OR-030-6-41

ENVIRONMENTAL ASSESSMENT RECORD
FOR PROPOSED OIL & GAS
LEASING IN THE VALE AREA

VALE DISTRICT

OREGON

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FEB 1977

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
P. O. Box 700
Vale, Oregon 97918

IN REPLY REFER TO
1791

March 18, 1977

Enclosed for your review is the Environmental Analysis Record (EAR) for proposed oil and gas leasing in the Vale area.

Any comments you may have will be appreciated. Your comments along with data in the EAR will help us to make a decision regarding the oil and gas leasing program for the Vale area.

It must be determined whether any lease applications will be denied, or if mitigating measures other than those recommended in the EAR will be needed.

After reviewing the information in the EAR and comments from local, State and other Federal agencies and from the public, a recommendation to the State Director, Oregon State Office, Bureau of Land Management (BLM) will be made suggesting that an Environmental Impact Statement be prepared should circumstances so warrant. If the State Director concurs, he will, in turn, so recommend to the Director, BLM, who will ultimately make the final decision.

Should you have any questions, or desire a meeting with BLM personnel on oil and gas lease applications, please contact the undersigned official.

Sincerely,

Fearl M. Parker

Fearl M. Parker
District Manager

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

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[illegible]

[illegible]

Vale, [illegible]

[illegible]

March [illegible], 1977

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Any comments you may have will be appreciated. Your comments along with data in the EAR will help us to make a decision regarding the oil and gas leasing program for the Vale area.

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Should you have any questions, or desire a meeting with BLM personnel to discuss the lease applications, please contact the undersigned.

Sincerely,

Pearl [illegible]

District Manager

TABLE OF CONTENTS

Figures

Tables

APPENDICES

A. U.S. Department of the Interior Secretarial Order No. 2948 and Letter of Implementation.

B. Federal regulations and forms pertaining to oil and gas resource exploration and development.

C. State of Oregon regulations pertaining to oil and gas resource development and production, and an overview of this resource development with a description of state-federal cooperation.

D. Fauna of the Vale EAR area.

E. Comprehensive land use plan for Malheur county, 1973.

F. Malheur County Zoning ordinance.

G. Letter soliciting comments on environmental impact of oil and gas leasing in the Vale EAR area with a list of individuals to whom the letters were sent and replies to enquires.

ENVIRONMENTAL ASSESSMENT RECORD

FOR PROPOSED OIL & GAS

LEASING IN THE VALE AREA

INTRODUCTION

Over the years, there has been considerable interest in exploration for oil and gas resources in the Vale, Oregon, area. As of this writing, there is only one application for an oil and gas lease in this area. This lease, consisting of 800 acres, includes Section 9 and the SW¼ of Section 10, T.19S., R.45E., W.M., Oregon and is filed under Serial Number OR-8730. No leases have been issued to date in the area. Because the area surrounding Vale is similar in nature, it was decided to write a single Environmental Assessment Record (EAR) for the area outline in Figure 1.

There are 91,200.67 acres of Federal land, 89,538.56 acres of private land and 1,640.00 acres of State land in the EAR area (Table 1). The Federal government owns the mineral estate to most of the Federal land and to some of the private land (Table 2).

The following Environmental Assessment Record is written to include all private lands within the area on which the Federal government owns the mineral estate.

An interdisciplinary team of Bureau of Land Management (BLM) resource specialists from the Vale BLM District prepared the analysis.

Information on the land and associated resources in the EAR area were obtained from previous reports prepared for geothermal resource leasing, and from inventories and data furnished by Federal, State and local agencies as well as individuals having knowledge of the lands or the operations involved. Data recorded in BLM inventory documents called Unit Resource Analyses (URA) was utilized. Land use capabilities and potential resource conflicts are listed in documents called Management Framework Plans (MFP). These documents have inventories, conditions, uses, production, quality and management potentials for defined geographic areas of BLM administered lands.

The lands applied for oil and gas leasing are not in a Known Geologic Structure (KGS), and therefore are considered as non-competitive lease applications.

Energy related programs have a high priority within the Department of the Interior. The Bureau has the responsibility of insuring that within the framework of environmentally sound policies, energy - mineral development should be encouraged. Further, the Government should receive a just return for the leaseable and saleable energy - mineral resource when it permits development and production.

I. PROPOSED ACTION AND ALTERNATIVE

The proposed action involves the leasing of Federally owned oil and gas resources, with special stipulations, pursuant to the Act of February 25, 1920 (41 Stat. 437; 30 U.S.C., 181 et seq.), as amended and supplemented, including the amendatory act of August 8, 1946 (60 Stat. 950; 30 U.S.C., sec. 181 et seq.) and the act of September 2, 1960 (74 Stat. 781; 30 U.S.C., sec. 181 et seq.). Pertinent regulations are found in the Code of Federal Regulations, Public Lands: Interior, Title 43, Part 3100. Copies of 43 CFR are available at all BLM offices.

PURPOSE OF ACTION

The purpose of issuing Federal oil and gas leases in eastern Oregon is to permit exploration and, if commercial reserves are discovered, an orderly development of oil and gas resources.

FEDERAL OIL AND GAS LEASING PROCEDURES

Roles of the Bureau of Land Management and U. S. Geological Survey

The BLM administers Federal laws and regulations relating to mineral resources on land under it's primary jurisdiction (National Resource Lands), Federal lands withdrawn for other agencies, acquired Federal lands, and Federal mineral resources on private lands. The BLM, in consultation with the U. S. Geological Survey (USGS), determines whether and the conditions under which Federal oil and gas leases will be issued. If the lands being considered for leasing are withdrawn for another Federal agency, that agency is involved in the process of determining whether the land will be leased. Of the 1832,379.23 acres in the EAR area, 91,200.67 acres are Federal land (Table 1). National Resource Lands occupy 86,988.53 acres and Reclamation Withdrawal lands occupy 4,212.14 acres.

After leases are issued on lands administered by the BLM, the USGS, after consultation with BLM, administers oil and gas operations on the leases. The survey is responsible for maintaining engineering, geologic, geophysical, economic, and other technical expertise needed to assure compliance with applicable laws, regulations, and Department objectives. The BLM and USGS responsibilities for administration of oil and gas operations on Federal leases are described in Secretarial Order 2948 and the implementing working agreement (Appendix A).

Administration of Geophysical Explorations

Geophysical explorations are normally conducted before an oil and gas lease is obtained. However, the procedures are described here to provide and over-view of the full range of administrative activities relating to oil and gas operations on Federal lands.

If an operator wants to conduct geophysical explorations on BLM administered lands, he must file a Notice of Intent (Form 3040.1) with the appropriate BLM Distirct Manager before he enters the land (43 CFR 3045). This regulation does not pertain to lands where the Federal Government owns the mineral rights but not the surface rights. When he signs the Notice of Intent form, the geophysical operator agrees to conduct the exploration activities according to terms and conditions designed by the Federal Government and the State of Oregon to minimize adverse impacts (Appendix B and C). The operator must also post a bond before entering the land.

When a Notice of Intent is received, a BLM district staff specialist reviews the proposed operation and may meet with the operator in an effort to minimize the environmental effects of the surveys.

Upon completion of operations, the operator must restore the area as nearly as practicable to it's original condition.

Pre-lease Procedures

Pre-lease procedures involve the following:

(1) Land-Use Planning. Land-use capabilities and potential resource conflicts are considered in a document called a Management Framework Plan (MFP). The MFP indicates how land uses in a planning area will be coordinated and identifies constraints for future actions taken in the area. Basic resource data are recorded in inventory documents called Unit Resource Analyses (URA's).

(2) Environmental Analysis. Before a decision is made on whether oil and gas leases will be issued in a specific area, the BLM prepares an Environmental Assessment Record (EAR). The EAR describes the setting in which the action is to occur, possible environmental impacts of the proposed action, and measures to reduce adverse impacts of the proposed action.

(3) Lease Stipulations. Information gathered in the land-use planning and environmental analysis processes and other data are used by the BLM to determine whether oil and gas leases will be issued for specific lands, and if so, the conditions or stipulations to which the prospective lessees will have to agree prior to the issuance of the leases. Most of the stipulations in oil and gas leases issued in recent years relate to the prevention or mitigation of unfavorable environmental impacts.

All oil and gas leases issued by BLM at the present time contain an open-ended set of stipulations. The stipulations are included on BLM Form 3109-5 (Appendix B). These stipulations insure that after the lease is issued, the USGS and the BLM have additional opportunities to specify measures the lessee must take to protect environmental values.

Oil and gas leases also contain site-specific stipulations. These stipulations are developed individually for each lease area.

(4) Classification Report. Before a lease is issued, a classification report is prepared by the Geological Survey to determine whether the lease will be issued on a competitive or non-competitive basis. The USGS determines whether all or any parts of the area applied for are within a Known Geologic Structure (KGS). An area is classified as being within a KGS if it is within the trap, whether structural or stratigraphic, of a producing oil and gas field as best as can be determined from the geologic data available for leasing until it is offered at a competitive lease sale. If the area is not within a KGS it may be leased on a non-competitive basis.

No Known Geologic Structures have been identified in Oregon.

Lease Issuance

If a tract has not been previously leased, a lease is issued on a non-competitive basis to the first applicant (1) if the land is legally available, (2) if the USGS determines that it is not a KGS, and (3) if the BLM determines through the land-use planning and environmental analysis process that oil and gas development is acceptable and appropriate.

When leases outside KGS's expire, terminate, are relinquished or cancelled, land-use plans and environmental analyses are reviewed to determine whether the tracts should be re-offered for leasing and, if so, the kind of stipulations to be added to the new lease. The tracts are re-offered by being posted on a monthly list. All applications for the posted tracts received during the filing period are considered to have been filed simultaneously. A public drawing is held, and one application is drawn for each tract.

If there are no simultaneous applications for a tract it becomes available to the first application submitted subsequent to the drawing. Non-competitive leases are currently issued for a primary term of 10 years.

Since Oregon has no KGS areas at this time, no competitive leasing is scheduled in the State.

Lessees must furnish bonds conditioned upon compliance with the lease stipulations. Bonds must be provided before a competitive lease is issued and before a drilling permit is issued on a non-competitive lease.

Post-lease Procedures

During the term of the lease, the Geological Survey supervises the operations of the lessee in that portion of the lease tract within the "area of operations". The implementing working agreement for Secretarial Order 2948 (Appendix A) gives a definition of the area of operations. The USGS asks the BLM for recommendations on surface protection and rehabilitation measures before the Survey acts on requests from lessees for approval of plans for drilling or other surface-disturbing operations. The BLM administers the oil and gas leasing regulations and terms of the lease in that portion of the lease tract outside the area of operations.

The "open-ended" lease stipulation (Form 3109-5) (Appendix B) requires the lessee, prior to entry upon the land, to submit for approval to the USGS a map and surface use plan explaining the nature of the anticipated activity and surface disturbance. The lessee also submits this information to the BLM. If the lessee proposes to conduct any activities which would disturb the environment, he will be required to obtain approval from the Survey at least once during the life of the lease. If he finds oil or gas and wishes to drill additional wells to develop the field or construct facilities needed to reach full production, he will be required to return to the Survey for approval of plans for each new stage of development. The information the lessees must furnish in the surface use plan is listed in the Survey's Notice to Lessees Number 6 (NTL-6) (Appendix B).

For all exploratory well proposals, the USGS prepares an Environmental Analysis in consultation with the BLM. If the BLM so requests, the USGS will also hold a joint field inspection to analyze the environmental impacts of the proposed action. Stipulations are attached to the drilling permit to minimize adverse environmental impacts. The lessee may be asked to change the proposed well site if drilling in the original location would have severe environmental impacts.

If oil or gas is discovered, lessees are required to submit additional lease development plans and permit requests to the USGS for approval. After the USGS has reviewed the proposed plans and permit applications, consulted with and received input from the BLM, the proposed plans are modified, if necessary, to insure that proper construction practices are followed. The lessee is required to prepare for contingencies such as fires, accidents, blowouts, spills, and leaks, and to notify various state and Federal agencies, such as the Environmental Protection Agency (EPA), in the event of an oil leak or spill. Regulations pertaining to holding and disposal of waste drilling fluids and chemicals may be found in Appendix B.

The USGS is responsible for final approval of abandonment operations when oil and gas operations are terminated. The Survey will not approve the abandonment unless reclamation is carried out to the satisfaction of the BLM. When abandonment or cessation of operations results in expiration, cancellation, or relinquishment of the lease, the lease, the USGS requests the BLM to inspect the lease-hold area for compliance with the surface protection and reclamation stipulations in the lease and drilling permit. The lessee is required to reclaim the area insofar as practicable to its condition prior to the oil and gas operations.

REGULATIONS OF OIL & GAS OPERATIONS BY THE STATE OF OREGON

Oregon is an associate member of the Interstate Oil Compact Commission and has adopted many of the policies and model rules suggested by this group of state regulatory agencies. State rules require bonding, blowout prevention equipment, controlled disposal of brines, and the cementing and casing of wells. State law also sets well spacing limits and provides for the protection of correlative rights of landowners. In 1961 the Legislature passed a unitization law which defines the conditions for forming field-wide operating units, provides for settlements between working interests and allows compulsory unitization when 75% of the royalty ownership favors unit operations.

State regulatory authority is vested in the Department of Geology and Mineral Industries which issues drilling permits, approves casing programs, inspects blow-out prevention equipment, witnesses abandonment plugging, and collects well records. In the event of a discovery, the rules of the department require uniform development and regular reporting of storage and production. Stipulations added to the drilling permit at the request of the State Department of Environmental Quality require compliance with State air and water quality laws.

Before drilling permits are issued, the applications are reviewed by the Department of Environmental Quality, Water Resource Department, Fish and Wildlife Commission, and the Department of Land Conservation and Development.

A summary of these regulations may be found in Appendix C.

SUMMARY OF OIL & GAS LEASING & EXPLORATION IN EASTERN OREGON

Oregon has seen several periods of oil and gas exploration. Small speculative ventures based on little, if any, geologic studies were initiated mainly on private land from 1900-1940. From 1940-1962, the exploration was more intense and professional, with many deep expensive test holes. At the close of World War II, large oil companies did extensive geologic studies. A third period of serious on-shore activity began in 1975, led by the major oil companies.

Between 1902 and 1920, 40 holes were drilled in Oregon by wildcatting groups whose total estimated expenditure was about three million dollars. Of the 40 holes, 25 were located in eastern Oregon, but most were shallow, with the deepest well of the period extending to a depth of 4,360 feet. Figure 2 shows locations of drilling sites in Malheur County and Table 3 sumarizes the results of the activity. The Ontario Cooperative Oil and Gas Company well near the town of Ontario in Malheur County was one of the most significant tests of the period. The well blew out when gas and sand was encountered at 2,200 feet. The large flow was shortlived and after a few days, only a small amount of gas remained. This explains why 18 of the 25 holes drilled in eastern Oregon during this period were concentrated in northern Malheur County.

From 1920 to 1940, 45 holes were drilled in Oregon with a total estimated expenditure of $512 million. Most of this effort was west of the Cascades. About 15 holes were drilled in eastern Oregon, mostly in the southern parts of Klamath and Lake Counties and northern parts of Malheur and Harney Counties, but were mostly shallow by present standards.

Large oil companies began exploring in Oregon at the close of World War II and continued their efforts in eastern Oregon. In 1954, El Paso Natural Gas Company drilled the deepest hole in the western Snake River

Basin to 7,470 feet. The unsuccessful hole was about eight miles west of Vale. In 1958 Sunray Midcontinental Oil Company and Standard Oil of California operators drilled a well southeast of Prineville in which gas was found in Cretaceous marine sediments. Since the gas occurred in a bed with mainly shales, no tests were made. By 1963, most of the large oil companies terminated their on-shore efforts in Oregon and turned to the more interesting off-shore explorations which ran from 1960 to 1967. The total estimated on-shore expenditures in Oregon for the period 1941-65 was about $14.3 million, most of which was spent west of the Cascades.

In 1970, Texaco became interested in the Paleozoic-Mesozoic marine beds of central Oregon, and leased over 200,000 acres of Federal, State and private lands in Crook and Grant Counties near the location of two encouraging holes drilled in 1955 and 1958. Most of this lease acreage was on Federal land.

In 1971 three significant events occurred. The first, Texaco drilled a 7,998 foot hole in the center of it's lease block (then about 250,000 acres covering about 400 square miles), but no commercial discovery was made and the hole subsequently plugged and abandoned. The second, two major oil companies also moved into the area when Standard Oil of California and Amoco applied for Federal leases on significant acreage in eastern Oregon. And the third, the BLM responded to environmental pressures and stopped additional leasing in Oregon.

No holes were drilled during 1972. Standard Oil delayed the start of a wildcat hole in the remote southeastern corner of the state (southern Malheur County) to the following year. Standard's 1973, 8,414--foot hole on a Federal lease was unsuccessful and subsequently plugged and abandoned. As a result of this hole, Standard gave up it's interest in southern Malheur County. No holes have been drilled nor have new oil leases been issued since 1971.

Altogether only 12 deep holes have been drilled up to the present, most of which were on Federal land. Texaco and Standard are currently the major Federal leaseholders in eastern Oregon, and together, hold about 172,000 acres. The State of Oregon has issued leases covering 8,484 acres in eastern Oregon. Estimated expenditures of over $1.5 million were made by oil and gas leaseholders in eastern Oregon, primarily for exploration.

In spite of the approximately 30 dry holes drilled in northern Malheur County, the drill spacing is still quite low when compared to other "wildcat" areas that have subsequently entered production. It is altogether probable that geothermal test drilling will compliment and encourage renewed oil and gas exploration.

STAGES OF IMPLEMENTATION

Petroleum operations progress through five phases: 1) preliminary investigations, 2) exploratory drilling, 3) development, 4) production, and 5) abandonment (Figure 3).

Several phases may occur simultaneously in an area. One company may drill an exploratory well on a lease while another company conducts preliminary investigations on adjacent areas. However, if only one company is interested in the area, normally only one phase of the operation will take place at a time.

Exploratory wells are drilled on a small percentage of the area covered by preliminary investigations.

Phase I - Preliminary Investigations

Preliminary investigations often preceeds the issuance of a lease. They are described in this section to provide an overview of the entire range of oil and gas operations.

Preliminary investigations begin with an office review of geological and technical data available for the region. In many oil and gas producing regions, an office analysis may develop enough information to proceed with drilling without conducting additional preliminary investigations. However, the office analysis may indicate only a broad prospective area, and further preliminary investigations may be required.

Preliminary investigations are made from the air and on the ground.

Airborne investigations involve the use of small aircraft and helicopters to conduct visual reconnaissance, photographic, and geophysical surveys. These may be followed by on-ground geological and geophysical surveys which involve either casual or intensive use of the land. Casual uses generally do not disturb the surface. Intensive uses include operations which require clearing of new access trails, movement of heavy equipment, or other actions which can result in substantial surface disturbance.

Geological surveys normally are a casual use. Rock outcrops and topography are examined to determine the structural attitude and age of surface formations, and geologic maps are prepared. In many areas, rock outcrops have been mapped and sufficient information obtained to enable the geologist to recommend a drilling location without conducting additional surface exploration work. However, when surface structures are not present or do not provide conclusive indications of subsurface structures, geophysical investigations may be needed to outline structures where oil or gas may be trapped.

Geochemical and soil-gas surveys involve casual use of the land. In geochemical surveys, the chemical contents of water, soil or vegetative samples are analyzed for the presence of oil or gas. In soil-gas surveys, soil samples are analyzed to determine whether minute traces of gas have excaped to the surface from petroleum reservoirs.

In geophysical surveys, subsurface formations are evaluated by analyzing properties such as gravity, electrical conductivity, magnetic susceptibility and structural attitude. The seismic survey is one of the most commonly used geophysical methods. It is an intensive use method and involves the use of heavy truck-mounted equipment. Other geophysical methods, such as temperature, gravity, magnetic and radiation surveys, usually are confined to existing roads and trails.

In seismic surveys, a shock wave is sent into the subsurface and the time required for the wave to travel to and return from a subsurface horizon is recorded. A map of the subsurface can be drawn from an analysis of the differences in the time it takes the wave to be reflected back to the surface from the various rock formations.

Explosive, thumper or vibrator methods are used to produce the shock wave.

In the explosive method, shot holes are drilled to a depth of 50 to 200 feet. Four to twelve holes are drilled per mile of line. The holes are loaded with 5 to 50 pounds of explosives and detonated. The same hole may be reloaded and shot several times to find the depth and explosive charge returning the best reflection or refraction signal.

The thumper and vibrator methods pound or vibrate the earth to create a shock wave. Less than 50 square feet of surface area is required to operate the equipment at each test site. If there is brush or loose rock in the area, it may be removed to provide a more solid base for the test.

The sensors and energy source are typically located along straight seismic lines laid out on a 1 to 2 mile grid. Existing road systems are used where available. Lines may be cleared of vegetation and loose rocks to improve access for the trucks. Each mile of line cleared to a width of 8¼ feet utilizes one acre of land.

Phase II - Exploratory Drilling

This phase does not begin until a lease has been acquired by the operator. In areas where preliminary investigations are favorable and information warrants further exploration, exploratory drilling may be conducted. More precise data on the geologic structure are obtained by stratigraphic tests. The presence of suspected oil and gas deposits may be confirmed by exploratory drilling of deep holes.

(1) Stratigraphic Tests. Stratigraphic test holes are drilled 100 to 500 feet deep to locate geologic indicators. The holes are usually drilled with truck-mounted equipment and disturb a relatively small area. Stratigraphic holes in areas of shallow high pressure zones are cased. The roads and trails constructed for access to the test sites are temporary and involves minimal construction. The drill site occupies approximately 900 square feet and is sometimes placed in the center of new or existing trails.

(2) Exploratory Wells. Exploratory wells are deeper tests requiring larger drilling rigs with support facilities, and may disturb a larger surface area than stratigraphic tests. Required facilities include roads, drill pads, mud pits and--in some cases--camps and airports.

Both the stratigraphic tests and exploratory wells require a permit to drill issued by the appropriate Geological Survey District Engineer. The State of Oregon also regulates exploratory drilling and associated activities and facilities.

Nationwide, one out of every seven exploratory wells drilled in 1974 was finished as a producer. However, only one in 59 resulted in the discovery of significant recoverable reserves (more than one million barrels of oil or six billion cubic feet of gas). Of the 200 or so wells drilled in Oregon, none has been financially successful.

After a drilling site has been selected, a heavy-duty road is built to move the drilling rig and other equipment to the location. The roads are not designed for permanent access.

The well site occupies about an acre and is cleared of all vegetation and graded nearly flat. Depending on the soil in the area, the well site or drill pad and roads may or may not be graveled. The drilling rig, mud pumps, mud pit, generators, pipe rack, and tool house are located on the drill pad. Other facilities such as storage tanks for water and fuel may be located on or nearby the drill pad. Water trucks are used when pipeline installations or water wells are not practical.

A water supply is required for mixing drilling mud, cleaning equipment, cooling engines, and other uses. A pipeline may be laid several miles to a pump installed at a stream or to a water well.

The drilling mud is maintained at a specific weight and viscosity to cool the bit, reduce the drag of the drill pipe on the sides of the well bore, seal off any porous formation, contain formation fluids to prevent a blowout or loss of drilling fluid, and bring the drill cuttings to the surface for disposal. Various additives are used in maintaining the drill mud at the appropriate viscosity and weight. Some of the more rarely used additives are caustic, toxic, or acidic in nature. Others are simply weight additives and fluid loss additives.

A well completion requires installation of steel casing between the surface casing and the pay zone. The casing is selectively cemented to improve stability and to protect specific zones. The drilling rig and most of the support equipment are usually moved from the well site after the casing is cemented.

Storage tanks are required to hold oil produced from an exploratory well. A separator may be required to separate the soil and gas. If water is produced with the oil, a treater may be needed. The gas separated from the oil may be burned off as waste during the initial stage of development of an oil field.

If gas is discovered, the operator is allowed to flare only enough gas for a short period of time to determine the well's capabilities. The well is then shut-in until a gas line is constructed.

The completion of several exploratory wells as commercial producers usually marks the beginning of the development phase.

<u>Phase III - Development</u>

Oil field developmental steps are outlined below:

(1) Well Spacing Pattern. A well spacing pattern must be established before development drilling begins to determine the spacing unit assigned to each well.

If a well spacing pattern has not been previously established for the area, the operator proposes a spacing pattern to the State regulatory agency and to USGS for approval pursuant to the Oil and Gas Operating Regulations, 30 CFR 221. Information considered by USGS in establishment of a well spacing pattern includes data obtained from the discovery well on the porosity, permeability, pressure, lithology and depth of formations in the reservoir; data on well producing rates and type of production (predominantly oil or predominantly gas) and the effects of the proposed well spacing pattern on the economics of recovery.

Most spacing patterns established at the present time for Federal leases are from 10 to 40 acres per well for oil production and units of 160, 320, or 640 acres per well for gas production (Appendix B).

(2) Drilling Procedures. Procedures used in drilling development wells are about the same as those used for a wildcat well, except that there usually is less subsurface sampling, testing and evaluation.

(3) Surface Use. Facilities required for development drilling may include access roads; well sites; flowlines; storage tank batteries; facilities to separate oil, gas, and water; and injection wells for salt water disposal. In some instances, gas injection wells for either fuel conservation for future production or maintaining stable reservoir pressure may be used. In remote locations, camps and air strips may be required.

Access roads usually are better planned, located and constructed than roads built during the drilling of wildcat wells (Appendix B).

When an oil field is developed on a spacing patter of 40 acres per well, the wells are ¼ of a mile from each other. If a section (1 square mile) is developed with 16 wells, at least 4 miles of access roads are built, and approximately 4 to 6 miles of flowlines are installed between the wells and the tank batteries.

Surface uses in a gas field will be significantly less than in an oil field because gas wells usually are drilled on 160-acre per well or larger spacing units. A 160-acre per well spacing pattern requires four wells per section and approximately 2 miles of access roads and pipelines. Separation and storage facilities are not required for gas production unless the production is rich in liquids, or condensate. It may be sold without spearation and the purchaser may separate the liquids at a central processing point far removed from the lease.

Phase IV - Production

Oil and gas field facilities are shown in Figure 4 and are outlined below:

(1) Well Facilities

(a) Oil Fields. Pressures in some petroleum reservoirs are great enough to force oil to the surface. The result is a flowing well. However, most oil wells in the United States require the use of some means of artificial lift to bring the oil to the surface. Pumping and a technique known as "gas lift" are the two methods of artificial lift used at present. Flowing wells and wells with gas lift facilities require a minimum of equipment at the surface and produce little or no sound. All pump systems require more surface equipment and create more noise than flowing wells and gas lift facilities.

(aa) Flowing Wells. The surface equipment at the head of a flowing well may be limited to a series of valves, or "Christmas tree" and a fenced service area ranging from 15 x 15 to 50 x 50 feet around the wellhead and Christmas tree.

(bb) Artificial Lifts.

(i) Pumping. Over 90 percent of the oil wells in the United States in 1971 were on artificial lift, and most of the artificial lift wells used sucker rod pumps. Other pumps commonly used on oil wells are hydraulic and centrifugal pumps.

All of the pump systems require some surface equipment and fuel or electric power lines. All generate some noise, ranging from almost none for electric motors to high noise levels for single cylinder gas engines.

(ii) Gas lift. Gas lift is used in some oil fields where low cost, high pressure natural gas ia available and where pressure in the petroleum reservoir is sufficient to force the petroleum part of the way up the well. The addition of gas lowers the specific gravity of the petroleum so that it flows to the surface. The system is quiet and uses little ground. However, it will be used less in the future as supplies of high pressure natural gas decline.

(b) Gas Fields. Most gas wells produce by normal flow and do not require pumping. Surface use at a flowing as well usually is limited to a 20 x 20 foot fenced area. If water enters a gas well and chokes off the gas flow, a pump may be installed to pump off the column of water.

(2) Flowlines. Crude oil usually is transferred from the wells to a central collection point, or storage tank battery, before it is transported from the lease. Natural gas is often sold at the wellhead and transported directly off the lease. If processing is required to remove liquid hydrocarbons or water, however, the gas may be transferred to a central collection point prior to sale.

Oil and gas are transferred from the wells to central collection points in flowlines. The flowlines usually are 3 or 4 inch diameter steel pipes. They may be buried, installed on the surface, or elevated. Natural and man-made corrosive liquids, groundwater and salt concentrations and electric currents can corrode buried steep pipe. Several protective measures have been developed. They include coating the steel pipes with paint, plastic, cement, felt wrapping and bitumen; feeding controlled electric currents to the metal flowlines; burying masses of metal and attaching them metallically to the metal flowlines and substituting non-metal pipe for steel.

(3) Separating, Treating and Storage Facilities. If the fluids produced at the well contain gas and water, the oil, gas and water are separated before the oil is stored in the tank battery. The batteries usually contain at least two tanks and usually are located on or near the lease.

Small leases may contain only one tank battery; large leases may contain several, with each battery containing separating, treating and storage facilities.

(4) Disposal of Produced Water. After water is separated from oil at the tank battery, it is disposed of under USGS supervision. Although most produced waters are brackish to highly saline, some produced waters are fresh enough for beneficial surface use. Ranchers and farmers in some cases have filed prior rights claims on oilfield water so they can use it for agricultural purposes.

Saline water is disposed as required by USGS Notice NTL-2B (Appendix B), mainly in evaporation pits or by subsurface injection. Evaporation pits are used mainly in arid regions where evaporation rates are high.

USGS may require that evaporation pits be lined with an impervious material and be inspected periodically to insure that the lining is maintained. Concrete, asphalt, plastic, bentonite and epoxy resins are used for pit linings.

Because salt water seldom issues from heater-treaters or gun barrels completely free from oil, oil skimmer pits are installed between the separating facilities and the evaporation pits, when surface disposal is used.

When salt water is disposed of underground, it usually is introduced into a subsurface horizon containing water of equal or poorer quality. It may be injected into the producing zone from which it came or into other producing zones. In some cases, this stimulates oil production. In other cases, it could reduce the field's productivity and may be prohibited by state regulation or mutual agreement of the operators.

In some fields, dry holes or depleted producing wells are equipped for salt water disposal; but occasionally new wells are drilled for disposal purposes. Cement is squeezed between the casing and sides of the well to prevent the salt water from migrating up or down from the injection zone and into other formations. The salt water is generally injected down the well through tubing.

Depending upon the porosity, permeability and pressure of the disposal zone, the salt water may be injected without pressure.

If pressure is required, an injection pump is used to force the salt water into the disposal zone.

(5) Methods of Increasing Petroleum Recover. Oil cannot be produced unless forces within the petroleum reservoir are geat enough to drive the oil to the well bore. Primary production occurs when energy in the reservoir is sufficient to drive the oil to the well. When natural energy sources are inadequate, secondary production methods involving gas or liquid injection may be used to supplement the natural forces.

In water flooding, the most commonly employed form of secondary recovery, water is injected into the reservoir to drive additional oil to the producing wells. On the average, a successful waterflood will increase recovery by roughly 10 to 100 percent.

Other secondary techniques for improving oil recovery have been tested, including miscible flooding (injecting chemical compounds with water) fire flooding (starting a controlled fire in the reservoir) and steam flooding (injecting steam into the reservoir). Some of the techniques have been used for tertiary recovery after a water flood.

Natural gas also is injected into some oil reservoirs during primary recovery as a pressure maintenance program.

(6) Land Required for Oil and Gas Producing Facilities. The land uses for all facilities in a developed field may range from 22.4 acres per square mile with a 20-acre per well spacing pattern, to 2.4 acres per mile with a 640-acre per well spacing pattern. This spacing is delineated in Appendix B.

Less land is usually used in gas fields than in oil fields because gas production often does not require storage on the lease.

(7) Employment. The number of people required to operate an oil or gas field varies with the characteristics of the production and the number of leaseholds in the field. If the wells flow without pumping, one employee in a large, modern field can control production of about 25 wells. When wells are pumped, one employee in a large modern field can control production on 10 to 20 wells. If oil storage tanks are manually gauged and sampled, one employee can service approximately 25 tanks. If automatic gauging and sampling devices have been installed, one person can service the equivalent of 100 - 150 tanks. In a large, modern field, one five-man maintenance crew can service up to 50 wells.

Phase V - Abandonment

(1) Exploratory and Development Wells. Dry wells normally are plugged before the drilling rig is removed. This allows the operator to use the drilling rig to plug the hole and avoid bringing in other plugging equipment. The operator must obtain permission from the USGS district engineer to plug the well.

Well plugging requirements vary with the characteristics of the rock formations, subsurface water and the well. Generally, however, the hole is filled with heavy drilling mud to the bottom of the cemented casing. A cement plug is installed in the bottom of the casing, the casing is filled with heavy mud and a cement cap is installed on top of the well. In uncultivated areas, a pipe may be installed as a monument, giving location and name of the well. In croplands, the casing is cut off and capped below plow depth, and no monument is installed. Plugging requirements provide for protection of aquifers and known oil and gas producing formations by placement of additional cement plugs.

After the plugging is finished, the drilling rig is removed and the surface, including the reserve mud pit, is restored to its original condition, insofar as possible and according to requirements of the surface management agency. The operator's report of abandonment is approved by the USGS after the surface management agency approves actual surface cleanup and restoral.

(2) Production and Injection Wells, and Related Facilities. Before a lessee abandons a former producing well, he must demonstrate its unsuitability for further profitable production to the USGS district engineer. A copy of the operator's notice of intention to plug and abandon is transmitted to the surface management agency to obtain the agency's recommendations on surface restoration.

In some cases, wells are plugged as soon as they are depleted. In some cases, depleted wells are not plugged immediately, but are allowed to stand idle for possible later use in a secondary recovery program.

Truck-mounted equipment is used to plug former producing wells. In addition to the measures required for a dry hole, plugging of a depleted producing well includes the installation of a cement plug in the perforated section in the former producing zone and -- if casing is salvaged -- a cement plug is put across the casing stub. In cultivated areas, the cement pumpjack foundations are removed or buried below plow depth. In areas where removal or burial would cause more surface damage than the foundations, they are left at the site.

When an entire lease is abandoned, the separators, heater-treaters, tanks and other processing and handling equipment are removed and the surface restored. Flowlines and injection lines installed on the surface are removed, but buried lines usually are left in place. The operator's bond with the Federal Government is not terminated until the surface management agency has approved surface restorations, USGS has approved subsequent reports of abandonment and royalties due the Federal Government have been received.

SUMMARY OF STANDARD MITIGATING MEASURES

The preceeding sections on Federal leasing procedures and State regulation of oil and gas operations refer to regulations and standard notice forms and stipulations which could apply to all geophysical operations for oil and gas and/or activities of oil and gas leasees on National Resource Lands in Oregon. The notice forms, stipulations, and regulations are summarized in Appendices B and C.

ALTERNATIVE TO THE PROPOSED ACTION

"No leasing" would involve an administrative decision by the BLM not to lease any of the National Resource Lands for oil and gas development.

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

NON-LIVING OR ABIOTIC ENVIRONMENT

Climate

The climate of eastern Oregon is characterized by hot dry summers and cold, wet winters. Precipitation and temperature data are presented in Tables 4 through 9. The Malheur Branch Experiment Station is located approximately 10 miles ESE of Vale while the Nyssa and Owyhee Dam stations are located about 14 miles SE and 25 miles south, respectively of Vale. The town of Vale is situated nearly in the center of the EAR area.

The annual precipitation averages 9.55 inches with the greatest amounts falling during the months of November, December, January and May. However, it should be pointed out that much of the November through January totals falls in the form of snow. The least amount of precipitation falls during the month of July.

The annual temperature averages 63.6°F with January having a mean monthly temperature of 28.7°F and July with 74.7°F. Accordingly, mean monthly highs of 36.6°F in January and 92.8°F for July reflect this trend as do mean monthly lows of 19.7°F for January and 55.9°F for July. The highest recorded temperature, 111°F was recorded at both the Owyhee Dam and at Vale while the lowest, -39°F, was recorded at Vale. The average number of frost free days in the vicinity of the EAR area ranges from 123 at the Owyhee Dam to about 151 at Vale.

Prevailing winds are north to northwest.

Topography

The topography of the northwest portion of the EAR area is characterised by a series of terraces and uplands dissected by numerous canyons and drainages. Generally, elevations rise from east to west and vary from 2,200 to 4,600 feet. Slopes vary from nearly level to steep.

The portion of the EAR area centered around Vale (elevations of 2,242') is flat in the center and in the northeast corner. The northwest corner consists of low rolling hills while the southeast corner varies from rolling hills to steep buttes. Two buttes, Rhinehart and Vale dominate the landscape with elevations of 2,920 and 3,169 feet respectively. The Malheur River bisects the level area into two separate plateaus.

The area south of Vale consists primarily of rolling plateaus dissected by several intermittent drainages.

Soils

The following data was obtained from a study conducted in 1969 by the Oregon State Water Resources Board (Lovell, et.al.) and is presented in Table 10. The soil type units refer to a map issued by the Oregon State Water Resources Board while data includes slope, major land use, drainage classification, runoff permeability, water holding capacity, root zones, shrink-swell potential, workability, erosion hazard, flooding potential, soil limitations, irrigation suitability, temperature limitations, and hydrologic groups.

Air

Presently, air quality is generally high. One exception is during the non-irrigating season. During this time, bare cropland is susceptible to wind erosion, with resultant dust storms, as low pressure centers with accompanying winds move through the area. Dust storms commonly occur during the time prior to or at the conclusion of the irrigation season, as fields are being, or have been, worked in preparation for crop planting. This is not a major problem or source of pollution.

A second pollution source is from smoke during range fires and from burning trash on agricultural lands. This is not a significant source of pollution and is a minor problem except during periods of temperature inversion.

Water

The Malheur River, a tributary of the Snake River, flows between the two parts of the area. Water quality of the Malheur River is low at present and intensive irrigation use degrades it further. This stream is seasonally warm, high in sediment and dissolved solids. Concentrations of basic nutrients, nitrogen and phosphorous, are high; phosphorous concentrations are particularly high. High nutrient concentrations have stimulated heavy algal growth. Concentrations of dissolved solids in the Malheur average over 1,000 mg/l. Bacterial contamination of the Malheur also exists. Dissolved oxygen concentrations fluctuate with low flows and algal activity.

Stream flow for the Malheur River ranges from no flow at times to over 12,000 cfs, with an average of 183 cfs for a 49-year period of record.

However, sediment and dissolved solid contributions to the Malheur from National Resource Lands within the EAR area are insignificant.

Several ground water aquifers exist within the EAR area. Quality of water varies among the aquifers; some waters are not potable. Some deeper wells 500-600 ft. produce warm water. Most potable wells within the town of Vale are 20-40 ft.

The shallow wells are located in flood plain alluvium of the Malheur river.

Geology

Stratigraphy - The oldest rocks in the region surrounding Vale and lying to the south are Miocene age and belong to the Deer Butte Formation. The formation is fairly widespread in the Kern and Sourdough Basins about 20 miles southwest of Vale. Here it consists of fine-grained tuffaceous sediments with a few inter-bedded basalt flows in the lower part and grades upward into massive sandstones and conglomerates. The Deer Butte Formation was deposited on a dissected erosion surface so the total surface varies considerably. The maxiumum thickness of the lower member is unknown, but is at least 415 feet while a maximum thickness of 1,248 feet has been measured in the upper member (Corcoran, et.al., 1962). The only exposure of the Deer Butte Formation is on the Vale Butte where well-cemented arkoses and conglomerates characteristic of the upper part of the unit form the butte as an erosional remnant. However, the formation almost certainly underlies the entire area.

The sandstones are composed primarily of quartzite, quartz, and chert grains with some plagioclase feldspar. The conglomerates have cobbles up to six or eight inches across and are composed predominantly of granites, rhyolites, quartzites and quartz. The source area for the Deer Butte Formation is not definitely known, but it appears to be about 35 miles to the southeast in the vicinity of Silver City, Idaho. Here, there is a mineralized granite stock about 10 miles wide by 25 miles long which seems a likely source for the quartz and feldspar present in the formation. Fossil leaves, bones and fresh water mollusks have been found in the formation but the vertebrate remains appear to be the most diagnostic and according to Shotwell are of Barstovian (upper Miocene) age (Johnson, 1961).

Overlying the Deer Butte Formation in the Vale area is the Chalk Butte Formation of Pliocene age. The Chalk Butte is a part of the larger Idaho Group which is also composed of the Kern Basin Formation and the Grassy Mountain Basalt. Of the Idaho Group, only the Chalk Butte Formation is present in the Vale area. Rocks of the Chalk Butte are the most abundant type at the surface within the Vale area and probably represent about 70% of the surface exposure. The formation is mostly sedimentary and the predominant lithologic types are tuffaceous sandstones, siltstones and conglomerates with lesser amounts of tuff ash beds and fresh water limestone. Interbedded basalt flows, generally less than 30 feet thick, are fairly common but are very local and lenticular so are not useful for correlation. A partial thickness of 538 feet has been measured at the type locality in SE¼, Section 22, T.20S., R.45E. However, the faulting present in the area and the relatively unconsolidated nature of the deposit, make the true thickness difficult to obtain. The environment of deposition apparently fluctuated from fluviatile (stream deposited) to lacustrine (lake deposited) with the lacustrine environment predominating in the Vale area.

Although the Chalk Butte is very poorly consolidated and weathers to gently rounded hills and valleys, the silt content seems to predominate over clays because there is very little evidence of landsliding. In the area north of Vale and in parts of the area south of town, there is some aeolian erosion but many former dune areas are now becoming stabilized by vegetation.

Leaves and fresh-water mollusks have been collected from the Chalk Butte and J.A. Shotwell has assigned a middle Pliocene (Hemphillian) age to vertebrate fossils from the type locality of Chalk Butte (Corcoran, et. al. 1962). Terrace gravels are found capping a good number of the ridges throughout the area but are especially numerous along the east of Lytle Boulevard and to the north of Vale. These gravels are of recent, Pleistocene and possibly upper Pliocene age and represent the erosional remnant of a once more widespread gravel flood-plain of the Owyhee and Malheur Rivers. Thicknesses range up to 50 feet or more and are comosed of poorly to moderately consolidated basaltic, quartzitic, and chert pebbles and cobbles. Sorting ranges from fair to poor and cementing material often consists of white caliche layers that both make the gravel hard to quarry and chemically undesirable for concrete aggregate.

There is no obvious faulting or fracturing in this area. Beds generally tip about 4 to 5 degrees to the northeast.

There is no known published geologic map on that portion of the EAR area centered about Bully Creek Reservoir. Various unpublished Masters thesis on the area are available for inspection either as open file reports of the Oregon Department of Geology and Mineral Industries or in several university libraries. The nearest published geologic map is the Mitchell Butte Quadrangle 1962 by R.E. Corcoran et. al. (1962). This map, at a scale of one inch equals two miles, covers a three mile by 14 mile section of the southern part of this area. The following discussion is based largely on an extension of the geology of the Mitchell Butte quadrangle plus field observations and publications, as referenced, on specific geologic topics.

The oldest rocks in the Bully Creek area belong to the Owyhee Basalt of middle Miocene age and is a very widespread unit in Malheur County, Oregon, consisting of basalt flows and interbedded tuffs. The unit is named for exposures along the canyon of the Owyhee River below Owyhee Dam which is approximately 25 miles south of Vale. The Owyhee Basalt can be traced southwestward to the Steens Basalt and northwestward to the Columbia River Basalt. The unit ranges in thickness from greater than 1500 feet in the Succor Creek area about 30 miles southeast of Vale, to a feather edge of a few feet in some areas about 15 miles south of Vale. The only known outcrop of the Owyhee Basalt in the Bully Creek area is in the southwestern portion where the Malheur River cuts through the basalt to form Malheur Canyon.

Overlying the Owyhee Basalt is the Deer Butte formation of late Miocene age. Deer Butte has been described in detail above for the Vale area. The distribution of the Deer Butte Formation has not been mapped in the Bully Creek area. This is, in turn, overlaid by the Chalk Butte Formation of Pliocene age and is also described above.

Structure - The EAR area lies in the western extremity of the depression known as the Snake River downwarp. This large structural trough, presently occupied by the Snake River, extends from Yellowstone Park in Wyoming across southern Idaho and into eastern Oregon. Continuing studies indicate the large down-dropped fault block, or graben, may be comparable in size and complexity to the Rhone Valley of Germany and the rift valleys of East Africa. The large structural trough is bounded by nearly vertical faults. The basin apparently gradually sank during the Miocene and Pliocene to receive thousands of feet of sediments. The fault system associated with the structure is only now becoming fully appreciated through recent geophysical exploration, (Couch, French and Johnson, 1975; Larson and Lillie, French and Couch, 1975). There are many more faults, trending mostly north-south, in the Vale area than previously thought. Displacements are very difficult to determine from surface observations because of the "healing" effects of the poorly consolidated Chalk Butte formation, but probably range in hundreds of feet. The downthrown side is usually to the east but the Lytle Boulevard area may be an exception with the Vale Buttes being upthrown with respect to the area west of the boulevard, accounting for the exposure of the Deer Butte Formation in Vale and Rhinehart Buttes. Formational dips in this area generally range from 2 to 5 degrees to the northeast, but are locally steeper near faults.

Recent work by the Oregon Department of Geology and Mineral Industries (Bowen and Blackwell, 1975), indicates that a major northwest-trending fault zone running through Vale and the eastern portion of the Bully Creek area. Temperature gradient data, stratigraphic information, physiographic observations and magnetic and gravity data all indicate the existence of a fault parelleling Lytle Boulevard and Willow Creek, called the Willow Creek fault (Fig. 5). Approximately 6 miles west of the Willow Creek fault lies the parallel Bully Creek fault. The area between the two faults is apparently downthrown. That is, the earth's surface has been broken along the fault lines and the area between the faults has sunk relative to the areas east and west of the faults. This area, called a graben, extends northward, probably through the eastern portion of the Bully Creek area. Bowen and Blackwell have confirmed that the Willow Creek and probably the Bully Creek faults are important geologic controls on the location of the geothermal resource. Evidence includes the presence of Vale Hot Springs on the Willow Creek fault, several warm-water wells both northwest and southeast of Vale, and the high heat flow southeast of Vale. Physiographic evidence includes the abrupt western face of Rhinehart Butte southeast of Vale and the lineament formed by Willow Creek valley which extends for 30 miles in a nearly straight line northwest of Vale. The Bully Creek fault is less topographically pronounced than the Willow Creek fault but the existence of

Owyhee basalt exposed at the surface in the Malheur River canyon area on the upthrown side of the fault plus stratigraphic evidence to the south are adequate confirmation of its location.

A second set of faults, approximately perpendicular to the Willow Creek and Bully Creek zones is also identified by Bowen and Blackwell. They have identified the Malheur River fault, which is believed to parallel the Malheur River northeast of Vale. Relationships are less clear but the hot spring above Bully Creek reservoir, sometimes called Neal Hot Spring (NW¼, Sec. 9, T.18S., R.43E.) is probably located on a northeast to southwest trending fault. The hot spring in Alkali Gulch (SW¼, Sec. 5, T.17S., R.45E.) may be on the same fault line.

Economic Geology - Aside from sand and gravel, there has been no significant mineral production in the EAR area. However, there has been considerable interest in other resources, including geothermal energy and oil and gas. Interest in mercury and uranium has been slight. The following narrative describes the current status of these resources. The location of these resources is shown in Figure 6.

(1) Minerals

(a) Sand and Gravel. Sand and gravel of varying quality is widely distributed at the higher elevations throughout the EAR area with a number of pits and quarries being opened. Most of the mineral has been used by the Oregon State Highway Department and Malheur County for road construction. Appreciable amounts have also been used by the various irrigation districts for lining canal banks to prevent erosion. Smaller quantities have been used by individuals for various uses. The abundance and wide distribution of gravel should mean that adequate sources will be available for local uses regardless of oil and gas development. Indeed, the gravel will be highly useful material in road, drill site and other construction required for oil and gas production if development does proceed. Cut and fill from new road construction may well expose new deposits that would permit closing and rehabilitation of some existing pits that are not aesthetically pleasing.

There are also several areas with rock reportedly suitable for building stone. These are unproven and in a somewhat unfavorable locations. Native stone has been used in building construction and for riprap along the Vale Flood Protection Levie on the Malheur River.

(b) Uranium. There are several claims filed in 1955 southeast of Vale, placing them in the Chalk Butte tuffaceous sandstones. There is no known mineral values in these sediments, but there was extensive claim-staking for uranium in this region as well as throughout the western United States during the 1950's. These claims were probably only speculative for uranium with no evidence of mineralization. These lands are not considered to be valuable for uranium. Locations of these claims is shown on Figure 6.

(c) Mercury. In the Hope Butte area north of Bully Creek Reservoir, there is a sizeable block of approximately 1,120 acres under mining claim location for mercury. Most of these claims were located in the early 1950's with some additions in 1964. Proof of labor has been filed in the County courthouse on the claims up to the present. There has been a considerable amount of exploration work done on the property. Most of this was probably done to fulfill assessment work requirements as production has been very minor. Mercury occurs as cinnabar intimately mixed with opalite, diatomite, and altered tuffs and lake bed deposits. Both the opalite, which is a light-colored rock consisting of a mixture of chalcedony, quartz, and opal, and the mercury were introduced along faults and fissures by hydrothermal or hot water solutions. If these deposits are characteristic of others around the world, mineralization is shallow, probably less than a thousand feet deep (Brooks and Bailey, 1969).

An additional mineral claim southeast of Vale, filed in 1965, was supposedly for the extraction of mercury. Examination of samples from various cuts showed no evidence of mineralization and the land is not considered valuable for mercury.

(d) Oil and Gas. A review of oil and gas exploration in eastern Oregon is presented above. Exploration for oil and gas has taken place in the Vale area since the early 1900's. Activity has been sporadic and tied to periodic fluctuations in nationwide exploratory activities. Several shallow wells provide gas for a number of local ranches and varying quantities of gas have been discovered in many of the test wells, but none have produced commercial quantities for sustained periods. Figures 2 shows the locations of exploratory oil and gas wells in Malheur County and Table 3 summarizes known data.

An inland sea invaded large portions of eastern Oregon during the Devonian Period (350 million years ago) and has subsequently retreated and invaded the area many times in geological history after that. More than 35,000 feet of sediments were deposited and formed the beds which have potential oil and gas value. Oil and gas are generated from burial of plant and animal remains deposited in marine sediments from that period. Those beds of continental origin (i.e., primarily lavas and volcanic ash) are not source beds for oil and gas.

Drill hole data showed traces of paraffinitic oil, asphalt or gas from eastern Oregon marine beds. The thick mantle of Cenozoic volcanics overlying the marine beds make drilling more expensive. Geophysical means are good enough to give adequate data on beds beneath the volcanics.

About 6,000 square miles in eastern Oregon are believed to be underlain by unmitamorphosed Mesozoic marine sediments with oil and gas potential. About 600 square miles are underlain by Tertiary-Quaternary freshwater lake deposits several thousand feet thick with gas potential in eastern Oregon.

The USGS in their determination as of June 7, 1968, considers the entire area valuable for oil and gas, as well as most of Malheur County. It should be noted that this determination is subject to change as new information becomes available. Leasing of land for oil and gas would be controlled by the government and would be compatible with other resource development.

(2) Geothermal

The Neal and Vale Hot Springs were both stagecoach stops in the early history of eastern Oregon and later became focal points of considerable geothermal interest. Detailed information on the properties of these and other geothermal springs and the accompanying geothermal activities has been described in detail in the Environmental Assessment Records for the Vale Known Geothermal Resource Area; Proposed Geothermal Leasing, Vale Known Geothermal Resource Area Addition; and, Proposed Geothermal Leasing, Bully Creek Geothermal Interest Areas, all of which are available at the Vale BLM District office. The locations of the areas covered by current leases are shown in Figure 6.

(3) Ground Water

There are no producing water wells on National Resource Lands in the Bully Creek area. Although there are numerous wells on private lands, especially in the alluvium of Willow Creek valley, this data is not available. It is known that the majority of these wells are for livestock and domestic consumption so water quality is high. Total dissolved solids is also high, as is typical of most desert and semi-desert aquifers but not so high as to be detrimental in most cases. Quantitative water quality data is not available. Ground water on the public lands is probably quite abundant as is evidenced by the large number of springs. Many of these springs have sufficient flow year-round to supply livestock watering systems.

Data on the ground waters in the area are available for only two stock water wells. These are the BLM North Harper and Page Wells in R.45E., T.19S. (Fig. 7). Static water level in the North Harper Well is approximately 600 feet or a water table elevation of 2,200 feet. The well has a total depth of 696 feet, a yield of approximately 8 gallons per minute and the maximum surface temperature of the water after pumping was 92°F. The Page Well has a total depth of 622 feet, a static water level of 434 feet, or a water table elevation of 2,415 feet. The well yields approximately 12 gallons per minute and a maximum surface temperature of the water after pumping was measured to be 80°F. The low yields are due to the fine grained nature and resultant low porosity and permeability of the Chalk Butte tuffaceous sandstones. Yields may be greater in the vicinity of the many faults which traverse the area.

Geological Hazards

Several potential geological hazards have been identified in the subject area. These include natural and induced seismicity and unstable foundation conditions.

Natural and Induced Seismicity - The subject area is prone to natural seismicity. It is located in an area classified as Zone II of expectable earthquake intensity. This is an area in which damage of moderate severity can be expected. This zone classification corresponds to intensity VII of the modified Mercalli Scale.

In addition to natural seismicity, there is the possibility of inducing seismic activity by fluid injection in or near potentially active fault zones during resource development. Specific site investigations, at a time when the actual injection sites have been determined, are required for definitive hazard evaluation.

Unstable Foundation Conditions - The frequency of occurrence of land slides in the subject area is unknown. Although there have been no land slide deposits identified within the area, several occurrences have been noted adjacent to it. Land slide deposits are unstable, and are to be avoided in drill site selection.

Several soil units containing tuffaecous materials occur within the subject area. These materials frequently alter to montmorillonite, and produce unstable foundation conditions because of the pronounced thixotropic and swelling properties of this clay. Again specific site investigations are required for definitive hazard evaluation.

LIVING OR BIOTIC ENVIRONMENT

Flora

The entire EAR area is considered to be a part of the Cold Desert Biome. The floral assemblage, the Agropyron-Festuca Association, is typically composed of bluebunch wheatgrass (Agropyron spicatum), Idaho fescue (Festuca idahoensis), Sandberg's bluegrass (Poa secunda), squirreltail (Sitanion hystrix) and big sagebrush (Artemesia tridentata), the latter a principal indicator of over-grazing. The topography of the area provides a wide variety of small vegetative habitats due to different exposures to solar radiation, slope of the land, and other differences. The more arid or xeric habitats often support spiney hopsage (Grayia spinosa), and a limited amount of purple sage (Salvia cornosa), fourwing saltbrush (Artiplex canescens), and horsebrush (Tetradymia spp.). Less arid or more mesic exposures support small populations of anetlope bitterbrush (Purshia tridentata), and associated perennial bunchgrass species, especially bluebunch wheatgrass and Idaho fescue.

A century of abusive vegetative utilization by domestic livestock has converted the majority of the bluebunch wheatgrass understory to one of annual grasses, notably cheatgrass (Bromus tectorum); annual forbs, especially mustards (Sisymbrium spp.), and peppergrass (Lepidium perfoliatum); and has increased the abundance of rabbitbrush (Chrysothamnus spp.) and big sagebrush in the shrub overstory. The more flammable annual species facilitated frequent wildfires to further alter the vegetative community toward sub-climax or seral vegetation. As a result of the Vale Range Rehabilitation Project, which began in

1962, several large areas within the analysis area boundary have been subjected to land treatment practices. The practices include plowing and seeding introduced grass or spraying with herbicide for brush eradication. These areas and the specific practices employed are delineated (Figure 8) and the range improvement jobs summarized on Table 11 and plotted on Figure 7. Most seeded areas now consist chiefly of a crested wheatgrass (Agropyron cristatum). Sandberg's bluegrass community with scattered plants of big sagebrush and rabbitbrush interspersed. Composition in brush eradication areas consists of somewhat less density of sagebrush with a composition of grass species representative of the better condition untreated areas. The predominant grass species of the untreated area at present is Sandberg's bluegrass. It is likely that this species has replaced bluebunch wheatgrass during the long history of abusive livestock use and wildfire vegetative changes.

Bluebunch wheatgrass can still be found in areas less accessible to livestock and areas furthest from water such as ridge and hilltops, rock piles, and rimrock ledges. Other plant species that can be found in the area are Indian ricegrass (Oryzopsis hymenoides), needle and thread (Stipa comata), Therber's needlegrass (Sitherberianca spp.), giant wild rye (Elymus cinereus), creeping wild rye (Etriticoides spp.), wild mustard (Brassica spp.), balsam root (Balsamoriza sagittata), Russian thistle (Salsola kali), Scotch thistle (Onopordum acanthium), current or gooseberry (Ribes spp.), and snowberry (Symphoricarpus spp.). The exposed surface of most rock have lichen growing on them. The undisturbed litter under sagebrush provides habitat for mosses.

Fauna

Wildlife Resources - The fauna of the EAR area is typical of the Agropyron-Festuca Association of the Cold Desert Biome. A list of mammals, birds, reptiles, amphibians and important arthropods characteristic of the area is presented in Appendix D. A portion of the area is irrigated farmland which provides an additional diversity of mesic habitats. The Chinese pheasant and valley quail are two common game birds in the irrigated areas.

Mule deer and pronghorn antelope are big game species characteristic of upland portions of the EAR area (Figure 9). The deer population is cyclic with the last peak appearing about 1960, but present numbers are unusually low and are concentrated on and about Cottonwood Mountain.

Pronghorn antelope utilize the brush-free burned areas, especially southeast of Hope Butte and south of Vale. Herd size varies with the severity of winter. During hard winters, as many as 250 individuals have been censused in the Hope Butte area.

Waterfowl use of Bully Creek Reservoir is heavy during the autumn and spring migrations. Wetlands along Bully and Willow Creeks and the Malheur River provide habitat for dabbing ducks, short reaches of other streams provide habitat for waterfowl during periods of streamflow.

Bully Creek Reservoir has been stocked with sport fish by the Oregon Fish and Wildlife Department and currently supports a fair to good trout fishery. During the next several years the largemouth black bass and crappie fisheries should develop. Morrison Reservoir, a large stock-water pond, also supports a trout fishery and has been fenced to exclude livestock.

Of the wildlife species found in the EAR area, only one, the western spotted frog (Rana pretiosa), is considered to be threatened by an interagency task force composed of Federal, state and academic representatives. The threatened status of this species is not rated.

Livestock - Grazing by domestic cattle and sheep occurs in the EAR area. The recognized grazing season in the areas of use -- or allotments -- is from April 1 through October 31. Authorized grazing use on Federal land is administered under Section 3 of the Taylor Grazing Act (43 U.S.C. 315, 315a, 315h, 315n). To facilitate management of licensed livestock and to improve range conditions, a large expenditure of public funds has been made for range improvements in the area. A large acreage of seedling, many miles of fence and numerous stockwater developments have been constructed over the past 30 years. For a complete list of range improvements in the area, refer to Table 11, and for project locations refer to Figures 7 and 8. A description of the grazing allotments and authorized use in the EAR area is presented in Table 12.

Approximately 460 remaining acres of Federal land in this area have no authorized grazing use.

There are no wild horses or burros protected under Public Law 92-195 within the analysis area.

Ecological Interrelationships

Ecological interrelationships deal with interworkings between and among all living and non-living components of a given habitat or area. The term eco-system is used when referring to habitat and community as an interacting unit. The functions of an eco-system are dependent upon the primary producers that convert solar energy to chemical energy. Plants generally are the primary producers which convert solar energy, moisture, and the basic elements into usable organic energy. The consumers -- cattle, deer, etc., use the plants and they, in turn, are utilized by man and predators such as coyotes, bobcats, etc. The decomposers are primarily bacteria and other organisms that break down material which is recycled through the system.

The eco-system approach attempts to consider the plant and animal communities and populations as a whole in relation to one another and to their total environment. The major component sub-systems are the hydrologic cycle, energy flow, and the nutrient cycle.

Hydrologic Cycle - The hydrologic cycle is depicted in Figure 10. The sun supplies heat energy and this, together with the force of gravity, keeps the water moving from the earth to the atmosphere as evaporation and transpiration, and from the atmosphere to the earth as condensation and precipitation. Stream flow and ground water movement complete the cycle. While there is no identifiable point of beginning or end, the oceans generally are considered to be the major source, the atmosphere as the transportation vehicle and the land as the user. Within the total system there is no water lost or gained, but the amount available for use may fluctuate widely seasonally and geographically with supplies ranging from too much to too little. Water quality impacts resulting from man's use of lands, natural resources, and water supplies complicate problems of maintaining balance with man's needs within the capabilities and limitations of this natural system.

Of the many factors which contribute to the physical environment of an eco-system, the movement of water into, through, and eventually out of the system is a major stimulus in the functioning of the system. This cycling of water in the eco-system essentially consists of precipitation inputs, run-off outputs, and a series of intermediate processes influencing the magnitude of the precipitation/run-off relationship. These include interception, infiltration, percolation, evapotranspiration, surface run-off and storage at various levels of the system. The hydrologic cycle may be combined into a conceptual model of watershed behavior in a grassland as shown in Figure 11.

The eco-system in which the EAR area is included (Cold Desert Eco-system) is characterized by low precipitation input with considerable variation from year to year. Evapotranspiration is great, the net result is little soil moisture is available when the weather is warm enough for the plants to use the moisture effectively. This reduces the potential for production of the living components in the Cold Desert Eco-system.

Energy Flow - Energy flows through the eco-system, it does not cycle. The components of the energy flow consist basically of abiotic inputs, producers, consumers, and decomposers as shown in Figure 12. For example, grasses (producers) capture energy from the sun by photosynthesis and utilize soil nutrients, water, etc. to produce vegetation. Herbivorous and carnivorous animals (consumers) feed on plants and other animals to acquire energy. Bacteria, fungi, and some kinds of animals (decomposers) derive energy in the process of decomposition of dead organisms. Energy is continuously being utilized (used by each group of organisms or lost) and new energy is being acquired from solar radiation.

In the Cold Desert Eco-system solar radiation is high but due to other climatic factors such as limited precipitation and sparce vegetative cover, little solar energy is captured by the plants and used. Therefore, the production capacity of the desert is greatly reduced and the food chain shortened.

Nutrient Cycle - Certain chemical elements such as nitrogen, oxygen, phosphorous, and potassium are essential for the maintenance of life on the planet Earth. These nutrients, as well as others, circulate continually through the environment following fixed patterns or cycles and in the process are made available in various forms to man and animals (consumers). For example, nitrogen is recycled from plants (producers) to the atmosphere and back in a complicated process whereby organic material is converted into inorganic ammonia, nitrites, and nitrate by successive armies of micro-organisms (decomposers). The nitrate, if not looped back through plants or stored in the soil, is denitrified, and the nitrogen is returned to the atmosphere as gas where it again is available to nitrogen fixing plants, thus, completing the cycle.

The nutrient cycle occurs slowly in the Cold Desert Eco-system as large quantities of nutrients are tied up in shrubby plants that have a slow rate of decomposition.

It is questionable whether the nutrient cycle is in balance on the lands within the EAR area. Livestock grazing intensities vary on these lands from moderate to heavy. Steep topography and lack of water in some areas are factors which restrict or prevent grazing altogether.

Livestock grazing accounts for a significant amount of the nutrients being removed from the area. Rodents also harvest a significant amount of vegetation. Rodents, in turn, are preyed upon by coyotes and raptors.

Coyotes are trapped in winter, primarily for their pelts. High fur prices has intensified this effort. They are also hunted for sport. The predators do not remain within the boundaries of the EAR area. The amount of nutrient loss resulting from rodent predation and the subsequent loss of predators is unknown. It is estimated that this loss is insignificant.

Succession

The stage of plant succession of the area has regressed considerably from where it was before the advent of white man in the area. Through historical uncontrolled grazing, the perennial grasses favored by cattle have been eliminated and less desirable grasses and brush have replaced them. Much of the site is capable of producing a much denser stand of perennial grass and forbs; however, the natural upward succession is slow due to low rainfall, poor and immature soils, and harvesting activities carried on by the rodents and livestock.

In an attempt to improve range and watershed conditions, areas with deeper, more mature soils have been revegetated through seeding of crested wheatgrass (Agropyron cristatum) an introduced perennial grass. This has created a patchwork of artificially induced seral communities. In areas that supported an understory of native perennial grasses, sagebrush was sprayed with herbicides to reduce brush-grass composition of these communities and speeded the increase of perennial grass cover in the treated areas. A complete list of seedings and brush eradication jobs can be found on Table 11 and locations of these land treatment areas are shown on Figure 8. Range improvement projects are shown in Figure 7 and tabulated in Table 11.

HUMAN VALUES

There are no known human inhabitants on Federal land in the EAR area, however, human influence is very evident. The farthest boundaries are of the area within a 30 minute drive from the City of Vale and large areas of the EAR area are visible from Vale. A large amount of private land around Vale is in cropland, much of which is under irrigation.

Recreational Values

There is a significant amount of recreational time spent on this area. Major recreational pursuits include off-road vehicle use which occurs throughout the area with most intensive use around the hills north of Bully Creek Reservoir and south of Vale. There is a cross-country motorcycle race course in the hills north of Vale. There is good chukar hunting in the hills and washes throughout the area and some deer hunting in the western half of the Bully Creek area. Varmint shooting occurs near the roads. Bully Creek and Morrison Reservoirs provide good sport fishing opportunities. A county park is located on the southeast corner of Bully Creek Reservoir which provides camping, picnicing and swimming facilities as well as opportunites for water sports and fishing. In the northwest corner of the Bully Creek area there is a "rockhound" area where cinnabar, petrified wood and some agate can be obtained. Figure 11 shows the location of major recreational areas in the EAR area.

Educational and Scientific Values

Approximately 15 miles of the historic Oregon Trail passes through the EAR area. A pioneer grave from the 1860 period (Wentworth girl) is located on Bureau of Reclamation land in the northeast corner of the Bully Creek area (Figure 13). The unmarked Glennville townsite is located nearby on private land.

The archaeological status of the area south of Vale in the EAR area is described by Ruebelmann (1975). On the basis of this report, one can expect to find archeological (and paleontological) sites throughout much of the EAR area.

Cultural Values

Historical Background - Malheur County, now recognized as one of Oregon's leading agricultural counties, was first settled by miners and stockmen in the early 1860's. Gold was first discovered in Mormon Basin in the northwest part of the county in the Spring of 1863. Soon afterward, the first two large stock ranches were established in Jordan Valley in the east central part of the county.

In the Fall of 1863, Jonathan Kenney built a small log house at the Malheur River ford on the Oregon Trail just south of the present site of Vale. In this cabin Kenney conducted a wayside inn for the accommodation of emigrants, miners, and freighters. The historic old emigrant road, forming a link in the line of travel between Independence, Missouri and the Willamette Valley of western Oregon, entered Malheur County near the mouth of the Boise River, crossed the Malheur River at Kenney's cabin, and left the county by way of Willow Creek and Tub Springs north of Vale.

In 1870, L. B. Rhinehart purchased the Kenney Station and in 1872 built a stone house. This old land mark, known as the "Old Stone House" is still standing. For years it was the only hostelry in this portion of the country. Until 1883, the Old Stone House occupied the site of the future town of Vale in solitary peace.

The Malheur River, Willow and Bully Creek Valleys, all tributary to Vale, became well settled and the little town grew to be an important trading center. The impetus given the town by its selection as the temporary County Seat in 1887 was considerable and many new business enterprises were added. The selection of Vale as the permanent County Seat by the general elections of 1888 and 1890 not only established the permanency of the town, but also strengthened it commercially.

By 1900 Vale had a population of about 130. It possessed a newspaper -- The Malheur Gazette, a bank -- The First Bank of Vale, a schoolhouse and one church -- The Methodist Episcopal Church. In addition there were numerous business enterprises, including the only flouring mill in Malheur County -- The Vale Milling Company. The citizens of Vale and the surrounding country determined to present the county with a much needed courthouse. A two story stone structure was completed on the site of the present courthouse in the Fall of 1902.

Until 1900 Malheur County possessed an excellent stock range of immense proportions. With increasing population and settlement of the county the range gradually failed to support the stock grazing upon it and stock raising declined. The farming industry began growing in importance in the early 188's in Malheur County.

In 1883 two important irrigating canals were built; the Owyhee canal, which distributed water from the Owyhee River in the immediate valley, and the Nevada canal which distributed water from the Malheur River in the lower Malheur Valley. These two canals had a significant impact on the community, contributing to make farming a profitable industry long after the stock industry passed into minor importance.

The Oregon Short Line Railroad was also a major influence in the development of Malheur County in the 1880's. A station was established at Ontario in 1884, which rapidly became an important shipping point as a result. It was more accessible from the stock ranges of Malheur, Grant and Harney Counties. The establishment of this trade center made the development of agriculture and other resources not only possible, but highly profitable.

Since 1900 the town of Vale has had a steady growth and has reached a population of 1,705. This growth is based on the development of the farming industry, primarily due to irrigation, and an increase in numbers of related agribusinesses. A general increase in population and a population shift from rural to urban living are nation-wide trends which are responsible for the growth of Vale and of Malheur County.

Social Background - Malheur County, like the nation in general, is undergoing a population shift from rural to urban living. Vale and the nearby towns of Ontario and Nyssa have shown large population increases while the county as a whole has not. There has been a considerable emigration from the county, especially in the 24-44 year age group. There is also an annual influx of several thousand migrant farm laborers during the summer harvest season.

The population of Malheur County is approximately 85 percent caucasian. Nearly 10 percent of the people are Spanish-surnamed, primarily Mexican-Americans. Japanese-Americans comprise close to four percent of the population. Included in the caucasian group is another ethnic group which has maintained its own separate identify within the local community are the Basques.

The Basques first came to eastern Oregon in the 1880's, settling in the area between Ontario and the Steens Mountains, on southward, where raising sheep was the main industry. Many were eventually able to acquire land and herds of their own. A large number of Basque ranches were established along Jordan Creek in the southern part of Malheur County.

The Basque way of life is rapidly disappearing. Many young Basques do not speak the Basque language. Their life style and values are more Americanized. Members of the younger generation no longer restrict themselves to the agricultural pursuits of their parents, or limit social contacts to the Basque community (Kressman and Yturri, 1938).

There are a little over 900 Japanese American people now living in Malheur County, mostly around Ontario. Prior to 1940 there had only been 20 to 30 families, but during World War II close to 4,000 Japanese people were evacuated from the coast to relocation camps in the county. In 1946, when they were allowed to return to the coast, the number dropped to approximately 2,000 (personal communication: George Iseri, Ontario, Oregon -- March 6, 1974).

He stated that approximately 75 percent of the Japanese Americans in Malheur County work in agriculture, and most of these own their own land. Many Japanese Americans in recent years have joined inter-ethnic rather than ethnic cooperatives, and are taking prominent roles in the affairs of local communities. One part of the Japanese culture very actively maintained is the Ontario Buddhist Church. With a congregation of about 900 people, it draws its membership from a large radius in Oregon and Idaho.

The population of Mexican American people in Malheur County fluctuates with the seasonal demands for farm labor. However, there are over 2,500 permanent residents living in the county year-round. The large percentage are United States citizens, approximately 30 percent being citizens of Mexico with permanent resident visas. Many Mexican Americans in the county speak little or no English. They continue to live in a culturally segregated environment where the Spanish language is the main form of communication.

<u>Social and Economic Situation</u> - Malheur County has a current population of approximately 24,100 people. Most of the population, about 75 percent, live within a 25-mile radius of the EAR area and will be directly effected by oil and gas developments. Most of the population is concentrated along the Snake, Malheur and lower Owyhee River valleys. The main towns of Ontario, Nyssa and Vale are in the agricultural area. In 1974 the population of Ontario was 7,700, Nyssa was 2,735, and Vale was 1,705. Nearly 40 percent of the people live in or near Ontario, about 16 miles east of the EAR area. Vale is nearly in the center of the EAR area.

The county economy is largely dependent on agriculture, livestock production being the highest single contributor to the economy. Other agriculture products are dairying, sugar beets, potatoes, onions and corn. The food processing plants at Ontario and Nyssa are dependent on the local agriculture. Ontario is the major trade center for Malheur County.

According to the 1970 census Malheur County was the third poorest county in the state, but is currently estimated to be the second poorest. Grant Morgan Association statistics indicate that nearly 4,600 people, about 20 percent of the total population, are living at or below the poverty level. The following table indicates the annual income at which the poverty level is determined:

For Family Of	Non-Farm Residents	Farm Residents
1	$2,000	$1,700
2	2,600	2,100
3	3,300	2,800
4	4,000	3,400
5	4,700	4,000
6	5,300	4,500
7	5,900	5,000
over 7	add $600 for each person	add $500 for each person

Most housing is owner occupied. Rentals in Ontario, Nyssa and Vale are very scarce. The area is served by two hospitals, the County Hospital at Nyssa and Holy Rosary Hospital in Ontario. One doctor and a dentist serve Vale. Six doctors and two dentists serve Nyssa. Ten dentists and 19 physicians serve Ontario.

ATTITUDES AND EXPECTATIONS

Local Attitudes and Expectations

Due to shortages of manpower and funds, it was not possible to conduct a comprehensive survey of attitudes and expectations held by the general public. In order to get some concept of public opinion, interviews were conducted with several local businessmen, news media personnel and government officials in the Vale - Ontario - Nyssa triangle. The following narrative is based on information gathered in these interviews for this EAR and previous EAR's pertaining to geothermal exploration issued by this office.

Vale - Attitudes in Vale were described as basically supportive of the status quo. People interviewed felt that in the past, conservative attitudes have discouraged and impeded commercial and industrial development in Vale. The rate of development is increasing, with local support, but continues to be limited.

According to the people interviewed, Vale citizens support strong local government and local control of economic development. They are concerned about the effects that rapid growth in population and/or development might have on the quality of life in their community. Those interviewed felt that most people living in Vale enjoy the rural style of life and wish to maintain it in their community.

The people interviewed felt that Vale would support an approximate growth rate of 5 percent, which would mean a growth in population of about 100 people. They also felt that the people of Vale would oppose heavy industry that was noisy or polluting, and would prefer small industry, varying in size from 20-30 to 30-100 employees.

Those interviewed reported that Vale supported the construction of Treasure Valley Community College, as well as the development of the West Park Plaza shopping center, although local business people were initially opposed to the shopping center. Both the college and shopping center are located in Ontario.

Nyssa - According to the people interviewed in Nyssa, public attitude there has supported planned development, a steady consistent growth pattern at a moderate rate. The development of an industrial park has promoted the growth of light and agriculture related industry in Nyssa. The people interviewed felt that industries such as Albertsons Feed Yard and the Amalgamated Sugar Company have brought stability to the whole irrigated valley area. Migrant workers are also seeking jobs in these industries more and more as the demand for farm labor decreases due to expanding farm automation.

People in Nyssa have not supported the Treasure Valley Community College, in the opinion of those interviewed, because of the increased taxes involved. Voters in Nyssa have consistently defeated TVCC budgets and nearly defeat local school budgets. The general public did support the construction of the West Park Plaza shopping center, although local business people had some reservations about it at first.

According to those interviewed, the people of Nyssa want clean, non-polluting, light industry, preferably related to agriculture. However, some respondents indicated that Nyssa may be forced to attract other types of industry to promote growth and that some people in Nyssa would support a free, open door policy to all new development. In addition, Nyssa is working together with Ontario to explore the possibilities of establishing a dry land port authority which would encompass the entire irrigated agricultural area, greatly enhancing industrial-commercial development.

The people interviewed felt that Nyssa would benefit the most from the growth of small industries in the range of 50 to 150 employees, stating that the people of Nyssa are very concerned about the stability of their local economy and would oppose any industry large enough to dominate the whole economic structure of the community.

Ontario - The people interviewed in Ontario felt that public attitudes there had undergone a change in recent times. They indicated that in the past Ontario had had an erratic growth rate, some areas of development not keeping pace with others, an effective pressure group often being the determining factor. Those interviewed expressed the opinion that public attitudes in Ontario now supported more balanced development with diversification in industrial, commercial and residential growth.

According to the individuals interviewed, the people of Ontario were divided over the issue of building Treasure Valley Community College, mainly because of the taxes involved. However, support for the college has grown since its completion. The people interviewed also indicated the development of West Park Plaza shopping center received the support of the general public, in spite of some initial opposition from downtown business people. The shopping center has brought in considerably more trade to the downtown business district which has off-set loss of some business to the shopping center. With the addition of West Park Plaza, Ontario draws from a trade area in Oregon and Idaho with a population of over 50,000 people.

Whereas in the past Ontario has encouraged any size and type of industrial development, according to those interviewed, public attitudes have shifted in favor of clean, non-polluting industries, particularly those related to agriculture. They also prefer labor intensive industries that create more jobs for local people rather than bringing in outside employees.

The people interviewed felt that Ontario has a great potential for industrial development, which may be expanded even more through the possible development of a dry land port authority in cooperation with Nyssa, as mentioned previously.

Public Attitudes and Expectations Toward BLM

According to the people interviewed, public attitudes and expectations of BLM management and activities are very positive. The people of Vale like having the BLM office in town which they see as a business that does not take resources out of the community but adds to the community. All of the people interviewed in Vale, Nyssa and Ontario supported BLM in its multiple use concept. The general public, with some exceptions, supports BLM management policies.

This has been a change from public attitudes previous to the Vale Project in the early 1960's. At that time, public attitudes towards BLM were very negative. The success of the Vale Project has apparently had a significant positive effect on public opinion.

Those interviewed indicated that people throughout the valley enjoy the use of open space in Malheur County, and value its availability for public use. People like open space to carry on their recreation activities and support county, city and Federal government programs which provide for open space. Quality of open space is more important than quantity of open space.

Public Attitudes and Expectations to Oil and Gas Developments

Based on the information gathered in interviews, representatives of local governments and the general public in Vale, Ontario and Nyssa are supportive of oil and gas resource developments and they feel that their communities will benefit from the developments. It appears that the general public is better informed technically on oil and gas resource development than on the problems associated with other resource developments, such as geothermal steam.

However, the failure of past drilling attempts in Malheur County to locate any economic reserves of oil or gas has installed a general attitude of pessimism among many local people towards the possibilities of economic discoveries by future operations. Some people believe that the possibility of any economic discovery is remote at best. They base this on the fact that previous drilling activities have resulted in only minor shows of oil or gas.

Several private landowners have been approached by oil company representatives concerning possible leasing of their property for oil and gas development. Attitudes have ranged from absolute refusal to acceptance of leasing.

Many people have heard and read about the proposed leasing of National Resource Lands for oil and gas resource developments. However, most are not aware of what oil and gas development activities would mean to them or what the processes involved would entail.

LOCAL REGULATORY STRUCTURES

Land Use Planning

The following information was obtained by interview from people in city and county government agencies in Vale, Nyssa and Ontario.

1. Acceptability of Planning Within the Local Population

   a. City Planning:

   The cities of Nyssa, Vale and Ontario all have city planning commissions. In general, the people of these cities accept and support land use planning. The cities recognize there has to be some type of zoning and planning to have an orderly growth. However, vested interest groups still oppose it.

   According to the people interviewed, the cities of Nyssa and Vale appear, at the present, to have enough land use planning to carry them through. The people of Nyssa are very interested in land use planning. The planning commission is becoming more active and responsive to land use planning. In the past, land use planning and zoning ordinances lacked enforcement; therefore, they were not followed like they should have been. This encouraged a minimum effort to be put forth toward any future land use planning. The City of Ontario has had a tendency to look at land use planning as a necessary nuisance but a favorable balance is beginning to emerge in the community.

   b. County Planning:

   Land use planning in Malheur County is less than two years old. In general, people of Malheur County were skeptical of land use planning. They were afraid the designation assigned to their land would be different from what they wanted to use the land for. A minority of people in the county do not see the need for land use planning and resent outside people coming into the area to tell them what the land can be used for.

The county government tends to look upon land use planning as a nusiance. The Oregon Legislature forced all counties within the state to develop land use plans. Malheur County was one of several counties in the state in which a deadline was set to develop land use plans or the state would do the planning for them. People in general are for county planning providing it is not to restrictive. The people are recognizing it is necessary and are accepting it.

2. Present Comprehensive Land Use Plans, Zoning Ordinances, Building Codes, and Oil and Gas Ordinances

a. Comprehensive Land Use Plans (Appendix E)

Malheur County Court adopted the Comprehensive Land Use Plan for Malheur County on December 12, 1972, (Commissioner Journal, Book R, p. 479). However, the Comprehensive Land Use Plan was not actually accepted until August 15, 1973, because of an oversight in the recording of the minutes of December 12, 1972, Court's action. The Comprehensive Land Use Plan has been reviewed and accepted by the State of Oregon but is subject to further review and modification by the State to meet State of Oregon objectives. The County was forced to take action or the State of Oregon would step in and do the Comprehensive Land Use Plan for them.

b. Zoning Ordinances

On approximately June of 1973, Malheur County did develop a County Zoning Ordinance. The Malheur County Court adopted the zoning ordinance and it was filed on record August 17, 1973, in the public records (Micro film Inst. 148901). The zoning ordinance still has to be reviewed and accepted by the State of Oregon.

The private lands involved within the EAR area fall under the following zones of the County Zoning Ordinance: Exclusive Farm Use (F-1), and General Farm Use (F-2). The private lands adjoining the National Resource Lands are zoned for Exclusive Farm Use (F-1), and General Farm Use (F-2) on the zoning maps that accompany the proposed ordinance. See zoning map (Figure 14) and Appendix F for zoning ordinance.

Under Exclusive Farm Use (F-1), and General Farm Use (F-2), conditional uses are permitted for mineral exploration, mining and processing. The conditional use reads as follows: "Operations conducted for exploration, mining and processing of geothermal resources as defined by subsections (4) of ORS 552-010, aggregate and other mineral resources as other subsurface resources" (See page 9 of Malheur County Zoning Ordinance). Therefore, oil and gas resource exploration and development is permitted under conditional uses with the approval of the Malheur County Planning Commission. According to the Malheur County Planners and District Attorney any company wishing to conduct mineral exploration and development on private lands must submit their plans to the Malheur Planning Commission for approval.

c. Building Codes

The State of Oregon Legislature passed and adopted a uniform building code act (Senate Bill 73-Chapter 834, Oregon Law 1973) which became effective on January 1, 1974. The Act stated that all cities and counties within the State of Oregon must conform to the State Building Code by July 1, 1974. The Act requires all counties and cities to use a building permit system. Permits will be acquired from the county and city governments. Either the state or county, both will furnish inspectors.

The State Uniform Building Codes referred to are as follows: State of Oregon Structural, Mechanical, Electrical, Plumbing Speciality Codes and Fire and Life Safety Code, 1973 Edition as amended, Uniform Building Code - effective on July 1, 1974.

d. Oil and Gas Ordnances

There are no oil and gas resource development ordnances for Malheur County. The provisions for exploration and development of "aggregate and other mineral resources as other subsurface resources" is described above for farm use lands (F-1 and F-2). Plans for oil and gas resource exploration and development must be approved by the Malheur County Planning Commission for approval and bonded by the State of Oregon. There is no provision for posting a county bond.

Type Adequacy, Structure and Enforcement of Local Governmental Entities

There are two different schools of opinion relative to the type and adequacy of planning staff, type of governmental structure, and enforcement by local governmental entities regarding the making of land use plans and planning decisions, implementing plans, and the willingness and capability to enforce the land use plans and zoning ordinances: there are those who hold to the traditional type of county and city government and believe the present governmental bodies are performing adequately and see no need for a change. On the other hand, there are those who feel a change is needed in the present local governmental structure because certain segments of the people of Malheur County are not represented and/or the local government could perform more efficiently and effectively with a different type of government structure.

An analysis of local governmental entities are as follows:

1. <u>County Government</u>

The majority of the people interviewed indicated the people desire a change in the type of county government. These changes vary from "Home Rule" type of county government, to the addition of several county commissioners (perhaps a total of 5 to 7), to the present existing county government structure. They indicated people feel they are not being properly represented and the county government structure does not produce but tends to be involved in today's crisis and only gets by with a minimum amount of effort. Because of the growing complexity of county government, people feel it should be managed more professionally. However, there is a minority of people who feel no change is necessary in the present county government structure.

As for making land use plans and planning decisions, the interviews indicated people feel the county is slow in reacting and implementing the plans and the personnel who are involved in the making of planning decisions should be more knowledgeable or take time to be more knowledgeable. They indicated other people feel the county needs a group of people to keep the county personnel, who are making decisions, informed of alternative choices and decisions. While other people feel land use planning is still too new, the county personnel have not obtained a feel for it, and additional time will be required to get the planning worked out and implemented. After the county personnel get their feet on the ground, they will do an adequate job.

The interviews indicated a majority of people feel the county does not have an adequate planning staff, and the land use planning and implementation is deficient. Others felt that the positions are available but the county does not offer enough money to hire good qualified personnel. A minority group felt the county has an adequate staff to implement planning but planning is still too new and it will take time to get it worked out.

According to the Malheur County Planner, Land Use Planning is new in the county and the county is in the process of implementing and enforcing the land use plans and ordinances. He recognizes the planning staff is presently inadequate in manpower and funds to meet the demand of implementation and enforcement. He indicated that to have an adequate staff, the county needs one planner, one assistant planner, and two inspectors. Presently, there is only one planner who is in charge of planning, drafting and inspection.

The interviews indicated the majority of people feel the county is willing and capable of enforcement of land use plans and zoning ordinances but, because of limited manpower and funds, the enforcement is weak. They feel the county has the information available but tends not to follow through on enforcement, or, only makes a token effort. Others feel the county is willing and capable of enforcing land use plans and zoning ordinances but fails to disqualify itself in conflict of interest decisions. A minority group feel the county is doing an adequate job of enforcing the county land use plans and zoning ordinances.

As mentioned, the Malheur County Planner recognizes the enforcement of land use plans and the zoning ordinance is inadequate because of the lack of available manpower and funds.

2. City Governments

a. Vale

Vale has a mayor and a city coordinator type of city government. It is similar to city manager type of government, except the city coordinator is personally involved in several different jobs, such as, recorder-city clerk and municipal judge. There are various opinions whether the city of Vale has the right type of governmental structure to make planning decisions. The people interviewed stated a majority of people feel it is not working adequately because adequate zoning ordinances have not been developed and/or perhaps followed, and not properly enforced. A minority group of people feel the present situation is working adequately, and they do not see a need for a change. Those who feel the structure could be improved say positions are available within the city governmental structure but inadequate salaries are offered to hire good qualified personnel. Some of the planning services are contracted out and the Southeast Council of Government is relied upon for assistance on occasions.

The interviews indicated that many people feel the city of Vale has the willingness and capability to enforce existing city ordinances but the enforcement tends to be weak in some areas. Zoning ordinances sometimes are not properly enforced because city officials fail to disqualify or separate themselves in conflict of interest decisions and issues.

b. Nyssa

Nyssa has a mayor and city manager type of government. There are various opinions as to whether the city of Nyssa has the right type of governmental structure to make planning decisions. The interviews stated some people feel that under the present situation, the city does not have an adequate type of government structure because the staff and goals need to be changed. However, there are others who feel the present government structure is adequate.

The city of Nyssa presently has a very limited staff to plan, implement plans, and enforce plans in a proper manner, according to the Nyssa City Manager. He indicated the city could not handle land use planning on a large scale basis. The city of Nyssa has the capability to enforce the land use plans and ordinances but no leadership was expressed to carry out the enforcement. According to Nyssa City Manager, he would like to see the city upgrade their zoning ordinances and land use plans and establish some long range goals.

He indicated that in the past, zoning ordinances and land use plans lacked enforcement. Therefore, the local use plans and ordinances were not followed like they should have been. The city was getting by with a minimum of effort.

c. Ontario

Ontario has a mayor and city manager type of government.

All the people interviewed felt the city of Ontario has the right type of governmental structure to make planning decisions. According to the Ontario City Manager, the city of

Ontario has an adequate staff to plan, implement plans, and enforce plans in a proper manner. However, there are those who feel perhaps the city may be slow in preparing and implementing plans.

The city of Ontario has the capability to enforce the land use plans and ordinances. According to the Ontario City Manager, land use plans and ordinances are very strongly enforced. He also stated there have been very few requests for re-zoning in Ontario.

Need for Additional Ordinances and Land Use Planning

The majority of the people interviewed felt the county and city of Vale should definitely develop ordinances for geothermal and other mineral resource exploration and development, or at least develop an ordinance on a limited scale to get a feel for the problems. However, a minority felt no ordinances should be developed.

Those people who are knowledgeable and involved in land use planning and development of ordinances felt very definite about developing mineral resource ordinances while those who were not knowledgeable were opposed to any more ordinances. The people's concern spurred the Malheur County Planning Department to initiate and develop Oregon's first County Geothermal Ordinance on June 19, 1974 and may lead to the formulation of other ordinances pertaining to the development of other mineral resources.

According to the Malheur County Planner and District Attorney, mineral resource development is included in the present Malheur County zoning ordinance. Mineral resource exploration and development is permitted under conditional uses with the approval of the Malheur County Planning Commission. Therefore, any company wishing to conduct oil and gas resource exploration and development on private lands must submit their plan to the Malheur Planning Commission for approval.

III ANALYSIS OF THE PROPOSED ACTION AND ALTERNATIVE

The following section describes the anticipated environmental effects of oil and gas resource development in the EAR area and recommends specific measures to lessen or preclude such impacts. To make this analysis, the following constraints and conclusions were assumed:

1. All operations undertaken by the lessee will be in conformance with applicable Federal and State laws and regulations and

standard lease stipulations as detailed above under Summary of Standard Mitigating Measures in I, Description of Proposed Action and Alternative. The proposed action, as it is regulated by such laws, regulations, and stated operating procedures is what is being analyzed.

2. Additional, site specific, environmental assessments are a prerequisite to all surface exploration and/or development. The purpose of such subsequent analyses is to identify the environmental impacts of the proposed surface disturbing operations and to recommend appropriate mitigating measures to be included in the operations permit.

3. Road construction associated solely with oil and gas exploration will not be extensive. Many existing roads in the EAR area are capable of supporting loads associated with exploration equipment. Additional road construction would be costly and possible locations physically limited by topography.

4. A moderate oil and/or gas discovery in the maximum reasonable level of development; any production will be transported to existing refineries for processing and distribution. This is based upon the history of oil and gas exploration in Malheur County. Over 30 wells ranging in depth from 163 to 8,414 feet have been drilled with no commercial discovery. Even though such history is not conclusive, it appears reasonable to assume that any future commercial discoveries will be small to moderate in size, not justifying the installation of refineries.

In addition to these assumptions, the following analysis must also consider the possible type of impacts associated with the unpredictable -- accidents and errors in judgement, e.g. oil spills, fires and well blowouts. Since they are unpredictable happenings, the size or degree of the impact is debatable. A view of recent exploration and development history may help bring some perspective to such a debate.

In fiscal year 1975 (July 1, 1974 - June 30, 1975), according to the USGS, fires and well blowouts occurred on 20 of the 10,092 producing onshore Federal leases as follows:

Fires		Blowouts	
Wyoming	7	Wyoming	2
Oklahoma	2	New Mexico	4
Mississippi	1	Colorado	2
	10	Utah	1
		California	1
			10

Table 13 is a compillation of crude oil spills reported to the Environmental Protection Agency in five western states during 1972. The figure represents only oil spills attributed to field operations and do not include transportation or refining of crude oil. Of the total, 40 percent resulted from flow line corrosion or freezing with the remaining 60 percent caused by human error, mechanical failure, natural causes, poor maintenance, or in a few cases, vandalism. The data includes spills in all ownerships --Federal as well as state and private.

ANTICIPATED ENVIRONMENTAL IMPACTS

Non-living Components

Geology - Slope stability hazards, flood hazards, subsidence, earthquakes and volcanic hazards are the principal geologic hazards which may either interrupt or destroy oil and gas operations in the EAR area. The effects of erosion will be described below under soils. The construction of access raods would probably be the activity most likely to be affected by geologic hazards with pipeline construction, well drilling, and oil and gas production following in order of importance. A possible benefit of oil and gas exploration would add to the fund of knowledge of stratigraphy, structure and geologic history of the region and may aid future evaluations of mineral and energy potentials. Additional load construction associated with exploration and development could be used for range management and recreation access.

1. Slope stability hazards - The probability of mass movements of unstable slope material in the EAR area is not as great as in some National Resource Lands, but remains as a factor which must be considered in oil and gas resource development planning. Landslides, rockfalls, debris avalanches, mud flows and soil creeps are natural phenomena which have been known to occur in the area. Triggering events include human activities and natural processes such as earth quakes, heavy rains, and rapid snow melts.

    a. Slides - Slides usually involve surface material such as soil, rocks and vegetation. However, some slides contain bedrock. Bedrock slides commonly move along planes of weakness in the rock. Planes containing clay materials in tuffaceous shales dipping 15 degrees or more tend to be more plastic when wet and large masses of material can move if the slope is steep enough.

    Steep slopes are prone to rapid slides or rock falls with movement of materials as high as hundreds of feet per second.

Areas are considered to be steeply sloping when regional slopes average 50 percent with local slopes ranging from 30 percent to vertical. Areas with moderate slopes, ranging from 20-30 percent, may be prone to slower moving slides. Rapid slides have been known to have caused fatalities and extensive property damage. Slower slides, even though they are not usually fatal to man, have caused significant property and environmental damage.

In oil and gas fields, slides can rupture pipelines, cause oil spills and well blowouts, rupture wells, pollute groundwater and damage foundations.

b. Mud flows - Mud flows are not common in the EAR area. These occur when water on sloping land saturates the soil, reducing its internal friction. Mud flows can move quickly, especially on steep slopes, or barely perceptible rates on gradual slopes.

2. Flood hazards - Should oil and gas resource development facilities be placed on terrain that has a flooding potential, the resultant flooding could rupture pipelines, wash out roads, damage wells, and create other environmental problems.

3. Subsidence - Subsidence of the ground surface above an oil and gas reservoir could result from the withdrawal of large volumes of fluids from poorly consolidated formations charged at greater than hydrostatic pressure. Such subsidence would reach a maximum rate during the production phase. Subsidence can be reduced or prevented by adequate geological studies, planning and engineering controls.

Subsidences can cause cracked foundations, structural damage to large storage structures and other facilities, reservoir failures, pipeline ruptures, and subsurface aquifer damage.

Most incidents of deep subsidence have been caused by fluid withdrawal at depth. Usually, the withdrawn fluids have been either water, oil, or both. Deep subsidence can be prevented or stopped by reinjecting fluids or slurry.

Shallow subsidence occurs when surficial material settles. Heavy structures on poorly consolidated soils such as low density silts, peat, peaty soils, or wet marshy soils have caused subsidence. The pressure of a heavy structure or structures is sufficient to drive much of the water out of the soil or compact low density dry silts. Heavy structures may also sink into soft clayey soils with low bearing strengths.

4. Earthquakes - Historical data on earthquakes in Oregon indicate that there has been no loss of life and damage confined to cracked walls, masonry chimneys, broken lights and windows, and objects falling from shelves. Although Oregon lies within the Circum-Pacific Earthquake Belt, the state has fewer recorded earthquake shocks than either California and Nevada lying to the south or Washington to the north.

   Between 1841 and 1958, 167 noticable quakes occurred in Oregon, of which 90 were in the western part of the state and 73 occurred off shore. There is no data on the strength of earthquakes in eastern Oregon, but there is one quake of Intensity V on the Modified Mercali Scale (Intensity I: low -- Intensity XII: total destruction) per decade in the western part.

   There has been some speculation that a fault zone under stress could trigger earthquakes. The only recorded instance involving petroleum operations occurred in Rangely Field, Colorado, where earth tremors appeared to be related to fluid injection in connection with petroleum waterflooding. A U. S. Geological Survey report on the Rangely Field indicated, however, that water injection could possibly assist in preventing earthquakes. Although it is a well known fact that earthquakes occur when there is movement along a fault zone, such as the San Andreas Fault near the Pacific Coast, many subsurface faults related to known oil and gas reservoirs have retained their stability over long periods of geologic time. This is evidenced by the fact that these faults (known as "sealing faults") often form subsurface traps for petroleum.

   If these had not maintained their stability the petroleum would not have remained trapped for long periods of geologic time.

5. Volcanic hazards - The probability of hazards from volcanic activity in eastern Oregon is extremely remote.

Soils - Soil erosion and probability of slope failures will increase with the construction of access roads, trails, drill pads, tank batteries, pipelines and associated field facilities. The increase will result from the removal of protective vegetation and associated detritus, the compaction of soil, alteration of natural drainage systems, and undercutting or overloading of natural slopes.

The movement of heavy equipment and various construction activities increases airborne dust particles and deteriorates air quality in direct proportion to the loss of protective vegetation. Road construction not only destroys vegetation but channels over surface water flow, increasing the sediment load of run-off water and, consequently, the scouring action. Increased soil loss and stream sedimentation result.

Increased human activity on the land within the EAR area increases the potential for accidental fires. Vegetation destroyed by fire increases the loss of soil through wind and water erosion.

The sidecast of roads built on steep sideslopes can be unstable, depending on the nature of the soil. The sidecast can become fluid during heavy snow melts or during short periods of hard rainfall and "sluiceouts" result, scouring away soil in its path. The result is loss of vegetative growth sites and high amounts of sediments in streams.

Road construction could also initiate rotational type slides. Slides of this type are found on slopes usually less than 50% when the toe of a rotational slump is removed, it increases the likelyhood of mass soil movement by the removal of support. The size of rotational slump ranges from ten hundred cubic yards to several million.

Soil could be eroded if drill cuttings were accidentally jetted from the mud pits during the drilling of stratigraphic test holes and wildcat wells. The chemical additives in the drilling mud could also destroy nearby vegetation and increase the potential for erosion. If the well were not properly cased, briny water could enter an aquifer which had been penetrated while drilling. The polluted water could lead to the surface where the aquifer outcrops, destroying vegetation and causing erosion. Accidents such as explosions, fires, spills, leaks, and blowouts could reduce vegetative cover over relatively large areas. Such accidents could also cause soil sterility.

The overall erosional impact would be greater and of longer duration during the development stage. However, it would occur over a limited area. The wells would be connected by road systems which would have a greater impact than a road to a single exploration well. Each additional well would increase the overall impact due to the additional area involved. The construction of dams, tank batteries, pump stations, camps, and flow lines would have a moderate to severe impact on soils due to erosion caused by the loss of vegetation, compaction, and disturbance caused by construction. The impact from accidents would be the same as those described for the exploration phase. Each new well would decrease the potential for accidents. The potential for well blowouts would decrease if the subsurface pressures were known.

Erosional impacts of drilling would increase as the production phase is entered should additional oil and gas zones be discovered.

In secondary recovery operations, additional erosion would be caused by construction of drill sites, flow lines from the separation facilities, and water sources for injection wells. Continual use of roads and trails by heavy tank trucks and maintenance vehicles would compact the soil. Overland water flow would increase unless the roads were surfaced. Erosion would occur along stream banks if streams were forded at low water crossings.

The magnitude of fires, leaks, and spills during the production phase could be greater than during other stages of development. Fires at a tank battery or treatment plant could cause erosion because of the loss of vegetative cover and temporary soil sterilization.

In the abandonment of a field, it might not be possible to reclaim all disturbed sites to their condition prior to development. As a result, erosion rates might be higher than they were before oil and gas were discovered. If mud pits were not properly reclaimed, they might be breached after field abandonment. The escaping fluids could destroy vegetation and lead to soil erosion.

Improperly abandoned roads could create additional erosion problems.

Land Use - Oil and gas exploration, development and production activities may conflict with other land uses, particularly in areas where comprehensive land use plans have not been adopted and implemented.

The amount of land required for oil and gas field operations would be influenced by well spacing patterns, whether oil or gas were discovered, the extent to which oil and gas field facilities were duplicated, and terrain. The land used for all facilities in a developed field may range from approximately 22 acres per square mile with a 20-acre per well spacing pattern, to less than 3 acres per square mile with a 640-acre per well spacing pattern. The amount of ground used in actual operations may be greater in some areas and less in others. Most spacing units established at the present time for oil wells on Federal leases are from 10 to 40 acres per well. Less land is usually used in gas fields than in oil fields because gas production often does not require storage on the lease. The most common spacing patterns established at the present time for production of gas on Federal leases are 160, 320, or 640 acres per well. Generally, more land would be used for roads in steep terrain than in flat county.

Construction and operation of oil tank farms, battery and pump stations, oil collection and transportation lines, and electric transmission lines associated with an oil or gas field could constrain or curtail land use activities in the immediate vicinity.

Roads, trails, airstrips, and other facilities left after abandonment of oil and gas operation could benefit exploration and development of other mineral resources. The presence of electric transmission lines could provide a ready source of power for development of minerals other than oil and gas in an abandoned field.

All phases of oil and gas operations would affect, to some degree, recreation uses and values. Construction of facilities would change the appearance and character of the land. Where development occurred, land would be removed from recreation use. Public access to operating fields, unless closely supervised, could be denied because of possibilities of vandalism or injury.

Recreational uses which depend on motorized travel such as fishing, hunting, rockhounding, and off-road vehicle uses, could benefit because of improved access. Better access, however, could adversely affect some resources because of overuse and crowding.

Oil and gas operations could disrupt agricultural activities on surrounding land. The impact on livestock forage losses caused by roads, wells, and other developments would normally be minor. Livestock grazing would be adversely affected to a minor extent by the intensive activity associated with a developing field. Historical or seasonal patterns of livestock use might be disrupted. In some areas, roads developed for oil and gas operations could be used for range management purposes.

All phases of oil and gas operations would introduce changes in populated areas. The possibility of accidents such as fires, blowouts, and subsidence would be a matter of some concern. Oil and gas operations could also produce noise, odors, and visual intrusions in these areas.

Air - Preliminary investigations using existing systems of unsurfaced roads during dry weather may raise heavy clouds of dust. Dust levels could be especially high in xeric sites during the dry summer season, especially during the intensified construction activity of the development phase.

During the construction of access roads and drilling sites in the exploration and development stages, the engines of construction machinery emit exhaust fumes and particulate matter.

A well blowout may discharge natural gases into the atmosphere. These may be odorous or toxic, or both, such as hydrogen sulfide. Other blowout emissions include brackish or saline water, drilling mud and (very rarely) oil. These pollutants may be sprayed hundred of feet into the air and, in strong winds, can be carried for distances of more than a mile.

Air quality would be degraded if natural gas were flared or oil were burned during drilling and testing operations.

A blowout can result in a fire when highly volatile hydrocarbons are ignited by contact with hot engine manifolds or sparks from engine exhausts. The fire may burn for days or weeks before it can be extinguished, emitting smoke and the products of hydrocarbon combustion into the atmosphere.

It is well known that the climate near the ground and surrounding vegetative cover (micro-climate), may differ significantly from the surrounding micro-climate. Oil and gas activities which remove vegetation alters micro-climates. Although such changes may be limited to relatively small areas, the micro-climate within those areas undergo significant damage. Destruction of vegetative cover exposes the soil surface to direct solar radiation, increased air movement and higher wind activities. As a result, soil temperatures and mosute losses from evaporation will increase. The effects of destroying or changing the vegetation will vary with the size and density of the vegetation and the size of the area.

Water - The greatest impact of preliminary investigation activities on water resources would be an increase in the suspended sediment concentration of streams caused by road construction and increased travel of vehicles over un-roaded terrain. This would be particularly true if roads were hastily constructed by tractor and where streams were forded by heavy equipment.

Exploratory wells in the EAR area would probably penetrate groundwater aquifers. If the wells were not properly cased or sealed as called for in Federal and State regulations, brines could contaminate groundwater supplies.

If mud pits constructed for exploratory wells were improperly located on sites which could slide into streams, fine silts and clays, caustic chemicals, acids, soaps, oils, and brines contained in drilling mud could enter streams. The silts and clay could increase suspended sediment concentration of the water and form channel deposits subject to further erosion during periods of high flows. The remaining pollutants could reduce the quality of the water for use as a domestic supply. At high concentrations, some chemicals could be toxic to aquatic vegetation. Destruction of stream channel vegetation could increase channel erosion.

Development of an oil or gas field would require the construction of additional roads. If they were improperly constructed, they could contribute excessive suspended sediment to streams and introduce the possibility of oil leaks entering streams.

If sewage disposal systems for crew housing were improperly designed or constructed, streams could be contaminated with sewage effluent. Some soils in the area are unsuitable for septic tanks because of low permeability and/or high groundwater tables.

During the production phase, water could be contaminated because of leaks in pipelines and corrosion of well casings in producing wells and injection wells. Effects of groundwater contamination might not be noted for some time if the permeable layer intersected a stream a long distance away or if a groundwater pumping well were far removed from the oil well. If the aquifier were extensive but not used, the potential for future groundwater utilization would be reduced.

If mud pits were not properly reclaimed upon the abandonment of a field, they could be breached and allow sediments to reach bodies of water. Abandoned roads could continue to erode and contribute sediment to streams. Corrosion of the casings of capped and plugged wells could allow contamination of groundwater reservoirs.

Living Components

Aquatic Flora - Activities associated with discovery, development, and abandonment of an oil and gas field could impact aquatic vegetation as a result of (1) surface disturbance and accompanying erosion; (2) disposal of by-products of the production process; (3) accidental spills of drilling mud and oil; and (4) use of water for oil and gas field operations.

Construction of access roads for preliminary investigations, exploration, and development would cause some soil erosion. Cut and fill slopes which expose soil to wind and rain could ultimately result in soil particles being carried into the aquatic habitat. When roads are built across steep slopes, the potential for mass soil movements is increased. If landslides enter stream channels, stream banks with steep gradients are scoured and downstream vegetation is covered by sediment and debris. Where slides do not enter stream channels, runoff from the newly disturbed areas can contribute large quantities of silt to the stream below. The chronic low-level yield of soil from gravel-surfaced roads causes sedimentation of aquatic habitats. As vehicles use the road, small quantities of silt are worked to the surface and washed into drainageways with each rain.

Construction of roads and survey lines during the exploration and development phases would estroy aquatic vegetation where they crossed streams, marshes, or small ponds.

Sedimentation caused by oil and gas construction operations would have a long-term effect on aquatic plants, especially in shallow waters of marshes and ponds. Deposition of sediments changes habitat conditions by making water more shallow, accelerating the natural process of plant succession. Turbid water prevents solar radiation from penetrating to lower levels and limits photosynthetic activity, reducing the productivity of the water mass. It can also smother vascular plants with a deposition of fine particles.

Aquatic vegetation could suffer both short and long-term impacts if exploratory actions disrupted or eliminated the water supply of small springs. If they were improperly cased, stratigraphic and wildcat wells could alter ground water hydrology, reducing aquifer flows. Lowering of ponds, springs or marshes or reduction of summer stream flow adversely affects aquatic plants. As water levels and/or stream flows are reduced, less living space and few nutrients are available to the aquatic vegetation.

Aquatic habitat would be adversely affected during the development and production phases if oil entered streams as a result of pipeline leaks in the gathering system; spills, leaks, and equipment failures while handling and storing extracted oil; and defective separators. Experiments and studies of accidental spills show that crude oil and distilled products are toxic to plants.

Fire started by blowouts, explosions, or other accidents could burn riparian vegetation as well as emergent plants in marshy habitats.

<u>Terrestrial Flora</u> - Vegetation can be affected during the preliminary investigation and exploration phases by cutting and clearing of vegetation, earth moving operations, and exposure to fire.

Vegetation destroyed by clearing operations is not always confined to sites cleared for roads, buildings, flowlines, wells, and other facilities also call for clearing operations. Soil erosion which starts on the cleared sites may progress to adjacent lands. As the productivity of the lands is lowered, vegetative growth will be reduced because of the loss of organic matter and nutrients, a breakdown of soil aggregates, a reduction of field capacity, a reduction in the rate of infiltration of water, and a decrease in activity of the soil flora and fauna. In addition, material carried away from the cleared area can kill vegetation when deposited elsewhere. In general, regions having steep slopes, weak underlying rocks, a surface bare of vegetation, and subject to torrential rains suffer most from erosion.

Another adverse impact associated with surface clearing is reduction of site productivity due to soil compaction by heavy machinery. Where compaction occurs, vegetative growth is reduced due to the physical restriction of root growth and reduction of water available for plant growth. Wet soils are most susceptible to compaction.

Site productivity is also reduced on cutbanks and sidecast material where soil humus has been removed or covered by sterile soils from lower horizons.

Oil or briny water could kill terrestrial vegetation and reduce site productivity. Vegetation could also be killed or damaged if mudpits leak, break, or overflow.

Vegetation might be adversely affected by polluted air if hydrogen sulfide escaped from oil and gas wells or if liquid or gaseous wastes produced during well testing were burned.

Oil and gas operations could increase the potential of wildfire in the proposed lease areas. Fires could be started by well blowouts, operation of mechanized equipment, and careless smokers. The threat of wildfire in the EAR area ranges from slight to none during winter to high during the dry period of June through September. Fire may reduce soil productivity through loss of soil nitrogen and other essential elements either directly or through loss of vegetation.

The greatest threat to vegetation during the production phase is exposure to oil, brine, and toxic gases. The potential of spills increases as flowlines, valves, pumps, and storage tanks deteriorate during the life of the operation.

Aquatic Wildlife - Activities associated with oil and gas exploration and development could adversely affect aquatic organisms by increasing stream sediment loads and by physically changing or polluting aquatic habitats.

The sediment loads of most streams in the EAR area are the results of natural erosional processes. However, oil and gas exploration, development and production activities could cause sediment loads to exceed those attributable to natural processes. Most natural sediment is transported during high stream flows of winter when impacts to the biota are minimal. Sediments created by land disturbance activities frequently occur at lower flows and at other more critical times of the year.

Oil and gas activities which can lead to sedimentation include:

- Road construction. The potential for sedimentation would be particularly high if steep cut banks along streams and gullies were disturbed, gravel removed from streams, stream channels relocated, or streams forded or crossed without culvert installations. Roads that are poorly maintained or not surfaced for year-round use often contribute heavy sediment loads.
- Drilling of stratigraphic and exploratory wells.
- Accidents which result in loss of vegetation.
- Construction gathering system pipelines.
- Clearing for well sites and tank battery installations.
- Constructing crew facilities and sanitary facilities.
- Constructing drilling mud pits.
- Preparing areas for abandonment.

These activities could alter aquatic ecosystem by causing sediment to be deposited in stream channels and ponds. The physical changes would have undesirable effects on populations of fish and other aquatic organisms.

Sediment blocks the transmission of light through water, reducing algal and vascular plant production and imparing the ability of many species of fish, including trout, to feed. When sediment covers spawning and feeding grounds, it reduces the survival potential of many species and encourages higher rates of cannibalism among many.

Sediment can adversely affect other aquatic wildlife by filling living spores, covering food supplies, interfering with feeding, interrupting reproductive functions, and smothering aquatic invertebrates such as mussels and larval insects. All of these impacts would reduce the numbers and productivity of invertebrates.

If road construction initiates land slides, aquatic habitat could be adversely affected by excessive sedimentation and stream channel scouring. The resulting movement of soil and debris into streams can displace and kill fish and other aquatic life downstream from the slide. Of greater impact than the immediate mortality of aquatic life is the loss of the stream's biological productivity due to physical alterations. Stream banks can be scoured, gravel lost, pools obliterated, and barriers created. The habitat may not be restored to its former productivity for many years. The potential for slides is high in several portions of the EAR area because of steep slopes, unstable soil materials, and periodic heavy moisture, especially during the winter months.

Large quantities of sand and gravel are often required for roads, well sites, and other construction. If these materials were removed from streams, fish and other aquatic life could be lost and aquatic habitat destroyed. Channel changes frequently reduce total habitat and increase gradient. Increased gradients cause increased velocities, greater scouring, and less hospitable habitat. Fish cannot negotiate streams with excessive velocities.

If culverts were not installed to appropriate standards, barriers for resident fish, especially during spawning seasons, could be created. Conditions at the outfalls of improperly installed culverts keep fish from entering the culvert; or velocities are too great for fish to swim the length of the culvert.

Crude oil contains a water-soluble fraction that is toxic to fish and other organisms.

Saline water emitted during well blowouts may be blown great distances if strong winds prevail at the time. Leachates from the briny water could degrade surface water quality after the accident.

Water contaminated with hydrogen sulfide gas could accidentally enter surface water during well drilling operations or well blowouts. The gas is highly toxic to fish.

Caustic additives to drilling mud could get into local waters during blowouts or if mud pits were accidentally breached. Caustic compounds destroy sensitive gill tissue of many organisms, causing impaired ability to absorb dissolved oxygen and dispell metabolic wastes.

Shallow ground water aquifers could become contaminated by saline water, oil and gas from stratigraphic test holes and wildcat wells if they were improperly cased. Blowouts could also add pollutants to subsurface supplies of fresh water.

If an oil field were improperly abandoned, breached mud pits, leaking wells, or steep cut banks could cause continued sedimentation of streams. Briny water and oil could also pollute sub-surface waters after abandonment if wells were not adequately plugged or capped. This chronic sedimentation and pollution would continue to have a debilitating effect on aquatic organisms as long as it was allowed to continue.

Terrestrial Wildlife - Airborne reconnaissance flights by fixed wing aircraft or helicopters at low levels during preliminary investigations could disturb and displace migratory waterfowl, breeding animals, and nesting raptors. Wildlife is particularly vulnerable during crucial periods such as breeding and raising of young. Occasional flights by fixed wing aircraft would cause the least disruption, but continued intensive search, especially helicopters, could pose a particular hazard to wildlife in the area.

Migrating waterfowl congregating in large flocks on bodies of water for resting and feeding, and can be easily driven away from these sites by low flying aircraft.

Moderate use of existing roads and trails for sampling, surveying, mapping and general reconnaissance can be conducted without undue wildlife habitat disturbance. The greatest hazard to wildlife comes from harassment during crucial periods of nesting and breeding.

Drilling of exploratory wells could make the vicinity of the well site untenable to most wildlife during the drilling operations. If caustic additives were used in drilling muds and they accidentally escaped from the drill site, they could contaminate surrounding vegetation or water. Short periods of gas flaring could cause odors and air pollution discernable by wildlife and increase the area of wildlife non-use.

A well blowout with the ensuing discharge of gas, oil, water and other contaminants could adversely affect wildlife habitat for a considerable distance around the drilling site.

Development of a field and related facilities could bring additional people into the area. This influx of human activity could preclude use of the area for nearly all wildlife. Associated powerlines would endanger flying and perching birds. Small species of mammals, amphibians, and reptiles would be endangered by the extensive road systems and traffic.

Construction of pipelines and storage tanks would increase the danger of oil spills and seeps. Accidental introduction of oil and gas into surface or ground waters could kill birds and animals drinking the water. Oil could saturate the plumage of waterfowl and shore birds, preventing them from flying and causing eventual death through poisoning or starvation.

Semi-aquatic wildlife such as beaver, muskrat, river otter, and mink are particularly vulnerable to oil spills.

Many wildlife species are dependent on vegetation growing along streams, lakes and marshes. The vegetation provides food and nesting and escape cover. Any activity which destroyed this vegetation would lower the quality and quantity of habitat. Contamination could destroy aquatic emergent or floating vegetation or make the water unusable for drinking or food production.

Loss of habitat for blowouts, spills, leaks, and subsurface contamination, while less dramatic than direct impacts on animals, is usually more serious. Animal populations displaced from an area can eventually be replaced from surrounding ranges provided the habitat remains intact. Destruction of the habitat, however, may preclude repopulation for extended periods.

If water demands during drilling were excessive and lowered water tables and drained small ponds, aquatic plants and animal life could be adversely affected. If hot water, sometimes a by-product of drilling, were allowed to contaminate surface water, temperatures could be increased beyond the tolerance of aquatic plants and animals.

Pipelines constructed above ground tanks, pumping stations, air strips, and camps could interfere with the free and accustomed movement of animals. These facilities and activities associated with their use and maintenance could impede the use of mule deer and pronghorn antelope migration routes and wintering, fawning, and calving areas.

Most of the environmental impacts associated with development could continue during the production phase. Production could be prolonged through secondary recovery by the injection of gas or water producing wells. This could cause a water shortage for wildlife if surface water were used as the source for injected water.

Domestic Livestock - Drill pad, pipeline, and associated construction as well as off-road vehicle traffic may disturb livestock in areas where animals normally concentrate, such as water sources and preferred grazing areas. Emissions of waste and mud pit water may be hazardous to livestock. Pipelines and equipment may interfere with livestock movement. Loss of forage production will take place if disturbed areas are not reseeded. If development occurred on one of the many small areas leased to grazing, a well site could eliminate a portion of the lease area.

Human Values

Historical-Archeological Resources - The educational and scientific potential of a cultural resource, whether historic, archeological or paleontological, is greatest when that resource is undisturbed. Any surface disturbing activity which encompasses all or part of the site where that resource is located detracts from its value by destroying or obscuring the intra-site relationships which existed between the various elements of the site. In addition, the educational value of a cultural resource may be impacted by adjacent off-site activities which destroy or substantially alter the original setting.

Discovery of previously unrecorded archaeological sites during the exploration and development phases of petroleum operations is a possibility. Road construction, drill pad construction, etc. will remove vegetative cover from areas previously hidden from view facilitating the search for archeological resources. This is viewed as a positive impact provided that any sites discovered are promptly brought to the attention of the Authorized Officer.

Anticipated adverse impact on cultural resources during the preliminary investigation phase of petroleum exploration (seismic, geochemical, and soil gas testing) is slight. With the exception of seismic testing, investigative techniques employed during this phase to not involve significant levels of surface disturbing activity. Seismic testing, regardless of the technique used to generate shock waves, involves localized surface disturbance at the point of the test. Additional surface disturbance may occur if it is necessary to construct access roads to facilitate seismic testing operations.

Exploratory drilling, will result in disturbance of the surface at the site of the test. Stratigraphic tests require an area approximately 30' x 30' for the placement of the truckmounted drill rig. Some drillsite preparation (clearing) may be necessary to construct a temporary access road to reach the selected test site.

Exploratory wells require larger drill rigs and more extensive support facilities including access roads, drill pads, and mud pits. The average drill site occupies approximately one acre which must be cleared and graded flat.

Development activities including the drilling of additional wells and the construction of support, transport and storage facilities will have the greatest potential impact on cultural resources. The magnitude of this impact is in direct proportion to the number and kind of facilities necessary to realize full production capabilities. Adverse impact may be anticipated as a result of drill site preparation, access road construction, pipeline construction, and tank battery construction.

Additional adverse impact can be anticipated should accidental oil spills occur during the production, transport or storage of crude petroleum. Archeological sites are particularly vulnerable because contamination of charcoal samples with petroleum renders the samples useless for radio-carbon dating purposes.

Additional impact on cultural resources is not anticipated during the reclamation and abandonment phase of petroleum activities.

Social Welfare - The personal income and employment generated by an oil and gas development would in most cases represent the major economic effects. The discovery and development phases would likely require local employment in road building, site construction and other field crew operations. It has been estimated that in most cases local labor is used for 10 to 15 percent of oil and gas field employment. Many companies will train and retain local labor for the production phase. The specific impact on local employment will depend on the size of the exploration effort and size of the field if discovery is made. Even though unemployment has been relatively low in Malheur County in recent months, any oil and gas development could be beneficial at this time.

Specific employment and income effects can be estimated when a detailed description of the operation is made available (site specific). If it can be determined how many employees will be hired for a particular site as each phase progresses, an income effect can be determined.

All oil and gas operations, regardless of size, would require a certain amount of support from local trade and service industries. If the company decided to purchase much of the equipment and supplies required for their operations from local sources, this impact could be more significant than the direct employment effect.

The following aspects of social welfare are considered separately for purposes of this EAR:

(1) Local Economic Stability - The high value of oil and gas resources typically results in a "land rush" situation when new fields are discovered. Rapid development may create a very unstable economic and social situation in small rural communities. Larger urban areas would feel little effect, but since oil and gas operations usually take place in remote rural areas, it is likely some smaller towns would be affected. A large oil and gas field may cause a small community to gear up for a substantial increase in economic activity and then leave the town in a vacuum when activities or the resources begin to decline or the field abandoned.

(2) Populations - Population in the proposed oil and gas lease areas are characterized by low density and stablilized growth. The discovery and development of oil and gas in these rural areas could result in significant population in-migration.

(3) Community Services - As populations increase, especially if resource development is rapid with little or no lead time, additional burdens are placed on housing, schools, police and fire protection, medical facilities, and other public services. Small towns and communities may have an especially difficult time adjusting to the strain of added populations. Planning and financing such facilities in such areas may be a slow process and the quality of services for all might suffer initially.

With abandonment of an oil and gas field, some emigration can be expected. When local communities have provided services and facilities to meet demands during development and production phases, they may now be left with facilities far in excess of long-range needs. The greatest impacts would occur when (1) substantial emigration occurs, and (2) local communities have incurred large bond indebtedness to pay for facilities no longer needed.

(4) Life styles and cultures - In the final analysis, impacts of oil and gas development on existing life styles in the community can only be evaluated fully by persons in the "real" situation.

Sudden growth and development can change local life styles. Increased population and some urbanization are in themselves a threat to the life styles of residents who have enjoyed a stable rural environment. A small community can be transformed into a group of secondary communities--each with different economics and social interests.

Oil and gas development might hasten local urbanization. Urbanization is not simply the growth of population. A town can become "urbanized" without an increase in population. For example, the activities of the residents might become increasingly tied into and dependent upon decisions made in urban control centers. Such an arrangement could change existing communities into "bedroom communities" with most residents traveling to outlying areas for work and many of their needs. Life styles could change if oil and gas development created a greater division of labor and if residnets became less oriented toward local cultural and historical values and more oriented toward extra-community events.

Landscape Character and Aesthetics - All phases of the proposed oil and gas exploration will have impacts on the landscape quality. In some areas, seismic survey lines have been the major visual impacts of oil and gas exploration. The criss-cross pattern of brushed lines has interrupted the texture and color of the vegetation and superimposed unnatural lines on the land form. In the proposed lease area, surveys may be done mainly along existing roads and the visual impact should be relatively slight. The impact of exploratory drilling will be very noticeable but localized in nature.

The most obvious visual impact to be expected from the exploratory drilling phase would result from any new road construction involved and from clearing and leveling the drill sites. Whenever possible, a drill site is selected on reasonably level ground, accessible by an existing road. If a promising location warrants it, however, considerable road construction and site preparation may be undertaken. About one acre is required for the average drill site.

The actual drilling operation would result in an obvious but temporary visual intrusion. Any road construction or site clearing would be a visual contrast of a permanent nature.

Visual impacts of the development and production stages would be similar to those of exploration activities. Development of a producing field may include additional road building, drilling sites, power lines, pipelines, and tank facilities.

Ecological Interrelationships

Ecological interrelationships in the Agropyron - Festuca Association are relatively unstable and are more likely to be upset by mans activities than are more mesic associations. Oil and gas operations which alter any abiotic or biotic component of a grassland community may adversely affect their ecological interrelationships. The nature of many of the chain-like relationships in the cycles and flaws that link environmental components are not fully known. In most instances, impacts on one part of the ecosystem will affect other components.

Any oil and gas operation which affects soil, water or atmosphere could upset natural ecological relationships. The immediate impacts of some actions, such as the destruction of soil micro-organisms or the failure of water to infiltrate compacted soils in amounts required to maintain the nutrient cycle, may not be noticeable. However, the effects would eventually become apparent in the plant community's lack of vigor, in higher vegetative mortality, in greater volume of surface runoff, and in increased stream turbidity.

If the soil were polluted by saline water, spilled petroleum, or other chemicals, decomposes organisms may be reduced or eliminated. If soil were compacted by heavy equipment and off-road traffic, its pore space could be so reduced that its permeability and water-holding capacity would be impaired. Soil pollution and compaction could therefore inhibit nutrient cycling and reduce the vigor of producer vegetation, and of the remainder of the community.

If improperly designed operations caused mass soil movements which exposed underlying rock or poor and immature soil, the original vegetative species may not become re-established for a very long time.

The aquatic ecosystem's stability depends on the maintenance of water quality. Sedimentation and pollution of natural waters resulting from oil and gas operations could kill aquatic micro-organisms, vertebrates, and aquatic vegetation, or inhibit the capacity of the aquatic biota to reproduce and maintain itself.

Amphibians, birds and mammals partially dependent upon natural waters may also be adversely affected by degradation of water quality.

Emissions of toxic gasses during oil and gas operations could adversely affect vegetation in the area.

<u>Food and Community Relationships</u>

Food relationships will be altered on localized areas by loss of vegetation and subsequent animal production. The loss of use areas, critical for a species to complete its life cycle, would obviously be detrimental to that species. For example, the significance of destruction or encroachment upon a large segment of critical deer winter range could depend upon the exact location and amount of land involved.

Most impacts relating to the development and operational stages have been discussed previously, increased activity, noise, pollution of existing water, etc. All of these factors may alter animal habitat relationships either directly or indirectly.

ALTERNATIVE TO THE PROPOSED ACTION

Denial of oil and gas leasing on National Resource Lands within the EAR area may be considered an alternative to the proposed action. However, considering the nature of the laws and regulations pursuant to which oil and gas lease applications are made, denial requires cause, and denial for cause assumes an objective evaluation. Such is one purpose of this environmental analysis--to speculate on the significance of residual environmental impacts (those that remain after all reasonable mitigating measures are applied) to determine if there is justification for a recommendation of denial. Denial, therefore, is a possible environmental consideration in the process of deciding whether to lease or not to lease.

For the following reasons an analysis of the "no leasing" alternative would have little practical significance:

(1) As an alternative action, since no exploration or development would take place, lease denial would obviously have no adverse, on-site, environmental impact relative to National Resource Lands.

(2) Off-site impacts, primarily socio-economic in nature, could be affected by the no leasing alternative only if an economic quantity of oil and/or gas is assumed. Using that assumption, the impacts of no leasing involve considerations far beyond the reasonable scope of a regional or local analysis, e.g., National Energy Supply Policies.

(3) "No leasing" of National Resource Lands would not necessarily preclude resource development--because of the checkerboard public/private pattern of land ownership, oil and gas development could proceed on private lands.

The spin-off effect on private lands resulting from no leasing on intermingled public lands must also be recognized. Though conjectural as to degree, the effect could be over-development of private lands with the possible multiplication of on-site environmental impacts.

In addition, a no lease decision could conserve portions of possible oil and gas resources for use by future generations. Such a decision would also conserve other natural resources, including fish and wildlife, that would be unfavorably affected by oil and gas operations.

POSSIBLE MITIGATING MEASURES

Non-living Components

Geology - Most of the geological hazards described above can be prevented or minimized by properly designing and placing roads and other oil and gas facilities. Necessary geologic information should be collected before a drilling permit applicants surface use plan is approved.

Some slopes show signs of instability, including fresh or healed cracks, sag ponds, and back-tilted blocks. Some unstable slopes are not obvious and verification may require careful study. Flood-prone areas can be identified and facilities designed to reduce or eliminate flood hazards. Subsidence can be prevented or stopped by monitoring fluid withdrawals and reinjecting fluids when necessary.

Soil - Several measures may be utilized to lessen soil erosion caused by road construction during the preliminary investigation and exploration stages:

- Use of existing roadways as much as possible.
- New road construction only when necessary, and of a minimum operable width.
- Minimal construction during periods of heavy rainfall.
- Inclusion of facilities to control drainage, such as perforated pipe to provide sub-grade drainage, waterbars and culverts.
- Revegetation of roads not needed after preliminary investigations and exploration activities.

Steep slopes are common in the EAR. Oil and gas operations, like other intensive land uses could cause mass wasting of the slopes if proper precaustions were not taken in the design and construction of roads, pipelines, well sites, and other facilities. Wet soils and areas where consolidated bedrock is more than 10 feet below the surface tend to be unstable on steep slopes. Water tends to float the soil mantle out of a wet area if a road cut removes the support. Deep, fractured, or weathered bedrock on steep slopes does not provide good support after the slopes are disturbed. Steep slopes with wet soils and areas where consolidated bedrock is not near the surface should be avoided when possible in the siting of roads and other oil and gas field facilities.

Design features which reduce the potential for mass wasting could be incorporated if roads are built on steep slopes. Special effort and design features include, but are not limited, to the following:

- Designing the road segment to the minimum width which will safely accommodate traffic and equipment for the intended uses.
- Road location and design such that excavation will not remove support from the base of over-steepened slopes or remove the toe of previous slides.
- Efforts could be made to avoid locating roads in steep headwalls of drainages where sidecase of excavated material would increase the potential for mass wasting. If this is not possible, materials could be endhauled to a suitable disposal site.
- Perforated pipe could be installed in road ditches where ground water is contributing to slope instability.

All trails and fire lines could be seeded or mulched, cross-ditched, or waterbarred before the first winter. Spacings and design of cross-ditches and waterbars could be implemented to remove water from the trail before it gains enough erosive power to cause rilling. The water could be discharged onto materials or structures which would dissipate its energy and disperse the flow to prevent erosion of the slope below the waterbar.

Roads constructed during the preliminary investigation, exploration, and development phases and intended for permanent use could be surfaced and regularly maintained. Where necessary, material could be endhauled rather than sidecasted. Cut and fill slopes could be limited to prevent exceeding the normal angle of repose.

The erosional impacts of water flowing from seismic shot holes can be eliminated by requiring that the holes be adequately plugged. In areas of high hydrostatic pressure, the holes could also be cased.

Revegetation should be accomplished rapidly by clearing and constructing drill sites in a planned operation. Revegetation may be accomplished more rapidly if the top soil in the disturbed areas is removed, stock piled, and then respread.

The use of mud pits and protective or secondary dikes around the mud pit and around the low side of the drill site would reduce possible impacts from jetting of drill cuttings and from accidents. The use of proper drilling methods, including drilling with proper mud weight and viscosity, could assure well control and reduce the threat of erosion caused by accidents such as blowouts and salt-water flows.

Mitigating measures used during preliminary investigation, exploration, and development phases can also be used to mitigate the impacts of production facilities. Disturbed areas near these facilities would be in continued use and should have a permanent cover to protect the soil from erosion.

Impacts of accidental spills from storage facilities can be minimized by requiring secondary or protective dikes around the facilities. The potential for leaks and spills from pipelines and flow lines can be reduced by periodically testing the lines under abnormal pressures. X-ray tests of valves, pumps, and lines subject to high corrosion can be run periodically to calibrate remaining effective strength.

During abandonment of a field, drilling pads, temporary roads, and other facility sites can be ripped, topsoil redistributed, tilled, and revegetated.

Land Use - Land use conflicts can best be resolved by comprehensive local and regional land use planning and the adoption of effective land use controls before leasing and exploration takes place.

Land uses such as intensive recreation, wildlife habitat, and urban residential development, which are basically incompatible with oil and gas operations, can be protected by stipulations in leases or by excluding such areas from leasing.

Land uses such as agriculture and livestock grazing, can co-exist reasonably well with oil and gas operations. Impacts on these land uses can be mitigated by employing the erosion control, revegetation and water quality protection measures previously discussed. Roads developed for oil and gas development may facilitate range management if oil and gas and range programs were coordinated.

Possible conflicts involving electrical transmission and natural gas lines right-of-way corridors could be resolved prior to leasing and exploration activities. Road use and access problems could be resolved in a like manner.

Air - The following methods could be used to reduce the amount of dust created by construction of access roads during preliminary investigation:

- Require operators to use existing roads whenever feasible.
- Permit the construction of new roads and trails and off-road vehicular travel only when absolutely necessary.
- Limit earth movement disturbance of vegetation by building roads to the minimum level required by the geophysical equipment.
- Close and revegetate roads not needed after investigations are completed.

During the exploratory phase, roads to stratigraphic drilling sites and wildcat wells may be restricted to the minimum required by drilling equipment. If roads are constructed during dry periods, they could be watered regularly. If oil and gas is not discovered, the roads could be closed and the surface reclaimed.

The potential for air polluting accidents such as well blowouts and fires can be reduced by developing contingency plans, training oil and gas field employees, and using equipment such as blowout preventers. Particulate concentration build-up during periods of inversions could be lessened by the curtailment of drilling activities at such times.

Microclimatic changes can be minimized by limiting the areas cleared of vegetation; preventing spills, fires, and other accidents which can kill vegetation; and revegetating facility sites and roads when they are abandoned.

Water - Frequent inspections of oil and gas operations could be made to insure that contract stipulations are being followed. Periodic inspections of streams for evidence of increased suspended sediment loads and petroleum related pollutants could insure the maintenance of State water quality standards.

The number of stream crossings needed to gather geophysical data on an area can be reduced by planning geophysical operations. Stream crossing sites could be specified before operations begin. Crossings, culverts or bridges may be designed to carry a reasonable peak flow capacity; approaches would be constructed to minimize sediment production; roads leading to the corssing could be surfaced with rock and designed for proper drainage. Ford construction could be restricted to areas of the stream where the bottom is rocky enough to prevent the dispersion of sediment.

When the U. S. Geological Survey and the State of Oregon issue drilling and waste discharge permits, additional stipulations may be included to insure adequate containment or disposal of caustic drilling fluids and brines. Proper casing and sealing of wells could prevent contamination of ground water aquifers. Stream channels and ponds may require the application of slant drilling and cluster-well technique to insure adequate protection in particular areas of concern. Mud pit berms may be constructed large enough to insure containment of contents and anticipated additions due to rainfall.

Holding tanks and other storage areas surrounded by impermeable dikes and berms could catch oil in the event of spills. The immediate cleaning up of oil spills would reduce the possibilities of water pollution. Reinjection of produced water and gas into production formations may reduce the chance of polluting water in other formations.

Proper cleanup, removal and burial of wastes during the abandonment phase could mitigate adverse impacts to water quality. All sites with exposed soil could be seeded and fertilized to replace protective vegetation.

Living Components

Aquatic Flora - Measures to prevent soil erosion, degradation of water quality, loss of water supplies, destruction of terrestrial vegetation, and destruction of aquatic wildlife would also mitigate harmful impacts of oil and gas operations on aquatic vegetation.

During the preliminary investigation, exploration, and development phases, roads, pipelines and other facilities could be located to minimize the destruction of aquatic vegetation at stream crossings and to avoid disturbance of significant aquatic habitats. This could be accomplished by joint planning before preliminary investigations begin and by developing and enforcing stipulations in leases and drill permits. Equipment operators and others whose actions may damage aquatic resources could receive training on the importance of resources and on methods of doing their work without causing undue damage.

Mitigative measures to keep saline water and other toxic materials from killing aquatic vegetation include: (1) adequate well casing; (2) preventing well blowouts; (3) locating wells away from streams or ponds; (4) proper containment and reinjection of briny water into producing formations; (5) proper construction and maintenance of drilling mud pits; and (6) adequately sealing wells during abandoment. Secondary dikes may be built around exploratory and production wells to prevent toxic substances in drilling mud from reaching streams.

After the drilling is done, drilling mud pits could be drained and rehabilitated. The mud can be disposed of at sites where it would not affect water quality and vegetative growth.

Terrestrial Flora - The destruction of vegetation during clearing operations can be reduced by limiting the number of dimensions of road, pipelines, trails, test wells, and other facilities required to complete the work. The use of existing roads would further reduce the amount of vegetative destruction.

Vegetative destruction can also be minimized by controlling soil erosion. Measures which can be taken to control erosion are described in the soils section of this chapter.

Disturbed areas should be revegetated as soon as possible. Special measures may be necessary to successfully revegetate some areas, such as topsoil replacement, ripping of compacted soil, fertilization, mulching, watering, and use of vegetative species not normally available.

Erosion hazard areas could be revegetated initially with fast growing herbaceous vegetation with good soil holding characteristics. Subsequent efforts can be made to insure early development of native vegetation.

The chances of vegetation being killed by spills or leaks of oil or briny water can be reduced by: (1) locating wells, storage facilities and pipelines as far from drainages as possible; (2) constructing dikes around all facilities that generate or store contaminants; (3) using proper mud weight for drilling and blowout prevention equipment; (4) using tanks to contain fluids during drill stem tests; (5) reinjecting brine into the ground rather than using evaporation pits; (6) development of, and adherence to, contingency plans for controlling blowouts, spills, and leaks; (7) installing monitoring systems, including x-ray tests of valves and pumps to detect and shut down mechanical failures which could result in leaks, spills, or other accidents; (8) casing all wells and test holes where there is a possibility that oil or brine can mix with aquifers; and (9) upon abandonment, seal wells, remove storage tanks and flow lines, drain mud pits, and dispose of material in a proper waste disposal site.

Wildfires can be prevented or controlled by: (1) using spark arrestors on tractors and other power equipment; (2) maintaining adequate fire fighting equipment and material such as retardants and water supplies at all operating sites; (3) maintaining adequate communications with State and Federal fire fighting organizations; (4) insuring the availability of adequate numbers of trained fire-fighting personnel;

(5) keeping all personnel educated as to the hazards of fire; (6) maintaining fire breaks around fire hazard areas; (7) maintaining constant surveillance of all operating areas during periods of medium to high fire danger; (8) halting all operations during periods of extreme fire danger; and (9) properly disposing of vegetative debris.

Aquatic Wildlife - The most serious impacts of oil and gas operations on aquatic resources are the result of excessive sedimentation; accidental well blowouts; leaks and spills of oil, briny water and caustic components of drilling mud; contamination of ground water; physical alterations to the aquatic habitat; and improper disposal of domestic wastes.

Many of the measures directed toward maintenance of soil and water quality would also serve to maintain satisfactory habitat conditions for aquatic life.

Some accidents, such as leaks and blowouts, probably would occur regardless of the mitigating measures employed. However, the frequency and magnitude of such accidents could be reduced by careful operative practices and good maintenance practices. The use of blowout preventors could reduce well blowouts. Since it is most important from the standpoint of aquatic life to prevent oil, brine and drilling mud from getting into streams or lakes, slant drilling could be required at some sites to keep drilling operations away from surface waters. When drilling is required in sensitive areas, secondary dikes could be constructed around the drilling sites to retain oil and brine in case of blowouts. Tanks could be used to contain any liquids that flowed from the well during drill stem testing. Drilling muds could be disposed of where they would not degrade the environment. Mud pit sites can be restored to their former conditions after completion of the drilling.

Ground-water aquifers could be protected from oily and brine by sealing off the water-bearing strata with plugs about the well casing.

Consumption of water during drilling could be reduced by casing wells in highly permeable areas.

Careful planning of roads, pipelines, separators and storage batteries during oil field development would eliminate unnecessary roads and reduce soil disturbance. Stream crossings can be carefully planned and executed to minimize soil erosion. Cuts, fills and exposed banks can be mulched and seeded to minimize surface erosion.

Unavoidable stream damage may be mitigated by installing gabions, still logs, drop structures, riprap or sheer logs to create desirable habitat in adjacent areas.

Terrestrial Wildlife - Crucial wildlife areas, including wintering, breeding, nesting, fawning, and calving areas, and migration routes can be identified. These areas can be protected with protective stipulations or excluded from oil and gas activities.

Aerial and seismic activity can be timed to avoid wildlife areas during critical periods. Well heads can be located away from important habitat areas and slant drilling can be required to explore or tap pools located beneath critical habitat.

During preliminary investigation, exploration, and production drilling, drilling water and mud can be kept out of wildlife water supplies by storing them in metal tanks or leakproof pits. Briny water resulting from producing wells could be reinjected into the ground. Mud pits located near waterfowl habitats could be covered to prevent waterfowl entering and getting trapped in them. Fences may be built around mud pits if they are located in areas where large animals may fall in.

Waste by-products from drilling can be prevented from entering wildlife habitat with proper storage, treatment and disposal methods. Power lines located on or near heavily used flyways could be located underground where feasible. Safety devices could be installed on power poles and cross arms to prevent electrocution of perching birds, especially raptors. Utility poles located near busy roads can be designed to prevent raptors from perching on them.

Above ground installation of pipelines would provide easier detection of leaks, reducing the hazard to wildlife habitat from oil spills.

Temporary construction camps and permanent field operation facilities can be located away from crucial wildlife habitat. Compliance with State and Federal air and water quality and solid waste standards may prevent or minimize impacts on wildlife.

Reclamation of abandoned drilling sites and producing fields could include revegetation of disturbed areas with plant and grass species beneficial to wildlife. Open pits can be filled in and revegetated as well.

Human Values

Landscape Character - Measures which can be taken to reduce the visual impact of preliminary investigation and exploration include:

- Limiting access to existing roads and trails. If additional clearing is needed, it could be limited to that necessary to get the equipment to the site.
- Access roads could be designed to conform to the landscape as much as possible, following contours where possible, and have adequate drainage and erosion controls.
- Drill sites and pads could be kept to a minimum size.
- Retaining dikes may be built around mud pits and sumps.
- Drill sites could be located in areas which are as inconspicuous as possible, hidden from heavily traveled roads, and below skylines wherever possible. Drill sites could be prohibited on steep slopes where extensive excavation is required to make a level pad.

Much of the web of roads, seismic lines, pipelines and powerlines associated with field development could be reduced by advance planning. Much of the visual impact could be eliminated by properly locating powerlines, tank batteries, pump stations, and other surface structures. Immediate revegetation of all exposed soil on cut and fill slopes would reduce the impact of surface scars. Facilities could be made less obvious from a distance by painting them colors which blend with the surrounding landscape.

Little additional visual impact occurs in the production phase. The measures outlined above for development should be applied to the additional pipelines, pump stations, and treatment facilities constructed during this phase. Most of the noise associated with production can be controlled with engine mufflers and housings for flowline pumps.

Visual impacts in many areas can be largely eliminated in the abandoment phase by removing all surface structures, regrading well pads, roads, and impoundments to as near the original surface as possible and replanting with native vegetation.

Historical-Archaeological Resources - Two possible alternative measures are available for the mitigation of adverse impacts on cultural resources. Restrictions on surface occupancy may be used to protect known cultural resources present on National Resource Land. The second mitigation measure available consists of a standard stipulation which will be included in all oil and gas leasing agreements issued by the Bureau of Land Management in the State of Oregon. The text of this stipulation is set out in the following two paragraphs.

Prior to any operations under this lease, the Lessee will engage a qualified archeologist, acceptable to the Supervisor, to make a survey of the land to be disturbed or occupied. A certified statement signed by the qualified archeologist, setting out the steps taken in the survey and the finds thereof as to the existence of antiquities or other objects of historic or scientific interest, shall be submitted to the Supervisor. If the statement indicates the existence of such materials which might be disturbed by operations under this lease, the Lessee shall take such mitigating actions as may be required by the Supervisor, including, but not limited to, archeological salvage or protective measures or avoidance of the site, to protect and preserve such objects. The responsibility for the cost of the certificate, survey, and salvage will be borne by the Lessee, and such objects shall remain the property of the Lessor, or the surface owner if other than the Lessor.

If a cultural resource is discovered during project operations, activities will be stopped until a survey of the materials is completed by a qualified archeologist engaged by the Lessee and acceptable to the Supervisor, including but not limited to archeological salvage or protective measures or avoidance of the site, to protect and preserve the materials. Such materials shall remain the property of the Lessor, or the surface owner if other than the Lessor.

Social Welfare - The major potential adverse socio-economic effects of oil and gas development are:

(1) An increase in population placing a strain on local community facilities and services.

(2) Economic instability created by a rapid increase in employment, increase and demand for goods and services and a change in community life styles.

The impact on community service depends not only on the size of the development, but also on the rapidity of the development. Local officials of potentially impacted towns or cities could attempt to determine the development possibilities for their area well in advance of the time development might begin. The Geological Survey could confirm the location of oil and gas deposits. Companies could be requested to spell out possible development plans as soon as such plands for increased community development in case oil and gas development becomes a reality. Preplanning would eliminate some of the strain of facilities.

Economic instability could be partially alleviated by local officials understanding the uncertainty and finite nature of an oil and gas development operation. When the resource becomes depleted, demand for local community services and labor ceases. Local communities should be careful not to overreact in providing housing, services, and other facilities, and be left with a substantial excess when abandonment occurs.

If development resulted in a large influx of population into a small rural community, there might be little that could be done to mitigate the impact on life styles. The increase in population and the attendant crowding and urganization could represent an adverse effect on those who have enjoyed a stable rural community life. New residents probably would not perceive historic landmarks and cultural values in the same manner as original residents. The dissemination of information to new residents about these values might provide a common understanding.

Ecological Interrelationships

Measures to mitigate adverse impacts of oil and gas operations on individual components of the environment are described in previous sections of this chapter. Collectively, these measures represent actions which could be taken to maintain stable ecological interrelationships.

The more xeric portions of the Agropyron-Festuca Association and aquatic ecosystems are examples of areas where the maintenance of stable ecological interrelationships would be particularly important.

RECOMMENDATIONS FOR MITIGATION

Non-living Components

Geology - A geologic survey should be made before a drilling permit applicant's surface plan is approved. Such a survey should identify unstable terrain, springs, rock units and faults. In addition, flood prone areas should be identified and facilities designed to avoid flood hazards.

Subsidence should be reduced or stopped by monitoring fluid withdrawals and reinjecting fluids when necessary. Measures should be taken during reinjection to prevent contamination of groundwater supplies.

Soils - Surface occupancy should be prohibited where soil disturbing activities will cause mass wasting or cause soil damage for which there are no reasonable mitigating measures. Surface occupancy is questionable on slopes greater than 65 percent.

The following measures should be employed to lessen or minimize soil erosion caused by road construction during the preliminary investigation, exploration and development stages:

- Use existing roadways, landings and disturbed areas as much as possible.
- Construct new roads only when necessary, and keep to minimum operable width.
- Restrict construction during periods of heavy rainfall.
- Control drainage by use of perforated pipe, waterbars and culverts.
- Revegetate roads not needed after preliminary investigations and exploration activities.
- Avoid road construction on slopes over 75 percent. If steep slopes cannot be avoided, endhaul side slopes over 80 percent and headwalls over 75 percent.
- Locate waste sites for endhaul material on stable slopes.
- Avoid dug pickets of unstable soils on gentle slopes that are prone to slumping. If unavoidable, then stabilize by such measures as riprap, horizontal drains and surface drains.

All trails and fire lines should be seeded or mulched, cross-ditched, or waterbarred before the first winter. Spacings and design of cross-ditches and waterbars should be implemented to remove water from the trail before it gains enough erosive power to cause rilling. The water should be discharged onto materials or structures which would dissipate its energy and disperse the flow to prevent erosion of the slope below the waterbar.

Roads constructed during the preliminary investigation, exploration, and development phases that are intended for permanent use should be regularly maintained. Roads needed for yearlong use should be surfaced. Where necessary, material should be endhauled rather than sidecasted. Cust and fill slopes should be limited to prevent exceeding the normal angle of repose.

Revegetation should be accomplished rapidly by clearing and constructing drill sites in a planned operation. Topsoil in the disturbed areas should be removed, stockpiled, and then respread.

Mud pits and protective or secondary dikes around the mud pit and around the low side of the drill site should be required to reduce possible impacts from jetting of drill cuttings and from accidents. The use of proper drilling methods, including drilling with proper mud weight and viscosity should be required to assure well control and reduce the threat of erosion caused by accidents such as blowouts and salt water flows. Any excess contaminated water that could produce soil erosion or pollute the soil should be hauled off-site to a designated disposal area.

Mitigating measures used during preliminary investigation, exploration, and development phases should also be used to mitigate the impacts of production facilities. Disturbed areas near these facilities would be in continued use and should have a permanent cover to proect the soil from erosion.

Secondary or protective dikes should be required around storage facilities to minimize impacts of accidental spills. Pipelines and flow lines should be tested periodically under abnormal pressures. X-ray tests of valves, pumps, and lines subject to high corrosion should be run periodically to calibrate remaining effective strength.

During abandonment of field drilling pads, temporary roads and other facility sites should be ripped and topsoil re-distributed, tilled and revegetated with natural plant species.

Land Use - Ideally, land use conflicts should be resolved prior to leasing and exploration actions. Such problems can normally be solved by comprehensive local and regional land use planning. The adoption and implementation of effective land use controls further this end. Land uses, such as recreation, which are incompatible with oil and gas operations should be protected by stipulations in leases or by exclusion of such areas from leasing. Those land use conflicts that appear after oil and gas activities begin will ultimately have to be resolved at a more personal level (e.g., between the private landowner and the resource operator).

Impacts on land uses such as livestock grazing should be mitigated by emphasizing the erosion control, revegetation and water quality protection measures previously discussed.

Air - The amount of dust created by access road construction during the preliminary investigation phase should be mitigated by: (1) requiring operators to use existing roads whenever feasible; (2) allowing new road and trail construction only when absolutely necessary; (3) restricting earth movement and disturbance of vegetation during road construction to the minimum required level; and (4) closing and revegetating roads that are not needed often investions are completed.

Roads constructed during the exploratory phase to drilling sites should be kept to the minimum size and number required by oil and gas operations. Roads that are constructed during dry periods should be watered regularly to keep dust levels down. Should operations enter the production phase, heavy use roads should be surfaced.

The development of contingency plans, training oil and gas field employees, and using equipment such as blowout preventors will reduce the potential for air polluting accidents. Should inversions occur during periods of drilling activity, such operations should be curtailed until the inversion has broken up.

Water - Maintenance of water quality and quantities at existing sources may be achieved by employing the following mitigative measures:

(1) All operations should be required to meet the established water quality standards of the State of Oregon.

(2) Construction of roads and watercourse crossing structures should be limited to the dryer part of the year, generally from June through October.

(3) Disposal of waste products into either surface or ground water sources, or where it can enter surface waters during periods of high flows should not be permitted.

(4) Buffer strips should be required about all lakes and reservoirs and along all streams in order to protect riparian vegetation.

(5) Waste ponds should not be constructed within the flood channel of any stream.

(6) Holding or storage areas should be surrounded by an impermeable berm to contain any spills.

(7) All sites with exposed soil should be reseeded preferably with natural vegetation and fertilized.

(8) No water will be removed from any lake, reservoir, spring, or well on National Resource Lands without advanced written authorization of the Authorized Officer. Compensation will be made for any water removed from any Bureau of Land Management well.

Living Components

Aquatic Flora - Measures to mitigate adverse impacts on aquatic vegetation include the proper location and construction of stream crossings, roads, pipelines and other facilities. These actions will be accomplished as a joint planning function on the part of the Bureau of Land Management, U.S. Geological Survey and the resource developer. The development and enforcement of stipulations for leases and drilling permits will lessen the adverse impact potential throughout all phases of oil and gas operations.

Resource developers should educate their equipment operators and others whose actions may damage aquatic resources, on the importance of resources and on methods of getting the job done without causing undue damage.

Mitigative measures that should be employed to keep saline water and other toxic materials from killing aquatic vegetation include: (1) adequate casing of wells; (2) use of well blowout prevention devices; (3) locating wells away from streams or ponds; (4) proper containment and reinjection of briny water into producing formations; (5) proper construction and maintenance of drilling mud pits; and (6) adequately sealing wells during abandonment. Secondary dikes may be built around exploratory and production well facilities to prevent toxic substances in drilling mud from reaching streams. Upon completion of drilling, drilling mud pits will be drained and rehabilitated. Mud disposal should be at sites where it will not affect water quality and vegetative growth.

Terrestrial Flora - The number and dimensions of roads, pipelines, test wells, and associated facilities should be limited to those required to accomplish the work. Such restrictions would result in minimizing the amount of vegetation destroyed.

Vegetative destruction from soil erosion is an inherent factor of all surface disturbing actions. Mitigating measures that should be employed to control erosion are described above in the soils section.

Revegetation of disturbed areas should be completed as soon as possible. To successfully revegetate some areas, it will be necessary to employ measures such as topsoil replacement, ripping of compacted soil, fertilization, mulching, watering and use of seedlings of plant species not readily available.

Revegetation of erosion hazard areas should be with fast growing herbaceous vegetation with good soil holding characteristics. Subsequent efforts should be made to insure early development of native vegetation.

Mitigative measures that should be employed to reduce the chances of vegetation being killed by spills or leaks of oil or briny water include: (1) locating wells, storage facilities and pipelines as far as possible from drainages; (2) construction of dikes around all facilities that generate or store contaminants; (3) use of proper weight mud for drilling and blowout prevention equipment; (4) use of tanks to contain fluids during drill stem tests; (5) reinjection of brine into the ground rather than using evaporation pits; (6) development of, and adherence to, contingency plans for controlling blowouts, spills, and leaks; (7) installation of monitoring systems, including x-ray tests of valves and pumps to detect and shut down mechanical failures which could result in leaks, spills, or other accidents; (8) casing of all wells and test holes where there is a possibility that oil or brine can mix with aquifers; and (9) upon abandonment, seal wells, remove storage tanks and flowlines, drain mud pits, and dispose of material in a proper waste disposal site.

Oil and gas operations, like other land use activities on National Resource Lands, requires constant surveillance for wildland fire. Steps that should be taken to prevent or control wildfires are: (1) use of spark arrestors on tractors and other power equipment; (2) have adequate fire fighting equipment and materials at all operating sites; (3) maintain adequate communications with State and Federal fire fighting organizations; (4) insure that an adequate number of trained fire-fighting personnel are available; (5) keep all personnel educated as to the hazards of fire; (6) halt all operations during periods of extreme fire danger; and (8) properly dispose of accumulated vegetative debris.

Aquatic Wildlife - The following mitigative measures should be applied to maintain and/or minimize adverse impacts on aquatic wildlife habitats: (1) all stream crossing structures should be constructed so as not to reduce or impede normal rates of streamflow; and (2) restrictions described under water, above, are adequate to maintain and/or minimize adverse impacts on aquatic wildlife habitat.

Terrestrial Wildlife - In order to maintain and/or minimize adverse impacts on terrestrial wildlife habitats, the following mitigative measures should be applied to oil and gas resource developments: (1) exploration activites within identified crucial habitat areas should be prohibited; (2) activities within reasonably important habitat areas should be restricted to periods of non use; (3) habitat areas within lease areas, such as stream banks and marshes, should be protected from disturbance; (4) on-site protective measures should be formulated to give protection to wildlife species inhabiting the area; (5) construction facilities should be located away from crucial wildlife habitats; and (6) reclamation of all disturbed sites should be required.

Human Values

Landscape Character - Oil and gas resource development during the preliminary investigation and exploratory phases could have adverse impacts on the landscape. However, these impacts would be widely scattered and relatively localized in nature. Impacts to be expected during the development phase would be basically the same.

Most of the EAR area is classified as "C" quality scenery and "B" quality scenery along the entire western margin of the Bully Creek region, with a low or medium sensitivity. Recreational use and public attitudes indicate a sensitivity level of low to medium.

There are two particular areas involved which are exceptions to the above general evaluation. These areas include:

(1) Bully Creek Reservoir - There is a county park which is extensively used for camping and picnicing. It is recommended that no oil and gas resource facility be placed or road constructed on National Resource Lands within one-quarter mile of the reservoir. No resource development facility should be situated within view of the using public at the park.

(2) Oregon Trail - The Oregon Trail runs southeast and north from Vale through considerable areas in the EAR area (Figure 13). No activity of any sort should be permitted within 660 feet of this historic pioneer route.

Measures that should be taken to reduce the visual impact of both exploration and development activities include:

- Use existing roads whenever possible. Utilize natural benches or log landings for drill sites where possible.
- Keep drill sites to the minimal size practical.

- Keep drill sites located as inconspicuously as possible. If located along main roads, leave a screen of trees or brush if practical.
- Consolidate pipelines, powerlines and roads or common rights-of-way.
- Structures should be located to be as inconspicuous as possible, and should be painted to blend with the landscape.

In the abandonment phase, the following mitigative measures should be taken to eliminate visual impacts on the landscape:

- Completely remove all structures, material and debris. Properly dispose of any spills or waste.
- Regrade well-pads, access roads (if no longer of use for other purposes) and impoundments to as near the original surface as possible. Replant with natural vegetation.

Historical-Archaeological Resources - As stated above, the historical Oregon Trail, a major pioneer route of the XIX century, extends to the north and southeast from Vale in the eastern portions of the EAR area. Other locations of historic interest are the Wentworth grave site and the site of the Glennville community (Fig. 13).

In addition to the three historic sites, 11 archeological and 2 paleontological sites exist to the north and west of Vale as well.

The standardized antiquities stipulation added to all oil and gas leasing agreements issued by the Bureau of Land Management in Oregon will provide adequate protection and impact mitigation for heretofore undiscovered cultural resources within the analysis area.

Social Welfare - Immigration into the lower Malheur River Valley in response to new employment opportunities will be the inevitable result of discoveries of marketable quantities of oil and gas in the area. This will precipitate an increased demand for goods and services which local communities must meet. Affected communities would be well advised to anticipate these increased demands by careful evaluation of the production potential of the discoveries as that data becomes available. Using these evaluations communities can more accurately predict population growth and attendant demands for goods and services. Facilities and services can then be provided to meet actual projected needs avoiding the problem of grossly over or under estimating needed facilities and services.

Ecological Interrelationships

Mitigative measures to avoid alternations to the abiotic environment or the biotic community would necessarily incorporate the sum total of all mitigative actions recommended for the various components of this section, i.e., non-living and living. Collectively these mitigations should reduce or lessen the adverse impacts to be expected on ecological interrelationships.

Standardized Mitigating Measures

The Federal leasing procedures and State regulations on oil and gas resource development and the notice forms, stipulations, and regulations are summarized under this heading in I, Proposed Action.

RESIDUAL IMPACTS

This section describes impacts which could remain after mitigating measures are applied. Many of the impacts described below would result only if accidents, such as spills or well blowouts occur. The probabilities of such accidents and the ensuing impacts occurring on any given lease would be low, but the possibilities cannot be ignored.

Non-living Components

Geology - Some land subsidence and groundwater contamination could occur despite mitigative measures.

Although facilities may be built to withstand most earthquakes, the possibility exists that a particularly severe quake could rupture pipelines and storage tanks or trigger landslides on slopes on which access roads have been built.

Soils - Soils are affected whenever the natural interactions of parent material, vegetation, topography, and climate are disrupted. Measures to mitigate the effects of oil and gas operations would not restore soils to their natural state. Some measure of impact would remain until natural interactions had time to again reach harmony with each other.

Erosion processes are accelerated any time the protective cover is removed and the soil is disturbed. Mitigating measures could reduce erosion, but not eliminate it.

Productivity of the natural vegetation would be reduced if the area were disturbed or the soil compacted, and the reduced vegetation cover would lead to increased erosion. Some fill or cut bank failures could occur if roads, trails, or buildings were constructed on steep terrain. Accidental spills of some materials could sterilize soils. Areas where drilling mud, brackish water, or oil were stored or spilled would not recover to their initial state.

Land Use - Four factors are considered under this heading: recreation, mining, agriculture, and urban uses. A fifth topic, forestry, is of no significance in the EAR area.

1. Recreation. Roads and structures associated with oil and gas development change the character of the natural landscape. Although the increased access might benefit some recreational users, the majority of the impacts on an area's recreational values would be negative. During the development and operation phases, relatively small portions of the oil field may be off-limits to recreationists.

2. Mining. Oil and gas resource development precludes the use of a given area for other types of mineral development during the producing life of the field.

3. Agricultural. Disruption of grazing activities could not be avoided in some areas. Relatively small areas would be taken out of the grazing program in an oil and gas field. The overall impact would be comparatively minor.

4. Urban uses. Although extensive steps have been taken in other areas to minimize conflicts between oil and gas operations and residental, commercial, and industrial land uses, conflicts with these intensive land uses -- particularly residential -- cannot be entirely avoided. The possibility of explosions, fires, and other oil and gas field accidents poses the most serious, unavoidable conflict with other intensive land uses.

Air - Strict enforcement of air quality standards cannot entirely eliminate atmospheric pollution by oil and gas operations. Air quality would be degraded, at least temporarily and locally, by engine emissions and dust arising from construction activities and travel on gravelled roads. Well blowouts and accidental fires could occasionally add toxic vapors and particulates to the atmosphere. Air pollution would also result from some types of pumping equipment, and from fumes from the crude itself.

If oil and gas operations were carried out in the EAR area, some alteration of microclimate would be inevitable. Removal of vegetative cover for access roads and drilling sites would continue to affect microclimate in the field during the life of the oil and gas operations. If vegetation were disturbed on sites where revegetation to existing plant species is difficult, the microclimatic changes could remain long after reclamation operations are carried out during the abandonment phase.

Water - Stream crossing would inevitably produce sediment. Unexpected, or unusual, peak flows could cause erosion or the failure of stream crossing structures.

Geophysical data could be misinterpreted and shallow or narrow groundwater aquifers might be overlooked and not cased, allowing contamination by oil and briny water. Well casings for both production and injection wells could leak and allow contaminants to reach groundwater aquifers.

Living Components

Aquatic Flora - Some aquatic vegetation would be destroyed or buried by road or pipeline construction at stream crossings. The less in productivity would depend on the size and number of crossings and would be long-term in nature unless a similar amount of vegetation could be established elsewhere in the ecosystem.

In many cases, aquatic vegetation destroyed through massive earth slides can be replaced only by natural processes. The impact can be severe and last many years.

Sedimentation of aquatic ecosystems would be increased above natural levels despite all mitigative efforts to prevent it. Unavoidable sediment deposits in streams and standing water habitats would result primarily from roads, trails, and pipelines. Accidents during exploration and development would contribute additional sediment to streams and lakes. The long-term effects of excessive sedimentation are often more serious to aquatic plants to shallow water habitats than short-term effects from a single pollution kill.

Many measures can minimize the impacts of most planned actions on aquatic vegetation. However, some severe short-term effects are unavoidable because of accidents, human error, and mechanical failures. Leaks or spills from pipelines or storage facilities would occur periodically, causing pollution of surface waters despite contingency plans and quick cleanups. As a result of these events, some aquatic vegetation would be killed by oil, saline water, toxic substances in drilling muds, fires, and contaminated groundwater. Most of these impacts would be short-term in nature. However, the effects could be serious if large amounts of water and gas were spilled into streams or lakes or if sub-surface water contaminated by oil, gas, or briny water polluted aquatic habitats for prolonged periods.

Terestrial Flora - Mitigative measures could minimize the impact of most oil and gas operations on vegetation. However, the possibility remains that accidents such as leaks, spills, or fires could cause adverse impacts that could not be easily or rapidly remedied. It is also possible that planned rehabilitative measures, such as ripping of compacted soils or revegetation of disturbed areas, would be ineffective due to unforeseen circumstances. In some instances, it may be many years, especially in unfavorable sites, before native plant species become established.

Aquatic Wildlife - Even though mitigative measures were taken, soil erosion and sedimentation of surface waters would increase because of the construction of roads, trails, and pipelines during exploration and development phases. The damage to aquatic resources would vary, depending upon variables such as soil types, terrain, climatic conditions, degree of development, and time of year.

The long-term ecological effects of sedimentation of streams, ponds, and lakes are often of greater consequence to aquatic species than immediate, short-term effects of direct mortalities. For example, heavy sediment loads alter habitat conditions, making surface waters shallower and warmer. This creates unfavorable habitat conditions for cold water game fish, resulting in a predominance of undesirable non-game fish or total elimination of cold water fishes.

Even with good mitigative efforts, some short-term sedimentation can be expected from stream crossing, from gravel removal operations, and from channel changes. Sedimentation during construction would be short-term. However, it could continue for several years during heavy surface runoff until disturbed areas become stabilized with vegetation.

Little can be done to mitigate the effects of landslides on aquatic wildlife after they occur. The only effective mitigation measures are through planning, careful construction, and proper maintenance.

High turbidities during fishing seasons cause a reduction in effort and catch rates, and consequently a reduction in the harvest of the resource.

Excessive turbidities may have greater impacts if they occur during times of critical biological activity. These times are generally associated with reproduction, feeding and movement. These events occur during different times of the year for different species.

The most important unavoidable impacts on water quality and aquatic life would happen during exploration, development, and production phases. Despite the implementation of stringent mitigative measures, the possibility of accidents such as leaks, spills, explosions, fires, and blowouts could not be entirely eliminated.

Well blowouts could cause serious impacts on aquatic wildlife if the oil flowed directly into standing or running-water habitats. Complete cleanup might be impossible. Local waters could be damaged for relatively long periods of time, and detrimental effects could extend downstream for considerable distances.

Pipeline leaks could also cause considerable damage to freshwater fish and fisheries. The magnitude and longevity of the impact would depend upon the volume of oil lost, water levels, sediment loads, location of the spill, and the season and temperature. Plankton, benthic organisms, insects, fish, and spawning areas would likely suffer long-term effects from a large spill. Contamination of stream banks could preclude recreational use of areas for short times.

With the possible exception of incidents caused by well blowouts, contamination of surface waters by chemicals used in drilling mud can be prevented.

Some contamination of groundwater may occur during well blowouts, well drilling and subsurface waste disposal during secondary recovery operations. Polluted groundwater may enter surface water and degrade the aquatic environment. Damage to aquatic ecosystems would probably not be substantial or long lasting unless a badly polluted aquifer discharged a large flow into a small stream or pond.

Stratigraphic testing, well drilling, blowouts, and secondary recovery operations could cause groundwater losses which could not be mitigated. Diminishing groundwater levels could dry up small springs, sloughs or ponds, resulting in the decline or death of aquatic species.

<u>Terrestrial Wildlife</u> - While most impacts on wildlife could be reduced, some mortality or displacement of individual animals would be inevitable. Preliminary investigation and exploration activities such as aerial reconnaissance, seismic testing, and wildcat drilling would affect wildlife to some degree, but the impacts would largely be temporary.

Discovery and subsequent development of a producing oil and gas field would remove habitat currently used by many species of wildlife. Critical habitat areas could be excluded from exploration and development, but less important habitat would be removed from wildlife use. Wildlife harrassment caused by human activity in and around producing fields could not be entirely mitigated. Large species of wildlife, especially predators, would be adversely affected.

Accidental oil spills might occur even though extreme caution were used in extracting and storing oil. Normally such spills could be mitigated through cleanup and restoration. However, spills on habitat essential to wildlife would have adverse impacts that could not be mitigated for at least the time required to clean the spill site.

Human Values

Landscape Character - Impacts on the visual environment would be unavoidable during all phases of oil and gas operations. Vegetation patterns would be altered for varying lengths of time in the exploration, development, and production phases. Some soil movement would occur in all phases. Both the structures and the soil movement would interupt the natural character of the landscape and neither could be entirely mitigated.

If proper mitigating measures were taken after a field was abandoned, there should be little adverse impact on the visual environment. Exceptions might include areas where revegetation is a slow and difficult process and steep areas with extensive cuts and fills.

Social Welfare - The greatest impact on life styles might occur in the smaller rural communities. Opportunities to mitigate the impacts of increased populations in these areas is limited.

Because of the finite and relatively short-term nature of oil and gas resource development, a certain amount of short-term economic instability may be unavoidable.

Ecological Interrelationships

Actions which alter the abiotic environment on biotic community can affect ecological relationships in varying degrees and mitigative measures cannot be entirely effective. Despite all feasible precautions, some oil and gas resource development procedures would upset the natural balance of any ecosystem, at least temporarily. Actions or accidents which destroy vegetation, disturb soil, degrade water quality and pollute air would cause some disruption of ecological interrelationships. In such instances, the nutrient and hydrologic cycles may be interrupted until the affected area was revegetated and soil stabilized, or until the source of pollution was removed.

If grazing, road construction, mining or other activities had already affected ecological interrelationships, the added impact of oil and gas resource developments could create a cumulative effect that may not be offset by mitigating measures.

RELATION BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

This section considers the relationships between short-term use of the environment for oil and gas resource operations and the long-term productivity of the environment and its maintenance for other uses.

"Short-term" use refers to the period during which oil and gas operations would occur. This extends from exploration through abandonment and completion of reclamation. Short-term use may range from several months should preliminary investigations or wildcat drilling prove unsuccessful to up to over 50 years if commercial quantities of oil and gas were discovered.

"Long-term" is that time in which the subsequent effects of the action will still impact the environment. This may be considered to be the period of time beyond the point when all possible restoration has been completed.

Non-living Components

Geology - If oil and gas were discovered and developed, their use in the short-term would preclude long-term use of the resources for engergy or as raw materials in manufacturing processes. If oil and gas activities caused geological subsidence, the effects would extend into the long-term future.

Soils - Long-term productivity would be reduced where oil and gas activities create soil erosion or compaction. Productivity losses would be greatest in areas directly affected by facilities such as mud pits and toxic waste disposal sites.

Land Use - Oil and gas operations would have long-term impacts in areas with highly significant recreational value. Long-term rangeland productivity could be impaired by soil erosion caused by oil and gas activities. Livestock grazing would be restricted during field operations but could be resumed after abandonment. Oil and gas activities in developed areas could attract other industrial and commercial activity, usually based directly or indirectly on oil and gas resource development, and detract from the long-term value of the area for residential uses.

Air - Micro-climates would be permanently modified in areas where roads and other developments were maintained after oil and gas operations were abandoned and in those abandoned drill sites and roads in which the vegetative cover could not be restored to its orignal state.

Water - One long-term effect of the construction of roads and other facilities required in oil and gas resource development would be increased sedimentation in streams and reservoirs. Mitigative measures could reduce, but probably not entirely eliminate, sedimentation resulting from resource development activities on steep slopes. A very long period of time may be required for sediment-laden streams to regain a state of equilibrium.

Should ground water aquifers inadvertently become contaminated through oil and gas operations, it may take many years for the effects to be noted. Such contamination can usually be corrected only by natural processes which take many years, if not centuries.

Living Components

Vegetation - The long-term productivity of both aquatic and terrestrial vegetation could be reduced by construction activities, earth slides, accidents, human errors, and mechanical failures associated with oil and gas operations.

Destruction of vegetation when roads and pipelines across of adjacent to aquatic habitats results in reduced long-term productivity. A fill or sidecast placed in any aquatic habitat may remain there after the vacility is abandoned.

Large oil spills reaching surface waters could have a detrimental long-term impact on vegetation in the vicinity of the spill. Production of aquatic vascular plants, algae, and phytoplankton could be adversely affected, causing reduced production of all organisms throughout the food chain.

The long-term effect of increased sedimentation from oil and gas activities would be to shorten the life span of some aquatic ecosystems, thus eliminating aquatic plants from the environment sooner than under natural conditions.

Aquatic vegetation in small springs or ponds could be lost if shallow water aquifers were drained during well drilling.

The potential for long-term negative impacts on terrestrial vegetation would be greatest in areas with steep slopes, unstable soil, or fragile ecosystems. On sites where oil and gas activities caused soil erosion, compaction, or pollution, productivity could be reduced to the extent that indigenous plant species could not be established after the sites were abandoned. Only brush or forbs, for example, might grow on sites which previously supported associations of desirable range grasses.

Aquatic Wildlife - Accelerated sedimentation caused by oil and gas operations would adversely affect the long-term productivity of aquatic wildlife. The long-term ecological impact of sedimentation in streams is reduced production of indigenous cold water fishes. Habitat conditions become more favorable for non-game species that thrive in warm and shallow waters while cold water species, generally those sought by sportsmen, are either reduced in numbers or eliminated from an area. Some aquatic insects and benthic organisms, some of which serve as food for various fishes, are affected in a similar manner by changes in habitat caused by sedimentation.

Earth slides triggered by road construction could continue to occur after an oil field is abandoned, creating further adverse long-term impact on aquatic habitats.

Oil pollution of aquatic ecosystems from blowouts, leaks, and spills could reduce the long-term productivity of aquatic habitats. Plankton could suffer long-term adverse effects from oil pollution, as could populations of larger species which utilize the plankton directly or indirectly as food and which are utilized in turn by the sportsman.

Consumption of surface and ground water during oil and gas operations could cause a short-term depletion of water supplies, but impacts on aquatic habitats and their fauna could be long lasting. Ground water levels and aquifer pressures could be lowered, thus decreasing the rates of spring flows. During some years, this could eliminate small springs, marshes or ponds that are habitat for some species of fish.

Terrestrial Wildlife - Oil and gas preliminary investigations and exploration usually would not restrict long-term usage of the lands for wildlife habitat unless endangered species were affected. However, should oil and gas resources be discovered, subsequent development and production could have a short-term effect on wildlife through loss of wintering, breeding, feeding and migration areas. After production and site abandonment, the ecosystem may not be entirely rehabilitated. Human settlement and accompanying settlement may after the resources were depleted. Wildlife formerly found in the area of development may not use the habitat again due to changes in land use.

Smaller wildlife species such as rabbits, ground squirrels and other rodents, and many birds may reinhabit and small predator species that prey on them may reinhabit portions of their former habitats. Changes in the habitats may encourage exotics such as pheasants to become established.

Human Values

Landscape Character - Oil and gas field facilities would create a visual intrusion on the natural landscape during the short-term life of the operations. After field abandonment, the long-term effects would vary with the susceptibility of the landscape to reclamation. Areas with steep slopes, erodible soils, or fragile ecosystems would be most likely to bear long-lasting scars of oil and gas operations.

Social Welfare - In the short-term analysis, local communities may experience additional demands upon goods and services created by an expanding population responding to potential opportunities of new employment. Should oil and gas resources be sufficient size to warrant extended exploration and/or production activities, much of this new population could become permanent in nature.

With the cessation of oil and gas exploration and production activities, an emigration of most of the new population could be expected. This could result in a disproportionate amount of goods and services, etc., compared to the needs of the remaining population.

On a long-term basis, it is not expected that any action of proposed oil and gas lease operations would have any adverse impacts of a permanent nature on the social welfare of the residents of the analysis area.

Ecological Interrelationships

Short-term actions such as oil and gas operations pose their greatest threat to the continuing productivity of those ecosystems which contain plants having low growth rates and animals, usually most wildlife species, with low reproduction rates. These conditions are typical throughout much of the EAR area. In any small ecological unit, however, oil and gas operations would alter the natural balance and reduce long-term productivity where permanent roads and structures were installed and where mass soil movement occurred. The productivity and ecological equilibrium of aquatic habitats in streams and ponds could be permanently affected by actions associated with oil and gas operations.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Non-living Components

Geology - The major irreversible impacts on geologic resources would be the consumption of oil and gas and the commitment of construction materials such as sand and gravel for the development of the oil field.

Soils - Actions which destroyed topsoil or caused erosion could permanently affect vegetative productivity. The magnitude of the impact could be reduced by implementing appropriate mitigating measures.

If land slides exposed bedrock and precluded revegetation, the micro-climatic changes created by loss of vegetation would be irreversible.

Land Use - The effects of oil and gas operations in significant recreation areas could be irreversible. To a large extent, agricultural and forestry land uses could be resumed after field abandonment. Urban development resulting from oil and gas production could establish long lasting land use patterns.

Air - Micro-climatic changes created by loss of vegetation through land slide and erosion would be irreversible if revegetation did not occur.

Water - If there were no accidents or failures in any phase of oil and gas activity, there would be no irreversible and irretrievable commitment of water. However, some accidents would probably occur in spite of precautions. If ground water aquifers were contaminated, water quality would be reduced for long periods of time.

If subsidence occurred, ground water aquifers could be permanently impaired.

Reservoirs could suffer permanent loss of storage capacity because of increased sedimentation.

Living Components

Aquatic Flora - If ground water aquifers were drawn down excessively, aquatic habitat in small springs or ponds could be permanently eliminated due to desiccation, resulting in an irretrievable loss of aquatic vegetation.

The natural conversion of standing water habitats to land masses could be accelerated by oil and gas operations which contribute to sedimentation. Massive earth slides are the most visible sources of sedimentation, but the cummulative effect of increased sediment from other actions can cause the greatest effect on aquatic plants.

Minor amounts of aquatic vegetation would be eliminated at road and pipelines water crossings.

Terrestrial Flora - If all or most of the soil on a site were eroded or removed in a mass movement, the effect on vegetative productivity could be irreversible. If oil and gas operations contributed to the elimination of a threatened plant species, the effects would be irreversible.

Wildlife - It is not anticipated that oil and gas operations in the EAR area would result in the loss of an endangered species. Should it occur, however, it would represent an irreversible and irretrievable commitment. Small non-mobile species dependent on a microsite or other limited habitat would be especially vulnerable. Other more mobile species, such as the characteristic major wildlife species, could be eliminated from an area for a long period of time. Whether this would be irreversible is not known.

Discovery and development of an oil field might result in permanent urban development. The loss of habitat and attendant human activity could result in the loss or displacement of major game species and the larger predatory birds and animals. Any fish or wildlife production that is foregone during periods of development would be lost forever.

Heavy industrial and domestic water use could lower water tables, draining marshes and other wetlands. Waterfowl, other birds, amphibians, and small mammals formerly inhabiting the wetlands might be displaced or permanently lost.

Human Values

If properly planned and carried out, mitigation and rehabilitation measures should be able to restore aesthetic values in many areas. The original character of the landscape may never be retrieved where road building or other construction initiated land slides or other mass soil movements.

IV PERSONS, GROUPS, AND GOVERNMENT AGENCIES CONSULTED

The following local people or agencies were consulted concerning the development of potential energy resources of the EAR area:

George Iseri
Manager, Iseri Realty Agency
Ontario, Oregon 97914

Rev. Shinryo Sawada
Ontario Buddhist Temple
Ontario, Oregon 97914

Sola Stalez
Librarian, Vale Elementary School
Vale, Oregon 97918

Howard Ego
City Coordinator
Vale, Oregon 97918

Robert Harrod
Supervisor, Malheur Co.
Intermediate Educ. Dist.
Vale, Oregon 97918

Jim Grant
Manager, Idaho Power Co.
Vale Office
Vale, Oregon 97918

Jerry Auyer
Publisher and Editor
Malheur Enterprise
Vale, Oregon 97918

Alford Pottoriff
Malheur County Planner
Malheur County
Vale, Oregon 97918

Oregon Wildlife Commission
Ontario, Oregon 97914

Henry Schneider
City Manager
Nyssa, Oregon 97913

Dirick Nedry
Publisher & Editor
Gate City Journal
Nyssa, Oregon 97913

Don Young
President, Nyssa Branch
U.S. National Bank
Nyssa, Oregon 97913

Francis McLean
Publisher, Daily Argus Observer
Ontario, Oregon 97914

Roy Probasco
KSRV
Ontario, Oregon 97914

Jack Collins
City Manager
Ontario, Oregon 97914

Frank Yraguen
Malheur County District Attorney
Vale, Oregon 97918

In addition, letters of inquiry were sent May 25, 1976 to 168 individuals and organizations soliciting comments on the environmental impacts of oil and gas resource leasing in the Vale area. Replies from 13 parties were received. A copy of the letter, the list of persons and agencies to whom it was sent, and the replies can be found in Appendix G.

V INTENSITY OF PUBLIC INTEREST

Response to the District's request for input on the oil and gas EAR during preparation has been minimal as has response to previous requests on geothermal EAR's.

Responses have ranged from no objections to the proposed, to requests for additional information as the work develops.

The failure of previous drilling operations in Malheur County to discover commercially significant resources of oil or gas has created a general attitude of pessimism among many residents of the area towards the possibilities of economic discoveries by future operations. Some individuals residing within the EAR area believe that the discovery of economically significant resources is remote at best. Their beliefs are based upon the fact that past drilling activities have produced only minor shows of oil or gas. No oil and gas operations in Malheur County have ever progressed beyond the exploratory phase.

Some private land owners have been approached by oil company representatives concerning possible leasing of their property for oil and gas resource development. Their response has ranged from refusal to acceptance of lease terms.

Residents within the EAR area have heard or read about the interest in and the proposed leasing of certain Natural Resource Lands for oil and gas resource developments. However, most are not fully aware of what oil and gas resource developments would mean to them or what the processes involved would intail.

VI PARTICIPATING STAFF

This Environmental Assessment Report was prepared in the Vale District, Bureau of Land Management, by:

Richard A. Diener, Planning Environmental Coordinator
Gerald Henrie, Soils and Water Specialist
Philip Rumpel, Range Management Specialist

Robert R. Kindschy, Wildlife Specialist
Sheldon Saxton, Lands and Minerals Specialist
William C. Schneider, Outdoor Recreation Planner
Jack V. Roberts, Geologist

VII SUMMARY CONCLUSION

Three major impacts could occur as a result of the proposed action:

1. Alteration of the existing environment.

2. Temporary or short-term impacts on communities within the influence of the EAR area.

3. Contribute energy resources to meet the Nation's energy needs.

The degree of impact will be dependent upon the discovery of economically recoverable oil and/or gas resources and the size of the resource supply.

In summary, the environment may be considered to consist of the abiotic environment (soil and water) and the biotic community (vegetation and wildlife). Residual impacts on these components would occur in spite of close adherence to mitigative recommendations. These are as follows:

1. Soils

   - Erosion of a short-term nature would occur until revegetation and reclamation actions were completed.
   - Some loss of topsoil would occur.
   - Some soil compaction on sites of intensive use will occur and remain in spite of attempts to rip these areas. Complete soil reclamation will only be achieved by the successful revegetation of such areas.

2. Water

   - Some sedimentation will occur, but it will be of a short-term nature.
   - Reductions in available water supplies will result when the sources are used for oil and gas operations, but this would be a short-term impact in most cases. Contamination or depletion of ground water aquifers could result in a permanent loss of the resource.

3. Vegetation

- Removal of some species of range vegetation to facilitate oil and gas operations will require considerable time to replace. Other changes in the flora will be inevitable due to invasion by new species.
- Some areas will remain denuded due to loss of topsoil and proximity of bedrock to the surface.

4. Wildlife

- Habitat destruction would occur on a localized scale and usually be of a short-term nature.
- Habitat abandonment by some species could be of a long-term nature.
- Some mortality among smaller species would occur.

If exploration proved unsuccessful, there would be no subsequent development or land use, and restoration could be quickly made. Consequently, there would be no contributions to the national energy needs, and there would be no demands upon community goods and services.

The chief commitment would be the depletion of oil and gas reserves. These resources are not renewable.

The proposed leasing of Natural Resource Lands in the Vale District for oil and gas operations has received only slight interest. This is based primarily on the results of previous exploratory operations which have located no commercially important oil and/or gas reserves.

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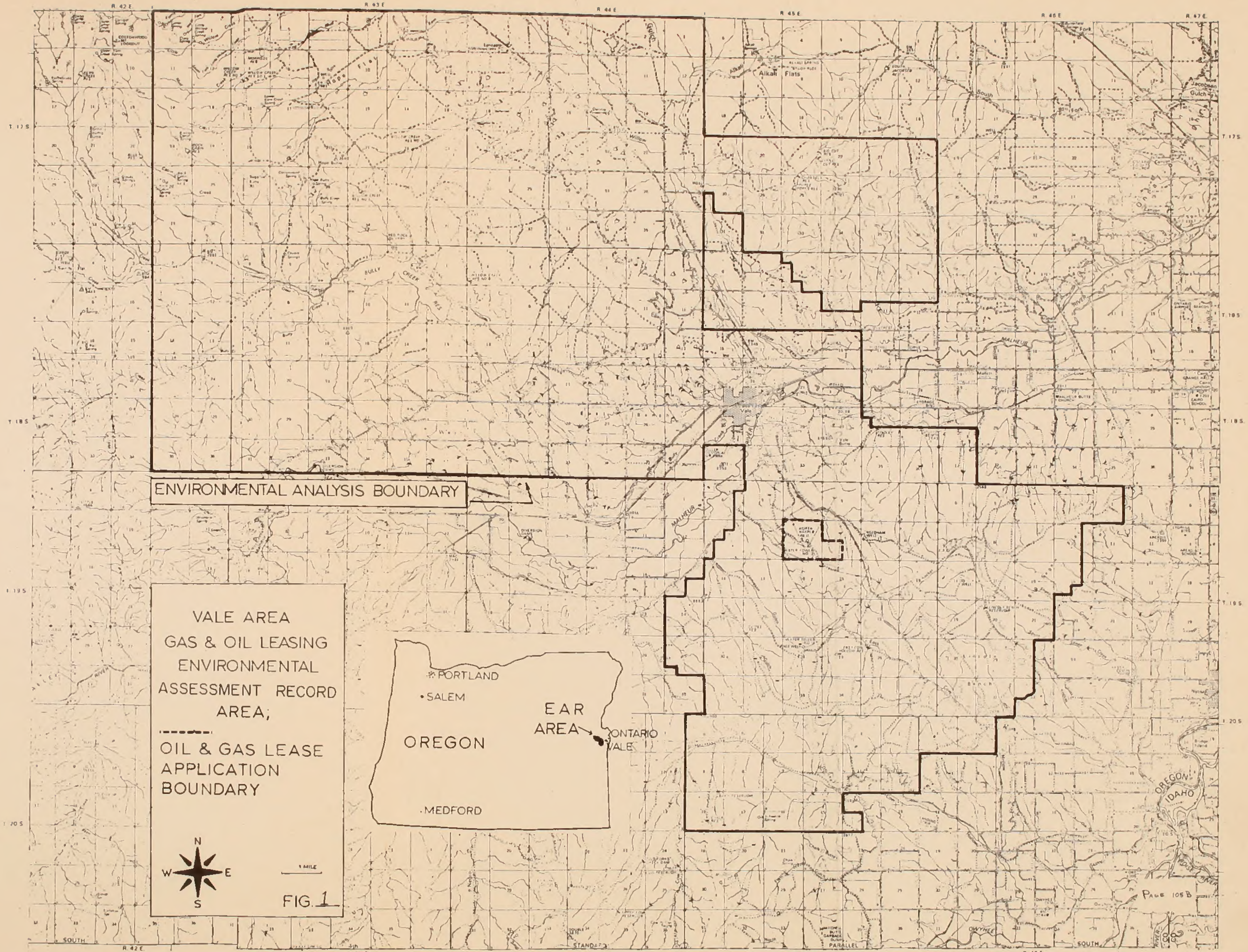


FIG. 1

Page 105B

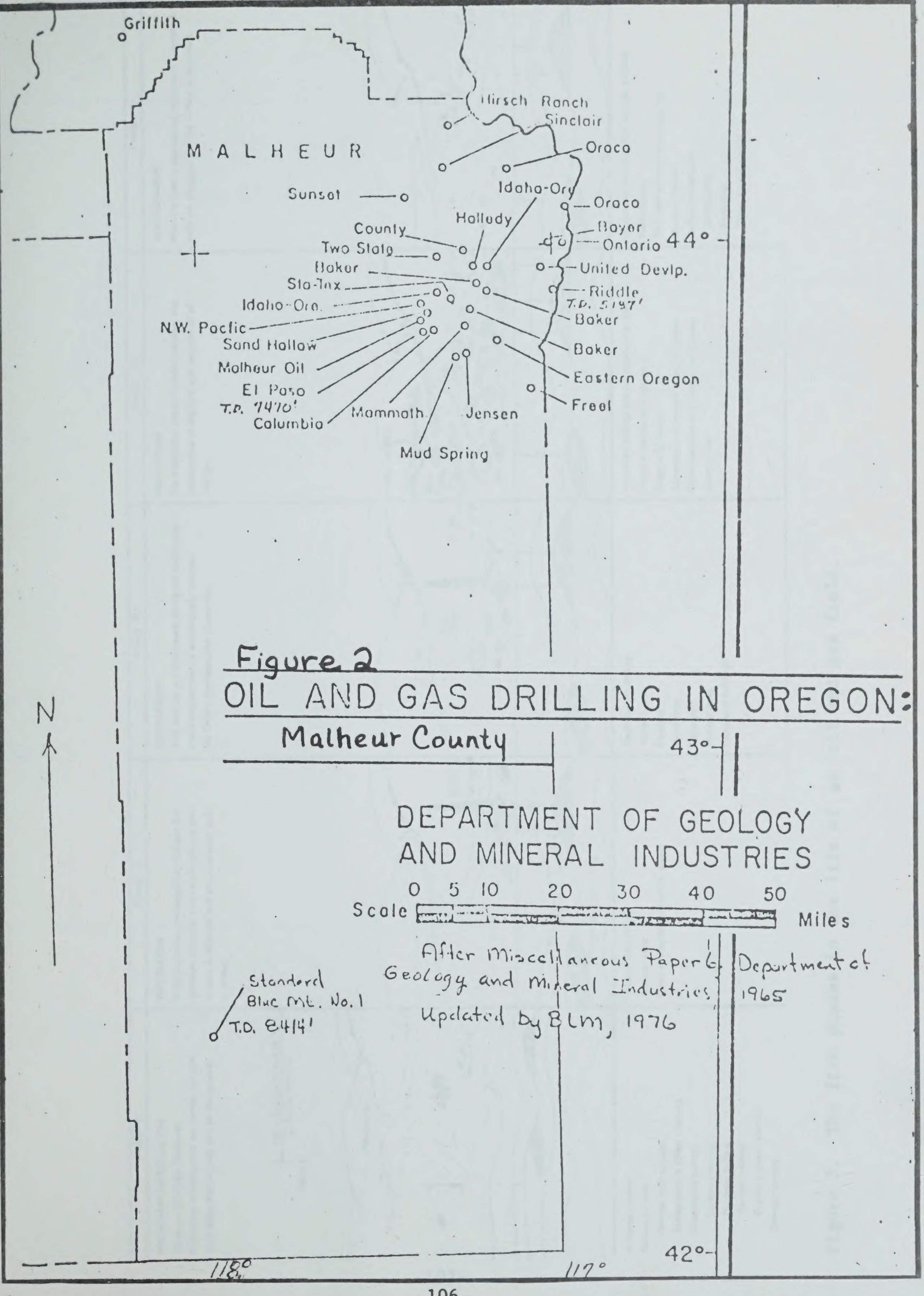


Figure 2
OIL AND GAS DRILLING IN OREGON:
Malheur County

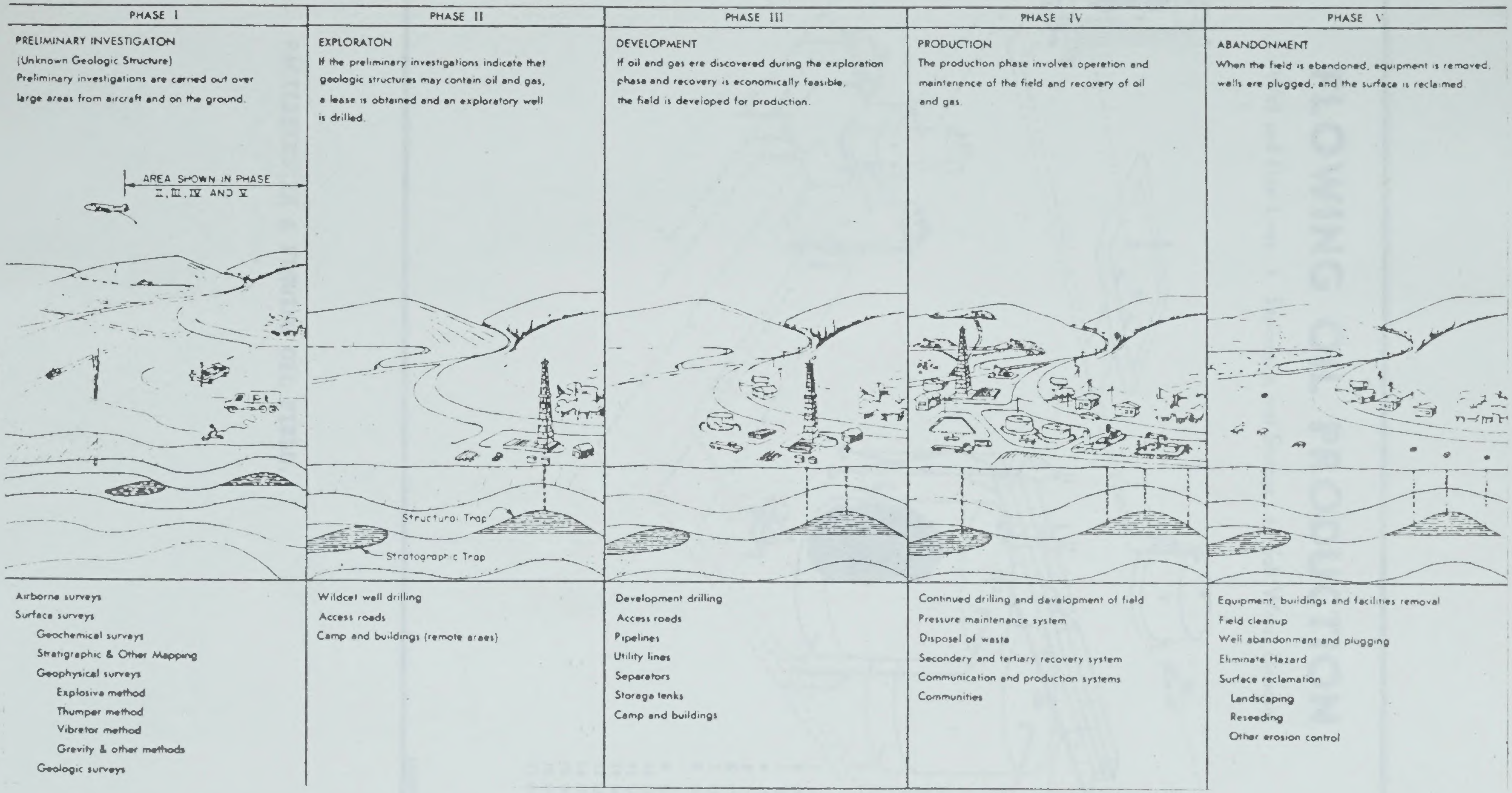


Figure 3. The five phases in the life of an oil and gas field.

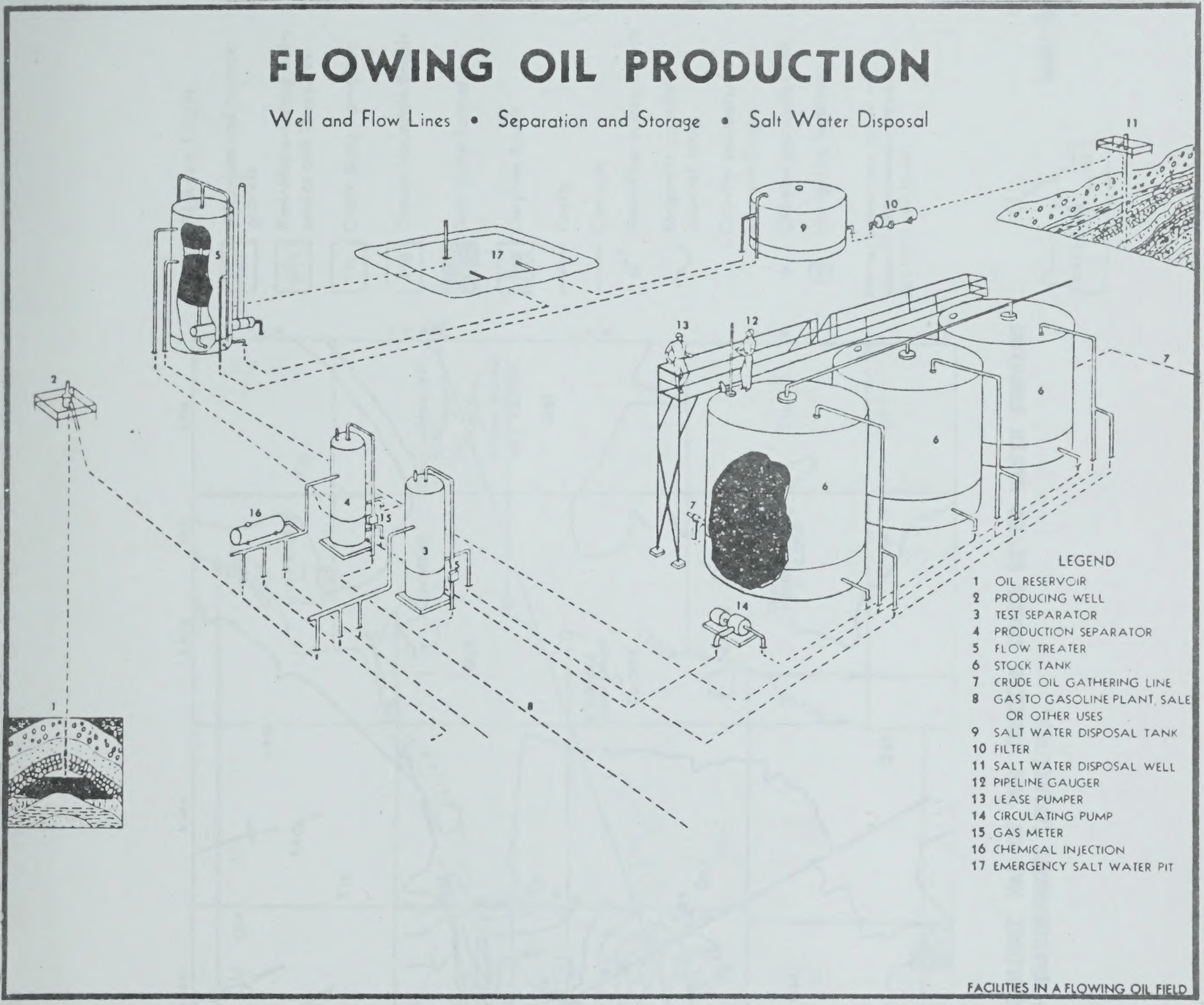
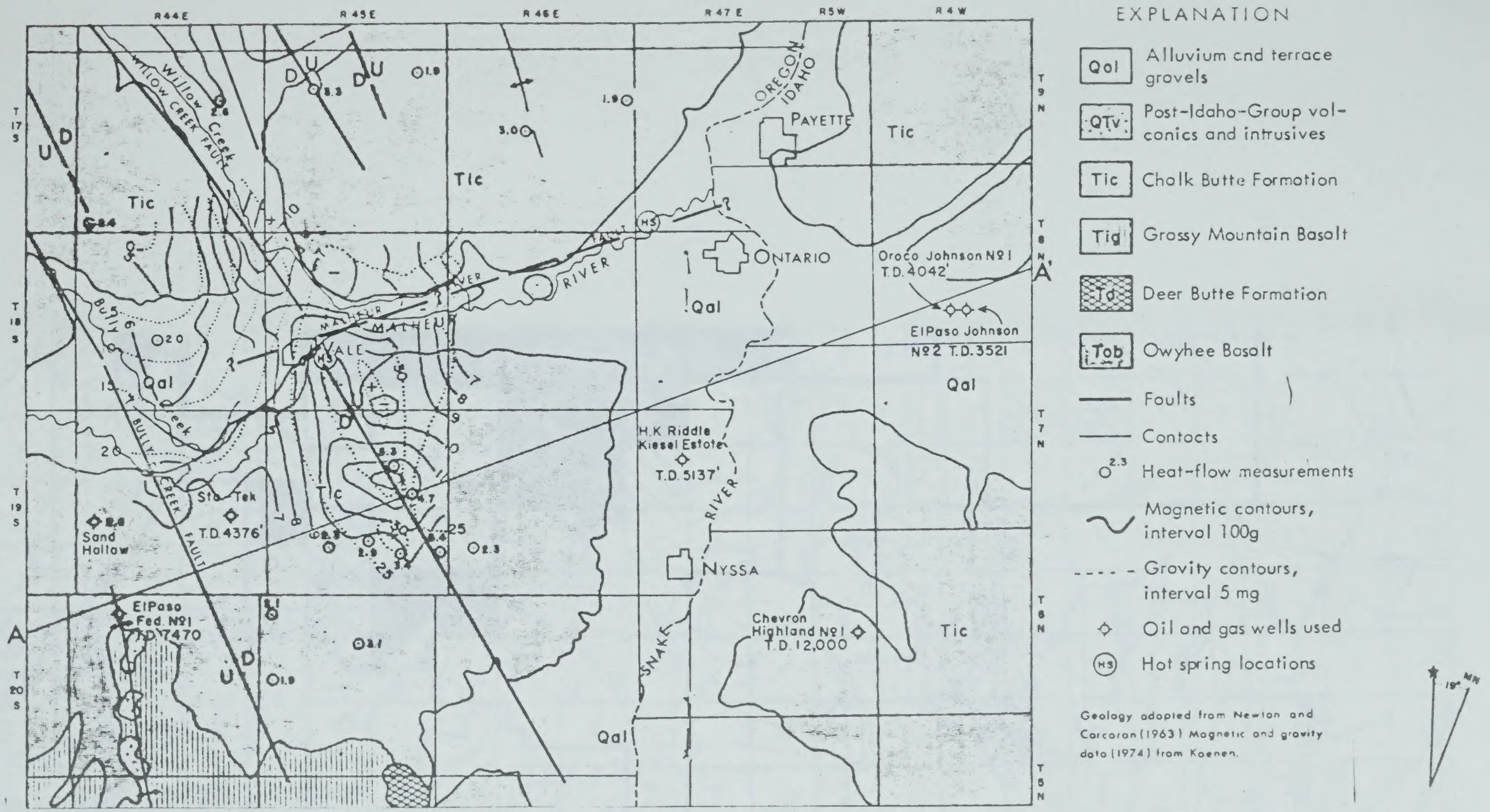


FIGURE 4. FACILITIES IN A FLOWING OIL FIELD.



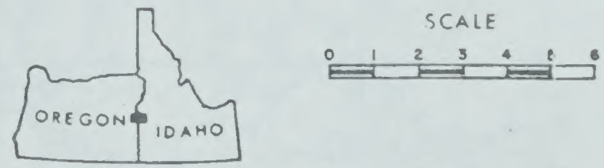


FIGURE 5. GENERALIZED GEOLOGIC MAP OF THE WESTERN SNAKE RIVER BASIN SHOWING HOT SPRING AND HEAT FLOW MEASUREMENT LOCATIONS.

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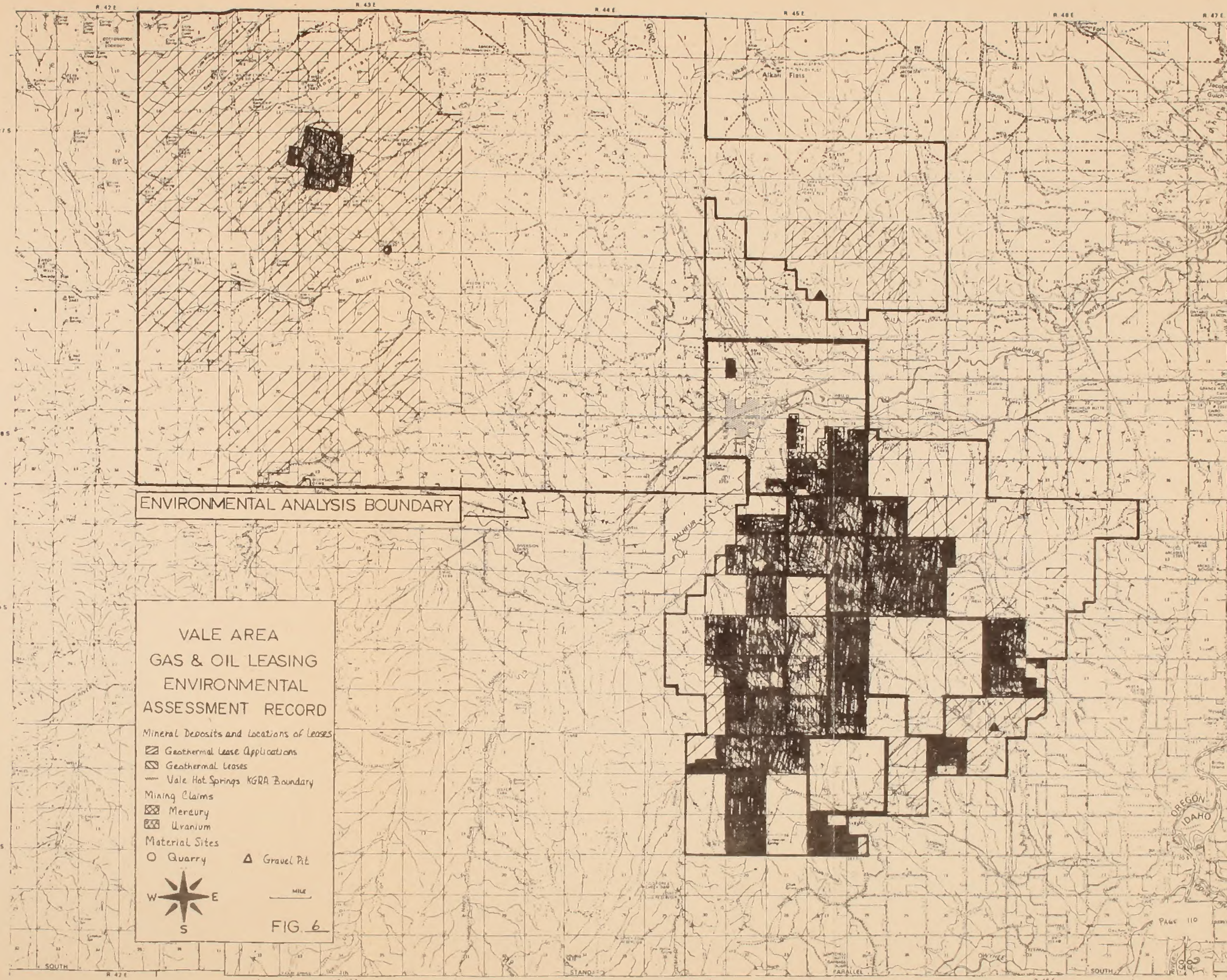

FIG. 6

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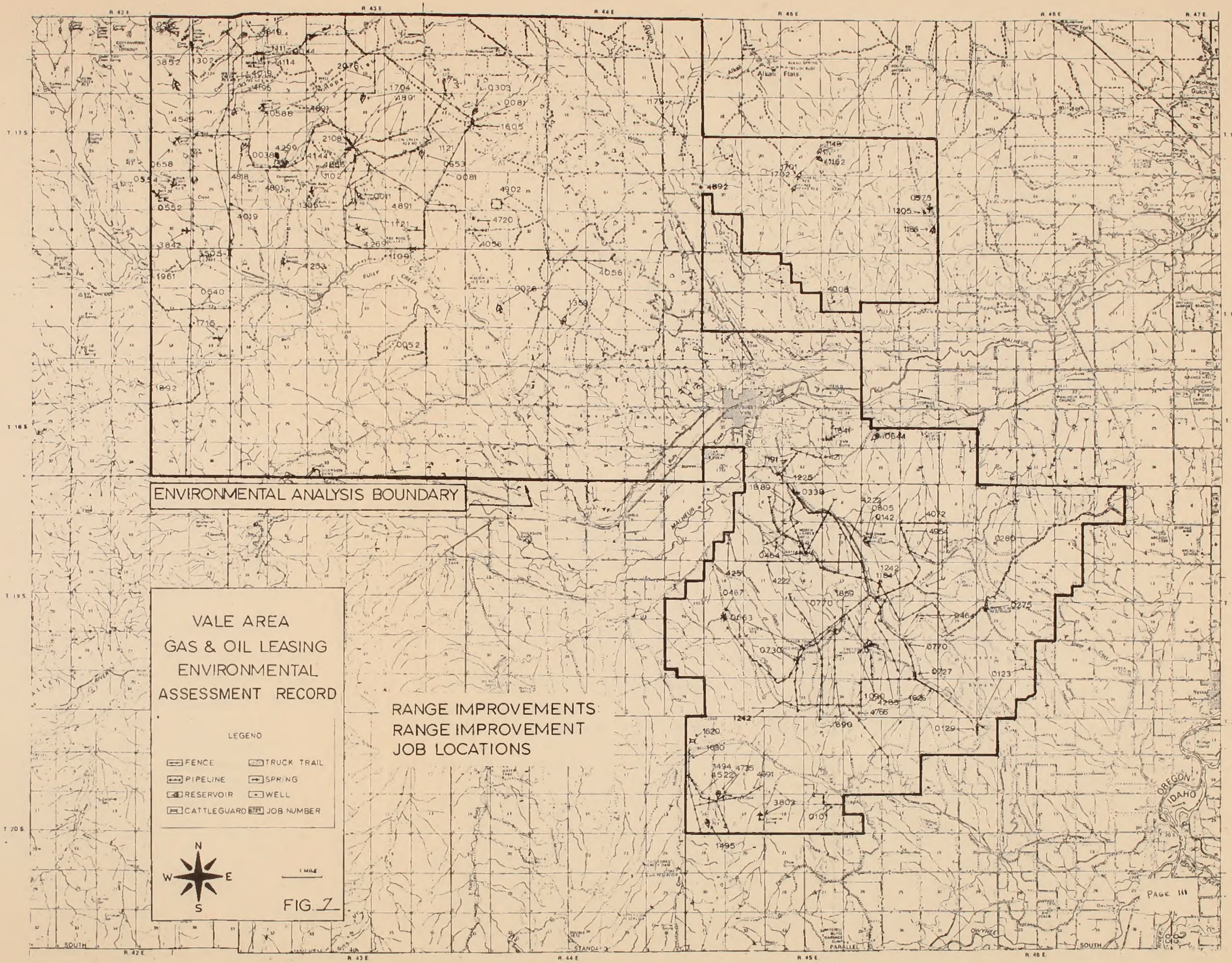

FIG. 7

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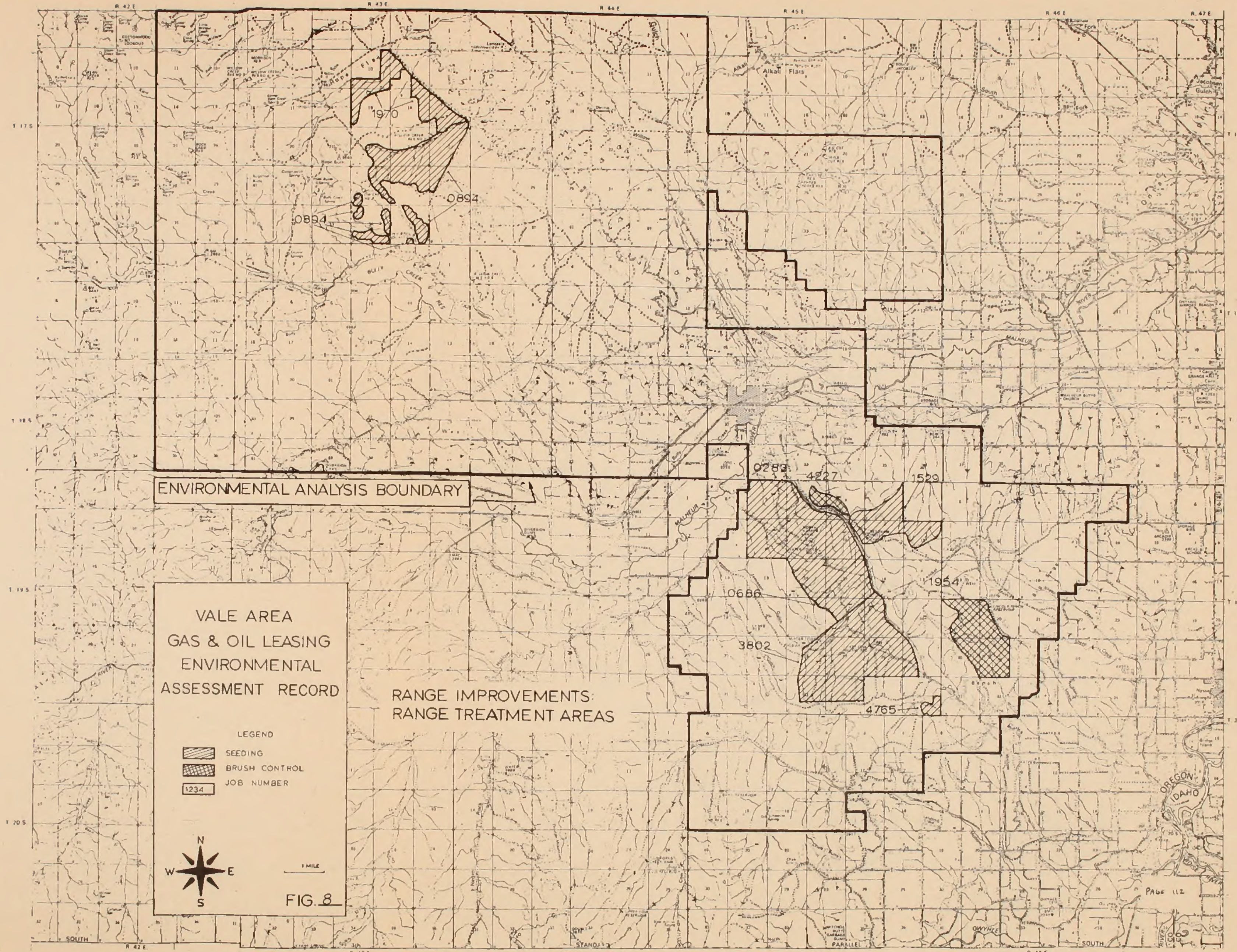

FIG. 8

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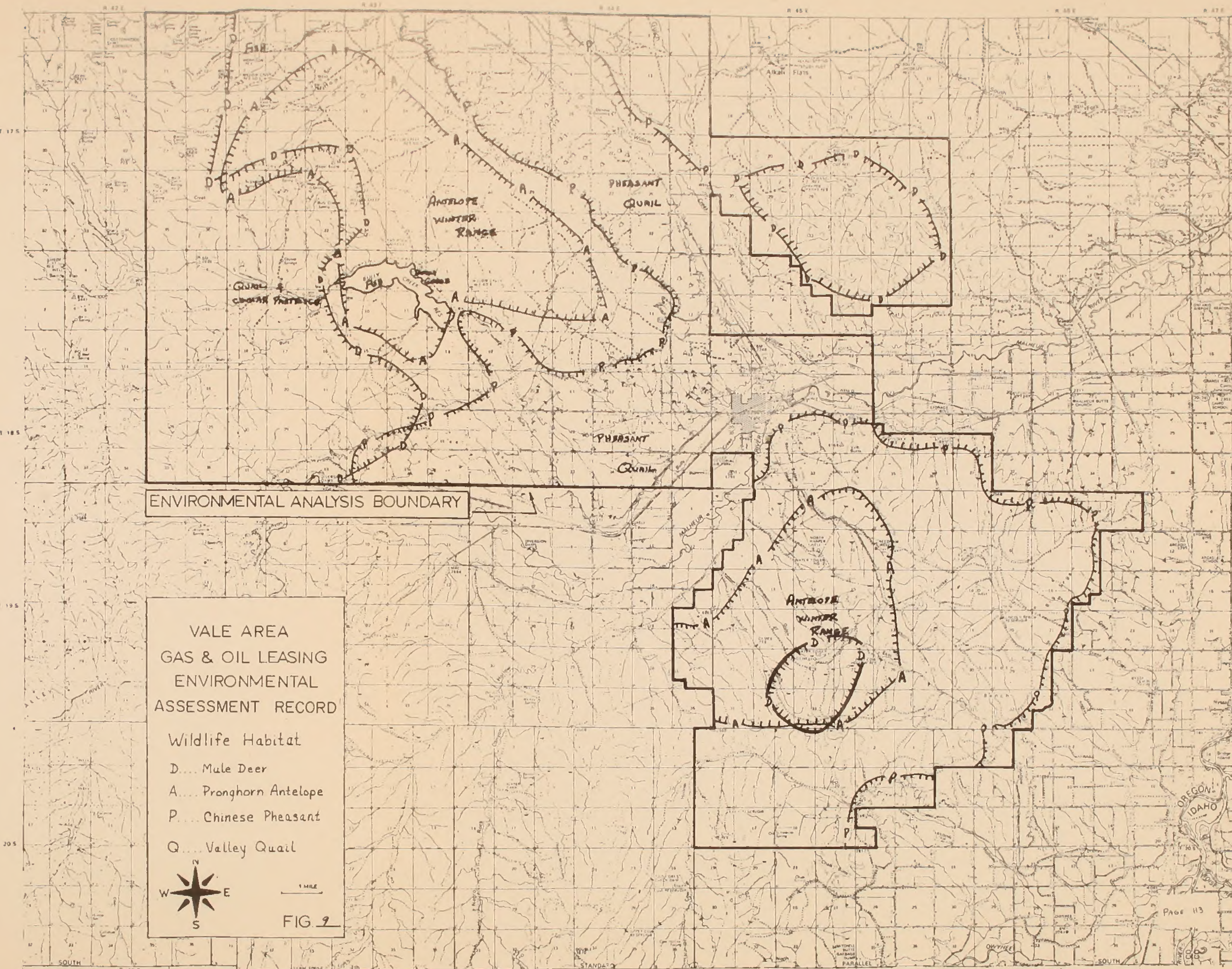

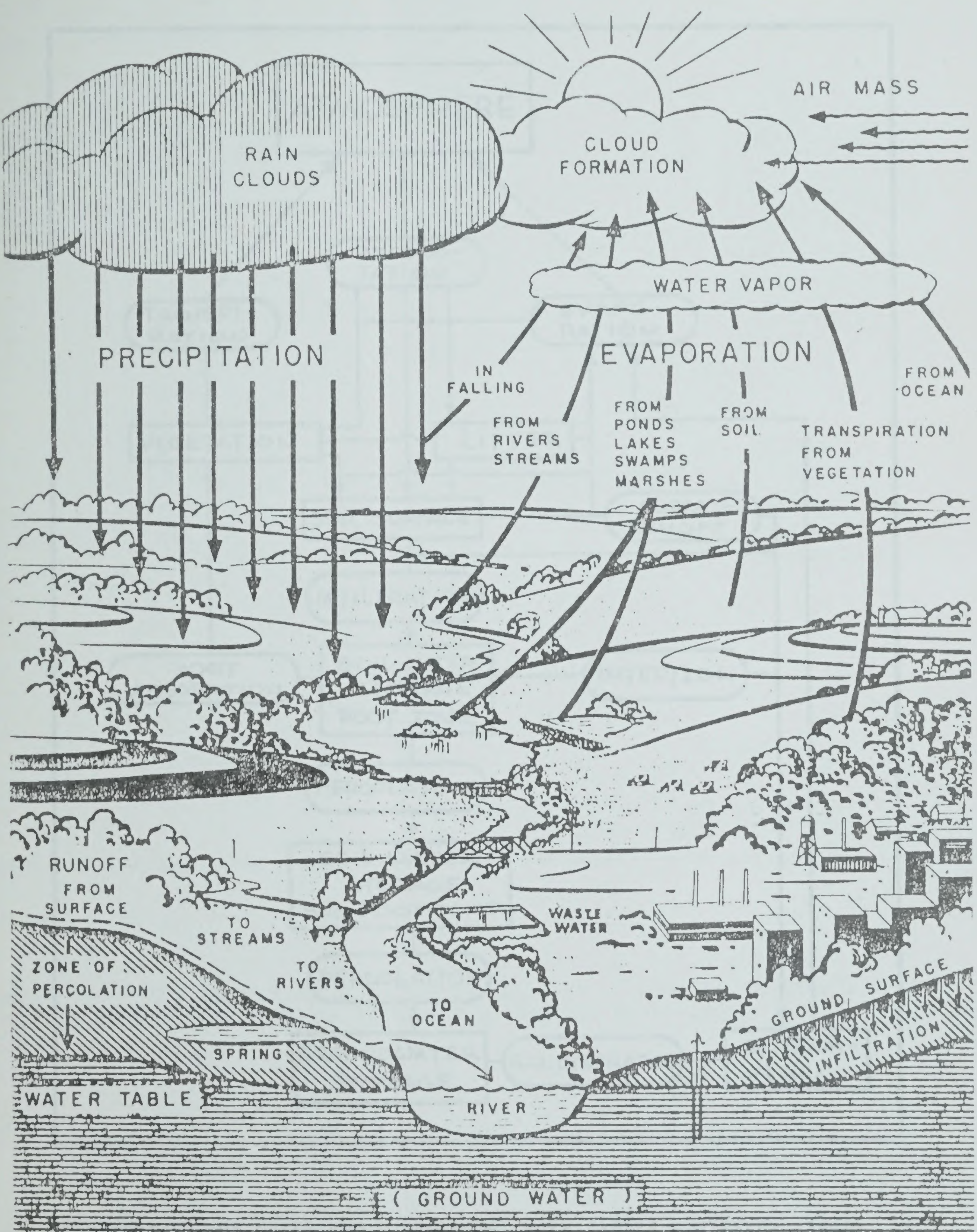

FIGURE 10. THE HYDROLOGIC CYCLE.

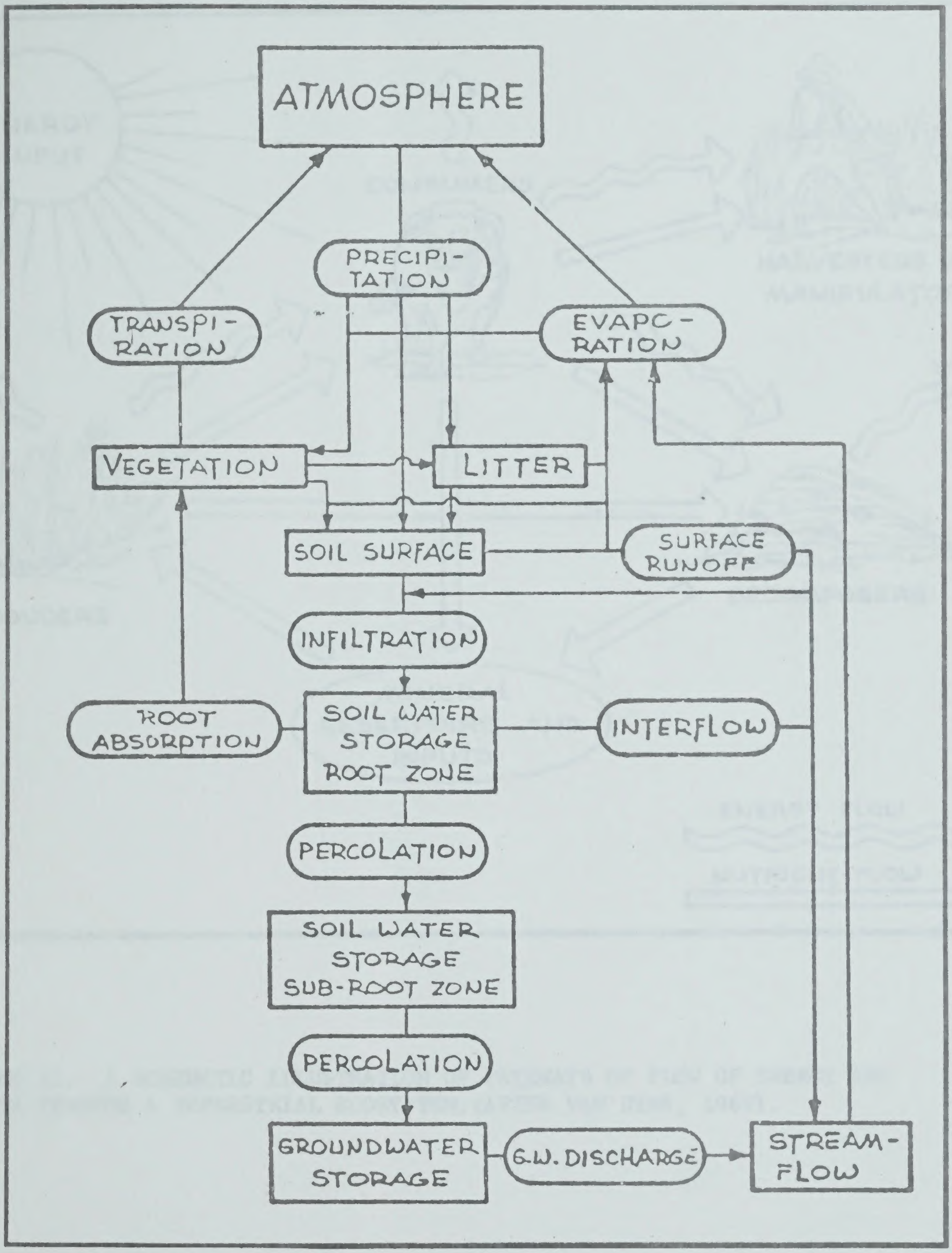

FIGURE 11. THE GRASSLAND HYDROLOGIC CYCLE (AFTER STRIFFLER, 1969).

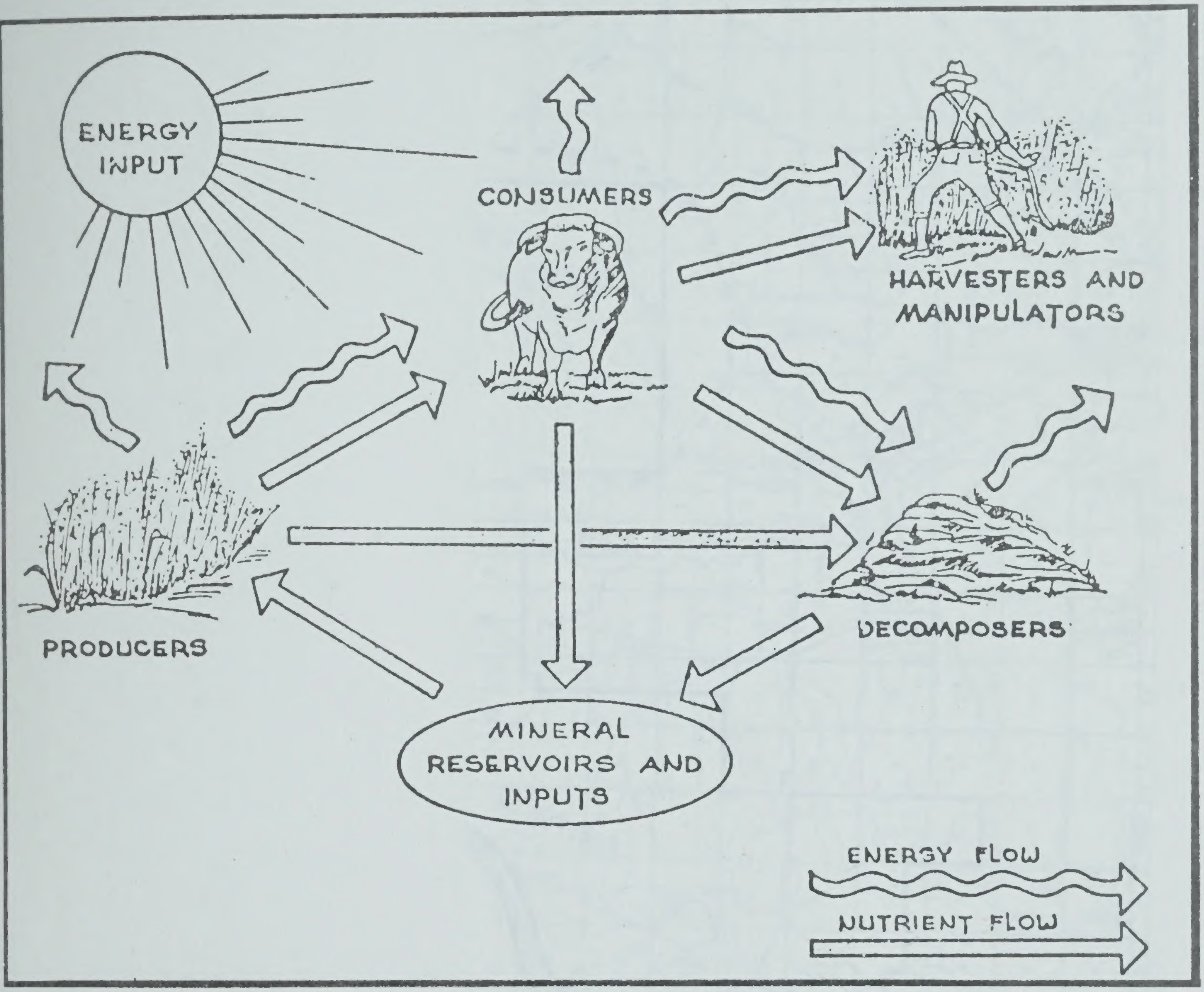

FIGURE 12. A SCHEMATIC ILLUSTRATION OF PATHWAYS OF FLOW OF ENERGY AND MATTER THROUGH A TERRESTRIAL ECOSYSTEM. (AFTER VAN DYNE, 1969).

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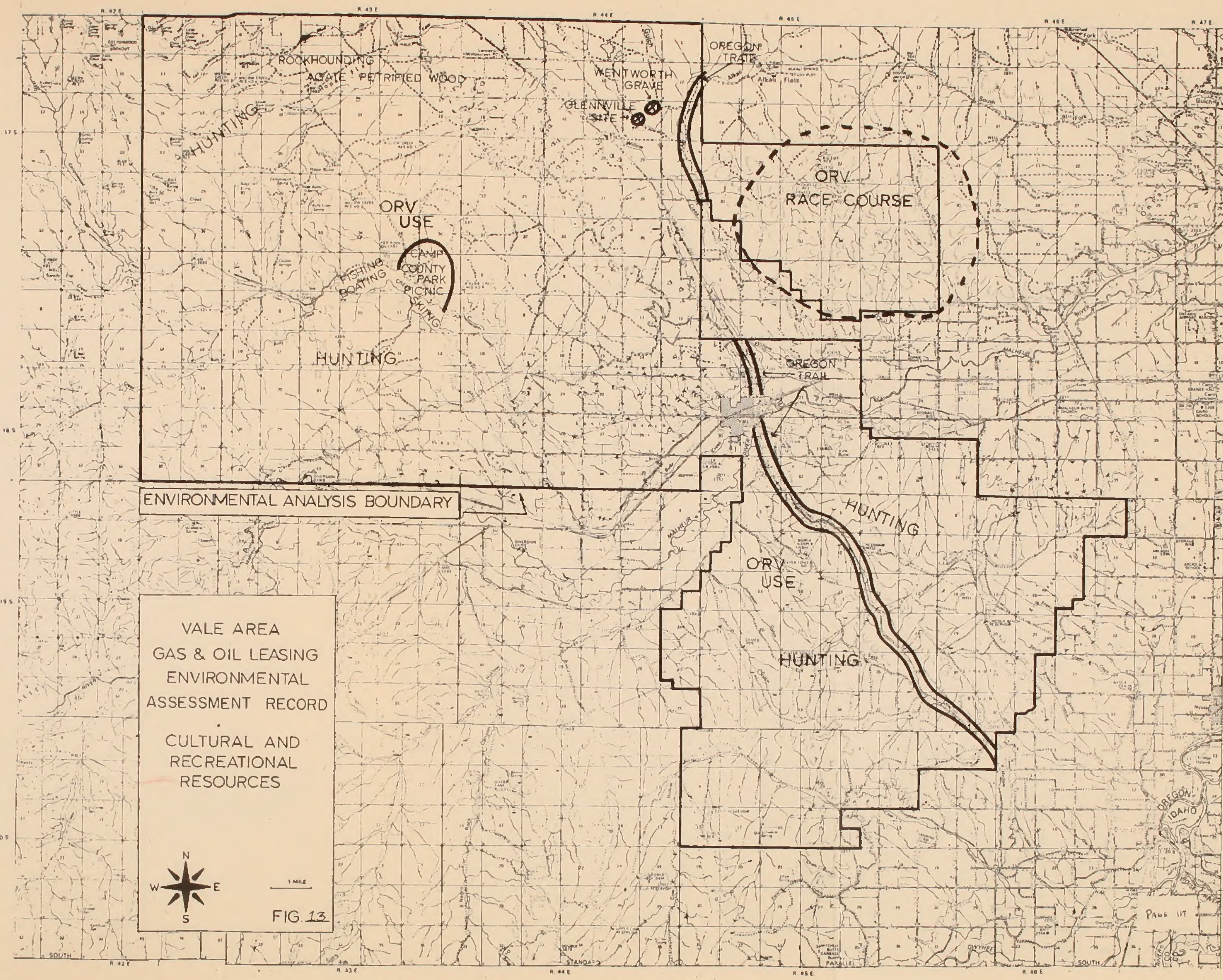


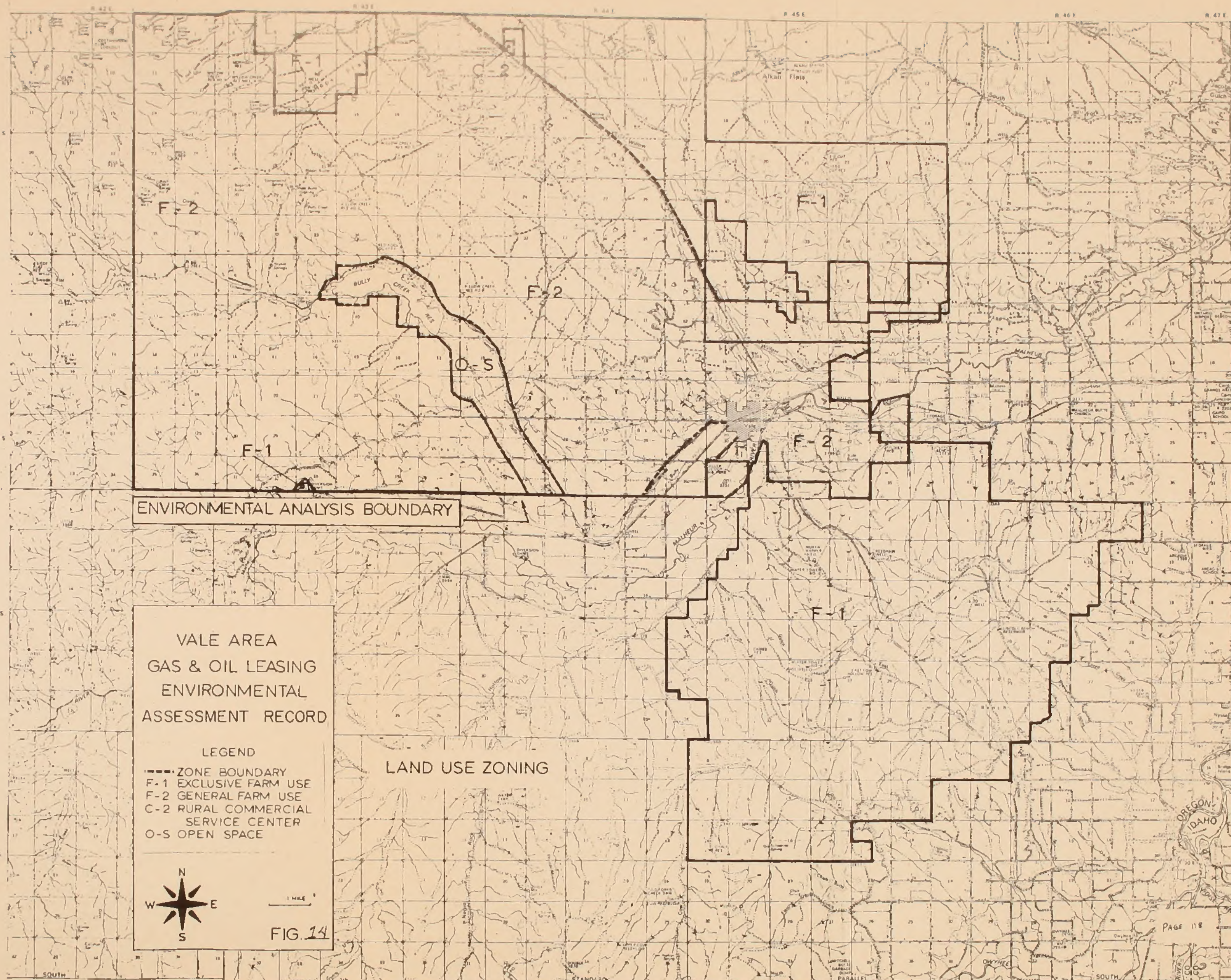

VALE AREA
GAS & OIL LEASING
ENVIRONMENTAL
ASSESSMENT RECORD
LEGEND
ZONE BOUNDARY
F-1 EXCLUSIVE FARM USE
F-2 GENERAL FARM USE
C-2 RURAL COMMERCIAL SERVICE CENTER
O-S OPEN SPACE
N
S
E
W
1 MILE
FIG. 14
LAND USE ZONING
ENVIRONMENTAL ANALYSIS BOUNDARY
F-1
F-2
C-2
O-S
Alkali Flats
MALHEUR
OREGON
IDAHO
PAGE 118

Table 1 SURFACE ACREAGE SUMMARY

Vacant National Resource Lands in EAR area	86,988.53
Reclamation Withdrawal in EAR area	4,212.14
Total, Federal land in EAR	91,200.67
Total, State land	1,640.00
Total, Private land	89,538.56
Total land in EAR area	182,379.23

Table 2 SUMMARY OF MINERAL ESTATE ACREAGE IN EAR AREA 1/

National Resource Land, Federally-owned mineral estate	82,603.38	2/
Reclamation Withdrawal and/or acquired land, Federally-owned mineral estate	3,581.98	
Private land, Federally (BLM)-owned mineral estate	8,912.46	
Private land, Federally (BLM)-owned oil and gas estate only	2,021.26	
State owned land and mineral estate	1,640.00	
Federal land, privately-owned mineral estate	5,228.31	3/
Private land, privately-owned mineral estate	76,79.840	

1/ Detailed maps showing the mineral estate acreage of the EAR area may be seen at the BLM District office, Vale, Oregon.

2/ On 920 acres of this total, ¼ of all minerals is federally-owned, on 40 acres of this total, ¼ of all minerals is Federally-owned. A total of 293 acres is in fragmented Mineral Estate with Federal ownership of oil and gas resources on 213 acres and other minerals, exclusive of oil and gas, on 80 acres.

3/ A total of 213 acres of this figure is in fragmented mineral Estate (this will appear as a duplication of the above figure) in which oil and gas is Federally-owned.

TABLE 3. SUMMARY OF OIL AND GAS EXPLORATORY ACTIVITIES

In Malheur County from 1902 to date

(Oregon Dept. Geol. Min. Indust., Misc. Pap. 6; 1965, and US Bur. Land Management)

Company	Well Name	Elevation and Location	Date	Depth	Remarks
Boyer, A.F.	Water well	Ontario, SE¼ Sec. 9, 18S., 47E. Elev. 2159'.	1902	215'	Gas in water, used to supply lighting jets and cooking range for more than 7 years.
?	?	A short distance Northwest of Weiser, Idaho.	1907	1050'	Gas blew mud & water 80' into the air.
Halledy, T.W.	Water well	Vale 18S., 45E. Elev. 2240'	Before 1909	1000'±	Gas encountered in water sand at 900'
Hirsch Ranch	Water well	Dry Gulch, approx. 18 miles North of Vale.	Before 1909	1700'	Gas reported.
Jensen	Water well	Near Mud Spring Sec. 29, 20S., 45 E. Elev. 3000'.	Before 1909	?	Gas reported at 100'.
?	Water well	Mosquite approx. Sec. 19, 15S., 46E. Elev. 2150'.	Before 1909	1400'	Good flow of gas reported at 1400'.
Baker & Malheur Oil Co.	Well No. 3	South of Vale, NW¼ Sec. 29, 19S., 45E. Elev. 2500'.	1909	163'	Cable tools. Few pieces of salt reported.
Boswell & Johnson	Water well	Vale ? 18S., 45E. Elev. 2240'.	1909	300'	Films of oil on sulfur water reported.
County	Water well	Vale Courthouse Sec. 4, 18S., 45E. Elev. 2242'.	1909	1100'	Found a trace of oil at 1100'.
Malheur Oil Co.	?	Southwest of Vale. Sec. 31, 19S., 44E. Elev. 2450'.	1909	1680'	Cable tool. Small amount of gas with H_2S odor.

Company	Well Name	Elevation and Location	Date	Depth	Remarks
Mammoth Oil & Gas Co.	?	Cow Hollow Sec. 6, 20S., 45E. Elev. 2700'.	1909	1280'+	Cable tools. Small amounts of gas and oil reported. Gas had H S odor.
Mud Spring	Gas Occurrence	Sec. 29, 20S., 45E. Elev. 3000'.	1909	--	Cold spring from which a "copious quantity" of gas issued.
Sand Hollow	Oil occurrence	West bank at Sand Hollow Wec. 29, 19S, 44E. Elev. 2390'.	1909	--	Dark gray bed of hard petroliferous freshwater sandstone. Good odor on fresh fracture. Yielded an ambercolored oil by ether extraction.
Small Creek	Oil occurrence	East side of Small Creek. NW¼ Sec. 2, 20S., 44E. Elev. 2600'.	1909	--	Dark gray sandstone, as found in Sand Hollow.
Baker & Malheur Oil Co.	Well No. 1	South of Vale. SW¼ Sec. 4, 19S., 45E. Elev. 2500'.	1909	340'	Cable tool. Oil show reported.
Baker & Malheur Oil Co.	Well No. 2	South of Vale. NE¼ Sec. 10, 19S., 45E. Elev. 2600'.	1909	329'	Cable tools. Some gas reported.
Columbia Oil & Gas	Well No. 1	Double Mountain SW¼ Sec. 4, 20S., 44E. Elev. 2650'.	1909-1910	975'	Cable tools. Hit a strong flow of gas in basalt at 580'. Gas had an H S odor. Oil films noted in bailing water.
Eastern Oregon Oil Co.	Well No. 1	Sec. 12, 20S., 45E.	1909-191	815'	Cable tools. Reported oil shows.

Company	Well Name	Elevation and Location	Date	Depth	Remarks
Ontario Cooperative Gas & Oil	?	Ontario 18S., 47E.	1909-1913	4362'	Cable tools, deepened with rotary. Well blew out while drilling at 1070' and 2200'. Blew mud and water over the derrick crown.
Sunset Oil Co.	?	About 12 miles NW of Vale.	1919	500'	
North-western Pacific Oil & Gas Co.	Well No. 1	Sand Hollow. Sec. 19, 19S.,44E. Elev. 2500'.	1919	1260'	Cable tools. Hit hot water (115 degrees F.).
United Devel. Corp.	Dorman No. 1	Ontario area. Sec. 25,18S,46E. Elev. 2250'.	1932	625'	Cable tools. Gas show reported 540'.
Western Pacific Oil & Gas Co.	Well No. 1	Approx. 8 miles SW of Vale. Sec. 19, 19S., 44E. Elev. 2500'.	Before 1938	1260+'	
Freel, Frank	Water well	Adrian. SW¼ Sec. 14, 21S, 46E. Elev. 2200'.	1942	508'	Cable tools. Gas in water used for cooking and heating, 1942-1960. Gas has H S odor.
Idaho-Oregon Prod. Co.	Elvera-Recla. No. 1	South of Vale. SE¼ Sec. 9, 19S., 44E. Elev. 2332'.	1954	4611'	Rotary. No shows reported.
Riddle H.K.	Kiesel Estate No. 1	Nyssa area. SW¼ sec. 8, 19S., 47E. 1260' N. of S. line & 1370' E. of W. line. Elev. 2177' Gr.	1954	5137'	Rotary. Gassy, fresh water 900-5042'.
Sta-Tex Oil Co. (R.A. Stamey)	Russell No. 1	Vale area, NW¼ Sec. 14, 19S., 44E. 330'S. of N. line & 330' E. of W. line Elev. 2290'Gr.	1954	4336'	Rotary. Some small gas shows.

Company	Well Name	Elevation and Location	Date	Depth	Remarks
El Paso Nat. Gas Co.	Federal-Spurrier No. 1	South of Vale. NE¼ Sec. 5, 20S., 44E. 360'S. of N. line & 5550'W. of E. line. Elev. 2519'.	1954-1955	7470'	Rotary. Some gas shows reported.
Oroco Oil & Gas	Bolles No. 1	Payette area. NW¼ Sec. 15, 17S., 47E. 660'S. of N. line & 400'W. of E. line. Elev. 2147'. Gr.	1955	1966'	Rotary. Well Blew out while drilling at 1540'. Tests showed gassy, brackish water below 1080'.
Sinclair Oil & Gas Co.	East. Ore. Land Co. No. 1	Willow Creek. SW¼ Sec. 15, 16S., 44E. 660'N. of S.line & 400'W. of E.line. Elev. 2147'.Gr.	1955	4888'	Rotary. No shows reported.
Oroco Oil & Gas Co.	McBride No. 1	Weiser area. SE¼ Sec. 19, 16S.,46E. 1566'N. of S.line & 1419'W. of E.line. Elev. 2900'.	1956	4506'	Rotary. No significant shows.
Two State Oil & Gas Co.	Vale City No. 1	Vale SW¼ Sec. 21, 18S., 45E. 3310'S. of N. line & 660' E. of W. line. Elev. 2250'. Gr.	1961-1962	1185'	Cable tools. No shows. Good.
Standard Oil Co. of Calif.	Blue Mtn. Fed. Unit No. 1	SW¼ Sec. 34 T. 37S., R. 41 E. Malheur County		8414TD	Abandoned August 8, 1973.

TABLE 4

MEAN MONTHLY AND ANNUAL PRECIPITATION (IN INCHES) FOR COMPLETE YEARS OF RECORD IN THE EAR AREA

Station	Yrs. of record	No. years completed	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Malheur Branch Experimental Station	34	33	1.30	1.02	.74	.71	1.17	.92	.10	.39	.42	.81	1.16	1.20	9.93
Nyssa	38	37	1.26	1.04	.76	.75	1.08	.86	.11	.37	.47	.85	1.20	1.28	10.13
Oywhee Dam	41	40	.95	.77	.64	.66	1.22	1.11	.16	.32	.47	.66	1.87	.93	8.76
Vale	80	77	1.19	.91	1.09	.67	1.15	.90	.12	.40	.50	.77	1.03	1.10	9.41

TABLE 5

MEAN MONTHLY AND ANNUAL SNOWFALL (IN INCHES) FOR COMPLETE YEARS OF RECORD IN THE EAR AREA

Station	Yrs. of record	No. years completed	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Malheur Branch Experimental Station	32	32	9.0	2.5	.8	T	T	T	O	O	O	T	1.8	3.8	17.9
Owyhee Dam	40	38	6.4	2.3	.6	T	T	T	O	T	.1	.8	2.4	2.4	12.6
Vale	76	74	8.5	3.1	.9	T	T	T	T	T	O	T	1.2	4.8	18.5

TABLE 6

MEAN MONTHLY AND ANNUAL TEMPERATURE (^{o}F) FOR COMPLETE YEARS OF RECORD IN THE EAR AREA

Station	Yrs. of record	No. years completed	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Malheur Branch Experimental Station	33	33	27.7	34.7	42.2	50.8	59.4	66.4	75.1	72.4	62.8	51.1	38.6	31.3	51.0
Nyssa	36	35	28.3	34.9	42.1	50.9	59.6	66.8	75.5	72.6	62.7	51.0	39.1	31.9	51.3
Owyhee Dam	39	38	30.9	51.8	44.1	52.9	59.6	66.1	73.9	72.1	64.3	53.8	41.4	34.3	52.5
Vale	70	70	28.0	34.9	42.1	50.4	58.9	66.0	74.5	71.6	61.8	50.6	38.9	31.7	50.8

TABLE 7

MEAN MONTHLY AND ANNUAL MAXIMUM TEMPERATURE (^{o}F) IN THE EAR AREA

Station	Yrs. of record		J	F	M	A	M	J	J	A	S	O	N	D	Annual
Malheur Branch Expermental Station	33		35.0	43.0	53.4	65.3	73.8	81.0	92.2	89.2	80.2	65.8	48.0	38.7	63.8
Nyssa	35		36.6	44.1	54.5	65.2	74.1	81.2	92.7	89.8	79.5	66.0	49.2	40.1	64.4
Owyhee Dam	30		38.8	46.0	55.4	65.8	74.7	82.2	93.4	91.4	81.8	68.6	51.3	42.9	66.1
Vale	78		36.3	43.0	55.0	66.0	74.2	82.1	92.4	90.1	79.4	66.8	49.8	38.7	64.5

TABLE 8

MEAN MONTHLY AND ANNUAL MINIMUM TEMPERATURE (°F) IN EAR AREA

Station	Yrs. of record	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Malheur Branch Experiment Station	33	19.1	24.8	30.0	37.1	44.6	50.6	57.5	54.8	45.9	36.8	27.9	23.9	37.8
Nyssa	36	20.7	25.3	30.2	38.2	46.0	52.4	58.9	85.8	46.1	36.5	28.3	25.0	38.6
Owyhee Dam	39	21.9	27.7	32.4	38.9	44.7	49.3	53.8	51.9	47.3	40.1	29.6	26.5	38.7
Vale	78	17.4	27.4	27.4	28.8	34.3	41.4	47.8	53.4	50.7	41.2	32.6	25.0	34.6

TABLE 9

RECORD HIGH AND LOW TEMPERATURE (°F) AND AVERAGE NUMBER OF FROSTFREE DAYS IN THE EAR AREA

Station	Record high temperature	Record low temperature	Ave. no. frostfree days
Malheur Branch Experiment Station	106	-22	143
Nyssa	108	-17	140
Owyhee Dam	111	-17	123
Vale	111	-39	151

Table 10- Soil Properties, Qualities, and Interpretations

Reconn. unit soil series and/or land types	Physiographic area	percent slope	Major land use	Drainage class	Runoff	Permeability	AWHC	Effective root zone	Shrink-swell potential	Workability	Erosion Hazard	Poss. of flooding or ponding	Major soil limitation	Irrigation suitability	Temperature limitation	Hydrologic group
	*							(inches)							**	***
Bakeoven	B	2-7	Range	Good	Med.	Mod.	V.low	7-10	Low	Poor	Low	None	Depth	V.poor	Mod. b/	D
Brogan	B	20-60	Range	Good	Rapid	Mod.	Mod.	20-40	Low	Good	High	None	Slope	V.poor	Mod. b/	B
(Bs)	B	35-60	Range	Good	Rapid	Mod.	Mod.	35-55	Low	Fair	High	None	Slope	V.poor	Strong c/	B
Bully	A	0-2	Cultivated	Good	Slow	Mod.	High	60	Low	Good	Mod.	Some	None	Excel.	Mod.	B
Encina	B	2-60	Range, cultivated	Good	Slow-rapid	M.slow	Mod.	60	Med.	Fair	Low-high	None	Texture-slope	V.poor-good	Mod. b/	B
Frohman	A	0-12	Cultivated	Good	Slow-rapid	V.slow	Low	10-20	Low	Good	Low-med.	None	Depth	Poor-fair	Mod.	D
Gacey	A	2-7	Range	Good	Med.	V.slow	V.low	10-20	Low	Poor	Low	None	Stones	V.poor	Mod.	D
Garbutt	A	0-2	Cultivated	Good	V.slow	Mod.	V.high	60	Low	Good	Med.	Some	None	Excel.	Slight	B
(Gi)	A	0-2	Cultivated	Good	V.slow	Mod.	V.high	60	Low	Good	Low	Some	None	Excel.	Slight	B
Jett	A	0-2	Cultivated	Good	Slow	Mod.	High	60	Low	Good	Low	Some	None	Excel.	Mod. b/	B
Locey	B	2-60	Range	Good	Slow-rapid	M.slow	Low	20-36	Low	Fair	Low-high	None	Texture-slope	V.poor-fair	Strong c/	C
Lookout	B	2-7	Range	Good	Slow	Slow	Low	16-24	Med.	Poor	Low	None	Stones	V.poor	Strong	C
(Ma)	A	0-12	Cultivated	Good	Slow	V.slow	Low	15-30	Med.	Fair	Low	None	Alkali	Poor	Slight	D
(Mc)	B	0-2	Cultivated	Good	Slow	Slow	High	60	Med.	Fair	Med.	None	Alkali	Fair	Mod. d/	C
Morfitt	B	2-7	Range	Good	Slow	Mod.	High	60	Med.	Good	Low	None	Depth	Good	Strong	B
Nyssa	A	0-35	Cultivated, range	Good	V.slow-high	M.slow	Med.	20-40	Low	None	Low	None	Hardpan, slope	V.poor-good	Slight c/	B
(Pe)	B	2-60	Range	Good	Slow-rapid	Mod.	Low	22-32	Low	Good	Low-high	None	Depth, slope	V.poor-good	Strong	C
Poall	B	2-60	Range	Good	Slow-v.rapid	Slow	Med.	15-40	Med.	Fair	Low-high	None	Texture, slope	V.poor-fair	Strong	C
Powder	A	0-2	Cultivated	Good	Slow	Mod.	High	60	Low	Good	Low	Some	Floods	Excel.	Slight c/	B
Riverwash	A	0-20	Pasture	Excess.	V.slow	V.rapid	V.low	0-10	Low	Poor	Med.	Some	Texture	V.poor	Slight	A

Table 10- Soil Properties, Qualities, and Interpretations (cont.)

Reconn. unit soil series and/or land types	Physio-graphic area	per-cent slope	Ma-jor land use	Drainage class	Runoff	Permea-bility	AWHC	Effec-tive root zone	Shrink-swell poten-tial	Worka-bility	Erosion Hazard	Poss.of flooding or ponding	Major soil limi-tation	Irri-gation suita-bility	Tempera-ture limit-ation	Hydro-logic group
	*							(inches)							**	***
Ruckles	B	2-60	Range	Excess.	Med.-rapid	Slow	V.low	14-20	Low	Poor	Low-high	None	Stones, slope	V.poor	Strong c/	C
(Sm)	A	0-2	Cultivated	Poor-1	V.slow	V.slow	Med.	20-40	Med.	Fair	Low	Some	Alkali	Fair	Slight c/	D
Stanfield	A	0-2	Pasture	S.poor-1	V.slow	Slow	Low	20-36	Low	Good	Low	Some	Alkali	Poor	Slight c/	C
Umapine	A	0-2	Pasture	S.poor-1	B.slow	Slow	Mod.	60	Low	Good	Low	Some	Alkali	Fair	Slight c/	C
Virtue	A	0-12	Cultivated range	Good	Slow-med.	M.slow	Low	15-36	Med.	Good	Low-med.	None	Depth, slope	Good-fair	Mod. b/	C
Unit 55	A	3-12	Range	Good	Slow-med.	Slow	Low	10-20	Low	Good	Low-med.	None	Depth	Poor-fair	Strong a/	D
Unit 56	A	3-35	Range	Good	Med.-rapid	Slow	Low	10-20	Med.	Fair	Low-high	None	Depth, slope	V.poor-fair	Strong a/	D
Unit 60	B	3-60	Range	Good	Slow-rapid	M.slow	Mod.	20-40	Med.	Good	Low-v.high	None	Slope	V.poor-good	Strong c/	C
Unit 75	B	3-60	Range	Good	Slow-rapid	Mod.	Low	10-20	Low	Poor	Low-high	None	Stones slope	V.poor	Severe b/	D
Unit 76	B	3-60	Range	Good	Med.-v.rapid	M.slow	Low	10-20	Med.	Poor	Low-high	None	Stones, slope	V.poor	Severe b/	D
Unit S76	B	3-20	Range	Good	Med.-rapid	Slow	Low	10-20	Med.	Poor	Low-med.	None	Stones	V.poor	Severe	D
Unit 77	B	3-60	Range	Good	Med.-v.rapid	Mod.	V.low	5-10	Low	Poor	Low-high	None	Depth	V.poor	Severe	D
Unit 79	B	3-60	Range	Good	Slow-med.	Mod.	High	60	Low	Good	Low-high	None	Slope	V.poor-good	Strong c/	B
Unit 82	B	7-60	Range	Good	Med.-rapid	Mod.	Mod.	20-40	Low	Good	Low-high	None	Slope	V.poor-fair	V.severe a/	B
Unit 83	B	3-60	Range	Good	Slow-rapid	M.slow	Low	10-20	Med.	Poor	Low-high	None	Stones	V.poor	V.severe a/	D
Unit 84	B	12-60	Range	Good	Rapid-v.rapid	Mod.	V.low	5-10	Low	Poor	Low-high	None	Stones	V.poor	V.severe a/	D
Steep Rock land		20-60+	Watershed	Good	V.rapid	Vari.	Vari.	Vari.	Vari.	Poor	Vari.	None	Rock	V.poor	Vari.	D

(cont.)

* Physiographic area
A. Low elevation terraces and flood plains (mostly irrigated)
B. Rolling to hilly grass-shrub uplands

** Temperature limitation
a. Ranges to severe
b. Ranges to strong
c. Ranges to moderate
d. Ranges to slight

*** Hydrologic group
Group A. Lowest potential for runoff. Deep, well-drained to excessively drained, sandy or gravelly soil with rates of water transmission.
Group B. Moderately deep to deep, moderately well to well-drained, moderately fine to moderately coarse-textured soils, lacking an impervious layer and having moderate rates of water transmission.
Group C. Soils moderately deep to bedrock, hardpan, or consolidated sediments; soils with somewhat poor drainage; and soils with fine to moderately fine-textrued layers having slow to moderately slow rates of water transmission.
Group D. Highest potential for runoff. Soils shallow to impermeable bedrock, pans, or very clayey soils with very slow rates of water transmission, and poorly drained soils.

Table 11. TOTAL NUMBER OF RANGE IMPROVEMENT TYPES BY UNIT AND COST IN THE EAR AREA.

Job Type	No. of Units		Total Cost
Reservoirs	22 each		$ 18,433.00
Fences	29 each	108 miles	62,037.00
Cattleguards	17 each		8,725.00
Seedings	6 each	11,704 acres	34,215.00
Springs	15 each		4,937.00
Pipelines	7 each	31 miles	90,068.00
Trucktrail	1 each	8 miles	546 00
Waterhole	1 each		43.00
Wells	3 each		6,404.00
Brush Control	2 each	1,960 acres	8,735.00
Hope Seeding Flat	1 each	2,290 acres	17,108.00
Guzzler	1 each		500.00
Pits	2 each		2,800.00
Test Plots	1 each		300.00
		Total:	254,851.00

TABLE 12 - SUMMARY OF LIVESTOCK GRAZING ALLOTMENTS IN THE EAR AREA

	Acres Federal Land		Active Grazing Qualif. AUM's		Number of
Allotment Name	Total Allotment	EAR Area	Total	EAR Area	Operators, Type
Westcott Individual Allotment	272	272	57	57	1:cattle
McElroy Individual Allotment	701	620	87	77	1:cattle
Jordan Individual Allotment	5051	5051	980	908	1:cattle
Westfall #2 Community Area of use	68,640	4670	12,940	881	6:cattle
Cottonwood Mtn. Area of use	33,788	23,580	5162	2235	7:cattle
West Bench Community Allotment	1110	1110	211	211	2:cattle
Willowcreek Livestock Assoc. Allotment	3533	3533	986	986	10:cattle
Kopp Individual Allotment	80	80	10	10	1:horse
Scudder Individual Allotment	80	80	15	15	1:cattle

TABLE 13 - Crude Oil Spills During Oil and Gas Development and Production Activities in Five Western States in 1972

State	Total Reported	Total Barrels Spilled [1]	Average-Number of Barrels per Spill	Wells in Production [2]	Number of Spills per 100 Wells in Production
Colorado	37	896	24	2,700	1.4
Montana	27	1,960	73	4,210	0.6
N. Dakota	19	813	42	1,490	1.3
Wyoming	74	9,676	131	9,300	0.8
Utah	16	1,434	90	900	1.8

(1) 646 bbls will cover one acre to a depth of 1 inch (646 bbl = 1 acre-inch)

(2) 1971 figures.

Source: Environmental Protection Agency, Region 8, Denver, Colorado

APPENDIX A

U. S. Department of the Interior Secretarial Order No 2948, dated October 6, 1972

Cooperative Procedures Pertaining to Onshore Oil, Gas and Geothermal Resources -- Implementation of Secretarial Order No. 2948.

Copies of these documents may be obtained or reviewed at any U. S. Bureau of Land Management office.

APPENDIX B

FEDERAL REGULATIONS AND FORMS PERTAINING TO OIL AND GAS RESOURCE EXPLORATION AND DEVELOPMENT

Code of Federal Regulations (CFR)

43 CFR 3040 - The purpose of these Bureau of Land Management regulations in this part is to establish procedures to be followed in conducting exploration of the public land for oil and gas.

43 CFR 3100 - These Bureau of Land Management regulations establish procedures for leasing of the public lands for oil and gas resources.

43 CFR 3110 - These Bureau of Land Management regulations define procedures for non-competitive leasing of the public lands for oil and gas resources.

40 CFR 112 - These U. S. Environmental Protection Agency regulations identify procedures, methods, and equipment to be used to prevent the discharge of oil from non-transportation related onshore and offshore facilities into navigable waters. The regulations apply to owners and operators of facilities engaged in oil and gas drilling, producing, gathering, storing, and other non-transportation related activities. Oil and gas operators are required in the regulations to prepare Spill Prevention Control and Countermeasure Plans.

40 CFR 1510 - The National Oil and Hazardous Substances Pollution Contingency Plan is contained in these Environmental Protection Agency regulations. As stated, the plan provides a pattern of coordinated and integrated responses by departments and agencies of the Federal Government to protect the environment from the damaging effects of pollution discharges. It promotes the coordination and direction of Federal and State response systems and encourages the development of local government and private capabilities to handle such discharges.

30 CFR 221 - These are the U. S. Geological Survey's Oil and Gas Operating Regulations. Among other things, they include requirements relating to well casing, well abandonment, and other mitigative measures.

GEOLOGICAL SURVEY REGULATIONS AND NOTICES

Geological Survey Notices to Lessees and Operators of Federal Oil and Gas Leases (NTL's) transmit the Geological Survey's operating requirements to lessees.

NTL-2B - Prescribes requirements for handling, storing, and disposal of water produced from oil and gas wells.

NTL-3 - Requires lessees to report discharges of pollutants and prescribes the contents of the reports.

NTL-4 - Requires lessees to pay royalties on oil and gas lost because of blowouts, fires and other reasons.

NTL-6 - Formalizes the requirement by the Survey that an oil and gas operator furnish a surface use and operating plant to the Survey and BLM and receive approval before entering the lease to conduct drilling operations. USGS and BLM use information in the surface use plan and other data collected by the agencies to develop environmental protection measures. The measures are included as conditions of the drilling permit issued by USGS.

Well Spacing Patterns - These Survey regulations pertain to well drilling locations and placement of production facilities on public lands.

U. S. BUREAU OF LAND MANAGEMENT FORMS

BLM Form 3040-1 - "Notice of Intent to Conduct Oil and Gas Exploration Operations". Geophysical exploration companies are required to complete this form before conducting geophysical operations on National Resource Lands. The form contains terms and conditions under which the operations must be conducted. More detailed conditions may be established to meet the unique requirements of the area where operations will be conducted.

BLM Form 3109-1 - "Lease Stipulations: Bureau of Reclamation". Lessees are required to pay any damage sustained by any reclamation homestead entryman or reclamation project resulting from any oil and gas operating activity of the lessee and to post appropriate bond.

BLM Form 3109-5 - "Surface Disturbance Stipulations". These are the "open-ended" stipulations. They are made a part of each oil and gas lease issued by BLM at the present time. These stipulations insure that, after the lease is issued but before drilling operations are started, USGS and BLM have additional opportunities to establish conditions which the lessee will have to meet.

Section 2, Par. (q) of BLM Form 3120-7 - "Protection of Surface, Natural Resources and Improvements". Provisions of this statement are designed to protect soils, crops, forage and timber, water and air, physical improvements, and archeological and paleontological resources in the area of operation on public lands or on private lands to which the Federal government holds the mineral rights.

OTHER REGULATIONS:

Bureau of Land Management Road Specifications - These regulations describe procedures involved in road construction on public lands. Items covered include clearing and grubbing, excavations and embankments, watering, renovation, bases and surfaces, and slope protection measures.

COOPERATING AGENCIES

1. Environmental Proection Agency
   Region X
   1200 - 6th Ave.
   Seattle, WA 98101

2. U.S. Geological Survey
   Conservation Division
   345 Middlefield Road
   Menlo Park, CA 94025
   attn; Oil and Gas Supervisor

3. U.S. Bureau of Land Management
   Oregon State Office
   P.O. Box 2965 - 1729 N.E. Oregon St.
   Portland, OR 97208

   U.S. Bureau of Land Management
   Vale District Office
   P.O. Box 700
   Vale, OR 97918

APPENDIX C

STATE OF OREGON REGULATIONS PERTAINING TO OIL AND GAS RESOURCE DEVELOPMENT AND PRODUCTION, AND AN OVERVIEW OF THIS RESOURCE DEVELOPMENT WITH A DESCRIPTION OF STATE-FEDERAL COOPERATION

State of Oregon Department of Environmental Quality memorandum dated September 2, 1975 by Loren Kramer to R.E. Corcoran, Dept. Geol. and Mineral Industry, on Special Conditions to Apply to All Deep Well Exploratory Drilling in Oregon. Establishes criteria for environmental protection during geothermal, mineral, or petroleum resource development.

"Cultural Resource Stipulations to Oil and Gas Leases Issued in Oregon". This document establishes criteria for protecting items of historical or scientific interest during mineral resource development in Oregon.

Chapter 632, Oregon Administrative Rules: Department of Geology and Mineral Industries. These regulations describe regulations for developing oil and gas resource development facilities in Oregon and measures to protect the environment during resource development and production.

"Statewide Overview of Possible Development on Federal Oil and Gas Leases in Oregon". This document describes the history of oil and gas development in Oregon, its potential future, various regulations on development and production, and State-Federal cooperation.

APPENDIX D

FAUNA OF THE VALE EAR AREA

MAMMALS THAT OCCUR ON LANDS IN THE VALE EAR AREA

CLASS MAMMALIA

Order	Latin Name	Common Name
Insectivora	Sorex vagrans	Wandering shrew
Chiroptera	Myotis lucifugus	Little brown bat
	Myotis californicus	California bat
	Myotis subulatus	Small-footed bat
	Pipistrellus hesperus	Western pipistrel
Lagomorpha	Lepus californicus	Black-tailed jackrabbit
	Sylvilagus nuttalli	Mountain cottontail
Rodentia	Eutamias minimus	Least chipmunk
	Spermophilus lateralis	Mantled ground squirrel
	Spermophilus townsendi	Townsend ground squirrel
	Marmota flaviventris	Yellow-bellied marmot
	Neotoma cinerea	Bushy-tailed woodrat
	Neotoma lepida	Desert woodrat
	Onychomys leucogaster	Grasshopper mouse
	Peromyscus maniculatus	Deer mouse
	Reithrodontomys megalotis	Harvest mouse
	Microtus longicaudus	Long-tailed vole
	Ondatra zibethicus	Muskrat
	Castor canadensis	Beaver
	Erethizon dorsatum	Porcupine
	Dipodomys ordi	Ord kangaroo rat
	Thomomys towsendii	Townsend's pocket gopher
Carnivora	Lynx rufus	Bobcat
	canis latrans	Coyote
	Vulpes fulva	Red fox
	Mustela frenata	Long-tailed weasel
	Lutra canadensis	River otter
	Taxidea taxus	Badger
	Mephitis mephitis	Striped skunk
	Procyon lotor	Raccoon
Artiodactyla	Antilocapra americanus	Pronghorn antelope
	Odocoileus hemionus	Mule deer

BIRDS OF VALE EAR AREA

CLASS AVES

Order	Scientific Name	Common Name
Pelecaniformes	Pelcanus erythrorhynchos	White Pelican
Ciconiiformes	Ardea herodias	Blue Heron
Anseriformes	Olor columbianus	Whistling Swan
	Branta canadensis	Canada Goose
	Branta canadensis leucopareia	Lesser Canada Goose
	Anas platyrhynchos	Common Mallard
	Anas streperus	Gadwall
	Mareca americana	Baldpate (Widgeon)
	Anas acuta	American Pintail
	Anas carolinensis	Green-winged Teal
	Anas cyanoptera	Cinnomon Teal
	Mergus merganser	American Merganser
Falconiformes	Cathartes aura	Turkey Vulture
	Buteo regalis	Ferruginous Hawk
	Aquila chrysaetos	Golden Eagle
	Falco sparverius	Sparrow Hawk
Galliformes	Alectoris graeca	Chukar Partridge
	Lophortyx californica	California Quail
	Phasianus colchicus	Ring-necked Pheasant
Gruiformes	Fulica americana	American Coot
Charadriiformes	Charadrius vociferus	Killdeer
	Capella gallinago	Common Snipe
	Recurvirostra americana	Avocet
	Larus californicus	California Gull
Columbiformes	Columba livia	Rock Dove
	Zenaidura macroura	Mourning Dove
Strigiformes	Otus asio	Screech Owl
	Bubo virginianus	Great Horned Owl
	Speotyto cunicularia	Burrowing Owl
Caprimulgiformes	Chordeiles minor	Nighthawk

Order	Scientific Name	Common Name
Micropodiformes	Selasphorus rufus	Rufous Hummingbird
Coraciformes	Megaceryle alcyon	Belted Kingfisher
Piciformes	Colaptes cafer	Red-shafted Flicker
Passeriformes	Tyrannus Verticalis	Western Kingbird
	Empidonax wrightii	Gray Flycatcher
	Eremophila alpestris	Horned Lark
	Tachycineta thalassina	Violet-green Swallow
	Hirundo rustica	Barn Swallow
	Pica pica	Magpie
	Corvus corax	Raven
	Corvus brachyrhynchos	Common Crow
	Sitta canadensis	Red-breasted Nuthatch
	Catherpes mexicanus	Canon Wren
	Salpinctes obsoletus	Rock Wren
	Turdus migratorius	Robin
	Lanius ludovicianus	Loggerhead Shrike
	Sturnus vulgaiis	Starling
	Vireo solitarius	Solitary Vireo
	Denroica petechia	Yellow Warbler
	Denroica auduboni	Audubon Warbler
	Passer domesticus	English (House) Sparrow
	Dolichonyx oryzivorus	Bobolink
	Sturnella neglecta	Western Meadowlark
	Agelaius phoeniceus	Red-winged Blackbird
	Euphagus cyanocephalus	Brewer Blackbird
	Molothrus ater	Brown-headed Cowbird
	Piranga ludoviciana	Western Tanagers
	Passerina amoena	Lazuli Bunting
	Pipilo erythophthalmus	Rufous-sided Towhee
	Passerculus sandwichensis	Savannah Sparrow
	Chondestes grammacus	Lark Sparrow
	Amphispiza belli	Sage Sparrow
	Junco oreganus	Oregon Junco
	Spizella passerina	Chipping-Sparrow
	Zonotrichia leucophrys	White-crowned Sparrow
	Melospiza melodia	Song Sparrow

LIST OF AMPHIBIANS AND REPTILES OF VALE EAR AREA

CLASSES AMPHIBIA AND REPTILIA

FAMILY BUFONIDAE

Bufo woodhousei woodhousei	Woodhouse's Toad; Rocky Mountain Toad

FAMILY HYLIDAE

Hyla regilla	Pacific Treefrog

FAMILY RANIDAE

Rana pretiosa	Spotted Frog
Rana catesbeiana	Bullfrog

FAMILY IGUANIDAE

Crotaphytus collaris bicinctores	Great Basin Collared Lizard
Crotaphytus wizlizenii wizlizenii	Long-nosed Leopard Lizard
Sceloporus occidentalis biseriatus	Great Basin Fence Lizard
Sceloporus graciosus graciosus	Northern Sagebrush Lizard
Uta stansburiana stansburiana	Northern Side-blotched Lizard
Phrynosoma platyrhinos platyrhinos	Northern Desert Horned Lizard

FAMILY SCINCIDAE

Eumeces skiltonianus	Western Skink

FAMILY TEIIDAE

Cnemidophorus tigris tigris	Great Basin Whiptail Lizard

FAMILY COLUBRIDAE

Coluber constrictor mormon	Western Yellow-bellied Racer
Pituophis melanoleucus deserticola	Great Basin Gopher Snake
Thamnophis sirtalis fitchi	Common Garter Snake; Valley Garter Snake

FAMILY VIPERIDAE

Crotalus viridis lutosus	Great Basin Rattlesnake

ARTHROPODS CHARACTERISTIC OF
THE VALE EAR OIL AND GAS EAR AREA

PHYLUM ARTHROPODA
CLASS Arachnida

Spiders - Quite a variety of species which are undoubtedly typical of the Intermountain/Great Basin sagebrush rangelands.
Wood ticks - The genus Dermacentor is seasonally abundant. Ticks of this genus have been known to transmit Rocky Mountain Tick Fever to humans.

CLASS Insecta - Certain species have a high impact upon agriculture but these species generally do not occur in the big sagebrush rangelands typical of the geothermal interest area.

Aphids - Occasionally on sagebrush, bitterbrush, and other species.
Lice - Frequently found on birds and mammals of the area. Many species are host specific to individual vertebrate species.
Red ants - Probably the most obvious insect species present on a permanent basis. Common throughout the area. Capable of inflicting painful bites to humans and other mammals.
Alkali bees - Insects of the genus Nomia, are common in beds near agricultural lands. A beneficial insect which pollinates legume seed crops.
Leaf-cutter bees - Species of the genus Megachile are used for the pollination of legume seed crops. These are raised by many local farmers; wild populations are common.
Stink beetles - Especially abundant in the autumn.
Lady bugs - Common during the summer, especially near agricultural lands.
Grasshoppers - Abundant on a cyclic basis; numerous species.
Crickets - Occasional to common.
Mormon cricket - Highly cyclic, generally uncommon here.
Flies - Deer flies, horse flies, bat flies, house flies, etc., are numerous and very evident. Face and heel flies harass livestock during the summer.
Mosquitos - Seasonally abundant in the proximity of the Cow Lakes, Cow Creek, portions of the Owyhee River, and irrigated farm lands.
Sagebrush web worm - Aroga websteri, a sagebrush defolient which is cyclic in nature, locally abundant.
Tent caterpiller - Common on bitterbrush.
Moths - Super-abundant night-flying species during the hot summer and early autumn. Numerous species.
Butterflies - Numerous species, many related to individual plant species.
Wheatgrass bugs - Irbisia pacifa and other genera, occasionally numerous on crested and bluebunch wheatgrasses.
Beet leaf hopper - utilizes wild mustards in life cycle; carrier of curley top, a destructive virus disease of sugar beets.

Spiders - Quite a variety of species which are undoubtedly present when the [illegible] sagebrush rangelands.
Wood ticks - The genus Dermacentor is seasonally abundant. [illegible] Rocky Mountain Tick Fever is [illegible].

[illegible] Insects - Certain species have a high impact upon [illegible] those species generally do not occur in the big sagebrush [illegible] of the [illegible] area.

Aphids - Occasionally on sagebrush, bitterbrush, and other [illegible]
Lice - Frequently found on birds and mammals of the area. Many species are host specific to individual vertebrate species.
Bed bugs - [illegible] insects common on a [illegible] throughout the area. [illegible] and other [illegible].
Alkali bees - [illegible] Nomia, [illegible] of alfalfa.
Leaf-cutter bees - [illegible] of the genus Megachile are used for the pollination of legume seed crops. These are raised by many local [illegible] populations are common.
[illegible] beetles - [illegible] abundant in the autumn.
Lady bugs - Common during the summer, especially near agricultural lands.
Grasshoppers - Abundant on a cyclic basis; numerous species.
Crickets - [illegible] common.
[illegible] generally uncommon here.
Flies - [illegible] flies, horse flies, bot flies, house flies, [illegible] and very [illegible] and [illegible] flies become [illegible] during the summer.
Mosquitoes - [illegible] in the proximity of the [illegible] Creek [illegible] of the Wyoming River, and irrigated [illegible] lands.
Sagebrush [illegible] - [illegible] a sagebrush defoliator which is cyclic in nature, locally abundant.
Tent caterpillar - Common on bitterbrush.
Moths - [illegible] abundant night-flying species during the hot summer and early autumn. Numerous species.
Butterflies - [illegible] species, many related to individual plant species.
Wheatgrass bugs - [illegible] and other genera, occasionally numerous on crested and bluebunch wheatgrasses.
Beet leaf hopper - [illegible] wild mustards in life cycle; carrier of curly top, a destructive virus disease of sugar beets.

APPENDIX E

COMPREHENSIVE LAND USE PLAN
FOR MALHEUR COUNTY, 1973

This Comprehensive land Use Plan, prepared by the Malheur County Planning Commission, is not included in this reproduction of the Vale Geothermal E.A.R. A copy of this 44 page plan may be viewed at:

1. The BLM District Office at Vale, Oregon.
2. The BLM State Office at Portland, Oregon.
3. The County Records of Malheur County at Vale, Oregon.

APPENDIX F

MALHEUR COUNTY ZONING ORDINANCE

This zoning ordinance is not included in this reproduction of the Vale Geothermal E.A.R. A copy of this 56 page ordinance may be viewed at:

1. The BLM District Office at Vale, Oregon.

2. The BLM State Office at Portland, Oregon.

3. The County Records of Malheur County at Vale, Oregon filed as Microfilm Instrument No. 148901 (Filed 8/17/1973).

APPENDIX G

LETTER SOLICITING COMMENTS ON ENVIRONMENTAL IMPACT OF OIL AND GAS LEASING IN THE VALE E.A.R. AREA WITH A LIST OF INDIVIDUALS TO WHOM THE LETTERS WERE SENT AND REPLIES TO ENQUIRIES.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
P. O. Box 700
Vale, Oregon 97918

IN REPLY REFER TO

3100

The Vale District office of the Bureau of Land Management is in the process of writing an environmental analysis report on the effect of oil and gas leasing and development on Federal lands within the area outlined on the enclosed map.

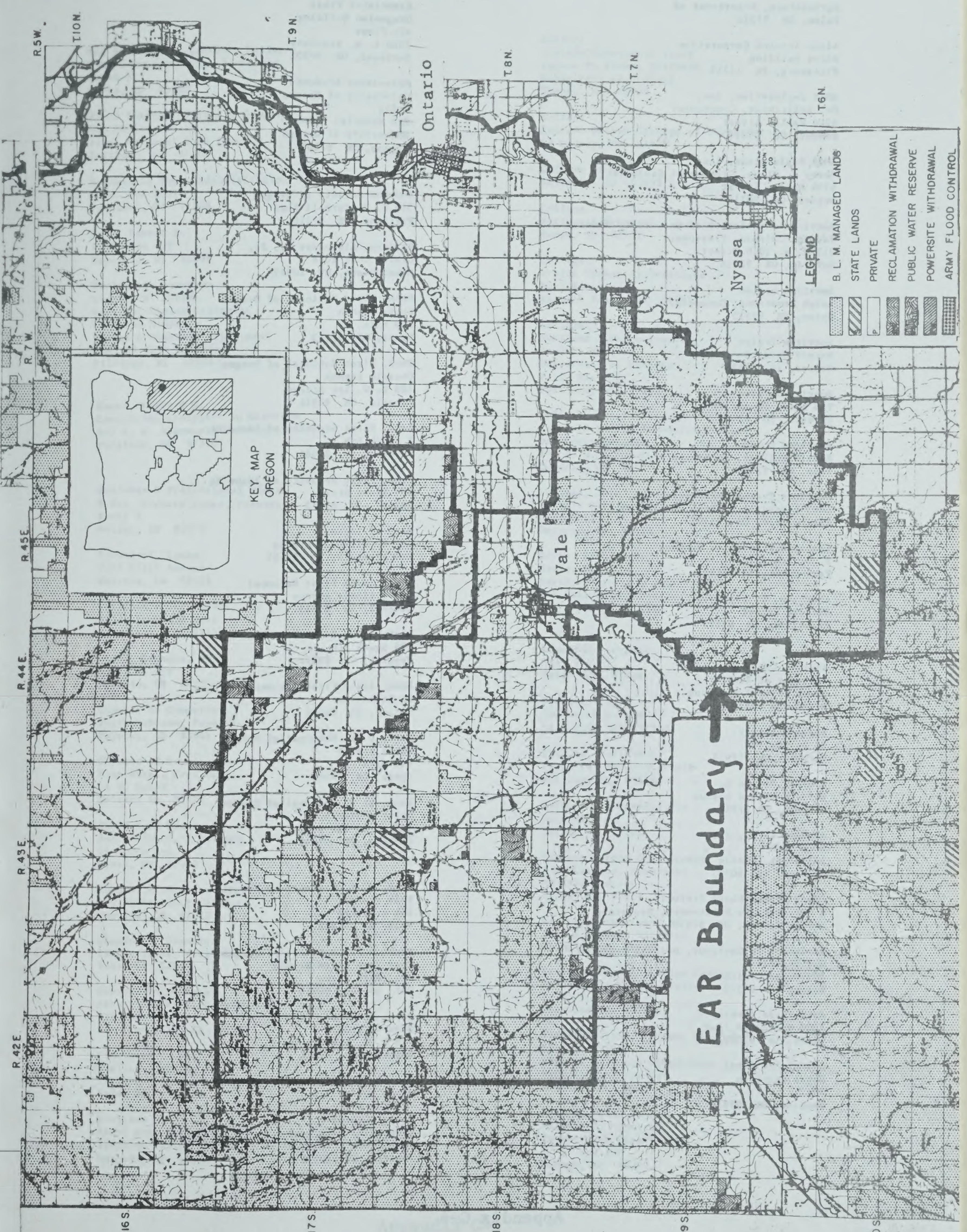
If you have any comments on the environmental effect of such leasing and development, or suggestions on mitigating measures that should be taken to protect the environment during oil and gas development, please submit them in writing to the Vale District Manager at the above address by mail postmarked not later than June 18, 1976.

Sincerely yours,

W. R. Papworth
ACTING DISTRICT MANAGER

Encl. (1)
1 - Map

AMERICAN REVOLUTION BICENTENNIAL 1776-1976



Ontario
Vale
Nyssa
EAR Boundary
KEY MAP OREGON
LEGEND
B. L. M. MANAGED LANDS
STATE LANDS
PRIVATE
RECLAMATION WITHDRAWAL
PUBLIC WATER RESERVE
POWERSITE WITHDRAWAL
ARMY FLOOD CONTROL
R.5W.
R.6W.
R.7W.
R.45E.
R.44E.
R.43E.
R 42E.
T.10N.
T.9N.
T.8N.
T.7N.
T.6N.
T.16S.
T.17S.
T.18S.
T.19S.
T.20S.

Appendix G-3

Agriculture, Department of
Salem, OR 97310

Alcoa Service Corporation
Alcoa Building
Pittsburg, PA 15219

AMAX Exploration, Inc.
Mr. Dellechaie, Geochemist
4704 Harlan Street
Denver, CO 80212

AMAX Exploration, Inc.
Harry J. Olson, Geothermal Geologist
4704 Harlan Street
Denver, CO 80212

American Association of University Women
Pauline Coleman, President
315 N. W. 10th Street
Ontario, OR 97914

American Legion
Ralph Armstrong, Commander
Nyssa, OR 97913

American Legion
Harold Ward, Commander
Weiser, ID 83672

American Legion
Tom Reed, Commander
Payette, ID 83661

American Legion
Ronald Hellman, Commander
Vale, OR 97918

American Thermal Resources, Inc.
5405 Stockdale Highway, Suite 205
Bakersfield, CA 93305

Anadarko Production Company
P. O. Box 9317
Fort Worth, TX 76107

Anderson, C. L., Mayor
522 1st Street
Fruitland, ID 83619

Andrus, Cecil
Governor of Idaho
State Capitol Building
Boise, ID 83700

Argus Observer
P. O. Box 130
Ontario, OR 97914

Arment, Horace L.
1016 S. W. 2nd Avenue
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Armour, L. H., Jr.
Room 1940
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Arock Grange-Hazel Fretwell
% Mrs. Lucille Montgomery, Secretary
Jordan Valley, OR 97910

Assistant to Governor, Natural Resource
Hal Brauner
109 State Capitol
Salem, OR 97310

Associated Press
1200 N. Curtis Road
Boise, ID 83704

Associated Press
Duane Kerttula
KYET
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Associated Press
Oregonian Building
4th Floor
1320 S. W. Broadway
Portland, OR 97201

Associated Students
University of Oregon
M-111
Erb Memorial Union
University of Oregon
Eugene, OR 97403

Audubon Society of Oregon
515 N. W. Cornell Road
Portland, OR 97210

Baldwin, Alexander T., Jr.
Croton Lake Road
Mount Kisco, NY 10549

Bank, First National of Oregon
Nyssa Branch
209 Main
Nyssa, OR 97913

Bank, First National of Oregon
Ontario Branch
189 S. W. 1st Street
Ontario, OR 97914

Bank, First Security of Idaho NA
2 South 8th
Payette, ID 83661

Bank, First Security of Idaho NA
407 State Street
Weiser, ID 83672

Bank of Idaho
130 N. Plymouth Avenue
New Plymouth, ID 83655

Bank, Idaho First National
210 Illinois Avenue
Council, ID 83615

Bank, Idaho First National
105 South 8th
Payette, ID 83661

Bank, Idaho First National
34 East Main
Weiser, ID 83672

Bank, U. S. National of Oregon
Nyssa Branch
500 Main
Nyssa, OR 97913

Bank, U. S. National of Oregon
Ontario Branch
281 S. W. 1st Street
Ontario, OR 97914

Bank, U. S. National of Oregon
Vale Branch
264 A Street
Vale, OR 97918

Bank, U. S. National of Oregon
West Park Plaza Branch
West Park Plaza
Ontario, OR 97914

Bank, Western
Ontario Branch
319 S. W. 4th Avenue
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Bauman, Larry, Mayor
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Berry, George W.
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% Mrs. Judy Andregg, Secretary
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Blyth Eastman Dillion & Company
Max Millis
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Coal and Minerals
Energy & Minerals Department
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Chamber of Commerce
Jerry McBroom, President
Payette, ID 83661

Chamber of Commerce
Mike Sweet, President
46 W. Court
Weiser, ID 83672

Chamber of Commerce
Jake Fischer, President
14 South 3rd
Nyssa, OR 97913

Chamber of Commerce
Roy Probasco, President
Ontario, OR 97914

Chamber of Commerce
ZaDean Auyer, President
Vale, OR 97918

Chevron Oil Company
Attn: Mr. D. G. Couvillon
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San Francisco, CA 94104

City Desk
Capital Journal
Statesman-Journal Company
Salem OR 97301

Civitans
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Treasure Valley Community College
Ontario, OR 97914

College
Eastern Washington State
Eugene P. Kiver, Chairman
Department of Geology
Cheney, WA 98004

College
Eastern Oregon College of Education
La Grande, OR 97850

College of Idaho
Caldwell, ID 83605

College
Northwest Nazarene
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Ontario, OR 97914

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Davis, Robert B.
Davis, Edward S., Jr.
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Democrat - Herald
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Land Title Escrow Company
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Lions Club
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Payette, ID 83660

Lions Club
Leonard Adams, President
Route 3
Weiser, ID 83672

Lions Club
% Dirick Nedry
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Nyssa, OR 97913

Lions Club
Don Hammar, President
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Lions Club
Ed Morgan
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Malheur County Courthouse
Vale, OR 97918

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Earnest Scuell, President
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Dick Dickenson, President
365 S. W. 8th Avenue
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Malheur County National Farmer's Organization
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Malheur County Planning Commission
Alfred Pottnoff
Malheur County Courthouse
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Malheur Dairy Herd Improvement Association
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Malheur Dairy Wives
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Malheur Enterprise
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Vale, OR 97918

Malheur Livestock Association
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Nyssa, OR 97913

Ontario Basque Club
Dolores Echanis, President
130 S. W. 13th
Ontario, OR 97914

Ontario Heights Grange
Leo Tachida
Ontario Heights
Ontario, OR 97914

Ontario Study Club
Mrs. Lewis Bean, President
748 S. W. 4th
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Optimists
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Ontario, OR 97914

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Oregon High Desert Study Group
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Oregon, State of
Division of State Lands
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Realty, Dealy, Inc.
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Nick Eddy
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School, District #1
Brogan, OR 97903

School, District #1
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Jordan Valley, OR 97910

School District #2
Miss Sandra Mayfield
Rockville Route
Marsing, ID 83639

School, District #8C
Mike Irons
497 S. W. 3rd Avenue
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School, District #12
Mr. Denzel Weeks
Juntura, OR 97911

School, District #15
Edwin Morgan, Superintendent
604 Cottage Street South
Vale, OR 97918

School, District #26
Walter L. McPartland
Nyssa, OR 97913

School, District #29 - Annex
Howard J. Stone
Route #3
Weiser, ID 83672

School, District #42
Mel Wiseman, Principal
Route 2
Vale, OR 97918

School, District #51
McDermitt, NV 89421

School, District #61 - Adrian
Glenn E. Ward
Adrian, OR 97901

School, District #66 - Harper
Les Matthews
Harper, OR 97906

School, District #81 - Arock
Mrs. Sandra Dowell
Arock, OR 97902

School, Aiken, George Elementary
Robert Patterson
1297 West Idaho Avenue
Ontario, OR 97914

School, Elemtary
James Bolton
Adrian, OR 97901

School, Junior High
Dan Martin, Principal
Nyssa, OR 97913

School, Junior High
Eugene Bates, Principal
537 S. W. 2nd Avenue
Ontario, OR 97914

School, Lindberg Elementary
482 Southeast Third
Ontario, OR 97914

School, Middle
Frank Deymonaz
Vale, OR 97918

School, Nyssa Elementary
Melvin Monn, Principal
Nyssa, OR 97913

School, May Roberts Elementary
Alvin Hicks, Principal
590 N. W. Eighth
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School Superintendent
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Nyssa, OR 97913

School, Senior High
Gary Wells
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School, Union High, District #3
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Malheur County District Attorney
Vale, OR 97918

United States Department of the Interior

IN REPLY REFER TO
3100

BUREAU OF LAND MANAGEMENT
P. O. Box 70
Vale, Oregon 97918

JUN 7 1976

DEPARTMENT OF THE INT
BUREAU OF LAND MANAG

MAY 25 1976

Gulf Mineral Resources Company
Glen E. Campbell Geothermal Exploration
Gulf Building
1780 South Bellaire Street
Denver, CO 80222

Gentlemen:

The Vale District office of the Bureau of Land Management is in the process of writing an environmental analysis report on the effect of oil and gas leasing and development on Federal lands within the area outlined on the enclosed map.

If you have any comments on the environmental effect of such leasing and development, or suggestions on mitigating measures that should be taken to protect the environment during oil and gas development, please submit them in writing to the Vale District Manager at the above address by mail postmarked not later than June 18, 1976.

Sincerely yours,

W. R. Papworth
ACTING DISTRICT MANAGER

Encl. (1)
1 - Map

No comment
GEC
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GULF OIL CORPORATION
CASPER AREA

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

OREGON STATE HIGHWAY DIVISION

Region 5 Office

P. O. Box 850 ... La Grande, Oregon 97850 ... Phone 963-3177

ROBERT W. STRAUB
GOVERNOR

F. B. KLABOE
Administrator and
State Highway Engineer

June 4, 1976

Mr. W. R. Papworth
Acting District Manager
Bureau of Land Management
P. O. Box 700
Vale, Oregon 97918

Dear Mr. Papworth:

The Oregon State Highway Division has considered the effects of oil and gas leasing and development on Federal lands surrounding Vale as outlined on the map enclosed with your letter of May 25, 1976, and can see no adverse effects upon our property as a result of this activity. We would, however, like to point out that we do have material sources in this area and would not want this to hamper our operation of these material sources.

Also, we do expect all laws and regulations relevant to highway matters to be complied with.

Thank you for the opportunity to comment on this.

Sincerely,

W. E. Schwartz
Regional Engineer

By [signature]

Bob Aldrich
Regional Office Engineer

BA:sh

cc H. S. Coulter w/attach
R. L. Schroeder "
C. K. Ansell "

Earth Power Corporation

522 South Boston Ave.
P. O. Box 1566, Tulsa, Ok. 74101

June 2, 1976

Re: 3100

Mr. W. R. Papworth
Acting District Manager
United States Department of the Interior
Bureau of Land Management
P. O. Box 700
Vale, Oregon 97918

Dear Mr. Papworth:

I can see no adverse environmental effect of oil and gas leasing and/or development in the proposed study area.

~~Sincerely~~ yours,

Ronald C. Barr
President

United States Department of the Interior

NATIONAL PARK SERVICE
Pacific Northwest Region
Fourth and Pike Building
Seattle, Washington 98101

IN REPLY REFER TO:
L7619
(PNR)PCC

June 14, 1976

Mr. W. R. Papworth
District Manager
Bureau of Land Management
P.O. Box 700
Vale, Oregon 97918

Dear Mr. Papworth:

In response to your request for comments on the effect of oil and gas leasing and development on federal lands near Vale, Oregon, we offer the following suggestions.

The "National Register of Historic Places" and the Oregon State Historic Preservation Officer should be consulted to determine if sites on, or eligible for, the National Register are located within the project zone. If there are, the procedures of the Advisory Council on Historic Preservation (36 CFR 800) should be followed.

To ensure that historical resources are given proper consideration it is also necessary to comply with the National Historic Preservation Act of 1966 and Executive Order 11593, "Protection and Enhancement of the Cultural Environment." We suggest this be done in the same manner as other aspects of the environment--i.e., they should be inventoried, their significance evaluated, impacts upon them assessed, and mitigative measures discussed in your report.

Sincerely yours,

Glenn D. Gallison
Associate Regional Director,
Planning and Resource Preservation

RECEIVED
JUN 18 1976
DEPARTMENT OF THE INT
BUREAU OF LAND MANAGEMENT

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Division of Ecological Services
Portland Field Office
919 N. E. 19th Avenue
Portland, Oregon 97232

June 14, 1976

MEMORANDUM

To : District Manager, Bureau of Land Management, Vale, Oregon

From : Field Supervisor, Ecological Services, Fish and Wildlife Service, Portland, Oregon

Subject: Effects of Oil and Gas Leasing in the Vale Area (Reference 3100)

Your office has requested our comments concerning the effect of oil and gas leasing and possible development on a large scale area near Vale, Oregon.

The general area shown on the map accompanying the request does not clearly identify actual leases. Many species of fish and wildlife are present in the indicated area, and oil and gas exploration and development may cause serious losses depending on the location and extent of development.

Oil and gas development in the area would cause some disturbance of fish and wildlife habitat. How much disturbance would depend on what care is taken to avoid detrimental exploration and construction practices. Improper road construction, for example, can result in denuded hillsides and streambanks. Such practices often lead to erosion problems which, in turn, can result in deteriorating water quality and loss of fish and wildlife habitat.

Our primary concern is to preserve the lease-site environment. To accomplish this goal, we recommend strict adherence to the water quality regulations of the Department of Environmental Quality regarding land development. Should they apply, the proposed regulations recommended by the Division of State Lands regarding leasing activities should be considered. In addition, we would appreciate being contacted prior to actual selection of a specific lease site(s) so that we may provide more detailed input early in the planning process. We would also be interested in attending any future public meetings which may be scheduled to discuss the above lease sites.

RoWeaver

for John W. Kincheloe

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1500 N.E. IRVING STREET
P.O. BOX 3737
PORTLAND, OREGON 97208

Reference: OBS

May 28, 1976

To: District Manager, Vale District Office, BLM, Vale, Oregon

From: Assistant Regional Director/Environment, FWS, Portland, Oregon

Subject: Request for input to oil and gas EAR (your May 25 request)

We are forwarding your request to our Ecological Services Portland Field Office. They are responsible for handling such activities in the State of Oregon.

Because we are not funded for oil and gas activities, our inputs may be less specific and less halpful than we would like. Nonetheless, we appreciate being informed of your EAR preparation and will make every possible attempt to help you.

You will be hearing directly from the ES field office before June 18. Similar requests in the future can be sent directly to them at:

Field Supervisor
Division of Ecological Services
U. S. Fish and Wildlife Service
P. O. Box 3737
(919 NE 19th Avenue)
Portland, Oregon 97208

for James W. Teeter

JUN 3 1976

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division
P. O. Box 3202
Portland, Oregon 97208

June 1, 1976

Mr. W. R. Papworth
Acting District Manager
Bureau of Land Management
P. O. Box 700
Vale, Oregon 97918

Dear Mr. Papworth:

The only comment this office can make, at this time, concerning your environmental analysis report on the effect of oil and gas leasing is to emphasize the need to analyze the impact of such development on surface and ground water. Mitigating measures should be designed to protect the quality of water, and the environmental analysis report should include an assessment of the amount of water to be diverted from other uses for the development.

Sincerely,

Stanley F. Kapustka

Stanley F. Kapustka
District Chief

JUN 3 1976

11 1976

STATE OF WASHINGTON

OFFICE OF THE GOVERNOR

OLYMPIA

DANIEL J. EVANS
GOVERNOR

June 10, 1976

Mr. W. R. Papworth
Acting District Manager
Bureau of Land Management
P. O. Box 700
Vale, Oregon 98918

Dear Mr. Papworth:

Thank you for your letter of May 25 notifying me of your district's intention to prepare an environmental analysis report on oil and gas leasing and development on federal lands.

Since this activity would be entirely within the State of Oregon, I am not able to give you site-specific suggestions. However, the Washington State Department of Ecology recently commented on an environmental analysis report prepared by your Spokane District on oil and gas leasing in Washington. I am enclosing that reply for your information.

Sincerely,

Daniel J. Evans

Daniel J. Evans
Governor

sp
enclosure

May 26, 1976

State of Washington
Department of Ecology

Richard L. Schaertl
District Manager
U. S. Dept. of the Interior
Bureau of Land Management
Spokane District Office
Room 551, U. S. Courthouse
Spokane, Washington 99201

SUBJECT: Comments on EAR for Proposed Federal Oil and Gas Leasing in Washington

Dear Mr. Schaertl:

Thank you for sending us the subject document. Representatives of the Department of Ecology have reviewed it and offer the following comments:

1. The mitigative measures presented seem quite good. Certainly, your decision on whether to prepare an EIS will depend, to a large extent, on the mitigative measures actually incorporated.

2. Water quality is a major concern of this Department. As indicated by this report, severe water quality problems could result from exploration activities poorly placed in space or time. Specific projects should be coordinated with our Department in that site-specific information we possess might contribute to site-specific mitigative requirements. We would need information on time, place, equipment, operations, disposition of wastes and steps planned to prevent water pollution.

It is hoped that these comments will be of assistance. A more detailed analysis will have to await the kind of information mentioned above. Specific requests for information should be directed to either our Central Regional Office--2802 Main Street, Union Gap, Washington 98903 (Attention: Clar Pratt) phone: 575-2800 or our Eastern Regional Office--East 103 Indiana, Spokane, Washington 99207 (Attention: John Arnquist) phone 456-2926.

Sincerely,

T. L. ELWELL
Environmental Review

TLE:cls

cc: Clar Pratt
John Arnquist

Thermal Resources Inc.

~~MAILING ADDRESS:
P.O. BOX 7406
TULSA, OKLAHOMA 74101~~

BUSINESS ADDRESS:
39 BROADWAY
NEW YORK, NEW YORK 10005

June 2, 1976

Re: 3100

Mr. W. R. Papworth
Acting District Manager
United States Department of the Interior
Bureau of Land Management
P. O. Box 700
Vale, Oregon 97918

Dear Mr. Papworth:

I can see no adverse environmental effect from the development of oil and gas in the proposed area.

Sincerely yours,

Oliver R. Grace

JUN 1 1976

OREGON PROJECT NOTIFICATION AND REVIEW SYSTEM

JUN 11 1976

STATE CLEARINGHOUSE

Intergovernmental Relations Division
240 Cottage Street S.E., Salem, Oregon 97310
Leslie Lehmann, Coordinator Phone: 378-3732

PROJECT ACKNOWLEDGEMENT

APPLICANT: Bureau of Land Management

PROJECT TITLE: Effect of Oil and Gas Leasing in Vale, Oregon

DATE RECEIVED: June 1, 1976

PNRS #: 7606 5 230

Your project has been assigned the file title and number that appear above. Use this reference in all future correspondence regarding this project.

- [ ] Initial 30-day State Clearinghouse review of your Notice of Intent began on the above date.
- [ ] The 30-day State Clearinghouse review of your final application began on the above date.
- [ ] Initial 30-day State Clearinghouse review of this HUD Housing project began on the above date.
- [XXX] Initial 30-day State Clearinghouse review of your Direct Federal Development project began on the above date.
- [ ] The 30-day State Clearinghouse review of your final Environmental Impact Statement began on the above date.
- [ ] Initial 45-day State Clearinghouse review of your draft Environmental Impact Statement began on the above date.
- [ ] The 45-day State Clearinghouse review of your State Plan/Amendment began on the above date.

If you have questions or need assistance, contact the State Clearinghouse at the above address and telephone number.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
16th Floor, 1220 S. W. Third, Portland, Oregon 97204

June 2, 1976

[illegible] JUN 8 1976 [illegible]
[illegible] DEPARTMENT OF THE INTERI[illegible] [illegible] OF LAND MANAG[illegible]NT

Mr. W. R. Papworth
Acting District Manager
Bureau of Land Management
P. O. Box 700
Vale, Oregon 97918

Dear Mr. Papworth:

We have no comments at this time on the environmental effects of oil and gas leasing and development on Federal lands in the Vale District. We appreciated the opportunity to review the planned leasing.

Sincerely yours,

Guy W. Nutt
State Conservationist

STATE OF OREGON 1859
ROBERT W. STRAUB
GOVERNOR

PARKS AND RECREATION BRANCH
DEPARTMENT OF TRANSPORTATION

525 TRADE STREET S.E. • • SALEM, OREGON • • 97310

RECEIVED
JUN 8 1976
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

June 3, 1976

Mr. W.R. Papworth
Bureau of Land Management
PO Box 700
Vale, Oregon 97918

Dear Mr. Papworth:

This letter is in response to your communication of May 25 (No. 3100) regarding oil and gas leasing in your district.

After a careful review of our files and those of the Museum of Natural History in Eugene, our office can offer the following information. Only an extremely small portion of the area has been surveyed for archeological or historical resources. This survey indicates, however, that the entire area should be very rich in cultural resources. The one survey that has been done covered only two sections in the Bully Creek area, but seven archeological sites were located.

Our office would like to request that any areas where ground-disturbing activities are to take place be carefully surveyed by competent professionals in history and archeology. When we have received a copy of the cultural resources survey we may then write off on the cultural resources to be affected and proposed mitigation measures. If your office does not maintain a list of qualified surveyors, we would be happy to supply you with one.

If our office can be of assistance to you in any way on this project, do not hesitate to contact us.

Sincerely,

Edward T. Long

Edward T. Long
Historic Preservation Archeologist
State Historic Preservation Office

EL:ko

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Region 6
P.O. Box 3623, Portland, Oregon 97208

8420

June 18, 1976

W. R. Papworth, Acting District Manager
Department of the Interior
Bureau of Land Management
P.O. Box 700
Vale, Oregon 97918

Dear Mr. Papworth:

We appreciate your consideration with respect to preparation of an Environmental Analysis Report on effect of oil and gas leasing in the immediate area around Vale.

The nearest National Forest lands are approximately 30 miles northwest of the proposed lease area.

We do not anticipate any major impact on National Forest from oil and gas leasing as shown on map attached to your 3100 letter. In the event a major discovery is made and cross-country transportation of oil or gas is expected by pipeline across National Forest lands, the environmental impacts of this should be made a part of the report.

Sincerely,

C. MERLE HOFFERBER
Director
Lands and Minerals

JUN 2 · 1976

ECEIVED

JUL

DEPARTMENT OF THE INTERIOR
EAU OF LAND MANAGEMENT
Vale Office

AN EQUAL OPPORTUNITY EMPLOYE

EXECUTIVE DEPARTMENT

INTERGOVERNMENTAL RELATIONS DIVISION

240 COTTAGE STREET S.E. • • • • SALEM, OREGON 9731

ROBERT W. STRAUB
GOVERNOR

STAFFORD HANSELL
Director

July 14, 1976

W. R. Papworth
Acting District Manager
Bureau of Land Management
Post Office Box 700
Vale, OR 97918

Dear Mr. Papworth:

Re: Effect of Oil & Gas Leasing
in Vale, Oregon
PNRS #7606 5 230

The State Clearinghouse has received additional comments on your project from the Department of Land Conservation and Development subsequent to our conclusion letter of June 30, 1976. LCDC comments as follows:

ADDITIONAL COMMENTS FOR PROJECT IMPROVEMENT: The effect of leasing and possible development on local communities and the county should be examined in light of the local comprehensive plans and efforts to update plans to reach compliance with the state goals. All actions should be closely coordinated with local jurisdictions.

Please consider these comments an addendum to our previous letter.

Sincerely,

William H. Young

William H. Young
Administrator

WHY:llh