WHITE RIVER SHALE PROJECT

ERDA PRESENTATION

3/31/77

WHITE RIVER SHALE PROJECT

Technology Development and Demonstration Program

WRSP

To Produce Shale Oil from Federal Leases U-a and U-b in Utah

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SLIDE R-1

THE WRSP PRESENTATION WILL:

Part 1– Review

- Progress in development of U-a and U-b

Part 2– Present

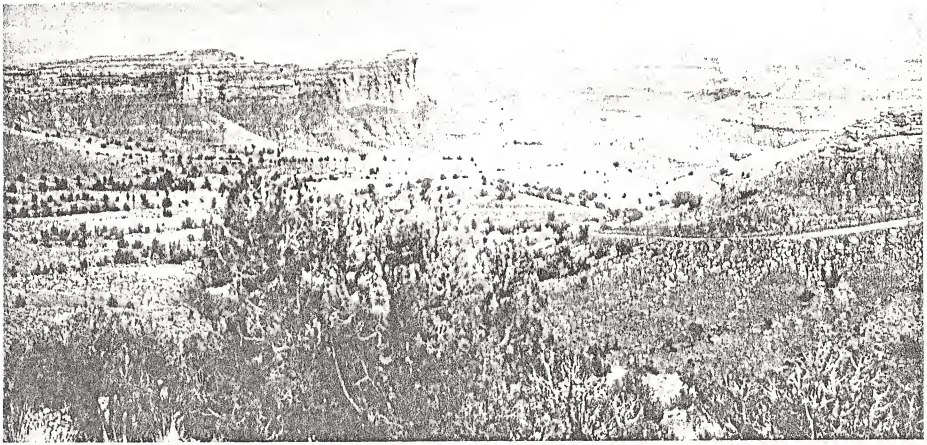
- Proposed technology development and demonstration program

Part 3– Review

- Schedules
- Cost estimates
- Financing plans
- Continuing development requirements

THE FEDERAL PROTOTYPE OIL SHALE PROGRAM WAS INTENDED TO:

- Provide a new source of energy by stimulating development of commercial oil shale technology by private industry
- Ensure the environmental integrity of the area and develop restoration techniques
- Permit an equitable return to all parties
- Develop federal management expertise in the supervision of oil shale development



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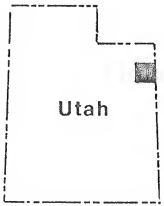
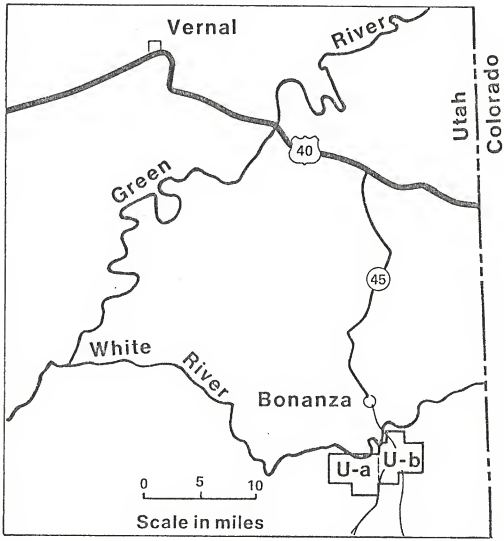
WRSP LOCATION



Area of location map



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SLIDE R-3

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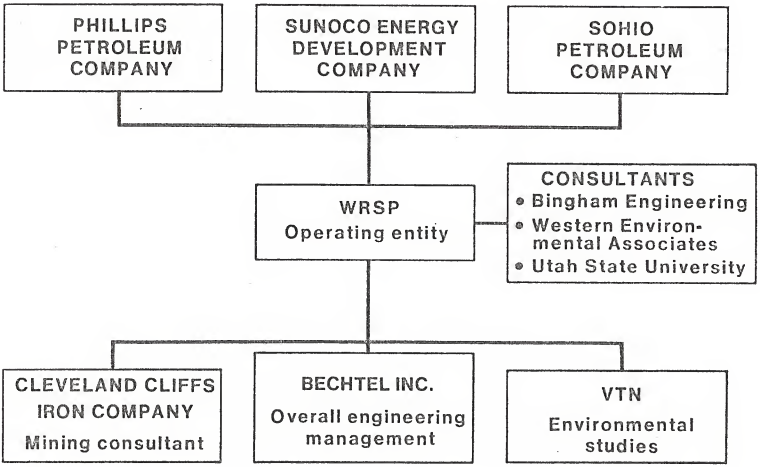
SLIDE L-4

WRSP ORGANIZATION CHART



WRSP ACTIVITIES
1974 TO 1977

- Exploration program
- Environmental studies
- Water supply
- Socioeconomic study
- Engineering studies
- Detailed development plan (DDP)
- Post DDP studies and tests
- Proposed technology development and demonstration program

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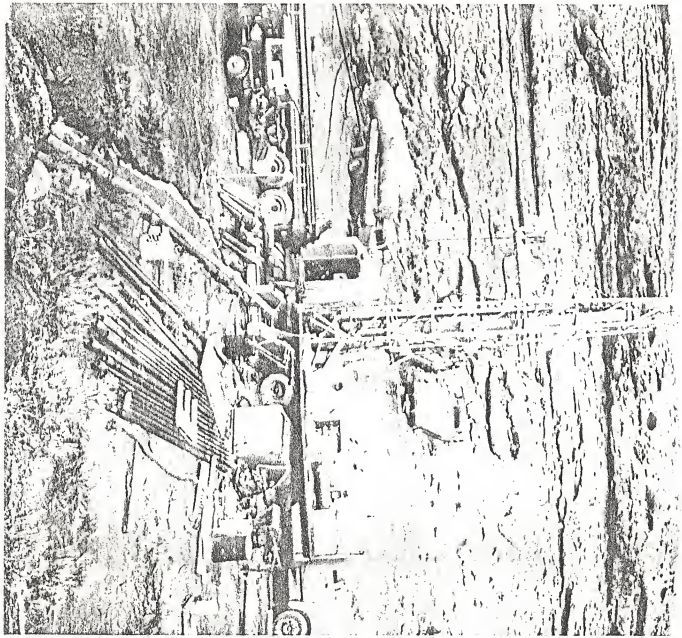
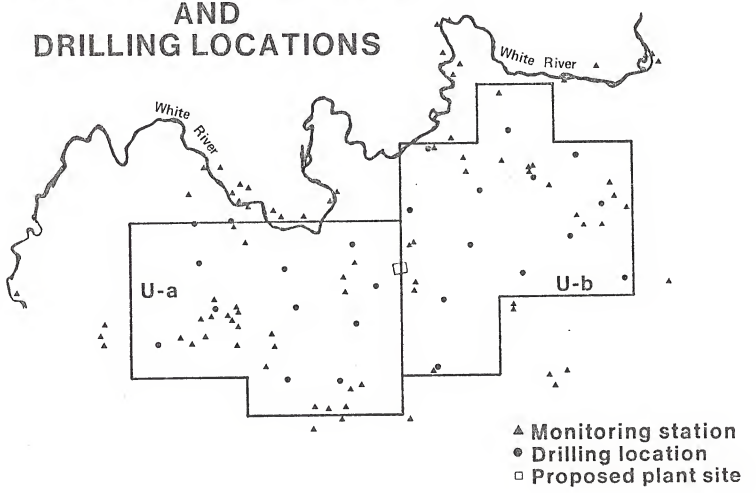


MONITORING STATIONS AND DRILLING LOCATIONS



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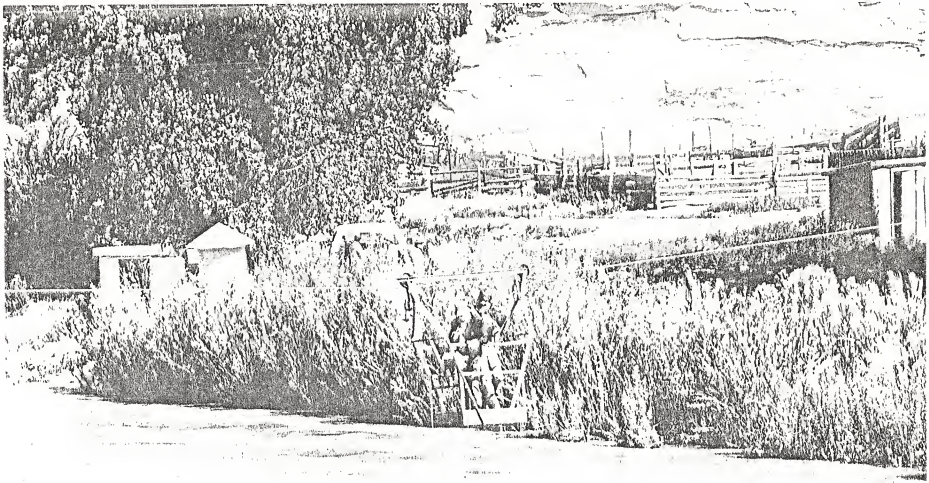

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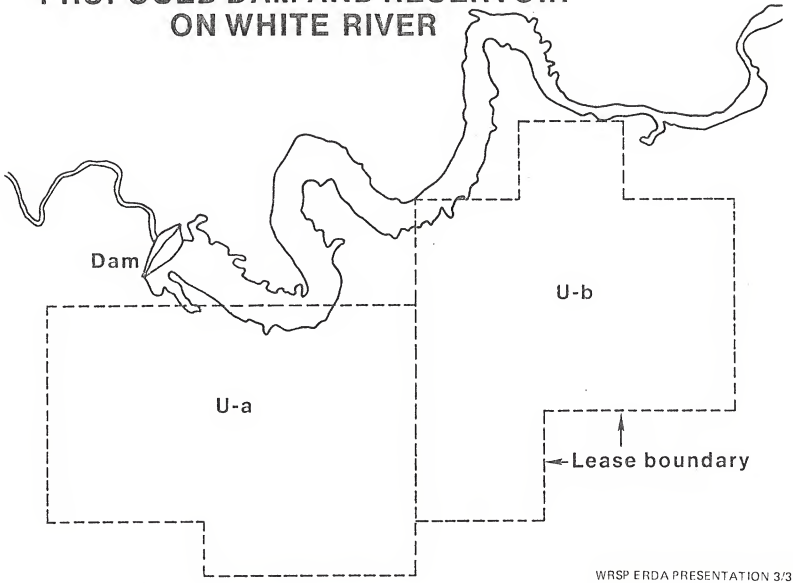
SLIDE R-8

STATE OF UTAH WHITE RIVER DAM AND RESERVOIR

- Proposed multiuse water storage
- Located adjacent to tracts U-a andU-b
- Sponsorship
  - Uintah Water Conservancy District
  - Ute Indian tribe
  - Utah State Board of Water Resources
- Objectives
  - Provide water for:
    Ute land irrigation
    Oil shale development
  - Improve water quality
  - Protect against floods
  - Provide recreation

STATE OF UTAH
PROPOSED DAM AND RESERVOIR
ON WHITE RIVER



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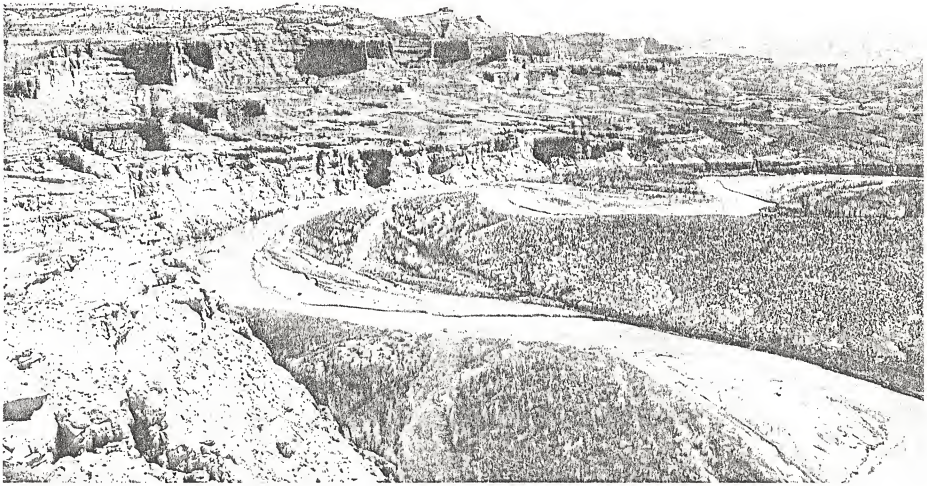

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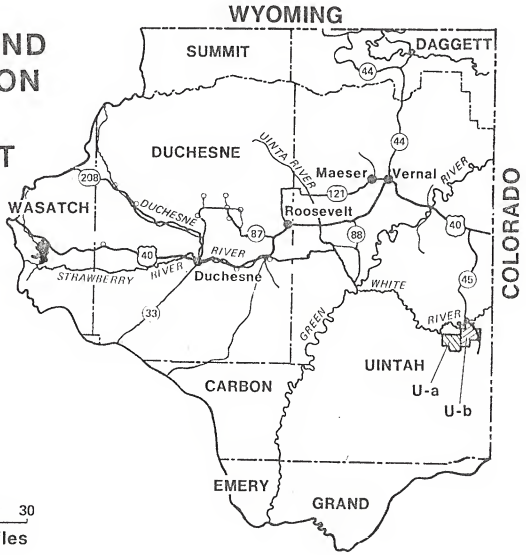
SLIDE R-10

WRSP ACTIVITIES
1974 TO 1977

- Exploration program
- Environmental studies
- Water supply
- Socioeconomic study
- Engineering studies
- Detailed development plan (DDP)
- Post DDP studies and tests
- Proposed technology development and demonstration program

URBAN AREAS AND TRANSPORTATION ROUTES IN NORTHEAST UTAH



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SLIDE R-11

UTAH COMMUNITY PLANNING GROUPS

- Energy Manpower Task Force
- Uintah Basin Energy Council
- Uintah Basin Human Development Council
- Uintah Basin Economic Development District Committee

ENGINEERING STUDIES COMPLETED

- Preliminary economic report
- Commercial development reports
- Retort evaluation studies
- Processing evaluation study
- Water supply and drainage plan
- Mining studies
- Detailed development plan (DDP)

SUMMARY OF DDP FINDINGS

- Modular demonstration on Utah shale required
- Joint government and industry funding required
- Resolution of problems necessary
  - Air quality
  - National energy policy
  - Prototype program lease provisions

POST DDP ACTIVITIES

- Exploration and mining studies
- Retort evaluation
- Retorting of Utah shale
  - Paraho DH
  - Union B
- Raw shale oil combustion tests
- Raw shale oil pumpability tests
- Environmental studies
- Technology development and demonstratration program

PART 2

WRSP PROPOSED TECHNOLOGY DEVELOPMENT AND DEMONSTRATION PROGRAM

OBJECTIVES OF PROPOSED PROGRAM

- Demonstrate:
  - Room-and-pillar mining in Utah oil shale
  - In-situ retorting technology
  - Surface retorting technologies
  - Environmental protection techniques
- Optimize resource recovery
- Promote development of Utah oil shale

TECHNOLOGIES SELECTED FOR DEVELOPMENT AND DEMONSTRATION

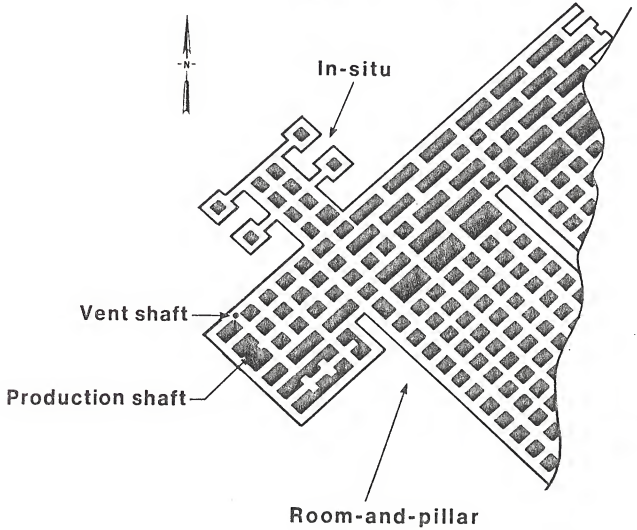
Mining:

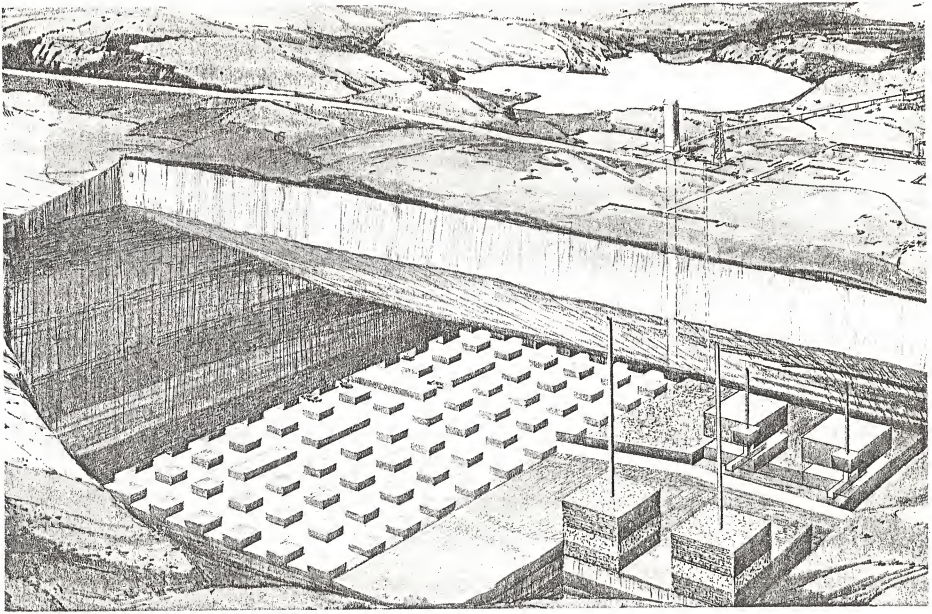
- Two level room-and-pillar
- In-situ retort preparation

Retorting:

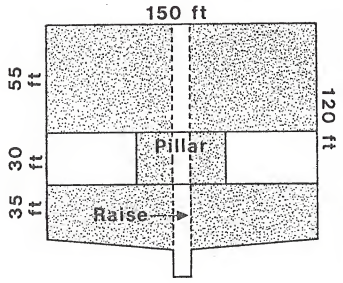
- In-situ
- Paraho DH – direct heated process
- Union B – indirect heated process

MINE PLAN

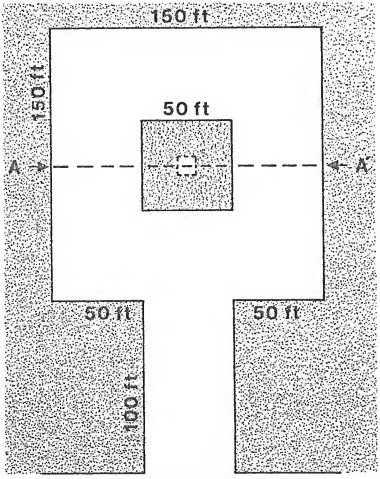




IN-SITU RETORT CROSS SECTION AND PLAN

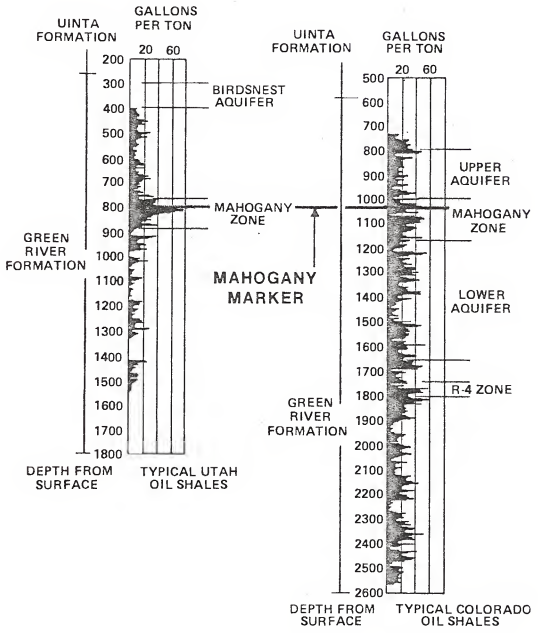


VERTICAL CROSS SECTION
A-A'



Haulage way
PLAN VIEW

COMPARISON OF UTAH AND COLORADO HISTOGRAMS



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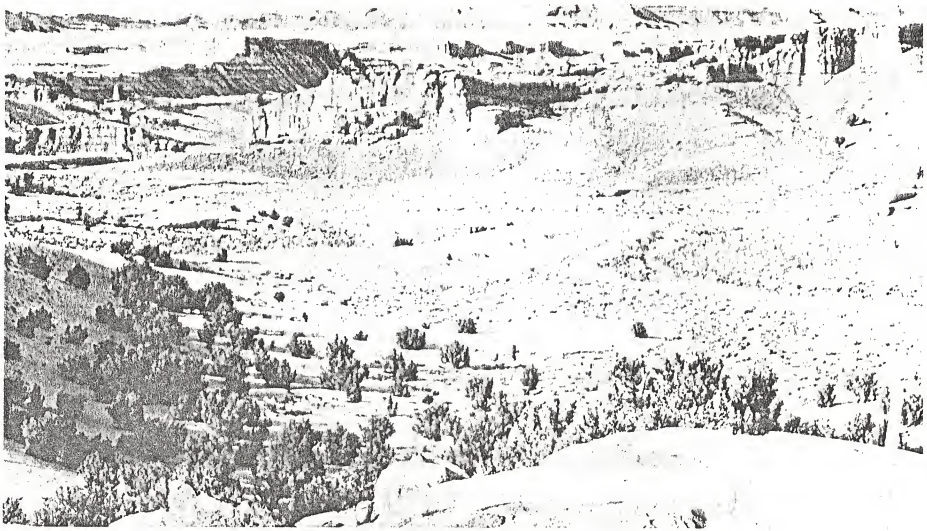
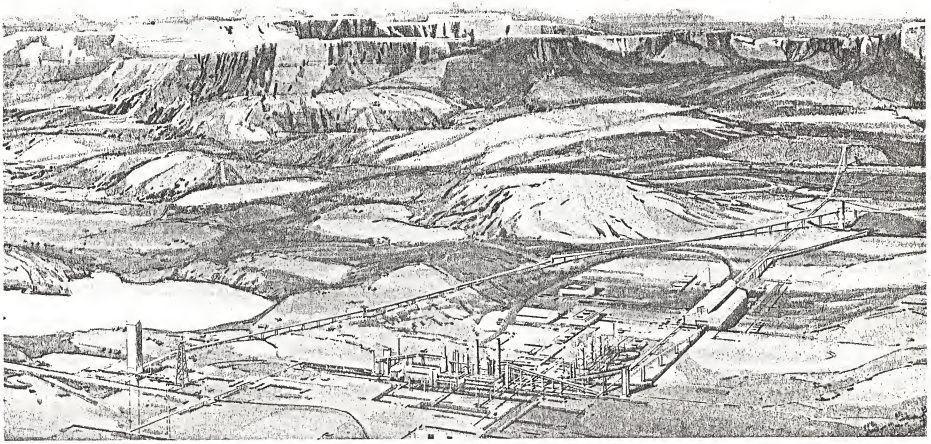
SLIDE L-15





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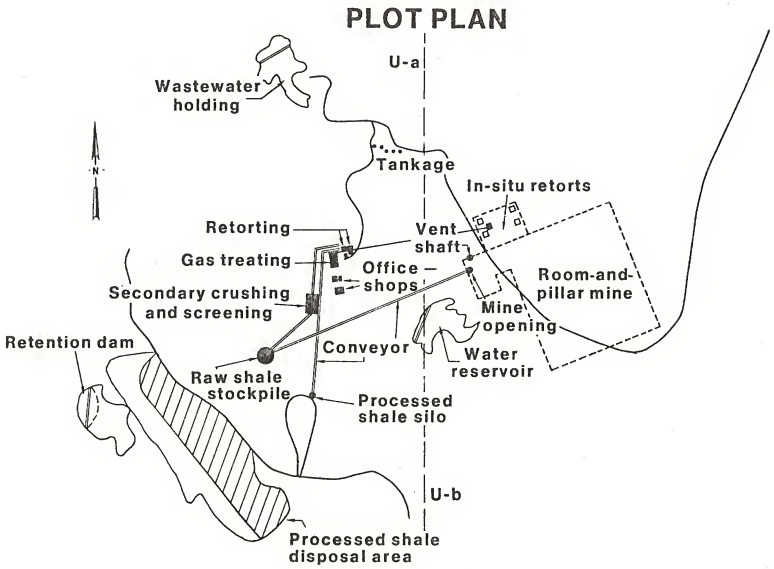
SLIDE L-16

SURFACE FACILITIES

- Mine—hoist, ventilation fans
- Materials handling systems
- Retorts—Paraho DH, Union B
- Processed shale systems
- Supporting facilities
- Environmental



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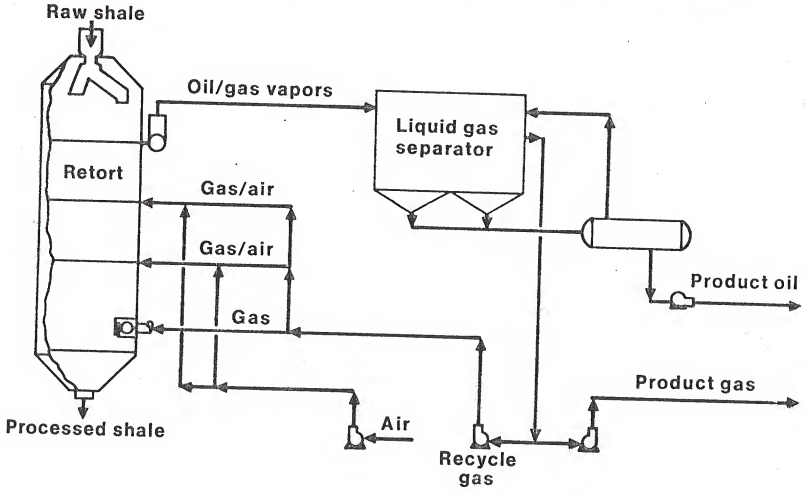
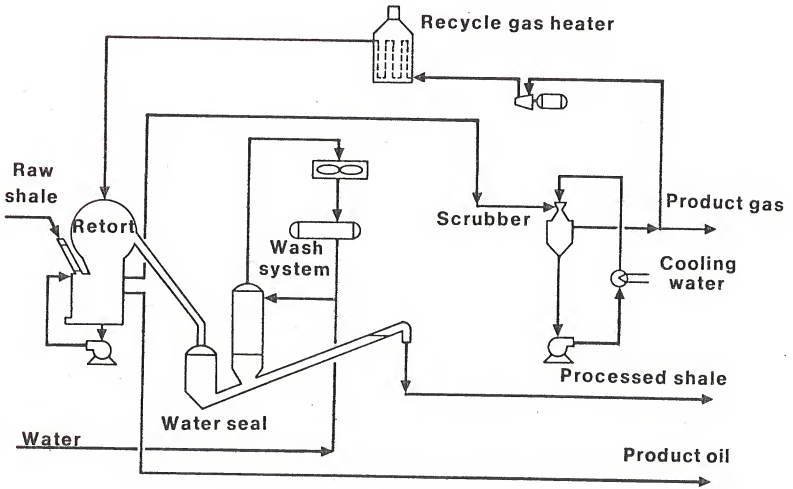
SLIDE L-17

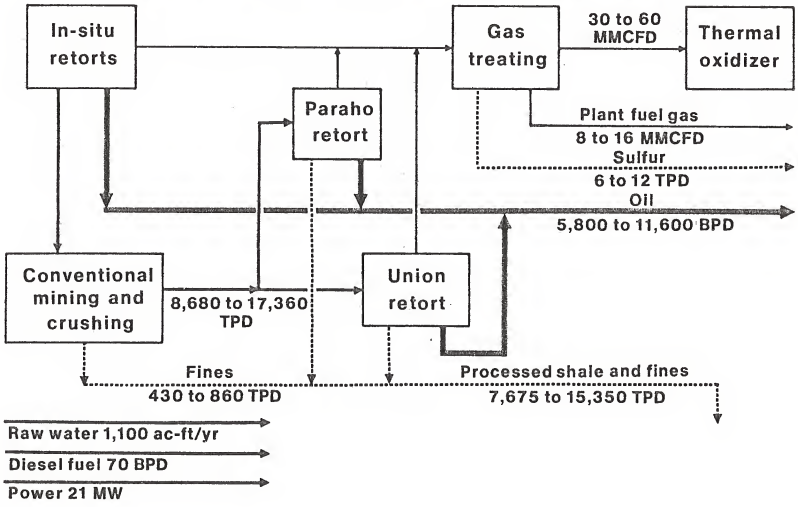
PARAHO DH PROCESS FLOW DIAGRAM



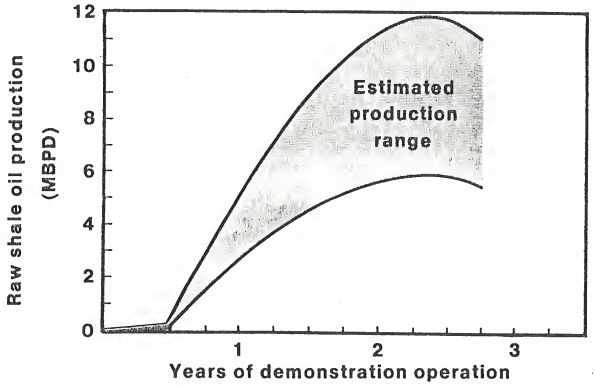
UNION B PROCESS FLOW DIAGRAM



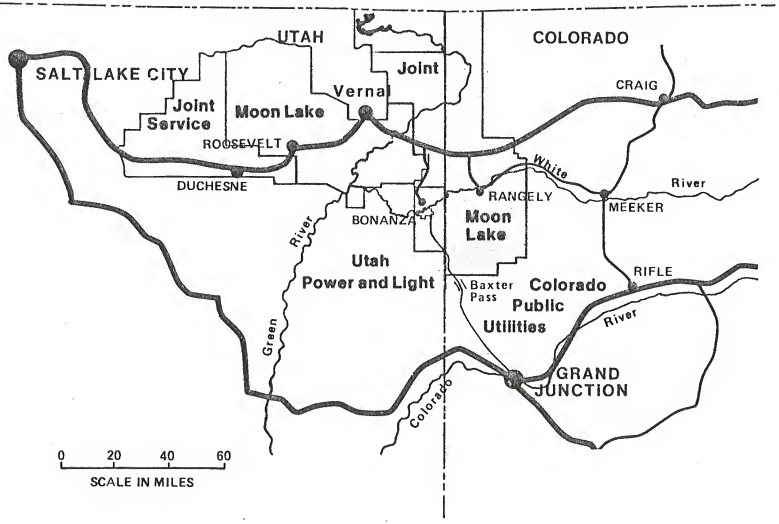
MATERIALS BLOCK FLOW DIAGRAM



ESTIMATED RANGE OF PRODUCTION



POTENTIAL RAW SHALE OIL MARKETS



ENVIRONMENTAL RESEARCH PLAN

- Characterize emissions
- Evaluate control strategies
- Monitor impacts
- Develop commercial management program

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SLIDE R-28

OBJECTIVES OF PROPOSED PROGRAM

- Demonstrate:
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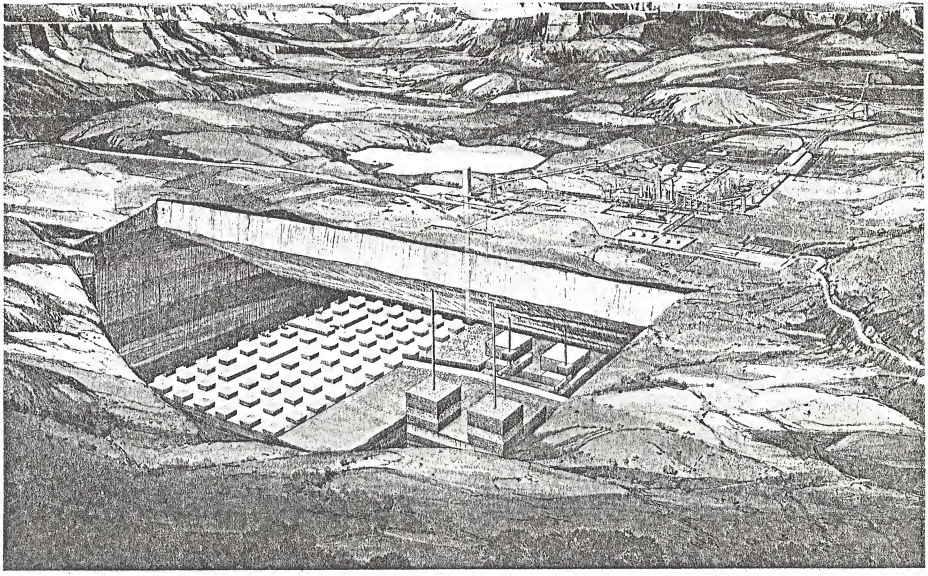
  - In-situ retorting technology
  - Surface retorting technologies
  - Environmental protection techniques
- Optimize resource recovery
- Promote development of Utah oil shale



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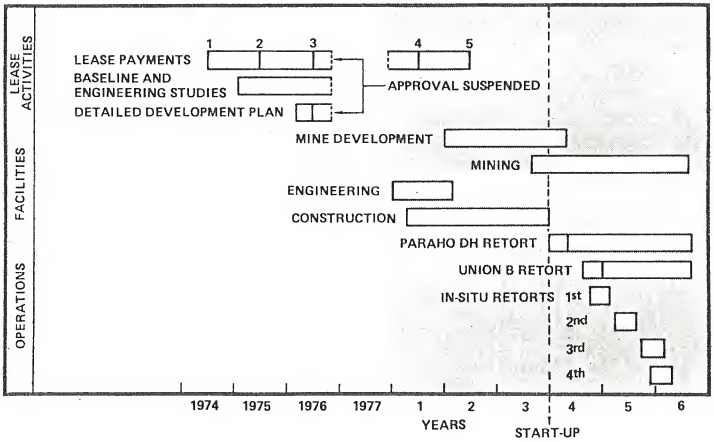
SLIDE R-29

PART 3

REVIEW

- Schedule of events
- Costs
  - Investment
  - Operating
- Financing Plans
- Continuing development requirements
- Summary

PROGRAM - SCHEDULE OF DEVELOPMENT

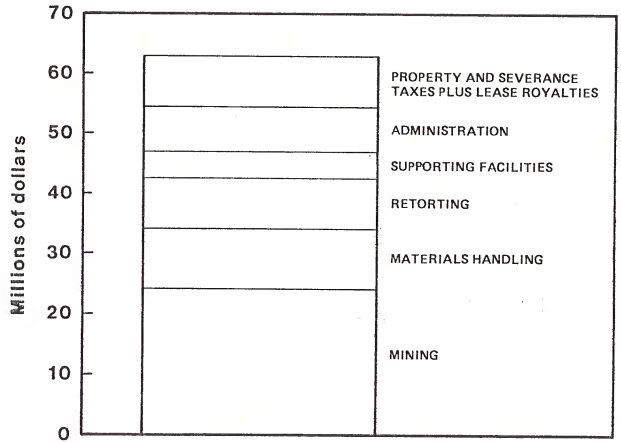


DEMONSTRATION PROGRAM
CAPITAL INVESTMENT
(1977 $)

	$ millions
Mining and materials handling	34.7
Retorting	64.2
Processed shale disposal	3.6
Site preparation	10.5
Supporting facilities	33.6
Total contractor costs	146.6
Environmental monitoring	6.3
Startup and other costs	24.4
Total capital investment	177.3

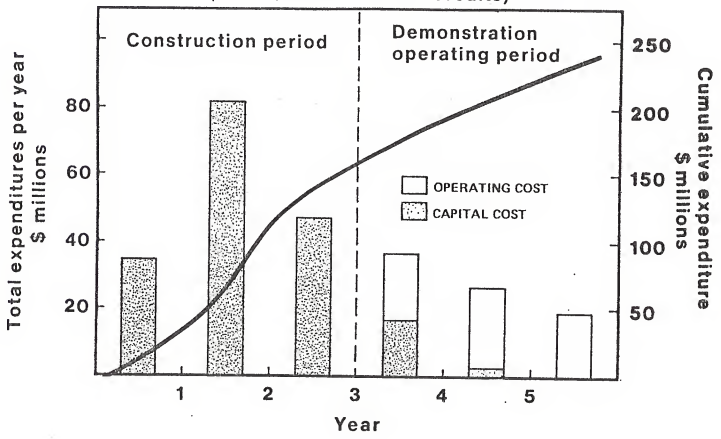
DEMONSTRATION PROGRAM TOTAL DIRECT OPERATING COST FOR 2.75 YEAR OPERATION

(1977 $)



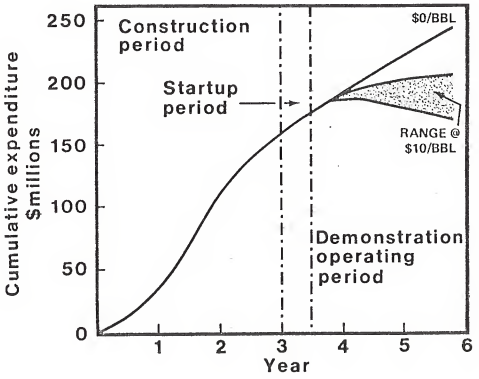
DEMONSTRATION PROGRAM EXPENDITURES

(1977 $ – No Product Credits)



DEMONSTRATION PROGRAM COSTS WITH SHALE OIL SALES CREDIT AT $10/BBL

(1977 $)



DEMONSTRATION PROGRAM
PROPOSED PROGRAM FINANCING
(1977 $)

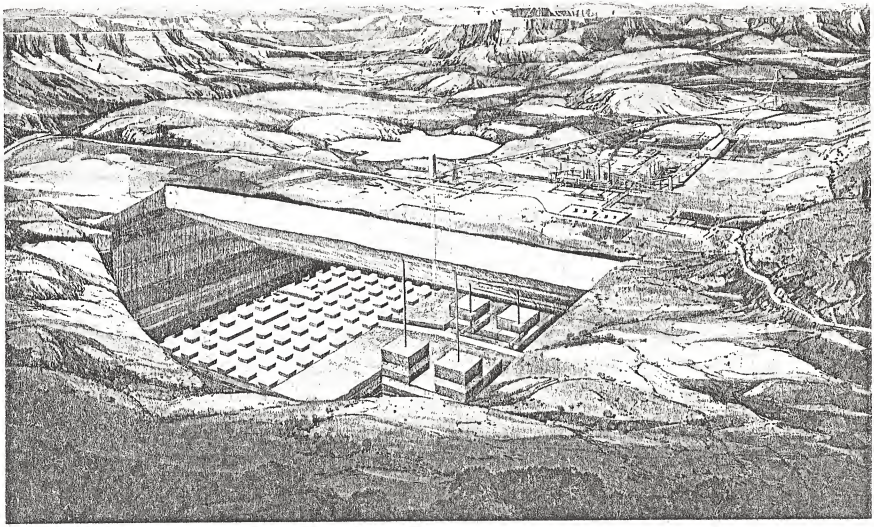
		$ millions
COSTS		
Capital investment		177
Operating cost		63
Modification capital		6
Total		246
SOURCES		
• WRSP		
Predevelopment engineering	6.0	
Environmental studies	7.5	
4th and 5th lease payments	48.3	
	61.8	61.8
• Government financing		184.2
Total sources		246.0
Potential oil credit @ $10/bbl	37 to 74	

CONTINUING DEVELOPMENT REQUIREMENTS PROBLEM AREAS

- Air quality regulations
  - Baseline readings exceed ambient air standards
- Lease schedules
  - Credit of 4th and 5th lease payments
- National energy policy uncertainties

SUMMARY

- Commitment to oil shale development
- Assets employed or pending commitment
  - Employed to date – $85 million
  - 4th and 5th lease payments pending – $48 million
- Post DDP tests and studies
- Utah support of oil shale development
- Oil shale – most attractive synthetic fuel
- Demonstration program required before commercialization to:
  - Assess technology and economics
  - Determine environmental protection measures required
  - Evaluate Utah oil shale



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