ALO/3992-1
DISTRIBUTION CATEGORIES
UC-66H AND UC-66I

REGIONAL OPERATIONS RESEARCH PROGRAM
FOR DEVELOPMENT OF GEOTHERMAL ENERGY
IN THE SOUTHWEST UNITED STATES

APPENDIX 5 OF

FINAL TECHNICAL REPORT
JUNE 1977 TO AUGUST 1978

JANUARY 1979

WORK PERFORMED UNDER DOE CONTRACT No. EG-77-S043992
FOUR CORNERS REGIONAL COMMISSION No. 672-066-075
NEW MEXICO DEPARTMENT OF ENERGY AND MINERALS No. 76-262

PREPARED FOR
DEPARTMENT OF ENERGY
DIVISION OF GEOTHERMAL ENERGY

FOUR CORNERS REGIONAL COMMISSION

**NEW
MEXICO
ENERGY
INSTITUTE**

NEW MEXICO ENERGY AND
MINERALS DEPARTMENT

P.O. Box 3EI Las Cruces, New Mexico 88003
505-646-1745

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

ALO/3992-1
Distribution Categories
UC-66h and Uc-66l

REGIONAL OPERATIONS RESEARCH PROGRAM
FOR DEVELOPMENT OF GEOTHERMAL ENERGY
IN THE SOUTHWEST UNITED STATES

Appendix 5 of

Final Technical Report
June 1977 to August 1978

January 1979

New Mexico Energy Institute
New Mexico State University
Las Cruces, New Mexico

Prepared for the
Department of Energy Division of Geothermal Energy
Under Contract No. EG-77-S043992
Four Corners Regional Commission
Under Contract No. 672-066-075
New Mexico Energy and Minerals Department
Under Contract No. 76-262

NOTICE

This report was prepared to document work sponsored by the United States Government. Neither the United States nor its agent, The Department of Energy, nor any Federal employees, nor any of their contractors, subcontractors or their employees, make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

Reference to a company or product name does not imply approval or recommendation of the product by New Mexico Energy Institute or the Department of Energy to the exclusion of others that may be suitable.

Printed in the United States of America

Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

Price: Printed Copy \$ Microfiche \$3.00

APPENDIX 5

This appendix is a collection of site specific scenarios compiled on state by state basis. These scenarios are extracted from the state team final reports.

TABLE OF CONTENTS

	Page
Site Scenarios for the State of Arizona	5 - 2
Site Scenarios for the State of Colorado	5 - 4
Site Scenarios for the State of Nevada	5 -93
Site Scenarios for the State of New Mexico	5-379
Site Scenarios for the State of Utah	5-386

SITE SCENARIOS FOR THE STATE OF ARIZONA

ARIZONA

ESTIMATED USEABLE GEOTHERMAL ENERGY AT VARIOUS AREAS IN ARIZONA

Electric Power Generation

Area	Proven	Probable	Inferred
1. San Bernardino Valley	0 MW	50 MW	500 MW
2. Clifton-Morenci-Safford	0 MW	50 MW	500 MW
3. Springerville	0 MW	100 MW	500 MW
4. Flagstaff	0 MW	100 MW	1000 MW
5. Kingman	0 MW	25 MW	100 MW
6. Yuma	0 MW	50 MW	50 MW
7. Hyder Valley	0 MW	50 MW	500 MW
8. Tucson	0 MW	10 MW	50 MW
9. Phoenix	0 MW	50 MW	500 MW
10. Wilcox	0 MW	25 MW	100 MW
11. Palo Verde	0 MW	25 MW	100 MW
12. Pinacati Field	0 MW	100 MW	500 MW
TOTAL	0 MW	635 MW	4450 MW

Non-electric power-space heating, cooling, agriculture is guestimate at 1.5 times total power generation for the state.

Non-Electric Power

	Proven	Probable	Inferred
Total electric power	0 MW	635 MW	4450 MW
x 1.5	0 MW	952.5 MW	6675 MW
Grand Total	0 MW	1587.5 MW	11,125 MW

SITE SCENARIOS FOR THE STATE OF COLORADO

SITE SCENARIO
Hartsel, Colorado

Summary of Relevant Milestones and Events/Calendar Year	1978	1979	1980	1981	1982	1983	1984	2020
Summary ● Power on Line								Approx. 2.5×10^{12} Btu'
Developer ● Geophysical Exploration and Resource Assessment								
● Leasing								
● Exploratory Drilling								
● Reservoir Characterization								
● Field Development								
User/Utility ● Plant Feasibility Studies								
● Plant Design/Construction								
● Site Activation/Start Up/Power On-Line								
Regulatory ● Environmental								
● Land Use/Water Use/Drilling								
● Pricing								
Financial ● Investment								
Detailed Project Schedule/Net Work								
1.0 Owner								
2.0 City/County	(1)	(2)		(3)		(4)		
3.0 State		(5)	(6)	(7)				
4.0 Developer/Provider								
4.1 Exploration	(8)	(9)	(10)	(11)		(12)		
4.2 Leasing								
4.3 Drilling								
5.0 User/Utility	(13)	(14)	(15)	(16)	(17)	(18)		
6.0 U. S. Dept. of Interior								
6.1 BLM	(19)	(20)						
6.2 USGS								
6.3 Drilling								
7.0 U. S. Dept. of Agriculture		(21)						
8.0 Environmental								
9.0 Pricing Reg.	(22)							
10.0 Financial Institutions	(23)	(24)		(25)	(26)			
11.0 DOE/DGE	(27)	(28)		(29)				
12.0								

Hartsel, Colorado

LEGEND

1. Fairplay learns about potential for geothermal heating.
2. Issues permit for test well then production wells.
3. Issues permit for greenhouse.
4. Recreation development obtains permit for development.
5. Issues permit for test well, then for production wells, disposal wells.
6. State and regulatory economic development agencies promote resource for process use.
7. Approves right-of-way request.
8. Does preliminary exploration. Applies for BLM leases, drills shallow gradient holes.
9. Applies for permit to drill exploratory well. Drills May. Produces test well - applies for or buys water rights.
10. Drills production and disposal wells. Supplies to Fairplay utility. Has approval for further field development.
11. Drills more wells; production and disposal.
12. Drills another production well.
13. Does preliminary study for space heating. Conversion from propane and for process uses.
14. Promoter for Fairplay system. Applies for federal grant or loan guarantee. Does engineering. Gets Right-of-way, starts construction.
15. Pipeline constructed. Business and homeowners convert to geothermal heating systems. Greenhouse does evaluation, decides to build here Applies for permit.
16. Greenhouse applies for loan - Federally guaranteed. Starts engineering design and construction.
17. Greenhouse on line. Other users become interested. Feed lot will use waste heat. Tourist attraction at South Park. City begins planning for facilities.
18. Recreation Development with baths, swimming pool at South Park. City begins construction. Will use geothermal for all possible energy uses.
19. BLM does EAR, issues leases.
20. USGS issues permits for test well, then for production wells (After EAR), and for disposal wells, approves right-of-way request.

LEGEND - Hartsel, Colorado (Continued)

21. BLM does EAR for development. Developer for system.
22. Price of natural gas deregulation. Tax incentive for geothermal developer.
23. Financing obtained for exploration program.
24. Financing approved for field development.
25. Approves loan application for greenhouse.
26. Approves loan for new recreational development.
27. Works with BLM to get leases out.
28. EAR for funding approved. Approves grant or loan guarantee.
29. Approves loan guarantee.

SITE SCENARIO

Glenwood Springs, Colorado

Summary of Relevant Milestones and Events/Calendar Year	1978	1979	1980	1981	1982	1983	1984	2020
Summary • Power on Line			◆	◆	◆			1.70 x 10 ¹² Btu's Consumed
Developer • Geophysical Exploration and Resource Assessment								
• Leasing								
• Exploratory Drilling								
• Reservoir Characterization								
• Field Development								
User/Utility • Plant Feasibility Studies		No. 2						
• Plant Design/Construction		No. 1	No. 2	No. 3				
• Site Activation/Start Up/Power On-Line			No. 1	No. 2	No. 3			
Regulatory • Environmental								
• Land Use/Water Use/Drilling								
• Pricing								
Financial • Investment								
Detailed Project Schedule/Net Work								
1.0 Owner								
2.0 City/County	(1)	(2)	(3)	(4)				
3.0 State	(5)	(6)	(7)					
4.0 Developer/Provider								
4.1 Exploration	(8)							
4.2 Leasing								
4.3 Drilling								
5.0 User/Utility	(9)	(10)	(11)	(12)				
6.0 U. S. Dept. of Interior								
6.1 BLM								
6.2 USGS								
6.3 Drilling								
7.0 U. S. Dept. of Agriculture								
8.0 Environmental		(13)						
9.0 Pricing Reg.								
10.0 Financial Institutions			(14)					
11.0 DOE/DCE	(15)	(16)						
12.0								

Glenwood Springs, Colorado

LEGEND

1. Permit for exploratory well.
2. Issues permits for well development.
3. Issues permits for well(s).
4. Issues permits for development.
5. State issues permits for exploratory well - O&GCC. State engineer, water quality and air pollution.
6. State issues permits for highway department to drill well.
7. Issues permits for city well(s).
8. State GS does perlimentary assessment and drills exploratory well on city lease.
9. City submits proposal for funding for conversion of school to geothermal heat. State highway department assesses for snow melt on planned highway.
10. City has engineering design done, establishes heating district, starts development. Highway department does engineering, environmental assessment, drills well, obtains right-of-way. City does preliminary evaluation assessment for second phase.
11. City installs in school.
12. City drills well(s), does engineering design, obtains right-of-way, starts construction of second phase - - public buildings, stores, new subdivisions. Highway department installs on roadway.
13. Decides whether to use heat exchanger because of high TDS.
14. Voters approve city bond issue.
15. Approves request to fund system development, works with EPA to develop simplified procedure for obtaining permits for test wells.
16. Heat exchanger developed for efficient use in highway for snow melt.

SITE SCENARIO

San Luis Valley, Colorado

Summary of Relevant Milestones and Events/Calendar Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	2020
Summary • Power on Line		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆ 43x10 ¹² Btu's Consumed
Developer • Geophysical Exploration and Resource Assessment											
• Leasing											
• Exploratory Drilling											
• Reservoir Characterization											
• Field Development											
User/Utility • Plant Feasibility Studies											
• Plant Design/Construction											
• Site Activation/Start Up/Power On-Line			◆ 4x10 ¹² Btu's	◆ 1.34x10 ¹² Btu's	◆ 1.1x10 ¹² Btu's	◆ 1.6x10 ¹² Btu's/yr.	◆ 1.8x10 ¹² Btu's/yr.	◆ 1.52x10 ¹² Btu's	◆ 1.54x10 ¹² Btu's		
Regulatory • Environmental											
• Land Use/Water Use/Drilling											
• Pricing											
Financial • Investment											
Detailed Project Schedule/Net Work											
1.0 Owner											
2.0 City/County	(1)	(2)	(3)								
3.0 State	(4)	(5)	(6)								
4.0 Developer/Provider											
4.1 Exploration	(7)	(8)	(9)	(10)							
4.2 Leasing											
4.3 Drilling											
5.0 User/Utility	(11)	(12)	(13)	(14)							
6.0 U. S. Dept. of Interior											
6.1 BLM			(15)								
6.2 USGS											
6.3 Drilling											
7.0 U. S. Dept. of Agriculture											
8.0 Environmental			(16)								
9.0 Pricing Reg.	(17)										
10.0 Financial Institutions	(18)	(19)		(20)							
11.0 DOE/DGE	(21)	(22)									
12.0		(23)									

San Luis Valley, Colorado

LEGEND

1. Permits for test well at Splashland. Permits for Baca Grande system. Permits for development.
2. Permits for production wells at Splashland, sand dunes test, then production mineral.
3. Permits for test wells at Shaws, production, lumber kiln at Mineral.
4. Permits for test wells. Permits for system development at Baca Grande (including PUC), and right-of-way. Permits for development at Mineral.
5. Permits for production wells, Splashland, Sand Dunes, Test at Mineral, then for field development on state private land.
6. Permits for test wells at Shaws, production - permits for lumber kiln.
7. Major assigns lease to company with direct use interest. Promote Alamosa to use for space heating. Test well drilled. Decides to invest in Baca Grande. Drills test well. Starts program at Mineral. Applies for Federal Grant.
8. Drills production wells. Installs heat exchangers at Splashland and Sand Dunes. Drills thermal gradient at Shaws. Drills test at Mineral, evaluates and produces.
9. More power on line as development proceeds at Baca Grande. Drills test well at Shaws, produces. Drills more wells at Mineral,
10. Drills production wells on federal land.
11. Feasibility study for Alamosa space heating public buildings. City floats bond. Baca Grande decides to install alternate heat in development. Sand Dunes gets federal guaranteed loan - permits for system development, right-of-way, does design. Decides to malt barley at Mineral. Applies for grant. Feasibility study for vegetables dehydration.
12. Alamosa gets right-of-way leases, permits, establishes heating district. Does design, construction. Baca Grande Construction. Decision to build greenhouses at Shaws. Applies for grant. Decision to do potato flakes. Design for barley malt plant at Mineral, then construction, Design for vegetable dehydration, then construction. Lumber mill decides to use, gets permit.
13. Engineer construction of greenhouse at Shaws. Right-of-way for lumber kiln, pipelines, design, construction.
14. Town of Saquache decides to use for heating, floats bond, gets permit and right-of-way. Designs, constructs.
15. Permits to develop field from USGS after EIS.

16. EIS for field development at Mineral.
17. Price of natural gas rises, makes retrofitting at Alamosa economical.
18. Approves loan for Baca Grande and for well at Mineral.
19. Approves loan for lumber kiln.
20. Municipal bond for space heating.
21. Approves loan guarantee for Baca Grande.
22. Approves grant for greenhouse. Approves grant for barley malting.
23. Downhole heat exchangers improved.

SITE SCENARIO

Wannita, Colorado

Summary of Relevant Milestones and Events/Calendar Year	1978	1979	1980	1981	1982	1983	1984	2020
Summary • Power on Line			◆		◆			$\sqrt{3.6 \times 10^{12}}$ Btu's consumed
Developer • Geophysical Exploration and Resource Assessment								
• Leasing								
• Exploratory Drilling								
• Reservoir Characterization								
• Field Development								
User/Utility • Plant Feasibility Studies								
• Plant Design/Construction		No.1		No.2				
• Site Activation/Start Up/Power On-Line			◆ 0.04×10^{12} Btu's/yr.		◆ 1.2×10^{12} Btu's/yr.			
Regulatory • Environmental								
• Land Use/Water Use/Drilling								
• Pricing								
Financial • Investment								
Detailed Project Schedule/Net Work								
1.0 Owner		(1)	(2)					
2.0 City/County	(3)	(4)	(5)					
3.0 State	(6)	(7)	(8)					
4.0 Developer/Provider (9)	(10)	(11)		(12)				
4.1 Exploration								
4.2 Leasing								
4.3 Drilling								
5.0 User/Utility	(13)	(14)	(15)					
6.0 U. S. Dept. of Interior								
6.1 BLM	(16)	(17)		(18)				
6.2 USGS								
6.3 Drilling								
7.0 U. S. Dept. of Agriculture USFS	(19)	(20)	(21)					
8.0 Environmental		(22)						
9.0 Pricing Reg.	(23)							
10.0 Financial Institutions	(24)		(25)					
11.0 DOE/DGE	(26)							
12.0								

Wannita, Colorado

LEGEND

1. Right-of-way for lumber kiln pipeline.
2. Leases right-of-way.
3. Permit for test well.
4. Permit for kiln.
5. Permit for district heating system in Gunnison.
6. Permits for test well.
7. Permit for water consumption for kiln.
8. Issues permit for production well.
9. Has state leases filed for NF leases in 1974.
10. Obtain leases on National Forest. Assigns all leases to direct use company. Company files application for permits for test well, obtains funds, promotes uses, drills thermal gradient holes.
11. Drills test well. Applies for permits for development and disposal including production of test well.
12. Drills wells for Gunnison space heating.
13. Does feasibility study for timber drying.
14. Starts design, construction of kiln. Feasibility studies for space heating at Gunnison.
15. Design, construction of space heating for Gunnison, pipeline from wells.
16. BLM issues leases after USFS review and USGS review.
17. USGS does EIS for development/disposal/utilization, including right-of-way.
18. Permits for Production/disposal/utilization.
19. Recommend leasing NF lands.
20. Input to EIS for development.
21. Approves right-of-way for pipeline to Gunnison.
22. Full EIS for development wells, primarily forest lands and for right-of-way.

LEGEND - Wannita, Colorado (Continued)

23. Natural gas prices higher. Incentives for geothermal development initiated.
24. Funds/exploration program available.
25. Town of Gunnison floats bond issue for space heating for schools, public buildings.
26. Assist with funding, exploration.

SITE SCENARIO

Pagosa Springs, Colorado

Summary of Relevant Milestones and Events/Calendar Year	1978	1979	1980	1981	1982	1983	1984	2020
Summary • Power on Line								
Developer • Geophysical Exploration and Resource Assessment								
• Leasing								
• Exploratory Drilling								
• Reservoir Characterization								
• Field Development								
User/Utility • Plant Feasibility Studies								
• Plant Design/Construction								
• Site Activation/Start Up/Power On-Line								
Regulatory • Environmental								
• Land Use/Water Use/Drilling								
• Pricing								
Financial • Investment								
Detailed Project Schedule/Net Work								
1.0 Owner		(1)	(2)	(3)				
2.0 City/County								
3.0 State	(4)	(5)	(6)					
4.0 Developer/Provider	(7)	(8)	(9)					
4.1 Exploration								
4.2 Leasing								
4.3 Drilling								
5.0 User/Utility	(10)	(11)	(12)	(13)				
6.0 U. S. Dept. of Interior								
6.1 BLM								
6.2 USGS								
6.3 Drilling								
7.0 U. S. Dept. of Agriculture								
8.0 Environmental	(14)	(15)						
9.0 Pricing Reg.								
10.0 Financial Institutions		(16)	(17)					
11.0 DOE/DGE		(18)	(19)	(20)				
12.0								

Pagosa Springs, Colorado

LEGEND

1. Allows right-of-way for district heating system.
2. Issues leases for wells to town
3. Allows right-of-way for district lines.
4. Issues permits for exploratory well.
5. Issues permit for consumption of water by town utility. Issues permits for production well for lumber company, then for development of kiln.
6. Issues permits for well(s).
7. State GS drills exploratory well.
8. Lumber company obtains leases, drills well(s).
9. Town utility drills wells for residential heating system, first new, then converted structures.
10. Town establishes utility authority. Applies for federal funds for direct application. Lumber mill does feasibility study for kiln-drying with geothermal.
11. Contractor does design. Construction starts for district heating for commercial, senior citizens, schools, reconvert to geothermal heat. Lumber mill applies for insured loan.
12. Utility authority gets federal funds - does feasibility study for residential space heating. Applies for guaranteed loan. Lumber mill installs kiln.
13. Town utility converts old residences to geothermal, installs geothermal in new, up to limit of resource.
14. DOE approves environmental assessment.
15. Lumber co-op obtains EPA approval for geothermal kiln.
16. Federally insured loan granted to lumber company for kiln.
17. Federal guaranteed loan to town utility.
18. Approves grant application - town.
19. Helps lumber company loan application approval.
20. Funds feasibility study for residential use. Helps guaranteed loan approval.

JUNIPER/CRAIG NO, 1/2
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. study for space heating				—													
Owners	Leases					—												
BLM	Leases					—												
USGS/State Co. and/or Town	Permits for test well						—											
Developer	Drill test well						—											
USGS/State Co. & or Town	Permit for field development/R.O.W.							—	—									
Utility	Water rights								—									
	R.O.W.								—									
Fin. Inst.	Loan or bond								—									
State/Co. & or Town	Permit to dev. system								—									
Utility	Design system									—								
Utility	Construction system									—	—							
Utility	Install in new structure, then retrofit existing									—	—							
Developer	Drill wells and/or produce test well									—								
	Heat on line																	

(.12 x 10¹² Btu's/yr)

ROUTT/STEAMBOAT HOT SPRINGS NO. 3/4

SITE DEVELOPMENT SCHEDULE

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Prelim. Geophysics																	
Developer	Drill Grad. holes, eval.																	
Developer	Feas. studies-Steam. Sprgs.																	
DOE/DGE	Grant for test well	Developer																
State/City	Permits for test well	Developer																
Developer	Drill test well, eval.																	
City	Establish heat. dist.																	
City	Obtain water rights																	
DOE/DGE	Guar. loan for system	City																
State/City	Permits-dev. test well	developer																
City	Right-of-way																	
City	Design																	
City	Constr. of system																	
City	Install. in approx. 225 dwell. units																	
Developer	Prod. test well																	
State/City	Permits for field dev.																	
Developer	Develop field																	
BLM-USFS	Leases on Natnl For.																	
USFS	Permit for grad. holes																	
Developer	Drill & eval. grad.																	
USGS, Co.	Permit for test wells																	
State																		
Developer	Drill test, eval.																	
USGS, Co.	Permits for field dev.																	
State																		
Developer	Field development																	
USFS-Priv.	Approve R.O.W.																	
Owners City	Expand system to 1000 homes. comm. & indust.																	
	Expanded as needed to .25 x 10 ¹² Btu's																	
	By the year, 2012, 7.4 x 10 ¹² Btu's consumed.																	

BRAND'S RANCH NO. 5

SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. Studies for space heating'				—													
Owners	Leases					—												
State/Co/ and/or Town	Permits for test well						—											
Developer	Drill test well, eval.						—											
State/Co/ and/or Town	Permit to dev. system						—											
Utility	Water Rights						—											
	R.O.W.						—											
Fin. Inst.	Loan or bond						—											
Utility	Design system						—											
Utility	Construct System							—										
Utility	Install in new structures, then retrofit existing							—										
State/Co.	Permits to dev. well						—											
Developer	Develop test well							—										
	Heat on Line								—									
										(.007 x 10 ¹² Btu's/yr.)								

5-20

HOT SULPHUR SPRINGS NO. 6
SITE DEVELOPMENT SCHEDULE

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics			—														
Developer	Gradient holes, eval.				—													
City	Feas. Studies for Hot Sulphur Springs		—															
Owner	Leases				—													
DOE/DGE	Grant for test well				—													
State/Co.	Permits for test well				—													
Developer	Drill test well, eval.				—													
State/Co.	Permit to produce test well				—													
State/City	Permit to dev. system				—													
Developer	Water rights					—												
City	R.O.W.					—												
DOE/DGE	Guar. Loan for system				—	—												
City	Design				—	—												
City	Constr. of system					—												
City	Retro-homes, bus.					—												
City	Connect to 123 homes, plus business					—												
City	Feas. studies for Kremmling/Granby				—													
BLM	Issue leases					—												
USGS	Permits for field development					—	—											
State/Co., Cities	Permits for system						—											
Cities	Design						—											
Cities	Construction							—										
Cities	Retrofit homes, bus.							—										
Cities	Connect to approx. 700 homes plus businesses							—										

(.02 x 10¹² Btu's/yr.)

(.14 x 10¹² Btu's/yr.)

HAYSTACK BUTTE NO. 7
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics			—														
Developer	Gradient holes, eval.			—														
Town	Feas. Studies for space heating			—														
Owners	Leases																	
DOE/DGE	Grant for test well			—														
State/Co./Town	Permits for test well				—													
Developer	Drill test well, eval.				—													
State/Town	Permit to dev. system				—													
Town	Water rights				—													
Town	R.O.W.				—													
DOE/DGE	Grant for system				—													
Town	Design				—													
Town	Constr. of system					—												
Town	Install-new homes, bus.						—	—	(.03 x 10 ¹² Btu's/yr.)									

ELDORADO SPRINGS NO. 8
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics			—														
Developer	Gradient holes, eval			—														
Resort	Feas. Studies for space heating			—														
State/Co.	Permits for test well				—													
Developer	Drill test well				—													
State/Co. City	Permits to dev. system				—													
DOE/DGE	Guar. loan for system					—												
Resort	Design					—												
Resort	Construction						—											
Resort	Retrofit res. & comm. buildings						—											
Resort	Connect							(.02 x 10 ¹² Btu's/yr)										

IDAHO HOT SPRINGS NO. 9
SITE DEVELOPMENT SCHEDULE

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics			—														
Developer	Gradient holes, eval.			—														
City	Feas. Studies for town space heating			—														
Owners	Leases			—														
DOE/DGE	Grant for test well			—														
Developer	Drill test well, eval.				—													
State/Co.	Permits to drill test well				—													
State/City	Permit to dev. system				—													
City	Water rights				—													
City	R.O.W.				—													
DOE/DGE	Guar. Loan for system				—													
City	Design					—												
City	Constr. of system					—												
City	Install. in homes, bus.					—												
City	Connect to homes, bus.					—												
BLM/USFS	Leases on Natl For.					—												
USGS/State County	Permit for field dev.					—												
Developer	Drill more wells							—										
USFS/Owners	Approve R.O.W.							—										
City	Expand system to as needed to existing structures.							—										
	Expand to $.25 \times 10^{12}$ Btu's - about year 2000																	

(.08 x 10¹² Btu'/yr.)

(.13 x 10¹² Btu's/yr.)

SOUTH CANYON NO. 12
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval					—												
Utility	Feas. study for space heating				—													
Owners	Leases					—												
BLM	Leases					—												
USGS/State/ Co. and/or Town	Permits for test well						—											
Developer	Drill test well						—											
USGS/State/ Co. and/or town	Permit for field de- velopment/R.O.W.							—										
Utility	Water rights								—									
	R.O.W.								—									
Fin. Inst.	Loan or bond								—									
State/Co. and/or Town	Permit to dev. system								—									
Utility	Design system									—								
Utility	Construct system										—							
Utility	Install in new struc- tures, then retrofit existing											—						
Developer	Drill wells and/or produce test well												—					
	Heat on line																	

(.02 x 10¹² Btu's/yr.)

PENNEY NO. 13
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. study for space heating				—													
Owners	Leases					—												
BLM/USFS	Leases						—											
USGS/State/Co. and/or town/FS	Permits for test well							—										
Developer	Drill test well							—										
USGS/State/Co. and/or Town/USFS	Permit for field development/R.O.W.								—									
Utility	Water rights									—								
	R.O.W.									—								
Fin.Inst.	Loan or bond									—								
State/Co. and/or town	Permit to dev. system									—								
Utility	Design system									—								
Utility	Construct system										—							
Utility	Install in new structure then retrofit existing										—							
Developer	Drill wells and/or produce test well										—							
	Heat on line											—						

(.10 x 10¹² Btu's/yr.)

COL. CHINN NO. 14
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. Studies for space heating				—													
Owners	Leases					—												
State/Co. and/or Town	Permits for test well						—											
Developer	Drill test well, eval.							—										
State/Co. and/or Town	Permit to dev. system							—										
Utility	Water rights							—										
	R.O.W.							—										
Fin. Inst.	Loan or bond							—										
Utility	Design System								—									
Utility	Construct system								—									
Utility	Install in new structures, then retrofit existing								—									
Developer	Permit to produce test well								—									
Developer	Produce test well Heat on line								—									
										(.04 x 10 ¹² Btu's/yr.)								

CEMENT CREEK/RANGER NO. 16/17

SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. Studies for space heating				—													
Owners	Leases					—												
State/Co./and/or Town	Permits for test well						—											
Developer	Drill test well, eval.						—											
State/Co./and/or Town	Permit to dev. system						—											
Utility	Water rights						—											
	R.O.W.						—											
Fin. Inst.	Loan or bond						—											
Utility	Design system							—										
Utility	Construct system							—										
Utility	Install in new structures							—										
State/Co.	Permit to develop well							—										
Developer	Develop test well								—									
	Heat on line									—								
BLM/USFS	Leases																	
USGS/State/Co.	Permits to develop field								—									
USFS	R.O.W.									—								
Developer	Drill well at Cement Creek										—							
Utility	Construct pipeline from cement creek											—						
Utility	Retrofit existing Structures												—					
	Heat on line													—				

(.02 x 10¹² Btu's/yr.)

(.03 x 10¹² Btu's/yr.)

CHALK CREEK, MT, PRINCETON NO, 21A
SITE DEVELOPMENT SCHEDULE

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Drills thermal grad. holes			—														
BLM/USFS	Issues Federal leases		—															
State	Issues permit to drill wildcat well			—														
Developer	Negotiate w/utility				—													
Developer & Utility	Feasibility Study				—													
Utility	Water rights				—													
Producer & Utility	Financial negotiations & Contract				—													
Utility	Environmental impact Statement prepared					—												
State/EPA	Permits issued for power plant						—											
USGS	Approve plan of operations for field development, disposal					—												
State/Co.	Permits for field Development						—											
Utility	Constr. Power Plant							—										
Producer	Drill development wells							—										
Utility	Power on line										—							
Utility & Producer	Second 50 MW unit on Line											—						

(50 MWe)

(100 MWe)

4/3/78

COLORADO

PONCHA SPRINGS NO. 23
SITE DEVELOPMENT SCHEDULE

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Drills thermal grad hole			—														
BLM/USFS	Issues leases		—	—														
State/Co.	Issue permits for wells			—														
Developer	Drills slim holes			—														
Producer/ Utility	Negotiate contract				—													
Utility	Buys water rights				—													
Utility	EIS for power plant				—	—	—											
State/Co./ EPA	Issue permit for power plant						—	—										
USGS	EIS for field development				—	—	—											
USGS	Approves field development						—											
State/Co.	Permits for field dev.						—											
Utility	Constr. power plant						—	—	—	—								
Producer	Drills dev. wells						—	—	—	—								
Utility	50 MW power on line										—	—	—	—	—			
Utility	Adds 2nd unit (100 MW)											—	—	—	—	—	—	—
Utility	Add 3rd unit (150 MW)														—	—	—	—
Utility	Add 4th unit (200 MW)																—	—

WELLSVILLE/SWISSVALE NO. 24/25
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. study for space heating				—													
Owners	Leases					—												
BLM	Leases					—												
USGS/State/																		
Co. and/																		
or town	Permits for test well						—											
Developer	Drill test well						—											
USGS/State/																		
Co. and/																		
or town	Permit for field development/R.O.W.							—										
Utility	Water rights								—									
	R.O.W.								—									
Fin. Inst.	Loan or bond								—									
State/Co. and/or																		
Town	Permit to dev. system																	
Utility	Design system								—									
Utility	Construct system									—								
Utility	Install in new structures, then retrofit existing									—								
Developer	Drill wells and/or produce test well									—								
	Heat on line																	

(.02 x 10¹² Btu's/yr.)

CANON CITY/FREMONT NO. 26/27
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. Studies for Space Heating				—													
Owners State/Co.	Leases					—												
and/or Town	Permits for test well						—											
Developer State/Co./	Drill test well, eval.						—											
and/or town	Permit to Dev. system							—										
Utility	Water rights							—										
	R.O.W.							—										
Fin. Inst.	Loan or bond							—										
Utility	Design System								—									
Utility	Construct system								—									
Utility	Install. in new structure then retrofit existing								—									
State/Co. Developer	Permit to Dev. well Develop test well Heat on line						—											
State/Co.	Permit to dev. field at Fremont								—									
Utility	Water rights									—								
Owners	R.O.W.										—							
Utility	Design Extension											—						
Utility	Construct extension												—					
Utility	Retrofit more structures Heat on Line													—				
												(.01 x 10 ¹² Btu's/yr.)						
												(.03 x 10 ¹² Btu's/Yr)						

DON K RANCH/FLORENCE NO. 28/29
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. Studies for space heating				—													
Owners	Leases					—												
State/Co./and/or Town	Permits for test well						—											
Developer	Drill test well, eval.						—											
State/Co./and/or Town	Permit to dev. system							—										
Utility	Water rights							—										
	R.O.W.							—										
Fin. Inst.	Loan or bond							—										
Utility	Design System							—										
Utility	Construct system							—										
Utility	Install in new structures, then retrofit existing							—										
Developer	Permits for field dev. at Don K Ranch								—									
Developer	Drills wells									—								
State/Co.	Permit to transport to Florence								—									
Utility	Water rights								—									
Owners	R.O.W.								—									
Fin. Inst.	Loan or bond								—									
Utility	Design expansion								—									
Utility	Install in more structures								—									
Utility	Construct pipeline								—									
	Heat on line									—								

(.02 x 10¹² Btu's/yr.)

(.09 x 10¹² Btu's/yr.)

SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. Studies for space heating at new subdivision				—													
Owners	Leases					—												
State/Co. and/or Town	Permits for test well						—											
Developer	Drill Test well, eval.							—										
State/Co. and/or Town	Permits to dev. system							—										
Utility	Water Rights							—										
	R.O.W.							—										
Fin. Inst.	Loan or bond							—										
Utility	Design system								—									
Utility	Construct system								—									
Utility	Install in new structures, then retrofit existing								—									
Developer	Permit to dev. test well								—									
Developer	Develop well								—									
	Heat on line									—								

(02 x 10¹² Btu's/yr.)

WAGON WHEEL GAP NO. 43
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. study for space heating				—													
Owners	Leases					—												
BLM/USFS	Leases					—												
USGS/State Co. and/or Town/FS	Permits for test well					—												
Developer	Drill test well							—										
USGS/State Co. and/or Town/USFS	Permit for field development/R.O.W.							—										
Utility	Water rights																	
	R.O.W.																	
Fin. Inst.	Loan or bond																	
State/Co. and/or town	Permit to dev. system																	
Utility	Design system																	
Utility	Construct system																	
Utility	Install in new structures, then retrofit existing																	
Developer	Drill wells and/or produce test well																	
	Heat on line																	

(.04 x 10¹² Btu's/yr)

CEBOLLA HOT SPRINGS NO. 47

SITE DEVELOPMENT SCHEDULE

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
USGE	Issue permits for thermal grad. holes		—															
Developer	Drill thermal grad			—														
USGS	Permit to deepen hole			—														
USGS/St./Co.	Permits for 3,000-5,000' holes			—														
Developer	Drills holes				—													
Owners	Issue Leases		—															
USGS	Approves plan of operation for test well				—													
State	Issues permits for test well				—													
Developer	Drills wildcat well					—												
Developer	Negotiate w/utility					—												
Dev./Util.	Feasibility study					—												
Utility	Buys water rights					—												
Prod./Util.	Fin. neg. & contract					—												
USGS	EIS/then approval of field development					—		—										
State/Co.	Permits for field dev.						—											
Utility	EIS for power plant					—		—										
State/Co/EPA	Permits for plant						—											
Utility	Constr. power plant							—	—									
Producer	Drills dev. wells							—										
Utility	Power on line (50 MWe)										—							
Utility	Add 2nd unit (100 MWe)											—						
Utility	Add 3rd unit (150 MWe)												—					
Utility	Add 4th unit (200 MWe)													—				

ORVIS NO. 48
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility Owners	Feas. Studies for space heating Leases				—													
State/Co. and/or Town	Permits for test well					—												
Developer	Drill test well, eval.						—											
State/Co. and/or town	Permit to dev. system						—											
Utility	Water Rights						—											
	R.O.W.						—											
Fin. Inst.	Loan or bond						—											
Utility	Design system							—										
Utility	Construct system							—										
Utility	Install in new structures then retrofit existing							—										
State/Co.	Permits for development of test well								—									
Developer	Develop test well																	
Utility	Heat on line in Ridgeway																	
Utility	Feas. study for Montrose																	
Utility	R.O.W. for Montrose																	
State/Co.	Permits for system																	
Utility	Design system																	
Utility	Construct system																	
Utility	Retrofit or install in houses/businesses																	
	In Montrose																	
	Heat on line																	

(.02 x 10¹² Btu's/yr.)

(.06 x 10¹² Btu's/yr.)

OURAY HOT SPRINGS NO. 49
SITE DEVELOPMENT SCHEDULE

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics			—														
Developer	Gradient holes, eval.			—														
City	Feas. Studies for Ouray space heating			—														
Owners	Leases				—													
DOE/DGE	Grant for test well				—													
Developer	Drill test well, eval.					—												
State/Co.	Permits to drill test well					—												
State/City	Permit to dev. system					—												
City	Water rights					—												
City	R.O.W.					—												
DOE/DGE	Guar. loan for system					—												
City	Design					—												
City	Constr. of system					—												
City	Retrofit. homes, bus.						—											
City	Connect to homes, bus.							—										
BLM/USFS	Leases on Natl For.														—			
USGS/State County	Permit for field dev.														—			
Developer	Drill more wells																—	
USFS/Owners	Approve R.O.W.																—	
City	Expand system to as needed, to $.15 \times 10^{12}$ Btu's per year by 2020.																—	

(.05 x 10¹² Btu's/yr.)

DUNTON/GEYSER/PARADISE NO. 51, 52, 53
SITE DEVELOPMENT SCHEDULE

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics			—														
Developer	Gradient holes, eval			—														
Resort	Feas. Studies for Dunton			—														
DOE/DGE	Grant for test well			—														
State	Permits for test well			—														
Developer	Drill test well, eval.				—													
State	Permits to produce test well				—													
State	Permit to dev. system				—													
Resort	Obtain water rights					—												
Resort	Obtain R.O.W.					—												
DOE-DGE	Guar. loan for system				—													
Resort	Design					—												
Resort	Constr. of system					—												
Resort	Retro. cabins, build greenhouse, fish tanks					—												
Resort	Connect to 10 cabins other facilities					—												
State	Permits for field development						—											
Developer	Drill additional wells						—											
Resort	Design						—											
Resort	Expand facilities						—											
Resort	Obtain R.O.W.						—											
Resort	Connect to new facility						—											

(.002 x 10¹² Btu's per yr.)

(.010 x 10¹² Btu's per year)
(.02 x 10¹² Btu's per yr)

SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. study for space heating				—													
Owners	Leases					—												
BLM/USFS	Leases					—												
USGS/State	Permits for test well							—										
Co. and/or town/US	Drill test well							—										
Developer	Permit for field development							—										
USGS/State	R.O.W.							—										
Co. and/or town/USFS	Water rights							—										
Utility	R.O.W.							—										
Fin. Inst.	Loan or bond							—										
State/Co. and/or town	Permit to dev. system							—										
Utility	Design system									—								
Utility	Construct system									—								
Utility	Install in new structure then retrofit existing									—								
Developer	Drill wells and/or produce test well									—								
Utility	Heat on line											—						
State/Co.	Feas. study for space heat at Stoner Ski Lodge									—								
USGS/USFS	Permits to extend system									—								
USFS/Owners	R.O.W.									—								
Utility	Design system										—							
Utility	Construct											—						
Owners of Ski Area	Expand facilities												—					
	Heat on line													—				

(.02 x 10¹² Btu's/yr)

(.04 x 10¹² Btu's/yr.)

PINKERTON/MOUNT NO. 55
SCENARIO FOR DEVELOPMENT

Operating Entity	Activity	Recipients	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Developer	Preliminary Geophysics				—													
Developer	Gradient holes, eval.					—												
Utility	Feas. study for space heating				—													
Owners	Leases					—												
BLM/USFS	Leases					—												
USGS/State	Permits for test well							—										
Co. and/or town/FS Developer	Drill test well							—										
USGS/State/ Co. and/or town/USFS	Permit for field development R.O.W.							—										
Utility	Water rights								—									
	R.O.W.								—									
Fin. Inst.	Loan or bond								—									
State/Co. and/or town	Permit to dev. system								—									
Utility	Design system									—								
Utility	Construct system									—								
Utility	Install in new structure, then retrofit existing									—								
Developer	Drill wells and/or Heat on line									—								
													(.09 x 10 ¹² Btu s/yr.)					

SCENARIO FOR DEVELOPMENT

5-42

SITE SCENARIOS FOR THE STATE OF NEVADA

NEVADA GEOTHERMAL AREA SCENARIOS 1-26

APPENDIX A.

FACTS AND ASSUMPTIONS PERTINENT TO THE
INTERPRETATION OF NEVADA SCENARIOS

- (1) Site Defined. A site (i.e. geothermal site, as in site specific scenario) is an anomalous thermal locality which has, or may have, the potential to be developed as a commercially viable geothermal resource.

Each site has one or more of the following elements:

- (a) A spring having water temperature of 21°C (70°F) for localities north of 38°N. latitude. South of this latitude the ambient air temperature noticeably increases, with a corresponding increase in the ground-water temperature. Therefore, south of 38°N. latitude thermal waters are taken to be 26° to 29°C (80° to 85°F) and warmer.
- (b) Well water having an anomalously high temperature for the depth at which it is recorded. The geothermal gradient is assumed to be 1° per 114 meters (1°F per 75 feet).
- (c) Any geothermal leasing activity such as a lease or lease application.
- (2) High, Intermediate, and Low Temperature Sites. Sites have been separated into three categories, consistent with USGS Circular 726, which are based upon the measured or estimated reservoir temperature:
- (a) High Temperature. Greater than 150°C; generally suitable for electric power generation.

(b) Intermediate temperature. 90° to 150°C; possibly suitable for electric power generation above 130°C; below 130°C, suitable for direct thermal applications.

(c) Low temperature. Less than 90°C; suitable only for direct thermal utilization.

Low temperature sites are present in all sections of the State, but are dominant in those sections where high and intermediate temperature sites are prominent.

- (3) Site Characteristics. Where exploratory or development data are not available to give direct or indirect quantification of reservoir characteristics (i.e., temperature, volume, depth, etc.), subjective methods of resource assessment and evaluation have been applied in order to partially quantify each geothermal site for *PLANNING USE ONLY*.

The technical and non-technical characteristics of each site have been compiled and compared with those of sites which have (1) a drilled reservoir, or (2) a geothermometer estimate by the USGS (in Circular 726). Table I is a partial list of the characteristics, each of which have, or potentially have, an influence on the interpretative value and ranking of a Site or Area.

TABLE I. Comparative Characteristics for
Site Specific and Area Scenarios

Land/Lease

National Resource Land
 KGRA (Competative)
 KGRA Lease Application
 KGRA Lease
 Non-KGRA (Non-competative)
 Non-KGRA Lease Application
 Non-KGRA Lease
 Geo-Sim
 Closed Cases
 State Land Lease
 Private Land Lease
 Indian Land Lease
 Withdrawn Lands
 Within
 Adjacent
 Near
 Operating Unit Applied For
 Operating Unit
 Lease Application/Lease Held By:
 Major Companies
 Small Companies
 Individuals

Geophysical

Aeromagnetic
 Magneto-Telluric
 Gravity
 Ground Noise
 Passive Seismic
 Active Seismic
 Electrical
 Induced Polarization
 Self Potential
 Geophysical Survey

Drilling

Temperature Gradient Holes (Number)
 Temperature Gradient Holes to 100' (Number)
 Temperature Gradient Holes 101' - 500' (Number)
 Exploratory Well (Number)
 Exploratory Well Less than 1,000' (Number)
 Exploratory Well 1,000 - 5,000' (Number)
 Exploratory Well Greater than 5,000' (Number)
 Stratigraphic Hole (Number)
 Producing Wells (Number)
 Depth to Reservoir Under 5,000'
 Depth to Reservoir 5,000 - 8,000'
 Depth to Reservoir Over - 8,000'

Water/Geochemistry

Thermal Springs (Number)
 (Calcareous Tufa Deposit Presently Forming)
 (Silicious Sinter Deposit Presently Forming)
 Calcareous Tufa Deposit (Inactive)
 Silicious Sinter Deposit (Inactive)
 Water Wells (Number)
 Water Analysis Available (Number)
 Highest Recorded Surface Temperature
 Estimated Reservoir Temperature
 Total Dissolved Solids (ppm)
 Favorable Geochemistry

Geology

Localized Thermal Trend
 Regional Thermal Trend
 Significant Faulting Present
 Volcanism Less than 6 Million Years old
 Volcanism 17 to 6 Million Years old
 Volcanism 34 to 17 Million Years old
 Volcanism 43 to 34 Million Years old

Transmission

Distance to Power Transmission Line 0-10 km
 Distance to Power Transmission Line 11-50 km
 Distance to Power Transmission Line Greater than 50 km

Thermal Resource Presently Used For
Bathing
Greenhousing/Space Heating
Commercial Processing
Electrical Power Generation

- (4) Quantification of Reservoir Characteristics - Temperature and Volume. All the reservoirs are assumed to be hot-water convection systems. Calculations for effective porosity and permeability, contained heat and useable heat, follow the methods used in USGS Circular 726. For most of the sites, significant departure from Circular 726 is in the more optimistic reservoir temperatures and volumes.

(a) Temperature. For the vast majority of sites, deep drilling has not penetrated the reservoir. Few sites have a recorded geothermometer temperature, and those which have been published are believed to be on the conservative (i.e. low) side. The Hot-Water Convection Systems charts in the Nevada Geothermal Area Scenarios (Appendix A) give SiO₂ and Na-K-Ca "Geochemical" temperatures, and actual "Subsurface" temperatures (from reservoir drilling tests). The "Energy Potential" for each site has been calculated, in part, using a *planning* reservoir temperature (shown in parentheses) which takes into account "Geochemical" and "Subsurface" temperatures of sites close by. *Planning* temperatures are highly subjective, and are drawn largely from geologic inference.

(b) Volume. The reservoir volumes given in the Hot-Water Convection Systems charts in the Nevada Geothermal Area Scenarios (Appendix A), are largely *planning* volumes -

that is, most are quite subjective. Even those that have been drilled are at best semi-quantitative. The majority of the volumes were arrived at after considering: (1) Volumes of the better known sites such as Beowawe Geysers and Brady's, (2) size and ownership of lease blocks, and (3) the areal extent of detailed temperature gradient holes and geophysical surveys. The minimum reservoir volumes are assumed to be either 5 km³ or 10 km³, a factor of two to four times larger than the minimum taken by USGS in Circular 726, which are considered to be conservative (i.e., low).

Estimates of useable energy for each Area should be considered optimistic valuations of the potential resource. USGS suggests that five times the presently known resource has yet to be discovered.

- (5) Most of the high and intermediate temperature geothermal sites will be discovered and developed in the regions where:
- (a) Circular 726 sites are situated,
 - (b) Hotter spring waters have been recorded, and
 - (c) Exploration companies have shown the most intense interest by way of leasing and exploration activity.
- (6) Low temperature sites situated at existing cities and towns will be developed with two decades.
- (7) The larger energy companies will develop most of the sites suitable for electric power generation. Numerous smaller companies will develop the intermediate and low temperatures resource for industrial processing and agricultural uses.

(8) Present technology for converting geothermal energy to electrical and direct thermal uses will be vastly improved in:

- (a) efficiency of conversion, and
- (b) minimum reservoir temperatures applicable, between now and the year 2020. Technology advances will permit:
 - a. Increased electrical power generation from existing wells.
 - b. Expansion of existing fields outward into the lower temperature periphery of existing high and intermediate temperature fields.
 - c. Utilization of upper intermediate temperature sites which initially will be suitable only for direct thermal uses.

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or

KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

NEVADA GEOTHERMAL AREA 1 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 1.

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 1

With the Charles Sheldon Antelope Range and Refuge located in the northern section, the Pyramid Lake Indian Reservation in the southern section and scattered private land throughout the area, approximately 1/3 of the area has restrictions to geothermal leasing. (leasing of indian lands is managed through the Bureau of Indian Affairs). Presently there are no federal environmental constraints on the remaining available public lands in the area. No apparent public opposition to geothermal leasing was expressed during the EAR hearings.

Of the fifteen (15) sites in this area, the Needles Rocks, Anaho Island and South Smoke Creek Desert are located on the Pyramid Lake Indian Reservation. In addition, Anaho Island is also a National Wildlife Refuge. No leasing has occurred at any of the sites in this area, nor are there any presently identified KGRAs. Seven of the sites (The Needles Rocks, Anaho Island, Surprise Valley, Middle Lake, Fortynine Lake, Sand Pass and Fish Springs) are located within U.S.G.S. defined Area

Potential Prospectively. Several Notices of Intent have been filed for geophysical survey work and shallow temperature gradient holes.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intents" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

I

5-55

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-57

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

10

5-58

AREA: 1

SITE CHARACTERISTICS:

SITE: THE NEEDLES ROCKS

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1993 50 MWe 1999
50 MWe 1995 25 MWe 2001
50 MWe 1997

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer	(1)																							
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan																									
Utility	Prepare Environmental Data Statement	BLM, USGS																								
BLM, FPC	Certify Plant & Site	BLM, FPC																								
STATE, USGS	Issue Permits	STATE, County																								
USGS	Process EIA/EIS (Drilling)	Producer & Utility																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

(1) Deep Hole Drilled & Abandoned, 1964

NEVADA GEOTHERMAL AREA 2 SCENARIO

5-61

Footnotess 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad= $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 2

In the northwest corner of this area is part of the Charles Sheldon Antelope Range, and BLM is considering the addition of several more tracts of land to this range. Of the thirteen (13) presently identified sites in this area, none are located within the considered tracts. Two sites, Bog Hot Springs and Virgin Valley Campground are located within the current antelope range. The remainder of sites are without environmental restrictions and are located on federal land.

Leasing activity has been significant within the area, with only five (5) sites without such activity: Bog Hot Springs, Virgin Valley Campground, Quinn River Crossing, Cain Springs and Deer Creek Peak. The most active leasing interest has occurred at the Baltazor Hot Springs KGRA-McGee Mountain-Gridley Lake Zone where about 75% of the interest is still in geothermal lease application status. Approximately 90% of the activity at Dyke Hot Springs and Pinto Hot Springs KGRA are now closed cases. Howard Hot Spring and

Bilk Creek Reservoir sites have about 90% of their leasing activity now in geo-sim status.

Most of the area is included in U.S.G.S. defined Area Potential Prospectively. There has been quite a few Notices of Intent filed for the area, for both geophysical survey and shallow temperature gradient holes. Most intensive interest indicated for Dyke Hot Springs and McGee Mountain sites.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intents" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973. Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

2

Sheldon W.L. Refuge
Sheldon W.L. Refuge

5-65

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site..

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974

- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-68

20,50,100 = MWe (megawatts electric); electrical power generation.
.037, .04, .017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

.037, .04, .017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 2

[illegible]

5-69

SITE CHARACTERISTICS:

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

50 MWe	1988	50 MWe	1994
50 MWe	1990	25 MWe	1996
50 MWe	1992		

[illegible]

NEVADA GEOTHERMAL AREA 3 SCENARIO

1

5-72

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 3

Of the five (5) sites in this area, only Jordan Meadow Mountain has direct federal environmental constraints. The constraint is a No Leasing-Pending Additional Environmental Studies for a proposed roadless area. Not all of the site is excluded from leasing. Throughout the area there are other small tracts of land which have a "No Leasing" constraint for Bighorn Sheep and Sage Grouse habitat. These additional restrictions do not directly affect any of the other sites.

Only two (2) sites in the area have shown any leasing activity. The first, Jordan Meadow Mountain is in about 50% geothermal lease and the second site, Cordero Mercury Mine is about 95% leased. There has been no leasing activity at any of the remaining three (3) sites: Five-mile Spring, Ninemile Summit Spring and Quinn River.

Presently there are no KGRAs in the area, and only the two sites with leasing activity are within U.S.G.S. defined Area Potential Prospectively. Of the few Notices of Intent filed for this area, only one site, Cordero

Mercury Mine was included. This was an intent to drill shallow temperature gradient holes by Earth Power Company.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

3

5-76

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974

- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-79

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 3

[illegible]

5-80

AREA: 3

SITE CHARACTERISTICS:

SITE: CORDERO MERCURY MINE

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1990

20 MWe 1992

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

NEVADA GEOTHERMAL AREA 4 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 4 .

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 4

Approximately 50% of the total area is covered by federal environmental constraints, which directly affects seven (7) of the eleven sites included in this area.

Of these particular seven sites, only one (1), South Fork has No Leasing-Pending Additional Environmental Studies (for archeological investigations). The other six (6): Hot Sulphur Springs, Hot Lake, Midas, Willow Creek, Dry Creek Mountain and Goosey Lake Flat allow leasing, but, are sites with special stipulations regarding seasonal use or entry and restrictions based on multiple uses of site and vicinity.

Nearly 40% of this area is under large blocks of private land, stock driveways and national forest land. Leasing activity has not been extensive, with only one (1) site, Hot Sulphur Springs with any leasing activity. About 2/3 of all activity in this site is under geothermal lease, the remainder of the activity is still in lease application. Present data indicates there are no closed cases at this site. Major companies have shown intensive

interest. Only three (3) of the sites: Hot Sulphur Springs, Hot Lake and The Hot Springs are included in U.S.G.S. defined Area Potential Prospectively.

Quite a few Notices of Intent have been filed for area, with only Hot Sulphur Springs and Burns Creek sites directly included in geophysical survey work by Southern Union Production Company.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973. Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

4

Some Private
Stock Driveway
Nat'l For.

5-87

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

FOR AREA 4

TOTAL Quads:

.037,.04,.017 = Quads. (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 4

[illegible]

AREA: 4

SITE CHARACTERISTICS:

SITE: HOT SULPHUR SPRINGS

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 30 MWe PLANT)

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1989

50 MWe 1991

50 MWe 1993

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer	(1)																							
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

(1) Extended lease time due to some environmental restrictions adjacent to and on small area of Site.

5-93

NEVADA GEOTHERMAL AREA 5 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 5 .

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface, 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 5

Approximately 2/3 of the total area is under private land (checkerboard pattern of alternating federal and public lands), national forest and some stock driveways. Of the twenty-one (21) sites located in this area four (4) are directly affected by federal environmental constraints. The decision allows leasing but has stipulations for seasonal occupancy restrictions for: Humboldt Wells, Goose Creek, Mary's River Ranch and Jackpot. Some of the other sites could possibly be affected by these and other environmental decisions for the area because they are located adjacent to the restricted tracts. Approximately 25% of area 5 is subject to some environmental (federal) decision.

Four (4) sites are located on Humboldt National Forest lands: Jarbidge Mountains, Rizzi Ranch Hot Spring, Tennessee Mountain and Wild Horse Hot Spring. When leasing activity becomes directed toward these sites, special environmental restrictions or stipulations may be required.

Presently there are no KGRAs located within the area and leasing activity cannot be considered significant, as only one (1) site has had any leasing action. All of the lease applications filed at Humboldt Wells site are now closed cases, no application went to lease. Eleven of the sites are located within U.S.G.S. Area Potential Prospectively.

There have been very few Notices of Intent filed for this area. Those filed were for both geophysical survey and shallow temperature gradient holes, which covered only a zone by Humboldt Wells to Mary's River Ranch.

There are four communities in this area: Wells, Jackpot, Montello and Mountain City, and the area includes about 2/3 of Elko County.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973. Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

5

Some Private
Humboldt Natl For.
Humboldt Natl For.
Humboldt Natl For.
Humboldt Natl For.

5-98

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- 1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE

FOR AREA 5

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252 x 10¹⁸ cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 5

[illegible]

AREA: 5

SITE CHARACTERISTICS:

SITE: HUMBOLDT WELLS

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1989 50 MWe 1995
50 MWe 1991 25 MWe 1997
50 MWe 1993

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer	(1)																							
BLM	Process EIA/EIS	CEQ	(1)																							
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

(1) Site located on and adjacent to private land, also, there are about 640 acres of the site which have environmental constraints (leasing allowed with seasonal restrictions). Whatever time to "on line" gained by presence or lease or use of private land leasing/rights-of-way, may be lost in seasonal restrictions. The environmental constraint does not apply to the entire site. No time adjustment made on this Scenario.

NEVADA GEOTHERMAL AREA 6 SCENARIO

5-105

. Footnotes 1 thru 7-see Explanation Page

. Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 6

This area is included within the controversial Black Rock Desert. Most of the controversy is from those who are interested in the protection and/or preservation of natural and historic phenomena associated with this desert. Quite briefly, there is an endangered fish (Soldier Meadows Dace) which is believed to be an ancestor of fish which thrived in ancient Lake Lahontan. The hot springs in the Soldiers Meadow area are the only known habitat for these fish. Soldiers Meadow is also one (1) of the sites in this area and, of course, has been excluded from leasing. Much of the Black Rock Desert is also being recommended for inclusion in the National Registry of Natural Landmarks. Archeologists, and historians are both greatly interested in the possible artifacts (one Clovis Point has been estimated at 11,500 years old). Some of the earliest accounts of the area were made by John C. Fremont. Also, the Black Rock Desert has had wagon trails (Noble Road) and forts (Camp McKee) within its boundary. The present environmental controversy is a deterrent to geothermal activity

and development.

Of the sixteen (16) sites in this area, six (6) are covered by federal environment constraints for "Excluded from Leasing": Double Hot Springs-Black Rock Hot Springs, Gerlach, Cholona, Trego, North Winnemucca Lake and Soldiers Meadows Hot Springs. There are eight (8) KGRAs identified for area 6: Double Hot Springs-Black Rock Hot Springs, Gerlach, Gerlach, N.E., Cholona, Fly Ranch, Fly Ranch, N.E., Trego and San Emidio Desert. But, the federal environment decision excluding leasing directly affects four (4) of the KGRAs: Trego, Cholona, Gerlach and Double Hot Springs-Black Rock Hot Springs, removing 50% of the geothermal interest areas.

There has been significant leasing activity in this area with most interest by major companies. Approximately 75% of all lease applications have become closed cases (have not gone to lease). Eleven (11) of the sixteen (16) sites in this area have had some, to significant leasing activity. San Emidio Desert (KGRA) site has about 15% of its activity

page 2 Non-Technical Components For Area 6

in geothermal leases by major companies. Over 50% of the Black Rock Desert has had leasing activity, but 98% never went to lease.

There have been a large number of Notices Of Intents filed for this area (17), with intense interest directed to the Black Rock Desert, including geophysical surveys and shallow temperature gradient holes. Some of the major companies who filed Notices of Intents are Chevron Oil, Southern Union Production, and Phillips Oil Companies.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973. Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

6

5-110

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
5. Drilling and Resource Data Sheets.
6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-113

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 6

[illegible]

5-114

AREA: 6

SITE CHARACTERISTICS:

SITE: SAN EMIDIO DESERT

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1987 50 MWe 1993
50 MWe 1989 25 MWe 1995
50 MWe 1991

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
ELM/Owner	Lease Land	Developer																								
ELM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

NEVADA GEOTHERMAL AREA 7 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 7

[illegible]

Footnotess .1 thru 7-see Explanation Page

5-117

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 7

Only 20% of this total area is covered by the checker-board pattern of alternating private and federal land sections. Remainder is national resource land. There are only four (4) sites in this area and they are without direct environmental constraints. Although the sites of Sulphur and MacFairlane's are located within the boundry of the Black Rock Desert, there are no environmental restrictions on this eastern edge. The MacFairlane's site is located adjacent to a very large block of "No Leasing" environmental constraints to the west which may, or may not disturb any geothermal development interests.

Presently there are no identified KGRAs within the area but impressive leasing activity has occurred at MacFairlane's with 80% of its applications in lease, and, at Sulphur which has 100% geothermal leases.

There have been a significant number (5) of Notices of Intent filed within this area. Concentration has been

indicated for the MacFairlane's and Sulphur sites and vicinity.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent's" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971.
Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

7

INTENTS

50

5-121

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BIM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE

FOR AREA 7

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

.037, .04, .017 = Quads (0.252 x 10¹⁸ cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 7

[illegible]

5-125

AREA: 7

SITE CHARACTERISTICS:

SITE: MacFAIRLANE'S

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1987

20 MWe 1989

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
ELI	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (De- veloper) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Trans- mission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

NEVADA GEOTHERMAL AREA 8 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 8

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 8

Approximately 90% of this area is covered by the familiar checkerboard pattern of alternating federal and private sections of land. The four (4) sites in this area are either located on or adjacent to private property, and the future availability of leaseable land for possible geothermal development may be of considerable importance. Federal environment constraints within the area do not directly affect any of the sites.

Leasing activity has occurred at three (3) of the sites:

Rye Patch KGRA with about 50% of its activity now in geothermal lease. The second site, Colado is also a KGRA with most all the activity now in closed cases. The third site, South Eugene Mountain has some geothermal leases. About 80% of the total leasing activity for this area has been conducted by major companies.

One (1) of the KGRAs, Colado is located about twelve (12) miles from the important community of Lovelock.

There have been four (4) Notices of Intent filed for the area with major focus in the Rye Patch-Colado zone for both geophysical survey and shallow temperature gradient holes.

A specific Plan of Operation has been filed by Phillips Petroleum Co. for their Federal leases at Rye Patch Reservoir area to drill six (6) geothermal wells to a depth of 2438 m (8000') plus or minus. All of the proposed geothermal wells are within a transportation and utility corridor.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973. Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

AREA: 8

[illegible]

5-132

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- 1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE
FOR AREA 8

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

037. Quads- (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

5-136

	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	
	390	490	490	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	500	500	450	450	350	
					30	30	80	80	130	130	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	
													30	30	80	80	130	130	180	180	180	180	180	180	180	180	
					</																						

AREA: 8

SITE CHARACTERISTICS:

SITE: RYE PATCH

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe	1988	100	1994
100 MWe	1990	100	1996
100 MWe	1992	50	1998

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 40 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer	(1)																							
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer									-															
Developer	Exploratory Drilling & Reservoir Evaluation		(2)								-	-	-	-	-											
Developer	Develop Utility Interest										-	-														
Developer & Utility	Feasibility Study											-														
Producer (Developer) & Utility	Financial Negotiations												-													
Producer	Site Selection												-													
Producer & Utility	Design														-	-	-									
Producer & Utility	Commitment to Development														Δ											
Producer & Utility	Prepare Master Development Plan	BLM, USGS														-	-									
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County														-	-									
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility														-	-	-								
USGS	Process EIA/EIS (Drilling)	CEQ														-	-									
FPC	Process EIA/EIS (Plant)	CEQ														-	-									
FPC	Process EIA/EIS (Transmission Line)	CEQ														-	-									
Producer	Development Drilling																-	-	-							
Utility	Plant Construction																-	-	-							
Utility	Install Transmission Line (40 km)																-	-	-							

- (1) Some leasing on private land (see References Sheet, 2c)
(2) Dates per Phillip's Plan of Operation for 6-8000' Wells (see:6)

NEVADA GEOTHERMAL AREA 9 SCENARIO

5-138

5-139

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 9

Close to 85% of the total area is covered by the well-known checkerboard pattern of alternating federal and private lands. Only one (1) of the nine (9) sites identified for this area: Brooks Hot Spring, is excluded from leasing by federal environment decisions. There are two (2) important communities in this area: Winnemucca and Golconda.

Presently there are no KGRAs in the area and leasing activity is not significant at this time. There are only two (2) sites with leasing activity: Hot Springs (Tipton) Ranch with closed cases and a few leases, and, Sand Dunes site with All activity now closed cases.

So far, only a few Notices of Intents are known for the area, focus has been at Hot Springs (Tipton) Ranch and Golconda sites.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intents" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

C

5-143

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or

KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
5. Drilling and Resource Data Sheets.
6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-146

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

.037,.04.017 = Quads (0.252 x 10¹⁸ cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

5-147

	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	
	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07	.06	.06	.06	.06	.06	.06	.06	.06	.06						
					20	20	70	70	120	120	170	170	220	220	245	245	245	245	245	245	245	245	245	245	245	245	
			.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03					
																							.005	.005	.005		

AREA: 9

Possible Subsequent Additions
Quads and On Line Date:

SITE CHARACTERISTICS:

SITE: GOLCONDA

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 0.07 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer(Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

NEVADA GEOTHERMAL AREA 10 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 10 .

[illegible]

. . Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 10

Approximately 50% of the total area is covered by the checkerboard pattern of alternating federal and private sections. This area is located about 125 miles from the Reno-Sparks metropolitan region. There are no direct environmental constraints for any of the five (5) sites in this area.

With 50% of the area in private land, there still has been significant leasing activity on federal lands.

... activity has been in and around the two (2) KGRAs:

Leach Hot Springs with about 75% of all applications now held as geothermal leases by major companies. The second KGRA, Kyle Hot Springs has had intense major company interest but All of the applications filed for this site and vicinity did not go to lease, but are now closed cases. There has been some leasing activity at Kent Springs where geothermal leases are presently shown.

There have been numerous Notices of Intent (10) filed

for this area, with the focus of geophysical survey and shallow temperature gradient hole activity for Leach Hot Springs. All five (5) sites are within U.S.G.S. Area Potential Prospectively.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intents" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

10

5-154

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE
FOR AREA 10

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

5-158

[illegible]

AREA: 10

SITE CHARACTERISTICS:

SITE: LEACH HOT SPRINGS

Possible Subsequent Additions
(MWe) and On Line Date:

100 MWe 1987	100 MWe 1995
100 MWe 1989	100 MWe 1997
100 MWe 1991	50 MWe 1999
100 MWe 1993	50 MWe 2001

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 35 MWe PLANT)

OPERATING ENTITIES			ACTIVITY			RECIPIENTS			70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																														
USGS	Approve NOI & Drill Permit	Developer																														
BLM/Owner	Lease Land	Developer																														
BLM	Process EIA/EIS	CEQ																														
County	Issue Land Use Permits	Developer																														
Developer	Exploratory Drilling & Reservoir Evaluation																															
Developer	Develop Utility Interest																															
Developer & Utility	Feasibility Study																															
Producer (Developer) & Utility	Financial Negotiations																															
Producer	Site Selection																															
Producer & Utility	Design																															
Producer & Utility	Commitment to Development																															
Producer & Utility	Prepare Master Development Plan	BLM, USGS																														
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																														
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																														
USGS	Process EIA/EIS (Drilling)	CEQ																														
FPC	Process EIA/EIS (Plant)	CEQ																														
FPC	Process EIA/EIS (Transmission Line)	CEQ																														
Producer	Development Drilling																															
Utility	Plant Construction																															
Utility	Install Transmission Line (40 km)																															

NEVADA GEOTHERMAL AREA 11 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 11 ..

[illegible]

. Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers; assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad= $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 11

A large area containing thirteen (13) identified sites. Approximately 1/3 of the total area is under the status of private land, (a checkerboard pattern consisting of alternating sections of federal and private land), National Forest and some stock driveways.

The most significant site, Battle Mountain, is located entirely within a federal environmental constraint decision for birds of prey. Leasing is permitted with special stipulations for seasonal occupancy. Also, this site is located on land classified for Bureau of Reclamation withdrawal, and is surrounded by private land. These site characteristics indicate a possible problem of additional leasing, some access considerations and possible restraints for development.

Despite the land status problems for the Battle Mountain site there has been major company leasing activities. Approximately 90% of all activity is still in lease application. Three (3) other sites, have shown leasing activity: Wild

Horse and Hot Springs Ranch which have shown significant activity by major companies with the former in lease applications and the latter in geothermal leases. The third site, Smith Creek Valley is now 100% Geo Sim status. Presently there are no KGRAs identified for this area. Most of the area is included in U.S.G.S. Area Potential Prospectively.

More than five (5) Notices of Intent have been filed for this area for both geophysical surveys and shallow temperature gradient holes. Concentration of interest has been at the Battle Mountain and Wild Horse sites.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

11

AREA: 11

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. The Nut-Walker Area,
Carson City District, Nev. 1975

- 1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-168

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

20,50,100 = MWe (megawatts electric); electrical power generation.

.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 11

[illegible]

5-169

AREA: 11

Possible Subsequent Additions
Quads and On Line Date:

SITE CHARACTERISTICS:

SITE: BATTLE MOUNTAIN

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST .017 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer						-	-																	
BLM/Owner	Lease Land	Developer	(1)																							
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer										-														
Developer	Exploratory Drilling & Reservoir Evaluation		(2)																							
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

(1) Acquired land-This acreage is still in Lease Appln.

(2) Exploratory drilling started late due to environmental restrictions and delay in leasing.

NEVADA GEOTHERMAL AREA 12 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 12 .

[illegible]

Footnotes 1 thru 7-see Explanation Page

5-172

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{°C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150\text{°}-200\text{°C}$
0.025 for $200\text{°}-250\text{°C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad= $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 12

Nearly 75% of the total area is under the familiar checkerboard pattern of alternating federal and private sections of land. In addition, the Entire area is affected by the federal environmental constraint for birds of prey and deer habitat. The constraint allows leasing but entry is restricted during certain seasons and also includes surface disturbance stipulations. All of the five (5) sites identified for this area are located within the checkerboard pattern.

Beowawe Geysers, one of the two KGRAs in area 12, has been a thermal area of considerable interest. One of the first descriptions of Beowawe Geysers was first described in 1869 during the construction of the Central Pacific Railroad. Several natural geysers were observed around 1934. Intensive drilling took place from 1959 through 1964 which apparently led to the discontinuance of the geyser activity. Leasing activity has been significant at the Beowawe Geysers site and adjacent area, with almost 50% of the activity now in geothermal leases.

Despite this site's location in the center of the checkerboard pattern, data indicates nearly 9000 acres are in geothermal lease outside KGRA boundary with approximately 11,183 acres within the KGRA. The other KGRA, Hot Springs Point has very few geothermal leases compared to the amount of activity now in Geo Sims. Horseshoe Ranch Springs and Duff Creek Range, both non-KGRAs, indicate some leasing activity, with both sites having several geothermal leases. All the sites within the area are located within U.S.G.S. Area Potential Prospectively.

There have been quite a number of Notices of Intents filed for the area with the concentration of interest at the Beowawe Geysers and Horseshoe Ranch Springs sites.

Although no major communities are located within this area, the area could be very important to two communities: Battle Mountain about 30 miles to the west and Elko about 70 miles to the east.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intents" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973. Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

12

5-176

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974

- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE

SITE NAME	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
Beowawe Geysers																	20	20	70	70	170	170	270	270	370

.037,.04,.017 = Quads (0.252 x 10¹⁸ cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 12

[illegible]

AREA: 12

SITE CHARACTERISTICS:

SITE: BEOWAVE GEYSERS

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe	1988	100 MWe	1998	100 MWe	2008
100 MWe	1990	100 MWe	2000	100 MWe	2010
100 MWe	1992	100 MWe	2002	50 MWe	2012
100 MWe	1994	100 MWe	2004		
100 MWe	1996	100 MWe	2006		

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

			100 MWe 1996 100 MWe 2006																							
OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USFS	Approve NOI & Drill Permit	Developer	(1)																							
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer	(2)																							
Developer	Exploratory Drilling & Reservoir Evaluation		(2)																							
Developer	Develop Utility Interest		(2)																							
Developer & Utility	Feasibility Study		(2)																							
Producer (Developer) & Utility	Financial Negotiations												-													
Producer	Site Selection												-													
Producer & Utility	Design													-	-											
Producer & Utility	Commitment to Development												Δ													
Producer & Utility	Prepare Master Development Plan	BLM, USGS													-	-										
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County													-											
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility														-	-									
USGS	Process EIA/EIS (Drilling)	CEQ														-	-									
FPC	Process EIA/EIS (Plant)	CEQ															-	-								
FPC	Process EIA/EIS (Transmission Line)	CEQ																-	-							
Producer	Development Drilling																		-	-						
Utility	Plant Construction																			-	-					
Utility	Install Transmission Line (40 km)																				-	-				

(1) Drilling activity in 1959, 1961, 1963, 1964, 1965.

(2) Assume completed because significant drilling/leasing activity by major companies and Sierra Pacific.

NEVADA GEOTHERMAL AREA 13 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 13 .

[illegible]

Footnotes .1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 13

A large area which presently has twenty-five (25) identified sites and three (3) important communities of: Eureka, Elko and Carlin. The northern 1/4 of the area is covered by the checkerboard pattern of alternating federal and private land sections, Indian Reservation and National Forest land. In the southern 1/4 of the area there is a significant amount of acreage in National Forest. Much of the area is covered by federal environmental constraints, only three (3) sites are directly affected: Carlotti Ranch Springs and Vivian Siding with seasonal occupancy restrictions and Diamond Mountains with no leasing pending additional environmental study decision.

The area has only two (2) KGRAs: Elko Hot Springs and Darrough's Hot Springs. Neither KGRA has any leasing activity within the KGRA boundary. The land status map indicates both sites are located on private property. Leasing activity has occurred in the vicinity adjacent to both KGRAs. Very few leases, perhaps 25% for both

sites. Four (4) other sites had some leasing activity (non-KGRAs), Walthi Hot Springs with 98% of all activity as closed cases and geo sims; Spenser Hot Spring which is located within a stock driveway also indicates 98% activity in closed cases, remainder in lease; Kingston and Wildcat Canyon sites with minor activity.

Very few Notices of Intent have been filed for the area, and none for any of the sites.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.

2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:

a. Nevada Clean Air Act of 1971. Amended in 1973.

b. Utility Environmental Protection Act, 1971.

Amended 1973.

Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

13

Some Private land
Stock Driveway

Private Land

5-187

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-190

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

5-191

AREA: 13

SITE CHARACTERISTICS:

SITE: DARROUGH'S HOT SPRINGS

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1991
20 MWe 1993

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer	(1)																							
BLM/Owner	Lease Land	Developer	(2)																							
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

- (1) Issue drilling permits extended to full year because of some environmental restrictions at Site.
(2) Darrough's Hot Sps. on private land. No leasing at KGRA Site-but leasing activity adjacent to Site, extended leasing 2 years more.

AREA: 13

Possible Subsequent Additions
Quads and On Line Date:

SITE CHARACTERISTICS:

SITE: ELKO HOT SPRINGS (1)

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST .007 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																			-					
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
PLM	Process EIA/EIS	CEQ	Completed																							
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

(1) Elko Hot Springs KGRA-Located on and within a private land block, and, the KGRA includes a part of the town of Elko. Very little (about 900 acres) of KGRA are federal land. Presently no leases, no intents nor environmental constraints for this Site.

94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20

5-194

NEVADA GEOTHERMAL AREA 14 SCENARIO

5-196

Footnotess .1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 14

Another large area containing twenty (20) presently identified sites. There are four (4) communities also within this area: Ely, East Ely, McGill and Ruth and all are located in the southern part of the area. About 40% of the total area is covered by federal environmental constraints but only three (3) sites: Sulphur Hot Springs (KGRA), Monte Neva Hot Springs (KGRA) and Step-toe sites are directly affected by the restrictions for seasonal occupancy. One (1) of the sites, Ruby Lake is located within the boundary of the Ruby Lake National Wildlife Refuge, which may require additional stipulations if interest is generated for this site.

Of the many sites in this area, only two (2) are KGRAs, as noted above. Both Monte Neva Hot Springs and Sulphur Hot Springs have had significant leasing activity, but most outside but adjacent to the KGRA boundaries. This may be accounted for by the presence of private land at both sites. About 95% of the activity at Monte Neva Hot Springs is now KGRA and is now in geothermal leases.

Most activity at Sulphur Hot Springs are now closed cases.

There has been activity at four (4) other sites Dolly Varden, Duck Creek, Snake Range and Shellborne Pass.

Very few Notices of Intents have been filed for the area.

Monte Neva Hot Springs KGRA is only site included in any of the geophysical survey work.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

14

Some Private Land

Some Private Land

Ruby L. Wild Ref.

Some Private Land

Some Private Land

Some Private Land

X

5-200

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:
2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps
 - a. Carson City District
Pyramid District, 1975
 - b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
 - c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
 - d. Elko District,
1975
 - e. Battle Mountain District
1976
 - f. Tonopah Resource Area
1975
 - g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
 - h. Pine Nut-Walker Area,
Carson City District, Nev. 1975
1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
5. Drilling and Resource Data Sheets.
6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-203

20,50,100 = MWe (megawatts electric); electrical power generation.

.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 14

[illegible]

AREA: 14

SITE CHARACTERISTICS:

SITE: SULPHUR HOT SPRINGS (1)

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe	1991	50 MWe	1999
100 MWe	1993	50 MWe	2001
100 MWe	1995	20 MWe	2003
100 MWe	1997		

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

			100 MWe 1997																							
OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USFS	Approve NOI & Drill Permit	Developer	(2)																							
BLM Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

(1) Sulphur Hot Springs located (by U.S.G.S.) as T31N/R59E Sec. 11-Now included in the Ruby Valley KGRA

(2) Drilling permits (Geophysical) and exploratory drilling may take longer due to some environmental restrictions even though there is some private property.

NEVADA GEOTHERMAL AREA 15 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 15 .

[illegible]

Footnotess 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir, assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 15

Approximately 80% of the total area is under private Indian Trust, State Parks and National Forest land classification. Along the western side of this area, is part of the Tahoe Basin (Toiyable Nat'l Forest) which is excluded from leasing by a Federal environmental decision. One of the sites, Crystal Bay, is included in this region. Another site affected by federal environmental decision is the Comstock Mining District which is excluded from leasing because of historic places which are listed on the Register of Historic Places. There are a total of fourteen (14) sites in this area and all of the sites are located either on or adjacent to private property.

There has been significant leasing activity in the area with the most important interest at the two (2) KGRAs, Steamboat Spring-Huffaker and Moana Spring-Lawton sites. Both sites contain private property. Most of the activity on federal land at these sites are lease applications which never went to lease. Six (6) other sites have had

leasing activity but all the leases are now closed cases.

Notices of Intents have been filed for the area, which most of the geophysical survey work centered in the Steamboat Spring-Huffaker and Moana Spring-Lawton sites, while most of the shallow temperature gradient hole activity was focused at Spanish Springs, Lockwood and Comstock Mining District sites.

Since most of the sites are located on private property, information is not easily available. Presently space heating and recreation are the two uses for the geothermal resource. The area also contains one of the two metropolitan regions in Nevada, Reno-Sparks. Growth is increasing as more land is removed from pasture and used for housing/retail/tourist development. Geothermal development will almost surely be in competition with the other entities for space.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973. Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

15

& Nat'l. Forest

5-211

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- 1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE
FOR AREA 15

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

.037,.04,.017 = Quads (0.252 x 10¹⁸ cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA: 15

SITE CHARACTERISTICS:

SITE: STEAMBOAT SPRING-HUFFAKER (1)

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 50 MWe PLANT)

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1991	50 MWe 2000
100 MWe 1994	50 MWe 2003
100 MWe 1997	

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (De- veloper) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Trans- mission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

(1) Federal/Private land. Area may have delays due to present recreational uses, known historic value and projected development for housing.

AREA: 15

Possible Subsequent Additions
Quads and On Line Date:

SITE CHARACTERISTICS:

SITE: STEAMBOAT SPRING-HUFFAKER

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST .037 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

NEVADA GEOTHERMAL AREA 16 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 16 .

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 16

Nearly 95% of the total area is taken by the checkerboard pattern of alternating federal and private lands, Indian Reservation and Bureau of Reclamation withdrawal. Only two (2) of the seven (7) sites in this area are on federal land: Huxley and Eagle Salt Works. The remaining five (5) sites are on one of the above noted land status. No federal environmental decisions affect this area.

There are two (2) KGRAs in the area. Brady's Hot Spring and Hazen. Both have had significant leasing activity with the majority of activity now in closed cases with few geothermal leases. Interest at both sites has been by both major and minor companies. Activity has also occurred at four (4) other sites, but not a significant trend. The exception is at Huxley. This site is a non-KGRA but has 60% of its leasing activity now in geothermal leases. Biddleman Spring is the only site without leasing activity. All seven (7) sites in this area are included in U.S.G.S. Area Potential Prospec-

tively.

Several Notices of Intent have been filed for the area with most interest for both geophysical survey and shallow temperature gradient holes concentrated at Brady's Hot Springs and Desert Peak.

The geothermal resources at the Desert Peak site are now being used in a newly completed food processing plant.

The leases and plant site are on private property. The communities of Wadsworth and Fernley are about 30 miles from this new plant.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

AREA: 16

[illegible]

5-223

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BIM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
- Carson City District, Nev. 1975

- 1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE
FOR AREA 16

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA: 16

SITE CHARACTERISTICS:

SITE: DESERT PEAK (1)

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe	1984	100 MWe	1992
50 MWe	1986	100 MWe	1994
100 MWe	1988	100 MWe	1996
100 MWe	1990	45 MWe	1998

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

(1) Private land

5-228

AREA: 16

Possible Subsequent Additions
Quads and On Line Date:

SITE CHARACTERISTICS:

SITE: BRADY'S HOT SPRINGS (1)

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 0.04 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study				Completed																					
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

(1) Dehydration/Processing plant on line-1978. Above based on this date.
DOE Loan Guarantee approved Oct. 14, 1977. Commitment to develop is based on this fact.

NEVADA GEOTHERMAL AREA 17 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 17 .

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 17

Approximately 85% of this total area is covered by Military Ordinance, Bureau of Reclamation withdrawals and the familiar checkerboard pattern. Only, this time the pattern is created by alternating sections of Fallon Wildlife Management area and Bureau of Reclamation, and/or private lands, as well as some federal lands. All three (3) sites in this area are affected by the federal environmental decision for military ordinance, as well as the other aforementioned land status. This area also includes part of the Stillwater Wildlife Management area which represents Nevada's largest waterfowl location, and, therefore a major recreational area. When geothermal development becomes feasible for this area, no doubt conflict will develop between recreation and site development. Additional environmental studies and decisions may be necessary.

Presently there are no KGRAs in this area, but there has been considerable leasing activity. Approximately 50-50% of all such activity has occurred at the Carson Sink-

Alkali Flat East and West sites. About 80% of the total activity is still in lease application. Most of leasing interest has been by individuals and/or investment groups.

Present data shows very few Notices of Intent have been filed for this area. But what geophysical survey and shallow temperature gradient holes activity intended, has included the entire area. All sites are also included in U.S.G.S. Area Potential Prospectively.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.

2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:

a. Nevada Clean Air Act of 1971. Amended in 1973.

b. Utility Environmental Protection Act, 1971.
Amended 1973.

Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

AREA: 17

[illegible]

5-235

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

FOR AREA 17

[illegible]

TOTAL Quads:

.037,.04,.017 = Quads (0.252 x 10¹⁸ cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 17

[illegible]

AREA: 17

SITE CHARACTERISTICS:

SITE: CARSON SINK-ALKALI FLAT, WEST SIDE

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1990

50 MWe 1992

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 25 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
ELM/Owner	Lease Land	Developer	(1)																							
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

(1) Present and possibly any future environmental constraints and land status pattern can be a deterrent in development. There are still over 34,000 acres in lease application. Only 10,800 acres have been leased. Have extended "Lease Land" by 2 years.

NEVADA GEOTHERMAL AREA 18 SCENARIO

5-241

HOT-WATER CONVECTION SYSTEMS IN AREA 18 .

[illegible]

Footnotes 1 thru 7-see Explanation Page

5-242

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 18

The Stillwater Wildlife Management area, Indian Reservation land, military and Bureau of Reclamation withdrawals and private lands make up approximately 75% of this total area. The Major waterfowl area for Nevada, Stillwater Wildlife Management Area and Stillwater Wildlife Management Refuge is located in the northern part of this area. It is a very popular and important recreational use region. Area is relatively free from federal environmental decisions with none of the sites having any constraints. When geothermal development is feasible in this area, conflicts will no doubt occur between recreation and development uses of land. Additional environmental studies may be necessary to resolve the conflict.

There are eight (8) sites in the area and two (2) are KGRAs: Soda Lakes-Upsal Hogback and Stillwater. Leasing activity at these KGRAs has been significant but, the greater activity has occurred outside but adjacent to the KGRA boundary. Most interest has been shown by major companies who do have a few leases in the KGRAs and vicin-

ity. Close to 95% of all the leasing activity for the area has occurred on non-KGRA land by major companies. Most of this activity has been at Four and Eight Mile Flats, North Sands Springs Range, Lee Hot Springs, Carson Lake and Rainbow Mountain. Basically, every one of the eight (8) sites in the area have leasing activity. All sites are also within the U.S.G.S. Area Potential Prospectively.

Extensive geophysical survey and shallow temperature gradient holes work have been implied by the Notices of Intent which have been filed. All sites have been included.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973. Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

18

Some Private
Wildlife Man.
Some Bur. Recl. Wdl.

5-246

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974

- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

FOR AREA 18

TOTAL **Quads:**

.037, .04, .017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 18

[illegible]

AREA: 18

SITE CHARACTERISTICS:

SITE: SODA LAKE-UPSAL HOGBACK (1)

Possible Subsequent Additions
(MWe) and On Line Date:

100 MWe 1987 50 MWe 1993
100 MWe 1989
100 MWe 1991

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 50 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

- (1) Based on unitization of KGRA in Oct. 1977-and planned Deep Well Test by Chevron. There could likely be concern from those who frequent area for recreation (Stillwater Wildlife Management).

AREA: 18

Possible Subsequent Additions
Quads and On Line Date:

SITE CHARACTERISTICS:

SITE: SODA LAKE-UPSAL HOGBACK (1)

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 0.02 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

(1) Above based on Fact that this Site was unitized Oct., 1977 with Deep Well Test planned by Chevron.

5-252

NEVADA GEOTHERMAL AREA 19 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 19

[illegible]

Footnotess.1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 19

A large area with eighteen (18) sites presently identified. Sou Hot Springs KGRA is only site in area with direct federal environmental constraint. The decision cover approximately 2000 acres of this KGRA which are being excluded from leasing pending additional environmental studies for archeological sites. Most of the sites are located in two important valleys: Dixie and Jersey which are important grazing areas.

Leasing activity has occurred at sixteen (16) of the eighteen (18) sites. There appears to be a grouping pattern of activity within the area, with four (4) significant zones:

1. North Dixie Valley

Three (3) of the five (5) sites in this zone are KGRAs: Sou Hot Springs, Hyder Hot Spring and Senator. Leasing activity has been very significant both in the KGRA's boundaries and in adjacent vicinities. There are many closed cases, some leases for both major and minor companies.

2. Central Dixie Valley

No KGRAs among the four (4) sites in this zone, but over 55% of the leasing activity for this zone has gone to geothermal leases, and about 35% still in lease application, remainder closed cases. Major companies have shown most interest.

3. South Dixie Valley

There is one (1) KGRA: Dixie Hot Springs among the three (3) sites for this zone. Most leasing activity has occurred beyond the perimeter of the KGRA mostly eastward. Perhaps no more than 20% of the activity is in geothermal lease, with remainder of activity divided between lease applications and closed cases.

4. Jersey Valley

With only two (2) sites and no KGRAs, this zone has had significant leasing activity, with almost 98% of this activity now in geothermal leases. The Jersey Valley site has 100% leases. Over half of the interest has been by major companies.

page 2 Non-Technical Components For Area 19

There has been extensive interest in both geophysical survey and shallow temperature gradient holes work, indicated by the numerous Notices of Intents filed. Focus of interest has been in zones 1 and 2, North and Central Dixie Valley respectively.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intents" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971.
Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- 1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-262

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 19

[illegible]

5-263

AREA: 19

SITE CHARACTERISTICS:

SITE: DIXIE HOT SPRINGS

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1989 50 MWe 1995
50 MWe 1991 25 MWe 1997
50 MWe 1993

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 20 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
FLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

NEVADA GEOTHERMAL AREA 20 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 20 .

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 20

Of the eight (8) sites presently identified for this area, only one (1) Buckskin Range is affected by federal environmental constraints. The decision was to exclude the region from leasing for protection of live water and wildlife management. Approximately 65% of the total area is covered by large blocks of private land, Indian Reservation, Indian Allotments, National Forest and State Park lands.

Wabuska Hot Springs and Wilson Hot Springs KGRAs.

There are two (2) KGRAs in this area: Wabuska Hot Springs with significant leasing activity by major companies, of which about 100% within KGRA are geothermal leases. The second KGRA, Wilson Hot Springs has 100% closed cases.

There is no leasing activity at the remaining six (6) sites. All the sites are within U.S.G.S. Area Potential Prospectively.

Significant interest in the area has been indicated by the number of Notices of Intents that have been filed, for both geophysical surveys and shallow temperature gradient holes. Focus of interest has been at the

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971.
Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

20

Some Private Land

Some Private Land

Some Private Land

5-270

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:
2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps
 - a. Carson City District
Pyramid District, 1975
 - b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
 - c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
 - d. Elko District,
1975
 - e. Battle Mountain District
1976
 - f. Tonopah Resource Area
1975
 - g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
 - h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
5. Drilling and Resource Data Sheets.
6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-273

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 20

[illegible]

5-274

AREA: 20

SITE CHARACTERISTICS:

SITE: WABUSKA HOT SPRINGS

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1988

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 30 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan																									
Utility	Prepare Environmental Data Statement	BLM, USGS																								
BLM, FPC	Certify Plant & Site	BLM, FPC																								
STATE, USGS	Issue Permits	STATE, County																								
USGS	Process EIA/EIS (Drilling)	Producer & Utility																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

5-275

AREA: 20

Possible Subsequent Additions
Quads and On Line Date:

SITE CHARACTERISTICS:

SITE: WABUSKA HOT SPRINGS (1)

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 0.03 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer							-																	
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

(1) Hot water being used for Greenhouse heating now.

5-276

NEVADA GEOTHERMAL AREA 21 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 21 .

[illegible]

Footnotess.1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad= $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 21

There are no federal environmental constraints for any of the sites within this area.

Presently seven (7) sites have been identified for this area with leasing activity at five (5) of the sites.

None of the sites have been designated as KGRAs. West Gabbs Valley and Dead Horse Wells-Wedell Springs have about 25% of their activity in geothermal leases and another 25% in lease applications, the remainder closed cases. At Kelly Wells and Downeyville sites, 80% of their activity is now in geothermal lease. All activity at these four (4) sites has been conducted by minor companies. At the site of Bell Falt, 100% of the leasing activity never went to lease.

Although there seems to be intensive leasing activity in the area, and most of the sites are within the U.S.G.S. designation of Area Potential Prospectively, the number of Notices of Intents filed have been very insignificant. Some shallow temperature gradient holes were scheduled for a location just south of West Gabbs Valley.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

21

5-282

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BIM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974

- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE

FOR AREA 21

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

.037,.04,.017 = Quads (0.252 x 10¹⁸ cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 21

[illegible]

AREA: 21

SITE CHARACTERISTICS:

SITE: DEAD HORSE WELLS-WEDELL SPRINGS

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1992
50 MWe 1994
50 MWe 1996

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 15 MWe PLANT)

OPERATING ENTITIES			ACTIVITY		RECIPIENTS		70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																												
USGS	Approve NOI & Drill Permit	Developer	(1)																											
BLM/Owner	Lease Land	Developer																												
BLM	Process EIA/EIS	CEQ																												
County	Issue Land Use Permits	Developer																												
Developer	Exploratory Drilling & Reservoir Evaluation																													
Developer	Develop Utility Interest																													
Developer & Utility	Feasibility Study																													
Producer (Developer) & Utility	Financial Negotiations																													
Producer	Site Selection																													
Producer & Utility	Design																													
Producer & Utility	Commitment to Development																													
Producer & Utility	Prepare Master Development Plan	BLM, USGS																												
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																												
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																												
USGS	Process EIA/EIS (Drilling)	CEQ																												
FPC	Process EIA/EIS (Plant)	CEQ																												
FPC	Process EIA/EIS (Transmission Line)	CEQ																												
Producer	Development Drilling																													
Utility	Plant Construction																													
Utility	Install Transmission Line (40 km)																													

(1) No Intents filed-Project such work-start in 1979.

NEVADA GEOTHERMAL AREA 22 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 22 .

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 22

Almost 50% of the entire area is under the U.S. Naval Ammunition Depot, National Forest and Walker Lake Recreation Area. Only one (1) site, Aldrich Station has been affected by federal environmental constraints, which is an exclusion from leasing for recreational uses.

Although there are eight (8) sites identified for this area, there presently are no KGRAs nor is there any leasing activity at any of the sites. The sites appear to be on federal land with no apparent access problems.

No Notices of Intent have been filed, and, only one (1) site: Sodaville Springs is within the U.S.G.S. Area Potential Prospectively designation. This area has three (3) important communities: Babbit, Hawthorne and Mina.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

22

Private & Bur. Re. Wd.

5-293

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding
number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
5. Drilling and Resource Data Sheets.
6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

5-296

20,50,100 = MWe (megawatts electric); electrical power generation.
.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 22

	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	
											.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	

5-297

AFPA: 22

Possible Subsequent Additions
Quads and On Line Date:

SITE CHARACTERISTICS:

SITE: SODAVILLE SPRINGS (1)

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 0.03 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
PLM	Process EIA/EIS	CEQ		Completed																						
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

(1) Greenhousing-Future-on line by 2005.

5-298

94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20

NEVADA GEOTHERMAL AREA 23 SCENARIO

5-300

HOT-WATER CONVECTION SYSTEMS IN AREA 23

[illegible]

Footnotes 1 thru 7-see Explanation Page

5-301

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 23

Of the eleven (11) sites presently identified for this area, two (2) have federal environmental constraints. The first, Tonopah Mining District is excluded from leasing because of the historic value of the site. The second, Fish Lake Valley has a decision which permits leasing but no surface entry, this decision covers about 1/2 of the described site.

Five (5) sites in the area have shown impressive leasing activity, especially at Fish Lake Valley and Southern Clayton Valley sites which both have 50% of their activity now in geothermal leases. The one (1) KGRA, Silver Peak Hot Springs presently has no active leases, all activity now in closed cases. Looking at the Land Status Map for Nevada (1:500,000) shows that most of the sites are located in or in the near vicinity of mining districts. About 98% of all leasing activity has been conducted by minor companies. All activity at Valcalda and Mt. Diablo sites are closed cases.

There have been no Notices of Intent filed for this area.

General Statement to Non-Technical Components Section,
Area Scenarios .

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971.
Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

23

Some Private Land

5-305

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or

KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE
FOR AREA 23

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

0.037-.04-.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

5-309

[illegible]

AREA: 23

SITE CHARACTERISTICS:

SITE: FISH LAKE VALLEY

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe	1993	100 MWe	1999
50 MWe	1995	50 MWe	2001
100 MWe	1997		

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 40 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer	(1)																							
BLM/Owner	Lease Land	Developer	(3)																							
BLM	Process EIA/EIS	CEQ	(2)																							
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

- (1) No Intents.
- (2) Detrimental restrictions for this Site. (No surface occupancy). Each lease with Intents will have to be individually considered. This will add a significant amount of time to acquiring leases and doing geophysical work.
- (3) Additional leasing may or may not be necessary. If additional lands for development are necessary other restrictions (Footnote 2) may prevent such acquisition.

NEVADA GEOTHERMAL AREA 24 SCENARIO

HOT-WATER CONVECTION SYSTEMS IN AREA 24

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad = $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 24

The southern half of this area is covered by the Nellis Air Force Base and Nevada Test Site. Also, about 35% of the total area is covered by federal environmental constraints which includes five (5) of the fifteen (15) presently identified sites for the area. Only one (1) site, Lunar Crater has a no leasing decision, pending additional environmental studies. The other affected four (4) sites permit leasing with seasonal surface occupancy and live water stipulations.

There is one (1) designated KGRA in the area: Warm Springs which has had some leasing activity by major companies who presently have several geothermal leases. The only other leasing activity has occurred at Lunar Crater with 100% of all activity now in closed cases (no leasing) and some activity at Railroad Valley-Pancake Range which are also closed cases.

Apparently there are no Notices of Intent filed for this area.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

24

Some Private Land

5-316

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or

KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- 1. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE
FOR AREA 24

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

.037,.04,.017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 24

[illegible]

5-320

AREA: 24

SITE CHARACTERISTICS:

SITE: WARM SPRINGS

Possible Subsequent Additions
(MWe) and On Line Date:

50 MWe 1992

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST 40 MWe PLANT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ																								
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop Utility Interest																									
Developer & Utility	Feasibility Study																									
Producer (Developer) & Utility	Financial Negotiations																									
Producer	Site Selection																									
Producer & Utility	Design																									
Producer & Utility	Commitment to Development																									
Producer & Utility	Prepare Master Development Plan	BLM, USGS																								
Utility	Prepare Environmental Data Statement	BLM, FPC STATE, County																								
BLM, FPC STATE, USGS	Certify Plant & Site Issue Permits	Producer & Utility																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
FPC	Process EIA/EIS (Plant)	CEQ																								
FPC	Process EIA/EIS (Transmission Line)	CEQ																								
Producer	Development Drilling																									
Utility	Plant Construction																									
Utility	Install Transmission Line (40 km)																									

5-321

NEVADA GEOTHERMAL AREA 25 SCENARIO

5-322

5-323

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad= $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 25

Approximately 60% of the total area is covered by federal environmental constraints, which directly affect four (4) of the twenty (20) sites now identified in this area. Many of the remaining sites may have some affect because their locations are quite often adjacent to large areas with restrictions. Most of the decisions are for the protection of deer habitat and so are stipulations for seasonal occupancy. All restrictions permit leasing. The south 1/3 of the total area is covered by part of the Nellis Air Force Base, Gunnery Bombing Range and Desert National Wildlife Range.

There are no KGRAs in the area, and only one (1) site, Granite Peak, located in the Humboldt National Forest, has no current geothermal leases. All activity is in closed case status. All the activity was conducted by individuals and/or investment groups.

There have been no Notices of Intent filed for this area.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971. Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private Indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

25

5-327

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e. = Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

- i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974
- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

COMPOSITE POSTULATED SITE DEVELOPMENT SCHEDULE
FOR AREA 25

[illegible]

20,50,100 = MWe (megawatts electric); electrical power generation.

.037,.04,.017 = Quads (0.252 x 10¹⁸ cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

5-331

[illegible]

AREA: 25

SITE CHARACTERISTICS:

SITE: CALIENTE (1)

Possible Subsequent Additions
Quads and On Line Date:

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST .005 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer															-									
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																-								
BLM	Process EIA/EIS	CEQ	Completed																							
County	Issue Land Use Permits	Developer																	-							
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

(1) Caliente Hot Springs-No leasing, No Intents-No Federal environmental constraints, partially located on private property.

5-332

NEVADA GEOTHERMAL AREA 26 SCENARIO

5-333

HOT-WATER CONVECTION SYSTEMS IN AREA 26

[illegible]

Footnotes 1 thru 7-see Explanation Page

EXPLANATION TO HOT-WATER CONVECTION SYSTEMS SHEETS

Footnotes

- (1) Maximum surface temperature reported from a spring or fumarole.
- (2) Predicted using chemical geothermometers, assuming last equilibration in the reservoir; assumes saturation of SiO_2 with respect to quartz, and no loss of Ca from calcite deposition.
- (3) Assumed average reservoir temperature based on data presently available. Temperatures from Circular 726 and other sources. Temperatures in parentheses are highly subjective.
- (4) From surface manifestations, geophysical data, well records, geologic inference and leasing activity. Assumes 1.5 km^2 if no data pertinent to size is available. Top assumed at depth of 1.5 km if no data available. Bottom assumed at 3 km depth for all convection systems. Calculated from assumed area and thickness.
- (5) Calculated as product of assumed volume, volumetric specific heat of $0.6 \text{ cal/cm}^3\text{C}$, and temperature in degrees C above 15°C .
- (6) 0.02 for $150^\circ\text{--}200^\circ\text{C}$
0.025 for $200^\circ\text{--}250^\circ\text{C}$
- (7) 25% Heat Content Recoverable as thermal energy at the surface; 1 Quad= $0.25 \times 10^{18} \text{ cal}$.

Non-Technical Components For Area 26

A large area in the southern part of Nevada which includes Clark county and the Las Vegas-Henderson metropolitan region. Approximately 35% of the area is within the Nevada Test Site, Desert National Wildlife Range and private property. Also, about 20% of the total area has some federal environmental constraints. Of the twenty-two (22) identified sites in the area, five (5) have critical restrictions which are for seasonal occupancy with leasing permitted. One (1) site, Moapa, has been excluded from leasing.

To date no leasing activity has occurred at any of the sites, but over half of the sites are included in the U.S.G.S. designated Area Potential Prospectively.

There have been no Notices of Intent filed for any of the sites nor any part of this area.

General Statement to Non-Technical Components Section,
Area Scenarios

1. All observations for environmental, leasing and "Intent" are based on data gathered in 1977, which has not been corrected, adjusted or up-dated.
2. All environmental decisions are federal (BLM) as there are no localities in Nevada which require an environmental statement. Nevada has only 2 laws requiring such reports:
 - a. Nevada Clean Air Act of 1971. Amended in 1973.
 - b. Utility Environmental Protection Act, 1971.
Amended 1973.
Requires environmental statement for utility plant siting.

Protection of environmental values is now explicitly and clearly a major criteria for BLM management activities. All BLM activities are governed by the "Federal Land Policy and Management Act".

3. Areas 15, 16, 17, 18, 19 grouped together make up a zone of Intensive and Extensive geothermal resource interests.

A little over 1/2 of the total land in this zone is available for geothermal leasing, the remainder is covered by private indian reservation, Bureau of Reclamation withdrawals, wildlife management and refuge, state parks and military use lands. The zone contains 10 KGRAs.

There has been intensive "Geophysical" and "Shallow Temperature Gradient Hole" interest indicated by numerous filings of "Intent to do Geothermal Resource Exploration" with U.S.G.S. To date we do not know how many of these projects were completed.

This zone does not have extensive environment decisions but some significant sites will be affected by such decisions. (i.e. Tahoe Basin Area and Carson Sink-Alkali Flat East and West)

There has been significant leasing in this zone, both within the KGRA's and its vicinity. The leasing interest is mostly by minor companies and individual and/or investment groups. Some sites showed 100% major company interest, such as Bell Flat, of which very few are still lease applications, the remainder closed cases.

This zone includes 1 of the 2 metropolitan localities in the state: Reno-Sparks - (should include Carson City) with many important communities, good to fair transportation arteries.

Economic Base: Tourism, Agriculture/Livestock, Warehousing. The growth in tourism and warehousing increases population energy needs.

26

5-338

EXPLANATION FOR AREA SHEETS

ENVIRONMENT: Federal environmental decisions relating to availability of federal lands for geothermal resource leasing. All data taken from Environmental Assessment Records prepared by BLM.

CRIT. R.: Critical Restrictions. Restrictions to lessee, in addition to those restrictions covered in the Geothermal Resource Lease Application (Sec. 14 and 18).

EXCLUD. PEND.: Excluded from Leasing. Pending additional environmental studies.

EXCLUD.: Excluded from all leasing.

LAND STATUS: Geothermal leasing status on federal lands.

LSE. APLN.: Lease Application

CLOSED: Closed cases. Application never became lease. In theory the land is available for geothermal leasing.

GEO. SIM.: Geothermal Simultaneous Drawing. These applications became leases, then were terminated or relinquished by the lessee. These parcels are held for simultaneous drawing.

OPEN: Open - No leases presently recorded for site.

A.P.P.: Area Potential Prospectively. As outlined by U.S.G.S., possible geothermal resource areas.

OTHER or
KGRA: KGRA - Known Geothermal Resource

OWNERSHIP INTEREST:

MAJOR: Major company interest or holdings.

MINOR: Minor company interest or holdings.

IND./INV.: Individual and/or investment group interest or holdings.

INTENTS: "Intent to Conduct Geothermal Resource Exploration" are filed with U.S.G.S.

GEO.: Geophysical work only. No Drilling (i.e.= Gravity, magnetotelluric and other surveys)

DRILL: Drilling of shallow temperature gradient holes.

OTHER: Any exploration work not included in above categories.

(NOTE: The filing of the Intent to conduct geothermal resource exploration Does Not imply the work was completed.)

References To Postulated Site Development Schedules
And Non-Technical Components Of Areas.

References (indicated by parentheses and corresponding number)

1. Oral Communication:

2. Regional Environmental Analysis Record
Geothermal oil/gas leasing (BLM) and maps

- a. Carson City District
Pyramid District, 1975
- b. Winnemucca District
Sonoma-Gerlach Resource Area
Buffalo Hills Planning Unit
1975
- c. Winnemucca District
Deno, Paradise, Blue Wing and
Sonoma Planning Units,
1975
- d. Elko District,
1975
- e. Battle Mountain District
1976
- f. Tonopah Resource Area
1975
- g. Fort Churchill-Clan Alpine Area,
Carson City District, Nev., 1975
- h. Pine Nut-Walker Area,
Carson City District, Nev. 1975

i. Esmeralda Planning Unit,
Esmeralda and Nye Counties, 1974

- 3. Lease Books (Nevada Team Data)
Data obtained from BLM public records and maps.
- 4. "Intent to Conduct Geothermal Resource Exploration"
(Filed with U.S.G.S.), (Maps and Folder) and maps.
- 5. Drilling and Resource Data Sheets.
- 6. Plan of Operation, Phillips Petroleum Company,
March 1, 1978 - To drill 6 geothermal wells to 8000'.
To determine the existence and commercial potential of
geothermal resources.
Estimating starting date - 6-78
Estimated comp. date - 12-82

FOR AREA 26

TOTAL Mile:

TOTAL Quads:

.037, .04, .017 = Quads (0.252×10^{18} cal.); direct thermal utilization. Quads available for commercial utilization. It is unlikely that the energy developed at each site will be wholly utilized, or utilized in the optimum or most efficient manner.

AREA 26

[illegible]

5-342

SITE CHARACTERISTICS:

SITE: SARCOBATUS FLAT-BEATTY (1)

POSTULATED SITE DEVELOPMENT SCHEDULE (FOR FIRST .005 QUAD DEVELOPMENT)

OPERATING ENTITIES	ACTIVITY	RECIPIENTS	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BLM	Approve Notice of Intent-	Developer																								
USGS	Approve NOI & Drill Permit	Developer																								
BLM/Owner	Lease Land	Developer																								
BLM	Process EIA/EIS	CEQ	Completed																							
County	Issue Land Use Permits	Developer																								
Developer	Exploratory Drilling & Reservoir Evaluation																									
Developer	Develop User Interest																									
Developer & User	Feasibility Study																									
Producer (Developer) & User	Financial Negotiations																									
Producer	Site Selection																									
Producer & User	Design																									
Producer & User	Commitment to Development																									
Producer & User	Prepare Master Development Plan	BLM, USGS																								
User	Prepare Environmental Data Statement	BLM, STATE, County																								
BLM, STATE, USGS	Issue Permits on Site	Producer & User																								
USGS	Process EIA/EIS (Drilling)	CEQ																								
Producer	Development Drilling																									
User	Plant Construction																									

(1) No leasing, No Intents, No federal environmental constraints for this Site. May be some private land.

5-344

APPENDIX B.

POSTULATED DEVELOPMENT SCHEDULE FOR NEVADA GEOTHERMAL AREAS
ELECTRIC POWER GENERATION (in MWe)

AREA	-- Identified --							----- Inferred -----																
	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01
1														20	20	70	70	120	120	170	170	220	220	245
2									20	20	70	70	120	140	190	240	290	310	335	335	360	360	410	410
3											20	20	70	70	90	90	90	90	90	90	90	90	90	90
4										30	30	80	80	130	130	180	180	180	180	180	180	210	210	260
5										20	20	70	70	120	120	170	170	220	220	245	245	245	245	245
6								20	20	70	70	120	120	170	170	220	220	245	280	280	380	380	480	500
7								20	20	70	70	90	90	90	90	90	90	90	90	90	90	90	90	90
8									40	40	90	90	190	190	290	290	390	390	490	490	540	540	570	570
9																						20	20	
10								35	35	135	135	235	235	335	335	435	435	535	535	635	635	685	685	735
11																								
12									20	20	70	70	170	170	270	270	370	370	470	470	570	570	670	670
13												20	20	70	70	90	90	90	90	110	110	160	160	180
14												20	20	70	70	170	170	270	270	370	370	420	420	470
15											50	50	50	100	100	100	200	200	200	300	300	300	350	350
16					20	20	70	70	120	120	220	220	320	320	420	420	520	535	635	685	730	830	855	905
17											25	25	75	75	125	125	125	125	125	125	125	125	125	150
18								50	50	150	150	250	250	350	380	430	480	480	580	580	680	680	780	780
19										20	20	70	105	155	205	255	305	355	390	415	465	485	535	585
20									30	30	80	80	80	80	80	80	80	80	110	110	160	160	160	160
21													15	15	65	65	115	115	165	165	165	165	165	165
22																								
23														40	40	90	90	140	140	240	240	340	365	415
24													40	40	90	90	90	90	130	130	180	180	180	180
25																								
26																								
TOTAL					20	20	70	195	355	725	1,120	1,580	2,120	2,750	3,350	3,970	4,570	5,030	5,645	6,215	6,785	7,235	7,785	8,175

Identified: Reservoir characteristics at least partially known from one or more deep test wells; economic or apparently economic.

Indicated: Used here as the probable to possible extension of an Identified reservoir.

Inferred: A possible resource which has not been tested by a deep well. It may, for example, be a site characterized by favorable geothermometry, temperature gradient holes, and geophysics; or it may be merely the site of a nondescript moderately thermal spring or geothermal leasehold.

-----Inferred-----

AREA	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	MWe in 2020	
1	265	265	315	315	335	335	335	335	335	360	360	410	410	460	460	460	460	460	460	460	
2	460	460	490	490	540	540	565	565	615	615	665	665	685	685	715	715	685	685	635	635	
3	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	70	70	20	20	
4	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	230	230	180	180	
5	245	245	245	275	275	325	325	375	375	425	425	425	425	425	425	405	405	355	355	355	
6	600	700	800	900	1000	1100	1200	1250	1320	1320	1420	1440	1480	1510	1580	1550	1620	1570	1590	1590	
7	90	90	90	90	90	90	90	90	90	90	90	90	90	70	90	40	90	70	90	90	
8	620	620	670	670	720	720	750	750	800	800	850	850	900	900	860	860	810	810	710	710	
9	70	70	120	120	170	170	220	220	245	245	245	245	265	265	315	315	335	335	335	335	
10	735	735	735	755	755	805	805	855	855	905	905	955	955	945	945	845	845	745	745	745	
11				20	20	70	70	120	120	170	170	220	220	245	245	245	245	245	245	245	
12	770	770	870	870	970	970	1070	1090	1190	1240	1290	1340	1340	1390	1390	1440	1440	1490	1410	1410	
13	200	200	250	250	270	270	290	290	340	340	360	360	360	360	380	380	430	410	430	430	
14	470	490	490	520	520	570	570	620	640	690	740	740	790	790	840	870	920	950	975	975	
15	350	400	400	400	400	400	400	400	425	425	425	475	475	475	475	475	425	425	425	425	
16	955	1005	1055	1070	1070	1120	1120	1220	1245	1295	1325	1375	1375	1375	1275	1275	1175	1175	1075	1075	
17	150	200	200	250	250	250	250	270	270	320	320	340	340	340	340	340	315	315	265	265	
18	880	880	930	955	955	1005	1005	1055	1055	1080	1080	1130	1130	1130	1155	1055	1105	1005	1055	1055	
19	635	635	695	695	745	745	795	830	830	880	880	930	950	950	1000	980	1030	980	945	945	
20	160	160	160	160	160	160	160	160	160	160	160	160	160	160	130	130	80	80	80	80	
21	165	165	165	180	180	230	230	280	280	330	330	330	330	330	330	330	330	330	315	315	
22																					
23	465	465	515	515	515	515	515	515	515	515	515	515	515	515	515	545	545	595	595	595	
24	220	220	270	270	270	295	295	345	345	345	345	375	375	425	425	475	475	525	485	485	
25																					
26																					
TOTAL	8,855	9,125	9,815	10,120	10,560	11,035	11,410	11,985	12,400	12,900	13,250	13,720	13,920	14,095	14,240	14,050	14,065	13,805	13,420	13,420	

APPENDIX C.

POSTULATED DEVELOPMENT SCHEDULE FOR NEVADA GEOTHERMAL AREAS

DIRECT THERMAL UTILIZATION (in Quads)

AREA	----- Identified -----										----- Indicated -----										----- Inferred -----			
	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
1																								
2																								
3																								
4																								
5																								
6																.037	.037	.037	.037	.037	.037	.037	.037	.037
7																								
8																								
9													.07	.07	.07	.07	.07	.07	.07	.07	.07	.07	.11	.11
10																								
11											.017	.017	.017	.017	.017	.017	.017	.017	.017	.017	.017	.017	.017	.017
12																								
13																					.011	.011	.011	.011
14																								
15									.037	.037	.037	.037	.037	.037	.037	.074	.074	.091	.091	.091	.091	.091	.091	.091
16				.04	.04	.04	.04	.04	.04	.04	.04	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08
17																								
18							.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.06
19																				.05	.10	.10	.10	.10
20							.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.06
21																								
22																								
23																								
24																								
25																.005	.005	.005	.005	.005	.005	.005	.005	.005
26																								
TOTAL				.04	.04	.04	.09	.09	.127	.127	.144	.184	.254	.254	.254	.333	.333	.350	.350	.400	.461	.461	.501	.571

Identified: Reservoir characteristics at least partially known from one or more deep test wells; economic or apparently economic.

Indicated: Used here as the probable to possible extension of an Identified reservoir.

Inferred: A possible resource which has not been tested by a deep well. It may, for example, be a site characterized by favorable geothermometry, temperature gradient holes, and geophysics; or it may be merely the site of a nondescript, moderately thermal spring or geothermal leasehold.

-----Inferred-----

5-348

AREA	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20		
1																								
2																								
3																								
4																								
5																								
6	.037	.037	.037	.037	.037	.037	.037	.037	.037	.037	.037	.036	.036	.036	.036	.036	.036	.036	.036	.036	.036	.036		
7																								
8																								
9	.11	.11	.11	.11	.11	.11	.11	.11	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.03	.035	.035	.035		
10																								
11	.017	.017	.017	.017	.017	.017	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016								
12																								
13	.011	.011	.011	.011	.011	.011	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010		
14																								
15	.091	.091	.091	.091	.090	.090	.090	.090	.090	.090	.090	.089	.089	.088	.052	.052	.052	.052	.052	.052	.052	.016		
16	.08	.08	.08	.08	.08	.08	.08	.08	.08	.04	.04	.04	.04	.04	.04	.04								
17																								
18	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04		
19	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.09	.09	.09	.09	.09	.09	.09		
20	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.03	.03	.03	.03	.03	.03	.03	.02	.02		
21																								
22						.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03		
23				.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02		
24																								
25	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005			
26												.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005		
TOTAL	.571	.571	.571	.571	.590	.590	.618	.618	.598	.558	.558	.561	.541	.510	.474	.464	.448	.408	.348	.353	.343	.302		

APPENDIX O

RPPM DATA FILE - NEVADA
July 7, 1978

AMS SHEET: VY

APPENDIX O

NEVADA

--- TEMPERATURES IN DEGREES C ---

WTE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
6058	BOG HOT SPRINGS	608	41°55'35"N	- 118°48'10"W	46N	28E	18	10	115°	88°		
6016	BALTAZOR HOT SPRINGS	608	41°55'40"N	- 118°42'35"W	46N	28E	26	10		93°		
	VIRGIN V. CAMPGROUND	608	41°52'15"N	- 119°00'40"W	45N	26E	3			32°		
	MIDDLE LAKE	616	41°44'00"N	- 119°47'10"W	44N	19E	13			28°		
	VIRGIN VALLEY	608	41°47'55"N	- 119° 6'00"W	45N	25E	25			Warm		
	MC GEE MOUNTAIN	608	41°49'20"N	- 118°49'00"W	45N	27E	24			55°-		
	LITTLE SAGE HEN SP.	608	41°49'45"N	- 118°33'10"W	46N	30E	36			ND		
	JORDAN MEADOW MTN.	608	41°52'10"N	- 118° 2'15"W	46N	35E	15			ND		
	FIVEMILE SPRING	608	41°00'55"N	- 118°15'00"W	45N	33E	22			28°		
	FORTYNINE LAKE	616	41°35'15"N	- 119°51'40"W	42N	19E	4			22°		
	GRIDLEY LAKE	608	41°45'25"N	- 118°50'20"W	44N	27E	14			42°		
6029	HOWARD HOT SPRING	608	41°43'25"N	- 118°30'10"W	44N	31E	4	10	130°	73°		
	BILK CREEK RESERVOIR	608	41°40'25"N	- 118°26'40"W	44N	32E	19	10		57°		
	NINEMILE SUMMIT SP.	608	41°42'20"N	- 118°15'15"W	44N	33E	10			26°		
6026	DYKE HOT SPRINGS	608	41°33'10"N	- 118°33'40"W	43N	31E	31	20	140°	70°		
	QUINN RIVER CROSSING	608	41°31'45"N	- 118°28'30"W	42N	31E	11			24°?		
	DEER CREEK PEAK	608	41°29'50"N	- 118°26'00"W	42N	32E	19			21°		
	DE LONG SPRING	608	41°29'20"N	- 118°17'50"W	42N	33E	29			26°		
6057	SOLDIER MEADOWS H.SPS	608	41°22'00"N	- 119°13' 5"W	40N	24E	23	12	115°	54°		
6012	PINTO HOT SPRINGS	608	41°21'55"N	- 118°47'35"W	40N	28E	21	10		94°		

5-350

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-351

AMS SHEET: MC DERMITT

NEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	CORDERO MERCURY MINE	608	41°55'40"N - 117°48'35"W		47N	37E	28	10		59°-		
	GOOSEY LAKE FLAT	608	41°46'20"N - 117°23'30"W		45N	41E	19			Hot		
	DEEP CRK.-SULPHUR CRK.	605	41°37'00"N - 116°17'40"W		43N	50E	24			ND		
6045	THE HOT SPRINGS	608	41°25'20"N - 117°25'10"W		41N	41E	19	10	110°	59°		
	SOUTH FORK	608	41°27'40"N - 117° 7'10"W		41N	43E	4			ND		
6008	HOT SULPHUR SPRINGS	605	41°28'15"N - 116° 8'40"W		41N	52E	8	20		90°		
	BURNS CREEK	605	41°23'40"N - 116° 3'40"W		40N	53E	6			Warm		
	SAND DUNES	608	41° 6'30"N - 117°34'00"W		37N	39E	3	10		70°		
	MIDAS	605	41°13'10"N - 116°50'30"W		39N	45E	36			Hot		
	DRY CREEK MOUNTAIN	605	41°15'40"N - 116°21'35"W		39N	50E	18			47°		
	HOT LAKE	605	41° 8'40"N - 116°44'00"W		38N	46E	35			ND		
	WILLOW CRK. RESERVOIR	605	41°11'15"N - 116°30'30"W		38N	48E	11			ND		
	EVANS CREEK	608	41° 3'35"N - 117° 5'10"W		37N	43E	26			Hot		
	LONE BUTTE	608	41° 1'45"N - 117°19'25"W		36N	41E	2			21°		

5-352

AMS SHEET: WELLSNEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	TENNESSEE MOUNTAIN	605	41°52'50"N - 115°37'30"W		46N	56E	14			40°		
	JARBIDGE MOUNTAINS	605	41°52'15"N - 115°24'55"W		46N	58E	167			27°		
	JACKPOT	605	41°57'40"N - 114°39'20"W		47N	65E	18			38°		
	SAN JACINTO RANCH SP.	605	41°52'10"N - 114°41'40"W		46N	64E	23			64°		
6061	GOOSE CREEK	605	41°10'00"N - 114° 5'00"W		46N	69E	1	2.25		43°		
	RIZZI RANCH HOT SP.	605	41°46'40"N - 115°55'30"W		45N	54E	20			41°		
6034	MINERAL HOT SPRINGS	605	41°47'10"N - 114°44'10"W		45N	64E	16	10	130°	60°		
6048	WILD HORSE HOT SP.	605	41°39'00"N - 115°46'20"W		43N	55E	4	2.25		54°		
	HOT CREEK SPRINGS	605	41°34'40"N - 115°10'55"W		43N	60E	32			68°		
	ROCK SPRING CREEK	605	41°34'25"N - 114°25'30"W		43N	67E	31			29°		
	WILKINS	605	41°25'10"N - 114°45'00"W		41N	64E	29			Hot		
	WINE CUP RANCH	605	41°24'00"N - 114°40'30"W		41N	64E	25			59°		
	THOUSAND SPRINGS	605	41° 6'50"N - 114° 9'20"W		40N	69E	10			96°?		
	GONCE CREEK	605	41°18' 5"N - 115°59' 5"W		39N	53E	2			ND		
	NORTH FORK	605	41°18' 5"N - 115°44'40"W		39N	55E	2			ND		
	MARY'S RIVER RANCH	605	41°13'40"N - 115°17'15"W		39N	59E	35			50°		
6027 6009	HUMBOLDT WELLS	605	41°11' 5"N - 115°00'00"W		38N	62E	17	20	140°	90°		
	WINTER CREEK	605	41° 3'45"N - 115°23'30"W		37N	58E	26			ND		
	CLOVER VALLEY	605	41° 3'35"N - 114°59'25"W		37N	62E	29			Warm		
	COBRE	605	41° 7'00"N - 114°22'50"W		37N	67E	3			77°		
	MULLIGAN CREEK	605	41°58'55"N - 114°22'40"W		47N	67E	9			30°		

5-353

AMS SHEET: LOVELOCKNEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
6033	FLY RANCH	616	40°48'40"N - 119°18'40"W		34N	23E	24	10	130°	94°		
	FLY RANCH, N.E.	614	40°54'00"N - 119°13'30"W		35N	24E	26	10		ND		
6022 6024	DOUBLE HOT SPRINGS- BLACK ROCK HOT SPS.	608	40°57'15"N - 119°00'00"W		35N	26E	3	60	150°	94°		
	SQUAW VALLEY	616	40°49'50"N - 119°31'55"W		34N	22E	18			ND		
	CHOLONA	614	40°50'55"N - 119°00'15"W		35N	26E	34	10		ND		
	SULPHUR	608	40°52'25"N - 118°42'20"W		35N	29E	35	10		ND		
	SAWMILL	616	40°42'30"N - 119°28'55"W		33N	22E	27			ND		
	LITTLE SAWMILL CANYON	616	40°41'00"N - 119°36'15"W		32N	21E	3			28°		
	GERLACH, N.E.	614	40°45'50"N - 119°15' 5"W		33N	24E	9	10		ND		
6028 6013	GERLACH	616	40°39'35"N - 119°21'20"W		32N	23E	15	30		98°		
6036 6035	TREGO	614	40°46'10"N - 119° 7'30"W		34N	25E	34	10	130°	86°		
	SOUTHERN EUGENE MTNS.	614	40°40'50"N - 118°13'40"W		33N	33E	35	20		ND		
	DUN GLEN CREEK	614	40°42'45"N - 118° 4'00"W		33N	35E	30			ND		
	NORTH FOX RANGE	616	40°35'35"N - 119°28'25"W		31N	22E	3			ND		
	SELENITE PEAK	614	40°34'55"N - 119°15'50"W		31N	24E	4			ND		
	BUFFALO CREEK	616	40°34'30"N - 119°43' 5"W		31N	20E	North Half			Warm		
	RYE PATCH	614	40°35'25"N - 118°16'50"W		31N	33E	4	60	182°	ND		
	SMOKE CREEK	616	40°28'10"N - 119°49'15"W		30N	19E	3			Warm		
	SO. SMOKE CRK. DESERT	616	40°19'45"N - 119°48'20"W		28N	19E	1	10		23°		
	SAND PASS	616	40°19'20"N - 119°54'00"W		28N	19E	6			Warm		

AMS SHEET: LOVELOCK-Sheet #2

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-355

AMS SHEET: WINNEMUCCANEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	HUMBOLDT RIVER	608	40°53'00"N - 117°56'10"W		35N	36E	28			29°		
	WINNEMUCCA	608	40°57' 5"N - 117°42'30"W		36N	38E	33			29°		
6039	GOLCONDA	608	40°57'25"N - 117°29'30"W		36N	40E	32	20	125°	74°		
	BROOKS HOT SPRING	608	40°49'45"N - 117°18'20"W		34N	41E	12			37°		
6032	HOT POT	608	40°55'10"N - 117° 6'20"W		35N	43E	11	10	125°	58°		
	RANCH SPRING	609	40°55'35"N - 116°53'45"W		35N	45E	10			28°		
6010	HOT SPRINGS (TIPTON) RANCH	608	40°45'00"N - 117°28'40"W		33N	40E	5	20	180°	85°		
6014	LEACH HOT SPRINGS	614	40° 6'20"N - 117°38'45"W		32N	38E	36	60	170°	96°		
	KENT SPRING	614	40°38'50"N - 117°13'45"W		32N	40E	16			ND		
	TIMBER CANYON	609	40°34'35"N - 117°13'30"W		31N	42E	11			24°		
	BATTLE MOUNTAIN	609	40°39'40"N - 116°52'15"W		32N	45E	11	5		Hot		
	SHEEP CREEK RANGE	609	40°44'50"N - 116°41'45"W		33N	47E	8			Warm		
6001	BEOWAWE GEYSERS	609/607	40°33'50"N - 116°35'20"W		31N	48E	17	80	240°	98°		
	VIVIAN SIDING	605	40°45'00"N - 116° 2'10"W		33N	53E	8			37°		
6051	CARLIN	605	40°41'40"N - 116° 8'10"W		33N	52E	33	10	120°	Boiling?		
	HORSESHOE RANCH SPS.	607	40°36'50"N - 116°28'10"W		32N	49E	32	10		58°		
	PINE CREEK	607	40°35'25"N - 116° 9'10"W		31N	52E	7			ND		
6006	KYLE HOT SPRINGS	614	40°24'20"N - 117°53'00"W		29N	36E	12	20	180°	96°		
	DRY LAKE	614	40°24'00"N - 117°24'50"W		29N	41E	7			Warm		
	NEEDLE PEAK	614	40°20'25"N - 117°27'10"W		28N	40E	2			ND		

5-356

AMS SHEET: WINNEMUCCA-Sheet #2

NEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
6031	BUFFALO VALLEY H. SPS	609	40°22'15"N -	117°19'20"W	29N	41E	23	15	130°	79°		
	MOUNTAIN SPRINGS MINE	609	40°18'35"N -	117° 4'00"W	28N	44E	7			43°		
6038	HOT SPRINGS POINT	607	40°24'25"N -	116°31'50"W	29N	48E	11	20	125°	59°		
	DUFF CREEK	607	40°19'00"N -	116°25'55"W	28N	49E	10	10		86°		
	CARLOTTI RANCH SPS.	605/607	40°19' 5"N -	116° 3'10"W	28N	52E	13			39°		
	BRUFFEY'S HOT SPS.	607	40°13' 5"N -	116° 4'40"W	27N	52E	14	10		66°		
	N.Y. CANYON KAOLIN DEPOSIT	614	40° 3' 5"N -	117°59'55"W	25N	35E	12			Hot		
6043	SCU HOT SPRINGS	614	40° 5'15"N -	117°44' 5"W	26N	38E	29	15	115°	93°		
6007	JERSEY VALLEY	614	40°10'45"N -	117°29'45"W	27N	40E	33	15	185°	57°		
	MC COY SPRINGS	614	40° 4'55"N -	117°36'20"W	26N	39E	33	15		49°		
6042	HYDER HOT SPRING	614	40° 1'15"N -	117°42'40"W	25N	38E	28	15		79°		
6047	HOT SPRINGS RANCH	609	40°11'50"N -	117° 6'00"W	27N	43E	23	2.25		53°		
	IS	609	40°11'20"N -	116°47'30"W	27N	46E	27			39°		
	CARICO LAKE	609	40° 7'45"N -	116°53'00"W	26N	45E	15			22°		
	DIAMOND VALLEY	607	40° 4'50"N -	116° 1'35"W	25N	53E	5			30°		
	WINNEMUCCA MOUNTAIN	608	41°00'00"N -	117° 1'15"W	36N	37E	13			34°		

5-357

A15 SHEET: ELKO

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-358

AMS SHEET: RENONEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	ANAHO ISLAND	616	39°56' 4"N - 119°30'20"W		24N	22E	53	10		49°		
	DOGSKIN MOUNTAIN	616	39°50'25"N - 119°43'40"W		23N	20E	22			Hot		
	WARM SPRINGS VALLEY	616	39°48'15"N - 119°38'45"W		22N	21E	5			43°		
	NORTH VALLEY	602	39°53'20"N - 119° 9'25"W		23N	25E	3			ND		
	HUXLEY	602	39°51'10"N - 118°47'20"W		23N	28E	24	10		ND		
	CARSON SINK-ALKALI FLAT, (WEST SIDE)	602	39°48'10"N - 118°31'30"W		22N	31E	5	10	Hot	ND		
	LONE ROCK	602	39°55'20"N - 118°18'00"W		24N	33E	29	10		ND		
	DIXIE COMSTOCK MINE- HUMBOLDT MARSH	602	39°51'45"N - 118°00'50"W		23N	35E	14	15		Hot		
6023	DIXIE HOT SPRINGS	602	39°48'00"N - 118° 3'40"W		22N	35E	5	20	150°	72°		
6002	BRADY'S HOT SPRINGS	602	39°47'00"N - 119°00'55"W		22N	26E	12	30	214°	98°		
	DESERT PEAK	602	39°00'20"N - 118°57'35"W		22N	27E	21	50	212°	ND		
	EAGLE SALT WORKS	602	39°44'00"N - 119° 1'30"W		22N	26E	35	10		Hot		
	HOT SPRINGS MOUNTAINS	602	39°41'10"N - 118°56'20"W		21N	27E	15	20		ND		
	CARSON SINK-ALKALI FLAT, (EAST SIDE)	602	39°47'00"N - 118°19'30"W		22N	32E	12	10		ND		
	SPANISH SPRINGS	616	39°34'15"N - 119°42'20"W		20N	20E	26			ND		
	LOCKWOOD	616	39°41'15"N - 119°41'20"W		19N	20E	12			ND		
6015	HAZEN	611	39°36'10"N - 119° 6'30"W		20N	26E	18	10		ND		
6017	SODA LAKE- UPSAL HOGBACK	602	39°32'50"N - 118°51' 5"W		19N	28E	5	35	165°	90°		
6018	STILLWATER	602	39° 1'00"N - 118°33'50"W		19N	30E	13	50	160°	96°		
	IXL	602	39°41'00"N - 118° 6'55"W		21N	34E	23	15		24°?		

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	DEEP CANYON	616	39°26'10"N	- 120°00'00"W	18N	18E	7			Hot		
	MOANA SPRING-LAWTON	616	39°29'50"N	- 119°48'35"W	19N	19E	25	40		48°		
6003	STEAMBOAT SPRING- HUFFAKER	616	39°23'10"N	- 119°44'30"W	18N	20E	23	70	210°	96°		
	BIDDLEMAN SPRING	615	39°29'35"N	- 119°25'00"W	19N	23E	20			24°		
	TABLE MOUNTAIN	602	39°28'50"N	- 118°16'45"W	19N	33E	29			ND		
	PIPOUETTE MOUNTAIN	602	39°30'20"N	- 118° 8'50"W	19N	34E	22			ND		
	RAINBOW MOUNTAIN	602	39°25'50"N	- 118°31'25"W	18N	31E	17			ND		
	SO. STILLWATER RANGE	602	39°23'20"N	- 118°23'00"W	18N	32E	34			ND		
	FAIRVIEW VALLEY	602	39°23'15"N	- 118°16'20"W	18N	33E	27			ND		
	CRYSTAL BAY	616	39°15'10"N	- 120°00'00"W	16N	18E	18			60°		
6059	WASHOE VALLEY	616	39°17' 5"N	- 119°50'25"W	16N	19E	3	20		53°		
	COMSTOCK MINING DISTRICT	611	39°17'50"N	- 119°38'20"W	17N	21E	29	10		ND		
	DAYTON	611	39°16'10"N	- 119°34'10"W	16N	21E	12			35°-		
	CHURCHILL VALLEY	611	39°15'55"N	- 119° 3'20"W	16N	26E	10			ND		
	CARSON LAKE	602	39°21'20"N	- 118°39'10"W	17N	30E	7	10	70°			
	CARSON HOT SPRINGS- PINYON HILLS	601	39°10'45"N	- 119°44' 5"W	15N	20E	9			49°		
	HOB0-SARATOGA SPS.	604	39° 4'25"N	- 119°45'35"W	14N	20E	17			50°		
6020	WABUSKA HOT SPRINGS	611	39° 9'40"N	- 119°11'15"W	15N	25E	16	20	155°	97°		
	CARSON HILL	611	39° 4'50"N	- 119°16'20"W	14N	24E	14			ND		
6011	LEE HOT SPRINGS	602	39°12'40"N	- 118°43'25"W	16N	29E	34	10	175°	91°		

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-361

AMS SHEET: MILLETT

NEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME(1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	IRON TANK SPRING	602	39°33'20"N - 117°25'45"W		20N	40E	36			29°		
	WILD HORSE	602	39°50'55"N - 117°30'00"W		23N	40E	20			ND		
	SENATOR	602	39°57'10"N - 117°52'55"W		24N	36E	1	15		Boiling		
	MT. GRANT	602	39°40'50"N - 117°53'30"W		21N	36E	23			ND		
	EDWARDS CREEK VALLEY	602	39°37'25"N - 117°44'50"W		20N	38E	6			24°-		
	IOWA CANYON RANCHES	609	39°55'10"N - 117° 7'40"W		24N	43E	27			39°		
	SANTA FE CREEK	609	39°14'15"N - 116°13'55"W		16N	44E	24			23°-		
6052	WALTI HOT SPRINGS	609/607	39°55'00"N - 116°37'20"W		24N	48E	30	10	120°	73°		
	SHIPLEY HOT SPRINGS	607	39°58'25"N - 116° 3'30"W		24N	52E	23			41°		
	NORTHERN CLAN ALPINE MOUNTAINS	602	39°49'00"N - 117°50'35"W		23N	37E	32			ND		
	TULE DAM SPRING	607	39°50'10"N - 116° 3'55"W		23N	52E	36			23°-		
	BARTINE HOT SPRINGS	607	39°34'00"N - 116°22'10"W		19N	50E	5			41°		
6040	KLOBE HOT SPRINGS	607	39°24'45"N - 116°20'45"W		18N	50E	28	10	130°	70°		
	SOUTH CLAN ALPINE MOUNTAINS	602	39°25'30"N - 117°59'30"W		18N	35E	13			ND		
6019	SMITH CREEK VALLEY	609	39°18'40"N - 117°32'20"W		17N	39E	25	20	160°	86°		
	BIRCHIM CREEK	609	39°18'25"N - 117°25'40"W		17N	40E	35			ND		
6037	SPENSER HOT SPRING	609	39°19'45"N - 116°51'40"W		17N	45E	13	10	125°	96°		
	CLIPPER GAP CANYON	609	39°14'40"N - 116°52'55"W		16N	45E	14			Hot		
	KINGSTON	613	39° 9'20"N - 116°59'10"W		15N	44E	14			ND		
	WILDCAT CANYON	613	39° 5'45"N - 117° 2'55"W		14N	44E	5			ND		

AMS SHEET: MILLETT-Sheet #2

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-363

AMS SHEET: ELYNEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	DIAMOND MOUNTAINS	607	39°54' 5"N - 115°52' 5"W		23N	54E	3			24°-		
	BUCK PASS	617	39°48'40"N - 115°36'35"W		22N	56E	1			24°-		
	DUCK CREEK	617	39°57'00"N - 114°45'30"W		24N	64E	17			ND		
6030	CHERRY CRK. HOT SPS.	617	39°53'10"N - 114°53'40"W		23N	63E	7	10		65°		
	BECKY PEAK	617	39°55' 5"N - 114°39'40"W		24N	65E	31			28°		
	SHELLBORNE PASS	617	39°47'30"N - 114°40'20"W		22N	65E	7			25°		
	NORTH SPRING VALLEY	617	39°49'45"N - 114°32'55"W		23N	66E	31			32°		
6050	MONTE NEVA HOT SPS.	617	39°40'00"N - 114°48'25"W		21N	63E	24	20		89°		
	PLEASANT VALLEY	617	39°40'55"N - 114° 4'30"W		21N	70E	21?			Warm		
	PANCAKE SUMMIT	617	39°25'55"N - 115°40'10"W		18N	56E	16			Hot		
	STEPTOE	617	39°32'20"N - 114°54'35"W		19N	63E	8			24°		
	MC GILL	617	39°26'00"N - 114°46'00"W		18N	64E	16			29°		
	ELY-LACKAWANNA HOT SPRINGS	617	39°16'50"N - 114°52'20"W		16N	63E	3			35°		
	SNAKE RANGE	617	39°20'20"N - 114°20'00"W		17N	68E	16			ND		
	BULL CREEK	617	39° 3'55"N - 115°38'30"W		14N	56E	23			Warm		

5-364

AMS SHEET: WALKER LAKENEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
6054	WALLEY'S HOT SPRING	604	38°58'45"N - 119°50'00"W		13N	19E	22	2.25	110°	71°		
	BUCKSKIN RANGE	611	38°57'45"N - 119°22'20"W		13N	23E	26			28°		
6055	HIND'S HOT SPRINGS	611	38°54'00"N - 119°24'50"W		12N	23E	16	10	105°	67°		
	MOUNT WILSON	611	38°51'45"N - 119°10'35"W		12N	25E	34			Hot		
	DOUBLE SPRING	612	38°58'00"N - 118°41'25"W		13N	29E	25			21°		
	WEST GABBS VALLEY	613	38°54'40"N - 118° 5'25"W		12N	34E	12	20		68°-		
	DOUBLE SPRING FLAT	604	38°47'50"N - 119°38'25"W		11N	21E	20			21°		
	WELLINGTON	611/604	38°45'00"N - 119°22'10"W		10N	23E	2			67°		
	WILSON HOT SPRINGS	611	38°46'45"N - 119° 9'45"W		11N	25E	34	10		Hot		
	DEAD HORSE WELLS- WEDELL SPRINGS	612	38°54'45"N - 118°18'15"W		12N	33E	17	20		67°		
	ALDRICH STATION	611	38°29'25"N - 118°58'00"W		7N	27E	4			43°		
	HAWTHORNE	612	38°31'10"N - 118°38'10"W		8N	30E	27			26°		
	SODA SPRING VALLEY	612	38°32'50"N - 118°23'40"W		8N	32E	14			ND		
	WHISKEY FLAT	612	38°17'00"N - 118°34'20"W		5N	31E	19			43°		
6046	SODAVILLE SPRINGS	612	38°20'35"N - 118° 6'20"W		6N	35E	29	10		38		
	RHODES SALT MARSH	612	38°16'45"N - 118° 4'35"W		5N	35E	22			ND		
	HUNTOON VALLEY	612	38° 7'45"N - 118°34'00"W		3N	31E	7			ND		

5-365

AMS SHEET: TONOPAHNEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME(1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	DOWNEYVILLE	613	38°55'10"N - 117°51'15"W		12N	36E	21			68°		
	KELLY'S WELLS	613	38°48'10"N - 117°57'10"W		11N	36E	18			ND		
	ALKALI FLAT	613	38°58'30"N - 117° 2'40"W		13N	44E	21			27°		
6025	DARROUGH'S HOT SPS.	613	38°49'25"N - 117°11' 5"W		11N	43E	7	10	140°	97°		
	MOSQUITO CRK. RANCH	613	38°49'30"N - 116°43'35"W		11N	47E	6			35°		
	LITTLE FISH LAKE V.	613	38°41'50"N - 116°26' 5"W		10N	49E	14			48°		
	HOT CREEK CANYON	613	38°31'50"N - 116°24'15"W		8N	49E	25	10		82°		
	HOT CREEK VALLEY	613	38°26'10"N - 116°16'40"W		7N	51E	30	10		61°		
	RAYSON HILLS	613	38°26' 5"N - 117°29'30"W		7N	40E	28			Warm		
	WILSON SPRING	613	38°25'25"N - 117°15'00"W		7N	42E	34?			Warm		
	PINON PEAK	613	38°20'20"N - 116°39'25"W		6N	47E	36			26°		
	LUNAR CRATER	613	38°23'20"N - 116° 4'20"W		6N	52E	13	20		ND		
	TONOPAH MINING DISTR.	613	38° 4'10"N - 117°13'10"W		3N	42E	35			ND		
	SAULSBURY WASH	613	38°15'15"N - 116°49'30"W		5N	46E	28			30°		
6041	WARM SPRINGS	613	38°11'30"N - 116°22'25"W		4N	50E	20	10	125°	63°		
	WILLOW CREEK	613	38° 1'35"N - 116°41'00"W		2N	47E	14			29°		

5-366

AMS SHEET: LUND

NEVADA

--- TEMPERATURES IN DEGREES C ---

SITE ID	SITE NAME	COUNTY	LATITUDE	LONGITUDE	TOWN- SHIP	RANGE	SEC- TION	RSVR** VOLUME (1)	SUB SURFACE	SURFACE	CS EST*	CS MEAS*
	DUCKWATER	613	38°56'10"N -	115°41'45"W	12N	56E	5			34°		
	WILLIAMS HOT SPRINGS	617	38°57'15"N -	115°13'55"W	13N	60E	33			53°		
	PRESTON	617	38°55'35"N -	115° 5'00"W	12N	61E	12			22°-		
	DOYLES WELL	617	38°56'25"N -	114°25' 5"W	12N	67E	2			24°-		
	SCHELL CREEK RANGE	617	38°48'15"N -	114°40'10"W	11N	65E	22?			Warm		
	GRANITE PEAK	617	38°49'10"N -	114°13'35"W	11N	69E	16			ND		
	BIG SPRING	613	38°33'20"N -	115°46'10"W	8N	55E	15			37°		
	RAILROAD VALLEY- EAGLE SPRINGS	613	38°34'10"N -	115°31'55"W	8N	57E	11			38°-		
	MOORMAN SPRING	613	38°35'45"N -	115° 8'25"W	9N	61E	32			38°		
	EMIGRANT SPRINGS	613	38°37'25"N -	115° 3'10"W	9N	62E	19			21°		
	MOUNT GRAFTON	610	38°39'10"N -	114°37'50"W	9N	65E	12			21°		
	RAILROAD VALLEY- PANCAKE RANGE	613	38°27'55"N -	115°47'25"W	7N	55E	16	10		71°		
	COYOTE HOLE SPRING	613	38°23'20"N -	115°52' 5"W	6N	54E	14			29°		
	WHIPPLE PEAK	613	38°25'40"N -	115° 1'30"W	7N	62E	32			24°		
	FOREST MOON RANCH	613	38°23'00"N -	115° 9'15"W	6N	61E	18			33°		
	CAMP VALLEY CREEK	610	38°17'30"N -	114°15'50"W	5N	69E	17			29°		

5-367

AMS SHEET: MARIPOSA

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-368

AMS SHEET: GOLDFIELD

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-369

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-370

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-371

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-372

AMS SHEET: KINGMAN

NEVADA

--- TEMPERATURES IN DEGREES C ---

[illegible]

5-373

SITE SCENARIOS FOR THE STATE OF NEW MEXICO

POSTULATED SITE DEVELOPMENT SCHEDULE
ANIMAS VALLEY

WBS 7002

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
Developer	Conducts casual reconnaissance exploration													
BLM, State	Leases Land													
USGS	Makes environment assessment	1975												
USGS, State	Approves plan of operation and issues permit to explore													
Developer	Conducts geophysical work and drills T.G. holes													
USGS	Makes EA for drilling deep exploratory wells													
USGS, State	Gives permission to drill													
Developer	Drill deep exploratory wells													
Developer	Conducts Feasibility Study													
Developer	Water rights application with State Engineer													
USGS	Makes EA for development													
	Gives permission to develop													
Developer	Drills development wells and runs production tests													
PSC	Certifies plant and site													
	Issue permits													
USGS	Approves plan of operation for production													

POSTULATED SITE DEVELOPMENT SCHEDULE
ANIMAS VALLEY

WBS 7002

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
Utility	Obtains R.O.W. for Power Line								—					
Utility	Plant Construction								—					
Utility	Puts power on line										20 MW Δ	10MW Δ		

POSTULATED SITE DEVELOPMENT SCHEDULE
KILBOURNE HOLE

WBS 7004

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
Developer	Conducts casual reconnaissance exploration	—												
BLM, State	Leases Land	—												
USGS	Makes Environment Assessment	—												
USGS, State	Approves Plan of Operation and issues permit to explore		—											
Developer	Conducts geophysical work and drills T.G. holes		—											
USGS	Makes EA for drilling deep exploratory wells			—										
USGS, State	Gives permission to drill			—										
Developer	Drills deep exploratory well			—										
Developer	Conducts Feasibility Study			—										
Developer	Water rights application with State Engineer			—										
USGS	Makes EA for development				—									
	Gives permission to develop					—								
Developer	Drills production wells and runs tests					—	—							
PSC	Certifies plant and site							—						
	Issue permits							—						
USGS	Approves plan of operation for production							—						
Utility	Obtains R.O.W. for Power Line							—						

POSTULATED SITE DEVELOPMENT SCHEDULE
KILBOURNE HOLE

WBS 7004

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
Utility	Plant Construction													
Utility	Puts power on line									10 MW	25MW	50 MW		
										Δ	Δ	Δ		

POSTULATED SITE DEVELOPMENT SCHEDULE
RADIUM SPRINGS

WBS 7008

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
Developer	Conducts casual reconnaissance exploration	—												
BLM, State	Leases Land	—												
USGS	Makes Environment Assessment	—												
USGS, State	Approves Plan of Operation and issues permit to explore	—												
Developer	Conducts geophysical work and drills T.G. holes		—											
USGS	Makes EA for drilling deep exploratory wells			—										
USGS, State	Gives permission to drill			—										
Developer	Drills deep exploratory well			—	—									
Developer	Conducts Feasibility Study			—										
Developer	Water rights application with State Engineer			—										
USGS	Makes EA for development				—									
	Gives permission to develop					—								
Developer	Drills development wells and runs production tests					—	—	—						
PSC	Certifies plant and site						—	—						
	Issue permits							—						
USGS	Approves plan of operation for production							—						

POSTULATED SITE DEVELOPMENT SCHEDULE
RADIUM SPRINGS

WBS 7008

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
Utility	Obtains R.O.W. for Powerline													
Utility	Plant Construction													
Utility	Puts power on line													

POSTULATED SITE DEVELOPMENT SCHEDULE
SOCORRO

WBS 7055

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
Developer	Conducts casual reconnaissance exploration													
BLM, State	Leases Land													
USGS	Makes Environment Assessment													
USGS, State	Approves Plan of Operation and issues permit to explore													
Developer	Conducts geophysical work and drills T.G. holes													
USGS	Makes EA for drilling deep exploratory wells													
USGS, State	Gives permission to drill													
Developer	Drills deep exploratory well													
Developer	Conducts Feasibility Study													
Developer	Water rights application with State Engineer													
USGS	Makes EA for development													
	Gives permission to develop													
Developer	Drills development wells and runs production tests													
USGS	Approves plan of operation													
Developer/User	District Heating System Installed													
Developer/User	Space Heating on line													

POSTULATED SITE DEVELOPMENT SCHEDULE
VALLES CALDERA

WBS 7001

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
State, Owner County	Issue Permits -- Exploration, Drilling of T.G. holes													
Owner, State	Lease Land													
Developer	Preliminary Geophysical Exploration		COMPLETED											
Developer	Exploratory Drilling and Reservoir Evaluation													
Developer	Develop Utility Interest													
Developer & Utility	Feasibility Study													
Developer & Utility	Financial Negotiations													
Developer & Utility	Prepare and submit proposal to DOE													
Developer & Utility	Site Selection													
Developer & Utility	Design													
Developer & Utility	Commitment to Development													
Developer & Utility	Prepare Environmental Data Statement													
State, PSC	Certify Plant & Site, Issue Permits													
State	Process EIR (Drilling)													
State, PSC	Process EIR (Plant)													

POSTULATED SITE DEVELOPMENT SCHEDULE
VALLES CALDERA

WBS 7001

OPERATING ENTITIES	ACTIVITY	1977	1978	1979	1980	1981	1982	1983	1984	1986	1990	1995	2000	2020
State, PSC	Process EIR (Transmission Line)													
Producer	Development Drilling													
Utility	Plant Construction													
Utility	Initial Power Line (16Km)													
Utility	Power on Line (55MW)													

Possible Subsequent Additions (MWe) and On Line Date: 100-1986, 100-1988, 100-1990, 100-1991, 100-1992, 100-1993, 100-1994, 100-1995, 100-1996, 100-1997, 100-1998, 100-1999

Composite Scenarios for Direct Utilization of Geothermal Resources in New Mexico

Site and Activity	Total MWh	78	80	82	84	86	88	90	92	94	96	98	2000	02	04	06	08	10	12	14	16	18
Socorro Spg. (Campus heating)	30					10	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30	20
Kilbourne Hole (Las Alturas & Anthony; Space heating, Crop Drying, etc.,)	50					20	40	50	50	50	50	50	50	50	50	50	50	50	50	50	50	30
Radium Spg. (Green houses, Crop dehydration)	50					20		50	50	50	50	50	50	50	50	50	50	50	50	50	50	30
Jemez Spg. (Space heating, Agriculture)	60	3	3	3	23	43	60	60	60	60	60	60	60	60	60	60	60	60	57	57	37	17
T or C (Space heating, recreation)	30	2	2	2	30	30	30	30	30	30	30	30	30	30	30	30	30	30	28	28	28	
San Ysidro (Space heating)	20						20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Animas (Space heating, green houses)	40	2	2	22	40	40	40	40	40	40	40	40	40	40	40	40	40	40	38	38	18	
Albuquerque	50					20	40	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Cumulative Total		7	7	27	93	193	290	330	330	330	330	330	330	330	330	330	330	330	323	323	313	237

Composite Scenarios for Geothermal Power Generation in New Mexico

Site	Total MWe	80	82	84	86	88	90	92	94	96	98	2000	02	04	06	08	10	12
Animas	100				20	20	100	100	100	100	100	100	100	100	100	100	100	100
Kilbourne	50				10	25	50	50	50	50	50	50	50	50	50	50	50	50
Lower San Francisco	20						15	20	20	20	20	20	20	20	20	20	20	20
Radium Spring	30					5	30	30	30	30	30	30	30	30	30	30	30	30
Valles Caldera	2000		50	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
Cumulative Total		50	100	230	350	595	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	

SITE SCENARIOS FOR THE STATE OF UTAH

Possible Development Forecast: Roosevelt Prospect (Phillips Petroleum Co.)

	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
Preliminary Exploration																		
Lease Land: State Forest BLM																		
Application for Water Rights																		
Geophysical Exploration																		
Unitization																		
Exploratory Wells																		
Reservoir Evaluation																		
Commitment to Develop																		
Master Development Plan																		
Environmental Baseline Data																		
Financial Negotiations																		
Order Equipment																		
Environmental Statement																		
Design and Drill Well System																		
Design and Drill Injection System																		
Design and Build Gathering System																		
Design and Install Powerline																		
Design and Build 55 MW Plant																		

Possible Development Forecast: Cove Fort/Sulphurdale (Union Oil Co.)

	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
Preliminary Exploration																		
Lease Land: State Forest BLM																		
Application for Water Rights																		
Geophysical Exploration																		
Unitization																		
Exploratory Wells																		
Reservoir Evaluation																		
Commitment to Develop																		
Master Development Plan																		
Environmental Baseline Data																		
Financial Negotiations																		
Order Equipment																		
Environmental Statement																		
Design and Drill Well System																		
Design and Drill Injection System																		
Design and Build Gathering System																		
Design and Install Powerline																		
Design and Build 55 MW Plant																		

[illegible]

Possible Development Forecast: Roosevelt Prospect (Getty Oil Co.)

[illegible]

Possible Development Forecast: Thermo Prospect (Republic Geothermal, Inc.)

	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
Preliminary Exploration																		
Lease Land: Private State BLM																		
Geophysical/Geological Exploration																		
Application for Water Rights																		
Exploratory Wells																		
Reservoir Evaluation																		
Commitment to Develop																		
Master Development Plan																		
Environmental Baseline Data																		
Financial Negotiations																		
Order Equipment																		
Environmental Statement																		
Design and Drill Well System																		
Design and Drill Injection System																		
Design and Build Gathering System																		
Design and Install Powerline																		
Design and Build 55 MW Plant																		

Possible Development Forecast: North Cove Fort Prospect (Caroline Hunt Trust Estate)

		78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
CHTE	Geophysical Exploration	—																	
	Lease Land																		
	General Exploration	—	—																
	Exploratory Wells	—	—	—															
	Application for Water Rights				—	—													
	Reservoir Evaluation		—	—	—														
	Commitment to Develop				Δ														
	Financial and Contractual Negotiations				—	—													
	Prepare Master Development Plan				—	—													
	Order Equipment				—														
	Environmental Data Statement		—	—	—	—													
	Design and Drill Well System					—	—	—	—										
	Design and Drill Injection System					—	—	—	—										
	Design and Build Gathering System						—	—	—										
	Design and Install Power line						—	—	—										
	Design and Build 55 MW Power Plant					—	—	—	—	—									

[illegible]

Possible Development Forecast: West Cove Fort Area (AMAX Exploration, Inc.)

	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
Preliminary Exploration																		
Lease Land: Private																		
State																		
BLM																		
Geophysical/Geological Exploration																		
Application for Water Rights																		
Exploratory Wells																		
Reservoir Evaluation																		
Commitment to Develop																		
Master Development Plan																		
Environmental Baseline Data																		
Financial Negotiations																		
Order Equipment																		
Environmental Statement																		
Design and Drill Well System																		
Design and Drill Injection System																		
Design and Build Gathering System																		
Design and Install Powerline																		
Design and Build 55 MW Plant																		

AGGREGATED SCENARIO--DIRECT UTILIZATION OF GEOTHERMAL RESOURCES IN UTAH

	Tot. Mwt	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
Monroe/Red Hill/Johnson	85		1	1	1	2	2	3	4	2	2	1	1	1	1		1		1		1		1
Crystal H. S.	43	1	1	2	4	2	2	1	1	1	1	1		1		1		1		1		1	
Wasatch/Beck's/Hobo	65			1	3	5	10	15	5	5	5	2	2	1	1	1	1		1		1		1
Midway	11			1	2	1	1	1		1		1		1		1		1					
Ogden/Hooper/Utah/Hill AFB	95			2	3	5	10	10	10	7	5	5	3	2	2	2	2	2	1	1	1	1	
Meadow/Hatton	45						1	2	4	10	10	3	2	2	1	1	1	1		1		1	
Joseph H. S.	45						1	2	4	4	2	2	1	1	1	1	1		1		1		1
New Castle	45*					1	1	2	4	7	10	8	4	2	1	1		1		1		1	
Cove Fort (Sulphurdale)	400*							2	4	7	10	10	10	5	5	3	3	3	3	3	3	2	2
Thermo	200*										1	2	4	10	10	10	5	5	3	3	3	3	2
Tintic	100*					2	2	2	4	4	5	5	4	3	3	3	3	3	3	3	3	2	2
Beryl	100*					2	4	10	15	10	5	5	5	4	3	3	3	3	2	2	2	2	2
Abraham	100*						1	1	2	6	10	10	5	4	4	3	3	3	3	3	2	2	2
West Cove Fort	100*								2	2	6	10	10	10	5	3	3	2	2	2	2	2	2
Black Rock Desert	100*								2	2	6	10	10	10	5	3	3	2	2	2	2	2	2
Veyo	10			1	1	2	2	1	1	1	1												
LaVerkin	10				1	1	2	2	1	1	1	1											
Crystal (Madsen's) H. S.	27					1	1	2	4	2	2	1	1		1		1		1		1		1
Other Areas	200*						1	2	4	4	4	6	6	4	4	2	2	2	2	2	2	2	2
Total for Year		1	2	8	15	24	41	58	71	76	86	83	68	61	47	38	32	29	25	24	24	21	20
Cumulative Total		1	3	11	26	50	91	149	220	296	382	465	533	594	641	679	711	740	765	789	813	834	854

Continued

	Tot. MWT	2000	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Monroe/Red Hill/Johnson	85		1		1		1		1		1		1		1		1		1		1	
Crystal H. S.	43	1		1		1		1		1		1		1		1		1		1		1
Wasatch/Beck's/Hobo	65		1		1		1		1													
Midway	11																					
Ogden/Hooper/Utah/Hill AFB	95	1		1		1		1		1		1		1		1		1		1		1
Meadow/Hatton	45	1		1		1		1		1												
Joseph H. S.	45		1		1		1		1		1		1		1		1		1		1	
New Castle	45*	1																				
Cove Fort (Sulphurdale)	400*	2	2	2	1	1	1	1	1	1	1	1		1		1		1		1		
Thermo	200*	2	1	1	1	1	1		1		1		1		1		1		1		1	
Tintic	100*	2	1	1	1	1		1		1		1		1		1		1		1		1
Beryl	100*	1	1	1	1	1	1	1	1		1		1		1		1		1		1	
Abraham	100*	2	2	1	1	1	1	1		1		1		1		1		1		1		1
West Cove Fort	100*	2	2	1	1	1	1	1	1		1		1		1		1		1		1	
Black Rock Desert	100*	2	2	1	1	1	1	1		1		1		1		1		1		1		1
Veyo	10																					
LaVerkin	10																					
Crystal (Madsen's) H. S.	27		1		1		1		1		1		1		1		1					
Other Areas	200*	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total for Year		19	17	13	13	12	12	11	10	9	9	8	8	8	8	8	8	8	7	8	7	8
Cumulative Total		873	890	903	916	928	940	951	961	970	979	987	995	1003	1011	1019	1027	1035	1042	1050	1057	1065

Aggregated Scenario--Electrical Production from Geothermal Resources in Utah

	tot. MWe	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000	01	02	03
Roosevelt Prospect	400			50		50		50		50		100		100											
Cove Fort Sulphurdale	200					50		50		50		50													
West Cove Fort	200						50		50		50		50												
North Cove Fort	200						50		50		50		50												
Thermo	100							50		50															
Other Areas (Sevier Lake, Black Rock Desert, Delta Area)	200								50		50		50	50											
TOTAL FOR YEAR				50		100	100	150	150	150	150	150	150	150											
CUMULATIVE TOTAL				50		150	250	400	550	700	850	1000	1150	1300											

Postulated Geothermal Direct Use Development Profile for Utah
(New development each year, MWt)

Approximate Scale 10^{10} MWt