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INDUSTRIAL APPLICATION OF GEOTHERMAL ENERGY IN SOUTHEAST IDAHO

by

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DISCLAIMER

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. SUMMARY

Southeastern Idaho has been identified as a region which is geologically favorable to the occurrence of geothermal energy. This area also contains industries which use large amounts of energy in the form of electricity and natural gas. Direct application of geothermal energy can potentially supply some of this energy.

The main industries in Southeastern Idaho are phosphorus/phosphate production and potato processing. Most of the energy required in the phosphate industries is electrical and therefore not replaceable by direct application of geothermal energy. The main area for direct use of geothermal energy in the phosphate industry is for drying of the ore at the mine site; however, most of this is energy now supplied by waste heat from the calcining process. With these facts in mind there is no reason for further study in the direct application of geothermal energy to the phosphate industry. However, there exists a large need for a dedicated supply of electrical energy to these industries and the possibility of using geothermal energy to generate electricity for these areas should be investigated.

The potato processing industry uses most of its energy to provide process steam for drying and cooking. Geothermal energy can potentially replace most of these energy requirements provided a high enough source temperature can be located. A 200°F geothermal source could supply about 40% of the industry's needs or about 2.6 (10^{12}) BTU/yr. A 400°F geothermal source could supply nearly 90% of the industry's needs or about 5.8 (10^{12}) BTU/yr.

Southeastern Idaho is an area endowed with certain geological characteristics which favor the occurrence of geothermal energy. There is a reasonable probability that exploration wells drilled anywhere within this region will encounter temperatures as high as 200°F at depths as shallow as 3,000 feet. Temperatures as high as 400°F have been proven through deep exploration drilling (10,000 feet) in the Snake River Plain and in the Gray's Lake area. Five sites in Southeastern Idaho are considered to be potential high temperature geothermal resource exploration areas. These sites are Battle Creek Hot Springs, Franklin County; Big Creek Hot Springs, Lemhi County; Blackfoot Reservoir, Caribou County; Magic Reservoir, Blaine County; and Raft River, Cassia County. Geochemical water analysis at these five sites indicates subsurface reservoir temperatures in excess of 300°F may exist. Exploration drilling is needed to prove the existence of a usable resource at these sites.

Geothermal resource temperatures sufficient for food processing (200 to 300°F) are probable within the Snake River Plain of

Southeastern Idaho at depths between 5,000 and 10,000 feet. Exploration for geothermal resources in the Snake River Plain can be considered to be very high risk due to lack of geological data regarding porosity, permeability and general hydrology.

Exploration for oil and gas in the Overthrust Belt of Southeastern Idaho has encountered high temperatures at depths of 5,000 to 10,000 feet. Further exploration in this region for oil and gas may prove existence of a geothermal resource capable of electrical generation or industrial processing.

II. INTRODUCTION

The Snake River Plain in Southern Idaho contains a large and identified geothermal resource. Most of these resources are at temperatures of less than 200°F; however, some locations contain resources up to 300°F. There are undocumented indications that sources up to 500°F have been located.

Throughout the same area there is also a concentration of industry requiring large energy inputs. These industries are composed almost entirely of the phsophorus/phosphate industries and the potato processing industry. This report identifies those phosphate related and food processing industries in Southeastern Idaho which require large energy inputs and assesses the potential for direct application of geothermal energy. The total energy demand is given along with that fractional demand that can be satisfied by a geothermal source of known temperature.

The report will discuss the specific industries in the following order:

A. Phosphorus Industry
   1. Elemental Phosphorus
      a. FMC-Pocatello
      b. Monsanto-Soda Springs
   2. Phosphate Fertilizer
      a. J.R. Simplot-Pocatello
      b. Baker Industries-Conda
   3. Phosphate Mining
      a. Simplot
      b. Beker
      c. Monsanto
      d. Other

B. Potato Processing
   1. General Process Description
      a. Granule Production
      b. Potato Flake Process
      c. French Fry (frozen)

2. Base Case Potato Plant

3. Compilation of Potato Processing Plants

The potato plants will be compared to a "typical" potato processing plant. The energy requirements section will identify the percentage of a particular plant's energy needs which could be replaced by direct utilization of geothermal energy. This percentage depends on the available temperature of the geothermal resource. Each plant will be examined using the format shown below.

Process Description
General Flow Diagram
Energy Requirements
Present Energy Usage
    Electrical
    Natural Gas
Comments on Geothermal Potential

The report will analyze the potential for geothermal resource development by examining the location of known thermal springs and wells, the location of state and federal geothermal exploration leases, and the location of federal and state oil and gas leasing activity in Southeast Idaho. Information is also presented regarding the location of geothermal, oil, and gas exploration wells in Southeast Idaho. The location of state and federal phosphate mining leases is also presented. This information is presented in table and map formats (see Appendix) to show the proximity of exploration and development activities to current food and phosphate processing facilities and phosphate mining activities.

III. PHOSPHATE INDUSTRY

A. Elemental Phosphorus Production

The two producers of elemental phosphate in southern Idaho are FMC Corporation and Monsanto Chemical. FMC is located outside of Pocatello, Idaho, and produces 120,000 tons of phosphorus per year, requiring about 1.1 million tons of phosphate ore. The plant's electrical demand is about 210 Mw. Monsanto Chemical is located at Soda Springs, Idaho, and produces 100,000 tons of phosphorus per year from about 700,000 tons of phosphate ore. Monsanto's electrical demand is about 140 Mw.

1. FMC Corporation-Pocatello, Idaho

Process Description. The plant receives phosphate ore with a moisture content of approximately 11%. This ore is screened, crushed, and briquetted. The water in the ore aids in the briquetting process and therefore this ore could not be pre-dried. The briquets are calcined in natural gas/carbon monoxide calciner. The calcined briquets are mixed with silica and coke and fed to any of four electric furnaces. By-products from the furnace consist of ferrophos and slag. The overhead gases from the furnace pass through a precipitator and then to spray condensers where the phosphorus is recovered. The dust from the precipitators is slurried with water and then dried in a natural gas fired fluidized bed unit. The CO off gas from the condensers is recycled back and used as a combustion gas in the calciner. This process is shown in Figure 1.

Energy Requirements. The energy required for this process is provided by natural gas and electricity. Locations of energy use which can feasibly be substituted by geothermal include steam production at 400°F and drying of product recovered from the precipitator. These energy requirements and their associated temperatures are shown in Figure 2.

Geothermal Potential at FMC. This industry has two main locations of energy consumption: electric furnaces and calciners. The electric furnaces use 90% of the energy required by FMC. The plant has an excess of carbon monoxide from the electric arc furnaces which it plans to recover and use to reduce natural gas consumption. This waste energy is about 219 (10^9) BTU/yr. or 30% of their natural gas requirements. The potential use of geothermal energy is in the generation of process steam and fluid bed dryer which are also the most likely places for use of waste heat. If this energy is used in the boiler and fluid bed dryer there will be reduced potential for geothermal energy. The large electrical requirements of this plant are presently on interrupt power and suggest a need for a dedicated electrical supply which could possibly be supplied by a geothermal power cycle.

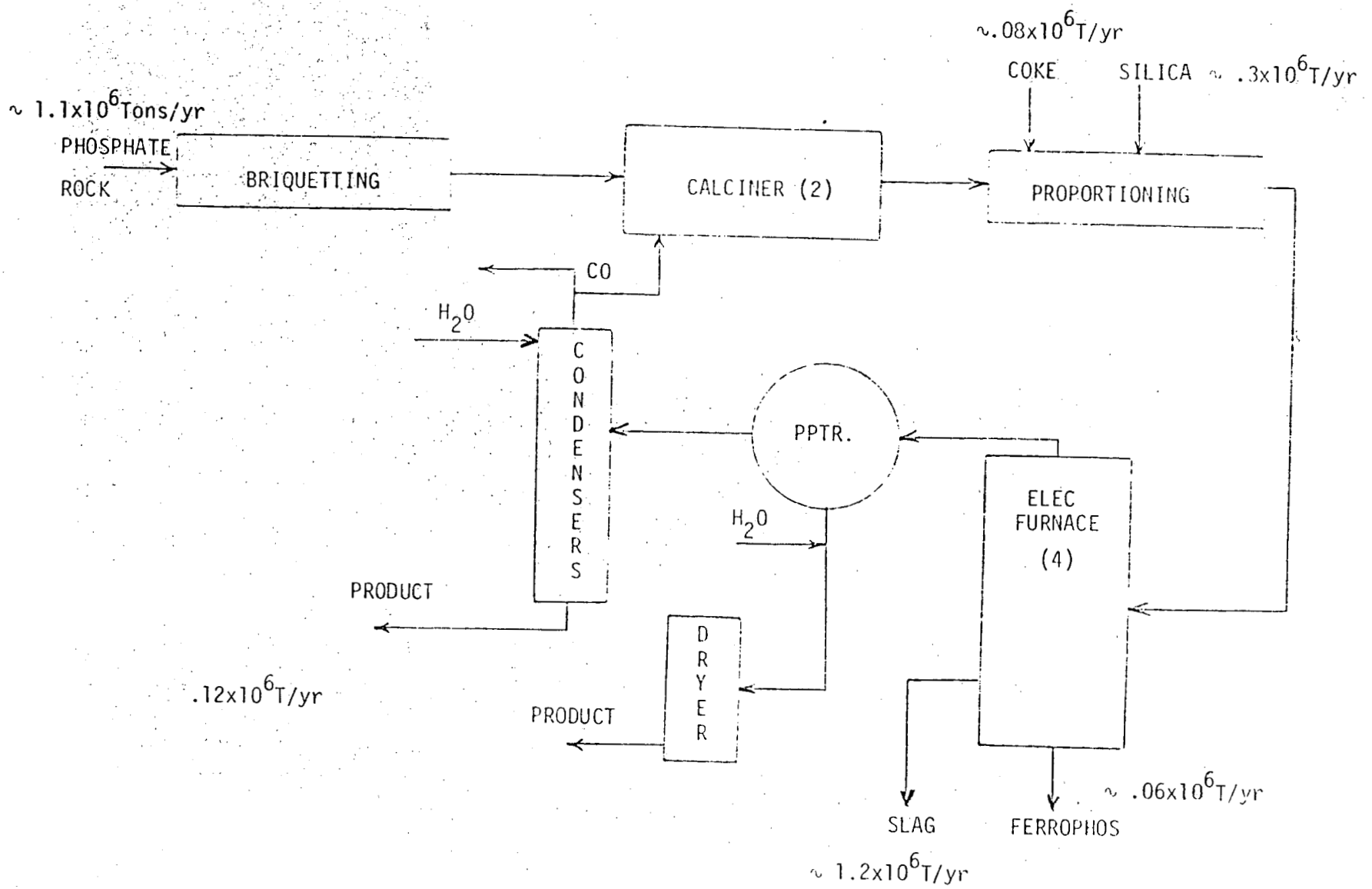
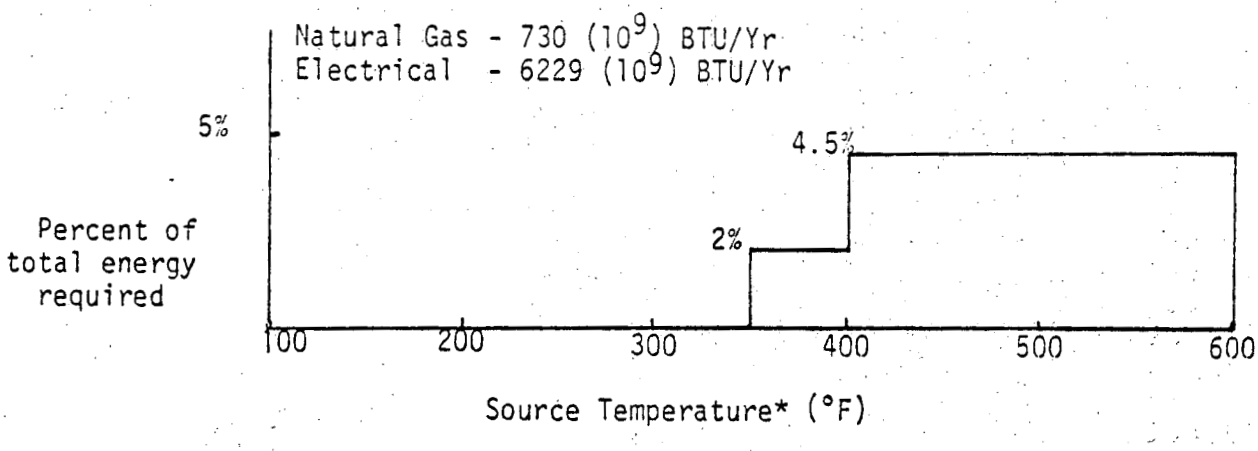


FIGURE 1. PROCESS FLOW DIAGRAM FOR FMC, POCATELLO

FIGURE 2: POTENTIAL ENERGY SUPPLIED BY GEOTHERMAL



*Other energy used is electrical or used at calciner temperatures (>1000°F)

2. Monsanto Chemical-Soda Springs

Process Description. Phosphate ore is crushed and screened and then fed to a large rotary kiln where it is "nodulized." This process dries the ore and removes the organic materials as well as calcining the ore. The calcined ore is combined with coke and quartzite and fed to one of three electric furnaces. The off-gases from the furnaces contain the elemental phosphorus product and are fed to a condenser where they are contacted directly with water from a closed cycle "phossy water" system. The carbon monoxide gas from the condenser is recycled as fuel for the kiln. The solids products from the furnace include a waste slag stream and "ferrophos" alloy. The process and approximate flow rates are shown in Figure 3.

Energy Requirements. The major energy required for this process includes electricity to operate the electric arc furnaces and natural gas to supplement the rotary kiln and to operate a small steam boiler. A waste heat boiler operating off the kiln off-gas provides a substantial amount of the process steam requirements. The natural gas used for process steam generation accounts for about 5% of the total energy required at Monsanto and is potentially replacable by geothermal energy. This would require a geothermal source of at least 400°F (Figure 4).

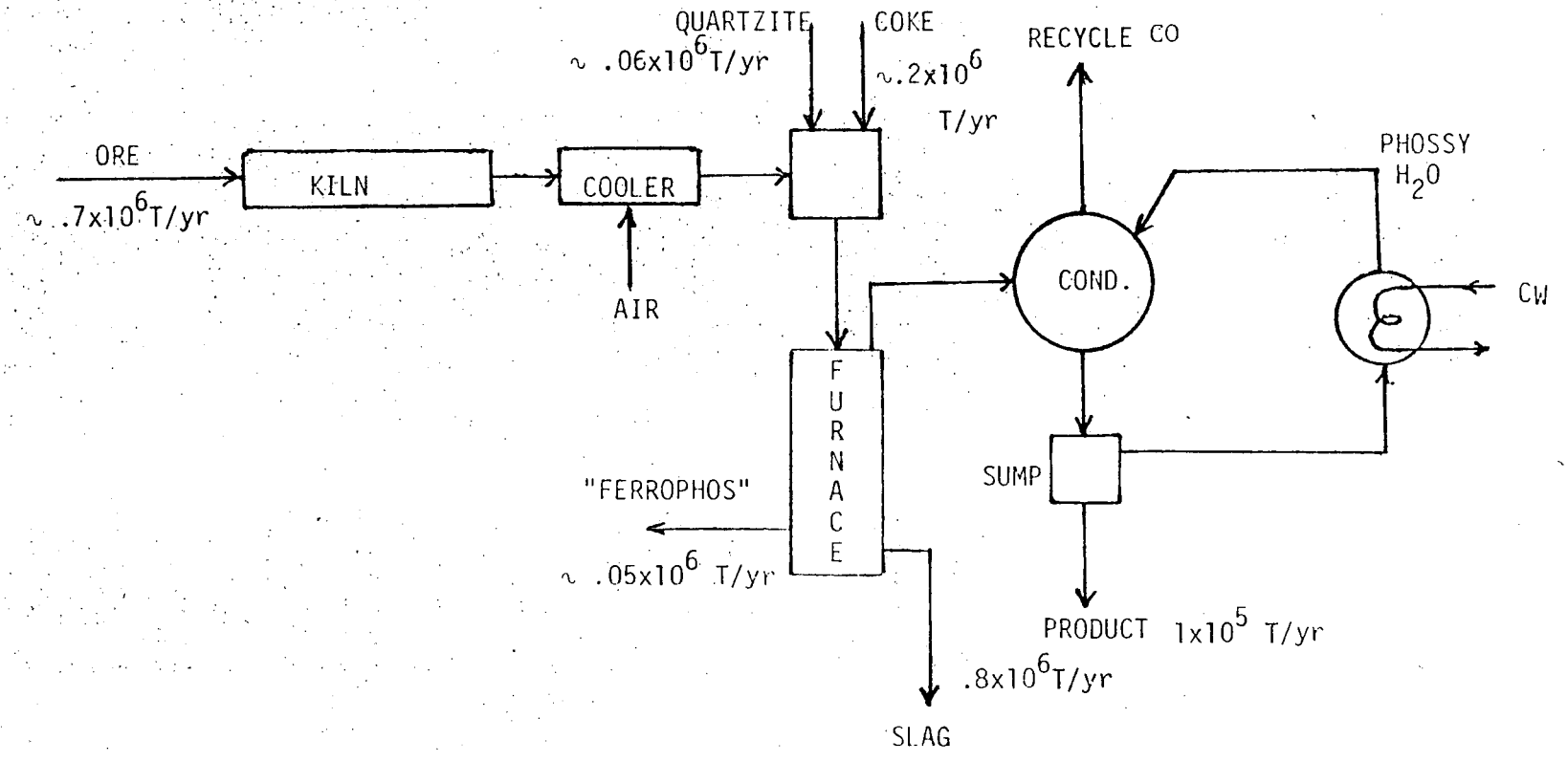
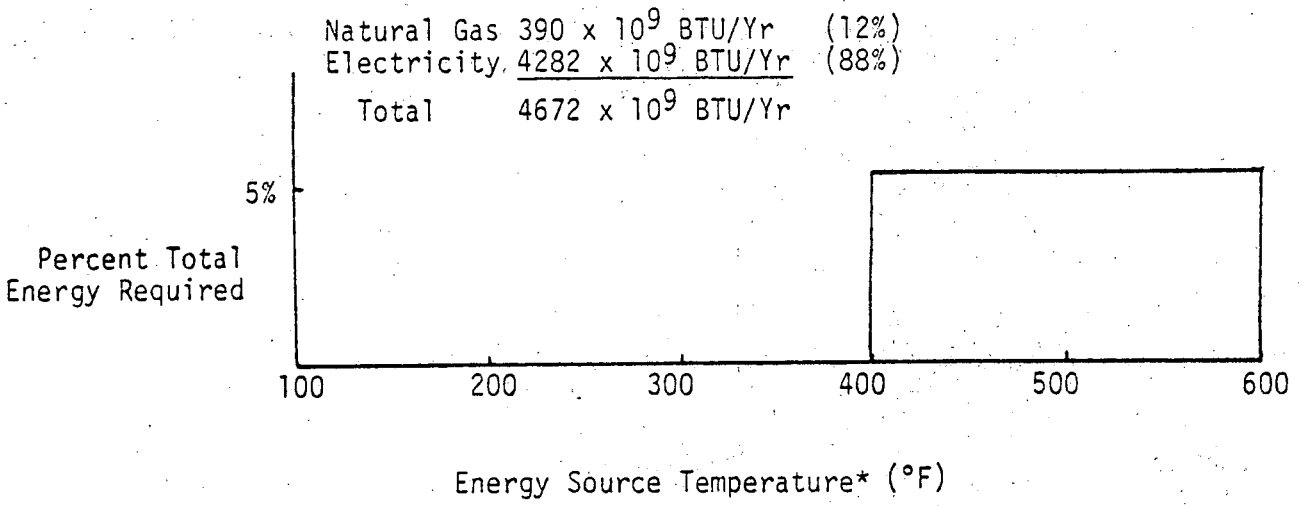


FIGURE 3: PROCESS FLOW DIAGRAM FOR MONSANTO CHEMICAL, SODA SPRINGS

FIGURE 4: POTENTIAL ENERGY SUPPLIED BY GEOTHERMAL



*Remaining requirements are electrical or used at temperatures exceeding 1000°F.

Geothermal Potential at Monsanto. Most of the energy used at Monsanto that could be replaced by a geothermal supply is presently being supplied by a waste heat boiler operating on the kiln off-gas stream. The natural gas used is primarily for start-up of the kiln and not replaceable by direct application of geothermal energy. The plant's large electrical requirements (140 Mw) suggest the need for a dedicated energy supply instead of the present interruptible power supply. A geothermal power cycle might be able to supply this energy, but would require well in excess of 25,000 gpm of 300-400°F water.

B. Phosphate Fertilizer Industry

The two companies producing phosphate fertilizers in Southern Idaho are Beker Industries and J.R. Simplot Company.

Beker is located in Conda, Idaho and produces 665 tons per year of fertilizer in the form of monoammonium phosphate (MAP), diammonium phosphate (DAP), and phosphoric acid at either 52% or 72% P_2O_5 concentration. This year (1979) production has been limited to 52% P_2O_5 due to a high magnesium content in the ore. This production requires about 1.5 million tons of phosphate ore which is mined near Conda. The plant's overall energy

requirements are met mainly by waste heat from the production of sulfuric acid from elemental sulfur. Purchased electricity is on the order of 5-10 Mw.

J.R. Simplot Company is located outside of Pocatello, Idaho, and produces about 1.0 million tons of fertilizer products annually. The phosphate products consist of ammonioum phosphate (365,000 T/yr.), triple super phosphate (73,000 T/yr.), phosphoric acid (292,000 T/yr.), and super phosphoric acid (183,000 T/yr.). Other Products include ammonium sulfate (64,000 T/yr.) and a nitrogen solution, UN-32 (64,000 T/yr.). Simplot's energy requirements include about 20 Mw of electricity and some natural gas for steam production. Simplot also produces sulfuric acid and recovers the waste heat for steam production.

1. Beker Industries-Conda, Idaho

Process Description. Beker's production plant is divided into two main sections, the mining operations and the phosphoric acid plant (Figure 5).

Mining Operations. The plant receives nearly 3.0 million tons of phosphate ore per year from Beker's mines near Conda for beneficiation and calcination. The ore is washed to remove some of the organics and fines and then filtered to about 14% moisture content. One-half of this ore is dried and then mixed with the wet ore to provide a calcine feed with 6-7% moisture. The ore has a high BTU content and is nearly self-calcining. Natural gas use is less than 22.0 million BTU/yr. Waste heat from the calcination is recycled to accomplish the drying. The mining operations produces an average of 5000 ton per day of calcined ore. About 50% of this ore is shipped by rail to Calgary, Canada. The other half is used by phosphoric acid plants.

Phosphoric Acid Plant. The phosphoric acid plant consists of three sections. One section burns sulfur to product SO_2 for the production of sulfuric acid. The next section mixes the sulfuric acid with calcined phosphate rock to produce phosphoric acid. Ten-fifteen percent of this acid is then concentrated in steam operated evaporators to produce either 52% or 70% phosphoric acid (as P_2O_5). The remaining acid is combined with sulfuric acid, ammonia and calcined phosphate to produce either monoammonium phosphate (MAP) or diammonium phosphate (DAP). The product is granulated by a mechanical operation and dried to produce granular MAP and DAP.

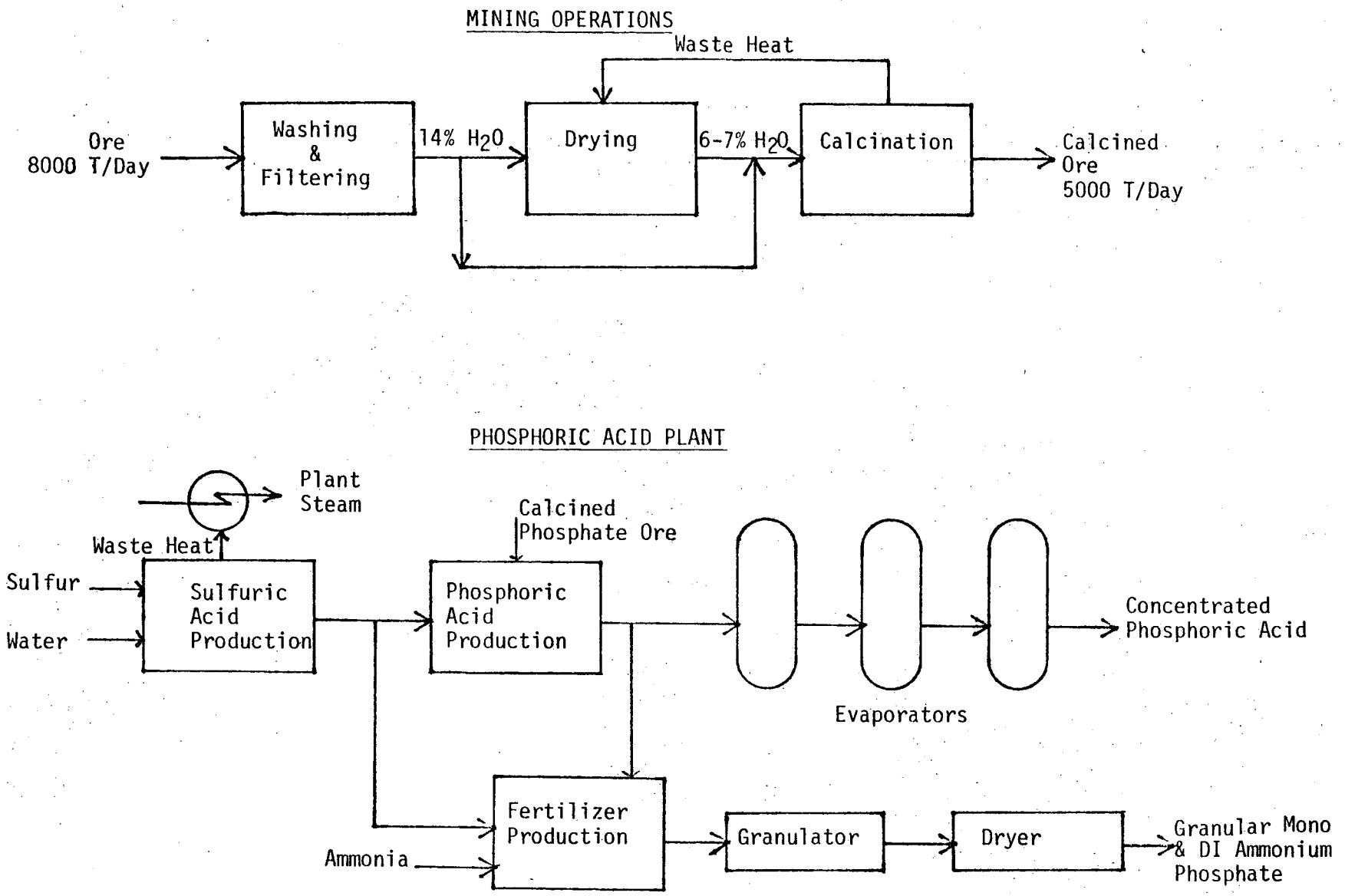
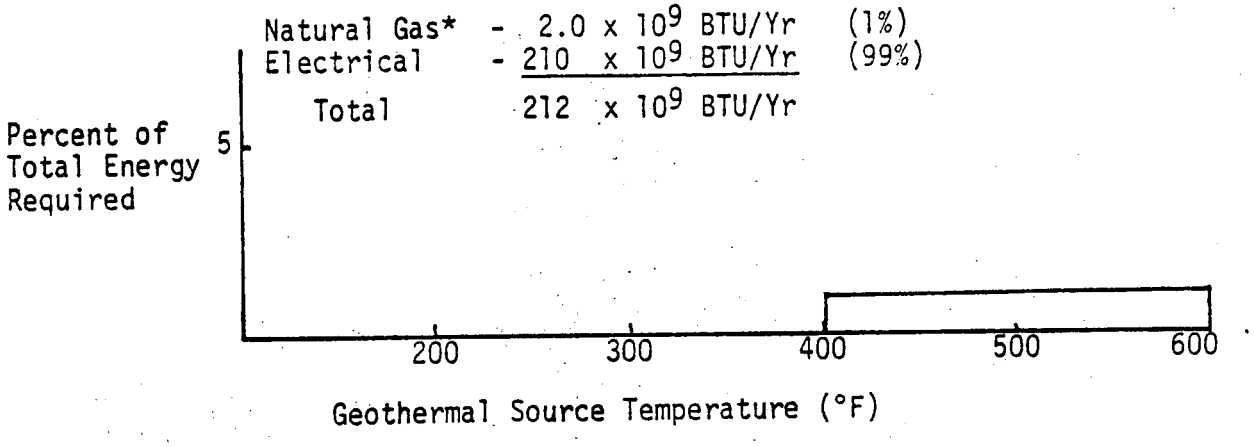


FIGURE 5: PROCESS FLOW DIAGRAM FOR BEKER INDUSTRIES

Energy Requirements. The major energy requirements at Beker are met by electricity and waste heat from the production of sulfuric acid. Some natural gas is used in the calcination process and for supplemental steam. Geothermal energy could be used for process steam generation instead of natural gas. This would require a geothermal source of at least 400°F and could potentially replace 1% of Beker's energy requirements (Figure 6).

FIGURE 6: POTENTIAL ENERGY SUPPLIED BY GEOTHERMAL AT BEKER



*This assumes that Beker's natural gas requirements are proportionately similar to Simplot's.

Geothermal Potential at Beker. The plant's non-electrical requirements are almost entirely met by waste heat. Some natural gas is used but this is primarily for start-up of the calcination process. There does not appear to be a need for direct application of geothermal energy at their location.

2. J.R. Simplot-Pocatello, Idaho

Process Description. This plant is actually an integrated complex consisting of a number of separate plants. There are three sulfuric acid plants (500, 600 and 1100 tons/day), two ammonia plants (150 tons/day each), two ammonium phosphate plants (1,000 tons/day), an ammonium sulfate plant (150 tons/day), a phosphoric acid plant which produces phosphoric acid for other portions of the complex (Triple Super Phosphate or TSP, ammonium phosphate) as well as for direct sales and a nitrogen solutions plant (UN-32). (See Figure 7.)

The sulfuric acid plants are standard in that sulfur is burned to produce SO_2 which is then converted catalytically to SO_3 before absorption in a recycle H_2SO_4 stream.

The ammonia plants are also standard and employ natural gas as a feed stock. The natural gas is steam reformed in the presence of a catalyst and then, after shift conversion, CO_2 absorption and methanation, it is catalytically combined with nitrogen to form ammonia. A portion of the ammonia is fed to the ammonium phosphate and sulfate plants and the remainder to the nitrogen solutions plant. In this latter plant, some of the ammonia is oxidized to NO_x over a platinum gauge catalyst and then absorbed in water to form nitric acid. Another portion of the ammonia is reacted with stripped CO_2 from the ammonia plant to form urea. The nitric acid is neutralized and then mixed with the urea to form a eutectic mixture of urea and ammonium nitrate (UN-32).

The feed to the phosphoric acid plant consists of phosphate rock and sulfuric acid. The rock is first calcined in three fluidized bed calciners and then mixed with H_2SO_4. The waste stream from this process is gypsum ($CaSO_4$) which is sent to a disposal pile. The acid is concentrated to various degrees in evaporators for either direct sale or to produce liquid fertilizer and ammonium phosphate.

The remaining plants are basically mixing operations, usually with some drying involved. Thus, TSP is produced by mixing phosphoric acid with phosphate rock and then dried; ammonium phosphate results from the mixing of NH_3,

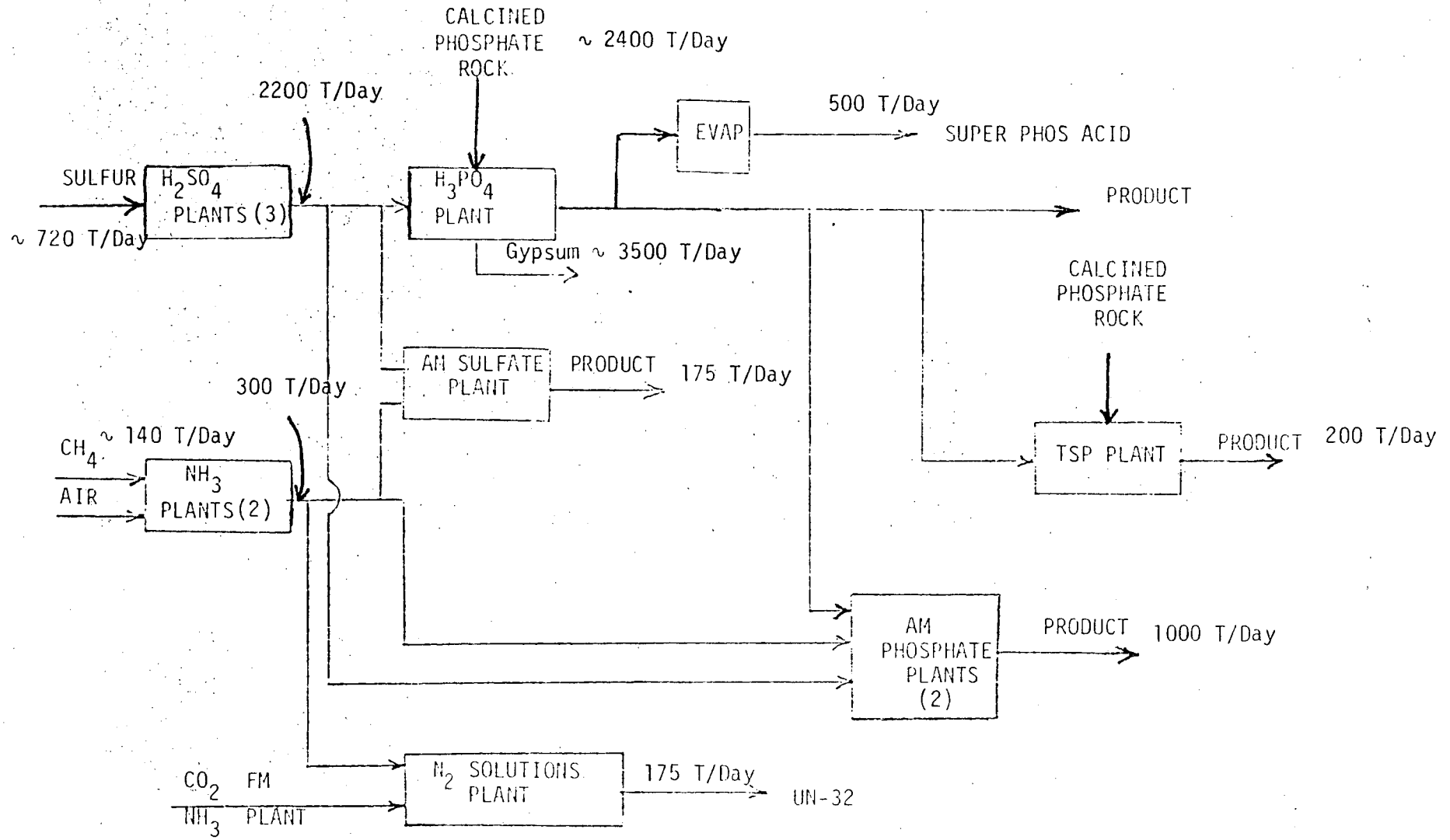


FIGURE 7: PROCESS FLOW DIAGRAM, SIMPLOT

H_3PO_4 and H_2SO_4 which is then granulated and dried; ammonium sulfate is crystallized from a mixture of NH_3 and H_2SO_4 followed by centrifuging and drying.

Energy Requirements. Simplot also acquires large amounts of waste heat from the production of sulfuric acid. The total natural gas used by Simplot is high but a large portion of this is used as feedstock to the ammonia plant. Simplot also uses natural gas to operate three fluidized bed calciners. The energy at Simplot replaceable by geothermal water is primarily that used for steam production (Figure 8).

Geothermal Potential at Simplot. Simplot is similar to Beker in that most of the non-electrical plant energy requirements are supplied by waste heat. There does not appear to be a need for the direct application of geothermal potential.

C. Phosphate Mining

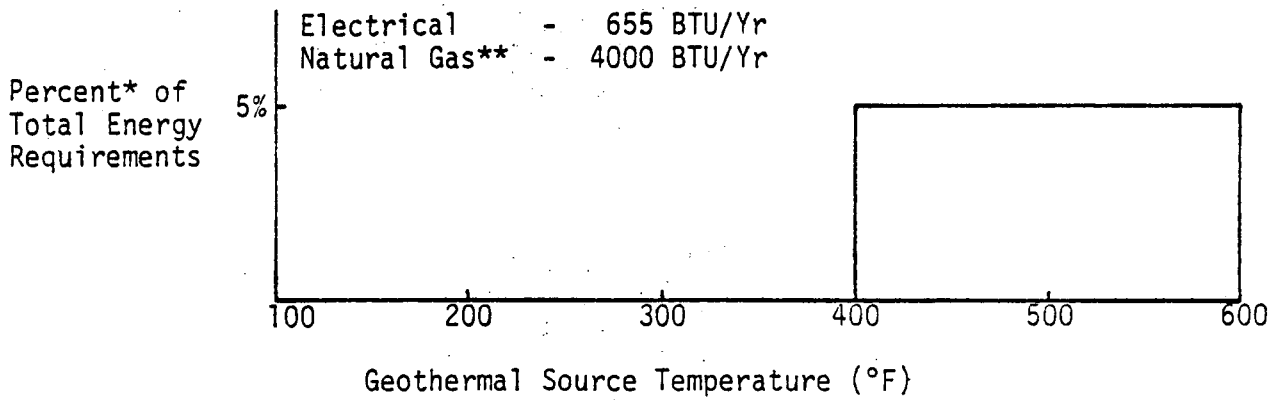
The major phosphate mining operations in southern Idaho are Beker Industries, Monsanto Company, J.R. Simplot, and Stauffer Chemical Company. The Alumet Group and Earth Sciences, Inc., also have plans for mining in southern Idaho but are not presently in operation.

Beker Industries strip mines nearly 3.0 million tons of ore per year. Mining and shipping is limited to the non-winter months, generally May to November depending on the weather. Monsanto mines up to 1.0 million tons of ore per year. Stripping is done year round but weather restricts mining and shipping to the months of May through October or November. J.R. Simplot Company operates two mines; both mines are located east of Conda, Idaho. Simplot's Gay mine produces about 3.0 million tons of phosphate ore per year. About 1.5 million tons of this ore is shipped to FMC Corporation, Pocatello and the other half is sent to Simplot's Conda mine for beneficiation. The mine is operated during non-winter months due to weather considerations. The Conda mine operates year round because the ore is dried sufficiently in the beneficiation process to allow shipping.

1. Alumet Group-Diamond Creek, South End of Upper Valley (about 20 miles Northeast of Soda Springs).

Process Description. There is no production at Diamond Creek at the present time. The Alumet Group plans to start mining in the near future at a rate of 0.5 million tons per year. The ore will be transported by truck to the rail spur now serving the Wooley Valley mine.

FIGURE 8: POTENTIAL ENERGY SUPPLIED BY GEOTHERMAL AT SIMPLOT



*Does not include natural gas used for ammonia production.
**Approximately 2500 x 10^9 BTU/Yr is used as feedstock to the ammonia plant.

Process Flow. No onsite processing is anticipated at this time. The ore may be beneficiated at a mill near Diamond Creek in the future. This would be a dry-process beneficiation plant.

Energy Requirements. No process.

Geothermal Potential at Alumet. A dry-process beneficiation involves crushing and screening of the ore and has no use for direct application of geothermal energy.

2. Beker Industries Corporation-North and South Maybe Canyon (about 16 miles Northeast of Soda Springs.

Process Description. Beker Industries presently mines about 2.7 million tons of ore per year. This ore is shipped about 35 miles by rail to the fertilizer plant at Conda, Idaho. At the plant the ore is beneficiated and calcined. The ore is mined and shipped from May to November depending on weather conditions. Snow and ice cause many problems with their mining operations. The ore is stockpiled at the fertilizer plant for winter operation.

Process Flow Diagram. Only mining operations.

Energy Requirements. Since there is no beneficiation at the mine there are no requirements directly compatible to geothermal energy.

Geothermal Potential at Beker Mine. Since the mine is difficult to operate in the winter it is not likely to be desirable to do beneficiation at the mine and this makes it unlikely that there would be a future use for geothermal energy at the mine.

3. Earth Sciences, Inc.-Paris-Bloomington Mine (2 miles west of Bloomington, Idaho).

Process Description. There is no production at this time. However, future plans include an underground mine to produce high-grade phosphate ore and a beneficiation plant near the mine site.

Process Flow. No designed process at this time.

Energy Requirements. No production.

Geothermal Potential at Earth Sciences, Inc. It is unlikely that Earth Sciences will have a use for the direct application of geothermal energy but this depends on the ore properties and specific beneficiation process used.

4. Monsanto Company-Henry Mine

Process Description. Monsanto can strip mine a maximum of 1.0 million tons per year of phosphate ore from the Henry Mine. Stripping is done year round but weather prevents transportation to the plant during the winter months. From May to October or November the ore is shipped by truck to the phosphoric acid plant at Soda Springs. No beneficiation is provided at the mine.

Process Flow Diagram. Mining operations only.

Energy Requirements. Energy usage is not compatible to a geothermal source.

Geothermal Potential at Monsanto's Mine. Geothermal energy would be advantageous if drying was accomplished at the mine. However, since it is difficult to operate the mining equipment during the winter, a drying operation at the mine would not be sufficient for year round shipping.

5. J.R. Simplot Company-Gay Mine (approximately 2 miles east of Conda, Idaho

Process Description. Simplot mines over 3.0 million tons annually from the Gay mine. Approximately 1.5 million tons of this ore is sold to FMC Corporation in Pocatello for the production of elemental phosphorus. FMC's process requires that the ore have a moisture content of 8-12 percent. Therefore FMC's ore is shipped unbeneficiated. The other 1.5 million tons is shipped to the Simplot Conda mine for beneficiation.

Process Flow Diagram. Only mining operations at Gay mine.

Energy Requirements. Since there is no beneficiation or drying, energy requirements are not compatible to a geothermal source.

Present Energy Usage. The energy used at this time is mainly in the form of diesel fuel for the mining equipment.

Geothermal Potential at the Gay Mine. Since FMC's ore is not dried and Simplot beneficiates their ore at the Conda mine it is not likely that a beneficiation or drying process will be considered for this mine and geothermal energy will therefore not be of use.

6. J.R. Simplot-Conda Mine (east of Conda, Idaho)

Process Description. About 1.0 million tons of phosphate ore is mined at this site annually. This ore, along with 1.5 million tons per year from the Gay mine, are beneficiated before being shipped to the fertilizer plant at Pocatello. Beneficiation includes a washing stage which removes the fines and most carbonaceous material. The ore is dried and then calcined. Since the ore is essentially self-calcining very little natural gas is required. Waste heat from the calcination stage is used for the drying stage. The ore is dried more during the winter to reduce freezing problems in shipping. Calcined ore is then shipped by rail to the fertilizer plant at Pocatello (Figure 9).

Energy Requirements. Present energy requirements at Simplot are met by electricity and waste heat from the calcination process. The only potential use of direct geothermal application is that energy now met by waste heat.

Geothermal Potential at Simplot. If an alternate heat source were available the ore could be dried at the mine but not calcined until it reached the plant which would provide more waste heat at the plant. To replace this calcine waste heat with geothermal water would take about 29,000 gpm at 300^{o}F. This assumes a 100^{o}F drop in geothermal temperature and 60% efficiency. The conclusion is that any use for geothermal at either the mining or the plant site would only replace existing waste energy. We see no ultimate use for direct application of geothermal energy.

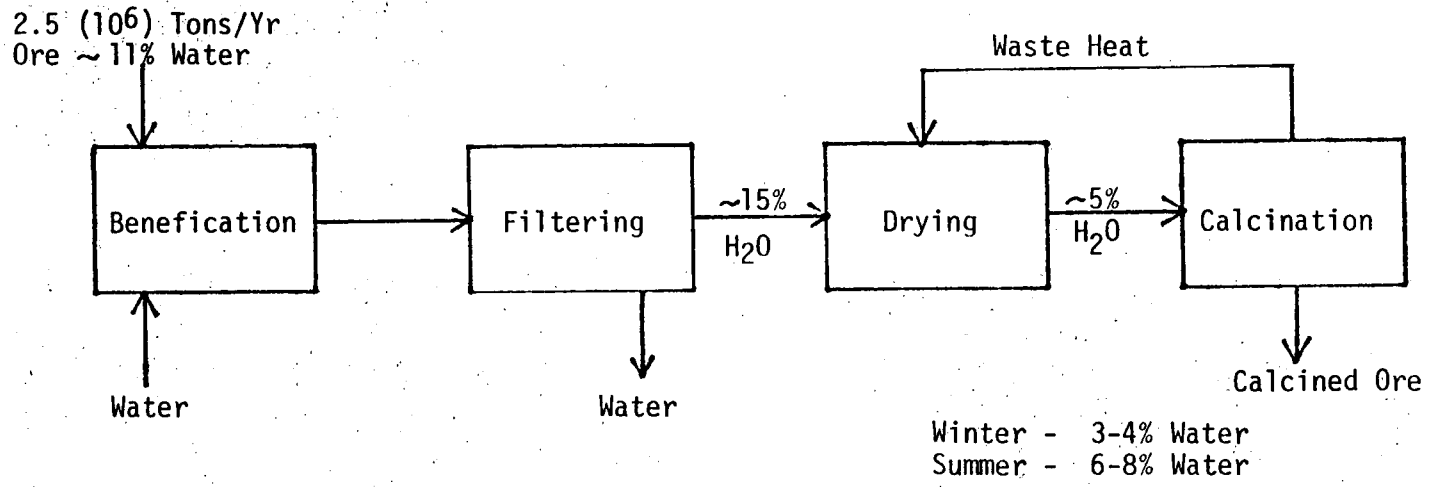


FIGURE 9: PROCESS FLOW DIAGRAM FOR CONDA MINE

7. Stauffer Chemical Company-Wooley Valley Mine

Process Description. Stauffer presently mines 1.0 million tons of ore per year. Stripping and ore extraction is done with rubber-tired scrapers, assisted by crawler dozers in loading. Stripping is done year round. The ore is hauled to a stockpile and loaded on railroad cars during the non-winter months, generally June to October. The ore's 10-12 percent water content makes shipping in the winter months impossible. The unbeneficiated ore is shipped by rail to Silver Bow, Montana, and Leefe, Wyoming.

Process Flow Diagram. There is no beneficiation or drying process at this time.

Energy Requirements. The energy required is in the form of fuel for the mining equipment and not compatible to a geothermal resource.

Geothermal Potential at Stauffer. If a beneficiation or drying process were to be used it would probably change the shipping duration. Stauffer will not do beneficiation unless an incentive such as transportation difficulties or inexpensive energy supply is encountered.

8. Summary of Phosphate Mining

It appears that the only potential use for geothermal energy is in the drying operation at the mine. This drying might allow the mine to operate during the winter months; however, there are many other winter-related problems not alleviated by drying the ore. Those operations that do drying also do beneficiation (which includes calcining the ore). In most cases the waste heat from beneficiation is sufficient to accomplish drying. There does not appear to be a role for direct application of geothermal in the phosphate industry.

IV. FOOD PROCESSING

The major food processing industries in southeastern Idaho are potato processing plants. These plants have similar processes and similar energy requirements. The potential use of geothermal energy in these plants will be examined by defining a "typical" potato processing plant. This plant will show the general energy requirements of a potato plant. Lamb-Weston's processing plant in American Falls will be compared to this "typical" plant as an example. Total energy requirements of the remaining plants will be given.

A. Typical Potato Processing Plant - Southern Idaho

Process Description. The southern Idaho potato processing industry can be divided into two types of production: frozen and dehydrated. The dehydration process has two different drying methods: drum dryers which result in potato flakes; and fluid bed dryers which are used for potato granule production. These processes have different energy requirements and are examined separately (see Figure 10).

Freezing Process. Raw potatoes are peeled, sorted, and cut to the desired shape in the first section of the freezing process. Live steam is added in the peeling stage to soften the peel. They are then blanched in approximately 200°F water which has been heated indirectly by steam. Next the potatoes are dried with hot air from natural gas combustion. After drying the potatoes are fried in hot oil at 375°F. Heat for the oil fryers is supplied by steam-oil heat exchanger. Finally the potatoes are cooled with ambient air and frozen in electrically operated freezers.

Dehydrating Process. In the dehydration process raw potatoes are peeled, sorted, and cut as in the freezing process. Next they are processed to make potato flakes or potato granules. In the flaking process the potatoes are next precooked at 170°F. After precooking they are dewatered and allowed to cool slightly before entering the cooker. Following the cooking stage the potatoes are riced and rolled into flakes on the drum dryers.

In the granule process the potatoes are blanched at 180°F after peeling and sorting. They are then cooked at 220°F. Drying takes place in a three-stage process. The first stage is a flash drying with air at 500-550°F. The second and third stages are fluid bed dryers operating with air at 250°F and 110°F, respectively.

Energy Requirements. The energy required by potato plants includes electricity and natural gas. The different processes require different percentages of electrical and natural gas as shown in Table 1.

The energy potentially replaceable by geothermal water in the frozen process includes steam production at 200°F and 350°F. A geothermal source at 200°F could supply 46% of the process energy requirements and a 350°F source could supply up to 85% (Figure 11). The flake

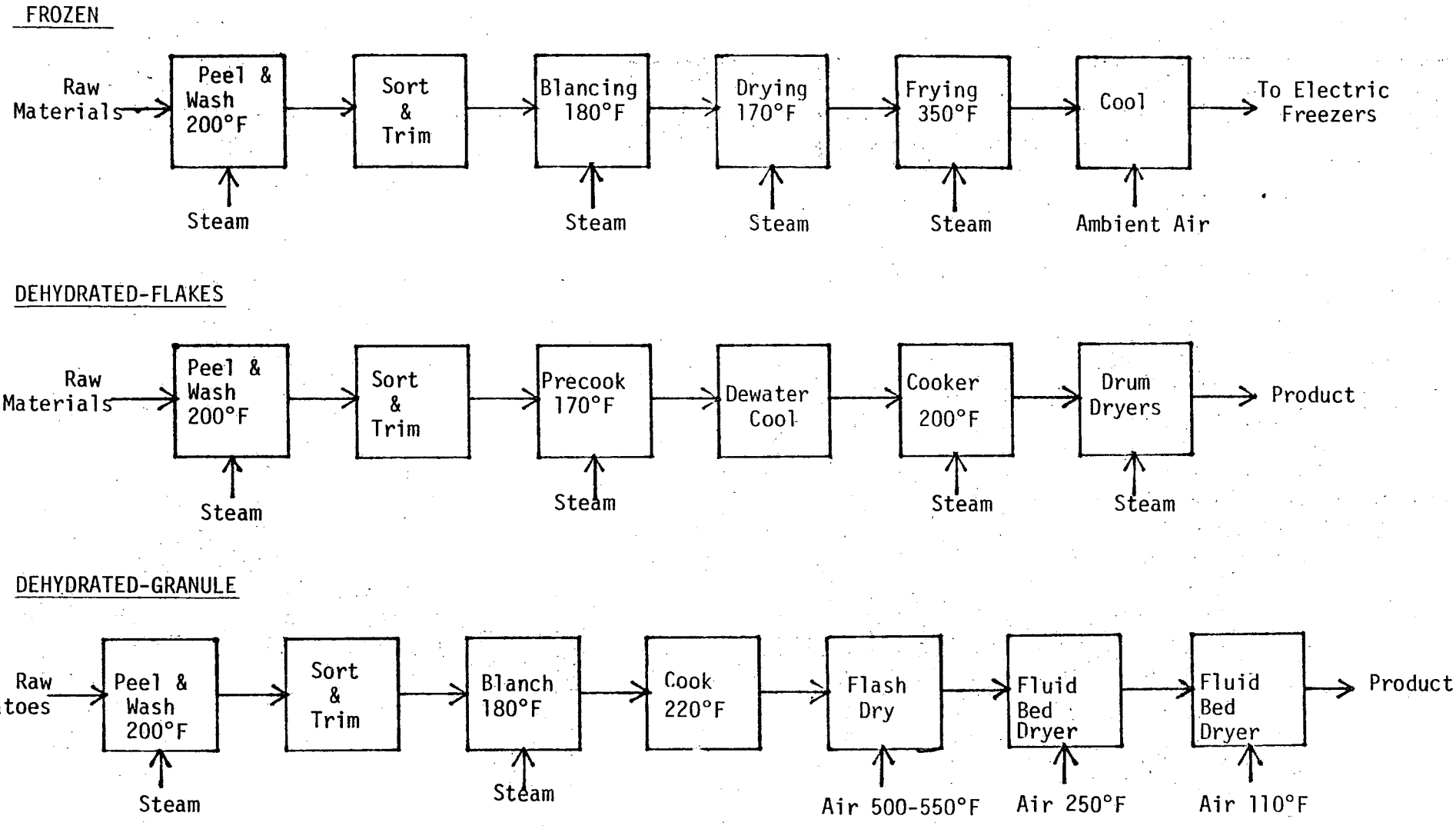


FIGURE 10: POTATO PROCESSING FLOW DIAGRAMS

TABLE 1

TOTAL ENERGY REQUIREMENTS
FOR "TYPICAL" POTATO
PROCESSES

Process Type	Percent of Total Required Natural Gas	Electrical
Frozen	85%	15%
Flakes	92%	8%
Granules	92%	8%

process requires steam at 200°F and 400°F. A geothermal source in the 200 to 400°F range could supply 39% of the process energy requirements while higher geothermal source temperatures could replace up to 92% of the process's total energy needs (Figure 12). The granule process uses steam at 200°F and air heated by natural gas to temperatures ranging from 110°F to 550°F. Figure 13 shows the total amount of the granule process's energy requirements that could be supplied by various geothermal source temperatures. A geothermal source in the 250°F to 500°F range could supply 60% of this process's energy requirements.

Geothermal Potential at "Typical Potato Processing Plant". Due to the health regulations the geothermal fluid would have to be treated or would have to be exchanged with a secondary fluid to avoid contact with the product. For the lower temperature applications equipment changes or alterations may be required. The high temperatures could possibly be used to replace natural gas in the main boilers and only this equipment would have to be changed.

FIGURE 11: POTENTIAL ENERGY SUPPLIED BY GEOTHERMAL IN THE FROZEN PROCESS

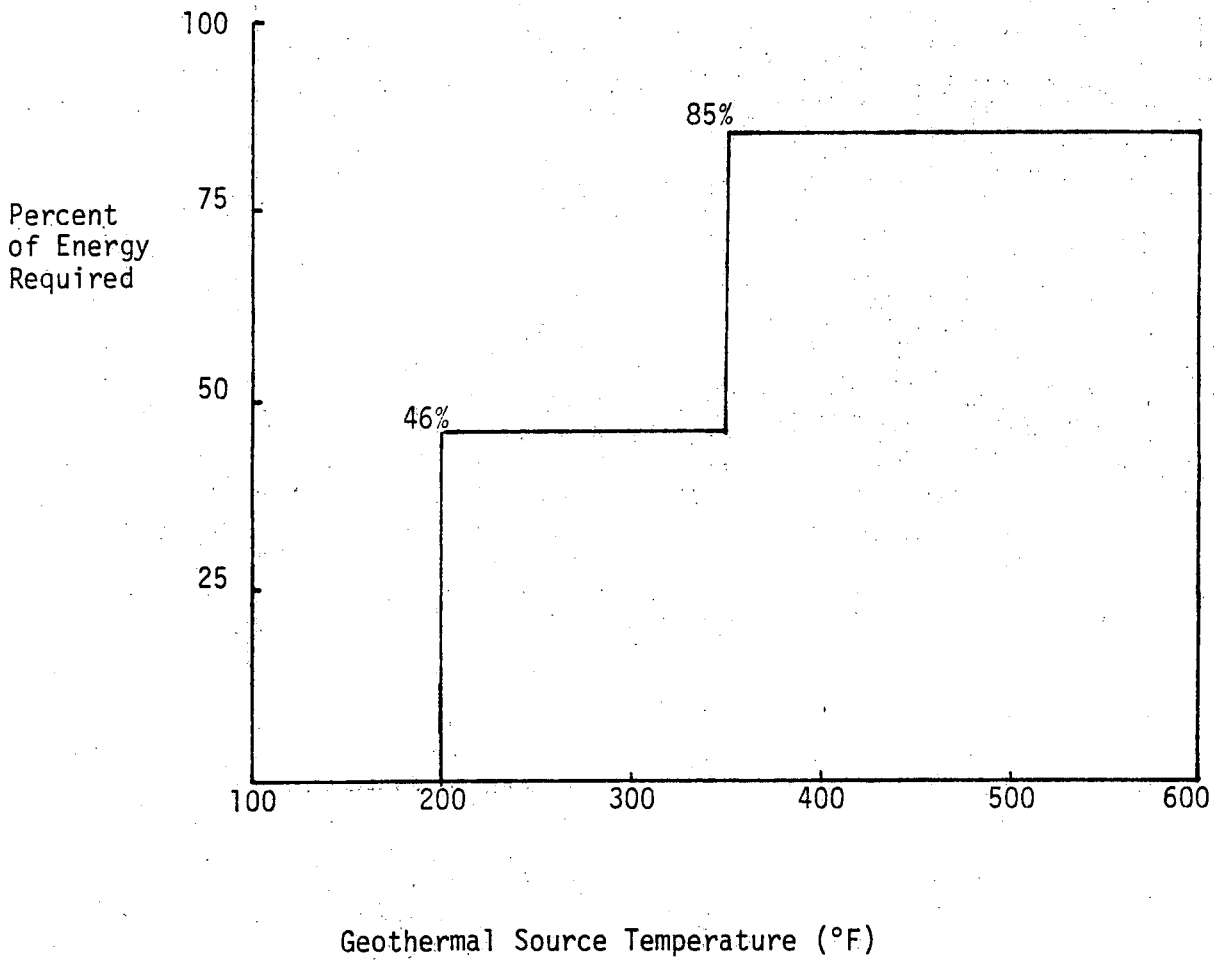


FIGURE 12: POTENTIAL ENERGY SUPPLIED BY GEOTHERMAL IN THE FLAKE PROCESS

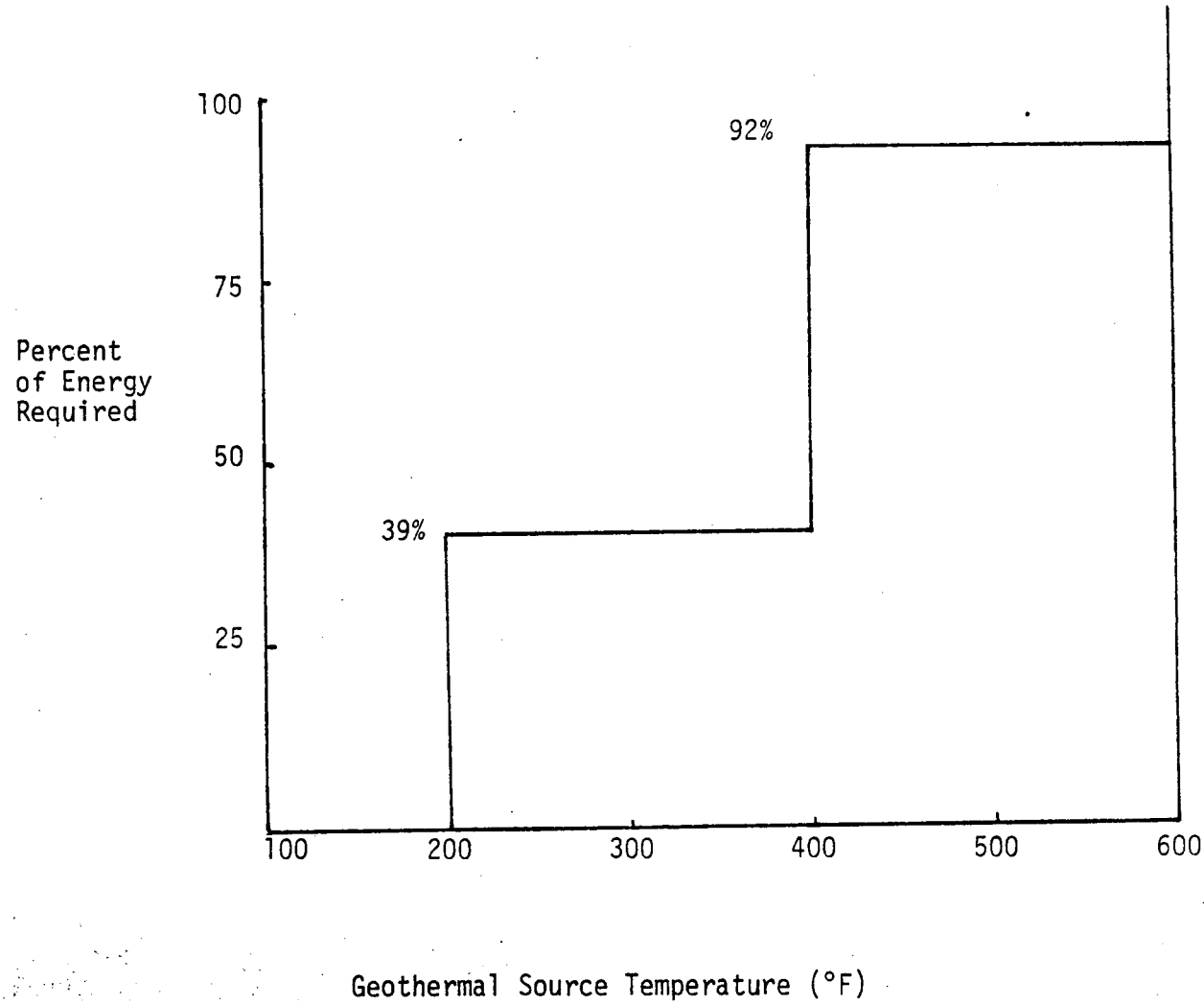
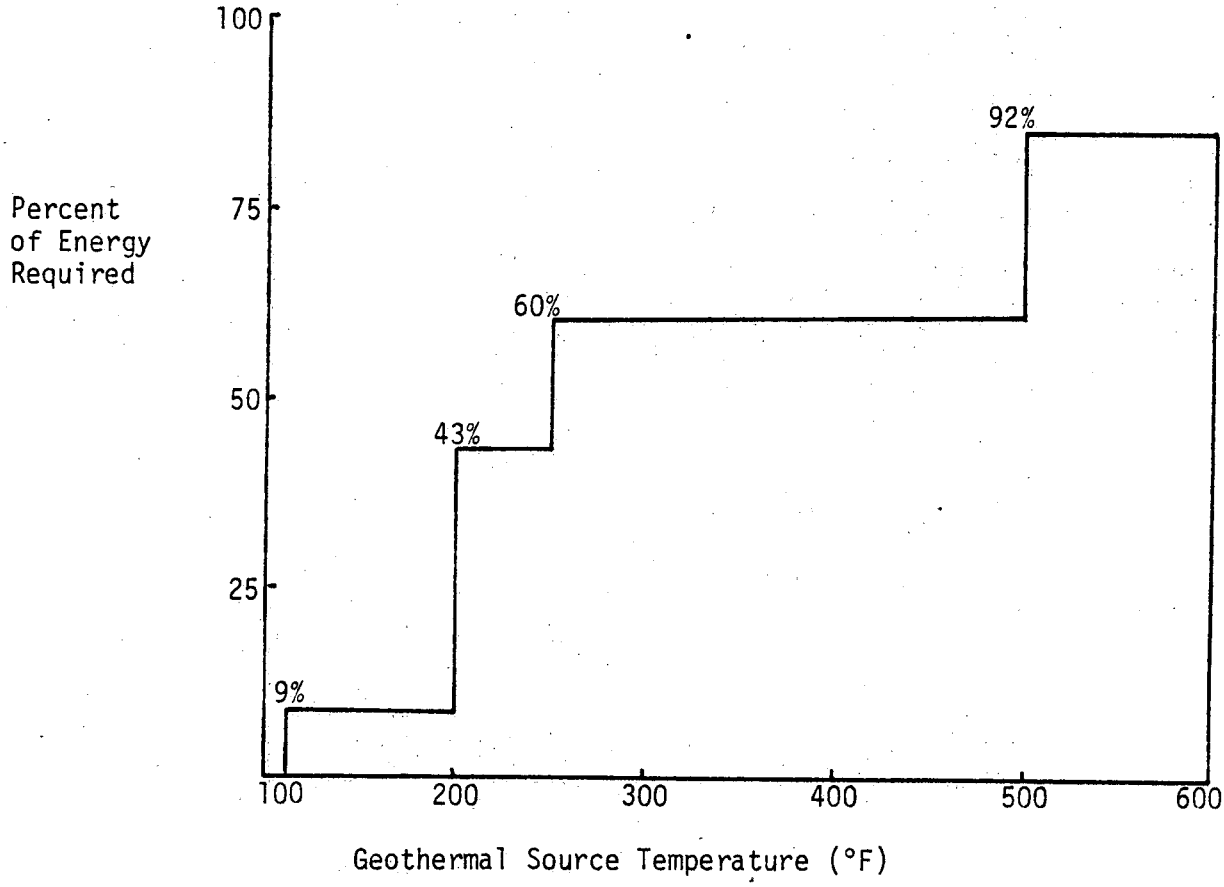


FIGURE 13: POTENTIAL ENERGY SUPPLIED BY GEOTHERMAL IN THE GRANULE PROCESS



B. Lamb-Weston, Inc., American Falls, Idaho

Process Description. This plant produces frozen french fries, has browns, and potato flakes; however, 90% of the production is in the form of french fries. Raw potatoes enter the plant and are peeled, sorted, and cut. The cut potatoes are blanched and then dried with hot air. The potatoes are then fried in oil at 375°F. The french fries are then cooled with ambient air and frozen in electric freezers. The frozen french fries are then packaged for shipping. Since this plant produces mainly french fries it is examined as a french fry process. (See Figure 14).

Energy Requirements. Lamb-Weston uses natural gas boilers to produce steam at 400°F. This steam is used in the 375°F fryers and in peeling and blanching operations at 200°F. Natural gas is also used to provide drying air at 500°F. The freezers require 3.0 Mw of electricity. Figure 15 shows the amount of energy replaceable by various geothermal temperatures.

Geothermal Potential at Lamb-Weston. Due to hot air drying instead of steam drying the energy profile for this company is slightly different from the typical potato plant. Geothermal energy could be of use if it is hot enough to be used as the main boiler energy source (400°F). The lower temperature applications would require some equipment modifications to meet health regulations and prevent contamination of the product with the geothermal source. For example, some cooking operations presently using live steam can be done using jacketed kettles.

C. Summary of Remaining Potato Processing Plants in Southeastern Idaho

Process Description. These plants are categorized into three process types: frozen, dehydrated flakes, and dehydrated granules. Table 2 summarizes the plants and their process types.

Flow Diagram. The flow diagrams for potato processing plants are similar and will be represented by the process types shown in the "typical" processing section.

Energy Requirements. The energy requirements for these plants are given in the "typical" processing section according to process type.

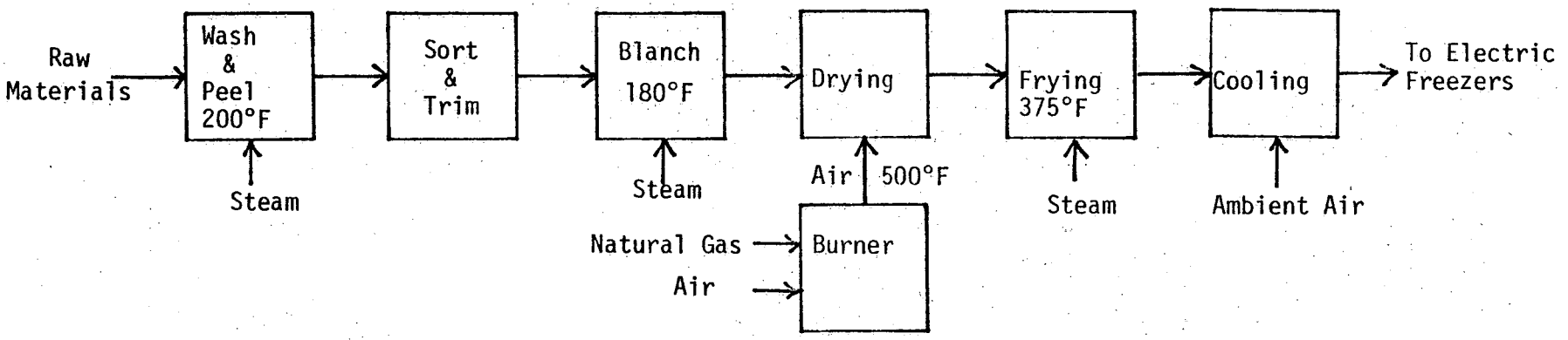
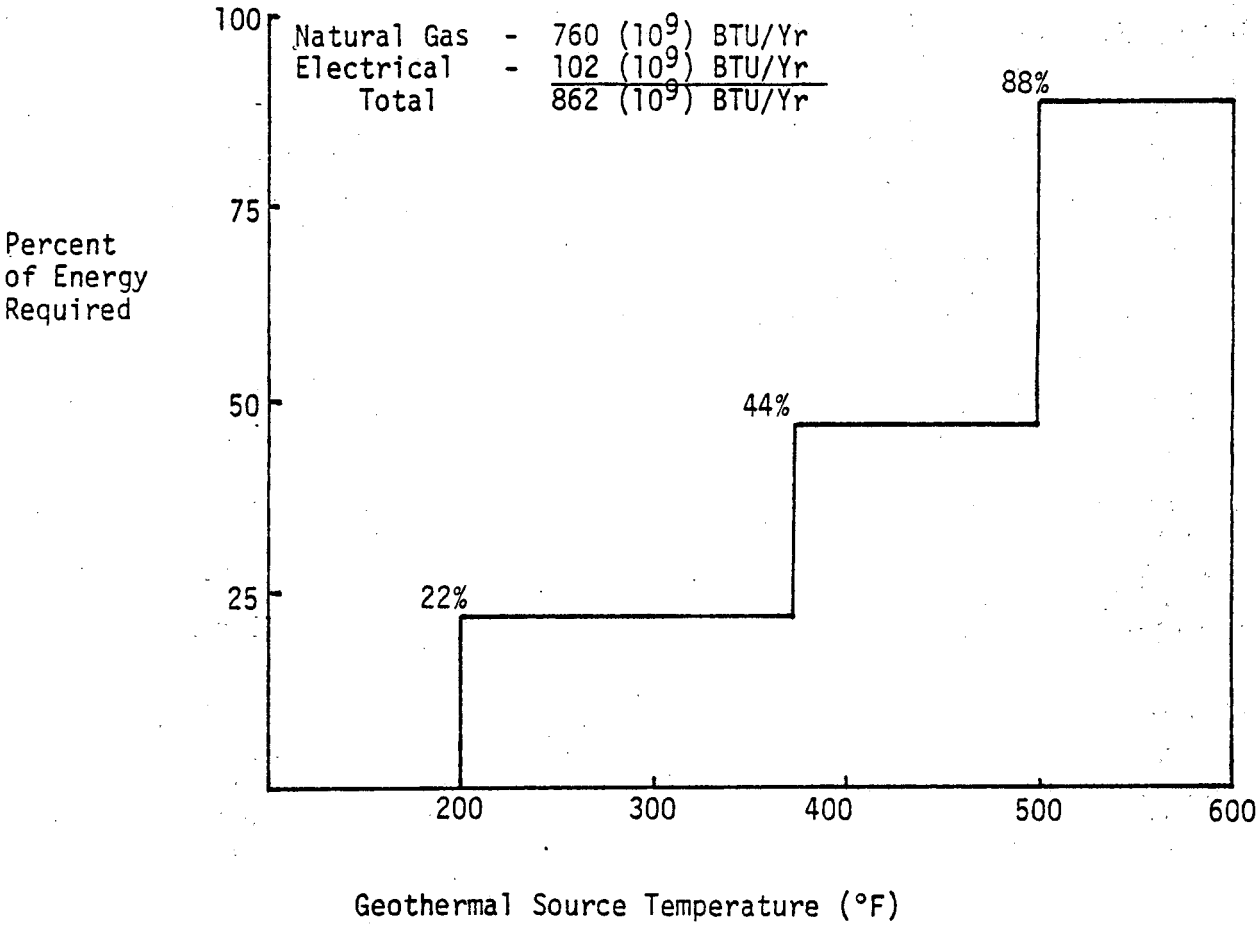


FIGURE 14: GENERAL FLOW DIAGRAM FOR LAMB-WESTON

TABLE 2: POTATO PROCESSING PLANTS IN SOUTHEASTERN IDAHO

Company	Type	Total Energy Req'd (10^9BTU/yr)
American Potato Company Blackfoot, ID	Granule	345
Idaho Fresh Pak Lewisville, ID	Flake	650
Idaho Frozen Foods, Inc. Twin Falls, ID	Frozen	520
Idaho Supreme Potatoes, Inc. Firth, ID	Flake	220
J.R. Simplot Co. Aberdeen, ID	Frozen	220
J.R. Simplot Co. Burley, ID	Frozen	345
J.R. Simplot Co. Heyburn, ID	Frozen	650
Magic Valley Foods Rupert, ID	Granule	650
Nonpareil Processing Blackfoot, ID	Flake	220
Lamb-Weston, Inc. American Falls, ID	Frozen	650
Ore-Ida Foods, Inc. Burley, ID	Frozen	860
Pro-Idah Foods, Inc. Ririe, ID	Flake	130
Rogers Bros. Company Rexburg, ID	Granule	345
The R.T. French Co. Shelley, ID	Granule	650
Roger Bros. Company Idaho Falls, ID	Flake	175

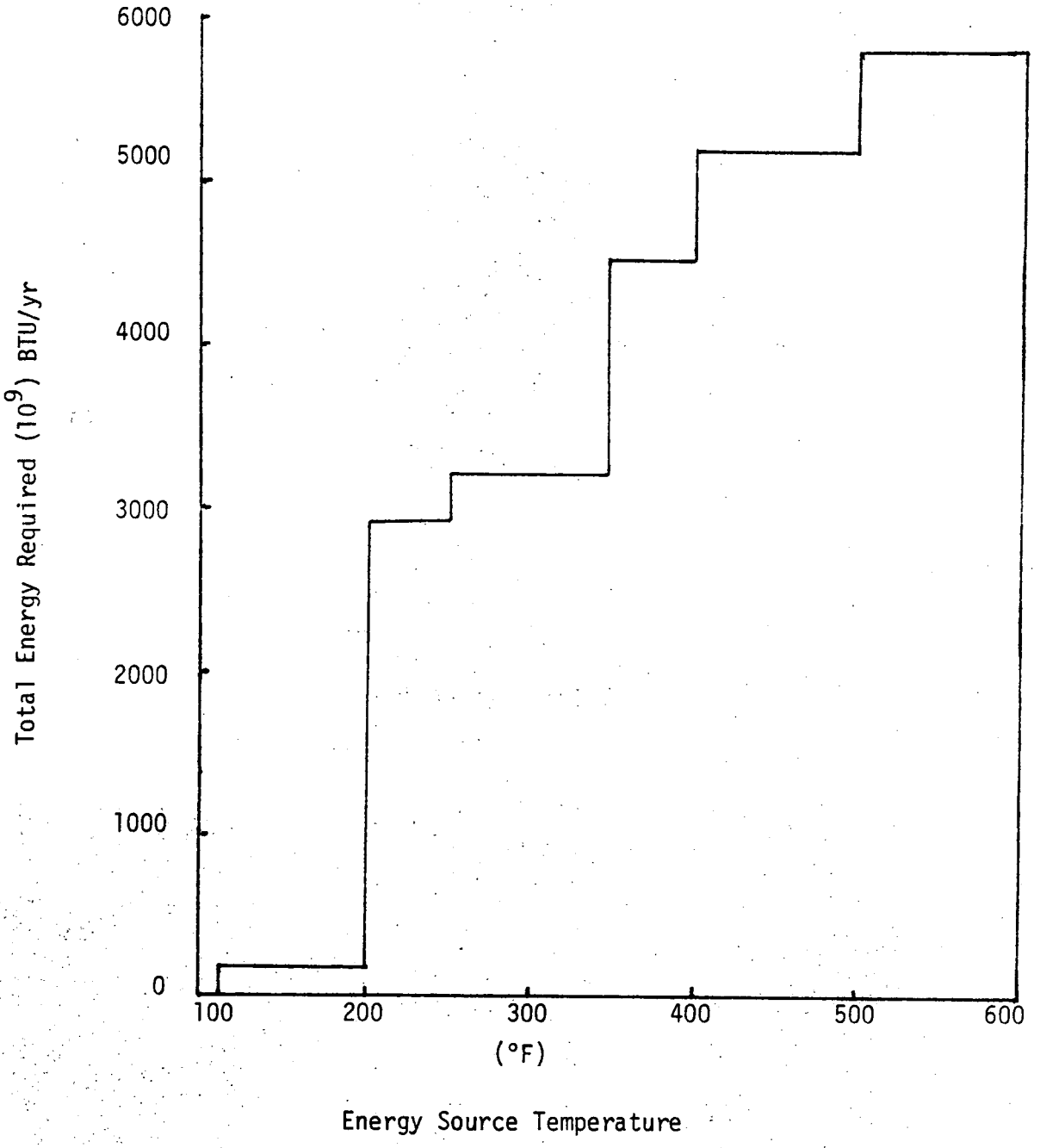
FIGURE 15: POTENTIAL ENERGY SUPPLIED BY GEOTHERMAL



Present Energy Usage. Table 2 lists the total amount of energy required by each plant and this can be used in conjunction with the information about "typical" plants to obtain specific requirements for each plant. Figures 11-13 show the total energy required for each type of processing. These figures also show the amount of energy replaceable by geothermal at a given plant for a known geothermal source temperature.

Figure 16 summarizes the potential use of geothermal energy in the plants listed in Table 2. A geothermal source in the 200°F to 300°F range could supply these plants with over 3000 (10^9) BTU/yr. of energy. This would require a total flow of at least 3000 gallons per minute.

FIGURE 16: TOTAL ENERGY USED FOR THE POTATO PROCESSING INDUSTRY



V. ENERGY EXPLORATION IN SOUTHEAST IDAHO

Known Geothermal Resources Prospects

Thermal springs and wells in Southeast Idaho generally share several characteristics including high total dissolved solids, high HCO_3 content and generally precipitate $CaCO_3$ in the form of travertine (Mitchell, Anderson and Johnson, 1979). This area also is endowed with certain geological characteristics which favor the occurrence of geothermal energy.

Southeastern Idaho is within an earthquake activity area known as the Intermountain Seismic Belt. (Smith and Sbar, 1974). This seismic zone is interpreted to be a boundary between subplates of the greater North American crustal plate, where differential movements between the Rocky Mountain province and the Basin and Range province are taking place (Smith and Sbar, 1972). Subplate boundaries are generally excellent areas for prospecting for geothermal resources. In Idaho, the approximate axis of the belt passes near Preston in Franklin County, through Soda Springs in Caribou County to Driggs in Teton County and up into the Yellowstone Park area (Mitchell, Anderson and Johnson, 1979). This area consists of predominantly block faulted mountain ranges, arranged in a north-south echelon pattern, across a region of low angle thrust faults. The area has characteristically youthful magmatic activity, areas of high heat flow, and thermal spring activity. Thermal springs are widely distributed through this region and wells have encountered thermal water locally. Most springs are associated with known faulting or lineaments. Five potential high temperature prospect areas have been identified and there is significant potential for additional high temperature areas being discovered as more detailed geological data becomes known. Table 3 lists the five known high temperature geothermal prospecting areas in Southeast Idaho. Table 4 lists the geothermal well permits that have been issued in Southeast Idaho by the Idaho Department of Water Resources. A Geothermal Well Permit is a drilling permit which is issued specifically for exploration of high temperature resources.

In addition to the geothermal well permits listed in Table 4, the Federal Department of Energy has drilled several geothermal exploration wells at Raft River K.G.R.A. in Cassia County. These wells have proven a 147°C geothermal resource. A pilot 5 MW electrical generation plant is currently under construction. In addition to electric power generation, this site has potential for direct applications for industrial processing. A DOE geothermal exploration well drilled at the Idaho National Engineering Laboratory in Butte County, although a dry hole, proved high temperatures exist at a depth of 3,000 meters in the Snake River Plain.

TABLE 3

High Temperature Geothermal Prospects in Southeast Idaho

Geothermal Site	County	Location	Land Ownership	Measured Temp* °C	Best Estimate* Subsurface °C	Types of Development Speculated and Notes
Battle Creek H.S.	Franklin	T. 15 S., R. 39 E., Sec. 8	Private	84	250	Electrical Generation (Wet Steam), Industrial Food Processing, Gasahol
Big Creek H.S.	Lemhi	T. 23 N., R. 19 E., Sec. 22	U.S.F.S.	91	175	Electrical Generation (Wet steam), Institutional Restrictions
Blackfoot Reservoir	Caribou	T. 6 S., R. 41 E., Sec. 19	Private, BLM, BIA	42	240	Electrical Generation (Possible), Based on dry oil exploration well
Magic Reservoir	Blaine-Camas	T. 1 S., R. 17 E., Sec. 23	Private, BLM	72	174	Electrical Generation (Binary), Industrial Processing
Raft River	Cassia	T. 15 S., R. 26 E., Sec. 23	BLM	147**	147	Electrical Binary Plant under construction, Gasahol

* Idaho Department of Water Resources, Bulletin 30, 1979.

*** Pump Test Temperatures at the Raft River Geothermal Test Site.

TABLE 4

GEOTHERMAL WELL PERMITS
EAST OF R. 20 E.

Permit Number	Applicant	Well Name	Location
13-GR-1	SUNOCI	CH. STOCKS No. 1	NESW S6 T15S R39E
13-GR-2	John Warrick	No. 1	NESE S7 T14S R39E
27-GR-1	White Water Development Company	Dropped	SWNW S25 T5S R36E
21-GR-1	Occidental Geothermal, Inc.	Strum No. 1	NENE S23 T9N R42E
21-GR-2	Occidental Geothermal, Inc.	Egbert Farms No. 1	SWNW S19 T9N R43E

Leasing Activity

A key factor in the development of geothermal energy for industrial locations in Southeast Idaho is the location of the resource exploration areas with respect to the industrial sites. The Idaho Department of Water Resources has identified several geothermal areas with potential for high temperature resources capable of industrial application. Also, private industry has leased large tracts of state and federal lands throughout Idaho for geothermal exploration and oil and gas exploration. Because oil and gas exploration areas in Southeast Idaho are also good prospects for geothermal resources, exploration for oil and gas must be considered when assessing the regional potential for geothermal energy development. Several oil and gas exploration wells have been drilled in Southeast Idaho and large tracts of state and federal lands have been leased.

Recent oil and gas exploration drilling activity has shown high temperature geothermal potential.

In general, the region is considered to have good potential for moderate to high temperature geothermal resources. High temperature geothermal resources which are capable of industrial processing (147°C) have been proven at Raft River KGRA in Cassia County and deep exploration wells in Butte and Bonneville Counties indicate high temperatures (250°C) exist at depths of 3,000 meters. Geochemical analysis of hot springs in Franklin County indicate resource temperatures of 250°C are possible at depth.

Data regarding the current status of exploration and leasing activity for geothermal, oil and gas, and phosphate resources was compiled to assess the intensity of exploration interest in Southeast Idaho. Exploration drilling activity was also inventoried to gauge the degree of exploration. This information was compiled into tabular and map form be commodity.

Tables 5 and 6 list the current status of geothermal leasing activity on State and Federal lands in Southeast Idaho. Table 7 is a summary of State of Idaho oil and gas leasing by lessee in Southeast Idaho. Table 8 is a summary of Federal oil and gas leasing by lessee in Southeast Idaho. Table 9 is a status registry of oil and gas drilling activity in Southeast Idaho.

This list is derived from the Oil and Gas Drilling Register maintained by the Idaho Department of Lands, and covers drilling East of R. 20 E. only. The information gives the location, principal driller, well name, date of drilling, depth drilled, logs on record, county, and additional remarks on well status.

Leasing and exploration drilling activity in Southeast Idaho has increased intensity in recent years. This surge in exploration activity is largely due to successful oil exploration in Wyoming and Utah.

Continued oil and gas exploration and geothermal exploration in the region could prove a new energy source which could be used by the local industrial market. The majority of the leasing exploration activity is located South of the Snake River Plain where the major industries are phosphate mining and processing. Tables 10 and 11 list the location of the major State and Federal phosphate leases in Southeast Idaho. The future development of these phosphate leases is partially dependent on adequate energy supplies.

The data presented in Tables 3 through 11 has been plotted on a map to illustrate the geographic relationships between current industries and energy exploration in Southeast Idaho. (See map appendix.)

Conclusions

Although Southeast Idaho is considered a good location for geothermal exploration, the potential for high temperature geothermal fluids is unknown.

High temperature geothermal resources capable of electric power generation and direct industrial applications are probable throughout the region but have been commercially developed only at Raft River in Cassia County. Extensive exploration for oil, gas, and geothermal could discover additional high temperature (150^{o}C) resources.

Development of high temperature geothermal fluids for power production will most likely be limited to small generation (5 MW) facilities, similar to the D.O.E. Raft River facility. Development of high temperature fluids (100^{o}C to 150^{o}C) for direct industrial applications will depend upon the resources location. Because these fluids must be used within close proximity to the wellhead, current industries will be limited to exploring locally. The development of new industrial parks at geothermal well sites will be limited by accessability to current transportation facilities.

TABLE 5

STATE GEOTHERMAL LEASES
EAST OF R. 20 E.

State geothermal leasing data was compiled from the index file of State Geothermal Leases maintained by the Idaho Department of Lands. The information is presented by lessee, and gives the lease number, location (resolution of one section), acreage, and county. All 'H' numbered leases were issued in 1975. The remainder have the date of issue as the last two digits of the lease number. This list covered only those leases east of R. 20 E.

ANADARKO PRODUCTION CO.
Box 1330
Houston, TX 77001

Total Acres: 12,612

Lease No.	Location	Sec.	Acres	County
3609-22-79	3S 41E	22	320	Bingham
-24-79		24	400	Bingham
-25-79		25	640	Bingham
-26-79		26	400	Bingham
-27-79		27	430	Bingham
-34-79		34	640	Bingham
-35-79		35	200	Bingham
-36-79		36	640	Bingham
3611-21-79	3S 42E	21	400	Bonneville
-22-79		22	640	Bonneville
-23-79		23	640	Bonneville
-24-79		24	611	Bonneville
-25-79		25	623	Bonneville
-26-79		26	640	Bonneville
-27-79		27	640	Bonneville
-28-79		28	160	Bonneville
-33-79		33	280	Bonneville
-34-79		34	480	Bonneville
-35-79		35	640	Bonneville
-36-79		36	635	Bonneville
3631-03-79	4S 41E	3	543	Bingham
-10-79		10	640	Bingham
-11-79		11	440	Bingham
-12-79		12	240	Bingham
-14-79		14	640	Bingham

KENNETH M. BRITT
Box 810
Jackson, MS 39205

W Subtotal 11,949
E Subtotal 11,563
Total Acres 23,512

Lease No.	Location	Sec.	Acres	County
2983-03-79	4N 40E	3	560	Madison
-11-79		11	360	Madison
-12-79		12	440	Madison
2985-18-79	4N 41E	16	640	Madison
-17-79		17	640	Madison
-18-79		18	521	Madison
-19-79		19	642	Madison
-20-79		20	480	Madison
-21-79		21	640	Madison
4699-36-78	14S 27E	36	640	Cassia
4825-36-78	15S 25E	36	640	Cassia
4829-16-78	15S 27E	16	640	Cassia
-36-78		36	640	Cassia
4909-16-78	16S 26E	16	640	Cassia
4911-16-78	16S 25E	16	640	Cassia
-24-78		24	520	Cassia
-25-78		25	440	Cassia
-26-78		26	640	Cassia
-35-78		35	560	Cassia
-36-78		36	640	Cassia

REUBEN BULLOCK
Box 370
Cody, WY 82414

(E) Sub total 640
(W) Sub total 1578
Total Acres 2218

Lease No.	Location	Sec.	Acres	County
H-473	12 N 42E	16	640	Fremont

CHEVRON U.S.A., INC.
Box 599
Denver, CO 80201

Total Acres: 10,562

Lease No.	Location	Sec.	Acres	County
H-421	3N 40E	1	330	Bonneville
H-422	3N 40E	2	40	Bonneville
H-423	3N 40E	13	240	Bonneville
H-424	3N 40E	14	280	Bonneville

CHEVRON, U.S.A., INC. (Continued)

Lease No.	Location	Sec.	Acres	County
H-425	3N 40E	16	440	Bonneville
H-426	4N 40E	22	38	Madison & Jefferson
H-427	4N 40E	23	92	Madison & Jefferson
H-428	4N 40E	25	92	Madison & Jefferson
H-429	4N 40E	26	184	Madison & Jefferson
H-430	4N 40E	36	198	Madison & Jefferson
H-431	3N 41E	5	94	Bonneville
H-432	3N 41E	6	139	Bonneville
H-433	3N 41E	8	54	Bonneville
H-434	3N 41E	9	22	Bonneville
H-435	3N 41E	16	640	Bonneville
H-436	3N 41E	17	160	Bonneville
H-437	4N 41E	31	56	Madison
H-438	4N 41E	32	6	Madison
H-430	14S 39E	36	40	Franklin
H-440	15S 39E	1	160	Franklin
3626-16-79	4S 42E	16	240	Bonneville
3631-13-79	4S 41E	13	640	Bingham
-24-79	4S 41E	24	641	Bingham
-25-79	4S 41E	25	600	Bingham
-36-79	4S 41E	36	640	Bingham
3817-01-79	5S 41E	1	642	Caribou
3819-06-79	5S 42E	6	644	Caribou
3877-21-79	6S 42E	21	640	Caribou
-28-79	6S 42E	28	640	Caribou
-29-79	6S 42E	29	360	Caribou
-32-79	6S 42E	32	240	Caribou
4025-08-79	7S 41E	8	640	Caribou
4027-20-79	7S 42E	20	640	Caribou

RICHARD C. HOEFLE
Box 611
Billings, Montana 59103

Total Acres: 7040

Lease No.	Location	Sec.	Acres	County
3835-16-79	6S 43E	16	640	Caribou
-20-79	6S 43E	20	640	Caribou
-21-79	6S 43E	21	640	Caribou
-29-79	6S 43E	29	640	Caribou
-32-79	6S 43E	32	640	Caribou
-36-79	6S 43E	36	640	Caribou
4029-16-79	7S 43E	16	640	Caribou
-17-79	7S 43E	17	640	Caribou
-21-79	7S 43E	21	640	Caribou
-28-79	7S 43E	28	640	Caribou
-36-79	7S 43E	36	640	Caribou

OCCIDENTAL GEOTHERMAL, INC.
5000 Stockdale Hwy
Bakersfield, CA 93339

Subtotal (w) 16,453
Subtotal (e) 12,153
Total Acres 28,606

Lease No.	Location	Sec.	Acres	County
H-151	11N 41E	16	640	Fremont
H-153	11N 42E	16	640	Fremont
H-156	12N 42E	36	323	Fremont
H-157	13N 42E	16	440	Fremont
H-158	13N 42E	36	640	Fremont
H-160	12N 43E	36	640	Fremont
H-161	13N 43E	16	640	Fremont
H-163	13N 44E	4	80	Fremont
H-164	13N 44E	9	160	Fremont
H-165	13N 44E	10	320	Fremont
H-166	13N 44E	16	640	Fremont
H-167	13N 44E	19	262	Fremont
H-168	13N 44E	30	320	Fremont
H-169	13N 44E	36	640	Fremont
H-762	11N 41E	36	640	Fremont
H-764	11N 42E	36	640	Fremont
H-767	10N 43E	16	640	Fremont
H-768	10N 43E	36	640	Fremont
H-769	11N 43E	16	640	Fremont
H-770	11N 43E	36	648	Fremont
H-771	12N 43E	16	640	Fremont
H-773	13N 43E	36	640	Fremont
H-774	10N 44E	16	640	Fremont

PHILLIPS PETROLEUM CO.
Box 239
Salt Lake City, Utah 84110

Total Acres: 58,306

Lease No.	Location	Sec.	Acres	County
2189-16-79	11N 33E	16	640	Clark
2189-36-79	11N 33E	36	640	Clark
2191-36-79	11N 32E	36	602	Clark
2347-36-79	10N 32E	36	640	Clark
2349-16-79	10N 33E	16	640	Clark
2351-16-79	10N 34E	16	640	Clark
2401-16-79	9N 34E	16	640	Clark
2403-36-79	9N 33E	36	640	Clark
2983-01-79	4N 40E	1	280	Madison
-02-79	4N 40E	2	320	Madison
-10-79	4N 40E	10	280	Madison
2985-01-79	4N 41E	1	641	Madison
-02-79	4N 41E	2	642	Madison
-09-79	4N 41E	9	400	Madison
-10-79	4N 41E	10	400	Madison

PHILLIPS PETROLEUM CO. (Continued)

Lease No.	Location	Sec.	Acres	County
-11-79	4N 41E	11	640	Madison
-12-79	4N 41E	12	640	Madison
-13-79	4N 41E	13	640	Madison
-14-79	4N 41E	14	640	Madison
-15-79	4N 41E	15	640	Madison
-22-79	4N 41E	22	640	Madison
-23-79	4N 41E	23	640	Madison
-24-79	4N 41E	24	640	Madison
3007-19-79	3N 41E	19	244	Bonneville
-30-79	3N 41E	30	324	Bonneville
-31-79	3N 41E	31	604	Bonneville
-32-79	3N 41E	32	240	Bonneville
3007-36-79	3N 41E	36	320	Bonneville
3009-20-79	3N 40E	20	640	Bonneville
-21-79	3N 40E	21	560	Bonneville
-24-79	3N 40E	24	320	Bonneville
-25-79	3N 40E	25	520	Bonneville
-29-79	3N 40E	29	400	Bonneville
-32-79	3N 40E	32	80	Bonneville
-33-79	3N 40E	33	440	Bonneville
-35-79	3N 40E	35	280	Bonneville
-36-79	3N 40E	36	280	Bonneville
3609-01-79	3S 41E	1	345	Bingham
-02-79	3S 41E	2	689	Bingham
-03-79	3S 41E	3	369	Bingham
-04-79	3S 41E	4	277	Bingham
-05-79	3S 41E	5	265	Bingham
-06-79	3S 41E	6	210	Bingham
-07-79	3S 41E	7	157	Bingham
-08-79	3S 41E	8	160	Bingham
-09-79	3S 41E	9	40	Bingham
-10-79	3S 41E	10	80	Bingham
-11-79	3S 41E	11	80	Bingham
-12-79	3S 41E	12	240	Bingham
-13-79	3S 41E	13	640	Bingham
-14-79	3S 41E	14	40	Bingham
-15-79	3S 41E	15	160	Bingham
-16-79	3S 41E	16	640	Bingham
-17-79	3S 41E	17	640	Bingham

PHILLIPS (cont.)

Lease No.	Location	Sec.	Acres	County
3609-18-79	3S 42E	18	517	Bingham
-19-79	3S 42E	19	40	Bingham
-20-79	3S 42E	20	480	Bingham
-23-79	3S 42E	23	40	Bingham
-28-79	3S 42E	28	640	Bingham
-29-79	3S 42E	29	320	Bingham
-32-79	3S 42E	32	280	Bingham
-33-79	3S 42E	33	640	Bingham
3611-16-79	3S 42E	16	640	Bonneville
3631-01-79	4S 41E	1	71	Bingham
-02-79	4S 41E	2	316	Bingham
-04-79	4S 41E	4	312	Bingham
-05-79	4S 41E	5	80	Bingham
-06-79	4S 41E	6	40	Bingham
-07-79	4S 41E	7	200	Bingham
-08-79	4S 41E	8	280	Bingham
-16-79	4S 41E	16	640	Bingham
-17-79	4S 41E	17	320	Bingham
-18-79	4S 41E	18	401	Bingham
-21-79	4S 41E	21	240	Bingham
-22-79	4S 41E	22	120	Bingham
-23-79	4S 41E	23	320	Bingham
-26-79	4S 41E	26	480	Bingham
3817-02-79	5S 41E	2	642	Caribou
-02-79	5S 41E	3	643	Caribou
-04-79	5S 41E	4	642	Caribou
-12-79	5S 41E	12	640	Caribou
3819-07-79	5S 42E	7	643	Caribou
-08-79	5S 42E	8	640	Caribou
-16-79	5S 42E	16	440	Caribou
-17-79	5S 42E	17	640	Caribou
-18-79	5S 42E	18	642	Caribou
-19-79	5S 42E	19	642	Caribou
-20-79	5S 42E	20	640	Caribou
-36-79	5S 42E	36	640	Caribou
3837-22-79	6S 42E	22	640	Caribou
-23-79	6S 42E	23	640	Caribou
-24-79	6S 42E	24	640	Caribou
-25-79	6S 42E	25	640	Caribou
-26-79	6S 42E	26	640	Caribou
-27-79	6S 42E	27	640	Caribou
-33-79	6S 42E	28	640	Caribou
-35-79	6S 42E	35	640	Caribou
3839-07-79	6S 41E	7	642	Caribou
-09-79	6S 41E	9	640	Caribou
-10-79	6S 41E	10	320	Caribou
-16-79	6S 41E	16	640	Caribou
-19-79	6S 41E	19	642	Caribou
-21-79	6S 41E	21	640	Caribou
-22-79	6S 41E	22	400	Caribou
-29-79	6S 41E	29	640	Caribou
-32-79	6S 41E	32	640	Caribou
4025-06-79	7S 41E	6	423	Caribou
-09-79	7S 41E	9	640	Caribou
4025-16-79	7S 41E	16	640	Caribou

PHILLIPS (cont.)

Lease No.	Location	Sec.	Acres	County
4025-16-79	7S 41E	18	320	Caribou
4027-17-79	7S 42E	17	640	Caribou
-25-79	7S 42E	25	640	Caribou
-26-79	7S 42E	26	320	Caribou
-32-79	7S 42E	32	640	Caribou
-35-79	7S 42E	35	320	Caribou
-36-79	7S 42E	36	560	Caribou
4851-05-79	15S 38E	5	486	Franklin
-08-79	15S 28E	8	640	Franklin
-16-79	15S 28E	16	600	Franklin
-17-79	15S 28E	17	480	Franklin

Subtotal (e)	55,391
Subtotal (w)	2,915
TOTAL ACRES	58,306

RAFT RIVER RURAL ELECTRIC COOPERATIVE, INC. Total Acres: 1280
Box 617
Malta, ID 83342

Lease No.	Location	Sec.	Acres	County
H-754	14S 26E	36	640	Cassia
H0755	15S 26E	16	640	Cassia

SOUTHLAND ROYALTY CO.
1000 Fort Worth Club Tower
Fort Worth, Texas 76102

Lease No.	Location	Sec.	Acres	County
4467-13-79	12S 39E	13	640	Franklin

TOTAL ACRES 2588

LAURA J. SPANGLER
2827 Venus Place
Boise, Idaho 83704

Total Acres: 640

Lease No.	Location	Sec.	Acres	County
2383-16-79	9N 43E	16	400	Fremont
-25-79	9N 43E	25	120	Fremont
-26-79	9N 43E	26	40	Fremont
-36-79	9N 43E	36	80	Fremont

SUNOCO ENERGY DEVELOPMENT CO.
12700 Park Central Place, Suite 1500
Dallas, Texas 75251

Total Acres: 2800

Lease No.	Location	Sec.	Acres	County
H-787	13S 26E	36	640	Cassia
H-789	15S 26E	36	640	Cassia
H-790	14S 27E	16	640	Cassia
H-791	16S 27E	16	640	Cassia
H-792	14S 38E	36	240	Cassia

SUPRON ENERGY CORP.
10300 North Central Expwy.
Building V, Fifth Floor
Dallas, TX 75231

Total Acres: 27,737

Lease No.	Location	Sec.	Acres	County
2157-16-79	12N 44E	16	160	Fremont
3817-09-79	5S 41E	9	640	Caribou
-10-79	5S 41E	10	640	Caribou
-11-79	5S 41E	11	640	Caribou
-13-79	5S 41E	13	640	Caribou
-14-79	5S 41E	14	640	Caribou
-15-79	5S 41E	15	640	Caribou
-16-79	5S 41E	16	400	Caribou
-22-79	5S 41E	22	440	Caribou
-23-79	5S 41E	23	640	Caribou
-24-79	5S 41E	24	640	Caribou
-25-79	5S 41E	25	640	Caribou
-26-79	5S 41E	26	280	Caribou
-29-79	5S 41E	29	80	Caribou
-31-79	5S 41E	31	40	Caribou
-32-79	5S 41E	32	40	Caribou
-33-79	5S 41E	33	40	Caribou
-36-79	5S 41E	36	440	Caribou
3819-29-79	5S 41E	29	640	Caribou
-30-79	5S 41E	30	642	Caribou
-31-79	5S 41E	31	560	Caribou
-32-79	5S 41E	32	640	Caribou
3837-13-79	6S 42E	13	640	Caribou
-14-79	6S 42E	14	640	Caribou
-16-79	6S 42E	16	240	Caribou
-20-79	6S 42E	20	240	Caribou
-34-79	6S 42E	34	640	Caribou
-36-79	6S 42E	36	630	Caribou
3839-03-79	6S 41E	3	280	Caribou
-04-79	6S 41E	4	641	Caribou
-08-79	6S 41E	8	640	Caribou
-15-79	6S 41E	15	440	Caribou
-17-79	6S 41E	17	640	Caribou
-18-79	6S 41E	18	641	Caribou
-20-79	6S 41E	20	640	Caribou
-28-79	6S 41E	28	640	Caribou
-30-79	6S 41E	30	641	Caribou
-31-79	6S 41E	31	640	Caribou
4025-04-79	7S 41E	4	438	Caribou
-05-79	7S 41E	5	441	Caribou
-07-79	7S 41E	7	614	Caribou
4025-17-79	7S 41E	17	640	Caribou
-19-79	7S 41E	19	612	Caribou
-36-79	7S 41E	36	360	Caribou
4027-01-79	7S 42E	1	419	Caribou
-02-79	7S 42E	2	423	Caribou
-03-79	7S 42E	3	425	Caribou
-10-79	7S 42E	10	560	Caribou
-11-79	7S 42E	11	600	Caribou

SUPRON ENERGY CORP (cont.)

Lease No.	Location	Sec.	Acres	County
4027-12-79	7S 42E	12	520	Caribou
-29-79	7S 42E	29	640	Caribou
4463-16-79	12S 41E	16	640	Franklin
4465-16-79	12S 40E	16	400	Franklin
-36-79	12S 40E	36	200	Franklin
4647-16-79	13S 40E	16	160	Franklin
-36-79	13S 40E	36	400	Franklin
4649-16-79	13S 41E	16	200	Franklin

UNION OIL COMPANY OF CALIFORNIA
461 S. Boylston Street
Los Angeles, CA 90017

Total Acres 131,707

LEASE NO.	LOCATION	SECTION	ACRES	COUNTY
2573-12-79	8N 42E	12	160	Fremont
-15-79	8N 42E	15	160	Fremont
-16-79	8N 42E	16	160	Fremont
-18-79	8N 42E	18	139	Fremont
-26-79	8N 42E	26	160	Fremont
-32-79	8N 42E	32	240	Fremont
-33-79	8N 42E	33	480	Fremont
-34-79	8N 42E	34	480	Fremont
-35-79	8N 42E	35	440	Fremont
2573-36-79	8N 42E	36	240	Fremont
2575-18-79	8N 43E	18	158	Fremont
-31-79	8N 43E	31	80	Fremont
-32-79	8N 43E	32	40	Fremont
2589-07-79	7N 43E	7	322	Fremont
-08-79	7N 43E	8	320	Fremont
-17-79	7N 43E	17	520	Fremont
-18-79	7N 43E	18	482	Fremont
2591-02-79	7N 42E	2	563	Fremont
-03-79	7N 42E	3	644	Fremont
-04-79	7N 42E	4	644	Fremont
-05-79	7N 42E	5	400	Fremont
-06-79	7N 42E	6	624	Fremont
-07-79	7N 42E	7	627	Fremont
-08-79	7N 42E	8	640	Fremont
-09-79	7N 42E	9	640	Fremont
-10-79	7N 42E	10	640	Fremont
-11-79	7N 42E	11	640	Fremont
-12-79	7N 42E	12	240	Fremont
-13-79	7N 42E	13	400	Fremont
-14-79	7N 42E	14	440	Fremont & Madison
-15-79	7N 42E	15	480	Fremont & Madison
-16-79	7N 42E	16	600	Fremont
-17-79	7N 42E	17	640	Fremont
-18-79	7N 42E	18	629	Fremont
-19-79	7N 42E	19	471	Fremont & Madison
-20-79	7N 42E	20	520	Fremont & Madison
-21-79	7N 42E	21	340	Fremont & Madison
-22-79	7N 42E	22	409	Fremont & Madison
-23-79	7N 42E	23	247	Fremont & Madison
-24-79	7N 42E	24	480	Fremont & Madison
-25-79	7N 42E	25	217	Madison
-26-79	7N 42E	26	329	Madison
-27-79	7N 42E	27	640	Madison
-28-79	7N 42E	28	640	Madison
-29-79	7N 42E	29	160	Madison
-30-79	7N 42E	30	197	Fremont & Madison
-31-79	7N 42E	31	280	Fremont & Madison
-32-79	7N 42E	32	640	Fremont & Madison

Union Oil Company of California (Continued)

LEASE NO.	LOCATION	SECTION	ACRES	COUNTY
2591-33-79	7N 42E	33	280	Madison
-34-79	7N 42E	34	640	Madison
-35-79	7N 42E	35	453	Madison
-36-79	7N 42E	36	333	Madison
2593-01-79	7N 41E	1	320	Fremont
-10-79	7N 41E	10	80	Fremont
2593-11-79	7N 41E	11	360	Fremont
-12-79	7N 41E	12	640	Fremont
-13-79	7N 41E	13	320	Fremont
-24-79	7N 41E	24	440	Fremont
-25-79	7N 41E	25	160	Fremont
2777-01-79	6N 41E	1	80	Madison
-9-79	6N 41E	9	160	Madison
-10-79	6N 41E	10	160	Madison
-11-79	6N 41E	11	480	Madison
-12-79	6N 41E	12	640	Madison
-13-79	6N 41E	13	640	Madison
-14-79	6N 41E	14	640	Madison
-15-79	6N 41E	15	640	Madison
-16-79	6N 41E	16	480	Madison
-21-79	6N 41E	21	40	Madison
-22-79	6N 41E	22	640	Madison
-23-79	6N 41E	23	640	Madison
-24-79	6N 41E	24	640	Madison
-25-79	6N 41E	25	320	Madison
-27-29	6N 41E	27	320	Madison
-34-79	6N 41E	34	240	Madison
-35-79	6N 41E	35	440	Madison
-36-79	6N 41E	36	640	Madison
2779-01-79	6N 42E	1	272	Madison
-02-79	6N 42E	2	641	Madison
-03-79	6N 42E	3	441	Madison
-04-79	6N 42E	4	401	Madison
-05-79	6N 42E	5	200	Madison
-06-79	6N 42E	6	160	Madison
-07-79	6N 42E	7	560	Madison
-08-79	6N 42E	8	640	Madison
-09-79	6N 42E	9	320	Madison
-10-79	6N 42E	10	160	Madison
-11-79	6N 42E	11	320	Madison
-12-79	6N 42E	12	360	Madison
-13-79	6N 42E	13	40	Madison
-14-79	6N 42E	14	40	Madison
-16-79	6N 42E	16	600	Madison
-17-79	6N 42E	17	640	Madison
-18-79	6N 42E	18	639	Madison
-19-79	6N 42E	19	520	Madison
-20-79	6N 42E	20	160	Madison
-21-79	6N 42E	21	160	Madison
-22-79	6N 42E	22	480	Madison

Union Oil Company of California (Continued)

LEASE NO.	LOCATION	SECTION	ACRES	COUNTY
2779-23-79	6N 42E	23	320	Madison
-24-79	6N 42E	24	440	Madison
-25-79	6N 42E	25	640	Madison
-26-79	6N 42E	26	640	Madison
-27-79	6N 42E	27	640	Madison
-28-79	6N 42E	28	640	Madison
-29-79	6N 42E	29	640	Madison
-30-79	6N 42E	30	640	Madison
-31-79	6N 42E	31	640	Madison
-32-79	6N 42E	32	640	Madison
-33-79	6N 42E	33	640	Madison
-34-79	6N 42E	34	640	Madison
-35-79	6N 42E	35	640	Madison
-36-79	6N 42E	36	640	Madison
2797-01-79	5N 42E	1	462	Madison
-02-79	5N 42E	2	503	Madison
-03-79	5N 42E	3	505	Madison
-04-79	5N 42E	4	508	Madison
-05-79	5N 42E	5	512	Madison
-06-79	5N 42E	6	493	Madison
-07-79	5N 42E	7	620	Madison
-08-79	5N 42E	8	640	Madison
-09-79	5N 42E	9	640	Madison
-10-79	5N 42E	10	640	Madison
-11-79	5N 42E	11	480	Madison
-12-79	5N 42E	12	360	Madison
-13-79	5N 42E	13	600	Madison
-14-79	5N 42E	14	520	Madison
-15-79	5N 42E	15	640	Madison
-16-79	5N-42E	16	640	Madison
-17-79	5N 42E	17	640	Madison
-18-79	5N 42E	18	551	Madison
-19-79	5N 42E	19	615	Madison
-20-79	5N 42E	20	640	Madison
-21-79	5N 42E	21	640	Madison
-22-79	5N 42E	22	640	Madison
-23-79	5N 42E	23	600	Madison
-24-79	5N 42E	24	640	Madison
-26-79	5N 42E	26	600	Madison
-27-79	5N 42E	27	520	Madison
-28-79	5N 42E	28	640	Madison
-29-79	5N 42E	29	640	Madison
-30-79	5N 42E	30	614	Madison
-31-79	5N 42E	31	618	Madison
-32-79	5N 42E	32	640	Madison
-33-79	5N 42E	33	640	Madison
-34-79	5N 42E	34	600	Madison
2799-01-79	5N 41E	1	533	Madison
-02-79	5N 41E	2	375	Madison
-05-79	5N 41E	5	184	Madison
-06-79	5N 41E	6	343	Madison
-07-79	5N 41E	7	638	Madison

Union Oil Company of California (Continued)

LEASE NO.	LOCATION	SECTION	ACRES	COUNTY
2799-08-79	5N 41E	8	120	Madison
-10-79	5N 41E	10	320	Madison
-11-79	5N 41E	11	640	Madison
-12-79	5N 41E	12	640	Madison
-13-79	5N 41E	13	640	Madison
-14-79	5N 41E	14	640	Madison
-15-79	5N 41E	15	640	Madison
-16-79	5N 41E	16	280	Madison
-17-79	5N 41E	17	160	Madison
-18-79	5N 41E	18	558	Madison
-19-79	5N 41E	19	240	Madison
-21-79	5N 41E	21	560	Madison
-22-79	5N 41E	22	640	Madison
-23-79	5N 41E	23	640	Madison
-24-79	5N 41E	24	640	Madison
-25-79	5N 41E	25	640	Madison
-26-79	5N 41E	26	240	Madison
-27-79	5N 41E	27	640	Madison
-28-79	5N 41E	28	640	Madison
-33-79	5N 41E	33	280	Madison
-34-79	5N 41E	34	640	Madison
-35-79	5N 41E	35	640	Madison
-36-79	5N 41E	36	640	Madison
3219-14-79	1N 39E	14	80	Bonneville
-16-79	1N 39E	16	560	Madison
-24-79	1N 39E	24	40	Madison
-36-79	1N 39E	36	640	Bonneville
3221-36-79	1N 38E	36	640	Bonneville
3397-16-79	1S 39E	16	320	Bingham
3401-16-79	1S 41E	16	640	Bonneville
-25-79	1S 41E	25	640	Bonneville
-34-79	1S 41E	34	320	Bonneville
-35-79	1S 41E	35	640	Bonneville
-36-79	1S 41E	36	640	Bonneville
3421-03-79	2S 42E	3	639	Bonneville
-04-79	2S 42E	4	638	Bonneville
-05-79	2S 42E	5	639	Bonneville
-06-79	2S 42E	6	629	Bonneville
-07-79	2S 42E	7	631	Bonneville
-08-79	2S 42E	8	640	Bonneville
-09-79	2S 42E	9	640	Bonneville
-10-79	2S 42E	10	643	Bonneville
-11-79	2S 42E	11	640	Bonneville
-14-79	2S 42E	14	650	Bonneville
-15-79	2S 42E	15	651	Bonneville
-16-79	2S 42E	16	640	Bonneville
-17-79	2S 42E	17	640	Bonneville
-18-79	2S 42E	18	632	Bonneville
-19-79	2S 42E	19	514	Bonneville
-20-79	2S 42E	20	600	Bonneville

Union Oil Company of California (Continued)

LEASE NO.	LOCATION	SECTION	ACRES	COUNTY
3421-21-79	2S 42E	21	600	Bonneville
-22-79	2S 42E	22	640	Bonneville
-23-79	2S 42E	23	640	Bonneville
-24-79	2S 42E	24	640	Bonneville
-25-79	2S 42E	25	640	Bonneville
-26-79	2S 42E	26	560	Bonneville
-27-79	2S 42E	27	400	Bonneville
-28-79	2S 42E	28	200	Bonneville
-29-79	2S 42E	29	320	Bonneville
-30-79	2S 42E	30	631	Bonneville
-31-79	2S 42E	31	592	Bonneville
-32-79	2S 42E	32	480	Bonneville
-33-79	2S 42E	33	560	Bonneville
-34-79	2S 42E	34	600	Bonneville
-35-79	2S 42E	35	520	Bonneville
-36-79	2S 42E	36	640	Bonneville
3423-01-79	2S 41E	1	665	Bingham
-02-79	2S 41E	2	346	Bingham
-03-79	2S 41E	3	454	Bingham
-04-79	2S 41E	4	349	Bingham
-05-79	2S 41E	5	48	Bingham
-08-79	2S 41E	8	120	Bingham
-09-79	2S 41E	9	360	Bingham
-11-79	2S 41E	11	640	Bingham
-12-79	2S 41E	12	604	Bingham
-13-79	2S 41E	13	322	Bingham
-15-79	2S 41E	15	120	Bingham
-16-79	2S 41E	16	640	Bingham
-17-79	2S 41E	17	200	Bingham
-19-79	2S 41E	19	440	Bingham
-20-79	2S 41E	20	200	Bingham
-21-79	2S 41E	21	280	Bingham
-22-79	2S 41E	22	160	Bingham
-23-79	2S 41E	23	80	Bingham
-24-79	2S 41E	24	405	Bingham
-25-79	2S 41E	25	80	Bingham
-26-79	2S 41E	26	320	Bingham
-27-79	2S 41E	27	360	Bingham
-28-79	2S 41E	28	320	Bingham
-29-79	2S 41E	29	640	Bingham
-30-79	2S 41E	30	27	Bingham
-32-79	2S 41E	32	120	Bingham
-33-79	2S 41E	33	400	Bingham
-34-79	2S 41E	34	520	Bingham
-35-79	2S 41E	35	120	Bingham
-36-79	2S 41E	36	644	Bingham
4675-16-79	14S 39E	16	640	Franklin
4677-10-79	14S 38E	10	205	Franklin
-15-79	14S 38E	15	120	Franklin

TABLE 6
FEDERAL GEOTHERMAL LEASES
EAST OF R. 20 E.

Federal Geothermal leases information comes from the Serial Register Pages of Geothermal leasing in Idaho, as maintained by the BLM. The information is presented by lessee, and gives the lease number, date of issue, the location (resolution of one section), acreage and county. This list covers leases east of R. 20 E. only.

L.H. Armour, Jr.
Room 1940, 135 So. LaSalle St.
Chicago, Illinois 60603

Total Acres:
1480.0

LEASE NO.	DATE ISSUED	LOCATION	ACREAGE	COUNTY
I-7673	9-1-76	T5S R27E Sec. 15,20,27	1480	Cassia

Delta Funds, Inc.
1401 Walnut Street
Philadelphia, PA 19102

Total Acres:
5762.0

LEASE NO.	DATE ISSUED	LOCATION	ACREAGE	COUNTY
I-9513	10-1-76 Lease Term. 10-1-78	T15S R27E Sec. 12,24,34	1520	Cassia
I-9514	10-1-76 Lease Term. 10-1-78	T14S R27E Sec. 10,11,15	1920	Cassia
I-9515	10-1-76 Lease Term. 10-1-78	T16S R27E Sec. 19,22,28 29,30	1360.66	Cassia
I-9516	10-1-76 Lease Term. 10-1-78	T16S R26E Sec. 24,30	961.25	Cassia

Pacific Energy Corporation
P.O. Box 1287
Ratchez, MS 39120

Total Acres:
2,560

LEASE NO.	DATE ISSUED	LOCATION	ACREAGE	COUNTY
I-7620	1-1-76	T2S, R44E, Sec. 13,24,25,36	2,560.0	Bonneville

Phillips Petroleum Company
Geothermal Operations
P.O. Box 239
Salt Lake City, UT 84110

Total Acres: 20,366.6
Less Termination 3,080.9
Net Acres 17,285.7

LEASE NO.	DATE ISSUED	LOCATION	ACREAGE	COUNTY
I-7792	7-1-78	T14S, R26E, Sec. 1,2,11	1,600.68	Cassia

Raft River Rural Electric Cooperative, Inc.
Box 617
Malta, ID 83342

Total Acres: 1883.1

LEASE NO.	DATE ISSUED	LOCATION	ACREAGE	COUNTY
I-14166(a)	4-1-78 KGRA	T15S, R26E, Sec. 14,15,21,28, 29,32	1,883.1	Cassia

(a) Competition Bid Lease Sale - KGRA - Raft River

Sunoco Energy Development Co.
12700 Park Central Place
Suite 1500
Dallas, Texas 75251

Total Acres:

LEASE NO.	DATE ISSUED	LOCATION	ACREAGE	COUNTY
I-7617	7-1-75	T14S, R27E, Sec. 25	640	Cassia
I-7633	12-1-76	T14S, R26E, Sec. 31,32 T15S, R26E, Sec. 5	1,777.55	Cassia
I-7634	2-1-78	T15S, R26E, Sec. 20,21,29	1,441.93	Cassia
I-7660	12-1-76	T16S, R26E, Sec. 8,9,17,20	1,680	Cassia
I-7702	8-1-75	T14S, R27E, Sec. 21,28	800	Cassia
I-7710	10-1-77	T16S, R26E, Sec. 3,10,15	1,713.74	Cassia
I-7720	5-1-76	T13S, R26E, Sec. 25	240	Cassia

Sunoco Energy Development Co. (Continued)

LEASE NO.	DATE ISSUED	LOCATION	ACREAGE	COUNTY
I-7781	7-1-75 Lease Term. 7-1-79	T13S, R27E, Sec. 25,26,35	1,920	Cassia
I-7802	7-1-75 Lease Term. 7-1-79	T14S, R27E, Sec. 26,35	1,280	Cassia
I-7844	7-1-75 Lease Term. 7-1-79	T15S, R27E Sec. 35 T16S, R27E,, Sec. 1,2,11	1,501.72	Cassia
I-9376	9-1-76	T16S, R27E, Sec. 5,6,7,8,18	1,708.8	Cassia
I-9377	9-1-76	T16S, R28E, Sec. 5,7	481.29	Cassia

E.J. Wilson & Sons
Lidy Hot Springs
Star Route
Dubois, ID 83423

Total Acres:
1,246.4

LEASE NO.	DATE ISSUED	LOCATION	ACREAGE	COUNTY
I-7949	10-1-77	T9N, R33E, Sec. 2 T10N, R33E, Sec. 35	1,246.44	Clark

TABLE 7

STATE OIL AND GAS LEASE ACREAGE BY LESSEE
East of R. 20 E.

This information is a summation of lease acreage by lessee, from the index file of State Oil and Gas Leases as maintained by the Idaho Department of Lands (specific location information is available from the Idaho Department of Lands and the Idaho Office of Energy). This list only covers leases east of R. 20 E.

Lessee	100% Ownership Lease Acreage	Joint Ownership Leases Percentage	Joint Ownership Leases Lease Acreage
A A Minerals	360		
Allied Chemical	320	75%	3,186.83
American Quasar Petroleum of New Mexico	4,676	50% 37.5%	44,851.39 27,883.72
Amoco Production Co.	30,963.04		
Donald B. Anderson	14,576		
Ida Lee Anderson	14,366		
The Anschutz Co.		50%	65,051
Arkla Exploration Co.		50%	8,511.68
Chevron USA, Inc.	1,227.06		
Cities Service Co.	55,159	75%	2,306
Conoco	39,220.55		
Croff Oil Co.	20,193		
Crown Central Petroleum		25%	42,357
Raymond T. Duncan	2,931		
Vincent J. Duncan	40		
Energy Reserves Group, Inc.		25%	320
Enserch Exploration, Inc.		25%	320
Filon Exploration Corp.		50%	320

Lessee	100% Ownership Lease Acreage	Joint Ownership Leases	
		Percentage	Lease Acreage
Martin Freedman and Robert Haynie	2,483		
General American Oil Co. of Texas	640		
W.A. Gillespie		50%	31,443
W.R. Grace		50%	4,126.51
Gulf Oil Corp.	103,397	50% 37.5%	40,724.88 27,883.72
Hamilton Bros. Oil		50%	5,304.2
Joanna D. Hoefle	3,430		
Richard C. Hoefle	2,246	54.1%	1,320
Hunt Energy Corp.	103,640.36		
Hunt Petroleum Co.	34,783		
IGC Production	1,841.5	25%	3,506.83
Impel Corp.	14,880		
Lewis H. Larson	2,560		
Louisiana Land	23,047.25		
Burt G. Lowe	130		
William S. Marshall		5%	5,374
Marshall and Winston		40%	5,040
Martin Oil Service, Inc.	320		
May Petroleum	40		
Len Mayer	14,712		
Mobil Oil Corp.	8,640		
Narmco		50%	22,694
National Refinery Cooperative Association		25%	42,357
Natural Resources	26,655	50%	31,443

Lessee	100% Ownership Lease Acreage	Joint Ownership Leases	
		Percentage	Lease Acreage
Frank J. Novosel	2,413		
Odessa Natural Corp.	5,395	50%	4,802
Pacific Transmission Supply Company		50%	5,304.2
Patrick Petroleum Corp. of Michigan		50%	8,511.68
Phillips Petroleum	43,922.41		
Reading & Bates Petroleum Company	26,751		
Reserve Oil, Inc.	15,808		
Dean R. Rogers	640		
Norma Rose	40		
Sanchez-O'Brien Petroleum Group	1,080		
Shell Oil Co.	61,191		
Robert Smith	4,218		
Sohio Petroleum	5,826	50% 25%	4,802 920
Howell Spear	5,826		
William A. Stevenson	12,560		
Sumatra Oil Co.		45.9%	1,320
Sun Oil Co.	3,840	50% 37.5% 12.5%	620 320 27,883.72
Supron Energy Corp.	1,879	50% 37.5% 12.5%	620 320 27,883.72
David A. Swenson	21,138		
Tucker & Snyder Exploration		20%	5,040
Union Oil of California	4,600		

Lessee	100% Ownership Lease Acreage	Joint Ownership Leases	
		Percentage	Lease Acreage
Webb Resources	84,173	75%	920
Western Reserves Oil	9,310	40%	10,418
Clayton W. Williams, Jr.	6,222		
Win-Mar Development		5%	5,374
James K. Wollard	25		
Delores Yates	1,700		
Total State Lease Acres East of R. 20 E.	1,048,558.05		

TABLE 8

FEDERAL OIL & GAS LEASE ACREAGE BY LESSEE
EAST OF R. 20 E.

Federal oil and gas lease information comes from the Serial Register Pages of Oil and Gas Leases in Idaho maintained by the BLM. This list is a summation of total acreage under lease by lessee in that portion of Idaho east of R. 20 E. (Information as to specific locations of an individual lease is available from the BLM and the Idaho Office of Energy).

Lessee	Total Acreage
Adobe Oil & Gas Corp.	3,284.42
Amoco Production Co.	72,398.68
American Petrofino Co.	48,251.18
American Quasar Petroleum of New Mexico	6,800.82
American Quasar Petroleum of New Mexico et al	53,662.58
Anderson, Donald B. Ltd. et al	215,357.37
Andregg, Kathy	4,210.53
Anschutz Corp. et al	23,796.49
Bloom, J.W.	2,103.04
Campbell, Graham S.	13,918.6
Chevron USA, Inc.	21,940.23
Cities Service Co.	64,512.16
Continental Oil Co.	32,290.15
Crest Resources, Inc.	1,928.98
Croff Oil Co.	8,453.34
David, Robert W.	1,007
Dever, Dolores A.	525.8
Double Eagle Petroleum & Mining Co.	80
Duncan, Vincent J.	160

Table 8 Continued

Lessee	Total Acreage
Edwards, Carolyn S.	5,127
Edwards, Stanley M.	24,571.9
Elf Aquitaine, Inc.	8,479.80
General American Oil Co.	21,590.64
Grace Petroleum Corp. et al	44,680.02
Gulf Oil Corp. et al	65,664.54
Hamilton Brothers Oil Co. et al	8,921.35
Hartley, Esdras	1,788.91
Haun, W.G.	2,560
Hoefle, R.C.	89,934.13
Hoefle, R.C. et al	142,364.87
Hunt Energy Corp.	15,357.88
Hunt Nelson Bunker Trust Estate et al	50,408.38
IGC Production	3,230.86
Impel Energy Corp. et al	15,730.01
Intermountain Gas Co.	3,260.14
Larson, Lewis H.	37,330.5
Lasrich, Beverley	200
Louisiana Land & Exploration Co.	182,879.95
Maddox, Bill J.	6,383.05
Maddox, Ruth	3,434.12
Maddox, Verba	1,737.6
Madrid, Louis S.	680
Marshall & Winston, Inc. et al	6,823.00

Table 8 Continued

Lessee	Total Acreage
Martin Exploration Management Corp.	2,475.4
Mayer, Len	29,420.13
Mayer, Len et al	51,408.05
May Petroleum Co.	12,155
Meinhart, Arthur E.	1,930
Mitchell Energy Corp.	240
Mobile Oil	144,759.98
Moore, W.V.	1,280
Mountain Fuel Supply Co.	3.75
Natural Resources Corp.	79,997.68
Natural Resources Corp. et al	21,543.87
Notestine, Tom	40
Novosel, Patricia Y.	2,520
Odessa Natural Corp.	158,134.23
Pacific Transmission Supply Co. et al	50,226.37
Patrick Petroleum Corp. et al	123,622.05
Phillips Petroleum Co.	119,670.11
Potts, Martha L.	4,318.99
Potts, Neal H.	640
Reading & Bates Petroleum Co.	16,141.6
Richey, Mark W.	2,483
Rogers, Dean R. Jr.	11,495.47
Sanchez O'Brian Petroleum Group	22,794.98
Scott, Charles W.	2,300
Shell Oil Co.	237,783.55

Table 8 Continued

Lessee	Total Acreage
Slane, Floyd E.	640
Smith, Robert W.	5,494.48
Smith, Robert W. et al	2,372.46
Sohio Natural Resources Co.	26.5
Spangler, Laura J.	7,358.32
Spear, Howell	7,897.24
Stevenson, William A.	3,814.96
Stoltz, Wagner, & Brown et al	125,141.87
Sun Oil Co. et al	159,410.21
Supron Enrgy Corp.	14,985.35
Supron Energy Corp. et al	33,059.06
Taft, Milford	9,181.9
Texas Pacific Oil Co., Inc.	76,993.0
Tiperary Oil & Gas Co.	1,899.25
Toltec Drilling Co.	54,725.94
Transocean Oil, Inc.	119,124.81
Trujillo, Rosita	6,558.2
Tucker & Snyder Exploration, Inc.	370
Webb Resources, Inc.	51,251.13
Webb Resources, Inc. et al	41,501.17
Western Reserves Oil Co.	2,499.37
Wilson, Earl R. et al	7,454.22
Wolter, George P., Jr.	799.59

TABLE 9

OIL AND GAS EXPLORATION WELLS IN EASTERN IDAHO
(EAST OF R.20E., B.M.)

TOWNSHIP	SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T14N R36E	32	Mondia Oil Co. Fred G. Ostland	Rose #1	1926	1385	No		Abandoned.
T6N R31E	27	U.S.G.S.			774		Butte	USGS; dry water.
T6N R44E	35	Fremont Oil Co.		1903	660	No	Teton	Abandoned.
T5N R44E	26	Am. Quasar Petro. of N.M.	Cook 26-1	10-77 to 2-78	6565	P & A: DL, BHC-sonic, CFD, FDC.CNL, DIL-SFL-E,TL, HRT	Teton	Plugged and abandoned.
T5N R44E	26	Am. Quasar Petro of N.M.	State 26-1				Teton	Permit 3-14-78; not drilled.
T5N R44E	28	Teton Valley L & L Co.	#1	1926	1300	No	Teton	Abandoned.
T5N R44E	28	Teton Valley L & L Co.	Bevan	1926	1392	No	Teton	Abandoned.
T5N R44E	28	Phillips Petrol. Co.	Horshoe #1	9-51 to 3-53	12720	Lithologic	Teton	
T5N R44E	28	Sun Production Co. 2525 N.W. Expwy. Oklahoma City, OK	1-28				Teton	Permit 4-17-78; not drilled.

TOWNSHIP	SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T5N R44E	32	Teton Valley L & L Co.		1929	100	No	Teton	Abandoned.
T5N R44E	33	Grand Teton Oil Standard Exploration		1931	3340	No	Teton	Abandoned.
T5N R44E	33	Supron Energy Corp. Bldg. V 5th Fl. 10300 N. Central Expwy. Dallas, TX 75231	Bevans #1				Teton	Spudded appx. 8-7-79.
T5N R44E	34	Sun Production Co. 2525 N.W. Expwy. Oklahoma City, OK	1-34 IGC	6-78 to 7-78	3715	DIL, BHC-Sonic, CNL-FDC, daily program	Teton	
T5N R45E	9	Cities Service Oil Co.	A#1	9-73 to 1-74	8402	BHL-GR DIL CNL-GR FDC	Teton	Plugged.
T4N R31E	16				475		Butte	USGS; dry water.
T4N R38E	24	Idaho Oil & Mines Corp.	Bullock & Sorenson	1953	455	Yes	Jefferson	Abandoned.

TOWNSHIP		SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T3N	R29E	14				547		Butte	USGS; dry water.
T3N	R30E	12				499		Butte	USGS; dry water.
T3N	R32E	29				698		Butte	USGS; dry water.
T3N	R41E	33	California Company	Sorensen #1	1928-1930	3774	Yes	Bonneville	Abandoned; showing of asphaltic material reported, not confirmed by log.
T2N	R31E	35		Arco I		635	Well log	Bingham	USGS water.
T1N	R44E	24	Edwin Allday	#1	9-65 to 2-66	5760	Mud, daily rpt., electric, DST's	Bonneville	Abandoned.
T1S	R39E	8	Union Oil Co. of California Box 2620 Casper, WY 82602	Hoff 1-8M	5-79 to 9-79	8936	No	Bingham	
T2S	R41E	2	Am. Quasar Petro of N.M. 330 Pacific Western Bldg. Casper, WY 82601	King 2-1	2-78 to 8-78	13555	P&A, FDC-CNL-GR; BHC-GR; DIL-SFL; 1-ESS DLT-GR; Cyberlook; Daily log; Geo Rot; Geolog; 9 DST's	Bingham	Plugged and abandoned.

TOWNSHIP	SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T2S R44E	23	Sun-Sinclair (Sun Oil Co.)	Big Elk Mtn. #1	2-49 to 10-50	5597	Yes	Bonneville	Abandoned; dry hole partly drilled, partly cored, lost mud.
T2S R44E	24	Pan American	T. J. Weber	9-63 to 10-64	9717	Yes	Bonneville	Abandoned.
T3S R45E	36	Am. Quasar Petro of N.M.	#1	8-76 to 2-77	14330	DLL, DIL; BHC-GR, DST (4) H_2O Analysis Cement	Bonneville	Plugged and abandoned.
T4S R42E	9	Continental Oil Co. 152 N. Durbin Casper, WY 82601	Gentle Valley #1	9-78 to 12-78	9913	Yes*	Bonneville	*Cyberlook (3), DLL-RXO, DIL (3 FDC/CNL (3), BH GR (4), HDT (4) HRT (3), CDR (2 Cement (1).
T7S R44E	32	Standard Oil of California	Dry Valley	7-52 to 11-52	7868	Hydrocarbon	Caribou	Abandoned.
T7S R46E	34	Wallace Wyoming & Great Western Oil Co.	#1	1926	2448	Hydrocarbon	Caribou	Much salt probably jurassic.
T9S R30E	35	Rockland Valley Oil		1926	1550	No	Power	Abandoned.
T9S R42E	27		Frazier #1 Ira Ellis	1956	3540	No	Caribou	See AAPG Symposium Vol. I-memoir 15 p. 526-7 O & G shows.

TOWNSHIP	SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T10S R33E	35	States Oil Co.	#1	7-69	3680	Yes	Power	Plugged.
T10S R36E	14	Cache Gas & Oil Co.	Ashlette #1	9-58 to 10-58	3003	Hydrocarbon	Bannock	Abandoned.
T10S R37E	19	Norton Oil & Gas	#1	1927	1349	Hydrocarbon	Bannock	Minor gas and oil show.
T10S R37E	19	Norton Oil & Gas	#2		2700	Hydrocarbon	Bannock	Minor gas and oil show.
T10S R43E	13	Union Texas Petroleum 1010 Lincoln Tower Denver, CO 80295	Big Canyon Federal 1-13	9-12-78 to 3-4-79	11734	Yes*	Bear Lake	DIL; FDC/CNL/GR; cyberlook; BHC/GR; GR-Casing Collar; DLL; Log Analysis; hydrocarbon.
T10S R43E	21	Eastern Idaho Development	State	5-56 to 8-56	3900	Hydrocarbon	Bear Lake	Abandoned; dry hole.
T10S R46E	8	May Petroleum Inc. c/o McIlroy-Adams Co. Rm. 103 152 N. Durbin Casper, WY 82601	Federal #1-8	9-77 to 9-78	16750	P&A; BHC-GR; DIL/SFL; HRT; CAL; FDC/CNL; cyberlook; geologic rpt; mud log	Caribou	Plugged and abandoned.

TOWNSHIP	SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T10S R46E	20	May Petroleum Inc. One Energy Sq. 4925 Greenville Dallas, TX 75206	Elk Valley #1	7-76 to 8-76	3919	Sonic log-gamma ray Laterolog, micro laterolog, induction-elect. Lithologic log, geologists rpt., temperature log, hydrocarbon, mud log	Caribou	
T10S R46E	28	Amerada Petroleum	Amerada T1-W1	8-63 to 10-63	4115	Gamma ray-neutron Cont dip meter Sonic log-gamma ray Latero log hydrocarbon	Caribou	Abandoned.
T11S R33E	2	Gem State Petroleum	#1	1926	3855	Yes	Power	Abandoned.
T11S R37E	35	Nuday Exploration 420 S. State Preston, ID 83263	Bannock 3A35	*			Bannock	*Permit 6-7-78, not drilled.
T12S R25E	17	Marsh Basin Oil & Gas		1926	600	Yes	Cassia	Abandoned.

TOWNSHIP	SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T12S R37E	1	Nuday Exploration 420 S. State Preston, ID 83263	Bannock 2A1	*			Bannock	*Permit 6-7-78, not drilled.
T12S R38E	8	Nuday Exploration 420 S. State Preston, ID 83263	Bannock 1A8	8-78 to 9-78	1840	DIFL BHC Acoustic Densilog	Bannock	
T12S R43E	3	Ladd Petroleum 830 Den. Club Bldg. Denver, CO 80202	Bennington #3-24		Pro. 13500		Bear Lake	App 7-13-79.
T12S R46E	30	Rocky Mtn. Oil Co.	Government	8-53 to 12-54	5013	Hydrocarbon	Bear Lake	Abandoned, dry hole.
T13S R44E	22	Am. Quasar Petroleum 707 United Bank Tower 1200 Broadway Denver, CO 80290	Jensen 22-1	9-77 to 1-78	11780	BHC Sonic comp Neutron FD dual laterolog, TL mud log, survey, 16 DST's, Shale dens	Bear Lake	Plugged and abandoned.

TOWNSHIP	SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T13S R46E	29	Cities Service Co. 1600 Broadway Suite 900 Denver, CO 80202	Williams-Rigby "A" #1		Pro. 9800		Bear Lake	App. 9-26-79.
T14S R26E	1	Al Griffith Std. American	Griffith-White #1	9-73 to 12-73	7000 (8000)	No	Cassia	Abandoned, tapped hot water.
T14S R30E	10	Phillips Petro. Utah Southern	Juniper #1	2-50 to 2-51	12844	Yes		Abandoned.
T14S R44E	31	J. Holme Danford Gen. Delivery Bloomington, ID 83223	99 x 101	8-76 to 9-76	805	DIFL, GR BHC ALC	Bear Lake	Completion shut-in.
T15S R21E	25	West Pearl Oil & Gas		1926	2823	No	Cassia	Abandoned, artesian water reported.
T15S R22E	30	Goose Creek Oil & Gas		1926	1400	No	Cassia	Abandoned.
T15S R27E	31	Al Griffith Simplot		1974	4000	No	Cassia	Abandoned.
T15S R38E	36	Willet Flying Service	Idaho Willet #1	9-66 to 10-66	4470	Hydrocarbon	Franklin	To be used as water well.

TOWNSHIP	SEC.	COMPANY	WELL NAME	DATE	DEPTH	LOGS	COUNTY	REMARKS
T15S R43E	1	J. Holme Danford Gen. Delivery Bloomington, ID 83223	99 x 104	2-77 to 6-77	809	Mud log	Bear Lake	Completion shut-in.
T15S R45E	34	Standard of California	Sheep Creek #1	5-52 to 12-52	6768	Hydrocarbon	Bear Lake	Abandoned, dry hole.
T16S R24E	26	Cougar Mining Co.	Spencer	1926	500	No	Cassia	Abandoned.
T16S R27E	9	Al Griffith Simplot	#1	6-74 to 7-74	4100	Yes	Cassia	Abandoned.
T16S R28E	20	Al Griffith	#1	9-73 to 10-73	6981	Yes	Cassia	Plugged.
T16S R38E	15	Utah-Idaho Exploration Co.	August Jensen #1	1956	5233	Gamma Ray-Neutron Microlaterolog *	Franklin	*Available from Rocky Mtn. Well Log Service, Denver, CO.
T16S R46E	10	Am. Quasar Petroleum 707 United Bank Tower 1200 Broadway Denver, CO 80290	Grace Federal 10-1	2-78 to 8-78	11860	P&A; FDC-CNL; BHC-GR; DLL; HRT	Bear Lake	Plugged and abandoned.

TABLE 10

IDAHO STATE PHOSPHATE LEASES
EAST R. 20 E.

This information comes from the index file of Phosphate Leases in Idaho, as maintained by the Idaho Department of Lands. The information is presented by lessee, gives the lease number, date of issue, location (resolution to one section), the acreage, and county.

Alumet Co.; P.O. Box 630; Golden CO 80401 — Total Acres: 600

Lease No.	Date	Location	Section	Acres	County
3914-R	10-4-64	8S 44E	31	160	Caribou
5594	3-20-74	8S 43E	24	160	Caribou
5596	3-20-74	8S 44E	30, 31	280	Caribou

Earth Sciences, Inc.; Hwy 93 North; Golden, CO 80401 — Total Acres: 958

Lease No.	Date	Location	Section	Acres	County
4010-R	4-8-66	14S 43E	16	320	Bear Lake
4011-R	4-8-66	14S 43E	16	360	Bear Lake
5497	7-29-73	14S 43E	15	139	Bear Lake
7196	4-19-76	14S 43E	15	139	Bear Lake

FMC Corp.; P.O. Box 4111
Pocatello, ID 83201 — Total Acres: 480

Lease No.	Date	Location	Section	Acres	County
3823-R	10-30-63	8S 44E	16	360	Caribou
3848		6S 40E	20, 21	120	Caribou

Monsanto Co.; Box 816
Soda Springs, ID 83276 — Total Acres: 4815

Lease No.	Date	Location	Section	Acres	County
3941-R	5-4-65	8S 43E	15,22	280	Caribou
3951-R	10-29-65	6S 42E	24,25	120	Caribou
3953-R	10-29-65	6S 39E	16	640	Caribou
3954-R	10-29-65	7S 40E	16	520	Caribou
7955	5-1-78	5S 38E	36	132	Caribou
7956	5-1-78	8S 42E	36	160	Caribou
7957	5-1-78	6S 43E	16	280	Caribou

TABLE 10 Continued

Monsanto Co. (Continued)

Lease No.	Date	Location	Section	Acres	County
7958	5-1-78	6S 43E	36	640	Caribou
7959	5-1-78	7S 43E	36	360	Caribou
7960	5-1-78	8S 43E	36	120	Caribou
7961	5-1-78	8S 44E	16	120	Caribou
7962	5-1-78	9S 44E	16	280	Caribou
8075	8-31-78	5S 42E	19,29,30	321	Caribou
8076	8-31-78	5S 42E	7,18	442	Caribou
8077	8-31-78	5S 42E	17,20	400	Caribou

Stauffer Chemical Co.
Star Route; Randolph, UT 84064

Total Acres: 320

Lease No.	Date	Location	Section	Acres	County
8213	7-1-78	14S 44E	36	320	Bear Lake

TABLE 11

FEDERAL PHOSPHATE LEASES
EAST OF R. 20 E.

This information comes from the Serial Register pages of Phosphate Leases in Idaho, as maintained by the Bureau of Land Management. Information is presented by lessee, gives the lease number, date issued, the term of the lease, location (Resolution to the Section), acreage and County.

ARCHER, ELIZABETH B.
Box 8031, Foothill Station
Salt Lake City, UT 84108

Lease No.	Date Issued	Term of Lease	Location	Acres	County
1 0 14914	5-1-70	1 Yr.	7S 44 E 24 7S 45 E 30,31	184.95	Caribou

BANNOCK CHEMICAL CO.
Box 27,
Boise, ID 83707

Lease No.	Date Issued	Term of Lease	Location	Acres	County
1 0 2400	8-1-53	20 Yr.	14 N 41 E 7,8,17 14 N 40 E 12	221.65	Clark
1 0 5379	10-1-54	20 Yr.	14 N 40 E 11,12,13,14	626.02	"
1 0 11683	5-3-63	20 Yr.	6 S 43 E 27	120	Caribou
1 0 12890	10-1-62	20 Yr.	8 S 45 E 24 8 S 46 E 18,19,20 29,30,31 9 S 46 E 6,7	2,520	Caribou

BEKER INDUSTRIES CORP.
124 W. Putnam Ave.,
Greenwich, CT 06830

Lease No.	Date Issued	Term of Lease	Location	Acres	County
1 0 13649	12-1-66	1 Yr.	9 S 44 E 8,9	120	Caribou

CONDA PARTNERSHIP
P.O. Box 68,
Conda, ID 83230

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 0 4979	4-1-54	20 Yr	9 S 44 E 2 7 S 44 E 28,33,34	321.25	Caribou
I 0 4979	10-1-50	20 Yr.	8 S 44 E 3,4,10,14,15,23,24	1,522.24	Caribou
I 0 12989	11-1-62	20 Yr.	9 S 44 E 14,15,23	560	Caribou

F. P. CHAMP & WILLIAMS FAMILY PARTNERSHIP
Box 436,
Logan, UT 84321

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 0 13731	8-1-63	20 Yr	9 S 44 E 9,10,11	360	Caribou

EARTH SCIENCES INC. et al
Earth Science Road,
Golden, CO 80401

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 0 12982	7-1-62	20 Yr	14 S 43 E 21	65.74	Bear Lake
I 0 14958	5-1-69	1 Yr.	9 S 43 E 15,22	400	Caribou
I 0 14959	7-1-69	1 Yr.	7 S 45 E 31,32	360	Caribou
I 0 14978	7-1-69	1 Yr.	8 S 45 E 16	360	Caribou
I 0 15259	8-1-69	1 Yr.	8 S 46 E 29,32	280	Caribou
I 0 16179	5-1-69	1 Yr.	9 S 43 E 22	40	Caribou

FMC CORP. et al
Box 4111,
Pocatello, ID 83201

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 203(a)	12-1-71	1 Yr.	T 5 S, R 37E 3,4,10	440	Bannock
I 0 2272	11-1-51	20 Yr.	4 S 40 E 29 7 S 44 E 4,5,6,8,9	80	Bingham
I 0 5975	6-1-55	20 Yr.	6 S 44 E 32 8 S 45 E 21,22,28,33	620.88	Caribou
I 0 8194	5-1-57	20 Yr.	9 S 45 E 4,9,16	1636.98	Caribou
I 0 11775	8-1-65	20 Yr.	7 S 43 E 22,23,26,27	560	Caribou
I 0 11866	2-1-67	1 Yr.	8 S 44 # 32,35 3 S 40 E 29,32	396.74	Caribou
I 0 11877	12-1-66	1 Yr.	4 S 40 E 5	835.47	Bingham
I 0 13215	12-1-66	1 Yr.	6 S 41 E 19	481.12	Caribou

Continued - next page

FMC CORP. et al
Box 4111,
Pocatello, ID 83201

Continued

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 0 13729	6-1-67	1 Yr.	7 S 43 E 26	120	Caribou
I 0 14184	4-1-68	1 Yr.	8 S 44 E 8,9	320	Caribou
I 0 14664	4-1-68	1 Yr.	6 S 40 E 6,7,8,17,18,21	1159.34	Caribou
I 0 15033	9-1-68	1 Yr.	6 S 43 E 17	160	Caribou
I 0 15035	3-1-69	1 Yr	7 S 43 # 18	200	Caribou
I 0 15041	7-1-69	1 Yr.	5 S 43 E 29,30,32,33	507.08	Caribou
I 0 15097	9-1-64	20 Yr.	8 S 44 E 5,6,8	719.38	Caribou
I 0 15122	9-1-64	20 Yr.	6 S 43 E 21,22,27	360	Caribou
I 0 15821	9-1-65	20 Yr.	9 S 44 E 6	120.43	Caribou
I 0 15940	11-1-69	1 Yr.	4 S 41 E 20,21,22,27,28	520	Bingham

LEONARD J. JARRAND
53 E. 4th S.
Salt Lake City, UT 84111

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 0 16876	7-1-69	1 Yr.	14 N 41 E 19 14 N 40 E 13,14,24	845.7	Clark

INTERNATIONAL MINERALS & CHEMICAL CORP.
5401 Old Orchard Road
Skokie, ILL

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 0 5549	6-1-56	20 Yr.	8 S 45 E 30,31 8 S 44 E 24,25	864.34	Caribou
I 0 7239	6-1-56	20 Yr.	9 S 45 E 17,20,29,30,31	640	Caribou
I 0 7240	6-1-56	20 Yr.	9S 45 E 31 10 S 45 E 6	344.85	Bingham
I 0 7240	6-1-56	20 Yr.	10 S 44 E 1,12	125	Caribou
I 0 7942	5-1-57	20 Yr.	10 S 45 E 5 9 S 45 E 16,21,28,29,32,33	1249	Caribou

MONSANTO CO.
Box 816,
Soda Springs, ID 83276
* - Phosphate use permit

Lease No.	Date Issued	Term of Lease	Location	Acres	County
BL O 55875	12-1-48	20 Yr.	T 7S R 43 E Sec. 7	280.95	Caribou
BL O 55894	12-1-48	20 Yr.	T 9S R 44 E Sec. 9	200	Caribou
BL O 56009	12-1-48	20 Yr.	T 9S R 44 E Sec. 15	200	Caribou
BL O 56192	9-1-49	20 Yr.	T 6S R 38 E Sec. 1	65.34	Caribou
I 14413 *	3-1-79	1 Yr.	6 S 43 E 31	40	Caribou
I 0 1	9-1-49	20 Yr.	9 S 43 E 10,11	200	Caribou
I 0 2	9-1-49	20 Yr.	8 S 43 E 12	120	Caribou
I 0 3	9-1-49	20 Yr.	9 S 43 E 2	160.65	Caribou
I 0 16	9-1-49	20 Yr.	4 S 40 E 29	160	Bingham
I 0 257	11-1-49	20 Yr.	9 S 43 E 7	120	Caribou
I 0 258	11-1-49	20 Yr.	9 S 44 E 18	80	Caribou
I 0 678	12-1-51	20 Yr.	8 S 44 E 15,22 5 S 40 E 2	200	Caribou
I 0 997	10-1-50	20 Yr.	4 S 40 E 28,33,34,35	591	Bingham
I 0 997				80.25	Caribou
I 0 1005	10-1-50	20 Yr.	6 S 39 E 6 5 S 39 E 31	200	Caribou
I 0 1440	10-1-50	20 Yr.	10 S 45 E 9,16,21,28	1080	Caribou
I 0 1441	10-1-50	20 Yr.	10 S 45 E 3,4,9	438.29	Caribou
I 0 5613	6-1-55	20 Yr.	7 S 42 E 22,23,26,35 7 S 43 E 6,7,18	520	Caribou
I 0 5723	6-1-55	20 Yr.	7 S 42 E 12,13	668.91	Caribou
I 0 5860	6-1-55	20 Yr.	5 S 41 E 19,20	120	Caribou
I 0 11451	9-1-60	20 Yr.	6 S 42 E 10,11,13,14,24 6 S 43 E 10,29,30,31,32	1402.85	Bonneville
I 0 13709	12-1-65	20 Yr.	7 S 42 E 26,35	80	Caribou
I 0 13719	3-1-69	1 Yr.	8 S 43 E 26,27	520	Caribou
I 0 13720	10-1-68	1 Yr.	8 S 43 E 14	200	Caribou
I 0 13778	11-1-66	1 Yr.	8 S 44 E 19	212.28	Caribou
I 0 13814	12-1-65	20 Yr.	6 S 43 E 31,32	80	Caribou
I 0 14080	4-1-64	20 Yr.	8 S 43 E 12,13,24 8 S 44 E 7,18,19	697.08	Caribou

EA REX MINING CORP.
Box 430,
Las Vegas, NV

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 0 6433	8-1-59	20 Yr.	2 N 42 E 25,35,36 1 N 42 E 1,12 1 N 43 E 6,7	1604.9	Bonneville
I 0 6638	8-1-59	20 Yr.	1 N 43 E 21,22,25,26,27,35,36 1 N 43 E 35,36 1 N 44 E 31	1520	Bonneville
I 0 10763	8-1-59	20 Yr.	1 S 44 E 5,6,8,9	1416.84	Bonneville
I 0 10764	8-1-59	20 Yr.	1 N 43 E 7,8,16,17,18,20,21	1363.95	Bonneville

J. R. SIMPLOT CO. PL Use Permit
Box 27,
Boise, ID 83707

Lease No.	Date Issued	Term of Lease	Location	Acres	County
BL 0 55163	2-1-49	20 Yr.	1 S 39 E 31	160	Bingham
I 203(a)	12-1-71	1 Yr.	5 S 37 E 3,4,10	440	Bannock
I 0 1603	3-1-52	20 Yr.	9 S 43 E 8,15,16,17,21,22 7 S 42 E 35 8 S 43 E 19	688.08	Caribou
I 0 4494	9-1-54	20 Yr.	8 S 42 E 2,11,14,15,24 6 S 39 E 1,2,12	527.48	Caribou
I 0 9945	6-1-59	20 Yr.	5 S 39 E 21,27,28,34,35	1763.34	Caribou
I 0 10338	6-1-59	20 Yr.	5 S 40 E 10,29,30	477.82	Caribou
I 0 13708	4-1-62	1 Yr.	8 S 42 E 2,11	80	Caribou
I 0 15523	8-1-65	20 Yr	8 S 42 E 23	80	Caribou
I 0 15820	8-1-65	20 Yr.	9 S 43 E 2,3	80	Caribou

J. R. SIMPLOT CO. PH Use permit
Box 67,
Conda, ID 83238

Lease No.	Date Issued	Term of Lease	Location	Acres	County
I 4298	12-1-74	1 Yr	T 8 S, R 42 E, Sec. 24,25	60	Caribou

STAUFFER CHEMICAL CO.
Star Route *PL Use Permit
Randolph, UT 84064

Lease No.	Date Issued	Term of Lease	Locateion	Acres	County
I 97	8-1-69	1 Yr	6 S 43 E 32,33 7 S 43 E 3,13,14	307.99	Caribou
I 7062 *	6-1-77	1 Yr	7 S 43 E 14 6 S 43 E 33	60	Caribou
I 0 4373	9-1-53	20 Yr.	7 S 43 E 3,10,11	467.73	Caribou
I 0 4374	9-1-53	20 Yr.	7 S 43 E 11,13,14	520	Caribou
I 0 4375	9-1-53	20 Yr.	6 S 43 E 15,22,23,25,26	800	Caribou
I 0 4775	6-1-55	20 Yr	7 S 43 E 23,24,25 8 S 45 E 32	440	Caribou
I 0 7238	6-1-56	20 Yr.	9 S 45 E 5,8,17	518.12	Caribou
I 0 7619	3-1-57	20 Yr.	6 S 43 E 9,15	360	Caribou
I 0 7881	5-1-57	20 Yr.	9 S 43 E 28,33	360	Caribou
I 0 15040	10-1-69	1 Yr.	7 S 43 E 11	120	Caribou

* Phosphate Use Permit

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