4 ALTERNATIVE ENERGY SOURCES	18-21

TABLE OF CONTENTS

(Continued)

RENO CREEK ISL PROJECT

VOLUME I

<u>Section</u>	<u>Page</u>
18.5 BENEFIT - COST ANALYSIS	18-22
18.6 ENVIRONMENTAL APPROVALS AND CONSULTATIONS	18-22
18.7 MINIMUM REQUIREMENTS FOR SUPERVISORY PERSONNEL AT THE RENO CREEK ISL PROJECT	18-22
18.8 ATMOSPHERIC DISPERSION MODELLING ASSUMPTIONS AND RESULTS	18-24
18.8.1 PROCESS DESCRIPTION AS IT RELATES TO MILDOS-AREA ASSUMPTIONS	18-26
18.8.2 SOURCE TERM ASSUMPTIONS	18-26
18.8.3 MILDOS-AREA SOURCE DESCRIPTIONS AND LOCATIONS	18-27
18.8.4 RECEPTOR DESCRIPTIONS AND LOCATIONS	18-29
18.8.5 USNRC APPENDIX A INFORMATION	18-31
18.8.6 CALCULATION OF RADON DOSE EQUIVALENT AT PERMIT BOUNDARY DUE TO RADON DAUGHTERS	18-31
APPENDIX A INFORMATION NEEDED BY NRC STAFF TO PERFORM RADIOLOGICAL IMPACT EVALUATIONS FOR COMMERCIAL-SCALE IN SITU URANIUM SOLUTION MINING FACILITIES	18-33

TABLE OF CONTENTS
RENO CREEK ISL PROJECT
FIGURES

<u>Figure</u>		<u>Page</u>
Figure 1.1	Reno Creek ISL Project Location	1-3
Figure 2.1	Surface Ownership Map	2-39
Figure 2.2	Surface Agreements and Grazing Rights	2-40
Figure 2.3	Rights of Way	2-41
Figure 2.4	Mineral Ownership Map	2-42
Figure 2.5	Oil and Gas Leases	2-43
Figure 2.6	Mineral Lease and Claim Map	2-44
Figure 8.1	Wind Rose - Casper, Wyoming, 1985 through 1989	8-13
Figure 9.1	Geologic Map of the Powder River Basin	9-2
Figure 9.2	Generalized Stratigraphic Column	9-4
Figure 9.3	Reno Creek Project Type Log	9-6
Figure 9.4	Seismic Risk Map of U.S.	9-8
Figure 10.3-1	Well Locations RME-Pilot Patterns	10-24
Figure 10.4-1	Permitted Groundwater and Surface Water Map	10-57
Figure 10.5-1	Location of Wellfield and Simulated Drawdown Grid	10-95
Figure 10.5-2	Drawdown Changes Adjacent to Mining Unit #1	10-96
Figure 10.5-3	Recommended Spacing Between Monitoring Wells for Mining Unit #1	10-97
Figure 10.5-4	Water Level Change Along a Line Between Injection and Recovery Wells	10-98
Figure 14.1	Sample Locations	14-3
Figure 15.1	Site Plan	15-2

TABLE OF CONTENTS
RENO CREEK ISL PROJECT
FIGURES

<u>Figure</u>		<u>Page</u>
Figure 15.2	Process Area Layout	15-3
Figure 15.3	Mine Access & Wellfield Roads	15-9
Figure 15.4	Typical Production Well	15-16
Figure 15.5	Typical Injection Well	15-17
Figure 15.C	Typical Monitor Well	15-18
Figure 15.7	Satellite Plant Process Flow Diagram	15-22
Figure 15.8	Resin Transfer System Flow Diagram	15-24
Figure 15.9	Satellite Building	15-25
Figure 15.10	Office & Laboratory Building Plan View	15-26
Figure 15.11	Waste Water Treatment System Process Flow Diagram	15-29
Figure 15.12	Waste Water Treatment System	15-30
Figure 16.1	Environmental Monitor Points During Operation	16-15
Figure 18.1	Reno Creek In Situ Mining Organization Chart	18-2
Figure 18.2	Restricted & Controlled Access Areas	18-7
Figure 18.3	Mildos Source & Close Proximity Receptor Locations	18-30
Figure 18.4	Frequency of Winds by Wind Speed & Stability Class	18-28

TABLE OF CONTENTS
RENO CREEK ISL PROJECT
VOLUME I

<u>Section</u>	<u>Page</u>
Table 5.1 Population Distribution	5-2
Table 8.1 Casper Average Snow Fall	8-2
Table 8.2 1990 Casper Relative Humidity	8-3
Table 8.3 Monthly Precipitation, Casper	8-4
Table 8.4 Monthly Precipitation - Gillette	8-5
Table 8.5 Monthly Precipitation - Kaycee	8-6
Table 8.6 Monthly Precipitation - Midwest	8-7
Table 8.7 Temperature Data - Casper, Wyoming	8-8
Table 8.8 Temperature Data - Gillette, Wyoming	8-9
Table 8.9 Temperature Data - Kaycee, Wyoming	8-10
Table 8.10 Temperature Data - Midwest, Wyoming	8-11
Table 8.11 Average Sky Cover - Casper	8-12
Table 10.2-1 Summary of Stream Discharge Data - Belle Fourche and Cheyenne Rivers	10-7
Table 10.2-2 Estimated Peak and Mean Annual Flows in the Reno Creek Area	10-8
Table 10.2-3 Surface Water Quality Data	10-9
Table 10.3-1 Reno Creek Basic Well Information	10-25
Table 10.3-2 Inventory of Regional Wells and Springs in the Vicinity of the Reno Creek Project	10-26
Table 10.3-3 Summary of Aquifer Characteristics	10-28
Table 10.3-3a Comparison of Ore Sand Aquifer Characteristics Derived from EFNI (Hydro)and RME Pump Tests	10-23
Table 10.3-4 Water-Level Data - Project Wells	10-30
Table 10.3-5 Groundwater Quality Data - Project Wells	10-34
Table 10.3-6 Groundwater Quality Data - Regional Wells	10-43
Table 10.3-7 Summary of Laboratory Aquitard Properties	10-55
Table 10.5-1 Input Parameters for the Reno Mining Unit #1 Simulation	10-90

TABLE OF CONTENTS
RENO CREEK ISL PROJECT
VOLUME I

<u>Section</u>	<u>Page</u>
Table 10.5-2	Drawdown Results for 1% Bleed Rate 10-105
Table 10.5-3	Drawdown Results for 2% Bleed Rate 10-106
Table 10.5-4	Drawdown Results for 3% Bleed Rate 10-107
Table 10.5-5	Drawdown Results for 2% Bleed Rate With Additional 20 GPM in Five Wells 10-108
Table 10.5-6	Permit Hydrologic Monitoring 10-109
Table 10.5-7	Input Parameters for Simulation of a 4 X 4 Reno Well Pattern 10-110
Table 10.5-8	Drawdown Results for the 4 X 4 Well Pattern Simulation 10-119
Table 11.1	Topsoil Volume Summary 11-4
Table 12.3.1	Acreages of Each Vegetation Type within the Study Area 12-13
Table 12.3.2	1993 Energy Fuels Upland Grassland Cover 12-14
Table 12.3.3	1993 Energy Fuels Big Sagebrush Cover 12-17
Table 12.3.4	1993 Energy Fuels Meadow Cover 12-20
Table 12.3.5	Summary of Percent Absolute Cover Data 12-24
Table 12.3.6	Sample Adequacy of Derived Cover Data 12-25
Table 13.1	1993 Aerial Survey Pronghorn Data 13-9
Table 13.2	1993 Mule Deer Observations 13-12
Table 13.3	1993 Raptor Nests 13-14
Table 13.4	1993 MBHFI Status in Northeast Wyoming 13-17
Table 14.1	Baseline Vegetation Samples 14-2
Table 14.2	Radionuclide Concentrations in Vegetation 14-4
Table 14.3	Environmental Gamma Radiation 14-6
Table 14.4	Environmental Radon Concentrations 14-13

TABLE OF CONTENTS
RENO CREEK ISL PROJECT
VOLUME I

<u>Section</u>	<u>Page</u>
Table 15.1	Anticipated Major Equipment List 15-28
Table 15.2	Water Balance 15-40
Table 15.3	Mine and Restoration Schedule 15-41
Table 15.4	Summary of Topsoil Characteristics for Soils Within Proposed Irrigation Area 15-48
Table 15.5	Environmental Monitoring Summary 15-70
Table 15.6	Summary of Results From Root Zone Leaching Simulations 15-76
Table 15 C-1	Typical Leachm Input File For Root Zone Simulation 15-79
Table 15 C-2	Leachm Input File for 44 Meter Profile 15-88
Table 15.7	Mine and Restoration Schedule 15-99
Table 16.1	Baseline Water Quality Parameters 16-4
Table 16.2	Parameters for Sediment and Soil Analysis 16-11
Table 16.3	Parameters for Analysis For Vegetation 16-13
Table 16.4	Radionuclides Monitoring 16-19
Table 17.1	Final Reclamation Seed Mix 17-8
Table 18.1	Instrumentation for Radiological Surveys 18-12
Table 18.2	Permits and Licenses 18-23
Table 18.3	Mildos Receptor Locations & Individual Receptor Location Data 18-25
Table 18.4	Radon Daughter Concentrations with Equilibrium Factors 18-32

VOLUME II

PLATES

Plate 4.1	Surface Lands Within the Permit Area
Plate 9.1	Cross Section Index Permit Area
Plate 9.2	Permit Area Structural Cross Section A-A
Plate 9.3	Permit Area Structural Cross Section B-B
Plate 9.4	Permit Area Structural Cross Section C-C
Plate 9.5	Permit Area Structural Cross Section D-D
Plate 9.6	Permit Area Structural Cross Section E-E
Plate 9.7	Permit Area Structural Cross Section F-F
Plate 9.8	Permit Area Structural Cross Section N-N
Plate 9.9	Permit Area Structural Cross Section M-M
Plate 9.10	Drill Hole Locations
Plate 10.2-1	Location of Regional Wells & Drainage Basins
Plate 10.3-1	Piezometric Map for the Ore Sand Aquifer, FT-MSL
Plate 10.3-2	Piezometric Map for the Upper Aquifer FT-MSL
Plate 10.3-3	Isopach Map of Upper Aquitard
Plate 10.5-1	Hydrologic Monitoring Site Locations
Plate 11.1	Baseline Soil Inventory Reno Creek Project
Plate 12.1	Baseline Vegetation Inventory
Plate 13.1	1993 Wildlife Baseline Big Game & Raptor Nests
Plate 13.2	1993 Wildlife Baseline Habitats
Plate 14.1	Regional Radiological Sample Locations
Plate 14.2	Gamma Survey, Soil & Vegetation Locations
Plate 15.1	Mine Plan
Plate 15.2	Treatment Pond Reno Creek Project

Plate 15.3	Irrigation Reservoir Reno Creek Project
Plate 15.4	Irrigation Pipeline and Area Layout
Plate 15.5	Geologic X-Section 1-1' in the Irrigation Area
Plate 16.1	Environmental Monitoring Site Locations
Plate 18.1	Mildos Remote Receptors and Demographics

VOLUME III

ATTACHMENTS

Attachment 9.1	Reno Creek Development Permit Area Drill Hole Data - Grid Block Listing
Attachment 9.2	Reno Creek Development Permit Area Drill Hole Data - Sequential Listing
Attachment 10.1	RME Pump Tests, EFNI Pump Tests and Aquifer Test Theory
Attachment 11.1	Soil Series Descriptions and Analyses
Attachment 14.2	Baseline Gamma Survey
Attachment 15.1	Reno Creek Project Demonstrated Restoration Report
Attachment 16.1	Water Quality Methodology WDEQ Guideline #8
Attachment 17.1	Bond Estimate Worksheets and References
Attachment 17.2	Reseeding Consents
Attachment 18.1	Mildos-Area Model Output